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The Impact of Coronavirus Pandemic on Romania's Economic Development

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Abstract: - The world is passing through the most difficult exogenous crisis in the history, which severely affects its stability in the long term, risking an uncontrolled slide into uncertainty. Compare to 2008 global financial crisis generated by non-performing loans and their securitization, the new corona virus (COVID19), which appeared in China in late 2019 and turned into an epidemic since January 2020, has severely affected the entire world economy. The pandemic is imposing a heavy burden on individuals and societies and putting health care systems under severe strain. It is obvious that the pandemic will pass, especially in the context of COVID-19 vaccines authorised in the EU following the positive recommendation of the European Medicines Agency fora conditional marketing authorisation for the BioNTech and Pfizer vaccine, Moderna, Johnson and Johnson and Astrazeneca too, but it will leave behind a severe economic crisis. The study is trying to present the main causes and characteristics of the crisis, with special attention to its impact on Romania, which has witnessed an economic downturn in the first half of 2020, registering a decline in Hospitality industry, manufacturing, distribution (other than consumer goods) and transport. To deal with high budget, Romania issued 3,3 billion euros worth of bonds at the end of May 2020. But, in the long term, the external debt burden is increasing, the sustainable development of Romania facing new risks arising from both the global crisis and the internal vulnerabilities.

Key words: - international crisis, global recession, causes and effects of the crisis, anti-crisis remedies, external debt, sustainable development.

1 Introduction

By December 2020, in the first year of coronavirus pandemic, were affected almost all countries and more than 60 million people all over the world. It has governments operating in a context of confusion, and experienced with difficult trade-offs given the health, economic and social challenges it raises. By spring 2020, more than half of the world's population had experienced a lockdown with constraint measures.

The measures taken by states to reduce the effects of the health crisis have been severe, the most important being stopping non-essential activities, restricting travel and banning travel to and from certain countries and causing shocks in production and distribution chains, but also strong contraction of demand for a wide range of goods and services.

Beyond the health and human tragedy of the coronavirus, it is now widely recognised that the pandemic triggered the most serious economic crisis since World War II. Many economies will not recover their 2019 output levels until 2022 at the earliest[1]. All economic sectors are affected by disrupted global supply chains, weaker demand for imported goods and services, a drop in international tourism[2], a decline in business travel,

[1] OECD (2020), OECD Economic Outlook, Interim Report September 2020, OECD Publishing, Paris, https://dx.doi.org/10.1787/34ffc900-en

[2] OECD (2020), Covid-19: Tourism Policy Responses (as of 25 March 2020), https://read.oecd-ilibrary.org/view/?ref=124_124984-7uf8nm95se&title=Covid-19_Tourism_Policy_Responses.

and most often a combination of these. Measures to contain the virus' spread have hit SMEs and entrepreneurs particularly hard[3].

This paper highlights the strong territorial impact of the COVID-19 crisis. Romanian government was at the frontline of the crisis management and recovery plan. It reacted quickly, applying a place-based approach to policy responses, and implementing national measures for in response to the COVID-19 crisis. Also, this paper looks at the impact of the crisis on the main sectors, as Romania is facing new risks.

It is known that the first signs of the financial crisis of the last decade appeared in the second half of 2007, but it took a while for the crisis to spread globally, culminating in the bankruptcy of Lehman Brothers in September 2008.

According to OECD[4], the recovery of OECD regions after the 2008 global financial crisis took years. In more than 40% of OECD and EU regions, even seven years after the start of the crisis, per capita GDP was still below pre-crisis levels. In contrast, the crisis created by the new Corona virus started and spread globally in a very short time, just a few months.

COVID-19 proved unique in its generation of both a supply side and a demand side shock, and its impact on all sectors and global regions. Governments had to manage the economic recovery and to mitigate the impact of a second and in some regions, even the third wave of the virus.

The COVID-19 crisis had a strong territorial dimension with significant policy implications for managing its consequences[5] and two central considerations for policy makers were:

The regional and local impact of the crisis was highly asymmetric within countries. In economic terms, the impact of the crisis was differing across regions, at least in its initial stages. Differentiating factors include a region's exposure to tradable sectors, its exposure to global value chains and its specialisation, such as tourism.

Subnational governments were responsible for critical aspects of containment measures, health care, social services, economic development and public investment, putting them at the frontline of crisis management, coordinated effort being critical.

2 The impact of the economic crisis engendered by COVID-19

The economic impact of the COVID-19 crisis is different across countries, depending on its exposure to tradable sectors and global value chains. Countries with economies that are heavily dependent on tourism such Greece, Italy, France etc. will be more affected by the coronavirus than other regions.

In the US for example, analysis of county-level infection by Brookings and economic data shows that the nation's COVID-19 case load not only remains heavily concentrated, but that the hardest-hit counties and metropolitan areas constitute the very core of the nation's productive capacity. According to Brookings, the 50 hardest-hit US counties "support more than 60 million jobs and 36% of its GDP"[6]. CARES, the Coronavirus Aid Relief and Economic Security Act, adopted by Trump, contains $560 billion that directly benefited individuals in the form of cash payments of up to $1,200. The legislation also expands unemployment and paid sick/family leave benefits, offers forbearance on federally backed mortgages, waives penalties on some early retirement withdrawals, and offers student loan relief and protections for renters. The aid package is the largest in U.S. history, dwarfing the $800 billion pumped into the economy by the American Recovery and Reinvestment Act of 2009.That money helped the country emerge from the Great Recession, but the rebound also cracked open a much larger wage gap.

All subnational government transactions[7] are likely to be highly affected by the crisis in the short and medium terms. A detailed analysis of the expected impact on expenditure, revenue, debt management and access to new borrowing permits identifying their contribution to changes in subnational government finance (see Figure 1).

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[3] OECD (2020), Covid-19: SME Policy Responses (as of 16 March 2020), https://www.oecd.org/cfe/leed/COVID-19-Italian-regions -SME-policy-responses.pdf.

[4] Organisation for Economic Co-operation and Development (OECD) "The territorial impact of COVID-19: Managing the crisis across levels of government"; https://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-COVID-19-managing-the-crisis-across-levels-of-government-d3e314e1/

[5] Ibidem 4

[6] Muro, Whiton and Maxim (2020), "COVID-19 is hitting the nation's largest metros the hardest, making a "restart" of the economy more difficult", *The Avenue, Brookings*, https://www.brookings.edu/blog/the-avenue/2020/04/01/why-it-will-be-difficult-to-restart-the-economy-after-covid-19/?utm_campaign=brookings-comm&utm_source=hs_email&utm_medium=email&utm_content=85726548

[7] OECD-CoR (2020), The impact of the COVID-19 crisis on regional and local governments: Main findings from the joint CoR-OECD survey, http://www.oecd.org/regional/multi-level-governance.htm.

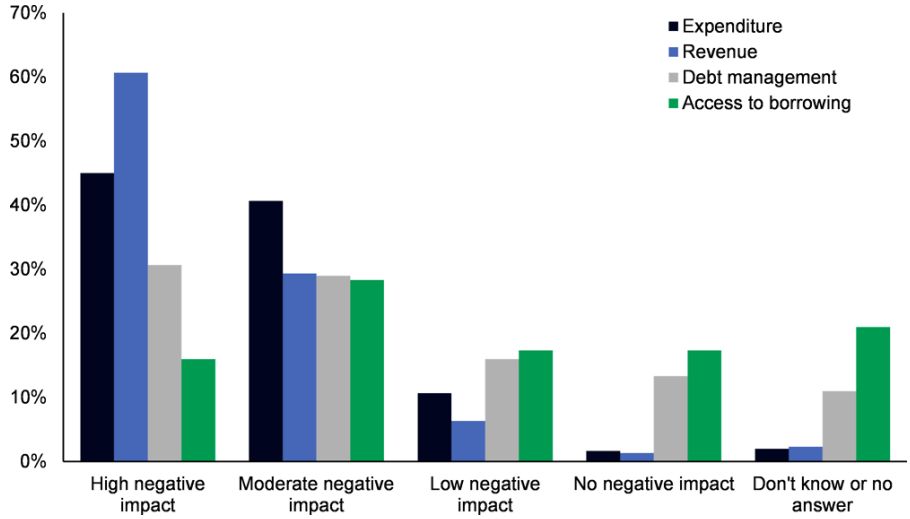

Figure 1: Source OCDE

Romania implemented restrictive measures in the spring of 2020 and had to reinstate some of them in the second and third wave in November 2020 and March 2021. Romania's national government faces strong pressure on expenditure and reduced revenue, thus increasing deficit and debt. While the crisis has already put short-term pressure on health and social expenditures and on different categories of revenue, the strongest impact is expected in the medium term.

In Romania, the effect of fiscal measures taken during emergencies and alert on the public budget for the budget is almost 1.5% of GDP which is added over the budget deficit of 4.6% in 2019 as a result of poor revenue collection budget, the high share of rigid expenditures in tax revenues, but also a lower collection of dividends from state-owned companies and the payment of state debts to private companies. The widening of the deficit from 2.8% of GDP in 2018 to 4.6% was determined by a decrease in total revenues of 0.1 percentage points and an increase in total expenditures by 1.7 percentage points. The increase of the budget deficit has been one of the main drivers of the deepening of the current account deficit in recent years, fiscal easing leading to an increase in household income over domestic supply capacity.

The government deficit increased due to a higher cost of public officials' wages and an increase in old-age pensions. Due to this this expansionary fiscal policy, in the first eleven months of 2020, Romania's general government debt went up by 24% (EUR 18.4 bln) to EUR 95.2 bln at the end of November 2020. The public debt to GDP ratio rose by 9.1pp to 44.4% of GDP at the end of November, from 35.3% at the end of 2019.

In April 2020, the excessive deficit procedure[8] was initiated on the one hand due to the breach of the budget deficit limit of 3% of the Treaty on the European Union on the entire forecast horizon, and on the other hand due to the lack of introduction of a fiscal consolidation following the warnings received from the European Commission. So, the EU Council issued a recommendation in April 2020 to close the procedure excessive deficit by 2022, a structural adjustment being proposed0.5% of GDP in 2020 and 0.8% of GDP in 2021 and 2022, respectively. Taking into account the exceptional situation and the measures taken leading to significant increase in the budget deficit, the European Commission decided to suspend provisions on the budget deficit target[9], to allow Member States to implement appropriate fiscal measures aimed at economic recovery[10].

To provide the liquidity needed to cover government spending, the central bank reduced its monetary policy interest rate to 1.25% and conducted repo operations as well as purchases of government securities on the secondary market. The reduction of the monetary policy interest rate, in three stages, confirmed the decrease of inflation in the medium and long term, at the end of 2020, the annual inflation rate being 2.1%, the lowest in the last three years.

The state also issued bonds worth 3.3 billion euros at the end of May, the highest amount obtained through an external bond issue, but the interest rate was about 1.6 percentage points higher than the issue of

[8] www.bnr.ro, Raport asupta stabilitatii financiare, An v (XV), nr.9 (19), pag.27

[9] „Communication from the Commission to the Council on the Activation of the General Escape Clause of the Stability and Growth Pact", COM (2020) 123 final.

[10] https:// ec.europa.eu/info/sites/info/files/economy-finance/letter_accompanying_the_launching_of_the_edp_for_romania_signed_evp_dombrovskiscssr_gentiloni.pdf.pdf.

January bonds, indicating an increase in risk aversion by investors. Although the rating agencies kept the evaluation of the Romanian public debt in the investment category, the outlook was changed to negative.

Regarding the evolution of GDP, except for the economic performance in the first two months of 2020, the impact of the pandemic and the state of emergency established by the Romanian authorities since March was felt, thus canceling that strong start. The first quarter of the year brought an economic stagnation (-0.04%, revised data) compared to the level of GDP in the last quarter of 2019.

According to the National Institute of Statistics, the second quarter of 2020 was the worst affected by the pandemic, bringing a record economic decline of 12.2 compared to the first quarter. This figure represents the largest decrease in the quarterly GDP of the Romanian economy, also exceeding the negative quarterly records of the economic-financial crisis of 2008-2009.

After this record decrease, the Romanian economy grew by + 5.6% in the third quarter compared to the previous quarter. Thus, in annual terms, Romania's GDP accumulated a decrease of 5.7%, both on the gross series and on the seasonally adjusted series, compared to the third quarter of 2019, which is at the same time a decrease below the national average. EU (-4.3%).

Regarding the longer-term economic outlook, UBB[11] researchers forecast that the full recovery of the economy in terms of performance in the run-up to this crisis will take about 2.5 years. The most likely scenario at the moment shows that Romania's GDP will return to the level before the pandemic during 2022, this return being conditioned by the production and efficient delivery of the vaccine against Covid-19 throughout the country, respectively the wise use of substantial EU economic support funds. For the time being, the vaccination strategy adopted at the country level has proved to be effective, considering that Romania is in the top five countries in terms of the vaccinated population until the beginning of February 2021.

Economic recovery will be mainly supported by the rebound in household consumption which accounts for 63% of GDP. Due to social distancing measures and declining incomes, it fell by 7% in 2020. Unemployment increased from 3.8% in 2019 to 7% at the end of 2020 due to loss of jobs. This rebound in household consumption has been encouraged by the government's support plan with 75% of short-time working being covered by the government and the freezing of water, gas and electricity prices. In 2021, it is expected to rebound by 3%, driven by the relaxation of health measures, but will remain constrained by lower wage growth and an increase in the unemployment rate, barring favourable provisions in the 2021 budget.

Even if the construction sector recorded a stagnation, investments concerning infrastructure and residential construction are expected to grow by 5% in 2021 and benefit from the Next Generation EU recovery plan, under which Romania will receive EUR 33 billion by 2023 (12 billion had been paid into the fund).

According to the National Institute of Statistics, Romania's trade deficit has worsened in the first 11 months of 2020, given that imports fell by 7.7% and exports fell even more by 11%. Between 1 January and 30 November 2020, exports totaled 57.1 billion euros, 11% less than in the same period in 2019.
Imports amounted to 73.5 billion euros, so that the trade deficit in the first 11 months of 2020 was 16.4 billion euros, higher by 908.7 million euros than in the same period last year.

Therefore, foreign trade fell in 2020, but will pick up again, even if its contribution to growth remains negative due to exports. Exports are expected to pick up in 2021 thanks mainly to exports of telecommunications and IT, machinery and vehicle exports. In 2021, the recovery in external demand is expected to exceed domestic demand and therefore, the trade deficit will narrow again. Also, remittances (3% of GDP) are expected to pick up when activity in the countries of expatriation resumes, in particular, Spain and Italy.

As a whole, the financial system has faced, in the context of the COVID-19 pandemic, a significant increase in uncertainty and a rapid adjustment of risk premiums in the financial markets. In the context of limiting the spread of the virus, the measures taken have generated supply chain bottlenecks and strong contraction in demand, while financial markets have faced significant increases in volatility and significant adjustments in financial asset prices.

After this virus spread globally and was declared a pandemic, the next day European stock markets reported declines of more than 10 percent, the maximum cumulative losses being over 35% in the first four months of 2020. These were similar corrections. those recorded during the financial crisis of 2007-2008. By the end of April, more than a third of these losses had already been recovered. Stock price volatility indices reached or even exceeded historical highs recorded during the 2007-2008 crisis. The oil segment was most affected by the decrease in consumption generated by the cessation or substantial slowdown of large economic activities consuming petroleum products and the introduction of social distance measures.

[11] https://news.ubbcluj.ro/perspectivele-economiei-romanesti-in-contextul-pandemiei-pe-baza-analizelor-efectuate-de-cercetatorii-ubb/

Regarding the Bucharest Stock Exchange, the BET[12] index decreased by about 30% by the end of March, following the evolutions of the main international indices, such as the S&P 500, DJIA, FTSE 100 and DAX, which experienced decreases of around 35%, recovery of losses in a percentage of approximately 80% - 85% taking place in the next 2 months. During this period, the Bucharest Stock Exchange was in the same trend of high volatility, in correlation both with the number of new cases of illness and as an effect of reducing the activity of enterprises in most fields of activity. The same strongly negative correlation, of - 0.81, was found in the case of the evolution of the BET index compared to the evolution of the number of new cases of diseases in China. On the other hand, the analysis of the correlation between the BET index and the number of new cases in the USA resulted in a moderate negative correlation of -0.46, which decreased as the number of new cases of diseases decreased. Thus, the reaction of the local stock market was in the general context of the evolution of international stock exchanges that reacted to the first signs of pandemic in China, the effects of pandemic transmission later in the US being already absorbed by capital markets.

Overall, the evolution of capital markets was in V, respectively in broad reductions in stock market indices, followed by a fairly rapid recovery, which does not take into account the long-term economic fundamentals, highlighting the decoupling of stock markets from the real economy.

3 Conclusions

The economic recovery, after the crisis of 2008-2009, was generated mainly by consumption, and investments remained at a modest level. In this sense, capital inflows are vital to adequately stimulate the transition from economic growth based on stimulating aggregate demand to one based on lasting growth of aggregate supply, by significantly improving the performance of factors of production. Public debt can only fuel economic growth if the total amount of revenue generated by debt is higher than the total debt balance. If the public debt increases as a result of financing current budget expenditures, there will be negative effects in the medium and long term in the economy.

This increased public debt will soon turn into a higher financing cost for our country. Country risk will be felt in the prices of treasury securities and CDS. An economy in dire need of financing will face limited access to primary markets and high interest rates. As such, dynamic economic growth must be doubled by the adoption of structural reforms and fiscal consolidation.

With regard to encouraging SME entrepreneurship, additional measures are needed. According to the Country Report launched by the European Commission in 2018[13], "SMEs in Romania would benefit from a larger capitalization, simplification of the insolvency framework and mobilization of additional private sources of financing, supported by the financial instruments of EU. It is estimated that an initiative signed with Romania by the Commission and the European Investment Bank will generate approximately EUR 500 million in the form of new loans to SMEs on favorable terms".

"Given the increasingly dynamic ecosystem in which it operates, the expansion of start-ups remains a challenge. Despite increased public support through the Start-up Nation program, the expansion of existing companies is hampered by a lack of clear legislation, an administrative burden, a lack of qualified staff and a low level of innovation.

The percentage of Romanian companies with an accelerated growth rate is among the lowest in the EU. Entrepreneurs who have set up a company do not have access to business mentoring, and school curricula are not aligned with the needs of future entrepreneurs". The challenges of the business environment affect investment, among which are the sustained political uncertainty and the unpredictability of new policies.

The main barriers to investment are: although public investment spending is relatively high, poor infrastructure quality is a brake on investment. The development of a quality infrastructure is slowed by:

- low absorption of EU funds;
- inefficiencies in project preparation, prioritization and implementation of projects and limited efficiency and poor corporate governance legislation applicable to state-owned companies. The adoption of the General Transport Master Plan of Romania in 2016 was an important step towards improving strategic investments in road infrastructure, but so far progress is slow.

Investments are affected by inadequate labor supply. Continued labor migration and labor shortages, lack of skilled staff and lack of skills correlation, low innovation in the business environment, lack of basic digital

[12] https://www.economistul.ro/stiri-si-analize-business/prof-univ-dr-dan-armeanu-ase-impactul-covid-19-asupra-pietelor-de-capital-18037/

[13] http://cnipmmr.ro/2018/03/14/pozitia-cnipmmr-privind-raportul-de-tara-din-2018-pentru-romania/

skills of a large part of the workforce lead to a reduction in the supply of skilled workers, which affecting investment decisions.

Poor governance and inefficiency of public administration continue to affect the business environment. Investments may be hampered by the maintenance of administrative and regulatory burdens, inefficiencies in public administration and public procurement, lack of predictability of legislation and lack of timely and effective stakeholder consultation.

Another structural challenge refers to the need to avoid the middle-income trap, by looking for solutions to increase the added value produced in the economy, including by stimulating innovation. In order to realize the potential for economic growth, solutions are needed in terms of the demographic problem and inequalities in society. In this sense, we also mention the need for the role of banks in financing the economy to increase, but prudently, the financial intermediation in Romania being on the last place in the EU.

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[2] OECD (2020), Covid-19: Tourism Policy Responses (as of 25 March 2020), https://read.oecd-ilibrary.org/view/?ref=124_124984-7uf8nm95se&title=Covid-19_Tourism_Policy_Responses.

[3] OECD (2020), Covid-19: SME Policy Responses (as of 16 March 2020), https://www.oecd.org/cfe/leed/COVID-19-Italian-regions -SME-policy-responses.pdf.

[4] Organisation for Economic Co-operation and Development (OECD) "The territorial impact of COVID-19: Managing the crisis across levels of government"; https://www.oecd.org/coronavirus/policy-responses/the-territorial-impact-of-COVID-19-managing-the-crisis-across-levels-of-government-d3e314e1/

[5] Ibidem 4

[6] Muro, Whiton and Maxim (2020), "COVID-19 is hitting the nation's largest metros the hardest, making a "restart" of the economy more difficult", *The Avenue, Brookings*, https://www.brookings.edu/blog/the-avenue/2020/04/01/why-it-will-be-difficult-to-restart-the-economy-[1] [7] OECD-CoR (2020), The impact of the COVID-19 crisis on regional and local governments: Main findings from the joint CoR-OECD survey, http://www.oecd.org/regional/multi-level-governance.htm.

[7] www.bnr.ro, Raport asupta stabilitatii financiare, An v (XV), nr.9 (19), pag.27

[8] „Communication from the Commission to the Council on the Activation of the General Escape Clause of the Stability and Growth Pact", COM (2020) 123 final.

[9] https:// ec.europa.eu/info/sites/info/files/economy-finance/letter_accompanying_the_launching_of_the_edp_for_romania_ signed_evp_dombrovskiscssr_gentiloni.pdf.pdf.

[10] https://news.ubbcluj.ro/perspectivele-economiei-romanesti-in-contextul-pandemiei-pe-baza-analizelor-efectuate-de-cercetatorii-ubb/

[11] https://www.economistul.ro/stiri-si-analize-business/prof-univ-dr-dan-armeanu-ase-impactul-covid-19-asupra-pietelor-de-capital-18037/

[12] http://cnipmmr.ro/2018/03/14/pozitia-cnipmmr-privind-raportul-de-tara-din-2018-pentru-romania/

How Can the Response to the Covid-19 Crisis Reshape the Future of Poland's Economy?[1]

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Abstract: - The articles analysis the impact of Covid-19 pandemic on the Polish economy on the one hand, and on the other the anti-crisis measures to combat or reduce the negative effects due to the restriction of economic activities. The author presents both the shield program against the Covid-19 pandemic and the draft recovery and resilience plan adopted by the Polish government. The multidisciplinary research methodology is based on a quantitative analysis of statistical macroeconomic indicators coupled with the qualitative research of the European Union documents. The conclusion of the article is that the most important impact of the current Pandemic Covid-19 crisis will be the "paradigm shift" that will reshape the future of all member states economies and EU on the whole. The Recovery and Resilience Facility and the National Recovery and Resilience Plans are two important instruments for the development of the paradigm shifts.

Key-Words: Covid-19, Poland, Romania, economic impact, anti-crisis measures, recovery and resilience plan
JEL Classification : E6, H12, H7, J2, J3

1. The resilience of the Polish economy to the pandemic Covid-19

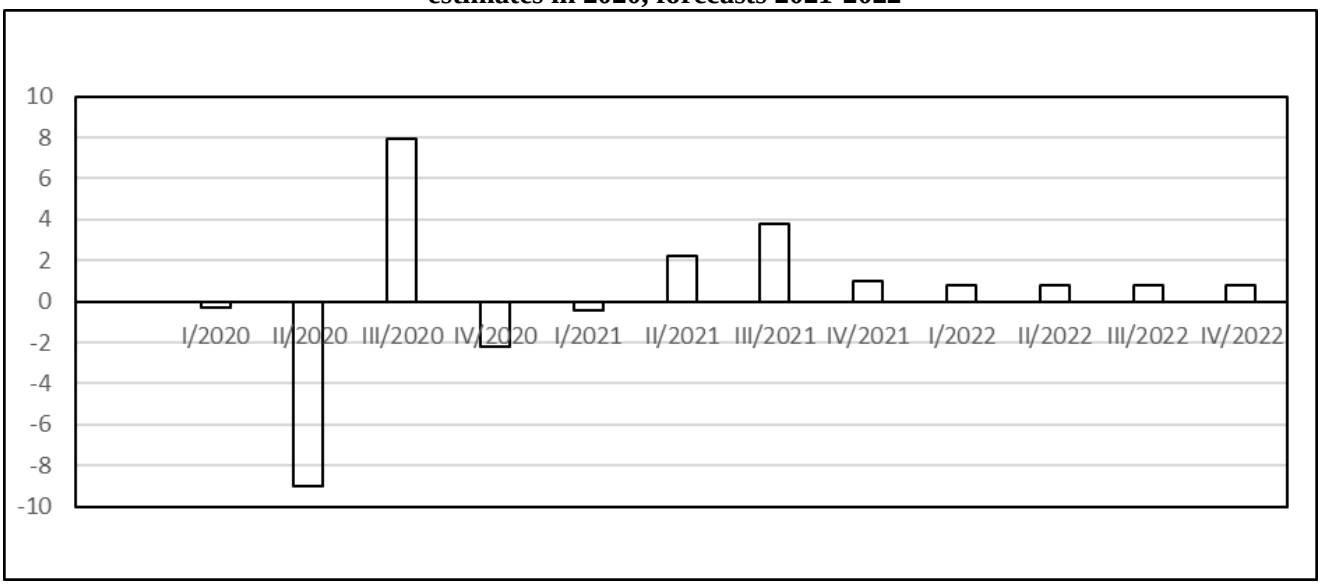
After joining the EU, between 2004-2019, Poland has performed in terms of stable economic growth and socio-economic development, but in 2020 the Covid-19 pandemic outbreak has interrupted Poland's cycle of continue GDP growth.

According to the European Commission's *European Economic Forecast Winter 2021*, published on February 6, Poland's economy rebounded in the third quarter of 2020, following a sharp decline in economic activity in the first half of the year. After a record decline in real GDP of 9% in the second quarter of 2020 compared to the first quarter of 2020, it increased by 7.9% in the third quarter compared to the second quarter, due to the rapid return of household consumption and exports. The economy continued its recovery trend during the last quarter of 2020, but the growth in SARS-COV-2 infections and the reintroduction of restrictions to control the pandemic have decreased economic activity at the end of the year. As a result, despite favourable developments in industrial production and retail sales in the last months of 2020, a slight contraction of 2.2% is expected in the fourth quarter of 2020 and an annual slowdown in real GDP of 2.8%, according to the latest data provided by the National Statistics Office of Poland. It should be noted that the European Commission's experts in the Winter Economic Report have estimated the same rate of GDP decline of 2.8% (note that in the Autumn Economic Report published in November 2020 was estimated a higher rate of decline of 3.6%).

The European Commission (2021a) estimates that the extension of restrictions at the beginning of 2021 will negatively affect economic activity in the first quarter of the year. However, as the number of vaccinations gradually increases and the severity of isolation measures diminishes, GDP growth is expected to pick up in the second half of the year. It should be noted, however, that in 2020, Poland experienced a moderate recession compared to the other Central and Eastern European countries, members of the EU, with the slowdown in GDP being by far the lowest. The European Commission forecasts real GDP growth of 3.1% in 2021 and 5.1% in 2022. However, this Commission forecast does not include any economic stimulus measures to be funded under the Recovery and Resilience Mechanism.

[1] The article is based on some of the conclusions from the presentation at the Bilateral Romanian-Bulgarian Round Table, organised by the Institute for World Economy, Romanian Academy, 24th November 24, 2020.

Chart 1: The evolution of growth rate (percentage change compared to the previous quarter), estimates in 2020, forecasts 2021-2022



Source: Author based on European Commission (2021a) data.

On March 19, the *Fitch Ratings Agency*, has granted Poland economy a stable outlook **(A-)**, which "reflects Poland's resilience to the coronavirus shock and Fitch's expectations that GDP growth will recover and the budget deficit will narrow this year, against a marked increase in government debt last year and continued downside risks from the path of coronavirus". Fitch (2021) forecasts the fiscal deficit to shrink from 7.2% of GDP in 2020 to 5.7% of GDP in 2021 (official target: 6%), and 3.7% in 2022 on expectations of lower than projected take-up of Covid related fiscal measures. Fitch Ratings Agency identifies the strengths and the weaknesses of the future evolution of the Polish economy (Table 1).

Table 1: The resilience factors and the risks of the Polish economy

RESILIENCE FACTORS	RISK FACTORS
- Public Finances: Fiscal consolidation over the medium term that leads to a sustained decline in government debt/GDP.	- Public Finances: Sustained increase in government debt, for example from a failure to consolidate public finances, crystallisation of contingent liabilities or weakening of economic growth over the medium term.
- External Finances: Sustained improvement in external finances, including a further decline in net external debt/GDP.	- Structural: Deterioration in governance standards or the business climate leading to an adverse impact on the economy.
- Macro: GDP growth that supports faster income convergence towards the 'A' category median.	- Core inflation continues to be strong, averaging 3.9% in 2020, reflecting supply-side constraints as well as a Covid-19 surcharge imposed by many service providers.
- The Polish banking sector is stable, well-capitalised (end-2020: total capital ratio of 21%), with healthy asset quality (end-2020: impaired loan ratio of 6.9%) and profitable. Banks were an important conduit for distribution of state-guaranteed credit from the BGK (Bank Gospodarstwa Krajowego) and Polish Development Fund in 2020.	- Fitch expects the current account surplus to shrink to 1.3% in 2021 before falling into deficit in 2022, as import growth picks up due to an expected uptick in domestic investment and consumption.

Source: Author based on Fitch Ratings (2021)

2. A shield against the effects of the Covid-19 pandemic

On March 2020, the Polish government has launched the package of support actions for the society and entrepreneurs referred to as "Anti-crisis Shield". The package role was to limit the negative effects of the pandemic, consisted of 5 main pillars including different areas of the economy, and was estimated at total of 212 billion zlotys (about 47,3 billion euros). It has included a series of anti-crisis measures to protect employees and jobs, amounting to 32 billion zlotys (approximately 7.14 billion euros). Supplementary, to counter the impact of the crisis caused by the Covid-19 pandemic on companies, the Polish government provided companies with loans which focused on ensuring the liquidity of companies, and included, among other things, postponing payments of taxes and social security liabilities, as well as extending the guarantees provided by the National Development Bank (BGK) for the provision of loans (Chancellery of the Prime Minister of Poland, 2020).

According with the European Commission (2021b), the policy measures adopted as Covid-19 anti-crisis are classified according to the following categories: (1) expenditure measures, (2) tax measures, (3) measures related to public guarantees, (4) other measures than fiscal providing liquidity support (Table 2).

Table 2: The Covid-19 anti-crisis measures adopted by the Polish government

CATEGORY OF MEASURES	APPLICATION NORMS
1. EXPENDITURE MEASURES	**1.1. MEASURES WITH IMPACT IN 2020** - Between period March – May 2020, the reduction in social security contributions for firms employing up to 50 people and self-employed. • Those employing up to 10 people and – in most cases – self-employed can benefit from a full reduction. • For the self-employed, there is also a cap on the income, excluding the high-income earners from the scheme. • For the entities employing 10 – 50 people the reduction amounts to 50%. • Bigger companies are not eligible. • To be eligible, the beneficiaries cannot have arrears in social security payments and must explicitly apply for this support. - Initially introduced for April 2020, then extended until June 2020 the economic downtime benefit for self-employed and those working on nonstandard (civil law) contracts. • A lump sum benefit for self-employed (50% or 80% of the minimum wage) and those working on non-standard labour contracts (up to 80% of the minimum wage) to compensate them for a drop in revenue. • To be eligible, the beneficiaries need to record a drop of at least 15% in revenue on a monthly basis due to the pandemic. • There is no need to the keep the activity running (it may be suspended due to the pandemic).

	- Subsidies to salaries and social contributions for companies applying or not for **Short-time work** (**STW**[2]) or furlough. • Entities, independently of their size, may ask for co-financing of their costs of salaries and social security contributions for a period of 3 months maximum. • The companies must record a drop in their revenue. • Several separate instruments regulated by different legal provisions are concerned. • In some cases, firms must reduce working time to get subsidies. • In other cases, firms are not allowed to participate in the STW to benefit from subsidies (to avoid double financing); however, they can but do not need to reduce working time. - Subsidies to self-employed not hiring employees. • Co-financing of a part of costs of running a business by natural persons not hiring employees. • Granted for maximum 3 months. • The amount depends on the decrease in turnover and amounts to 50% - 90% of the minimum salary. • The entrepreneur is required to maintain operations during the period for which the funding is granted. - A package of loans to firms that can amount up to 100 billion zlotys (4.5% of GDP). • A part of those loans (up to PLN 60 billion, over 2.5% of GDP) can be further granted under certain conditions (continuation of operations after the end of epidemic restrictions and preserving jobs). • Operational and technical details of those measures differ depending on the firms' size (micro – up to 9, SME – 10-250 and large – over 250 employees). • The loans are granted by the Polish Development Fund which in turn issues bonds to finance the operation. Bonds are guaranteed by the state and bought by the National Bank of Poland. - Loans to micro-companies / self-employed and NGOs of up to 5,000 zlotys (EURO 1,100 euros). • The loans may be converted into grants if the company continues operations for 3 months after the loan is paid.

[2] Short-time work (STW) schemes are defined in a 2020 European Commission regulation proposal as "public programmes that allow firms experiencing economic difficulties to temporarily reduce the hours worked while providing their employees with income support from the State for the hours not worked".

	- The new social benefit paid in June, July and August 2020. • A benefit for parents who needed to stay home to take care of small children (when schools were closed), benefits for persons taking care of disabled person, or dependent adult family member. • Also, a "solidarity benefit" – a lump-sum payment of 1400 zlotys (some 310 euros) to those who lost their job during the pandemic. • Those who qualified for an unemployment benefit (that is lower than the solidarity benefit) got a top-up to 1400 zlotys. - Holiday vouchers. • Amounting to 500 zlotys (some 110 euros) per child, to be redeemed until March 2021. • The initiative of the estimated cost up to 0.2% of GDP aims at supporting the local tourism economy. • It is estimated that nearly 6 million children could benefit from it. -. Effective as from September 2020, increase of the unemployment benefit • The unemployment benefit increased to 1200 zlotys (around 270 euros) for the first 90 days, and then it will amount to 950 zlotys (some 210 euros). - Subsidies to interest on bank loans granted under contracts concluded by 31 December 2020 to business entities whose financial liquidity deteriorated following the negative economic consequences of the pandemic. • The subsidies will apply to revolving and non-revolving working capital loans granted in zlotys. - Increased spending on healthcare, both current expenditure and, to some extent investment. **1.2. MEASURES WITH IMPACT IN 2021 (and/or beyond)** - The operations of the Polish Development Fund regarding loans to companies (see the entry for 2020) are expected to continue to some extent. The exact scale and fiscal impact depend on the 2020 rollout.
2. TAX MEASURES (DISTINGUISHING TAX DELAYS FROM OTHER MEASURES)	- A possibility to amend under certain conditions the 2019 CIT (Corporate Income tax) statements by lowering the 2019 income by the loss generated in 2020. - Inclusion in the tax-deductible costs of expenses related to cancellations of trips.

	- Postponement of the date of entry into force of the new tax obligations (for instance as regards new requirement on the standard audit file or the rollout of the new VAT (Value Added Tax) matrix. - Temporary postponement of payment deadlines of VAT. - Extension of deadlines for 2019 PIT (Personal Income Tax and CIT (Corporate Income Tax) settlements. - Social security contributions deferrals, redemptions or stage payments. - Postponement the application of the retail tax to 2021.
3. MEASURES RELATED TO PUBLIC GUARANTEES	- Guarantees of the development bank (Bank Gospodarstwa Krajowego – BGK). • A scheme of guarantees for medium and large companies affected by the pandemic worth in total 100 billion zlotys (4.5% of GDP). • A guarantee for a single company may amount up to 200 million zlotys, for loans up to 250 million zlotys (80%). • The intended purpose of the loan is to ensure the company's financial liquidity. • Guarantees can be used by firms that did not have financial problems at the end of 2019 and did not have overdue social security or tax liabilities as of February 2020.
4. OTHER MEASURES THAN FISCAL PROVIDING LIQUIDITY SUPPORT	**1.1. MEASURES WITH IMPACT IN 2020** -The interest rates were lowered to a historical low, with the reference rate lowered by 140 basis points to the historically low of 0.1%. • The National Bank of Poland (NBP) purchases government securities and government-guaranteed debt securities on the secondary market as part of the open market operations. • These amounted to over 100 billion zlotys in September (4.5% of GDP). • Deferring of the rollout of the pension savings scheme “Pracownicze Plany Kapitałowe” for medium companies. **MEASURES WITH IMPACT IN 2021 (and/or beyond)** - The National Bank of Poland is expected to continue to purchase government securities and government-guaranteed debt securities on the secondary market as part of the open market operations. The timing and scale of the operations will be not known.

Source: European Commission paper (2021b).

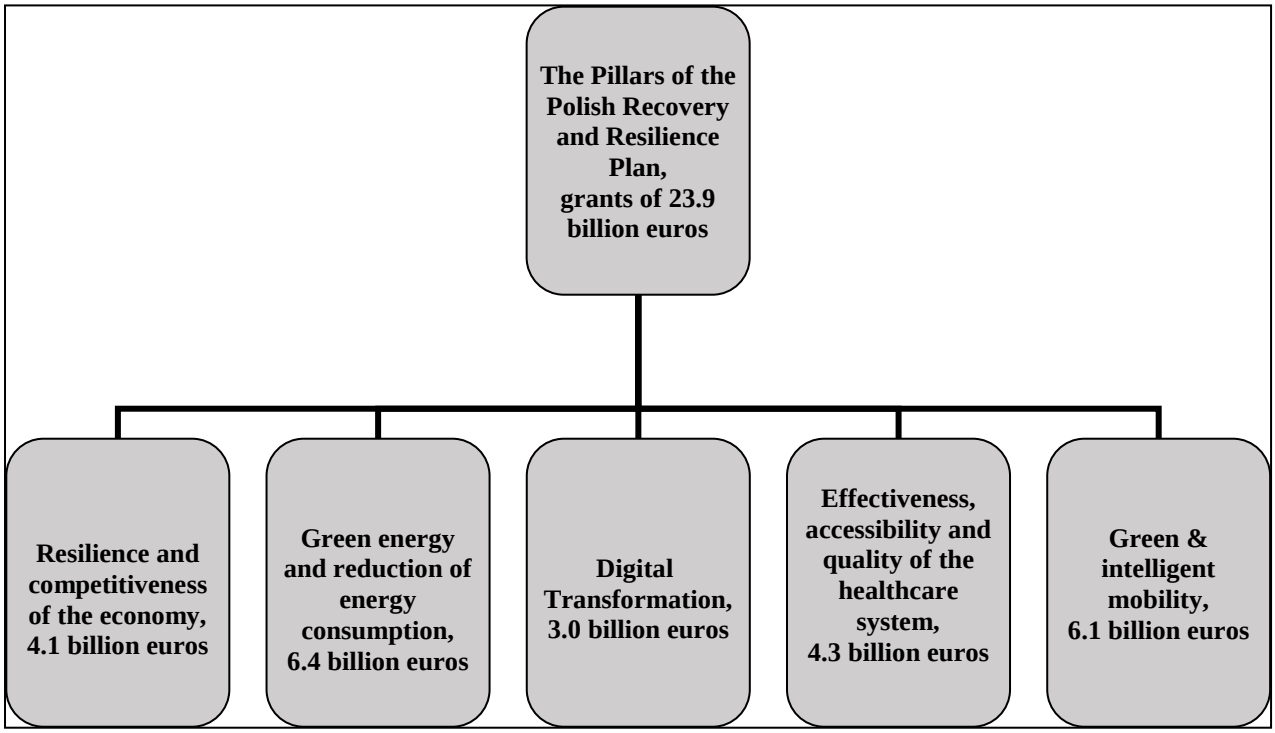
3. The Polish Recovery and Resilience Plan

3.1. The pillars of the Polish Recovery and Resilience Plan

For reforming and reconstructing socio-economic resilience**,** Poland will receive a 58.1 billion euros from the Recovery and Resilience Facility (from a total of 672.5 billion euros for the EU), of which 23.9 billion euros in grants and loans worth 34.2 billion euros, to be utilized through 2026 (within 7 years). It corresponds to an equivalent of grants of 4.8% of GDP and loans of 6.9% of GDP (11.7% of GDP altogether).

At the end of February 2021, the Polish Prime Minister and the Minister of Funds and Regional Policy announced the draft of the National Recovery and Resilience Plan. The document is open for public consultation until 2 April 2021. The draft plan is based on five pillars for the Poland's strategy (Figure1).

Figure 1: The five pillars of the Polish Recovery and Resilience Plan



Source: Author based on Polish Ministry of Investment and Development data

Congruent to the Ministry of Funds and Regional Policy, the National Reconstruction Plan has two main goals: rebuilding and restoring the resilience of EU economies and preparing for unforeseen circumstances, therefore (Polish Government, 2021):

- "Investments related to agri-food processing are also planned, which should help stabilize agricultural markets. It will be of key importance to prepare a new spatial planning system, which will enable quick investment decisions;

- Structural transformation will concern areas of key importance for the development of the Polish economy: industry 4.0, circular economy, strengthening the potential of the science sector to cooperate with enterprises and improving the transfer of knowledge and innovation to the economy. In this regard, many reforms have already been initiated, such as the Łukasiewicz Research Network. It is estimated that the EU funds will support further changes.

- Competitiveness of the economy also means staff/human resources. In this respect, the National Recovery and Resilience Plan focuses on rebuilding vocational education, reforming labour market institutions, and supporting parents' professional activity".

3.2. Experts' opinions on the Polish Recovery and Resilience Plan

According to *Waldemar Buda*, the secretary of state in the Ministry of Investment and Development, the component "resilience and competitiveness of the economy" consists primarily of measures to rebuild the sectors most affected by the pandemic. Due to the crisis, enterprises have to expand their activities or modernize them towards introducing green solutions. It is very important that SMEs will be able to receive both investment support and support related to the retraining of their employees to new activities of the company" (Polish Government, 2021).

The two experts from ING Bank Poland, *Benecki and Kasek* (2021) have pointed out that:

- "The proposed distribution of the grant money does not appear to match fully with the EU guidelines and green and digital priorities, but it probably meets the formal requirements. This suggests, however, a rather lengthy dialogue with the EC to finalize the document.
- We worry that the government lacks advanced reforms and projects e.g., those which would flirt with the idea of economy 4.0 or bring a technological leapfrog. So, for the time being, it proposed investments plans, which rather foster inclusion, regional cohesion, enhance basic infrastructure (roads) or is an extension of the anti-pandemic rescue plan, provided in 2020. There are also structural changes planned, but they seem to be at a quite early stage.
- Poland has not yet made up its mind on the utilization of the loan part of the available EU funding. This financing source is treated as potentially available, to be used in the later phase, maybe ad "calandas grecas".
- The Plan will not give a boost to the Polish economy in 2021, the major fiscal impulse is to occur in 2022-23 (+1.5% of GDP). Unfortunately, this will provide additional proof to the time inconsistency phenomenon in the economic decision-making".

Marcin Korolec[3] (2021), head of the Green Economy Institute, launches the question "What kind of Poland and EU do we want to see after COVID-19?", and underlines that "the Polish National Recovery Plan cannot be treated as an instrument to combat the crisis alone, but by supporting the digital and green transition it should create the foundation for the competitiveness of Poland's economy". In his opinion this plan of recovery and resilience should be seen as a new Marshall Plan and "this is not an opportunity for one year's profits, but for building the competitive advantage of future generations. The commitments undertaken today will take 40 years to repay – at least two generations of Europeans, including Poles".

Pursuant to Eurocities[4], *Rafał Trzaskowski*[5], the mayor of Warsaw explains that "the process of preparing the National Recovery Plan in Poland is not very transparent. The government completely ignores Polish cities in this process, commissioning activities only at the level of voivodeships (regions), including the preparation of project proposals." In fact, out of around 20 proposals made by the city in July last year, roughly half were included in the regional level applications, and, as the Mayor says, "so far we have no feedback on whether we can count on co-financing of Warsaw projects, despite the fact that these are very large, important projects that have an impact on the recovery of the economy after the Covid-19 crisis, such as the development of the metro network" (Eurocities, 2021).

"Zero carbon economy is not anymore a dream we chase, but a concrete political commitment: from EU by 2050, from China by 2060 and taking into account the recent change of the US administration, I would expect a similar announcement coming from there soon", commented *Jakub Miler*, CEO of EIT InnoEnergy Central Europe. "These are the new rules of the game. For Poland to follow that path is not an 'eco-extravagance', but a harsh necessity to keep the economy competitive and simply stay in the business". (InnoEnergy, 2021).

On Bloomberg Green, *Ewa Krukowska* (2021) reports that "transforming the energy sector in Poland, which depends on coal for more than 70% of power production, is among the top challenges identified in the national recovery plan. The overhaul will be "extremely costly" but in the longer-term green technologies may become the driving force of the economy, according to the government". Krukowska (2021) appreciates that Poland's largest oil company PKN Orlen SA, which is already building a hydrogen hub in central Poland, plans to spend 25 billion zloty ($6.6 billion) by 2030 to reduce carbon-dioxide emissions by more than 20%. In total,

[3] A lawyer and civil servant, he was the minister of environment in Donald Tusk's cabinet from 2011 to 2013 and secretary of state responsible for climate negotiations from 2013 to October 2015.
[4] Eurocities is the network of 190 cities in 39 countries, representing 130 million people.
[5] Rafał Trzaskowski is also a political scientist specializing in European Studies.

about 38% of the 23.9 billion euros of EU grants available will be spent on climate-linked activities by 2026 (Krukowska, 2021) (Table 3).

Table 3: The clean energy component of the Polish Recovery and Resilience Plan- million euros

ELEMENTS	THE AMOUNT
1. Housing sector energy efficiency	**3200**
2. Developing hydrogen and other alternative fuels	**797**
3. Offshore wind generation	**437**
4. Heating sector modernization	**388**
5. Power grid expansion for renewables integration	**329**
6. Improving energy efficiency of schools	**194**
7. Local renewable energy initiatives	**97**
8. Boosting companies' energy savings and renewables use	**28**

Source: Author based on Bloomberg Green (2021)

4. Conclusions

In my opinion, the most important impact of the current Pandemic Covid-19 crisis will be the "paradigm shift[6]", that will reshape the future of all member states economies and EU on the whole. The Recovery and Resilience Facility and the National Recovery and Resilience Plans are two important instruments for the development of the paradigm shifts. This new paradigm foundation is the European Green Deal, which main objectives are to turn climate and environmental challenges into opportunities, boost the efficient use of resources by moving to a clean and circular economy and making the transition just and inclusive for all.

In Poland, which is heavily reliant on polluting coal-fired power stations, the Recovery Plan should be used to decarbonising the energy sector and to build solid foundations for the country's future sustainable development. The green transition will be a great opportunity for the modernization of the economy and the growth of Polish companies, and together with the digital transformation will accelerate the Fourth Industrial Revolution's pace of change and broad impact.

The another sift of paradigm is linked with the fact that we are witnessing a change from an economic model in which services had an important weight, in favour of a model based on the development of productive, processing, industrial and agricultural sectors, which can provide the products necessary for the strategic autonomy of the European community space. The Covid -19 pandemic brought to the surface the instability of global supply chains. The most viable solution would be to shorten supply chains by developing production at local and regional level (in the EU). Certainly, the relocation of non-EU factories to countries such as Poland or other Central and Eastern European (CEE) countries, which have the comparative advantage of cheaper labour than in Western European and well-qualified countries, can be considered. Even if wages in CEE member states are higher than in countries from outside the EU area, the relocated firms from other member states to these areas may become important contributors to the host state budgets, and stimulate the economic development of the disadvantaged areas in the EU and the reduction of the economic gaps between member states.

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[6] A paradigm shift is a concept which was introduced by the American scientist Thomas Kuhn and promotes major changes in the fundamentals and applied practices.

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Is the Post-Covid-19 Crisis Era a Critical Juncture in Russia's Attitude towards the West?

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Abstract: 2020 was the 21st century's most disruptive and unsettling year to the date, generating an exceptionally strained economic and geopolitical context worldwide, and in Russia in particular. The rapid spreading of the coronavirus pandemic and the ensuing sanitary and economic crises that followed several years of economic slowdown, the oil-price war with Saudi Arabia, the recently created "entente" with China against Western allies and the continuing alienation from the West represented just several of the challenges that Russia faced. Furthermore, the Covid-19 crisis proved to be an unprecedented test for Russian decision-makers, demonstrating that despite the self-isolation policy applied during the recent years, the national economy is still extremely sensitive to external shocks and is not able to withstand them alone. In this new general context, our paper aims to assess the resilience of the Russian economy in the face of the Covid-19 crisis by analysing its main vulnerabilities, as well as the current validity of the national strategies and alliances, and the new potential opportunity revealed by the crisis –that of reopening the dialogue with Western economies with the view of improving bilateral relations and future cooperation.

Key words: Covid-19 crisis, Russian economy, Russian bilateral relations, geopolitics
JEL Classification: F0, F01, F22

1 Russia's geopolitical context prior pandemics and its economic implications

1.1. Short historical overview of the evolution of Russia's relations with Western countries

After the end of the Cold War, the perspective of an improvement of the relations between the East and the West was beginning to take shape at international level, materialized at the time in a new form of fruitful and mutually benefitting cooperation. According to this vision, Russia, the main successor of the Soviet Union, was to become fully integrated in the European structures and, after implementing ample democratic reform and economic liberalization measures, even become a "typically European country," all the more so since at national level there was a broad consensus on adopting the "pro-European" development path (Bakalova & Rogova, 2017).

Despite this encouraging start, the experience of the past three decades demonstrated not only that the initial desires were impossible to materialize, but also the sinuous evolution of the relations between the two parties, characterized by frequent dissensions and crises followed by periods of mutual reconciliation and intensified bilateral cooperation. However, this trend of cyclic alternation seems to have been permanently interrupted in the recent years by the illegal annexation of Crimea (March 2014), which represented the climax of previously unresolved tensions and of ample latent disagreements that over time eroded mutual relations and subsequently triggered the imminent "rupture."

It is worth mentioning that some analysis (Moagăr-Poladian & Drăgoi, 2015; Pop & Drăgoi, 2019) have stated that while the Crimean crisis has induced great tensions between EU-Russia relations, the energetic interdependence remain the backbone of their partnership and despite the recent disagreements concerning the future of post-soviet space it is important to rethink the future of this partnership on a more pragmatic view.

However, in the light of the tense events of the past few years, it now seems not only that the view of a common development path has been totally abandoned, but also that the delineation defining the future of this path has become increasingly uncertain. This new paradigm has revealed itself in the context of Russia's destabilizing interventions in Eastern Ukraine which eventually led to the annexation of Crimea, in contradiction with the European Union's fundamental principles and foreign policy approach, which are built on the assumption that in the post-modern era military conflicts and territorial conquests are a thing of the past. As a result, because the EU's foreign policy starts from the premise of the absence of classical military threats – seen as a particularity of the 21st century – and on the belief that security challenges could come mainly from non-state actors (e.g. terrorism, organized crime, regional conflicts such as that in the Balkans, etc.) –, the Union mainly founds its actions on the projection of its internal rules and values abroad, and not at all on the consolidation of military power or interventions of this nature (EU, 2007).

Given the current international framework – characterised by: a) ample geopolitical dissensions; b) economic uncertainties; c) increasing trade-related tensions; and d) frequent political hesitations –, correlated with Russia's permanent attempts over the last few years to reassert itself as a global power, and with the regime of progressive sanctions imposed on it by Western countries, we endeavour in the following sections to investigate from a wider perspective the way in which the relations between Russia and the great powers influenced its internal economic performance, its involvement in new strategic alliances and/or their consolidation (e.g. with China), as well as the evolution of Russia's foreign policy both before and during the Covid-19 pandemic.

1.2. EU-Russia: a sinuous relationship

Although the EU has always seen Russia as a strategic actor in relation to whom it sought: a) a normalization of relations; b) the country's modernisation and democratization as a prerequisite for its de facto Europeanization and Westernization; and c) the undertaking of bilateral and multilateral commitments, from the moment these endeavours began to be pursued there were many frictions that gradually led to the erosion of bilateral ties.

As such, the year 2000, when Vladimir Putin first became Russia's president[1], started with positive expectations as to the evolution of the political and economic relations between the two parties which had already deepened their cooperation ties based on mutual trust.

Despite the apparent calmness, a first sign of the future divergences was the extension of NATO and of the EU towards the East, unenthusiastically accepted by Russia which, at the time, lacked both the capacity and the necessary means to oppose it, being still involved in the Chechen separatist movement (the Second Chechen War) and other internal challenges (Koeth, 2016).

As a result of NATO's extension towards Russia's Eastern border, the pragmatism that had governed the country's relation with the EU turned to aversion beginning with 2004 and eventually began being termed by the international media as the commencement of a new Cold War (Cohen, 2005). In the same context, Russia did not respond to the EU initiative (of 2004) on the European Neighbourhood Policy (ENP), which regrouped the neighbouring countries of the extended Union – meaning Moldova, Ukraine, Belarus and Russia in the Eastern European area –, and instead opted for an association-based participation in the ENP. For obvious historical and geopolitical considerations[2], this area has always been a priority for the authorities in Moscow who were reluctant and even hostile towards the "interference" of the Western actors in the region.

After 2014, when the Eastern Ukraine conflict escalated and resulted in the illegal annexation of Crimea, the political dialogue between the Russia and the EU suffered a major blow leading both to the temporary freezing of the main mechanisms underlying the process of cooperation between the two parties and to the establishment of a mutual sanctions regime (European External Action Service (EEAS), 2021). As regards the economic and trade relations, after 2014 negotiations were discontinued on the extension and modernization of the EU-Russia Partnership and Cooperation Agreement (PCA) concluded in 1997 –, negotiations that had started in 2008, but which had not been completed because of blockages related to trade and investments. Nevertheless, despite the tensions that characterized the bilateral relationship during the last seven years, because of its geographic position, the size of its internal market and, last but not least, the tradition of around a quarter of a century of

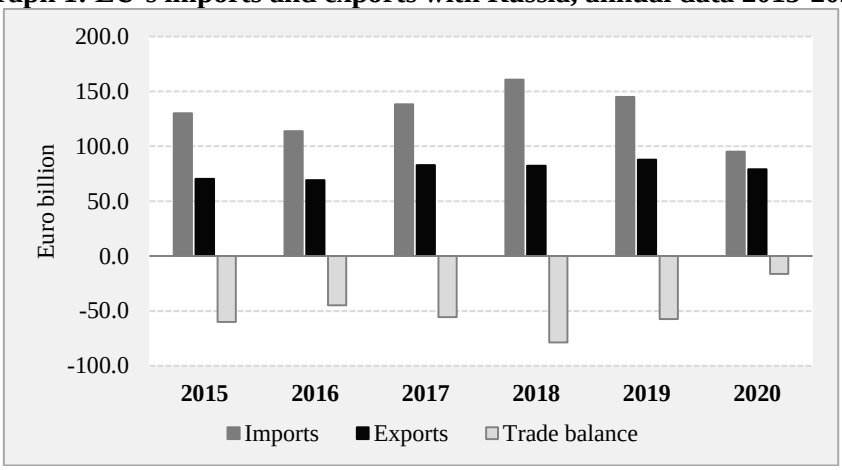
[1] In chronological order, Vladimir Putin's presidential terms in office are: (I) 2000-2004; (II) 2004-2008; (III) 2012-2018, and he is currently serving his fourth term in office.

[2] In the opinion of the Russian authorities, this regional space had an essential role in the process of integration in the Community of Independent States (CIS), facilitating the closeness of the member states from the nucleus of the community, i.e. Russia.

economic cooperation and bilateral exchanges, Russia continues to be a key-player for the EU and at the same time one of the Union's main suppliers of energy products, while the latter is Russia's largest trade partner.

Therefore, despite the fact that the policies on the application of mutual sanctions continue to be in force, in 2020, Russia ranked 5th among the EU's trade partners, accounting for around 5% of all of the EU's trade. The same year, the EU continued to be Russia's main trade partner with bilateral exchanges of goods totalling around EUR 174 billion – which represents a decrease of approximately 25% compared to the previous year (Graph 1) –, i.e. 40% of Russia's total trade.

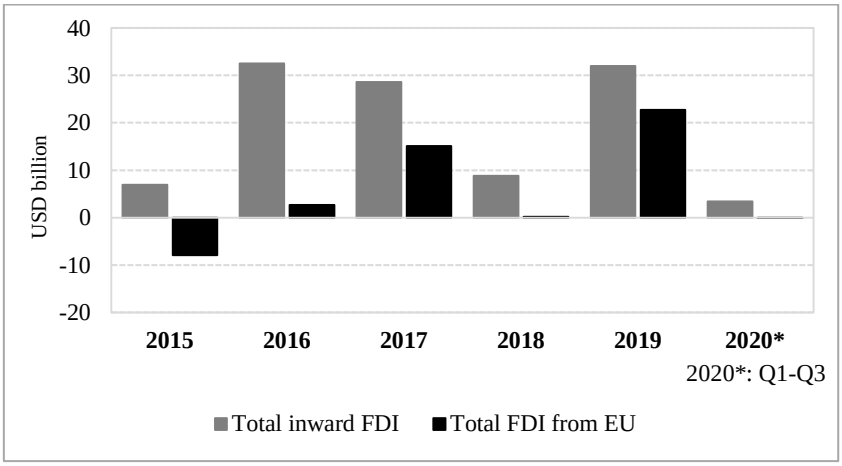
Graph 1: EU's imports and exports with Russia, annual data 2015-2020



Source: Authors based on data published by the European Commission (2021).

In terms of investments, Russia is highly dependent on European investors, with FDI flows from European countries representing between 55% and 75% of total FDI in Russia; given the lack of transparency of the data published by the Russian Central Bank, these figures are based on estimates (Dominguez-Jimenez & Poitiers, 2020). As regards the flow of FDI from the EU, in the year before the pandemic they regained their upward trend, accounting for over 70% of total investment flows towards Russia (Graph 2).

Graph 2: Total FDI inflow in Russia, 2015-2020*



Note: The data for 2020 only include the first three quarters of the year (latest available data).

Source: Authors' calculations based on the data published by the de Bank of Russia (2021).

Reliance on Russian energy exports is considered by many analysts a threat to the wealth, power and security of the EU. Given Russia's politicized energy strategy and the tense relations between the two parties, those concerns may appear legitimate, but are nevertheless inflated, since in the complicated context created by the pandemic it would not be in Russia's best interest to antagonize its Western partner. Even if the threat from Russia exists, the relationship between Russia and the EU in the energy field is not one-sided. Both sides have something to lose if it disintegrates (Table 1). For the EU's part, however, the relationship is much more balanced. The European Union is Russia's main customer, a position that elevates its significance to the Russian economy.

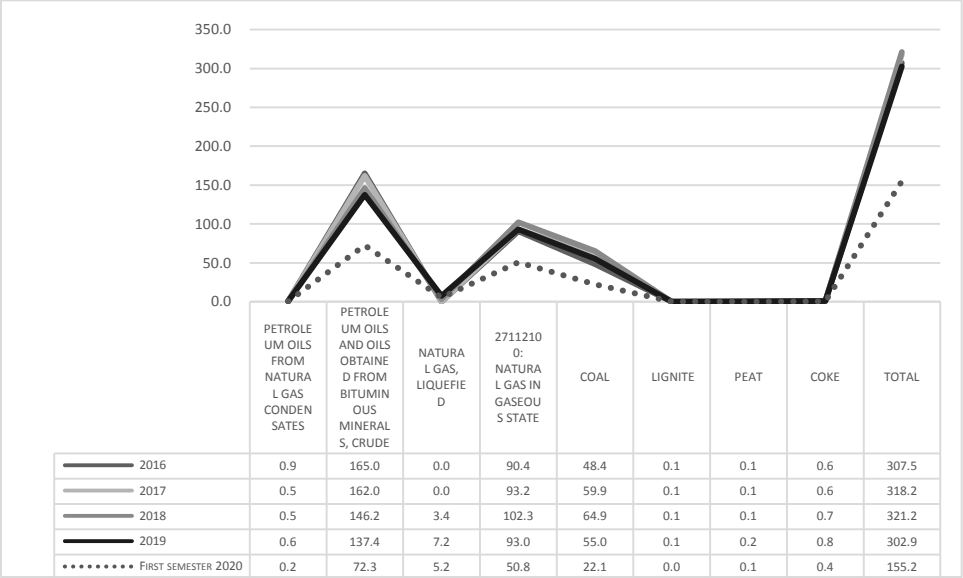
Table 1: EU main energy imports, top countries of origin (% of total), 2015-2020

Country	2015	2016	2017	2018	2019	2020 (first semester)*
Oil						
Russia	31.4	30,0	32.7	31.0	28.0	26.4
Iraq	4.8	7.9	8.6	8.5	8.5	-
Saudi Arabia	9.0	8.0	7.8	6.6	7.1	6.8
Norway	9.3	8.4	8.0	7.8	7.1	8.0
Kazakhstan	6.7	6.8	7.0	7.7	8.3	9.1
Natural gas						
Russia	41.6	43.7	41.8	40.4	44.7	39.3
Norway	25.7	18.0	17.9	18.1	21.3	12.9
Algeria	11.8	13.5	11.4	11.8	12.1	12.3
Qatar	4.1	3.3	4.1	4.6	6.3	-
Nigeria	2.2	2.2	2.7	3.0	5.9	-

Note: * Last available data.
Source: Authors' computations based on (Eurostat, 2021).

It is important to observe that even after the Crimean crisis, the energetic link between Russia and EU remains a strong one, while the energy imports from Russia are on a constant upward trend.

Graph 3: EU imports of energy products from Russia, 2016 - first semester 2020 (million tonnes)



	PETROLEUM OILS FROM NATURAL GAS CONDENSATES	PETROLEUM OILS AND OILS OBTAINED FROM BITUMINOUS MINERALS, CRUDE	NATURAL GAS, LIQUEFIED	27112100: NATURAL GAS IN GASEOUS STATE	COAL	LIGNITE	PEAT	COKE	TOTAL
2016	0.9	165.0	0.0	90.4	48.4	0.1	0.1	0.6	307.5
2017	0.5	162.0	0.0	93.2	59.9	0.1	0.1	0.6	318.2
2018	0.5	146.2	3.4	102.3	64.9	0.1	0.1	0.7	321.2
2019	0.6	137.4	7.2	93.0	55.0	0.1	0.2	0.8	302.9
First semester 2020	0.2	72.3	5.2	50.8	22.1	0.0	0.1	0.4	155.2

Source: Authors based on Eurostat, 2021.

As shown by the data presented, energy trade represents a fundamental element of the relations between the EU and Russia, the latter being the Union's main supplier of oil, natural gas and solid fuels. Also, as shown by the data above, the high energy interdependency – which also results from the fact that the EU is one of the main outlets for Russia's exports of such products – has remained constant or has even increased at times, despite the intensified political crisis and/or an apparent tendency towards securitization of the EU's relation with Russia in the energy field (Boersma & Goldthau, 2017).

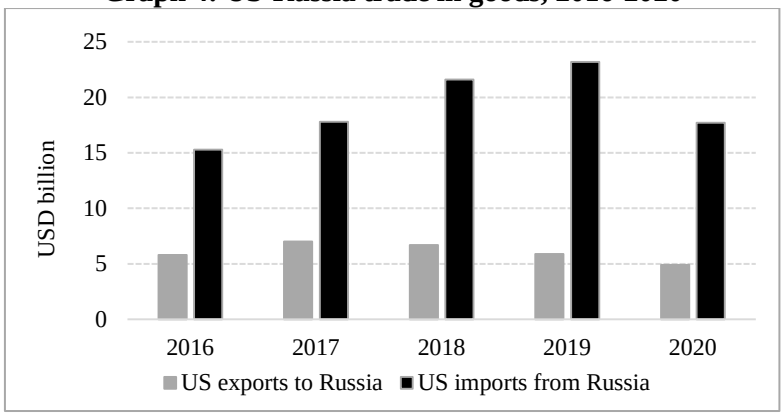
1.3. US-Russia post-sanctions relationship: on a frozen path

Seen from a historical perspective, bilateral relations between the US and Russia show a tension that is of unprecedented significance, with deep world-wide implications that exceed each of these two parties' scope of action. Beyond the common interests they share in a variety of fields (e.g. nuclear security, the combating of

terrorism and foreign violence, the fight against global warming, etc.), during the last decades or so, bilateral relations alternated between periods of intensified cooperation and periods of tensions and dissensions. At the same time, a series of more recent events – among which we refer to: the annexation of Crimea and the ongoing conflicts in South-Eastern Ukraine, Russia's military intervention in the Syrian civil war (2015), its supposed interference in the US presidential elections (2016) and in the presidential campaign of 2020 – have contributed to the gradual deterioration of the relations between the two countries, relations which at present are at a historical low (Stent, 2020). This situation is particularly relevant in the context in which political and security issues between the two countries prevail over their established economic ties (Russel, 2018).

As regards trade relations, the sanctions adopted in 2014 and 2018 were not aimed at the main categories of goods exchanged between the two states and, as a result, had little effect on the value of trade flows (Graph 4).

Graph 4: US-Russia trade in goods, 2016-2020



Source: Authors' representation based on UN Comtrade Database (2021).

It must also be stated that although the volume of US exports to Russia is not significant from the point of view of value, it comprises strategically important goods that cannot be easily substituted or purchased from other supplying countries (e.g. engines and latest generation components for deep-water drilling, etc.), in the context in which they are at present subject to sanctions.

1.4. Sino-Russian united front to the West

Although the partnership between the two countries has a tradition of a quarter of century – since April 1996, when the Sino-Russian "strategic partnership" was proclaimed –, more recently, faced with the isolation from the West, Russia urged for closer links with China. Among the driving factors that have contributed to the strengthening of bilateral cooperation are *a)* the determination of both parties to countervail the U.S. influence in their specific area of concern; *b)* the limitations in cooperation with the U.S., which has generated for each of the two countries a series of asymmetries regarding the geopolitical and economic power (Chase, Medeiros, Roy, Rumer, & Weitz, 2017).

China is currently the major trading partner for the Russian Federation, both in terms of imports and exports. In recent years, Russia's foreign policy has shifted significantly to the Chinese ally as a result of sanctions imposed by Western partners. The "backbone" of the new Sino-Russian alliance was the energy partnerships and, most importantly, the completion of the Great Siberia pipeline (" Power of Siberia"), which was a great commercial and energy success. The pipeline will deliver gas from Irkutsk (Kovyktinskoye field) and from the Yakutia gas production centers (Chayandinskoye field) to Vladivostok via Khabarovsk. Kovyktinskoye and Chayandinskoye are the two of the largest gas fields in Eastern Russia with 1.2 trillion and 1.5 trillion cubic meters of natural gas reserves.

With US-China tensions intensifying during Trump Administration amid the raising of protectionism from both sides and driven by the outburst of trade war between those countries, the issue needing further scrutiny is the possibility of China and Russia cooperating more closely even in the digital domain. It is thought that Russia expects not only its energy resources being exported to China, which succeeded in containing the spread of Covid-19 earlier than any other country and resumed economic activities, but also to benefit from China's inbound direct investment, such as for the development of digital infrastructure including 5G networks and data centres. Many analysts (Lukin, 2020; Kolodko, 2020) have stated that the pandemic will be a factor in strengthening the Russian-Chinese alliance, giving the two countries the opportunity to end U.S. hegemony as a factor of global power. In our opinion, however, the new Russian-Chinese alliance will not materialize in this

sense, of global unity and aggression. Rather dependent on pragmatic interests (Russia is the largest global energy supplier, and China a colossal market open to Russian exports), the Sino-Chinese alliance is expected to remain a "soft" one in the years to come. Both states have their own difficulties caused by the pandemic and cannot afford, economically, to start an aggressive isolationist towards the West. If the pandemic highlighted something clearly, this was the pre-eminence of economic interconnections that make it impossible to resume autarchic economic developments, the collapse of a large economy affecting, in a domino movement, the other great economic powers.

2 The Russian economy under a double “shock” in 2020: the oil price “war” and the Covid-19 crisis

2.1. The struggle for oil: Russia-Saudi Arabia oil price battle

With incipient tensions in the global oil market already present in early 2020, oil demand collapsed in March 2020 as a result of the oil price “war” with Saudi Arabia that lead to unprecedented negative price of oil. To better understand the context of the international market, we should mention that since mid-January 2020 world oil demand became questionable as the pandemic spread, causing production units closures and trips cancellation in/and to China. These concerns intensified even further in the following months when many states went into lockdowns and air travel was stopped, as a necessary requirement to prevent infections. The alleviation in global demand for oil over the previous year led Saudi Arabia (and OPEC) to call Russia to adjust its production in order to address oversupply in the market and to “manage” the international price for oil – within the so-called OPEC+ informal alliance – proposal that Russia refused, in an attempt to force U.S. shale oil producers out of the market (by controlling the prices) or in order to gain a larger share of the Asian market (Brennan, 2020). The Russian action determined Saudi Arabia to slash the price for its crude oil in response (to approximatively USD 31 a barrel) fact that, against the backdrop of demand reduction due to the Covid-19 pandemic, has crushed the international oil price in April 2020.

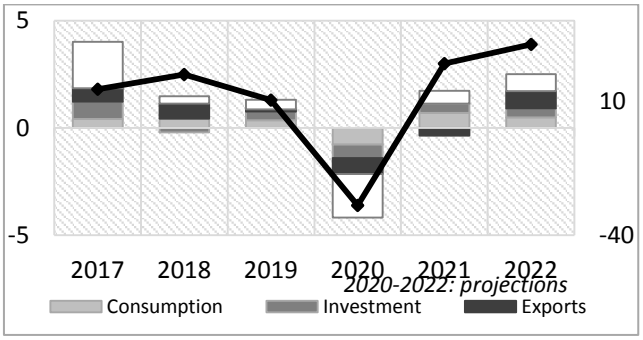
Even if since May, oil prices have seen a partial recovery, with the price of Brent crude oil averaging USD 40/barrel in June, up from USD 23/barrel in April, as OPEC+ Agreement implemented sharp cuts to production, the initial collapse of oil prices resulted in reduced fiscal revenues and a weakened Rubble. As a consequence, in the first half of 2020, the Russian federal budget registered a deficit of Rub 406.6 billion compared to a surplus of Rub 1,283.3 billion in the same period of 2019. As a consequence, heightened global risk aversion on financial markets, further exacerbated by a slump in oil prices, weakened the Rubble by 11% since the beginning of the year.

2.2. Recent challenges for the Russian economy as a result of the pandemic crisis

According to the IMF’s latest report on Russian economy (2021), even if the economic impact of the two combined shocks was very severe, the economic output in 2020 has been better than expected in the previous forecast report (as the economy contracted by 3.1% vs. 3.6% as estimated in the autumn forecast report, see Graph 5). The decline of Russian economic growth was further exacerbated by plummeting crude oil prices that dropped dramatically amid “oil price war” with Saudi Arabia.

In 2020, overall household consumption reduced by 6.2%, and gross fixed capital investment by 5% compared with previous year. The negative growth was reflected in most sectors, with manufacturing contracting 8.6% in this period; mineral-resource extraction decreasing by 8.4%, resulting in rapid shrinking of industrial production; and the transport sector experiencing a 7.7% contraction, driven by falling trade volumes since the beginning of the year.

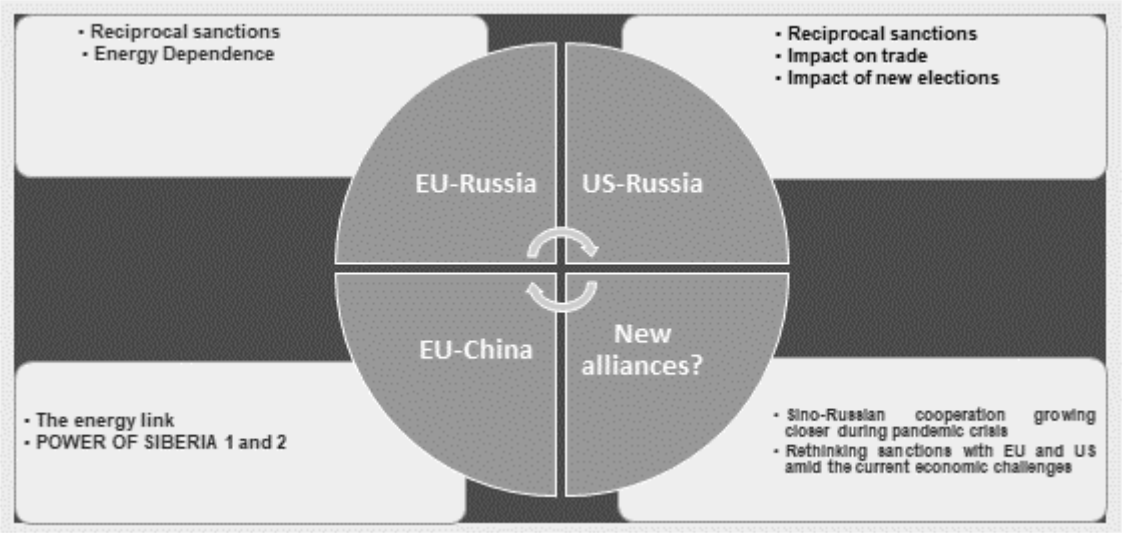
Graph 5: Russian real GDP and main contributors to its formation (percent)



Source: (IMF, 2021).

The Covid-19 crises proved to be an unprecedented test for the Russian decision-makers, demonstrating that in spite of the self-isolation policy applied in the last years, the national economy is still very sensitive to the external shocks and it is not able to withstand them alone. As such, the pandemic has highlighted the need of Russia to rethink its position in the relation with the main economic powers worldwide (Figure 1).

Figure 1: Russia's international cooperation in the pandemic era



Source: Authors' synthesis based on the studied literature.

3 Conclusions

Currently, amid the multiple social and economic challenges created by the Covid-19 crisis Russia could reconsider the importance of international partnerships by abandoning the autarchic approach from the previous years. Given the growing need for funds to support the economy, there is less and less support from the population for costly military actions such as the annexation of Crimea. Under these conditions, we could witness the emergence of Russia as a "soft" power in the international arena.

Maintaining reciprocal sanctions with the West seems to be the foreseeable medium and short-term scenario while EU has linked the lifting of sanctions on Russia to the full implementation of the Minsk Agreement. At the same time, questions remain in some EU countries about the effectiveness of sanctions, while there are also concerns that their indefinite extension could have a negative impact on EU trade. While the Covid-19 pandemic has generated important economic losses and imbalances in all economies, it could also be an important factor in reshaping the geo-political "game" between Russia and the West. Given the economic interdependence between the three "big" actors (Russia, the EU and the U.S.), but also China's increasing power and influence in the international arena, it is possible that in the near future we will witness a restructuring of mutual sanctions driven by pragmatic interests. The pandemic highlighted the structural weaknesses of the Russian economy, but also the fact that economic recovery, in an increasingly interconnected world, is not possible on its own.

Moreover the "oil price war" has shown to the Russian authorities that their main source of revenue for the federal budget is dependent on the agreements of major international producers while maintaining the EU as a major market for Russian energy exports remains vital.

The future Sino-Russian relationship will most likely take place under the sign of close energy cooperation, but without the prospect of an assumed ideological and political partnership while also tempered by Russia's willingness to not be perceived as a junior partner in its relationship with China.

Geo-politics in the pandemic era is proving to be a complex network in which new alliances can be jeopardized by unexpected challenges, while old rivalries can diminish through rediscovered cooperation. The Covid-19 crisis could unexpectedly become a bridge to renegotiating relations between Russia and the West, especially since, despite recent dissensions, Russia's interests could find a more lasting congruence in the European space rather than in Asia.

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Bulgaria's Fiscal Sustainability and Policy Response to the COVID-19 Outbreak

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Abstract: The analysis of the present study on the effects of the fiscal policy response of Bulgaria to the COVID-19 outbreak illustrates that the European Union (EU) additional fiscal rules introduced after the 2008 global economic and financial crisis help build buffers for the period of a new sudden macroeconomic shock. The new legislative initiatives to reform the coordination, monitoring and macroeconomic risk management in the EU taught lessons about fiscal framework from Maastricht, which inevitably has had an impact on national fiscal policies of the EU member states before COVID-19 pandemic. The assessment of Bulgaria's fiscal sustainability indicates that the government followed a strong fiscal discipline since early 2000s, which helped the country during both recent crises. Prior to the EU accession Bulgaria experienced strong economic growth above its potential provoked by the attractiveness of the country to foreign investors. The fiscal policy has been countercyclical, which contributed to the macroeconomic stability of Bulgaria as a country in the currency board arrangements. During the good periods when the output gap was positive the government created stable buffers with positive structural fiscal balance, which was above the medium-term budgetary objective (MTO) of 1% of GDP. Thus, in the emergency COVID-19 epidemic situation Bulgaria has had fiscal space for additional public spending and debt issuance. The assessment of the study shows that Bulgaria should return to its MTO with a gradual fiscal consolidation over the following years.

Key-Words: Fiscal policy, Public Economics, Public Finance.
JEL Classification Numbers: H3, E62

1. Introduction

During COVID-19 pandemic the governments across the world have implemented extraordinary fiscal actions to support households and businesses. Conventional and unconventional measures have been prompted by central banks to support the flow of credit and to prevent financial market disruptions (IMF, October 2020). To overcome the challenges of COVID-19 pandemic while also fighting with climate changes, the European Union (EU) has envisaged €1.8trillion EU Budget for supporting the EU economies through the Multiannual Financial Framework (MFF) for 2021-2027 (European Commission 2020). How did Bulgaria follow the fiscal rules in the EU before COVID-19 and how will the response to COVID pandemic cope with them in medium term for its fiscal sustainability?

To respond to that, this paper will focus its analysis on: (i) assessment of fiscal policy sustainability in Bulgaria for the period 2003-2019; and (ii) fiscal performance of Bulgaria and selected EU countries and Bulgaria's fiscal policy response to COVID-19 and future perspectives.

2. Assessment of Fiscal Policy Sustainability of Bulgaria (2003 – 2023)

The EU legislative initiative for coordination and monitoring of public finances through additional fiscal rules of the Growth and Stability Pact (GSP) with the adoption of Fiscal Pact and five directives "Six pacts" (European Parliament 2011) during the period 2011-2013 created buffers and taught lessons about fiscal framework from Maastricht, which inevitably has had an impact on national fiscal policies of the EU member states after the 2008 global economic and financial crisis. Before COVID-19 complexity had become the major problem of the EU fiscal rules for policymakers (Darvas et al., 2018). The EU fiscal rules system of the GSP became nearly unmanageable due to its complexity and the constant addition of exceptions, escape clauses and

other factors (Wieser, 2018). Additionally, the EU faces new challenges after Brexit, COVID-19 and transition towards green and digital economy, which may lead to amendments to the EU fiscal rules for the way forward.

One of the consequences of the COVID-19 outbreak has been that the EU relaxed temporary existing fiscal rules for general government fiscal deficit of 3% and government debt of 60%. The new Recovery Plan for Europe called Next Generation Europe (NGEU), being a part of the MFF for 2021-2027, aims to support of EU economies for sustainable recovery from COVID-19 pandemic, returning to fiscal and debt targets, and for effective movement towards environmental, digital and sustainable economy (European Commission 2020).

The rational for the EU fiscal policy rules is macroeconomic stability. Their developments point to a twofold task: first, making a credible reduction in the fiscal deficit within a range that will stabilize the debt ratio at a prudent level and, then, containing the debt ratio over the medium to long term. To maintain macroeconomic stability the EU regulations set up medium term objectives (MTOs) for the Member States in structural terms. The EU Regulation 1466/97 specifies that the MTOs should be pursued to achieve a structural fiscal deficit of at least 1% of GDP for countries in the euro area and in the EU Exchange Rate Mechanism II. Member countries, which are signatories to the Treaty on Stability, Coordination and Governance in the European Monetary Union, have even more ambitious commitment to achieve at least 0.5% structural fiscal deficit.

From theoretical point of view a structural deficit occurs when a country (or state, municipality, etc) posts a deficit even when the economy is operating at its full potential. This is the opposite of a cyclical deficit in that a cyclical deficit only occurs when an economy is not performing to its full potential (for example, if an economy is currently struggling through a recession

Conceptually, the most basic reason to be concerned about the structural deficit is that it is projected to grow faster than the economy. On the other hand, fiscal policy can contribute to economic recovery when it is countercyclical in the medium term and this is when changes in structural balance and output gap as deviations of actual GDP from potential GDP (Ygap) move in one direction. The reason is that the improved structural fiscal balance shows fiscal interventions in a restrictive direction, which is positive for business activity when the economy is growing above potential. In the opposite case, when the Ygap indicator is negative (i.e. the economy is growing below its potential), it is believed that an improved structural fiscal balance would further exacerbate fluctuations in economic activity.

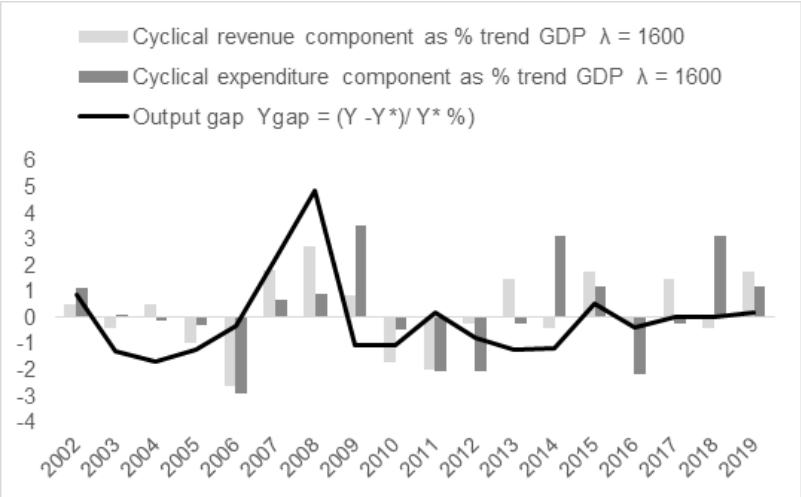
To assess Bulgaria's fiscal policy, the methodology of the International Monetary Fund (IMF) was applied by measuring the change in the primary structural fiscal balance against potential GDP; the trend of the structural components of the budget parameters relative to the potential GDP, and the endogenous response of the budget parameters to the changes in the business activity.

A quantitative measurement was applied. First, structural components of budget parameters were performed by clearing the cyclical elements of net budget revenues and expenditures at constant prices. Second, the change in the structural (cyclically adjusted) fiscal balance was defined as the difference between cyclically adjusted budget revenues and fixed expenditures.

For the calculation of structural components, the seasonally adjusted series for net budget revenues and expenditures on a quarterly basis at constant prices in Bulgaria (Q1 2002-Q4 2019) were filtered by HP filter (Hodrick and Prescott 1997) with a smoothing parameter $\lambda = 1600$ and calculated as a share of GDP. Simulations were made at $\lambda = 500$ and 1000 to ignore the subjectivity of the conclusions, and they did not substantially change the conclusions about cyclically adjusted budget parameters.

The cyclical components of the budget parameters were calculated as the difference between the budget parameters and their structural components on a quarterly basis, aggregated on an annual basis and expressed as a percentage of the potential (trend) GDP. The estimates for Bulgaria for cyclical items compared to the deviation of the actual GDP outturn confirmed their effect as an automatic fiscal stabilizer (Figure 1).

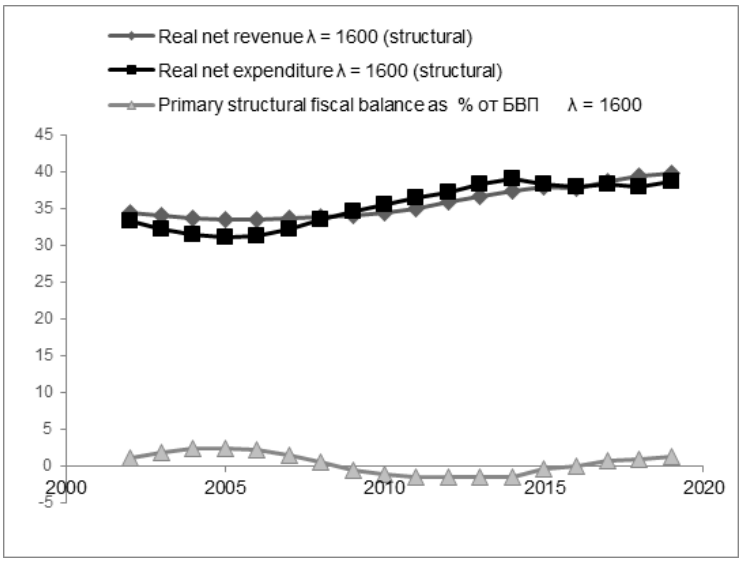
Figure 1. Output gap and cyclical budget components



Source: Own calculations, Eurostat (2020)

The econometric assessments of the structural components of the budget parameters and the primary structural balance, respectively, reflecting the medium-term intentions of the government and their trend show that their trend is most years aligned with the changes in output gap (Figure 2).

Figure 2. Primary structural fiscal balance and structural budget components



Source: Own calculations, Eurostat

The limitations of the applied approach are linked to HP-filter, which has several disadvantages. The most important in this context being that it is known for its revisions inherent to this procedure. This means that the estimated trend and cycle for the entire series will always be revised as new observations are added to the time series every month or quarter.

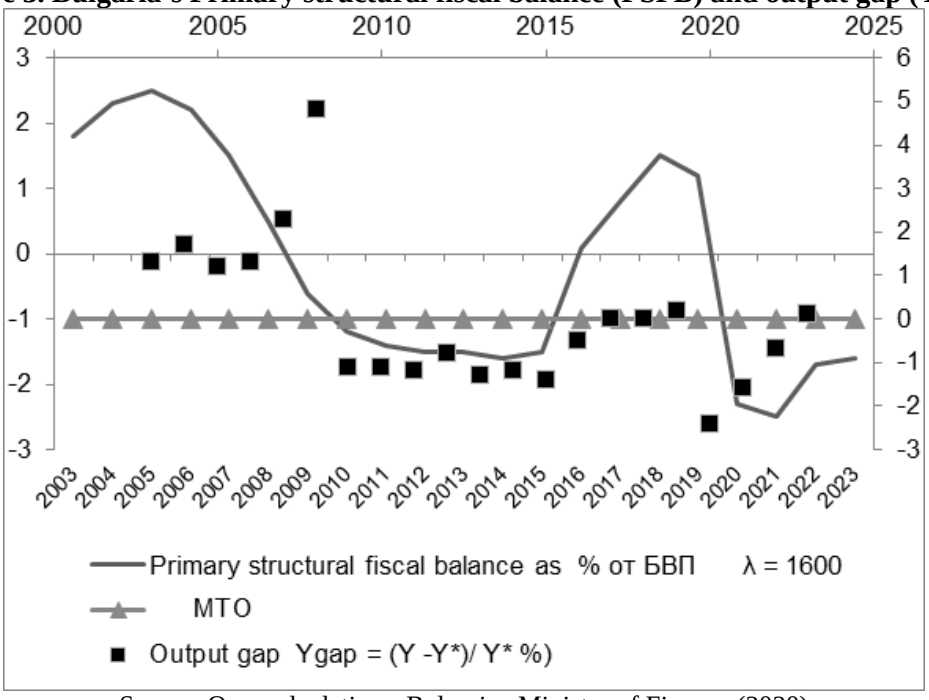
The assessment shows that the output was positive before the country's accession in the EU in 2007, peaking to 4.8% in 2008, and the structural fiscal balance moved in the same direction. Thus, the fiscal policy was countercyclical before the 2008 global economic crisis, which created buffers to cope with the consequences of the crisis.

Since 2009 the output gap and structural fiscal balance had turned to negative until 2016. The government achieved fiscal consolidation and created stable buffers during the period 2016-2019 when the output gap was positive again.

As a result of the COVID-19 pandemic the output gap and the structural fiscal balance for 2020 turned to negative again, but the projections showed a gradual improvement by 2023 (European Commission, 2020).

The assessment of the study shows that since early 2000s the fiscal policy of Bulgaria has been countercyclical. The country has kept the structural balance aligned with the output gap and above the MTO for a structural deficit of 1% several years before COVID-19 pandemic (Figure 3).

Figure 3. Bulgaria's Primary structural fiscal balance (PSFB) and output gap (Ygap)

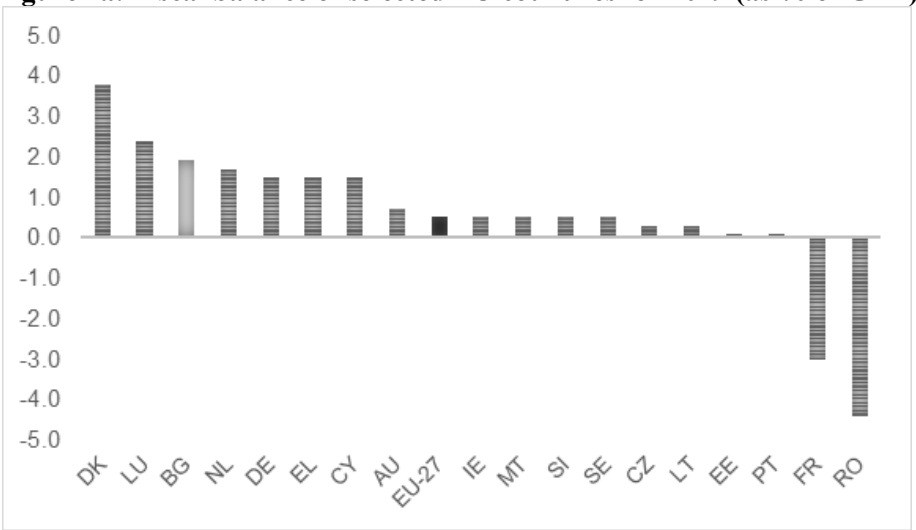


Source: Own calculations, Bulgarian Ministry of Finance (2020)

3. Bulgaria's Fiscal Policy Response to COVID-19 pandemic and Future Challenges

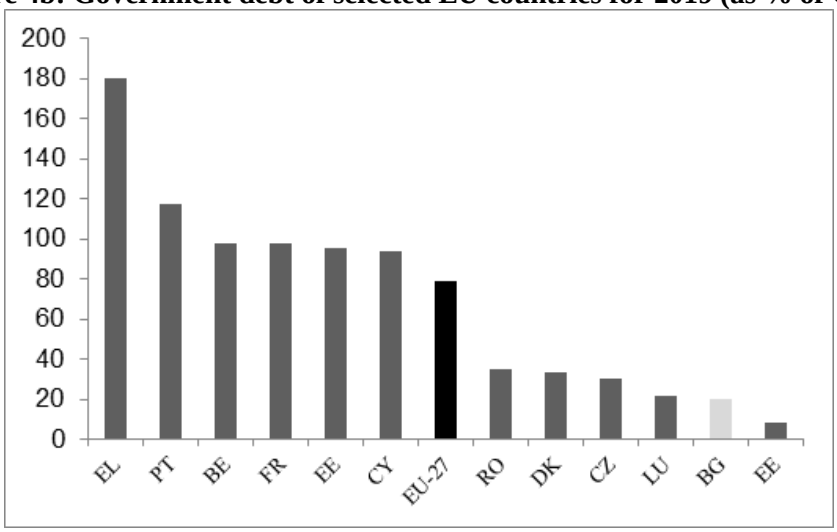
Before COVID-19 outbreak Bulgaria together with many other EU countries followed strict fiscal discipline with a budget surplus and lower government debt of GDP. In 2019 only France and Romania had a budget deficit above 3% of GDP, while more Member States had government debt ratios higher than 60% of GDP, breaching fiscal rules (Figures 4a and 4b).

Figure 4a: Fiscal balance of selected EU countries for 2019 (as % of GDP)



Source: Eurostat (2020)

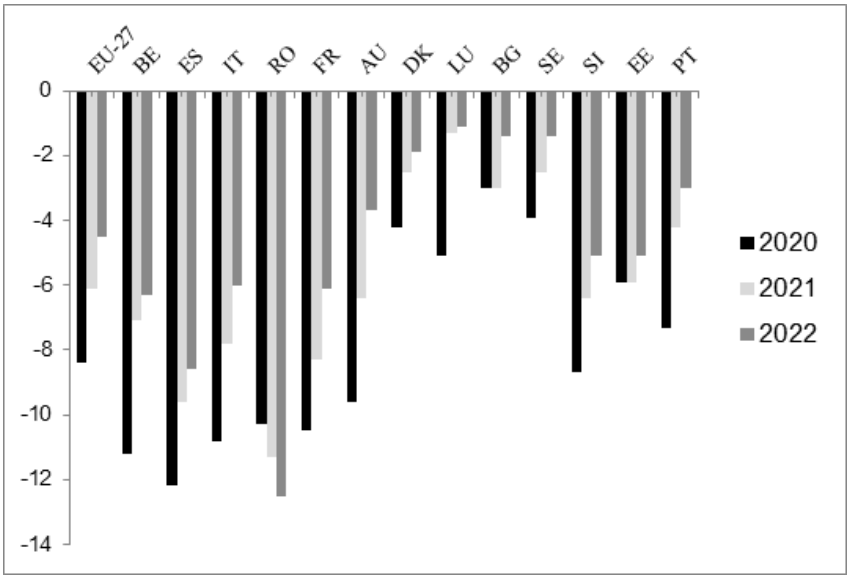
Figure 4b: Government debt of selected EU countries for 2019 (as % of GDP)



Source: Eurostat (2020).

Preliminary data about the COVID-19 outbreak suggest a significant economic impact from the pandemic in 2020 on fiscal deficits and government debt in the EU member states. The projected increases in general government deficits are expected to be much higher than those observed during the global financial crisis (European Commission, 2020). The large number of the announced COVID-related government policy measures will lead to significant annual deficits in medium term. All member States except Bulgaria are set to show deficits of over 3% of GDP in 2020 (Figure 5). Belgium, Spain, France, Italy and Romania forecast to exceed deficits of 10% in 2020 (European Commission, 2020).

Figure 5: Fiscal balance of selected EU countries for 2020 – 2022 (% of GDP)



Source: European Commission (2020)

Bulgaria is facing the COVID-19 pandemic from a strong fiscal position and the government has put in place measures such as support for businesses, higher remuneration for medical and security staff, subsidies and social support schemes (Bulgarian Ministry of Finance, 2020). The key anti-COVID-19 fiscal measures include:

- revenue measures for 0.3% of GDP for households with children, VAT reduction for restaurant services, books and baby food to 9 percent (from 20 percent) until end-2021;

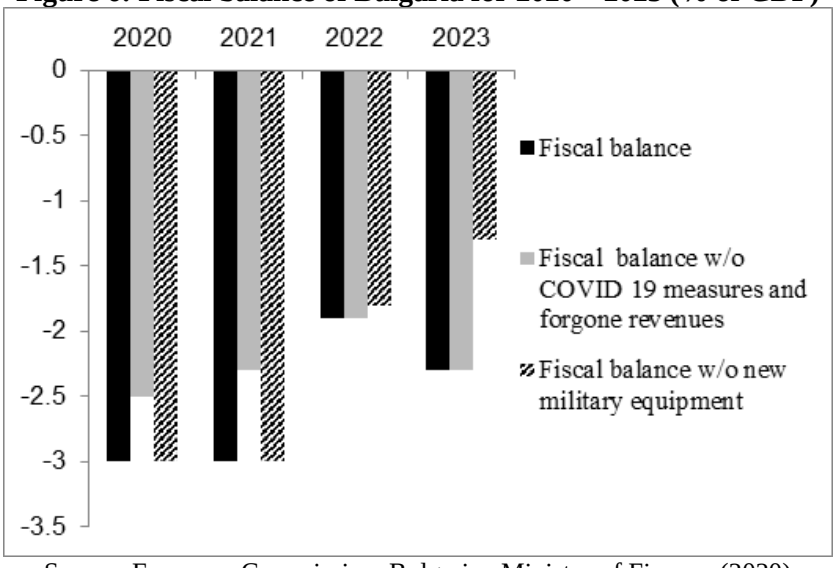
-support for various vulnerable groups of 1.3% of GDP, including pensioners (1% of GDP), parental support (0.2% of GDP) and freelancers in the area of culture.
-support for businesses 1.1% of GDP for 2020 through coverage of 60% of the wages of the employees in affected sectors that would have been otherwise laid off, including the social security contributions due by the employers. The support included reallocation of BGN173MM and 200 mn (0,3% of GDP) from the EU funds, respectively to support SMEs and larger companies that experienced at least 20 percent loss in revenues due to the pandemic; a minimum wage subsidy for the duration of three months to companies that hire an unemployed person; starting July 1, 2020 a monthly subsidy of a minimum wage (up to six months) for each job preserved, in tourism, hospitality and transportation sectors.
-additional remunerations in the ministries of health, interior and defense; bonus payments to medical and social services staff and expansion of social patronage services, but without impact on the expenditure ceilings of the budget.

The amendments to the 2020 budget act increased the amount of state guarantees that might be undertaken in order to cover Bulgaria's contribution to the EU Recovery Fund and its new instrument so-called temporary "Support to mitigate the Unemployment Risk in an Emergency" (SURE) programs(European Council 2020) . The resource of €200MM (out of €655MM) set aside for Bulgaria under the REACT-EU initiative is distributed in five of the existing operational programs from the programming period 2014-2020, which allow financing activities to support overcoming the effects of the crisis caused by the pandemic of COVID-19, and preparation for sustainable recovery (REACT-EU). A priority for Bulgaria remains the successful absorption of European funds and programs through which to achieve sustainable economic growth and the question is whether the country will manage to absorb the funds.

Thus, the fiscal stance for Bulgaria has been strongly expansionary in 2020 and 2021. The fiscal deficit on accrual basis for 2020 has increased up to 3.4%, exceeding slightly the 3% of GDP target (Bulgarian National Statistical Institute 2021) due to the one-off measures as a response to the pandemic. The impact of temporary revenue and expenditure measures related to preventing the spread of COVID-19 in the country is expected to be around 2.0% in 2020 and 2021.

Additionally, in 2022 and 2023 the acquisition of military equipment and related infrastructure aligned with the NATO responsibilities will have one-off negative effect on fiscal balance for 2022 and 2023. To finance the fiscal deficit the general government debt is expected to increase from 20.2% in 2019 to around 25% of GDP in 2020 and 26.5% of GDP in 2021, before returning to a downward trend in 2022. The debt increase should finance the primary deficit, but also serve as a precautionary borrowing for filling the required level of the fiscal reserve account (Figure 6).A fiscal consolidation during the following years is needed to return to MTO of 1% fiscal structural deficit. It should be achieved by a slight increase in revenues after the gradual recovery and withdrawal of emergency measures.

Figure 6: Fiscal balance of Bulgaria for 2020 – 2023 (% of GDP)



Source: European Commission, Bulgarian Ministry of Finance (2020)

Bulgaria will also benefit from the Recovery and Resilience Facility of the NGEU is €10 billion in grants and loans over the period 2021-2027. The impact on the aggregate demand from the EU additional funding should help gradually overcome the negative impact of COVID-19 outbreak on it.

4. Main conclusions

During the COVID-19 outbreak Bulgaria have launched a variety of emergency schemes, including provision of subsidies, benefits, loans and guarantees as well as the temporary postponement of tax obligations, increased social benefits and spending on healthcare, which pushed government deficits and debt levels above the heights reached during the 2008 financial crisis.

Public finances deteriorated significantly during both crisis, but during the 2008 global economic and financial crisis more of these negative consequences were not due to fiscal incentives. They were effects of automatic stabilizers (during the recession revenues decline and expenditure increase) and external factors (such as rescuing the banking sector). During COVID-19 pandemic Bulgaria similarly to the governments across the world increased significantly budgetary spending, which hampered temporally its fiscal sustainability.

The analysis of the present study on the effects of the fiscal policy response of Bulgaria to the COVID-19 outbreak leads to the conclusion that the strong fiscal discipline in Bulgaria during the times of growth built buffers, which have been used during the period of sudden macroeconomic shocks. Bulgaria's ability for additional spending has been determined by country's fiscal space and by good public debt levels before the crises.

The EU membership and additional EU resources from New Generation Europe as well as the MFF for 2021 – 2027 in support of the budget is expected to help Bulgaria alleviate its fiscal stance as a guarantor of macroeconomic stability. In a situation of emergency epidemic situation in Bulgaria a temporary deviation from the MTO of 1% structural fiscal deficit has been performed, but the envisaged gradual fiscal consolidation from 2022 is a positive sign for fiscal sustainability and macroeconomic stability.

Both crises have shown that Bulgaria and other member states need to create stable fiscal buffers to ensure fiscal space managing the consequences of the crises on economic activity.

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COVID-19 Implications on Global Value Chains in Bulgaria and Romania

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Abstract: - New structures formed because of the globalisation of the international economy. Global value chains (GVCs) represent a stage in the development of international production, trade, and investments. The countries of Central and Eastern Europe (CEE) are deeply involved in the European production and trade chains. This involvement stimulated the industrial base modernisation, the creation of new jobs, the expansion of export trade sectors, and foreign direct investment (FDI) attraction. Bulgaria and Romania are part of the European production model because of their inclusion in the European GVCs. Therefore, we have observed a positive effect on their export-oriented and investment policies. The pandemic COVID 19 crisis has a terribly negative effect on domestic and international economic development and growth. Because of the closure of the EU economies, the main European businesses squeezed their production, which reflected not only on the reduction of orders from major trade partners but also on the shrinking of domestic and foreign trade. These adverse effects affect the functioning of GVCs, which are likely to review their current activities and organisation of production. Under these challenging conditions, what will be the consequences for the Bulgarian and the Romanian economies?

Key-Words: European Global value chains (GVCs), European industrial model, Bulgaria and Romania GVC linkages, COVID 19 and implications on economies
JEL Classification: F12, F14, F23

1 Introduction

As new structures formed because of the globalisation of the international economy, global value chains (GVCs) represent a new stage in the development of the international production, trade, and investments. The countries of Central and Eastern Europe (CEE) are deeply involved in European production and trade chains. This involvement stimulated the industrial base modernisation, the creation of new jobs, the expansion of export trade sectors and foreign direct investment (FDI) attraction. Bulgaria and Romania are part of the European production model because of their inclusion in the European GVCs. As a result, we have witnessed a positive effect on their export-oriented and investment policies. The COVID 19 pandemic crisis has a terribly negative effect on domestic and international economic development and growth. Because of the closure of the EU economies, the main European businesses squeezed their production, which reflected on the reduction of orders from major trade counterparties and on shrinking domestic and foreign trade. These adverse effects affect the functioning of GVCs, which are likely to review their current activities and organisation of production. In these conditions, what will be the consequences for the Bulgarian and Romanian economies, which are part of the European industrial model?

2 The role of global value chains in the EU Member States of Central and Eastern Europe (CEE)

2.1 The global value chain structure

International production, trade and investment are increasingly organised within the so-called global value chains, which consist of industries located in different countries or regions. Global value chains are structures that draw on the shared capital of industrial and commercial companies in different parts of the world, benefiting from the comparative advantages of one or another country. Services that are linked to the industrial production are also part of the cross-border flows of goods, know-how, investments, services, and people involved in the production processes. The chain of interconnected production units, located in different parts of

the world, generates added value at each stage of the entire production process, from the intermediate goods to the final item.

The positive effects of GVCs on local economies are generally underlined. GVC penetration helps implement more in-depth reforms in the industries permitting the spread of spill-over positive effects on domestic sectors in terms of implementation of new industrial practices and the creation of new jobs. Production entities, parts of the international production chains, have a positive effect on a country's foreign trade boost and FDI attraction.

Although, GVCs are not a panacea for the host country economic development, as a structure acting according its interests, some high-tech information and technological communication (ICT) equipment is kept in the country of origin. Some secondary activities are established abroad, such as the production of intermediate goods and finished products, which are not of strategic economic and political importance. The external intermediate and final goods industries are as a rule of medium technological intensity and capacity. Very often the final products are re-exported back to the country of origin. In the framework of the GVCs a product can cross two and three borders until the finished item is obtained.

Global value chains are important structures in the world trade and investment process, having an impact on the economic development of the host country. Currently GVCs account for almost 50% of world trade. If GVCs activities rise by 1%, the level of the host country per capita income increases by more than 1%. It is about two times higher than the effect on the host economy during the conventional previous international trade relations.

2.2. The European GVC penetration in Central and Eastern EU countries

Initially, the GVCs from Europe involved production and trade activities at regional level since the networks were located at national level or nearby, in neighbouring countries. However, some special activities were transferred to the United States. According to R. Baldwin and J. Lopez Gonzales (2015), who study the operational activities of GVCs, the notion of international fragmented production is somewhat misleading. According to their research, value chains in the field of trade are mainly regionally positioned.

Later on, European GVCs expanded their outsourcing and offshore operations, investing in Asian economies, mainly in China, and taking advantage of those countries' comparative advantages, such as the developed industrial base, a high-absorption market, a relatively cheaper labour force, and a lack of requirements concerning labour protection and workers' rights.

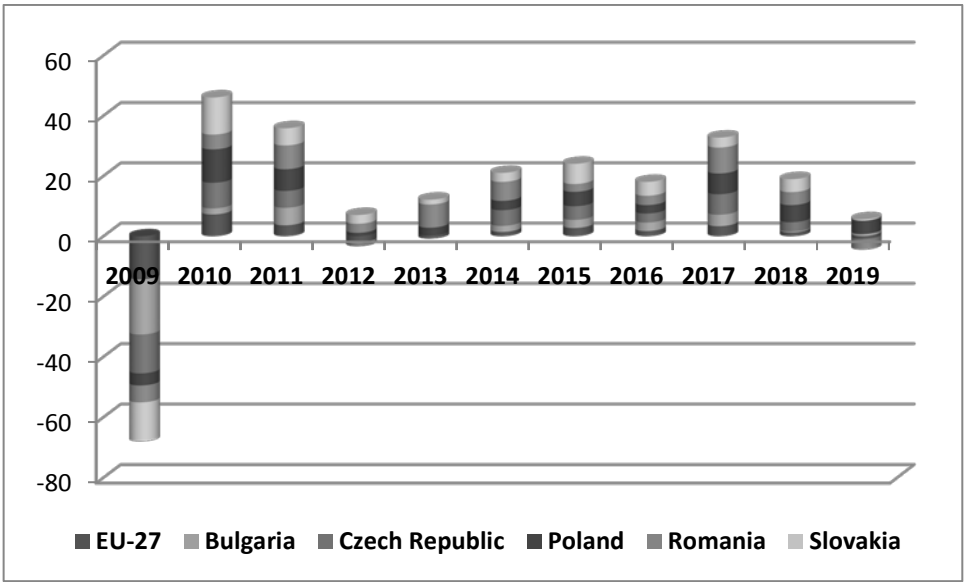
The combining effect of the opening of the Central and Eastern Europe (CEE) economies, their integration into the European Economic Area, the comparative advantages of these destinations, due to their closeness to Western markets, stimulate European GVCs in the sense of developing industrial and trade activities in the region. The comparative advantages of CEE economies are the developed industrial base, the skilled workforce, the similar production and trade traditions, the relatively lower production costs. The geographical proximity of CEE countries to Western Europe was one of the main incentives for GVC investments.

Bulgaria and Romania also became a point of interest for European GVCs, because after the EU integration and the investment risk decreased, the two countries became part of the European production and trade model. The scheme under which GVC capital transfer is carried out in EU CEE is classical – market studies, evaluation of the main FDI attraction factors, assembly of goods, transfer of industrial entities. Initially, low and medium value-added goods were produced (i.e. "average" activities were carried out). Later on, CEE located manufacturing networks fulfilled diversified industrial tasks, in relation with the economic specialisation of CEE countries, and produced higher value-added goods. Investments were made in the upgrading of more complex production chains.

Research and development centres, independent production of goods and more sophisticated activities were developed. Downstream activities, such as marketing, distribution, sales, and after-sales activities, which the international business theory as calls "functional upgrade", are also taking place. Recently, GVCs from China, Japan, and the US have been searching the easiest way to penetrate the vast market of EU countries through the CEE countries.

One of the signs of GVCs inclusion in CEE economies is industrial production growth. Following the global financial crisis (GFC), EU CEE industrial production increased in 2010 and 2017. Poland, Hungary, the Czech Republic, and Romania had the highest share in industrial production in the region. (Fig. 1).

Fig. 1: Industrial production in EU CEE countries annual growth rates 2009-2019*



*Annual rates of change for total industry, main industrial groupings and NACE divisions, calendar adjusted data, EU-27, 2005-2019

Source: Eurostat (2019).

A large share of CEE exports goes through the production chains of the EU-15 developed economies. This is a "hub and spokes" technology model, where the hub is represented the EU-15 and the spokes are the CEE countries (Cieślik, 2014). In Europe, the hub is represented by the German-Central European Supply Chain (GCESC), which expanded rapidly since the opening of the Central European (CE) economies such as the Czech Republic, Hungary, Poland, and Slovakia. The supply chains acquired great global importance. "Labour cost differentials together with geographical proximity and cultural similarities have led many German firms to shift large parts of their production to CE countries either by directly investing there or by purchasing intermediate inputs from local firms." (IMF, 2013)

German value chains are particularly active in the automobile industry, where increasing competition in both domestic and foreign markets has triggered a sustained process of outsourcing of manufacturing activities. According to the International Organization of Motor Vehicle Manufacturers (OICA), approximately 19% of European motor vehicle production takes place in CE countries, compared to only 9% in 2004. The opening of a plant of the French company Peugeot, which provides 900 jobs, in Trnava, Slovakia, and of a Volkswagen factory with 7,500 jobs in Bratislava (2010-2011) are an example.

European production chains established in CE are particularly active in innovative technologies (computer and electronics industry, motor vehicles). They are investing in the industrial structure and in information and communication technologies (ICT), which allow for the creation of technology clusters that horizontally, cover industries in different countries and related services. This production chain is a network for industrial production of intermediate goods at each stage of technological production. The CE average productivity in the real sector has improved. Investments in the renovation of the old industrial base increased, as did the professional qualification of workers. Global value chains from Germany and other developed economies are developing productive and trade links with CEE countries in labour-intensive industrial productions such as textiles and clothing and the food industry (e.g. in Bulgaria, Hungary, and Serbia).

3 Bulgaria and Romania and the Global Value Chains

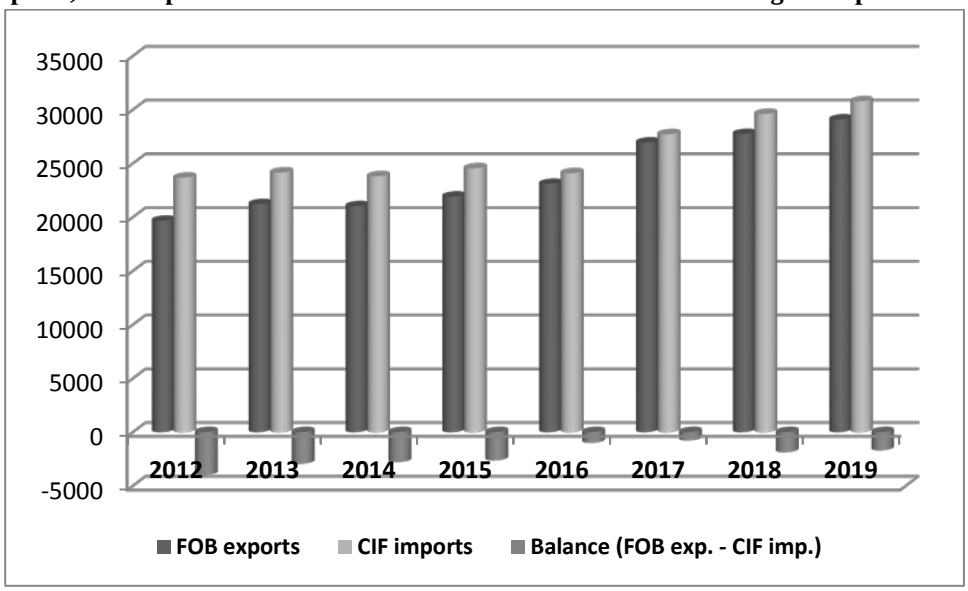
Bulgaria and Romania arise like attractive destinations for European value chains. The main determinants are integration into the European Economic Area, low production costs, diversified economy and specialisation in machine building industry, well-educated and high level of professional qualification of the labour force. The geographical proximity of Bulgaria and Romania to the EU developed economies is important and the risk of doing business is relatively low. At the same time, GVCs encountered restrictions when entering the Bulgarian and Romanian markets. For Bulgaria, limitations are due to bureaucratic obstacles towards start-ups and business creation, the distribution of added value generated by foreign affiliates, the large difference in funding for research and innovation, and the development of higher-tech industries. Similar constraints are encountered in

Romania. In addition to the difficult registration of new industries and companies, as well as the low level of research funding, there are public procurement barriers and the overall entrepreneurial policy in the country needs to be reappraised (European Innovation Scoreboard, 2020).

CEE countries are highly integrated into the Single European Market for goods and services and capital flows. They are dependent on new technological supply of equipment to overcome the information and communication technological gaps. The synchronization of economic activities between the CEE economies and the EU-15 has led to more correlated business cycles in Europe, with a positive effect on production capacity (Yosifov, 2014).

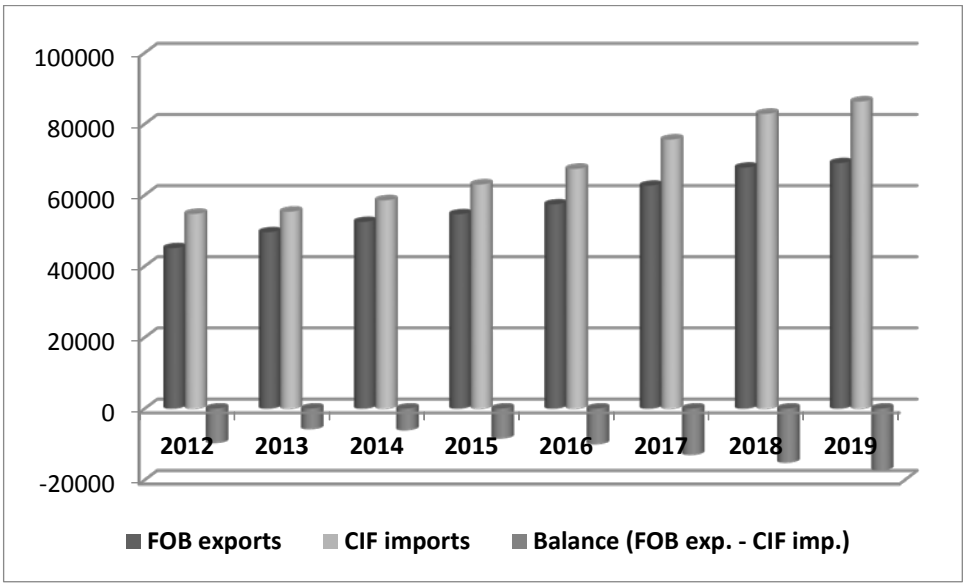
The production and trade activity of GVCs changes the foreign trade structure and increases the volumes of foreign trade flows. Bulgaria's and Romania's trade policy favours the higher integration of the international market of goods and services, mainly within the EU Single Internal Market.

Fig. 2: FOB exports, CIF imports and FOB/CIF balance of international trade in goods operations of Bulgaria



Source: National Statistical Institute of Bulgaria Bulgarian National Bank, data for the consecutive years.

Fig. 3: FOB exports, CIF imports and FOB/CIF balance of international trade in goods operations of Romania



Source: National Statistical Institute of Romania, Romania in figures, Statistical abstract for the years 2011-2020. https://insse.ro/cms/sites/default/files/field/publicatii/romania_in_figures_0.pdf

After the European debt crisis (2010), exports of goods from Bulgaria and Romania increased, including trade in intermediate goods within the GVC. The reason for that increase was due to the enhanced number of

orders in industry from Western counterparts. Romania's trade balance is higher than Bulgaria's. However, this higher balance is a result of Romania's broader industrial base, which requires increased imports. The improvement of export opportunities for Bulgaria and Romania are an indicator for the development of export-oriented industries into the structural sectors of these economies. The production process in the framework of GVCs contributes to the countries' specialisation of the economy, where the country has comparative advantages and traditional competencies. The acquisition of new knowledge and practices contributes to the enhanced transfer of technology between the foreign European company and the host country. The involvement of Bulgaria and Romania in GVCs has an impact on the improvement of labour productivity amelioration in the real economic sector.

Bulgaria's and Romania's industrial production potential and growth are evident from the added value and the industry employment. Moreover, the number of employed people in non-financial economy are higher than in the EU-28 (before Brexit) and the total value added delivered by the CE countries is even higher (Table 1).

Table 1: Value added, employment and apparent labour productivity in manufacturing in EU CEE countries, 2016 (%)

	Value added (VA) at factor costs % of total non-financial business	Persons employed % of total non-financial business
EU28	26.6	21.4
Bulgaria	**28.8**	**30.4**
Romania	**28.1**	**30.4**
Czech Republic	39.9	35.3
Hungary	38.5	27.7
Poland	33.1	28.7
Slovakia	36.6	31.4

Source: Based on statistical data provided by Eurostat Database 2016)

Domestic and foreign value added formed by exports and imports are indicators of the production and trade relations of Bulgaria and Romania. Both economies invest more in imported value added in the production of a given product, compared to the Eurozone and EU countries. Local value-added, as part of gross exports is higher for Romania (Table 2).

Table 2: Imports content of exports, as % of gross exports total and Domestic value added in gross exports total in % for 2016 for Romania and Bulgaria

Imports content of exports, % of gross exports total, 2016 (%)	
Romania	21.6
Bulgaria	32.2
Euro area 19	16.4
EU 28	11.6
Domestic value added in gross exports total, 2016(%)	
Romania	78.4
Bulgaria	67.8

Source: WTO data concerning global value chains (2016).

The integration of EU countries in the global production and trade chains is measured by the OECD GVC index. This index evaluates both the share of imported foreign value added in a country's exports (backward linkages chain), and the country's domestic value added in the exports of other countries, as a share of total exports of the country (forward linkages).[1]

[1] The level of trade in merchandise and services intermediate products is given by core measures such as foreign value added content of exports (backward linkages) and domestic value added content of partners' exports (forward linkages). Domestic value added sent to the consumer economy corresponds to the domestic value added embodied either in final or intermediate goods or services that are directly consumed by the imported economy. Domestic value added sent to third economies represents the domestic value added contained in intermediate goods or services exported to the partner economy that re-exports them to a third economy embodied in other products. This illustrates the multiple value added exchanges taking place among GVCs and corresponds to the forward GVC participation.

This indicator is divided into two parts; (1) an internal part, where the domestic industry supplies intermediate goods, and (2) an external part, where the intermediate goods are produced abroad. The index has the lowest value of 1 when no intermediate products are used to produce the final product or service, or when all manufactured goods and services reach the end user directly.

Bulgaria and Romania are involved in the production of intermediate goods for industries (part of the production of other goods for export). Some of the goods exported from the country are in turn used as intermediate goods in third countries – the rest of the world –, through the fragmented production process.
Bulgaria participates more significantly in GVCs through its industrial production and mainly as an importer of foreign goods for intermediate consumption (backward the chain). Bulgaria is classified in backward GVC integration (together with Lithuania, Estonia, Slovak Republic, Hungary, Ireland, Denmark, Luxembourg and Malta). These economies are net "receivers" of value added from the rest of the EU countries. The CEE European countries in this group are strongly influenced by the large presence of EU15 transnational companies (TNCs).

As a small open economy, the percentage of imported foreign value added in Bulgaria's exports is higher, both in imports from the EU and from third countries. Value added in intermediate goods contained in the production of goods or services are a significant component of the Bulgaria's gross export. Bulgaria is ordered among the backward linkages countries,, although this classification is not decisive, because each production process has its own characteristics. That is why in some cases, Bulgaria can be classified in the forward linkages group. The higher the value of the index is, the longer the fragmented production process. Small EU open economies with smaller internal resources, such as Bulgaria, have a high value in terms of an average length of the GVCs, meaning that the Bulgarian economy participates in industries characterised by high fragmentation of the production chain. Bulgaria's high index expresses the growing importance of export-oriented industries in the country, part of the fragmented production chain. Bulgaria is involved in this process through the automobile and textile production, the extraction of base metals, chemical products, machine building and equipment. Bulgaria's overall index is higher, mainly due to the country's high level of backward integration and diversified specialisation of the industry.

Being a country with diversified specialisation, Romania is classified in forward GVC integration (as are Germany, Austria, Sweden, France, Finland, the United Kingdom, the Netherlands, and Poland). The countries in in this group are net senders of value added, as well as innovative countries in Europe. Poland and Romania have experienced growth in their innovation indicators. Romania is classified as a country that invests more intrinsic value in gross exports (forward linkages). Romanian production of goods and services consumes less imported intermediate goods, while domestic value added is higher. Romania, as a country producing energy carriers and specialising in the automobile chemical industries and in the processing of raw materials, domestic value added is higher in exports.

Table 3: Bulgaria and Romania integration in GVCs among the 4 groups of the EU economies: Backward & Forward Linkages – All Industries – EU28

		Backward linkages – All industries – EU28						**Forward Linkages-All industries-EU28**					
		Foreign VA in Exports from world (%)		**Foreign VA in exports from other EU28 (%)**		**Foreign VA in exports from RoW (%)**		**Domestic VA in world exports (%)**		**Domestic VA in other EU28 in other EU28 exports (%)**		**Domestic VA in RoW Exports (%)**	
		2015	**2015-2005**	**2015**	**2015-2005**	**2015**	**2015-2005**	**2015**	**2015-2005**	**2015**	**2015-2005**	**2015**	**2015-2005**
BI*	**Bulgaria**	**36**	**4**	**17**	**6**	**19**	**-2**	**16**	**3**	**11**	**3**	**5**	**0**
BI	Denmark	29	3	15	0	14	3	18	-1	11	-1	8	0
BI	Estonia	35	4	20	3	15	2	17	-1	11	-1	5	0
BI	Hungary	43	-1	28	2	15	-3	16	2	12	1	4	1
BI	Ireland	40	5	19	1	21	3	12	0	7	0	5	0
BI	Lithuania	32	2	13	5	19	-2	17	2	12	2	5	0
BI	Slovakia	45	2	25	0	19	1	19	1	16	1	3	0
FI	Austria	27	1	17	-1	10	2	21	2	15	1	6	1
FI	Finland	26	-2	14	0	12	-2	21	1	13	1	8	0
FI	France	21	1	11	0	10	1	21	3	14	2	7	1
FI	Germany	21	2	10	0	11	2	22	1	13	0	8	1
	Netherlands	28	5	12	2	16	3	21	0	14	-1	7	0

	Poland	27	2	15	1	12	1	22	1	17	2	5	0
	Romania	**23**	**-5**	**15**	**0**	**8**	**-5**	**21**	**5**	**16**	**5**	**5**	**0**

Notes: * BI – Backward integration; FI – Forward integration; RoW – rest of the world;
The difference from 2005 to 2015 is expressed in percentage points.
Source: S. Comotti, R. Crescenzi, S. Iammarino, (July 2020) Foreign direct investment, global value chains and regional economic development in Europe, Final Report, European Commission, p. 25.

The Czech Republic is classified in the group of high GVC Integration (like Belgium and Slovenia). These economies with heterogeneous levels of overall economic development have a relatively high integration in EU GVCs in terms of both backward and forward linkages. The internal value added sent to the consumer economy corresponds to the internal value added embodied in final or intermediate goods or services consumed directly by the import economy.

The major industrial producing countries - Germany, France, the Netherlands, and Poland import foreign value added into the local production network. They also produce domestic value added, which accumulates in the countries' exports. This shows the high degree of their GVC integration, diversified industrial production and specialisation. Countries with low GVC integration (Croatia, Cyprus, Greece, Italy, Portugal, Spain and Latvia) are relatively less integrated and more dependent on rest of the world with respect to both backward and forward linkages (Table 3).

Table 4: Summary innovation index of Bulgaria and Romania

	Relative to EU 2019 in 2019	Performance relative to EU 2012 in	
		2012	2019
Bulgaria	45.4	42.3	49.5
Romania	31.6	40.2	34.4

Source: EU European Innovation Scoreboard 2020, Bulgaria, Romania.

Bulgaria and Romania are classified as *modest innovators* and their goal is to enter the group of "moderate innovators". Fast-growing enterprises in innovative sectors, employment impacts, and intellectual assets are the strongest innovation dimensions for Bulgaria. On the other hand, finance support, attractive research systems and innovators are the Bulgarian weakest innovation dimensions. According to the European Innovation Scoreboard, it is difficult for Bulgaria to move towards moderate innovators, despite the positive contribution of the strategy for the identification of thematic areas for economic development of firms, the innovation niches at regional level and the corresponding focus on financial resource.

Bulgaria's performance in 2019 increased compared to that of the EU in 2012. Romania recorded a decrease in the innovation index performance in 2019 compared to EU 2012 level, despite the innovation-friendly environment and the increase of export. Broadband internet penetration and medium and high-tech exports of good are indicators, which are close to EU average. Romania's lowest scores are recorded in terms of innovations by small and medium enterprises (SMEs) with marketing and organisational scope.

The number of patent applications field with the European Patent Office (EPO) grew by 4.6% reaching a high of 174.317 in 2017 (EPO Annual Report 2018). Transnational corporations from European countries also fuel this growth. Germany is the leading EU member in the patent field, has increased its annual growth rate of number of patent submissions by 2.9% in 2018 (Patent Cooperation Treaty, 2020).

More requests have been made by EU CEE countries for European patents in the last years than traditional innovating EU countries. Romania, Bulgaria, Poland have had increasing numbers of submissions since 2010. The number of patents in 2018 as designed by office and by country of origin for Bulgaria is 4 and 99, and for Romania – 20 and 109. (Patent Cooperation Treaty Yearly, 2020)

4 Impact of the COVID-19 pandemic crisis on GVCs - consequences for Bulgaria and Romania

A significant shock on the organisation, management and operation of production chains has occurred because of the COVID 19 pandemic crisis. The main blow comes from the closure of small and medium-sized enterprises (SME) and of the activities of larger enterprises in various sectors in an attempt to stop the spread of the COVID 19 infection. European value chains producing motor vehicles, pharmaceuticals, computers, electronics located in Bulgaria and Romania severely limited production due to the disruption of supply chains of intermediate goods and services. Material disturbances are looking at a length of one month to 3.7 years Entire industries, apart from those involved in the production of anti-infection products and medicines and health products are facing the challenge of overcoming the decline in production due to the freezing of orders and the

shrinking consumption. On the other hand, the medical equipment industry and drug production are sensibly on the increase. The crisis also did not disrupt inputs in the industries for assembling sophisticated machines, the final production of which is located in developed economies.

EU measures for combatting the fall in industrial production at the national level and for social support for business and workers and other aids are insufficient because funding for companies cannot compensate their normal gains from economic activities.

COVID 19 has a negative impact on GVC activities and it was obvious that there was a need to redefine the concept and the role of GVCs in the international economy. The WTO underlines a fall between 13% and 32% of countries' export, while UNCTAD estimates a FDI contraction of 30% to 40% during 2020 -2021.

The COVID-19 pandemic crisis shows the vulnerability of GVCs as a complex structure and the danger of the global fragmentation of the production process. Even when the infection was concentrated in China, European producers experienced problems in the industries, due to the delay and/or suspension of supplies from China. This led to a restructuring of European production chains, which limited their investments in Asia to a certain extent, in particular in China, and relocated some industrial activities and services back to Europe.

It has become apparent that there are goods and services that cannot be managed on a market basis. Food, health protection and the goods that accompany it, as well as the standard of living, cannot be governed by the will of structures of unknown capital origin, as it was emphasised by French President Emmanuel Macron. His call aimed to preserve the main vital industries at national level to avoid external adverse influences and shocks.

Within the European institutions, politicians are rethinking the reorganisation of economic and industrial activities. This is essential for building sustainable societies that are better able to withstand extreme events, health-related or natural disasters. Rethinking EU policy decisions concerns the structure of GVCs and the dangers arising from the fragmentation of the production process. *This means that the EU should consistently reorient its overall vision and policies to reduce the length and the complexity of GVCs to regionalize part of trade flows and to limit the relocation of businesses to third countries.*

The existence of significant measures to counter the COVID-19 pandemic crisis entails political consensus in Europe and world-wide. There are different economic and geostrategic goals at national and regional level in relation to GVC policies, which will most likely have a negative impact on the growth of international trade.

Depending on the dynamically changing international economic and political environment and in the context of the COVID-19 pandemic crisis, future additional costs will arise, which will limit the internalisation of production and the growth of international trade. Changes in international trade and investments have an impact on GVC expansion and activity, which will change over time. The reorientation of GVC policies towards investments at national and regional level, as it was the case in the early years of GVC expansion, may have impacts for the enlargement of GVC production in Bulgaria and Romania and the enhancement of their industrial and trade capacities.

5. Conclusion

The Covid-19 pandemic crisis led to an unprecedented contraction of the global and regional economy. This calls for a full reconsideration of available public policy options to support and relaunch economic growth and employment in a sustainable and equitable manner in all EU regions, and in Bulgaria and Romania. Coordinated multilevel evidence-based public policies are essential for GVCs and FDIs to support recovery. Targeted interventions are crucial to rebuild investor confidence and maintain the ecosystem conditions required for FDI retention.

This is particularly relevant to modest innovators like Bulgaria and Romania, when considering the operationalisation of GVC concepts to guide their network policy at regional level.

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EU Most Vulnerable Economies from the Tourism Sector Perspective: a Macroeconomic Approach

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Abstract: - Despite the resilience shown in recent decades, tourism is one of the sectors most affected by the Covid-19 crisis: many businesses in this area have interrupted or diminished their activity in the last months, and the tourist flows have decreased drastically, especially for the international tourism, either due to objective factors– regulations and restrictions, or subjective ones – tourist behaviour. Europe is the biggest international tourism market, and the European Union includes one of the most important tourist destinations, but also countries or regions where tourism is a key industry. The real impact of the health crisis in this sector is still the subject of complex analysis, and the evolution of the pandemic and its effects still offer only the possibility of estimated assessments at this time, as proved by repeated revisions of the economic reports. Moreover, the real impact of this crisis is difficult to be quantified or decoupled from the evolution of the European economies as a whole and its contagion effects. In this paper, we propose an assessment of the vulnerability of the EU through the contribution and impact of the tourism industry in member states' economies. Based on the statistical data of World Travel and Tourism Council and own calculations, we examine the main factors that can influence the resilience of economies through the tourism industry: the direct and total contribution of tourism in GDP, the direct and total contribution of tourism in employment, the share of exports of tourist services in total exports, the share of international tourism in internal tourism consumption.

Key-Words: tourism industry, EU member states, quantitative analysis, cluster analysis, economic vulnerability, pandemic crisis.
JEL Classification : L83, C38, C43, N74

1 Introduction

The year 2020 was marked by a 73% decrease in the number of international tourists and, in absolute terms, the decline is equivalent to one billion fewer tourists registered internationally by the World Tourism Organization (UNWTO, 2021). In monetary terms, the decline in international tourism flows has led to a loss of revenue of about $ 1.3 trillion, and this impact is estimated by experts to be more than 11 times greater than that felt in the global economic crisis of 2008-2009. The size of the unprecedented decline is even more visible if we look at the number of jobs lost, estimated to be between 100 and 120 million, mainly in SMEs. Unlike the rather local crises (Ebola in Africa, SARS & MERS in Asia-Pacific), the Covid-19 pandemic has affected all regions of the world. If in relative terms, the Asia-Pacific region experienced the largest decrease in international tourist arrivals (-84%), in absolute volume (number of tourists and revenues), Europe felt the crisis the most, as a

consequence of being the most visited region (in general, about half of international tourists, therefore the related tourist expenses).

Before the outbreak of the pandemic, the tourism sector was characterized by figures that gave it an unprecedented importance in the global economy: the total impact (including multiplier effects - indirect and induced) in GDP increased to 10.4% and 10.6% of the total number of jobs, the tourist services accumulated 6.8% of the total exports, respectively 27.4% of the global exports of services. As 2020 marked a decrease in the contribution to global GDP by 49.1%, the sector's contribution almost halved, reaching only 5.5% of the global economy in 2020. According to the World Tourism and Travel Council (WTTC, 2021), in Europe, the crisis has caused a decrease in GDP from tourism by 51.4% ($ 1126 billion) and has led to the loss of 3.6 million jobs (-9.3% of the total sector).

The economic and social risks caused by the vulnerability of the tourism market are seen on several levels and involve complex dimensions, in particular by affecting tourism demand, with an impact especially on SMEs, with negative effects on the labour market and, further on, with the second-round effects, on the tourist offer, on the incomes of the employees in the field and, natural consequence, with the exposure of the communities and regions dependent on tourism.

The paper aims to look at the vulnerability of the EU economies and the tourism sector in the Member States from the pre-pandemic levels of economic impact on GDP, the labour market, the multiplier effect, and dependence on tourism exports. The analysis can offer a long-term overview on the economic and social risks caused by the decline of the tourism industry in the member countries, isolating recent developments, directly dependent on the health crisis situation.

2 Literature review

The onset of the Covid-19 pandemic led to a variety of socio-economic trials and pressures, ranging from the health and economic crisis to the effects on sectoral industries, including in particular the tourism industry, which according to some estimates (Abbas et al., 2021) has lost more than $ 2.86 trillion, representing more than 50% revenue losses compared to previous years.

The tourism industry is very susceptible to crises, especially to those caused by natural disasters that impede travel (Okumus and Karamustafa, 2005), but also to economic ones (Bodosca et al., 2014) and also to anthropogenic disasters (terrorism, war, revolts) (Richter and Waugh, 1986), (Ryan, 1993). Most of the times, the states, including here the companies that operate in their economies, are poorly prepared or unprepared for these types of crises, and this is even more evident when crises affect important sectors of the global economy. The crisis caused by Covid-19 highlighted the need for business continuity, resilience and also for the existence of a backup plan in case of disasters (Croner-i, 2000).

Tourism is vital to the success of many economies around the world. Tourism boosts the economy's income, creates thousands of jobs, develops a country's infrastructure, and creates a sense of cultural exchange between foreigners and locals. For host destinations there are many benefits due to tourism (Yehia, 2019). In the global economy, tourism has become like a commodity to be marketed, so that consumers, i.e. tourists, "consume" the chosen destination as a product.

The World Tourism and Travel Council argues that the number of jobs created by tourism in many different fields is significant and that these jobs are not only part of the tourism sector, but can also include the agricultural sector, the communications sector, the transport sector, the health sector and education sector (World Travel & Tourism Council, 2017).

The news, but also the realities, have led to a dramatic decrease in the number of tourists, as they abandon their planned holidays due to fear of infection but also because of restrictions (Zenker et al., 2021). The contribution of travellers to the increased risk of infection has led authorities to restrict freedom of movement in most countries around the world, which again has affected tourism and its related industries (Uğur and Akbıyık, 2020).

Before the crisis caused by Covid-19 in the literature the debate was centred on the vulnerability of tourism in relation to terrorist attacks (Song et al., 2019), in relation to climate change (Scott et al., 2019) (Dogru et al., 2019), in relation to natural disasters (Rosselló et al., 2020), (Huan et al., 2004), in relation to economic crises and less in relation to pandemics (Lim and Won, 2020), (Stylidis and Terzidou, 2014). With the Covid-19 pandemic the focus of attention has shifted, so it is now the turn of protection and resilience to be in the focus of researchers (Sharma et al., 2021), (Kock et al., 2020) and studies of international organizations such as UNWTO or WTTC.

Today there is a strong focus on how to restart the tourism industry (OECD, 2020), (Helble and Fink, 2020), but also on ensuring the protection of tourists (Villacé-Molinero et al., 2021).

Starting from the fact that tourism is a crucial factor for many economies and an important source of income for most countries around the world, through our research we want to highlight the vulnerability of tourism to this situation of uncertainty. Other authors have also studied the implications of tourism due to its vulnerabilities such as (Duro et al., 2021) - vulnerability to pandemics, (Canh and Thanh, 2020) - the vulnerability of the economy due to fluctuations in the tourism industry, (Liu and Pratt, 2017) - the vulnerability of tourism due to extremism taken to extremes (terrorist attacks).

The focus of our attention has been on the EU member states that during the period since March 2020 have felt perhaps the greatest impact of Covid-19 on their economies, and in particular on the tourism industry (Vet et al., 2021).

3 Methods

The real impact of the pandemic on the tourism sector continues to be extremely difficult to predict, because the time and space dimensions of the crisis still cannot be anticipated, but also because its direct, indirect and contagious effects are difficult to be quantified.

This paper tries to respond to the main research question: "Which EU countries are most vulnerable to crisis from the perspective of the tourism industry?". In order to respond to the research question, we propose an assessment of the vulnerability of the EU through the contribution and impact of the tourism industry for the member states' economies.

The analysis is focused on the main factors that can influence the resilience of economies through the tourism industry: the impact on the economy, the weight in exports, the international tourism share in internal tourism.

The analysis is structured as follows:

- Empirical analysis - main indicators (27 EU countries and EU average, 2019) –from World Travel and Tourism Council database and authors own calculations: Direct & Total contribution of tourism in GDP, Direct & Total contribution of tourism on Employment, The share of exports for tourist services in total exports, The multiplier effect – GDP Multiplier, Employment Multiplier, The share of international tourism in internal tourism consumption.

- Building a Tourism Vulnerability Index:

    - A score was given for each indicator: 1 for worst result (as maximum vulnerability), and proportionally related to this value;

    - Weighted average: 10% (each) for: direct contribution in GDP, direct contribution in Employment, total contribution in Employment; K GDP, K Employment; and 20% (each) for: tourism share in exports, international expenditures in internal tourism consumption.

- Cluster analysis (K-means): seven clusters (predefined) based on main components - direct GDP, direct employment, GDP multiplier, employment multiplier, exports share, visitor expenditures share.

4 Results and discussion

Regarding the impact of the tourism industry on the GDP and labour market in the EU member states, the following can be found (see Annex):

- tourism had a high direct contribution to the GDP of Croatia (11.4%), Greece (8.2%) and Portugal (7.1%), but extremely low in Belgium (1.6%) and Ireland (1.5%), but also in Romania (1.8%); Croatia is the first in EU also taking into account the total contribution of tourism, a quarter of the country's GDP being due to this sector and its multiplier effects (25%); Greece (20.8%) is on the second position in the top of the most dependent countries on the tourism industry in the EU, on the other hand, in Poland, Ireland or Belgium, the total impact of tourism did not exceed 5%; however, Romania it was below the EU-27 average (5.3%);

- tourism contributes directly to 12.3% of the employed population in Croatia, accumulating up to 25.1% if we add the indirect and induced impact of the industry; Greece, Malta (10.8%), Portugal (8.5%) and Greece (8%) are among the top countries where tourism has a strong direct impact on the labour market, and the total share in the employed population reached over 20% in Greece (21.7%) and Malta (21.1%);

- In Romania, tourism contributed directly in 2019 to only 1.7% of jobs, the lowest share at EU level but, through its indirect and induced effects, reached 6.3% of the total labour market. In EU, the lowest shares in the labour market were in Poland and Belgium – both did not exceed 5% of the total contribution of tourism in employment.

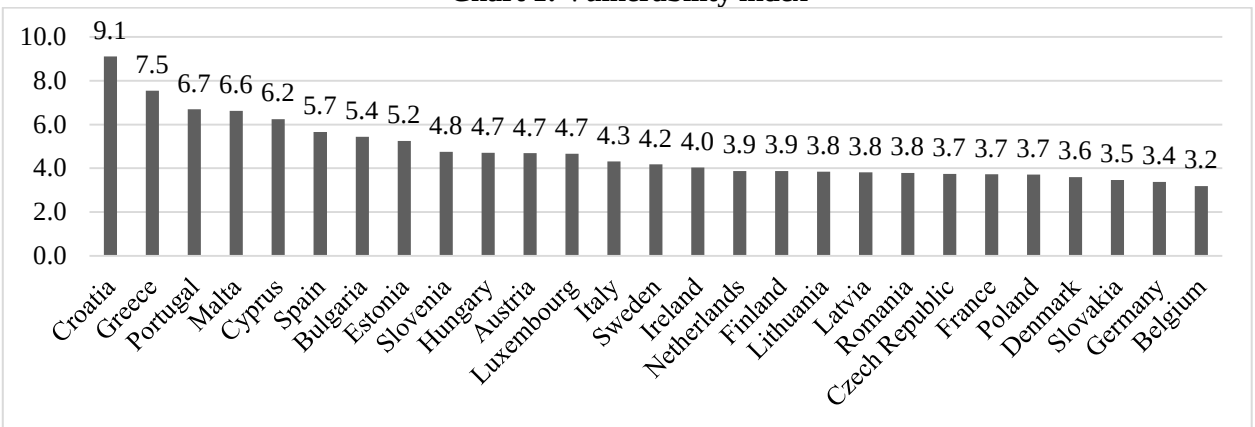
Regarding the multiplier effect (total contribution/direct contribution), the highest values in GDP formation were recorded in the Nordic countries - Finland (3.72) and Sweden (3.34), but also in Romania (3.26) and Bulgaria (3.44); on the other hand, in countries such as Austria (1.75) or Croatia (2.19), despite being mature tourist markets, the snowballing effects on supply chain were among the lowest at Community level. From the perspective of the labour market, Finland (3.8) and Romania (3.7) are also in the top of the countries where the multiplier effect of tourism is strong; on the other hand, there are countries where tourism is not a key industry, even though they are traditional European destinations, and also important source markets internationally (Germany, the Netherlands, Austria).

From role of tourism perspective in the exports of the member countries, the dependence of some European countries on the revenues from international tourism is confirmed: Croatia (38.6%), Greece (30.1%) and, to a lesser extent, Portugal (23.5%) or Spain (18%). In contrast, there are Slovakia, Ireland, Germany, the Netherlands or Belgium, where the share of tourist services in total exports was extremely low in pre-pandemic times (below 3%). The importance of the tourism industry in exports was low in Romania (3.7%) also, well below the Community average or below neighbouring countries (Bulgaria, Hungary), direct competitors in international tourism.

A key factor of vulnerability in the context of the crisis is the share of international tourism (exports) in domestic tourism (total tourism revenues). The countries which rely on foreign tourists are Cyprus, Croatia, and Malta, where, in 2019, about 90% of tourism revenues were from exports. In Germany, the most important source market in the EU, the share of international tourism did not exceed 15%, and in Italy or France, ones of the European top destinations, it was 25% or 35%, data that show the high adaptability of domestic tourism in these countries. Looking from this perspective, including the share of international tourism in the total domestic tourism of neighbouring countries (Bulgaria - 80%, Hungary - 75%), we can appreciate that Romania is less vulnerable in the long term and has not been equally affected by the weaker position in international tourism. However, the share of 43.5% of revenues is high, especially if we look on the small percentage of foreign tourist arrivals (20%).

Starting from the analysed indicators, the vulnerability index (figure no. 1) reflects the risks of economic impact generated by the tourism industry in Croatia, first of all, but also in Greece, Portugal, Malta or Cyprus. Germany or Belgium seems to be the least exposed European economies in terms of the tourism sector.

Chart 1: Vulnerability index



Source: authors, based on own calculations

The grouping of EU Member States through cluster analysis gives us a clearer picture of the elements of vulnerability. The extreme vulnerability of the Croatian economy is confirmed, and very high for the island

countries - Cyprus and Malta, respectively for the destinations of the Mediterranean Europe - Greece, Portugal, and Spain. Other states are vulnerable in terms of the importance of tourism exports (see cluster 4), the impact of tourism on the economy (Italy) or the multiplier effect (Romania).

Table 1: Cluster analysis

Cluster	Countries	Vulnerability	Characteristics
1	Croatia	Extreme vulnerability	Highest tourism impact in economy Exports highly (severe) dependent on tourism 90% foreign tourist
2	Cyprus Malta	Very High vulnerability	Dependence on international tourists (90%) Cyprus – higher share of tourism exports Malta – higher share in tourism contribution in economy
3	Greece, Portugal, Spain		Averages: - almost ¼ share of tourism in exports - 2/3 of tourism receipts from foreign visitors; - 14% up to 20% (Greece) tourism industry in economy
4	Bulgaria, Estonia, Hungary, Ireland, Luxembourg, Poland, Slovenia	Medium vulnerability	In terms of exports (75% average) Important share in exports (6% average)
5	Finland, Germany, Italy	Medium-low vulnerability	In terms of tourism impact (e.g. Italy) Lowest share of visitor expenditures (E.g. Germany)
6	Austria, Belgium, Czech Republic, Latvia, Lithuania, Netherlands, Slovakia		About 1:1 domestic-foreign Lowest share in exports (4.4% average)
7	Denmark, France, Romania, Sweden		40% average of visitor exports in internal tourism consumption Highest multiplier (about 3 average)

Source: authors' research;

5 Conclusions

The analysis of the economic vulnerability induced by the relevance of the tourism sector for the economy as a whole, strongly affected by the pandemic, shows important differences between the EU member states. However, the vulnerability index and clusters validate each other and show the levels of risk that some European countries have if the tourism industry does not achieve a rapid recovery after the crisis.

Greece, Croatia, Cyprus and Malta have economies with a high degree of vulnerability in tourism, as they are characterized by an extremely high degree of dependence on this sector not only terms of impact on GDP and the labour market, but also in terms of international tourism revenues. Secondly, among the countries with sectoral risk there are states that, although not shown to be dependent on tourism, are strongly affected by the collapse of the sector - we are considering here the countries of Southern and Mediterranean Europe, with most important international tourism destinations in the EU – as Greece, Portugal or Spain. With medium vulnerability, in particular through dependence on tourism exports, there are the countries of Central and Eastern Europe - Bulgaria, Estonia, Hungary, Poland or Slovenia. Other European destinations with mature and highly competitive tourist markets in attracting international tourists, Italy or France, but also Germany or the Scandinavian countries (Denmark, Finland, Sweden), are characterized by a medium vulnerability, either as a result of less dependent economies on tourism, or because it benefits from a domestic tourism with a high share in national tourism. Although the tourism industry in Romania does not accumulate an important share of the sector in the economy, whether we look at GDP or the labour market, the risks could arise from its multiplier effects on supply chain, especially in terms of significant multiplier effect.

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Annexes

Table 1: Tourism contribution and impact in EU member states, 2019

	Tourism contribution in GDP		Tourism contribution in employment		Multiplier effect		Tourist exports share (%)	international tourism* share (%)
Country	Direct	Total	Direct	Total	GDP	employment		
Austria	6.8	11.8	7.1	12.5	1.7	1.7	9.7	49.9
Belgium	1.6	4.3	2.0	4.9	2.6	2.4	2.4	47.6
Bulgaria	3.2	10.8	3.7	10.6	3.4	2.8	10.7	79.8
Croatia	11.4	25.0	12.3	25.1	2.2	2.0	38.6	89.2
Cyprus	5.4	13.8	4.8	13.2	2.6	2.8	17.3	90.3
Czech Republic	2.6	6.5	4.1	8.0	2.5	2.0	4.1	54.1
Denmark	2.4	6.6	2.5	6.9	2.7	2.7	4.8	43.1
Estonia	5.1	11.7	3.5	11.3	2.3	3.3	9.6	73.1
Finland	2.0	7.5	2.1	8.1	3.7	3.8	4.8	29.2
France	3.7	8.5	4.6	9.4	2.3	2.0	7.7	34.1
Germany	3.6	9.1	7.0	12.5	2.5	1.8	2.9	14.5
Greece	8.2	20.8	8.0	21.7	2.5	2.7	30.1	68.5
Hungary	2.8	8.3	5.1	10.0	2.9	1.9	6.4	75.7
Irland	1.5	4.3	2.5	5.9	2.8	2.4	3.0	79.0
Italy	5.8	13.0	7.4	14.9	2.3	2.0	7.9	24.2
Letonia	3.4	7.6	4.3	8.3	2.2	1.9	5.0	52.9
Lithuania	1.8	5.5	1.8	5.8	3.1	3.2	3.7	55.1
Luxembourg	4.3	8.9	5.8	11.1	2.1	1.9	3.3	81.0
Malta	5.3	15.8	10.8	21.1	3.0	2.0	9.6	89.9
Nederlands	1.8	5.7	5.7	10.1	3.2	1.8	2.9	51.5
Poland	2.0	4.7	2.2	5.0	2.3	2.3	4.4	68.7
Portugal	7.1	16.5	8.5	18.6	2.3	2.2	23.5	70.4
Romania	1.8	5.9	1.7	6.3	3.3	3.7	3.7	43.5
Slovakia	2.7	6.3	3.0	6.3	2.4	2.1	3.0	51.2
Slovenia	3.2	9.9	3.7	10.3	3.1	2.8	6.2	66.3
Spain	5.9	14.3	5.3	14.6	2.4	2.8	18.0	56.1
Sweden	2.4	8.2	3.7	9.8	3.3	2.7	6.9	44.6
EU-27	3.9	9.5	5.3	11.2	2.4	2.1	6.2	36.8

Source: Gateway, World Travel & Tourism Council statistical data – Data Gateway, authors calculations;
Notes: * in internal tourism

Implications and Challenges of China's Supremacy on the Global Rare Earths Market[1]

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Abstract: - China's spectacular economic development over the last four decades or so, and its atypical evolution during this process placed the country both at the forefront of the global rare earth trade, and at the centre of international concerns and debates on the implications this ascent has on the regulations governing global trade. Now an uncontested contemporary reality, China's supremacy on the global rare earth market has fuelled the fears of strongly industrialised countries for the future security of the supply of these raw materials, as a direct result of the extent to which Chinese governmental authorities will from now on choose to comply or not to comply with the international trade rules and practices in force. In these conditions, our article seeks to provide an overview of the evolution of Chinese policies in the field of rare earths, of how they helped transform natural resources endowment into a competitive advantage, and of the recent trends on this global market on which China is the leader.

Key-Words: rare earth, China's leadership on global rare earth production, rare earth world market
JEL Classification: L61, Q02, Q37, Q38, O13, O53

1 Uncertainties generated by China's dominance on the global rare earths market

Given the vital economic importance of rare earth elements[2] (REE) for the development of modern technologies, the international scepticism with regard to the exclusive dependency on China as a world leader in the production and exports of rare earths derives from the ample restrictive measures that the Chinese central authorities implemented in the past and which generated a supply deficit for the main developed economies, risking even to endanger the competitiveness of those countries' industries that rely on cutting-edge technologies and to slow down the performance of the emerging renewables sector (Ebner, 2014).

As shown by the international trade practice, in particular in the period preceding the global financial crisis, many countries used restrictive barriers such as export duties (Piermartini, 2004), seeking to limit external sales of metals and mineral products in order to: *i)* maintain the domestic supply of raw materials at an optimum level; *ii)* improve external marketing conditions; *iii)* lower the price on the domestic market for the benefit of local intermediary consumers; *iv)* comply with the environmental protection and natural resource preservation rules (Mancheri, 2015).

Invoking all these motives – which traditionally underlie the application of the trade barriers we refer to above –, at the launch of the Eleventh Five-Year Plan (2006-2010), the Chinese government put forth a strict rare earth regulation and export control policy based on three main lines of simultaneous action: *a)* the gradual reduction of quantitative export quotas; *b)* the limitation of the number of national companies authorised by the central authorities to trade in rare earths on external market; and *c)* the introduction of annual caps on the volume of operations allocated to these companies.

Evidently, all these export restrictions adopted by China generated a series of economic effects that were rapidly propagated at global level, causing an increase of the international price of rare earths and a disruption in the supply flows of the main manufacturers in the developed countries (which host the high-tech industries so

[1] This article is a synthesis of a more ample analysis developed by the author within the multiannual study entitled *China și competiția pentru supremație tehnologică în contextul strategiei de repoziționare și extindere a influenței sale globale* (China and the competition for technological supremacy in the context of the country's strategy to reposition itself and expand its global influence), coordinated by Sarmiza Pencea, Institute for World Economy (2020).

[2] In this article, we will alternatively use the terms "rare earths" (RE) and "rare earth elements" (REE) and their corresponding acronyms.

strongly dependant on imports from China). In these conditions, the US, Japan and the EU asked for consultations within the World Trade Organization (WTO) concerning the measures imposed by China on RE exports (e.g. duties, quotas, licences), invoking their incompatibility with the obligations assumed under the Protocol of Accession to the WTO (2001). Although following the WTO resolution against it China eliminated the RE export quota system, multiple uncertainties and fears still persist in the international economic environment because of the concentration of the global production of rare earths in this country.

Therefore, as shown by the experience of the last few decades, throughout its economic consolidation process China aimed to increase the added value of the wealth of its non-renewable natural resources, in particular rare earths. To reach this objective, the Chinese authorities restricted foreign participation in upstream sectors while encouraging foreign direct investments (FDI) in downstream industries – thus fostering the inflow of new technologies, know how, etc. – by not applying restrictions on the export of REEs from this sector (Wübbeke, 2013). This policy enabled a rapid transition from its status as a follower to the dominant position it holds now, when not only that China has surpassed the main leaders of the global REE industry, but has even gained control over the entire global value chain (Mancheri, 2015). In these conditions, developed countries have begun to feel more and more poignantly the fear of a new and increasingly acute dependency on China in relation to the sourcing of the new technologies that it develops for the processing of rare earths.

2 Rare earths: classifications, importance and main uses

Rare earths are 17 elements included in the periodic table[3], with the same physical and chemical properties: *i)* 15 of these belong to the lanthanides group, with atomic numbers from 57 to 71; *ii)* scandium (atomic number 21); and *iii)* yttrium (atomic number 39).

Because of their magnetic, optical and electrical characteristics, REs are essential elements for the modern high-tech industries, being used in a wide range of production processes and being incorporated in a variety of applications, whether independently or in combination with other chemical compounds and/or metal alloys (given that another property exclusive to rare earths is that even in very small quantities they help enhance the performance of end products) (Golev, Scott, Erskine, Ali, & Ballantyne, 2014).

Although they are called "rare earths", their abundance in Earth's crust exceeds that of widely used metals such as copper, zinc, nickel or lead (Gupta & Krishnamurthy, 2005). Instead, the limited availability of rare earth ores derives from the complexity of the extractive process, as they are found in mixtures with other mineral deposits and therefore require ample prospecting operations and expensive processing techniques. The most abundant category is that of lanthanides which, depending on their atomic number, are classified as "light" rare earths, while the elements included in the "heavy" RE group are less predominant.

Due to the lower production and marketing costs, on the one hand, and to the versatility of their properties, on the other hand, light REEs and yttrium are used on a large scale, for a multitude of industrial applications, while heavy rare earths have a much lower applicability, limited to industrial activities that require high technological specialisation (Goonan, 2011).

Although REEs exhibit multiple similarities in terms of basic chemical properties, each has its own unique features, making it impossible to substitute one for the other in the technological processes and in the specific applications they are used for. Depending on these individual particularities, on the strategic importance of the field they are used in, on the degree of difficulty in finding comparable and reliable substitutes, and on the accessibility of the supply markets, the US Department of Energy has identified five rare earth elements that are of "critical importance": neodymium, europium, terbium, dysprosium and yttrium (US Department of Energy, 2011). This status is used as a reference in the geological feasibility studies and projects related to extraction and processing, because ore bodies with a high percentage of rare earths classified as "critical elements" are considered less exposed to the market fluctuation risk.

As we stated above, rare earths are dispersed in Earth's crust and are found in the form of oxide mixtures in association with a variety of ores – most commonly with bastnäsite, monazite and xenotime minerals –, each having a composition different from these elements. In these conditions, in the post-extraction stage, the ore that comprises rare earths must undergo a series of complex separation processes in order for each individual element to be obtained.

[3] Lanthanum (La), Cerium (Ce), Praseodymium (Pr), Neodymium (Nd), Promethium (Pr), Samarium (Sm), Europium (Eu) Gadolinium (Gd), Terbium (Tb), Dysprosium (Dy), Holmium (Ho), Erbium (Er), Ytterbium (Yb), Lutetium (Lu), Scandium (Sc), Yttrium (Y).

As for their end use, rare earth elements have a double function: *a)* they act as *production enablers*, i.e. they are used in technological processes but are not incorporated in end products (for example, in the refining industry, they are used as catalysers in the fluid cracking process); *b)* they act as *enablers for the products they are incorporated in*, conferring key properties that enhance technological performance (e.g. through the addition of rare earths, the force of permanent magnets – used in the manufacture of electrical engines, turbines, etc. – increases by one unit). Also, because of their particularly versatile physical and chemical properties, rare earths are used both in the production activities of mature industries (metallurgy, glass processing, etc.), and in the highly specialised technological processes specific to more recent emerging industries (such as the production of permanent magnets) [Box 1]. Also, beyond their traditional applicability in technologically intensive sectors, over the last decade, rare earths have become essential elements in two new areas of strategic interest, namely the production of modern low emission power generation systems and the military and defence industry.

Box 1: Main fields of use of rare earths

1. Ceramic industry (La, Ce, Pr, Nd, Y, Eu, Gd, Lu, Dy): condensers, sensors, dyes, scintillation (luminescent) materials, refractive materials;
2. Metallurgical industry – alloys (La, Ce, Pr, Nd, Y): NiMH (nickel-hybrid metal) batteries, fuel cells, steel, light alloys, super alloys, magnesium/aluminium alloys;
3. Permanent magnet production (Nd, Pr, Tb, Dy): engines, disk drives, magnetic resonance imaging, electricity, microphones/speakers, magnetic refrigerators;
4. Phosphorus-based electronic materials (Eu, Y, Nd, Er, Gd, Ce, Pr): CRT, LPD, LCD monitors and screens, fluorescent light, medical imaging, lasers, optic fibre;
5. Glass processing/polishing industry (Ce, La, Pr, Nd, Gd, Er, Ho): polishing compounds/powders, dyes/dye removers, glass obtained using UV cutting/adhesion techniques;
6. Catalysers (La, Ce, Pr, Nd): oil refining, catalytic converters, additives (Diesel engines), chemical processing;
7. Other fields of use: nuclear energy (Eu, Gd, Ce, Y, Sm, Er); **defence industry** (Nd, Pr, Dy, Tb, Eu, Y, La, Sc, Sm); **water treatment; pigments** (Ce, Y); **fertilisers.**

Source: Author's schematic overview and synthesis based on the British Geological Survey (2011).

3 The transformation of resource endowment into a major competitive advantage for China

If until the mid-1980s the United States was the global leader both in the production of rare earths[4], and in the field of technological innovation on this market, presently it not only lost this supremacy but became totally dependent on imports from China. Also, the ample process of technological transfer that took place over the last few decades from the US and from other developed economies enabled China to develop a solid REE processing industry which at present outclasses strongly industrialised countries on many of the segments of the global value chain (US Geological Survey, 2014).

The spectacular evolution that China underwent from the beginnings of its exploitation of rare earth ores and up to the present shows that Chinese policy-makers realised early on how important REEs are for the country's economic and technological development and, as a result, successive governments drew up minute plans meant to lead China to a position of superiority on the global market (Mancheri, Sundaresan, & Chandrashekar, 2013). Therefore, China's current leadership position in the global REE production is due not only to its considerable reserves[5], but mainly to an active and sustained policy employed by the national authorities which fostered the growth of this sector.

Although rare earth production had started in China as early as the beginning of 1950s, the constraints the country was facing at the time – generated mainly by the low level of economic development – prevented the allocation of the funds required for the consolidation of this industry. Nevertheless, from this early stage, China conducted ample geological prospecting operations seeking to identify new mineral resources, including rare earths. Also, the *Baotou Institute for Rare Earth Research* was established in accordance with the *Twelfth*

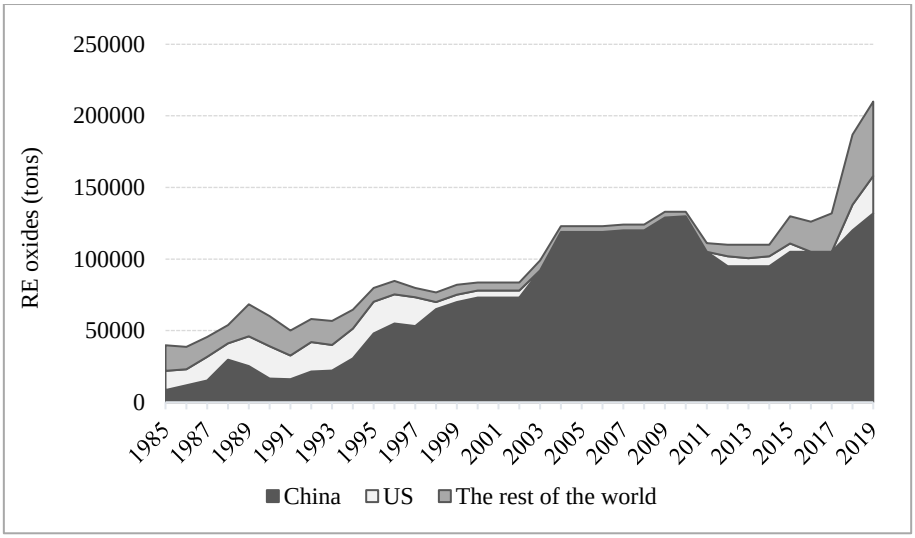
[4] In 1984, the production of the Mountain Pass mine (California) covered not only the US domestic demand, but also accounted for around 1/3 of the total global exports (Levkowitz & Beauchamp-Mustafaga, 2010).
[5] At present, China's rare earth reserves are at around 38% of the world total.

National Plan for the Development of Science and Technology (1958), and its activity led to significant achievements and progresses for the improvement of the REE extraction and separation process.

Under the leadership of Deng Xiaoping (1969-1997), who initiated an ample reform process in terms of economic liberalisation and modernisation, the Chinese development strategy took a new turn, in which scientific and technological advances gained significant ground. Because the launch of the initiative on the modernisation of the national economy meant acquiring and absorbing advanced technology from developed countries, the Chinese central authorities launched the so-called "open doors policy", with a strong focus on attracting foreign investment and directing it towards the science and technology sector and towards strategic industries (including towards the production of rare earths). By implementing this policy, China was seeking on the one hand to reduce the development gaps separating it from the main advanced economies and, on the other hand, to change the structure of national exports, by replacing low-processing REEs (predominant until then) with high added-value products.

As a result, towards the end of the 1970s, China's production capacity soared due to the massive government support granted for the improvement of mining technologies, and to the funds allocated to research and development (R&D) in the field of rare earth applications[6]. As shown by international statistical data (USGS, various years), in the period 1978-1989, the domestic RE production increased annually by around 40%, with China becoming the main global producer at the beginning of the 1990s (Graph 1).

Graph 1: Global rare earth production in the period 1985-2019 (tons)



Source: Author, based on data published by US Global Survey (USGS, various years).

Although at the stage when production capacity was being consolidated many of the national mining companies were not profitable, they managed to stay on the market as a result of non-performing loans and other forms of financial support received from the main commercial banks controlled by the Chinese government. The subsidies granted to large local companies in the RE industry was in line with the provisions of a more comprehensive government policy that sought to promote the internationalisation of the activity of companies involved in strategic fields, to enable them to acquire new production capacities using resources, technologies and know-how from the foreign markets.

As a result, the massive incentives received by the production companies – with an implicit effect on production costs – helped accelerate Chinese rare earth exports. Against this background, in the second half of the 1980s, global REE prices began to decrease, gradually forcing China's main competitors (the US in particular) out of the market.

Once almost all global production was transferred to China and once upstream industries were consolidated in accordance with the provisions of the five-year development plans, national policies began

[6] Among the government funded programmes aimed at intensifying production and innovation in the field of rare earths we mention: Programme 863, Programme 973, and a series of other national projects and initiatives which lead to the creation of specialised institutes, laboratories and research centres.

focusing on the acquisition of the technical expertise required for enhancing the technological level of the domestic rare earth production, to help expand the production capacity of related and downstream industries (e.g. the production of rare earth based alloys, powders and permanent magnets).

Although China had succeeded in overcoming the "Western monopoly" in the production of rare earth oxides and metals, in the 10th decade, these products represented relatively minor "links" in the REE production chains, on the one hand because of the development of numerous applications with a high-tech component suitable for REs[7] and, on the other hand, as a result of the fact that the price of rare earth oxides (REO) remained at a relatively low level on the global market, because of the increased competitiveness of the Chinese processing industry (De Medeiros & Trebat, 2014). As such, China was at the time only the main supplier of low-cost raw materials for the advanced industries of Japan and of the Western countries which had externalised almost all their polluting activities at the base of the value chain but had kept the added value industries domestically.

In this context, in 1990, the Chinese authorities declared the rare earth production a "protected strategic sector" (Jepson, 2012), a status that was transposed into a series of new restrictive regulations: a) total ban on foreign investments in the extractive business; b) the conditioning of FDI on a partnership with national companies (joint ventures), if the investment projects concerned activities in the REE separation and/or processing stages; c) the introduction of quantitative restrictions and of export duties.

The limitative and centralised control measures imposed on exports by the Chinese government sought to stimulate local downstream production, acting simultaneously in two directions – price decreases on the domestic market and price increases on the international market. This evolution of REE prices was meant to stimulate foreign companies to relocate their production operations to China, a move that also sought to help attract and acquire the technological capacities required for REE processing, in order to create national production chains.

Another line of strategic action adopted to increase the local companies' ability to access the upper segments of the production chains was the acquisition of foreign companies and, afterwards, their relocation to China.

4 The evolution of Chinese rare earth production and export policies

4.1 The promotion of upstream production exports phase: 1975-1990

In 1978, Chinese officials at the time, under Deng Xiaoping's leadership, concluded that the Maoist vision of the centrally planned economy could no longer generate efficient economic growth and was causing China to lag behind both the industrialised Western countries, and the new industrial powers in Asia. Given the low level of development that characterised the national economy at the time, the input of technology and the accumulation of foreign currency reserves could represent important sources both for the reduction of the development gaps, and for the launching of the economic modernisation initiative that was assumed in the context of the reform. Against this background, given the importance of REs for the developed economies, the Chinese authorities initiated an ample policy to promote production and exports, which started with the creation of the *National Group for the Development of Applications in the Field of Rare Earths* (later renamed the *Rare Earths Office*) (Shen, Moomy, & Eggert, 2019).

One of the relevant measures adopted by the Chinese government along these lines (1985) is the decision to reimburse export duties and apply a value added tax discount for producing companies, as a result of which the REO production doubled during the period 1985-1990 (from 8,500 tons in 1985, to around 16,500 tons in 1990; Graph 1). At the same time, as we have shown above, at this stage, decision-makers were focusing mainly on attracting foreign investments in the field of REE processing but restricted FDI in the extractive activity.

Although the upstream industrial activity initially proved profitable, as a result of the low production costs compared to the market price, the uneven regulation of the RE industry favoured an increase in the number of market competitors, determining a significant reduction of the REE price, despite the expansionist tendency and then the increased demand for these products. Also due to the poor administrative regulation, illegal production gained increasing ground during this period and, based on the low costs generated by tax avoidance, put pressure on price reductions.

4.2 The lax production and export restrictions phase: 1991-1998

Although the national RE industry was in full expansion, the negative aspects characterising the domestic market – low prices, the presence of illegal producers and the difficulties the local authorities had in implementing their

[7] Which contributed to an increase of the price of downstream products (UNCTAD, 2014).

verifications and controls – determined the adoption of more restrictive measures, meant to help remedy these shortcomings.

As a result, beginning in 1991, to restrict the number of companies operating in the RE production sector, decision-makers took a series of measures aiming to: *a)* suspend certain previously granted licences for geological exploration and mining extraction; *b)* provide for the possibility of licence renewal only based on an approval from the Ministry of Commerce (MOFCOM); *c)* limit the issuance of new licences (Su, 2009). Although the licence suspension provision was, in the authorities' view, an administrative tool that could resolve the issue of overinvestment, this measure also affected the companies that were complying with the government regulations in the field.

Also, after RE production gained the status of "protected strategic sector" which was granted in order to eradicate illegal activities and resource waste, central decision-makers included REE in the category of "nationally protected minerals in terms of extraction", the processing of which required an approval from the Chinese government in all the stages of the production chain (He, 2014). More exactly, the *Rare Earth Office* was given new powers related to: *i)* the long-term planning of RE resources allocation; *ii)* the preparation of projects for the development of RE-based compounds and products obtained from their processing; *iii)* the organisation of the domestic REE trade. At the same time, state-owned mining companies authorised by the *Rare Earth Office* were given priority in the organisation and performance of production activities, while joint ventures could only exploit limited reserves and private companies had restricted access to separation and melting activities.

Despite the stricter government policies in the field of REs and the increased state control over this sector, in 1998, China's REO production reached a record annual volume of 65,000 tons, accounting for a share of 85% of the world total, compared to the 30% share of 1991 (Graph 1).

4.3 The strict production and export restriction phase: 1999-2014

Because the deficiencies caused by the rapid development of the RE industry during the first phase had not been resolved and the measures adopted during the second regulatory interval were considered insufficient, the dilemma decision-makers faced was whether to opt for a consolidation of the economic growth process, or to take steps to comply with the environmental and natural resource preservation rules, given the high level of pollution generated by the rare earth extractive and processing activities.

In these conditions, according to the official arguments invoked by political leaders, it was imperative to implement more drastic measures that could effectively contribute to the limitation of production and, as a result, to the achievement of the environmental protection goals. The new government regulations adopted in the RE field provided for the application of: *a)* export quotas; *b)* production quotas; *c)* export duties; and for a stricter regime for the approval of foreign direct investment *(d).*

Box 2: Summary of the main restrictive measures adopted by China in the period 1999-2010

Export quotas
To be able to exercise increased control over the entire national production, in 1999, the Chinese central authorities introduced a system of quantitative export restrictions (in force in the period 1999-2014), based on which specific individual limitations were allocated to each rare earth based product, seeking to support the development of the downstream sector (Tse, 2011). Under the direct coordination of the government, the Ministry of Commerce established the export quotas based on this strategic objective, applying limitations in a way that favoured companies that were generating high added value and large state-owned companies. For example, in 2000, export quotas were reduced for primary goods and increased for intermediary products (rare earth oxides and metals), while permanent magnet elements were not subject to regulatory export quotas (Shen, Moomy, & Eggert, 2019). This trend persisted during the entire phase, with China continuing to maintain strict restrictions on the export of primary products and facilitate the external marketing of advanced products. At the same time, in particular towards the end of the interval, export quotas also took into consideration the production companies' compliance with the environmental rules (Wübbeke, 2013).
Production quotas
Another economic policy measure with a direct impact on the consolidation of the national production chain was represented by the application of production quotas, determined based on: i) the concentration of rare earths (a provision introduced in 2006, for which the Ministry of Land Resources (MLR) was responsible; and ii) the concentration of rare earths and the complexity of the separation process (the Ministry of Industry and Information Technology - MIIT). Although initially the MIIT would set up quotas for individual companies, beginning in 2016, production limitations were allocated to groups, which took over the responsibility of allocating quotas to the companies in their subordination

and then reported them to the MIIT and to the central authorities. The complexity of this system created great confusion among producers, in particular because of the discrepancies existing between the two categories of quotas (Kalantzakos, 2018).
Export customs duties
To achieve its proposed objectives, China introduced a progressive customs duties regime on RE exports: 10% of product value in 2007 (for RE ores, oxides and compounds) and, from 2008, 15-25%, depending on the degree of REE processing. After 2010, the authorities imposed duties for NdFeB alloys that were not used in the production of permanent magnets. In addition to stimulating downstream production, these measures were intended to protect non-renewable REE resources. Although they resulted in the quantitative reduction of exports, customs duties discouraged the export of REEs with a lower degree of processing, leading to a restructuring of the Chinese RE industry.

Source: Author's synthesis based on the cited literature.

As regards the international practice of using trade restrictions to reach environmental objectives, the literature (e.g. Gavin, 2013) shows that the optimum ways in which this market failure can be resolved are generally the application of domestic taxes on the polutting industries or the application of production taxes. Also, it must be said that export restrictions are generally applied in order to achieve the political objective of promoting downstream industries, seeking to increase the price of raw materials on the external market and decrease domestic prices. In China's case too, this government policy had a direct effect on the stimulation of internal development, on the one hand by facilitating the access of local companies to RE raw materials at low costs and, on the other hand, by incentivising FDI and cutting-edge technology inflows as a result of foreign companies relocating their production companies on the Chinese market.

A turning point for the introduction of stricter regulations in the Chinese RE sector was the adoption by the State Council of the *Decision to rectify and standardise the order on the development of mineral resources* (2005), which provided for a major industry reorganisation (State Council, 2005), meant to remedy the deficiencies related to poor management, resource waste and non-compliance with the environmental standards. The document also expressly set out a series of requirements concerning the reorganisation of mining operations and of production, the REE processing and marketing standards, and the beneficiaries. Based on the new provisions, decision-makers established both how quota systems were to be implemented (export and production quotas), and the competent authorities responsible for verifying and controlling their implementation.

Because despite the application of all the restrictive measures listed above illegal production continued to be significant in 2010 (estimated at around 30% of the total), the Chinese government imposed even stricter conditons, in particular with regard to the reduction of export quotas (Table 1).

Table 1: Evolution of export quotas in the period 2000-2014

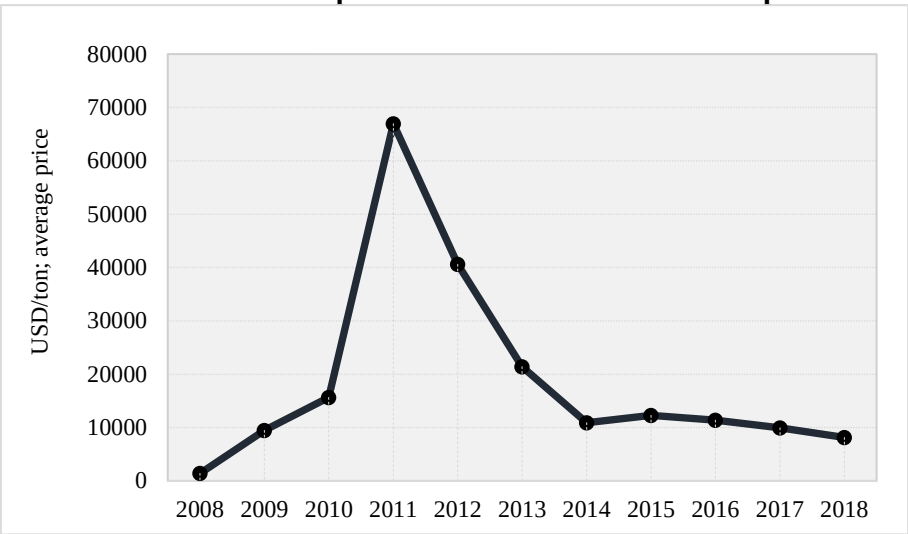
Year	Rare earth oxides (tons)	Annual changes (%)
2000	46,000	-
2001	data unavailable	-
2002	40,000	-
2003	data unavailable	-
2004	57,000	-
2005	65,580	+1.2
2006	61,070	-6.9
2007	59,643	-2.3
2008	49,990	-16.2
2009	48,155	-3.7
2010	30,259	-37.2
2011	30,184	-0.3
2012	30,996	+2.7
2013	data unavailable	-
2014	31,000	-

Source: Data published by USGS (various years)

The increasingly stricter control measures imposed by the Chinese authorities on commercial outflows of RE-based products – culminating in the significant decrease of export quotas in 2010 (by around 37%) – immediately resulted in the steep increase of the REE price on the international market (by approximately 430%),

in 2011 (by approximately 160%)[8] (Graph 2). Prices returned to the levels of the years prior to the application of trade restrictions in 2014, when following the unfavourable WTO decision, China announced the lifting of export quotas beginning in 2016.

Graph 2: Evolution of rare earth prices at international level in the period 2008-2018*



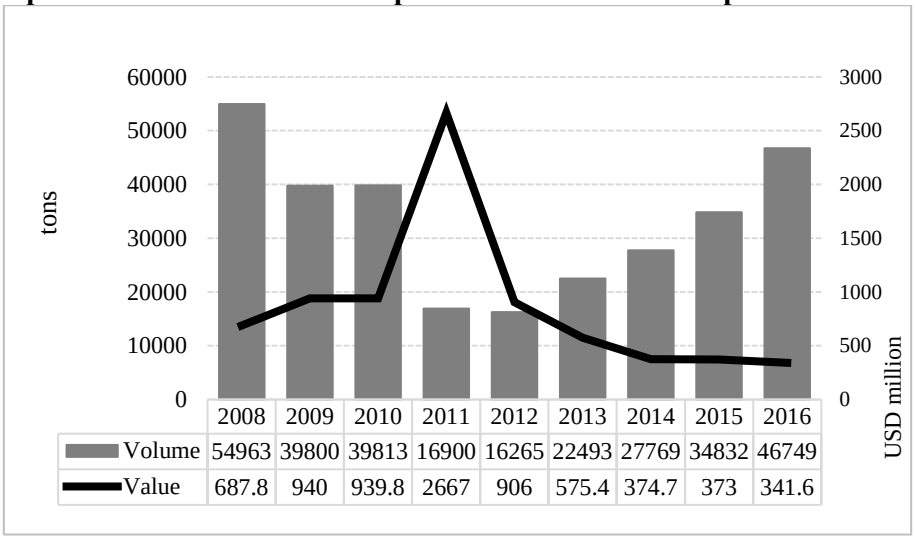
Note: *Latest available data at the time when the analysis was prepared.
Source: Author, based on statistical data published by China Power Project (2020).

Also, as shown by the data presented in Graph 3, beginning in 2011, the objectives of the restrictive commercial policy applied by China where achieved, in the sense that despite the 42% reduction in terms of volume, the value of REE exports the same year grew by approximately 3%, based on the structural change of these exports, i.e. the increased share of higher added value products.

Nevertheless, according to some authors (e.g. Mancheri, 2015), a possible adjacent cause of the considerable reduction of Chinese REE exports in 2011 could be the lower demand from developed countries – US, Japan and the EU, China's main trade partners for the export of these products –, who were still facing the negative effects of the global financial crisis.

From 2013 onwards, in the years before the quotas were lifted, the export volume resumed its upward trend, with increases of around 23% and 25%, respectively.

Graph 3: Evolution of Chinese exports of rare earths in the period 2008-2016



	2008	2009	2010	2011	2012	2013	2014	2015	2016
Volume	54963	39800	39813	16900	16265	22493	27769	34832	46749
Value	687.8	940	939.8	2667	906	575.4	374.7	373	341.6

[8] After the years 2000 – when China's entry on the international market caused a major decline of REE prices and eliminated the main competitors from the market, in particular the US –, rare earth prices remained relatively stable until 2007. With the major cut of export quotas by the Chinese authorities in 2011, the price of certain rare earth-based products on the international market increased by as much as 850%. In these conditions, a significant number of mining projects became operational in many countries (including the US) (Machacek & Fold, 2014).

Source: Author, based on the statistical data published by US Geological Survey (USGS, various years) and China's General Administration of Customs (CGAC, various years).

As regards RE production, in the period 2005-2010 China held a constant share of approximately 97-98% of the global total (Graph 1). However, against the background of the effects the restrictive trade measures adopted had on market price and supply stability, which determined certain producing countries (e.g. the US, Australia, the Russian Federation) to resume their productive activity, in 2015, China's share of the global REE production decreased to around 80%

4.4 The post-restrictions phase

The restrictions imposed by China on rare earths production and trade triggered a series of protests from the US, Japan and the EU, whose high-tech industries were strongly dependent on the imports from China. As such, in 2012, the three great economic powers brought an action against China before the WTO, based on several grounds: a) the export duties on ores and primary rare earth products (as well as on tungsten and molybdenum) were not listed in the WTO Accession Protocol and, therefore needed to be eliminated; b) the major restrictions imposed by China on the export of rare earths infringed the WTO and Protocol terms; c) the regulations on the granting of export licences did not comply with the commitments assumed at the time of the accession to the WTO (WTO, 2014).

Despite China's claims that its export policies were comparable with the exceptions set out in Articles XX and XI of the GATT[9] (1994), as their main objectives were the protection of non-renewable resources, environmental protection and the protection of population health, the WTO ruled against it and considered that the measures did not meet the requirements of the exemptions from the Protocol. As a result, beginning with 2015, China cancelled its RE export quotas and duties system. Therefore, at present, companies no longer need approvals to carry out export activities, and licences can be obtained on the basis of trade agreements only.

After losing the dispute before the WTO, China focused more on the use of political and legislative tools to attain the government's objectives related to industrial restructuring, environmental issues and the fostering of rare earth use in the downstream sector. For example, more recently (2018), the National Congress adopted the *Law on the environmental protection tax*, which provides for the obligation of national companies to internalise environmental costs.

Another initiative (2015) is the aggregation of the state-owned companies into six large production groups through mergers and acquisitions, coordinated and controlled by the central government, each of these groups covering various segments of the REE production chain. This new strategy allows government authorities to exercise their control function over the entire industry in a more efficient manner.

At the same time, the new policies focused on the production of primary RE goods, to increase the profitability of the companies in the extraction and separation field, and at the same put pressure on companies producing end goods. These measures determined an improvement of the financial performance of upstream companies and the increased competitiveness of the downstream sector.

5 Recent trends in China's rare earth trade

As results from the above, as the economic development process advanced, Chinese leaders tried to turn the country into a key player in the rare earth industry which was considered to be of major strategic importance. This trend has continued through the recent years, when China strengthened its leadership position in the field of production and global exports, reaffirming the fact that despite the propensity for market change, this hierarchy is unlikely to change during the coming years.

As we have shown, China's current dominance is the result of the industrial policies adopted by the government authorities over several decades, having as main objectives both to increase the competitiveness and efficiency of the national rare earth industry, and to outclass the developed economies and acquire global supremacy on this market. Although at present the majority of strongly industrialised countries have taken

[9] According to Article XI of GATT, each WTO member state has the right to temporarily apply export restrictions to prevent or relieve "critical" shortages of food products or other essential products in the exporting country; Article XX allows for the application of exceptional quantitative restriction to achieve certain political goals (e.g. the preservation of depleting natural resources) and to ensure the essential materials for the domestic processing industry, with certain "qualifications" (WTO, 2014).

concrete steps to limit their exposure to the risks generated by further discontinuations of the supply flow, as shown by statistical data, they continue to be strongly dependent on China.

In the period following the elimination of the restrictions, Chinese RE exports increased substantially (Graph 3 and Table 2), culminating in 2018 with a record volume of 69,296 tons, which exceeds the export volume of the preceding year by around 35%. In terms of export structure, the majority share (around 86%) is held by rare earth metal compounds.

Table 2: Chinese rare earth trade flows in the period 2017-2019*

EXPORTS						
	2017		**2018**		**2019**	
	Volume (t)	**Value** (USD mil.)	**Volume** (t)	**Value** (USD mil.)	**Volume** (t)	**Value** (USD mil.)
Total export, of which:	51,200	416.0	69,296	648.2	46,331	440.2
RE metal compounds	45,685	336.2	59,296	449.9	39,481	324.2
RE metals	5,515	79.8	10,000	198.3	6,850	116.0
IMPORTS						
	2017		**2018**		**2019**	
	Volume (t)	**Value** (USD mil.)	**Volume** (t)	**Value** (USD mil.)	**Volume** (t)	**Value** (USD mil.)
Total import, of which:	34,403	181.0	81,967	277.8	41,068	274.2
RE metal compounds	34,322	174.4	7	1.7	41,042	272.2
RE metals	81	6.6	81,960	276.1	26	2.0

Note: *Although for other products, China's General Administration of Customs database provides statistical information for the period 2015-2019, for RE-based goods, at the time this chapter was being prepared, the data published only captured the interval stated, in annual terms.
Source: Author's calculations based on the statistical data published by China's General Administration of Customs (CGAC, 2020).

In 2019, against the background of a declining demand from the main export markets, the sustained growth stage (started in 2013) was interrupted, and Chinese RE export contracted severely both in terms of volume (decreasing by around 33% compared to the previous year), and in terms of value (-32%). The main cause that contributed to the decline in demand from the main trade partners is represented by the success of the measures taken by the developed economies over the recent years to find alternative supply sources that could curb the increasing dependency on China. For example, the US recently tried to reconquer the position it had held in the past on the global market by reopening the Mountain Pass mine, which resumed production in 2017[10]. The EU also launched a series of actions meant to reduce dependency on China, by financing an initiative for the recycling of permanent magnet waste and turning it into RE-based materials and alloys (2018). At the same time, South Korea tried to diversify its supply of rare earths both by increasing imports from Japan, and by finding innovative ways to lower consumption.

Despite all these progresses however, China continues to be the main global RE exporter (Table 3), in particular for rare earth metal compounds.

Table 3: Evolution of global rare earth exports in the period 2008-2018
(cumulated values)

Country	**Cumulated export volume (tons)**	**Share in global total (%)**	**Cumulated export value (USD mil.)**	**Share in global total (%)**
China	407,886.6	42.3	8,112.2	46.3
US	89,467.1	9.3	953.6	5.4
Malaysia	87,696.1	9.1	942.4	5.4

[10] However, the extractive production of the Mountain Pass mine is at present sent to China for processing.

Austria	87,055.1	9.0	867.8	5.0
Japan	68,412.9	7.1	2,172.6	12.4
Rest of the world	223,172.0	23.2	4,467.7	25.5

Source: Author, based on US Comtrade data (2020).

Geographically, Japan is the main destination of Chinese rare earth exports, receiving around 50% of the total in 2019 (Table 4).

Table 4: China's main RE trade exchange partners in the period 2017-2019

EXPORT						
Country	**2017**		**2018**		**2019**	
	Export value (USD mil.)	% of total	Export value (USD mil.)	% of total	Export value (USD mil.)	% of total
Japan	188.2	45.2	240.3	37.1	216.2	49.1
US	68.4	16.4	88.5	13.7	79.3	18.1
South Korea	36.6	8.8	29.4	4.5	33.3	7.6
France	17.4	4.2	X*		X	
The Netherlands	34.7	8.3	49.3	7.6	25.0	5.7
Hong Kong	X		12.4	2.0	X	
Italy	X		X		8.5	1.9
IMPORT						
Country	**2017**		**2018**		**2019**	
	Import value (USD mil.)	% of total	Import value (USD mil.)	% of total	Import value (USD mil.)	% of total
Malaysia	138.7	76.6	81.6	29.4	75.6	22.6
Myanmar	12.4	6.8	63.9	23.2	152.8	55.7
Japan	6.4	3.5	8.5	3.1	8.8	3.2
France	4.0	2.2	2.2	1.0	X	
US	2.9	1.6	37.8	13.6	8.6	3.1
India	X		X		1.8	0.7

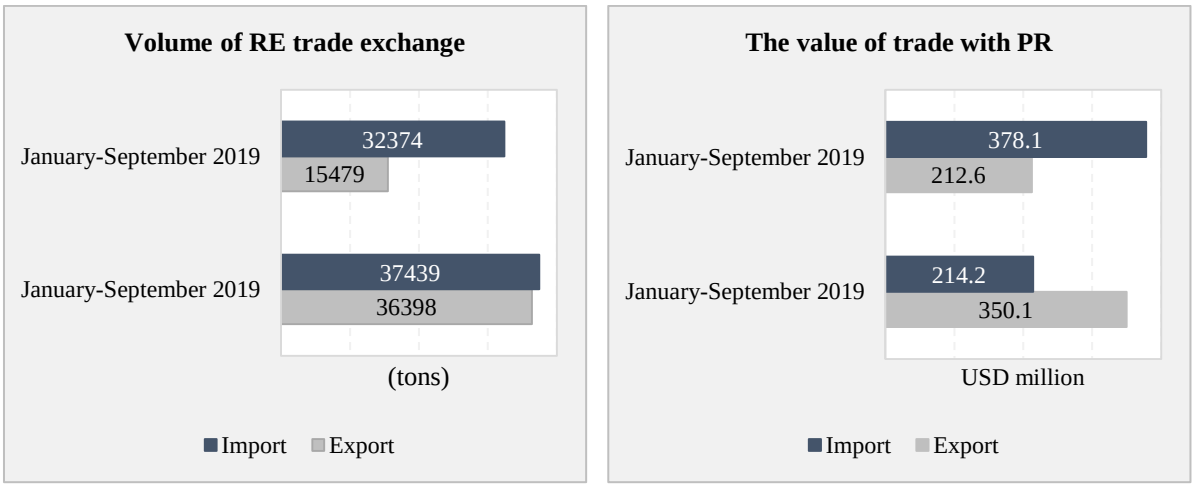
Note: * X – The country in question is not included among the Top 5 trade partners in the reference year.
Source: Author's calculations based on the statistical data published by China's General Administration of Customs (CGAC, 2020).

The same year, the US, ranking second in the hierarchy of main importers, recorded a growing share of China's total exports, albeit a decrease by around USD 24 million in terms of value.
China's economic development and its advancement along the global RE value chain increased domestic consumption and determined an increase of imports. As such, in 2018, RE import grew by around 240% compared to 2017, reaching a record volume of approximately 81,967 tons and placing China first among global importers (China Power Project, 2020).

Although this trend did not continue in 2019, when RE imports fell by around 50%, certain analysts estimate that by mid-decade China will become a net importer of rare earths. In these conditions, its influence on the global rare earth industry could diminish and new the players on the market could consolidate their competitive position.

As illustrated by the most recent data published by China's General Administration of Customs, against the background of the effects generated by the Covid-19 pandemic, which led to a steep decrease of the global demand for rare earths, in the months of January through September 2020, the volume of Chinese exports saw a major decline (by around 135%) compared to the same period of the preceding year (Graphs 4 and 5).

Graphs 4 and 5: Comparative evolution of Chinese RE trade flows in the period 2019-2020 (January-September)



Source: Author's calculations based on the statistical data published by China's General Administration of Customs (CGAC, 2020).

According to national analysts (Lei, 2020), this decrease occurred in the context in which, for several months, production was discontinued or operated well below potential in the main industrialised economies. At the same time, the factors that additionally contributed to the decrease in demand on the international market include export delays, and the stock growth tendency seen during the recent years.

Nevertheless, some experts have expressed the opinion that this decline could also be generated by the growing geopolitical tensions with the US, as a result of the warning launched by the Chinese government (July 2020) regarding the application of financial sanctions on US companies involved in the sale of weapons to Taiwan. In the first half of 2020, exporters of rare earths to the US recorded a volume of 5,184 tons, which in annual terms means a decrease by around 35%. According to estimates by Chinese analysists, this trend will continue until the end of this year, due to both the slowdown in production, and to the ineffective measures adopted by the Donald Trump Administration for combatting the pandemic.

6 Conclusions

China's current global monopoly in the extraction, production and export of rare earths is based on a series of major comparative advantages (whether acquired or created), which are impossible to replicate or equal by the country's potential competitors.

a) China has the largest rare earth reserves, estimated at present (2020) at around 40% of the global total. From the discovery of the first rare earth deposits in the Bayan Obo region (as early as the 1930s), significant resources were found in 21 other Chinese provinces and autonomous regions.

b) As the RE sector was formed and grew, the country had access to cheap labour, which resulted in low production costs, thus enabling China to rapidly surpass the US production capacity and consolidate its monopoly based on cost advantages.

c) China's spectacular economic growth over the recent decades enabled the acquiring of the funds required for investments in the development of the domestic RE production and the acquisition of mining operations and production capacities on the external market.

d) The government authorities' sustained efforts to expand knowledge and technological capabilities, through the promotion of RE research and development and through the stimulation of technological transfer,

transformed China into a global leader in the field of expertise and cutting-edge technology development with applicability in the extractive and production sector. Because the US and the other strongly industrialised economies did not invest equally large amounts of money in research and development related to new REE production and separation technologies (in particular in the context of outsourced production), China gained supremacy on all the four segments of the global chain: extraction, processing, separation and production.
e) The Chinese legislation – more permissive in terms of compliance with environmental protection rules – also played an important part in the quest for global market leadership. While at the beginning of the 1990s industrialised countries imposed stricter environmental standards which considerably hindered progresses in the extractive sector, China continued to expand the RE mining operations.
f) Acknowledging the strategic importance of these resources, the national long-term development plans prepared at central level included from a very early stage ample policies meant to lead to the development of the ER production sector.
g) Most Chinese companies involved in the ER production and processing activity are state-owned companies, financially supported by the government. In these conditions, because of the subsidies they receive, they are able to react quickly to market changes.
All the above-mentioned advantages helped China gain the current monopoly position on the international rare earth market, a position which it is unlikely to lose, at least on the short and medium term.

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Flexible School Budgeting: Funding Reform Of The Regional Schools, Case Of The Czech Republic

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Abstract: The regional school funding of public schools in the Czech Republic undergoes structural changes. The funding reform is supposed to be a part of the overall strategic policy changes in educational system. The present research analyses and compares the school budgeting formulas used for allocation the public funds for pedagogical and non-pedagogical staff of the secondary schools in the Czech Republic. By means of the selected sample of secondary schools situated in the Region of Zlín it gives a comprehensive explanation of the main differences of the previous and newly introduced allocation formula. The analysis of the budgeting formula shows the main changes and allow to compare inn order to evaluate the principles of flexible budgeting.

Key-Words: Education, funding, budgets, educational policy, salary, school
Jel classification: I22, I23, I25

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1 Introduction

Public school systems have limited resources with which they try to achieve their objectives. The overall budget level of school funding to provide a high quality education for everyone matters, but the proper allocation strategies are likely to be more important. The mechanisms through which school funding is governed, distributed and monitored play a key role in ensuring that resources are evenly directed to where they can make the most difference.

As per International Student Assessment research: „Among the countries with higher overall levels of school funding, there is no observed relationship between cumulative spending per student and student´s performance". What matters more is not the aggregate level of expenditure, but rather the design of educational policies and the mechanisms through which funds are allocated (OECD, 2017b). Whereas even in countries where the overall level of funding for schools is comparatively high, there may be underinvestment in certain parts of the school system, which can result in serious educational inequalities Thus when talking about school funding it would be a mistake to focus merely on either budget increase or cost savings. The thing is to implement the strategies to achieve greater efficiency in a school funding system that would go in line with a focus on improving quality and equity. Various educational funding policies aim at reshaping the organisational structures and changing institutional habits in school systems. In general, it takes time to accept the changes and consequently to develop and implement carefully.

In the Czech Republic, there is a number of different sources of funds for school budgets, depending also on the type of school and level of education. These include the state budget (coming through the regional budget), additional funding from the regional budget, additional funding from the municipality budget (especially for basic schools), funds earned by the school itself, donations and parental contributions. Since January 2020, the new mechanism used for the distribution of the assigned funds for funding Czech public schools from the state budget has been introduced. The newly introduced so called school funding reform focuses on the setting of the main part of the assigned funds intended for educational work that include mostly salaries of teachers. It derives from the amount of financial means for tariff salaries in the given school and additional per capita amounts per teachers. The Ministry of Education, Youth and Sports (MEYS) states that the new method allows taking into account the

real needs of the schools better than the previous formula funding per pupil. It is applied in nursery, basic and upper secondary schools and conservatoires. The resources for individual schools are directly set by the MEYS, the regional authorities have only a limited power. Ministry sets the new calculation formula based on a combination of cost and performance financing and declares the funds provided to each school to be more predictable (MEYS, 2019). The reform is connected with an increase in the total amount of resources for public education sector from the state budget. The budget of current expenses for schools and school facilities established by municipalities and regions for 2020 is of about 12,1 % higher than that approved for 2019. The first year running on new funding rules is over and it provides space for evaluating the recent impacts and comparing the effects. The present paper is supposed to be the first applied research that gives a comprehensive analysis and comparison of both funding methods on the homogeneous group of selected secondary schools in the determined region in the Czech Republic. It presents the real and actual data and own calculations necessary for further evaluation.

The studies on formula funding of schools (Bischoff, 2009, Levacic, 2008, Levacic and Downes, 2004, Ross and Levacic, 2000) provide a straightforward categorisation of the different variables (e.g. pupil number, socio-economic background of pupils) and coefficients (i.e. the cash amounts which multiply the variables to determine funding allocation). Policy measures and goals regarding the school funding, allocation models that are aligned to a school system's governance structures, linking budget planning procedures at different levels are described in the OECD Review (OECD, 2017). Education and Training Monitor 2019 published by European commission (EU, 2019) includes twenty-eight individual country reports, main education and training indicators that discus measures to modernise education provided the principles of effectivity and equity

2 Objectives of the study

This report gives the comparison of the funding models and compares the funds received by chosen group of secondary schools based on the former and the newly established school funding policy in the Czech Republic. It provides a comprehensive explanation and comparison of the changes in funding the secondary schools that have taken place. The key assumption is based on the idea of the equity of salaries for educational staff at the similar types of school. Fair and equal salaries stand for the equity and stability to provide education on the regional level taking into account different size and location of the school units. A particular attention will be paid to funding for teaching costs as this item serve the research for carrying out the crucial analysis. The outcomes will be compared and analysed consequently. The analysis based on the comparison resulting from the own calculation will allow to pursue the main objective of the presented study: to make recommendation on the appropriate flexible budgeting process of the secondary schools. To what extend can the new calculation method change the allocation of funds? Do these elements cover the initial assumptions for the flexible budgeting process? These starting points and questions refer to the construction of hypothesis set for the present research: (1) The real effects of establishing Phmax calculation formula demonstrates in higher financial flows in case of smaller schools. (2) The calculation method cannot assure the flexible budgeting.

The present paper will firstly provide basic facts of school funding in the Czech Republic, consequently will explain both former and current central funding formulas used to allocate funding for teaching costs to be able to present a comprehensive analysis of the data concerning both methods. Finally, the results will be discussed and evaluated.

3 Methods and data

A complex of theoretical methods has been used as the basis of the research. The methods for presented study were chosen as follows: At the beginning it a was a standard internet search on the official web site of the MEYS and educational department of the Zlín Regional office in order to gain all necessary information on the changes in school funding mainly on the calculation formulas. The following empirical method of interviewing the staff of regional department has been used as well. For comparative study the data were observed, obtained and downloaded from the official annual reports of the concerned schools. The references for theoretical framework were outsourced in the key publications by Levacic (Levacic, 1998), Levacic and Downes (Levacic and Downes, 2004) with a view to build up own concept of flexible budgeting. Collaterally, the analysis of the financial flows followed. The use of comparative methods was realised on the own calculations executed through the use of described formulas.

The selection of school units whose financial flows were analysed was executed on the following limits: among seven tens of regional secondary schools (of which 16 gymnasia) 8 of them were chosen to form an

appropriate group suitable for presented research - a representative group of schools, homogenous from the functional point of view, located in different areas of the Zlín region and of a different size as far as the number of students is concerned. The vocational schools where the number of programmes is respectively much larger and difficult to detect correctly must have been excluded from the presented research. Only the secondary grammar schools „Gymnázium“ are included in the presented research. It was necessary to exclude the multidisciplinary schools or the religious schools (for example Gymnázium and Industrial school, Gymnázium and Commercial school). Anyhow the data calculation of the funding on per student normative basket formula allocation it was necessary to take into account the number of students in each of the following six programmes that typical gymnasium offers: regular gymnasium students, upper and lower stages of six-year long and eight-year long programmes, and sports programme, each number multiplied by the respective normative amount and all summed up. Table No1 presents the list of selected schools and number of students.

Table No 1: list of the schools analysed in the present research

	school	number of students (2020)
1.	Gymnázium Uherské Hradiště	939
2.	Gymnázium Zlín - Lesní čtvrť	920
3.	Gymnázium a Jazyková škola s právem státní jazykové zkoušk	703
4.	Gymnázium Kroměříž	539
5.	Gymnázium J.A.Komenského Uherský Brod	466
7.	Gymnázium Františka Palackého Valašské Meziříčí	405
8.	Gymnázium Ladislava Jaroše Holešov	387

Source: own processing, based on annual reports of the schools

As a matter of fact, the research applies to relatively small group of school entities. Nevertheless, the selected group is an easily understood and homogenous sample that could manifest the effect of the changes. The comparative analysis will show if and on what scale do the changes in financial flows manifest. The comparative analysis will be conducted for two periods of time. The former 2015-2019 will simulate the theoretical financial flows distributed to each school according the principles of student basket formula the latter 2020-2021 will show the flows calculated on Phmax principal. A particular attention will be paid to funding for teaching costs as this item serve the research for carrying out the crucial analysis. The outcomes will be compared and analysed consequently.

The budgeting analysis can be executed from different points of view. For that reason, the funds intended for salaries of pedagogical staff seem to be the most relevant items to be analysed and compared. In the presented research a special attention will be paid to the construction of the former and current school budget formulas that determine the redeployment of the funds that are intended to cover salaries of educational staff at secondary schools in the Czech Republic.

4 Basic facts of school funding in the Czech Republic

Education funding in the Czech Republic is decentralised. The central government budget is the main source of funding for public education in the Czech Republic including both central (state) budget and local funding. Local governments are responsible for various levels of education. Municipalities manage and finance basic schools, while regions manage and finance secondary schools, both general academic and vocational. Local governments play an important role in case of secondary schools both in assuring the funding and influencing the distribution and use of school resources. Common rules of funding secondary education in the Czech Republic have undergone particular changes over last 5 years. In this period of time, there are two major points to emphasize as far as the cash flows are concerned. These changes include in the first place the total raise of volumes and secondly structural changes. The new school funding reform was enacted in 2019 and introduced in 2020, setting up new formula funding scheme model of financing schools. In order to compare the two mechanisms, it is necessary to understand the expenditures of schools.

All non-investment education expenditures of schools and education institutions in the Czech Republic are divided into two categories: the direct costs and the operational costs. Direct costs come from the central budget, and operational costs are covered from the local budgets. Costs regulated by the state are direct costs and include primarily salaries for teachers and non-teaching staff, textbooks, teaching aids, further professional development of teachers and other expenditures resulting from labour laws. In this way the state takes responsibility for the financing of those educational functions, which are centrally regulated. The operational

costs of schools include maintenance of schools, energy expenditures, communal services, small repairs. Operational costs of schools are financed from regional revenues; they are not included in national or regional normative. The regions receive an education grant from the central budget to finance the secondary schools under its managerial control and allocate these funds to individual schools. Regions being the founders of the secondary school are responsible for these operational costs.

5 School budgeting

5. 1 Theoretical framework

By a flexible budgeting process, we mean a process of establishing budgets of all secondary schools managed by the region. Through the budget formulas the authorities try to satisfy the different needs of schools within the context of limited available budget funds. Funding schools by formula is quite commonly used method to determine school budgets. Previously the budgeting was based on a very simple formula assuming that the amount receive by schools is based on the previous year and adjusted by a small percentage typically upwards (cf. Jones, 1996). In Europe, in the early 2000s 13 countries employed formula based school funding regimes along with significant financial delegation to schools (Levacic, 2008b). Since that time the formula funding regimes have changed substantially by being extended and in many cases becoming more complicated. Nevertheless, there are some clear trends in how formulas are constructed: countries are moving away from simple, pupil number-based formulas towards taking into account differences in learning needs of students, varying curriculum goals of education programmes, and different cost of schools sites (cf. Levacic and Ross, 2000).

Levacic states that formula funding for schools is a mathematical formula which "contains a number of variables (items such as number of pupils in each grade, area of school, poverty […]), each of which has attached to it a cash amount" (Levacic, 2008b, p. 206). Caldwell gives another formulation of formula funding as: "an agreed set of criteria for allocating resources to schools which are impartially applied to each school" (Caldwell et al., 1999, p. 9). In compliance with the first formulation of the definition, formula funding can be applied to more centralised education systems as well; the key is the mechanism of allocation rather than how the money is spent. It excludes formula funding schemes between different levels of government. The impact of formulas on incentives and school finances can be clearly distinguished from other allocation mechanisms whereas this is not the case when redistribution by formula takes place between different levels of government. It also excludes the question of how the total education budget is determined and focuses on the distribution of available public money (Fazekas, 2012).

There are four main groups of variables used in school funding formula in OECD countries (Levacic and Downes, 2004):

- basic, student number and grade level-based,
- needs-based,
- curriculum or educational programme based,
- school characteristics-based.

Each of these may serve different policy goals:

- Most formulas allocate funds to schools mainly on a student number basis (equivalent number of enrolled pupils at each grade level or number of courses thought which is adjusted according to grade or age level to correct).
- Needs-based variables are included in school funding formulas in order to take into account the additional resource needs of teaching pupils with learning disabilities or who come from disadvantaged socio-economic backgrounds. The additional resources are meant to provide further help for such pupils by offering them, for example, additional teaching time, specialised learning material, and smaller classes.
- Curriculum or education programme-based variables acknowledge the different resource implications of enhanced and specific education programmes such as music, languages or sports education. Higher costs can arise from additional courses, more expensive teaching materials, higher salaries for specialist teachers.

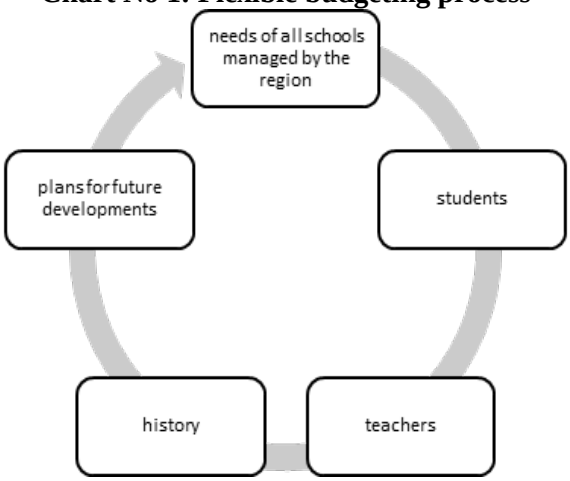
- School characteristics-based variables reflect the cost differentials arising from the size of the school, the relative isolation of the school's community, physical aspects of the school premises, and local price levels. School size substantively changes the per pupil costs of education: small schools are typically costlier per student than larger ones. Isolated and rural communities tend to incur higher

After fixing the variables and used indicators the formulas count on with the coefficients attached to each indicator. The use of school funding formulas surely depends on the characteristics of the wider policy environment, the autonomy of schools to manage the allocated funds. Even after fixing the variables and indicators for the calculation the difficult question remains: what monetary values or coefficients to attach to each indicator. costs due to extra autonomy of travelling expenses.

5.2. Suggested principles of flexible budgeting

Based on the above mentioned assumptions the following chart No 1 assumes own proposal of flexible budgeting process.

Chart No 1: Flexible budgeting process



Source: own processing

The flexible budgeting process enables to establish a flexible funding mechanism of the secondary schools managed by the region to satisfy their different needs within the context of limited available budget funds. It includes:

- a comparative review of the needs of all schools managed by the region
- comparison of characteristics of their students (including students with special educational needs, academically outstanding and academically non-motivated students, students engaged in sport and arts activities, immigrant students
- comparison of characteristics of their teachers (including new or experienced teachers, needs for in-service training, need for additional positions of pedagogues or psychologists)
- their current and historical budget allocation
- plans for future development including forecast demographic trends and changing requirements of the regional labour market

5.2.1. Allocating formulas

Before the explanation of both former and current financing system in the Czech Republic it is important to briefly present the basic facts of school funding in the Czech Republic. As it will be explained in following chapter the student basket allocation formula is a complex calculation with many variables.

5.2.1.1. Former system to allocate public funding to schools - the funding principle based on the standardised "student basket" formula¨

As discussed above, the Czech regions perform a double function in the education finance system. As owners of the secondary schools and special schools, they receive funds for those schools and allocate them to individual schools, although legal regulations heavily constrain their freedom in this process. The allocation of central funds for direct costs in education used to be designed through a system of per student normative amounts.

This system was in operation since 2001 and covered both the central level, namely the distribution of funds from the national to regional budgets, and the regional level, namely the distribution of funds to secondary schools managed by the region itself. The allocation system based on per student normative amounts was simple at the national level, with just five age-based normative amounts, and at the same time extremely complex at the regional level. For secondary education there were regional normative amounts for every educational programme provided in the region's schools. These include:

- normative amounts for gymnasia, separately for regular programme (four years) and for upper and lower years in long programmes (six and eight years)
- normative amounts for various artistic and sport schools' normative amounts for all professional and vocational profiles offered in the region's schools.

Each school managed by the region received the allocation based on the number of education programmes offered in the school and on the number of students in each programme. This was the case of gymnasia that were allocated by the student basket only through the formula given as a fixed amount in each budget year. Other decisions made by the schools were not affected directly by any single component of the formula or method of calculation. The key component and essential determinant of the system was the number of students officially attending the school. At this point it is necessary to underline that using a large number of different normative amounts made the regional allocation process rather difficult.

Teaching costs were funded from the central government budget in the form of a specific formula grant, namely the "student basket" scheme. based on the so called normative per unit of effort. This scheme was elaborated and introduced as the core of the education finance for each school by the

The key elements of this calculation are the number of students taught in the school unit, salary regulation and the coefficient that can be interpreted as the major determinant of funding is the number of students in the school. The amount needed to cover teacher and other staff salaries per a school unit was calculated on the base of the average salary for 12 months. This amount forms the core of the student basket. This was given as a fixed amount of annual salary limit (SL) for a school unit in each budget year counted on the principle of the formula that took into consideration number of teaching (NTS) and non-teaching staff (NNTS) multiplied by the average salary of teaching (AST) and non-teaching staff (ASNT):

$$SL = 12 \times (NTS \times AST + NNTS \times ASNT)$$

The grant is calculated as a fixed per-student amount. NTS and NNTS were given by a performance – coefficient ratio that calculated with a given number of students in total per a school unit (P) and coefficients for the teaching (CftT) respectively non-teaching staff (CftNT):

$NTS = P/CftT$ $NTS = P/CftNT$

As already mentioned the key component of the system that was crucial was the number of students officially attending the school. Other decisions made by the schools were not affected directly by any single component of the formula or the method of calculation, only through the amount of the student basket. This is given as a fixed amount in each budget year and the budget or other decisions made by the municipalities or schools were not affected directly. The CftT / CFtNT, AST / ASNT were revised or updated annually. See table No 2:

Table No 2: overview on the annual growth of average salary AST, ASNT in CZK

	2015	2016	2017	2018	2019
AST	24 550	26 080	28 170	31 507	36 841
ASNT	14 617	15 527	16 119	18 875	20 812
annual growth AST (%)		106%	108%	112%	117%
annual growth ASNT (%)		106%	104%	117%	110%

Source: Region of Zlín, Department of Education

Once the amount of the student basket was approved, total expenditures could not increase unpredictably within the fiscal year. The amount of the student basket for each school unit was set every budgetary year by the central government. Apparently, the higher the share of teachers with more years of experience or belonging to a higher qualification category, the larger the actual salary expenses are in the school. In the short term schools

had only limited influence over this factor. As a matter of fact, the total funding for a school was determined not on the basis of raw enrolment figures but the number of equivalent students, i.e. a weighted sum of students.

In response to this criticism, the ministry elaborated a radical reform, aiming at a complete change of the system of financing the education. The goals settled by the MEYS are declared as follow:

(1) To allocate funds in a transparent and predictable way

(2) To establish a more equitable system of allocating resources

The idea behind this is to acknowledge the legitimately higher costs of smaller schools which have lower enrolment rates due to their rural location. The following part will present an overview of the new system of redistribution of funds for the secondary schools which principles will be presented in the following chapter. In order to compensate the additional incurred costs or the losses caused by the decrease of the number of students the local governments were forced to use several methods to balance the school budgets or to increase school resources. Resourcing this way was not systematic, transparent and presented uncertain financial resources not convenient on the long term.

The data on which the research is based can be completed by the comments of educational department staff: "In order to allow regions to perform their duties, the ministry provided us (regions) with software that supported the calculation of the normative amounts (from year to year), and to actually allocate funds to individual schools. For each individual school it was difficult, even impossible to control the calculation and if the funding was done correctly." This fact means that the computerisation and mechanical application of the rigid calculation done by a special computer programme reduced understanding the formula and using it strategically to address differentiated needs of schools.

Another fact important to emphasize is that due to the existence of different programmes at gymnasia (upper and lower stages of six-year long and eight-year long programmes) in many cases it may be very difficult or even impossible to distribute the funds correctly according to the method as many teachers and other school staff contribute to the teaching in the education programmes on a different scale. there is no sound methodology to allocate parts of FTE staff to different programme. At the same time, this approach oversimplifies actual employment situation at schools, because there are more than just two distinct categories of school staff: apart from teacher conducting classes or conducting practical training, the following: school leadership (principals and deputy principals), school administration (office staff, accountants and similar), support pedagogical staff (psychologists, pedagogues, librarians, curriculum advisors), technical staff (maintenance of equipment and machinery, gardeners, drivers), cleaning staff. Of course, all these categories of staff work in Czech schools, fulfilling their different roles. However, from the point of view of school finance, they are also quite different, in terms of employment levels or salaries. A flexible budgeting process should recognise this variety and not lump them all into two inflexible categories.

5.3. New system of funding "Reform 2020"

The formula should essentially ensure horizontal equity of funding across schools. In order to ensure the equitable system, the new funding approach includes the elements that takes into account school size, by means of weighting factors. They are supposed to increase proportionally with the real teaching costs and are inversely proportional to school size, acknowledging higher per student costs when class size is smaller. These coefficients can be derived from the basic formula for the student basket by substituting higher values for students' weekly school hours, determined by the curricula for each school year and lower expected class sizes for small rural schools. As administration costs are included in the formula proportional to the required spending on teacher salaries, higher coefficients for smaller schools do also account for higher administration spending due to fixed costs to some extent. Unlike the previous student basket calculated basically on a performance – coefficient ratio and an average salary of the teaching staff the introduced formula called Phmax is supposed to express the maximum of teaching lessons per one class. The calculation is adjusted for each field of education and organisation of the classes. As for secondary grammar school there are two types of educational levels lower-secondary and upper-secondary education. Consequently, the level of Phmax differs.

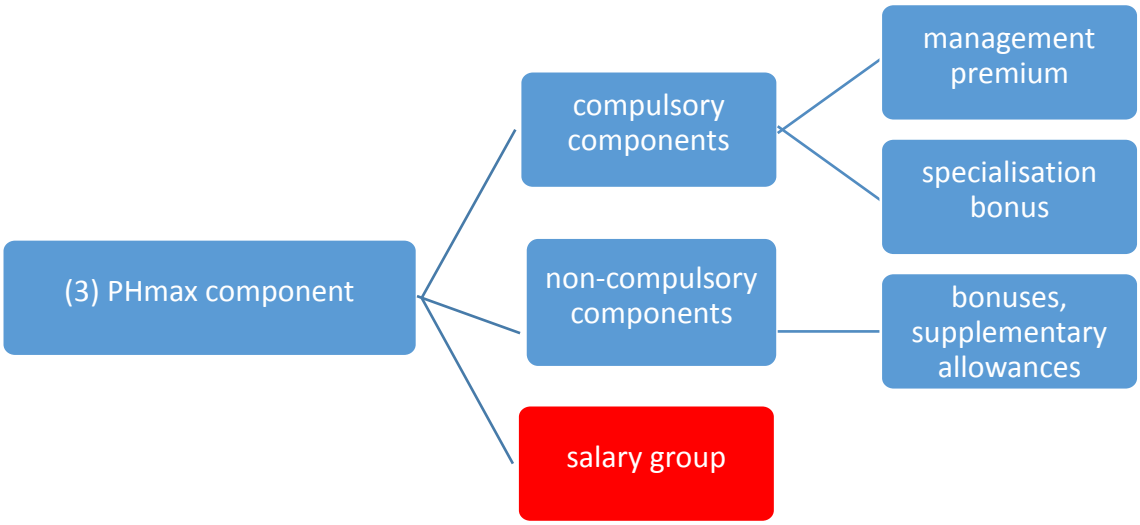
Calculation method of Phmax enables to cover and adjust different components of the salary - compulsory components of extra – pay salary for management, educational advisory services. By the 2020 reform the MEYS aims at fulfilling one of the strategic goals which is to make the education on primary and secondary level more efficient, to eliminate the discrepancies and disparities of each individual school unit as far as the evaluation of the teachers is concerned. By establishing a new calculation formula, the MEYS sets the rules for making the funding more flexible going beyond the pure number of students and considering other relevant factors in the allocation process by increasing the number of parameters that would reflect different factors to add some more flexibility in funding scheme as the allocation formulas should always reflect the education

priorities and education policies of the governance level which adopts them. Unlike the student basket former calculation, the Phmax formula allows to take into account the groups and grades of particular educational establishments, specialisation bonus for educational advisory services or methodologists for forecasting and preventing major educational and formative problems. Other surcharges and bonuses are individual and depend on headmaster´s choice. Unlike the student basket former calculation, the Phmax formula allows to take into account the groups and grades of particular educational establishments. Specialisation bonus for educational advisory services or methodologists for forecasting and preventing major educational and formative problems. Other surcharges and bonuses are individual and depend on headmaster´s choice.

5.4. Teacher´s salary scale and it´s components

To make the overview complete it is useful to provide information on teacher´s salary scale and it´s components. Salary scale is settled by government regulation. More aspects are taken into account: salary groups, compulsory and non-compulsory components. Chart No 2 gives a description of components included in Phmax calculation.

Chart No 2: description of components of Phmax calculation



Source: Own processing

The chart is supposed to reveal the components of the teacher´s salary that hasn´t changed since the introduction of the Phmax formula. Through Phmax it is possible to consider salary groups and other individual components. As far as the salary groups are concerned following table shows the differences between the groups.

Table No 3: Development of salary grades of teaching staff and the differences in salary grade groups

salary grade	parctice	2015	2016	2017	2018	2019	2020
1	within 2 years			22 620	26 020	28 630	30 930
2	within 6 years	21 000	21 530	23 100	26 570	29 230	31 570
3	within 12 years	21 700	22 280	24 020	27 630	30 400	32 840
4	within 19 years	22 800	23 430	25 030	28 790	31 670	34 210
5	within 27 years	24 280	25 000	26 590	30 580	33 640	36 340
6	within 32 years	26 350	27 250	28 810	33 140	36 460	39 380
7	over 32 years		27 940	29 500	33 930	37 330	40 320

The difference between salary grade is significant and can differ by 30 % for the first and last grade.

6 Results of the research

6.1. Research outcomes

Having presented both calculation schemes it is possible at this point to compare the funds distributed to a chosen sample of secondary schools in years 2015 - 2021. As stated before, for the comparative reasons the period is divided into two parts: 2015-2019 when the funds were allocated through student basket formula and a

shorter period of two years 2020-2021 going on already under Phmax funding. Table No 4 serves for the analysis of financial flows of salaries of the teaching and non-teaching staff.

Table No 4: List of analysed schools and financial flows intended for salary of teaching and non-teaching staff in CZK

	student basket formula					Phmax	
	2015	2016	2017	2018	2019	2020	2021
1. Gymnázium Uherské Hradiště	26 240 851	28 389 283	30 960 467	34 958 726	41 004 835	48 187 710	52 981 533
annual salary rise in income for school unit (in %)	100%	108%	109%	113%	117%	118%	110%
number of students	915	928	932	936	944	939	N/A
2. Gymnázium Zlín - Lesní čtvrť	26 185 561	28 029 650	30 086 479	33 566 822	40 076 244	47 894 443	53 308 476
annual salary rise in income for school unit (in %)	100%	107%	107%	112%	119%	120%	111%
number of students	913	916	906	899	923	920	N/A
3. Gymnázium a Jazyková škola s právem státní jazykové zkoušky Zlín	19 840 842	20 613 598	22 439 213	25 014 978	29 896 527	43 050 617	49 416 063
annual salary rise in income for school unit (in %)	100%	104%	109%	111%	120%	144%	115%
number of students	688	675	677	671	676	703	N/A
4. Gymnázium Kroměříž	14 938 781	15 601 902	17 095 664	19 544 094	22 890 782	29 749 716	33 051 722
annual salary rise in income for school unit (in %)	100%	104%	110%	114%	117%	130%	111%
počet žáků	533	520	525	533	537	539	N/A
5. Gymnázium J.A.Komenského a Jazyková škola Uherský Brod	15 567 182	15 670 446	15 820 655	17 101 988	19 882 561	24 554 127	27 905 581
annual salary rise in income for school unit (in %)	100%	101%	101%	108%	116%	123%	114%
number of students	545	513	476	457	457	466	N/A
6. Gymnázium Františka Palackého Valašské Meziříčí	11 323 064	12 088 252	13 434 408	15 446 495	17 725 016	22 891 711	24 833 395
annual salary rise in income for school unit (in %)	100%	107%	111%	115%	115%	129%	108%
number of students	392	392	402	411	406	405	N/A
7. Gymnázium Ladislava Jaroše Holešov	11 650 017	12 886 414	13 963 047	14 712 723	16 837 167	21 829 638	24 201 412
annual salary rise in income for school unit (in %)	100%	111%	108%	105%	114%	130%	111%
number of students	408	422	422	396	390	387	N/A
8. Gymnázium Otrokovice	8 130 714	8 825 987	10 039 668	11 641 086	13 749 036	18 381 684	20 269 285
annual salary rise in income for school unit (in %)	100%	109%	114%	116%	118%	134%	110%
number of students	288	292	306	315	320	320	N/A

Source: Own calculations, MEYS

The calculations of student basket in the period 2015 – 2019 formula are based on the own calculations of fixed amount of annual salary limit (SL) for a school unit in each budget year. They are individually counted on the principle of the formula that was explained previously on the theoretical principle of consideration number of teaching and non-teaching staff multiplied by the average salary of teaching and non-teaching staff that was used for allocating the funds. The data for funds distributed in years 2020 and 2021 are obtained directly form the official source of MEYS.

6.2. The quantitative comparison

The functional dependence on number of students vs received funds is evident. The unfavourable situation was in practice compensated by extra pay ups that were allocated evenly, unpredictably and not systematic and took into account especially the number of students. Consequently, this could negatively affect the standards required by the school in order to gain as much students as possible respectively as much money as possible. It is for example the case of Gymnázium Jana Amose Komenského, Uherský Brod (unit No 5) that registered a drop in number of students four years in a row (2016-2019) by 56 students that was more than 10 %. The effects for the income of the school were destructive. In general, the years 2016-2017 were difficult for smaller schools due to unfavourable demographic development and low increase in average salaries (see Table No 2 – an overview on the annual growth of average salary AST, ASNT). Since 2020 the Phmax calculation method has been fully introduced. Besides an overall annual increase in 2020 in comparison with year 2019 for each school unit in the examined group there are similarities to be observed: in case of smaller schools in terms of number of students (units No 5-8) there is a higher increase in salary funding of 30-34 % in 2020 for units No 4-8 and at the opposite end the bigger school units with twice more students registered the increase only of 18 – 20 %. As for school unit No 4 a steep increase (by 144 % in 2020) cannot be explained by means of standard budgeting formulas. The representatives or the school and regional authorities confirmed that the above average increase is caused by the organisational changes in the education process and resize of the classes and is connected with recruitment of additional pedagogical staff.

On the one hand the above mentioned facts reflect the effects of the systemic changes caused by Phmax allocation formula. The student basket formula didn´t take at all into consideration the additional needs that are though indispensable for meeting the needs of pedagogical practice: for in-service training, need for additional positions of pedagogues or psychologists as described before. The allocated costs consider and express the maximum of teaching lessons per school. Some of these salary costs were financed from extra funds and in practice the bigger schools were able to spread these costs among more students. The allocation didn´t consider the fact that even if the number of students varies from year to year and drop the number of teaching hours remain

the same in order to provide the curriculum. Loss of students presented always a slump in the income of schools even if the teaching time didn´t change. These inconveniences are supposed to be solved by the Phmax calculation. This effect demonstrates in the higher increase of funds allocated to smaller schools. As for 2021 the increase in funding the salaries are evenly distributed: 10-11 % for each school unit. As far as unit No 5 is concerned there is a certain point to be raised on. This school unit registered a drop of one fifth of the students and the school had to eliminate the number of classes. The adjustment of the Phmax calculation mechanism didn´t reflect to such an extent in 2020 and is supposed to be matched in 2021.

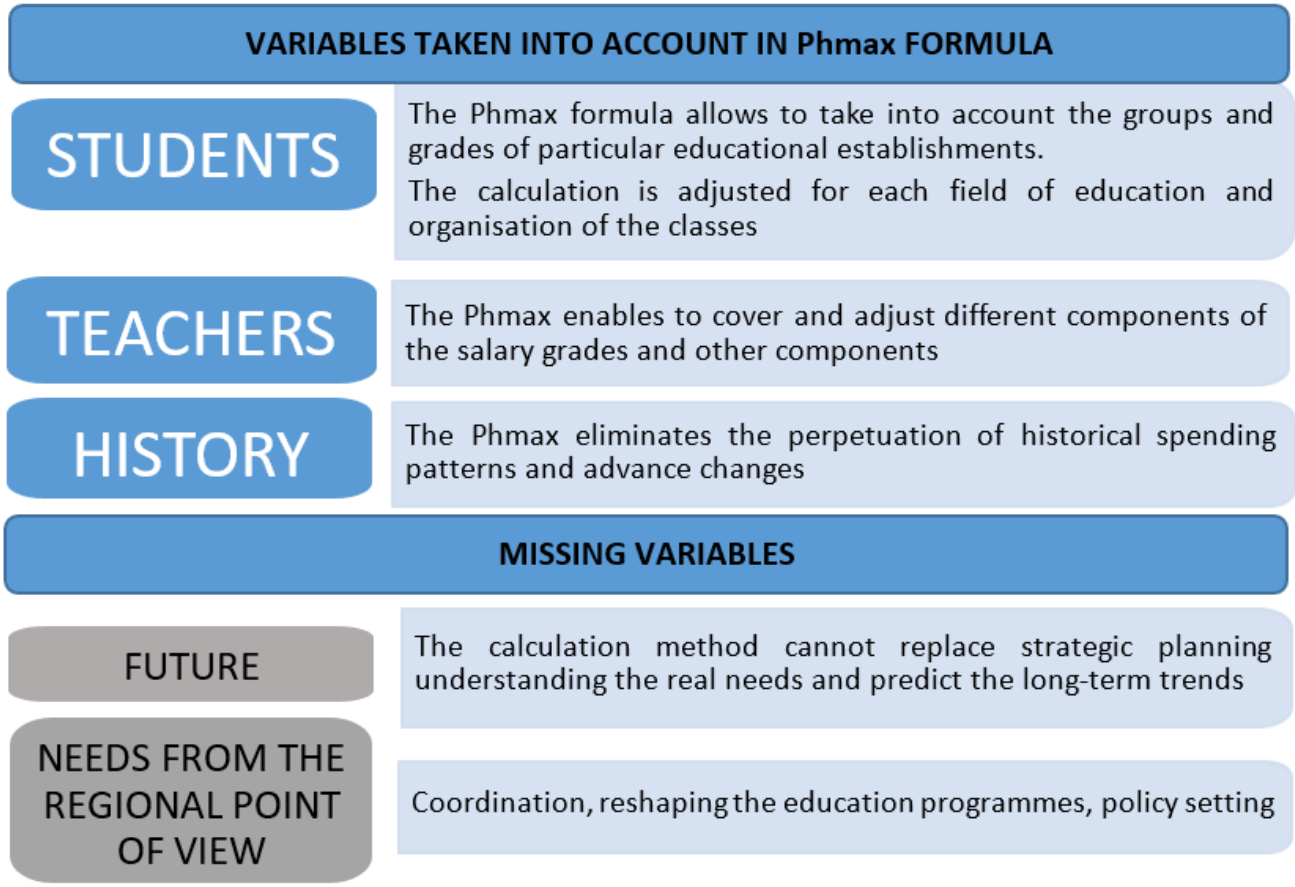
On the other hand, the individual cases (school unit No 3 and 4) confirm that the capacities of both student basket formula as well as Phmax formula go beyond the limits of formula budgeting and the organisational and structural tasks had to be solved separately. This matter will be discussed in the next analysis.

6.3. The analysis of budgeting principles

The above mentioned aspects that result from the comparative part of the study carry the budgeting on the regional level. In order to answer the second hypothesis, it is necessary to ask if the new calculation method covers the initial assumptions of the flexible budgeting described in the chapter 4.2.

From this point of view, the role of process of allocating the funds is supposed to assess the regional equity of school finance. The method of the Phmax calculation is able to ensure that the funding cannot be cut below a sufficient level on average. Nevertheless, it does not cover all necessary components of the chart No 1: Flexible budgeting process. Keeping these assumptions in mind the flexible budgeting process consists of the following main points and is assumed in the chart No 3:

Chart No 3: Flexible budgeting process and Phmax formula



Source: own processing

These both aspects of missing variables are important from a long-term planning perspective. They proof that the Phmax formula cannot assure the flexible budgeting process as described in chapter 4.2. The Phmax formula does not consider long term strategy policy neither on local nor on national level. The complete budgeting process follows an approach to use the funding which involves analysis of both financial and educational data and the identification of effective policies and programmes that are supposed to improve and support decision making process. These complex methods of effective managing and planning the financial resources require comprehensive information about resource inputs, educational processes and outcomes. It is necessary to keep in

mind that the existing data on different aspects of a school system are often split across levels of governance and different institutions. All these aspects confirm that it is not possible to transfer the planning and strategy policies on one level. In the case of Phmax formula funding, the variables are able to ensure the local disparities in case of students, teachers and the historical funding data but cannot reflect other local conditions: the demographic previews, labour market situation or follow the overall education strategic policy.

6.4. Results of the main objectives of the study

Follow-up the comparison and analysis the summary of the results will focus on the hypothesis set for the present research.

The analysis and comparison based on the own calculation and data provided by MEYS and Regional Education Department show the redistribution in favour of smaller schools that previously suffered from unfavourable demographic development. These changes demonstrated mainly in case of the schools that suffered from the decline of their students due to unfavourable demographic development. We have seen that the previous student basket formula attributed to these schools only the increase of by 1-4 % even though they were supposed to maintain the number of classes and teaching hours. After the implementation of school funding reform, the smaller schools were compensated. Their income increased by 29 to 34 % in comparison with bigger school units with more students, their increase in funding the salaries was around 18 %. The scale of variable components included in the Phmax formula enables to cover and adjust different components of the salary - both compulsory and extra pay salary for management, educational advisory services and supplementary pedagogical services. The salary grades are considered as well, which could be quite an important aspect as the lowest and highest grade differs by about one third, considering the rising age of teachers. New coming teachers need mentor support and supervision of their more experienced colleagues which is as well considered in Phmax formula. Last but not least the Phmax involves the specific needs of the curriculum in the variable of teaching lessons per one class and the school as a whole. It is important to remind that the research focused mainly on the first year going on new founding principles. The second year (2021) demonstrated equal rise in salary and does not reflect any differences between the schools. This can mean that for coming years the changes will follow the data from previous year. Anyhow the flexible budgeting principles are not limited by the facts mentioned above. The method of the Phmax calculation is able to ensure that the funding cannot be cut below a sufficient level on average. From this point of view, the structural changes comprising the demographic development as well as the long term school programme and field structure planning must be executed on the regional levels taking into account the clear objectives coming from the central level. They should be in accordance with the overall policy strategies of the country but above all, it is highly important to reflect the local particularities of the region. That´s why the regional authorities should work on the long term strategies of the educational policy in the region taking into account the demographic prospective. Setting the right goals requires comprehensive information and communication on all levels of the process: school units – regional authorities – central authority. Data relevant for effective long term school planning are split across levels of governance and different institutions. At this time the construction of Phmax formula serves to guarantee the level of financial resources for each school unit as described above taking into account students´ and teachers´ specific variables as well as previous financial flows. The Phmax formula does neither deal with the long-term setup of the schools nor the strategic planning. These areas of interest require a set of governance arrangements and split responsibilities based on the existing data on different aspects. From these points of view both hypothesis set at the beginning are confirmed.

7 Conclusion

The presented research demonstrated on the predefined sample of secondary schools located in the Region of Zlín the impact of two budgeting formulas. The description of both funding principles provided a deeper comprehension of the weaknesses of the former budgeting formula that left very little room for a flexible budgeting process at the regional level. The 2019 education funding reform set the expectations in terms of fairer and more equal allocation. The objective by which the aim of the reform was supposed to be met was the newly established allocation Phmax formula that was also described. The analytical and comparative methods allowed to summarize the effects of the funding reform funding. For that reason, the funds intended for salaries of pedagogical staff seemed to be the most relevant items to be analysed and compared. In order to prosecute the analysis, own calculation based on the student basket formula of the five-year period 2015-2019 and the retrieved data for 2020 – 2021 were treated. Consequently, the rise in financial flows over the reference period were analysed and compared. The comparison allowed to confirm the hypothesis set. The comparative analyses proved that the changes in the redistribution appeared to be significant and approved the first hypothesis. The real effects

of establishing Phmax calculation formula demonstrates in higher financial flows in case of smaller schools. The impact of the changes in budgeting formula is significant as far as the effects of the reform are concerned. Thanks to the scale of variable components of Phmax formula, it enables to cover and adjust different components of the salary - both compulsory and extra pay salary for management, educational advisory services and supplementary pedagogical services. Another feature important to achieve more precise salary cost is the consideration of real salary groups of pedagogical staff at each school. Last but not least the Phmax involves the specific needs of the curriculum in the variable of teaching lessons per one class.

The calculation Phmax formula takes into account the student, teacher and historical factors. It was explained that policies aimed at reshaping the organisational structures and changing institutional habits in school systems as well as the strategic planning and educational policies are not involved in the formula. Therefore, as per hypothesis 2, the calculation formula itself cannot assure the flexible budgeting. The school funding policies are closely interlinked with wider developments in school governance contexts. There must exist wider cooperation between schools – regional and national level on the design of strategic long-term plans. To choose the right fields of study in appropriate number of schools and classes to balance the labour market demand in conformity with overall long term strategic policy seems to be crucial. The introduction of a school funding formula brought about the desired results ranging from transparency to increased efficiency to allocate resources. However, as the analysis based on flexible budgeting principle shows it cannot contribute to balancing the strategic long term policy oriented goals. In this respect there is an ample room for co-ordination work of school profiles and for improving cooperation between schools and the regional authorities. Education responsibilities of regions are complex and require serious strategic planning and oversight of many quite different institutions. In particular, their duty is to phase out old education programmes, no longer in tune with the expectations of the market and to phase in new ones, that are more in demand and relevant for future competitive economy strategies. This makes the allocation of funds extremely difficult and must be discussed on all the levels of educational process.

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Annual reports of analysed school units

Financial Inclusion Disparities in the European Union

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Abstract: - The European Union is a leader when it comes to various inclusion indicators. At first glance, this would suggest that the EU enjoys a high level of financial inclusion. The analysis we performed reveals that the EU-level averages often hide extremes. While Western European countries have a very high level of financial inclusion, when we look at the countries in Eastern Europe, we can even talk about a financial exclusion of the population. The study relies on three sets of indicators, related to the use, geographical access, and digitalization of financial services. On a positive note, inclusion indicators have improved over the analyzed period. However, this improvement took place at different paces for the Member States and, as a result, disparities not only persisted, but even deepened in many cases.

Key-Words: - financial inclusion, financial integration, disparities, European Union, financial services access, digitalization

JEL Classification: - G20, G21, G50, G53

1 Introduction

Few studies to date have explicitly addressed the issue of financial inclusion in the Member States of the European Union, primarily because statistical data, or rather the lack thereof, have not allowed for the development of complex analyses. Perhaps the most comprehensive approach in this regard is the study conducted under the auspices of the World Bank by Demirguc-Kunt and Klapper (2012), a large-scale survey that provides us with a sufficiently clear perspective on the level of global financial inclusion.

The European Union in general, and the euro area in particular, lead the rankings in terms of various inclusion indicators. At first glance, these rankings would suggest that the EU enjoys a high level of financial inclusion. The analysis we perform in this article reveals, however, that the averages at Union level often hide extremes. While Western European countries have a very high level of financial inclusion, in Eastern Europe - usually in the countries that joined after 2004 - we can talk about financial exclusion, as the extent to which the population participates and benefits from financial services is much lower. The need for financial inclusion has been recognized and reaffirmed by the EU authorities several times. We mention here the project of the capital markets union (European Commission, 2015), which aims at facilitating the access of enterprises and of the population to financial services. Although at declarative level the European Commission has spoken out in support of market development and financial inclusion, concrete actions are lagging behind, against the background of the lengthy decision-making process and of the recent turmoil caused by the pandemic crisis.

The analysis of financial inclusion in the EU Member States targeted three sets of indicators:

i) Financial services use: current accounts, deposits, contracted loans, credit cards, wages received in current accounts or in cash from the private sector, payments from public authorities in current accounts or in cash.

ii) Geographical access to financial services: number of ATMs per 100,000 adults, number of commercial bank branches per 100,000 adults.

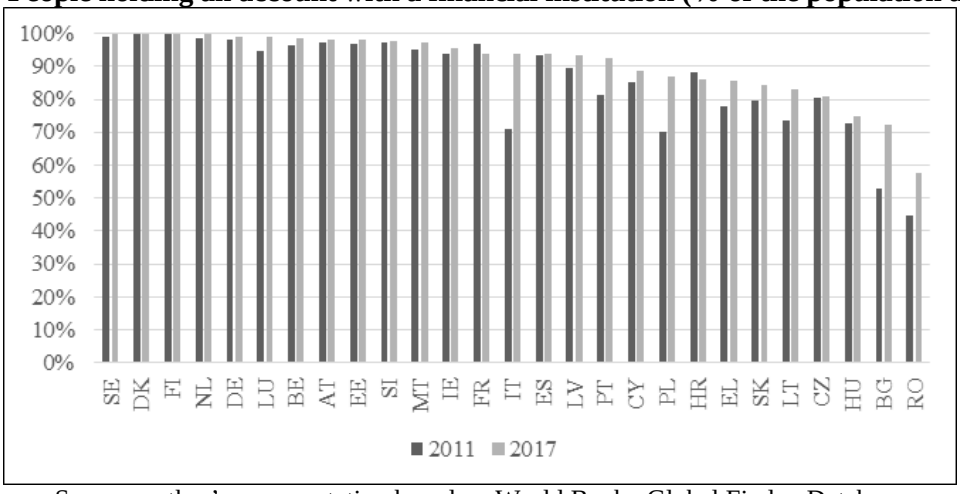
iii) Digitalization of financial services: the use of a debit or credit card for online purchases, online payments made in the previous year.

Inclusion indicators have improved during the analyzed period, therefore there is a positive trend at Union level in terms of financial inclusion of the population. However, this improvement has taken place at different paces in the different Member States and, as a result, not only that disparities persisted, but in many cases they even deepened. These disparities make the case for the necessity that national authorities develop and implement inclusive policies comprising concrete measures. Moreover, the success of such policies would be enhanced by the active involvement of the Union authorities and the timely resumption of the Commission's action plans for the development of the Member States' financial markets.

2 Financial services use

A current account is a basic service, often complementary to other types of financial services. Existing data show that current account facilities are easily accessible in the European Union, especially if we consider the average of 91% of the population over 15 holding such a financial instrument at EU level in 2017 (up from 86 % in 2011). As mentioned above, the averages do not accurately reflect the actual situation of the Member States, and the graphical representation below indicates very sharp discrepancies between developed and emerging markets (Graph 1). In Sweden, Denmark, Finland, or the Netherlands, 100% of the surveyed population had a current account open with a financial institution in 2017. A relatively recent analysis by the European Central Bank (Esselink and Hernández, 2017) states that more than 93% of the Eurozone population owned or had access to a bank account in 2016, which reflects, at first glance, a very good access of the population to primary financial services. However, we note lower percentages in the countries of belonging to the Southern part of the Eurozone (e.g. Greece, Slovakia) and in the Baltic States (Latvia, Lithuania). Hungary, Bulgaria and Romania occupy the last three places. Although the countries of Central and Eastern Europe show a low penetration of financial services on their markets, for some of them we notice a significant increase in these percentages between 2011 and 2017: Romania from 45% to 58%, Bulgaria from 53% to 72%, Poland from 70% to 87%. This high growth rate can be explained by the fact that these countries have emerging, unsaturated, and rapidly expanding markets in terms of financial services. High growth rates are generally specific to emerging economies and reflect their underdevelopment and the so-called "catching-up" effect in relation to developed markets, which are advancing at a much slower pace.

Graph 1. People holding an account with a financial institution (% of the population aged 15+)



Source: author's representation based on World Bank– Global Findex Database

If discrepancies exist in the case of demand deposits, which *sine-qua-non* are a support tool for other financial services, they become much more obvious if we analyze the situation of term deposits. Savings deposited with financial institutions give us an even clearer picture of the development of the financial markets in question. A small percentage of the population holding a deposit shows one of the following:

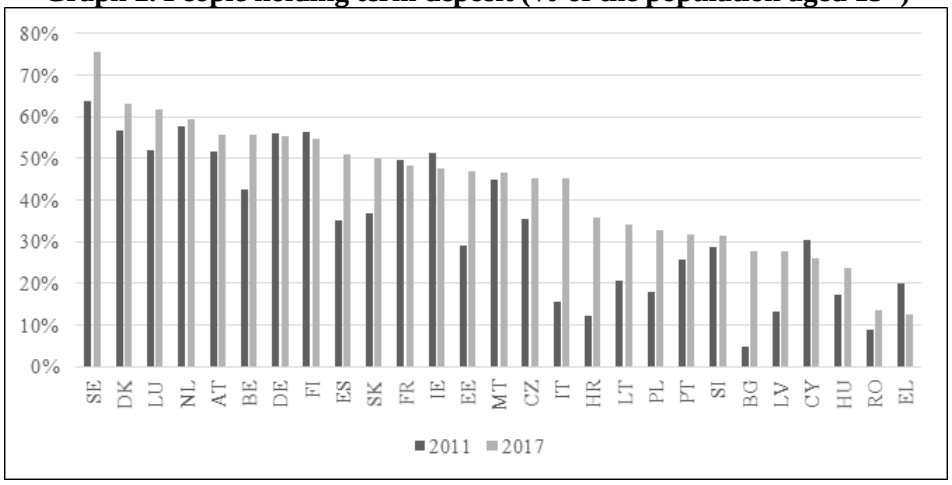
(i) the population does not make savings and only relies on subsistence income,
(ii) the population does not trust financial institutions,
(iii) the population does not have access to financial institutions,
(iv) deposits are not attractive, because of the low interest rates offered.

Each of these possible explanations suggests that financial intermediation is weak in these markets. We take into account the fact that the main purpose of banks is, or should be, to channel deposited financial resources back into the economy. The lack of these resources has negative effects on the supply of loans and on the financing of production activities.

Among the countries where the highest percentages of the population deposits savings in banks are Sweden (75% in 2017), Denmark (63% in 2017), Luxembourg (62% in 2017) and the Netherlands (59% in 2017) - Graph 2. At the other end, countries such as Poland, Hungary and Bulgaria have comparable levels in 2017, between 33% and 24%. The worryingly low percentage of the Romanian population depositing savings with banks puts into question the country's degree of economic development, especially considering the fact that enterprises mainly rely on bank loans for financing. On a positive note, deposits are on the rise, from only 9% of the population over the age of 15% in 2011.

Greece occupies the last place, with a declining percentage in 2017 compared to 2011. We recall that through the systemic risk management package, the Greek authorities temporarily banned not only the liquidation of term deposits, but also cash withdrawals from demand deposits. Subsequently, for a long time, very strict daily limits were imposed on the amounts withdrawn, in order to maintain liquidity in the banking system. In general, the instability of the Greek financial system, but especially these measures meant to restrict the population's access to its own resources, significantly affected the confidence in financial services.

Graph 2. People holding term deposit (% of the population aged 15+)

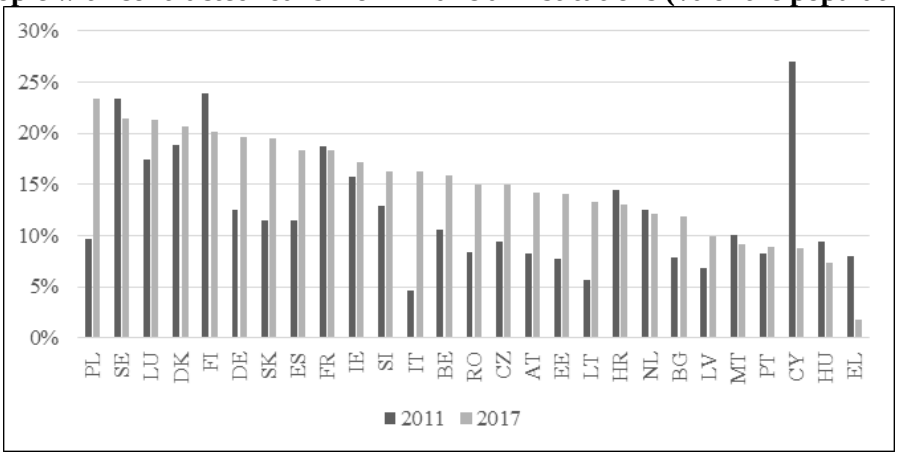


Source: author's representation based on World Bank– Global Findex Database

Perhaps the most relevant aspect of financial inclusion is the access to finance. In terms of loans contracted by the population, the ranking is heterogeneous, and the differences between 2011 and 2017 are wide. This time we find Poland on the first place. In Poland, an obvious leap occurred between the two years we analyzed, from 10% in 2011 to 23% in 2017. Also, Romania is in the middle of the ranking, surpassing countries such as Austria or the Netherlands. Sweden (21%), Luxembourg (21%), Denmark (21%) or Finland (20%) are once again at the forefront of the hierarchy. The percentage of the population that accessed a loan in 2017 varies from 23% in Poland to 2% in Greece – Graph 3.

According to Gómez Urquijo (2015), discrepancies in terms of contracted loans do not necessarily reflect people's access to financial services. They can be correlated with the countries' culture. Specifically, some countries, especially those in Central and Eastern Europe, perceive long-term indebtedness negatively and regard it strictly as a last resort financing source.

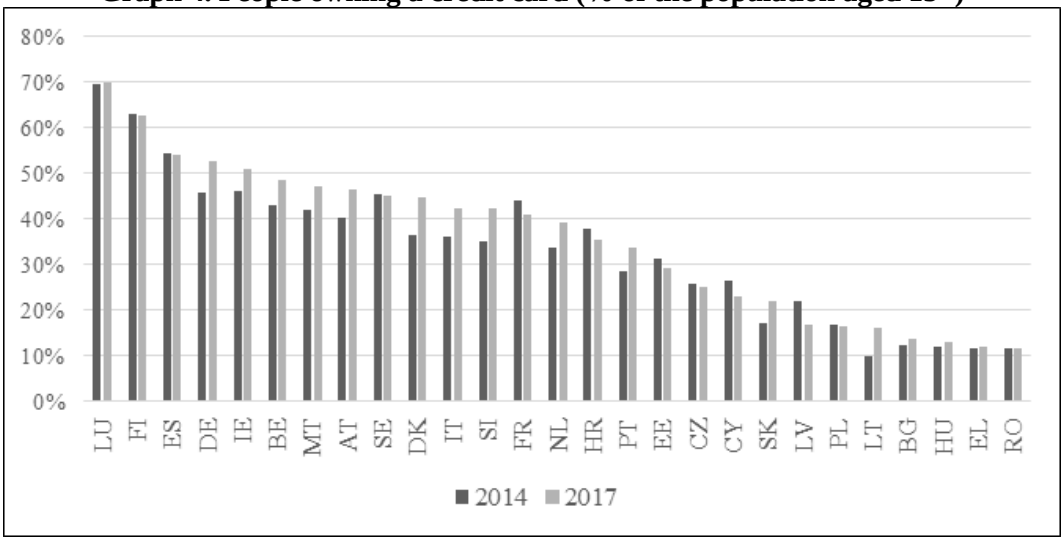
Graph 3. People with contracted loans from financial institutions (% of the population aged 15+)



Source: author's representation based on World Bank– Global Findex Database

Credit cards are also a popular financial instrument, but relatively more sophisticated than demand deposits. As expected, a smaller part of the population resorted to such services that allow credit purchases. The percentages vary, in 2017, from 70% in Luxembourg to only 12% in Romania (Graph 4). Credit cards have started to become more attractive as banks have eased access conditions and interest rates on purchases have fallen. On the emerging markets, financial institutions are taking extensive steps to popularize these tools by collaborating with online stores and offering preferential conditions to new customers who choose the alternative of a credit card. The extremely low percentages in Romania, Greece, Hungary, Bulgaria and Lithuania, but also the minimal evolution between 2014 and 2017 may indicate the reluctance of the population and even the lack of confidence in credit instruments. This lack of trust is even recognized by the World Bank (2019) as the main reason for the voluntary exclusion from the use of financial services.

Graph 4. People owning a credit card (% of the population aged 15+)

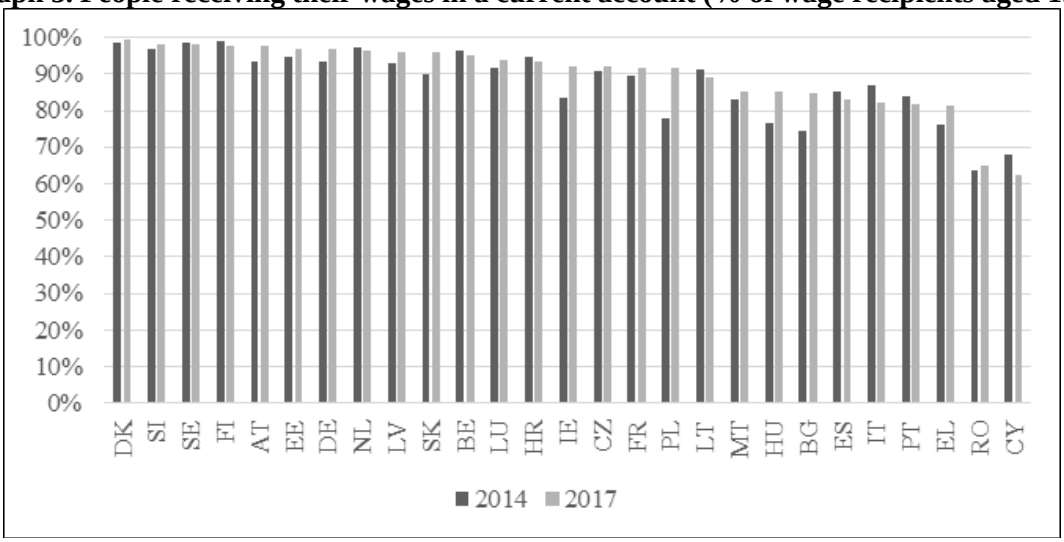


Source: author's representation based on World Bank– Global Findex Database

In 2017, high percentages of the employed population received salaries in a current account – Graph 5. The fact that in recent years, private companies abandoned cash payments and conditioned the payment of wages on the holding of a banking account could be a possible explanation for the high values.

The percentage of people who received their salary in a current account in 2017 varies between 99% in Denmark and 62% in Cyprus. We also notice very high percentages in Slovenia (98%), Sweden (98%), or Finland (98%). Romania is once again at the bottom of the ranking with only 65%, preceded by Cyprus with 62%.

Graph 5. People receiving their wages in a current account (% of wage recipients aged 15+)

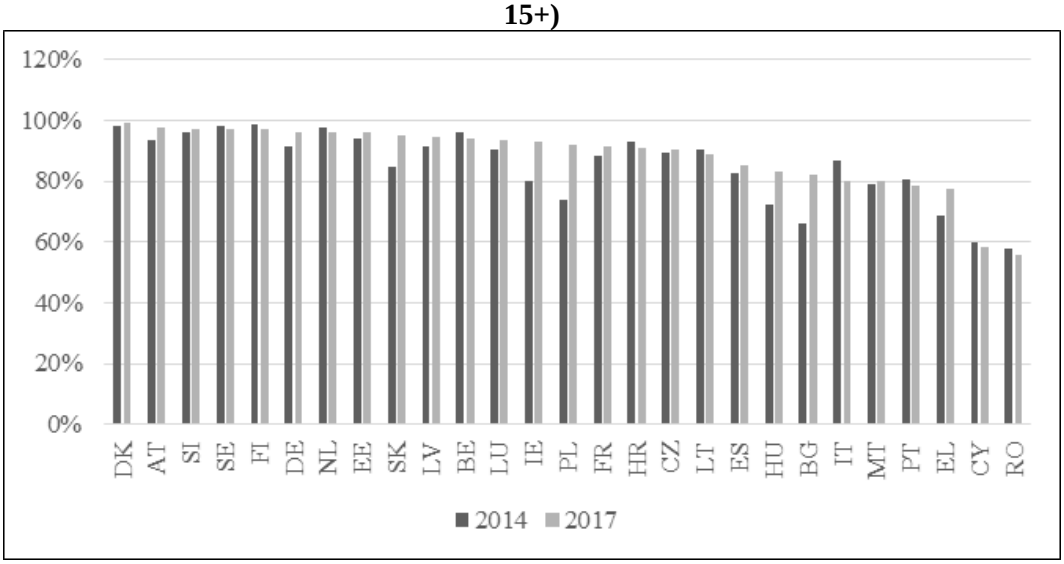


Source: author's representation based on World Bank– Global Findex Database

Graph 5 gives us an overview of the wages received in bank accounts. However, the data reveal sharp discrepancies between public and private systems. As we can see in Graph 6, most of the wages received in bank

accounts are in the private system. According to these data, the private system contributes to a greater extent to the financial inclusion of the population in the Member States. At the top of the hierarchy in 2017 are countries such as Denmark (99%), Austria, Slovenia, or Sweden, all of them with 97% of the employed population receiving wages from private companies through a financial institution. The last three countries from this point of view are Greece (77%), Cyprus (58%) and Romania (56%).

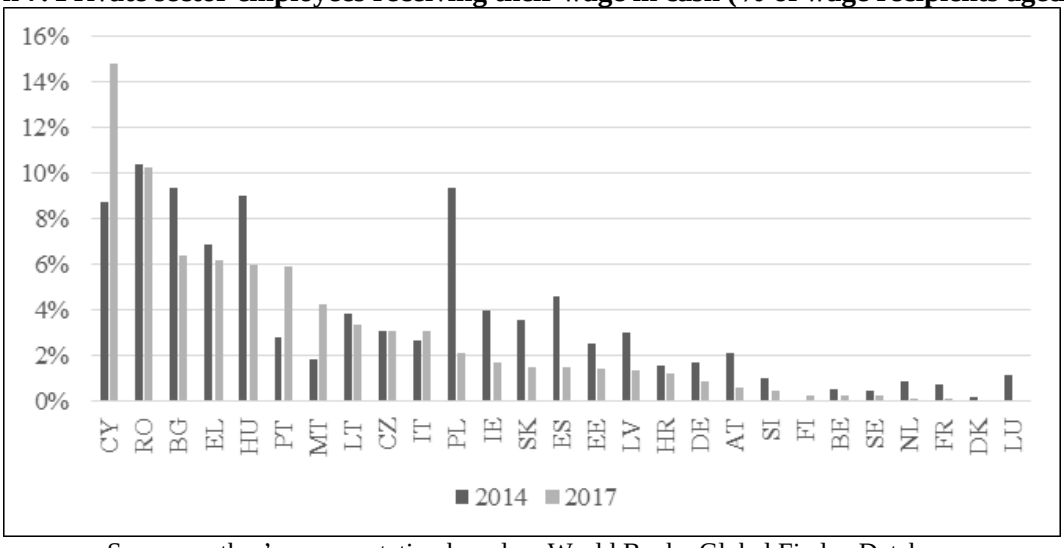
Graph 6. Private sector employees receiving their wage in a current account (% of wage recipients aged 15+)



Source: author's representation based on World Bank– Global Findex Database

Data on the payment of cash wages in the private sector show a reversed hierarchy. This time, on the first positions we find the countries with a strong cash payment culture: Cyprus (15% in 2017), Romania (10% in 2017), Bulgaria (6% in 2017). The percentages for Luxembourg, Denmark, France or the Netherlands are equal or very close to 0% - Graph 7. It is easy to see that transfers to current accounts are generally preferred to cash payments, and we recall again that a large proportion of private companies - especially multinational companies - have conditioned the payment on the holding of a bank account. This may be the reason why Central and Eastern European countries still have relatively small percentages of cash payments.

Graph 7. Private sector employees receiving their wage in cash (% of wage recipients aged 15+)

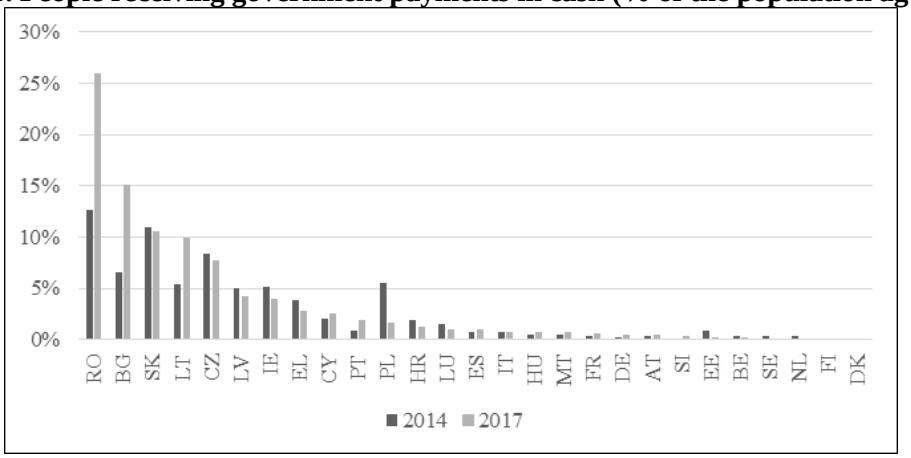


Source: author's representation based on World Bank– Global Findex Database

Payments made by governments through bank transfers, instead of cash payments, indicate the degree of participation of the authorities in the financial inclusion of the population. From the data analyzed up to this point, we infer that access to a current account should not be a barrier for financial inclusion. Therefore, in some Member States - especially in Central and Eastern Europe - the authorities prefer not to use bank intermediation when making payments to the public. Graph 8 confirms the discrepancies mentioned above. The percentage of

people who received cash payments from state authorities varies between 26% in Romania to 0% in Denmark. In Romania's case, we notice a doubling of the percentage in 2017 compared to 2014, most likely due to the social policy measures adopted and to the public expenditures made in this regard. Bulgaria and Slovakia occupy the next two places in the ranking of government cash payments, with 15% and 11% respectively in 2017. According to the data, in countries such as Denmark, Finland, the Netherlands or Belgium, the authorities prefer to make payments in current accounts.

Graph 8. People receiving government payments in cash (% of the population aged 15+)



Source: author's representation based on World Bank– Global Findex Database

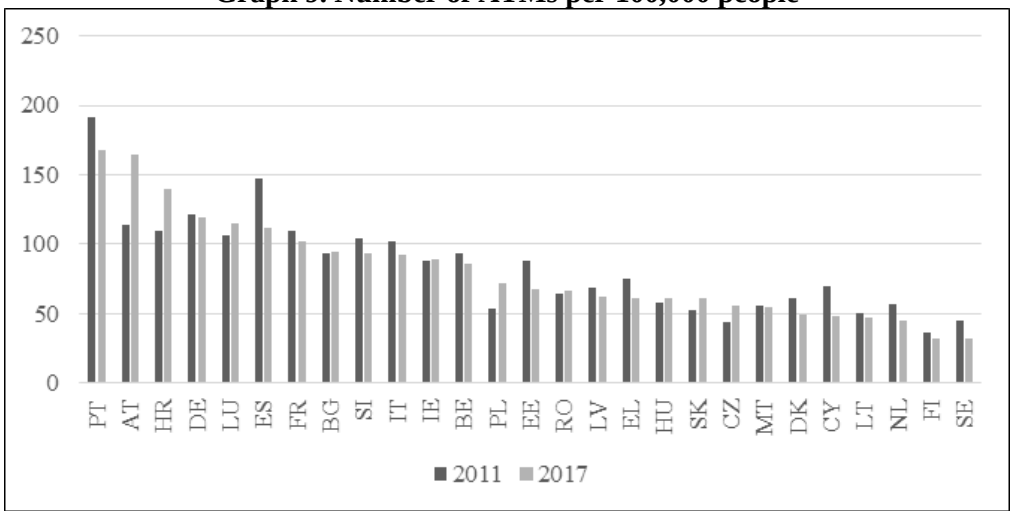
3 Geographical access to financial services

Geographical access to financial services is perhaps the most relevant aspect of financial inclusion. It is easy to understand that inclusion cannot be achieved without the proper financial infrastructure. In this sense, our analysis focuses on two indicators: the number of ATMs and the number of bank branches per 100,000 people, respectively.

The number of ATMs per 100,000 inhabitants varies in 2017 between 167 in Portugal and 32 in Sweden (Graph 9). It is interesting to note that the number of ATMs is not always correlated with the level of economic development. We can see that the density of ATMs is much lower in countries with developed capital markets such as Sweden, Finland, or the Netherlands. These percentages are not surprising, given that financial services in these countries are highly digitalized. We recall that ATM infrastructure allows cash withdrawal, and the need for cash is higher in emerging countries. However, the ranking is not homogeneous, as we also find developed countries with a high density of ATMs. For example, Austria had 165 ATMs per 100,000 inhabitants in 2017. Incidentally, Austria is also host to many of the headquarters of the European Union banks.

We notice that Romania is in the middle of the ranking, with a density of 66 ATMs. It should be noted that although the density seems optimal at national level, ATMs are usually concentrated in urban areas and are almost completely absent in rural areas.

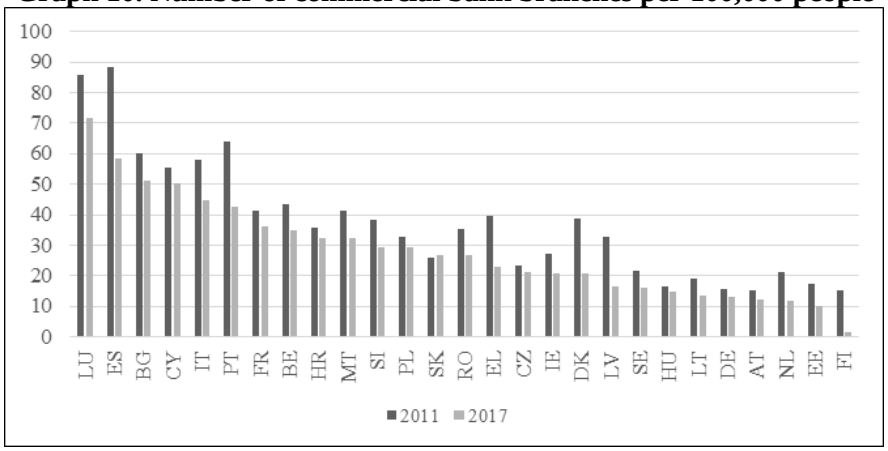
Graph 9. Number of ATMs per 100,000 people



Source: author's representation based on IMF - Financial Access Survey

The density of bank branches per 100,000 people varies significantly, from 71 in Luxembourg to 1.4 in Finland (for 2017) – Graph 10. At the same time, we notice a general downward trend in terms of the number of bank branches between 2011 and 2017. The progress made in recent years in terms of digitalization of financial services has rendered a considerable number of physical banking units redundant. We notice this phenomenon of accelerated digitization in the countries with the lowest figures: Finland (1.4 banks), Estonia (10 banks), the Netherlands (11 banks), Austria (12 banks), Germany (12 banks) and Lithuania (13 banks). Finland has no more than 1.4 banks per 100,000 people, although it is a country with a very high level of financial inclusion. This example illustrates that from a certain degree of development onwards, the physical financial infrastructure is no longer a determining factor for financial inclusion. The presence of banks and the interaction with their officers are more relevant in emerging economies, especially in predominantly rural areas where the population does not have access to online services or does not have the necessary knowledge for this access. Bulgaria, for example, has a fairly high density of banks (51 per 100,000 people in 2017). In the same period, Romania had 26 banks per 100,000 people.

Graph 10. Number of commercial bank branches per 100,000 people



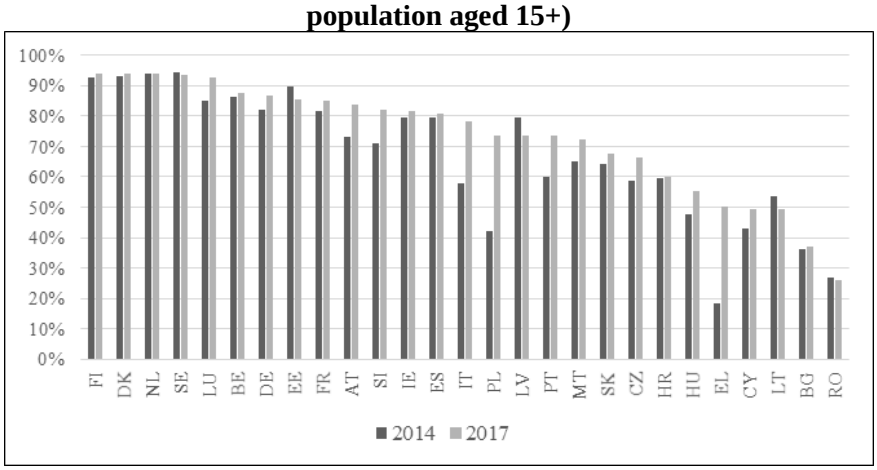
Source: author's representation based on IMF - Financial Access Survey

4 Digitalization of financial services

It is important to point out that purchases using electronic payments contribute to the reduction of tax evasion (OECD, 2017). In light of this, we note that Romania and Bulgaria are the countries with the lowest rates of electronic payments use, while also being countries where poor state revenue collection has already become an acute structural problem. In Romania, only 26% of the population over the age of 15 made purchases using solely electronic payments (37% in Bulgaria, 49% in Lithuania). We also notice that the same respondents have current accounts in a higher proportion, but we deduce that a good part of them choose not to use them to make payments.

Countries such as Finland, Denmark, the Netherlands and Sweden are again first in terms of electronic payments (all with 94% in 2017) – Graph 11. Poland and Greece stand out among the rest of the Member States, with a significant shift between the two periods - electronic payments doubled between 2011 and 2017.

Graph 11. People who used a debit or credit card to make a purchase in the past year (% of the population aged 15+)



Source: author's representation based on World Bank– Global Findex Database

The percentage of people who made online payments varies between 98% in Denmark and 33% in Romania. The first places are occupied by Denmark, Finland, Sweden, the Netherlands and Luxembourg, while the last places are occupied by Romania, Bulgaria, Greece, Hungary and Cyprus. There may be several explanations why respondents, although holding accounts, choose not to use them to make online payments. Possible reasons include:

(i) lack of funds (accounts exist but have no funds);
(ii) lack of trust in financial institutions (funds exist, but are withdrawn as soon as they are received, with subsequent payments made in cash);
(iii) lack of trust in online merchants (consumers prefer cash on delivery over digital payment in advance, as a guarantee of delivery of the product under the established conditions).

These may indeed be influenced by local culture, but as we will find out in the next section, the lack of transparency of banks in Central and Eastern European countries is one of the main reasons why the population does not use financial services.

5 Financial inclusion issues in Central and Eastern European countries

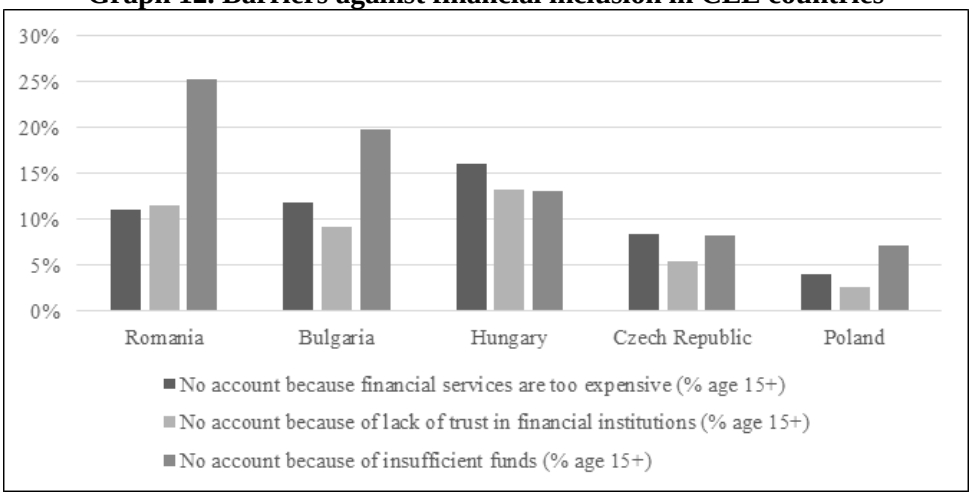
The analysis of the previous indicators revealed that there are sharp discrepancies in terms of financial inclusion between EU Member States. As we have seen, the physical financial infrastructure is not necessarily a determinant of financial inclusion. A high density of banking units or ATMs does not necessarily correspond to a more intensive use of financial services, just as having a bank account does not in all cases imply its actual use in transactions.

Countries such as Romania, Bulgaria, Hungary, the Czech Republic or Poland stand out, with a significantly lower level of financial inclusion than Western European countries. With the exception of Hungary, the main reason why respondents do not have a current account is that of insufficient resources – Graph 12. In these cases, we talk about an involuntary exclusion of the population from the use of services, and this is perhaps the most difficult obstacle for the development of financial markets. The justification given by the population signals the real problems that these economies face: very low living standards, especially in rural areas, and low income, often untaxed, on the verge of subsistence. The percentages of the population without an account due to the lack of necessary financial resources are as follows: Romania 25%, Bulgaria 20%, Hungary 13%, the Czech Republic 8%, Poland 7%.

Another reason why the population does not use these services is the lack of trust in financial institutions (Romania 11%, Hungary 13%, Bulgaria 9%, Czech Republic 5%, Poland 3%). According to Xu (2020) or van der Cruijsen et al. (2020), public confidence in financial institutions is a determining factor for the population's participation in the proper functioning of financial markets and, as a result, for, financial inclusion.

Last but not least, the cost of financial services is an important exclusion factor. Given that in these countries, a large part of the population foregoes financial services due to limited funds, it is easy to understand that any additional cost would discourage the population from initiating any connection with banks. This is also the reason why in recent years banks have reduced or waived administration costs or transaction fees. In any case, they are still an important barrier, especially for low-income people.

Graph 12. Barriers against financial inclusion in CEE countries



Source: author's representation based on World Bank– Global Findex Database

6 Conclusion

Increasing financial inclusion is a condition for the development of the European Union's capital markets. As we have seen in the previous sections of this article, not only that disparities between Member States have persisted in recent years, but they have even grown. The global financial crisis of 2008, the eurozone sovereign debt crisis and, more recently, the pandemic crisis generated by Covid-19 have brought to light a series of structural weaknesses of the internal financial markets. Addressing these shortcomings and reducing disparities first requires addressing their root causes.

In the emerging EU economies, the lack of public confidence in the banking systems has a strong impact on the financial inclusion process. As a result, in countries with lower financial inclusion, banks launched campaigns to promote financial instruments and reduced much of the administrative and trading costs. However, boosting public confidence is a long-term process that requires coordinated actions by national and European authorities. The European Commission (2008) recognizes the need to restore confidence in the banking systems, in order to stimulate lending and access to financial services for households and businesses, all the more so in the context of a global crisis. Also, according to the European Commission (2013), consumers must have access to basic financial services. For this purpose, banks should reduce or even eliminate administrative costs.

A project to facilitate access to financial services was implemented in 2015 (European Commission, 2015). Although at declarative level, the European Commission spoke out in support of market development and financial inclusion, concrete action is lagging behind, against the background of the lengthy decision-making process and the recent turmoil caused by the pandemic crisis. Moreover, fiscal consolidation and the tightening of lending conditions following the 2008 crisis have limited the access to finance for people and businesses. Gomez Urquijo (2014) reminds that disparities in terms of access to finance and lending restrictions limit economic growth, especially in emerging countries. Increasing the degree of financial inclusion at Member State level depends to a large extent on the integration of capital markets. Broadly speaking, the integration of these markets would involve:

- a more effective supervision of financial markets;
- the standardization of financing costs for governments, for the population and for businesses;
- the facilitation of cross-border access to finance;
- increased transparency and public confidence in banking systems.

It is important to emphasize that these objectives cannot be achieved without the existence of a Union body to coordinate and supervise the market integration process. Perhaps this could be the main reason why disparities have widened, although the Commission's plans have explicitly addressed this issue since before the global crisis of 2008. We emphasize the need for the national authorities to implement inclusive policies comprising concrete measures. Moreover, the success of such policies would be enhanced by the active involvement of the Union authorities and the timely resumption of the Commission's action plans for the development of the Member States' financial markets.

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China's Race to Rise and Shine in High Technology

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Abstract: This article looks at the nowadays heated competition for technological supremacy between China, a rising technological power, and the US, the current global authority in high technology and grand creator of new industries, innovative products, processes and services. It mainly addresses China's race to not only catch up, but replace the current global leaders in research, development and innovation, in a huge national push to break the technological dependency on the US and on the other technologically advanced nations and, making use of all the available means, legitimate or not, to accelerate the nation's progress towards self-reliance, self-sufficiency, the innovation-driven economy and to the final goal of reaching global technological dominance.

Key-Words: China, high technology, research and development, innovation, RDI, technological competition
JEL Classification: O3, O33, O34

1 Introduction

Following decades of rampant advancement of globalization, in the early 2020s the world is more integrated than ever in its history. Structured in global value chains (GVCs) and international industrial networks, global production involves most countries of the world in various cooperation and trading activities, capitalizing on their competitive advantages and improving every aspect of the economic performance: production costs, input consumptions, the product quality, content in knowledge, innovation and professional skills, the diversity of the offer and its adequacy to the different segments of the world demand. In search of ways to improve economic efficiency and get higher profits, multinational companies (MNCs) constructed this global production architecture by transferring activities between countries, most often from the developed to the developing ones. They first relocated production capacities, transferred basic technologies, lower-skilled jobs, best practice, but in time they came to transfer increasingly more sophisticated technology, knowledge and know-how, higher-skilled jobs, research-development-and-innovation (RDI) capabilities and even intellectual property (IP). Entire industries were gradually relocated between countries, leading to utterly transformed national economic structures and multiple new trade flows among them.

Against this background, international cooperation and global exchanges of goods – primarily of intermediaries – escalated, the MNCs made huge profits, while consumers all over the world got access to a diversity of higher quality goods that used to be unaffordable. As new links of the GVCs, many developing countries benefitted from increased foreign direct investments (FDI) that helped them develop new industries, adopt new technologies, train local labour, educate the young, nurture local innovation and research activities, increase their exports and gross domestic product (GDP). Everyone seemed to be winning, but the true big winners of globalization have been some of the developing countries which understood and used the chance they had to make a significant leap in their development. Among them, the greatest winner of all was China.

China was the developing country that benefitted the most from globalization, foreign direct investments inflows and free international markets to hasten its own economic development, modernization, urbanization and technological catching-up. Within the global production system, as part of a large number of regional and global value chains (VCs), China came to play the central role of *a world workshop*, which assembled or manufactured and exported huge and growing quantities of goods, in most of the goods categories. Consequently, in 2010 it became both the world's largest industrial producer and the top exporter of goods, globally. In some production areas China became the undisputed dominant manufacturer, as for instance in *personal computers*, by making 90% of the global production, or in *mobile handsets* (90%), *air conditioners* (80%), *photo voltaic panels* (70%), *footwear* (65%) and many other industries. In terms of international trade, China came to rank first in the global

exports of over 450 categories of goods, to rank second in other almost 150 categories and third in 100 more others. Among these, it came to make, for instance, 60% of the world exports of *lighting appliances*, over 40% of the global exports of *mobile and landline phones*, as well as 45% of the world exports of *computers* and 35% of the overall exports of other *office equipment* (Rajanayagam, 2020). On the other hand, in other markets – such as for instance in the oil, coal, copper, rice, soy, semiconductors and many others – China is the largest importer globally. It ranks first in the global imports of 200 categories of goods, second in the imports of other about 120 categories and third in 100 more ones. With such a pervasive and highly ranked presence, either as a major exporter, or as a key importer in the international exchanges of goods, this country has become the main trade partner of over 120 countries and has come to play a decisive role in the price formation on many of the world's markets (Pencea, 2020).

Due to consistently high levels of national and foreign investments, to the expanding production and exports, the Chinese GDP kept growing at a high pace for decades and, as such, China climbed into the second position in the global hierarchy of the largest economies, just behind the US. The country got through the 2008-2010 global economic crisis like a winner and, a decade later, it was one of the very few economies that succeeded to avoid recession in the difficult year of 2020, managing, when all the world was devastated by the Covid-19 pandemic, a 2.3% increase in its gross domestic product. Chinese GDP reached USD 14.7 trillion, accounting for about 20% of the world total (Statista, 2020a, b; Capri, 2020a; Kemp, 2019).

However, China's catching-up race did not finish yet – neither once it became the second largest economy in the world, nor after heaping numberless superlatives and top rankings all along this race –, because China is indeed a large economy, but it is plagued by huge debts (300% of its GDP), non-performing loans, overcapacities, inefficiencies, wastage, low and decreasing productivity; it is still unsustainable, uncoordinated and unbalanced[1], still polluted and polluting, still technologically dependent on the West and not able enough to produce original high-tech breakthroughs (West, 2021). The USD 10,000 average GDP per head is still placing China in the dangerous range of the *middle-income trap* risk that occurs when an economy gets stuck in a stage in which it is already too developed to keep building upon low-cost competitiveness and low-tech industries, yet not developed enough to compete in high-tech, knowledge-intensive and innovative activities. It therefore needs to change its growth engines and development model.

Mindful of the *middle-income trap* threat, the Chinese strategists and leadership have long devised and since the early 2010s have also started to implement a number of initiatives, strategies and policies meant to steer the economy to a consumption-led development model, backed by a high-technology, innovation-led economic structure able to confer China, in time, the statute of unique globally-dominant technological power it dreams of. Moreover, the lessons of the 2008-2010 global economic crisis and the disruptions, crises and international tensions triggered by the Covid-19 pandemic, have convinced Chinese decision-makers once more that China's future prosperity and security depended on detaining complete domestic value chains in high-tech industries and a robust knowledge-based, innovation-led economy, capable of generating its own breakthroughs and to pioneer new high-tech industries.

Noteworthy, the *Chinese dream* of recapturing the country's long-lost glory doesn't simply envisage leveling the technological gap that still separates China from the advanced economies and attaining high technological prowess. It rather goes much further, targeting - on the one hand -, the replacement of the current technologically-savvy global powers at the top of the world high-tech hierarchies (US, EU, Japan and a few others) transforming them into China-dependent economies, and - on the other hand -, it aims at changing the global rules, institutions and governance in accordance with China's authoritative socialist system and with its economic and political interests. To that end and to hasten the process, besides strongly supporting the national research, development and innovation effort, the Chinese strategies and policies strive for massively transferring to China, by any means necessary, the latest scientific breakthroughs, any advancements in knowledge, technologies, know-how and intellectual property created in the rest of the world, hoping that once all those are "introduced, digested, absorbed, re-innovated"(Guo, 2005), China could make the leap to truly substantial homegrown innovation, an innovation-intensive, innovation-led economy and, eventually, establish itself as the only leading high tech power of the world. Obviously, the targets of first choice for knowledge and high technology transfers are the US, the EU (primarily Germany, France, Italy, Sweden), the UK, Japan, Singapore,

[1] In the early 2007, Wen Jiabao, Chinese premier at the time, famously labeled Chinese economy as "unstable, unbalanced, uncoordinated and unsustainable". Ten year later, Beijing policies seem to have been quite unsuccessful in completely correcting these issues (Holland, 2017).

South Korea, Taiwan etc., but actually no country may consider itself exempted, especially as national databases are also assets of great interest.

2 A brief account on Chinese endeavour to foster home-grown RDI

Although China had aspired much earlier, since the 1980s, to become a global innovation powerhouse, it was only at the beginning of the 21st century that high-level decisions to back that endeavour were made and proper funding was provided. In the early 2000s Chinese policy-makers started devising increasingly more ambitious industrial strategies and plans that targeted domestic RDI advancement. The ideas and plans produced by a very fragmented science, technology and innovation (STI) system have been gradually refined and agglutinated into a number of unifying landmark documents that provided the necessary strategic vision and guidance. The most important of them are:

- *National Medium and Long-Term Program for the Development of Science and Technology* (2006-2020), (MLP, launched in 2006);
- *A Thousand Talents Plan* (TTP, 2008);
- *Made in China 2025* (MC2025, 2015);
- *Internet Plus* (2015)*;*
- *One Belt, One Road* (OBOR, 2015) renamed *Belt and Road Initiative* (BRI, 2017);
- *A New Generation of Artificial Intelligence Development Plan* (2017);
- *China Standards 2035* (2020);
- *Five-Year Plans* (FYPs), especially the 13th (2016-2020) and the 14th (2021-2025).

Together, these inter-connected, complementary and synergic strategies and plans create a complex, multi-faceted and multi-layered master plan that (i) helps direct the nation's material, financial and creative resources towards a number of attentively selected, high-tech industries of the future (MLP; MC2025), (ii) steer the digital transformation of the economy and support the wide usage of internet applications in every realm of productive activity (Internet Plus), (iii) design the incentives that attract top professionals and talents, Chinese and foreign, to work and innovate in China (TTP), (iv) so that China becomes an absolute RDI and high-tech authority that sets its own technical standards globally (China Standards 2035). On top of all these, BRI is the overarching strategy that is expected to simultaneously meet a whole lot of challenges pertaining to both keenly needed domestic reforms and to a host of Chinese foreign policy goals.

In terms of research, innovation, new technology absorption and development inside China, MLP and its improved continuation, MC2025, make up the corner stone strategies. Nevertheless, while MLP is laying a strong stress on fostering *indigenous innovation* and home-grown technologies, MC2025 is less limitative and isolationist, building more upon the strengths of international cooperation, foreign strategies, best practices and technological accomplishments and moving the accent from domestic to foreign-grown innovation. Given the urgency of meeting the CCP[2]'s ambitious targets before some of the country's most important anniversary events – MC2025 is implying, somehow, that any kind of technology transfers, including the illegitimate ones, are justified, accepted and encouraged, as long as they contribute to building the innovation-led economy and society sooner.

China's spending on research and development (R&D) as a percentage of its GDP has kept increasing even before these programmatic documents were launched, but it substantially accelerated afterwards. As the Chinese annual GDP grew at increasingly higher speed (by an average of about 10% yearly, for over three decades, before the 2008-2010 global economic crisis), the quantum allocated to R&D has escalated too: from just 0.56% of GDP in 1996, R&D expenditures more than doubled in the next decade, to 1.37% in 2006, and then stepped up to 2.12% in 2016, 2.23% in 2019 and 2.40% in 2020. However, in spite of all efforts, it still remained under the 2.5% target set by the MLP for 2020 and way behind the 2.8% accomplished yearly between 2017and 2020 by the US, relative to a considerably larger GDP. Chinese research and development expenditures might reach that same level - 2.8% of GDP -, only by 2025, according to the Center for US-China Relations at the Tsinghua University (World Bank, 2021; Hankock & Zhou, 2021). In absolute value, Chinese R&D expenditures jumped from a total amount of USD 327.8 billion in 2019 (when US spent USD 583.5 billion), to a record USD 378 billion (RMB 2.44 trillion) in 2020, performing a 15.3% (10.3% in RMB) rise in the wake of the US-China high-tech war flare-up and the consequent Chinese renewed push for technological self-reliance and self-sufficiency.

[2] Chinese Communist Party.

China has always chosen to invest very low amounts in basic research, but under the new circumstances that is going to change. The minister of Science and Technology declared in March 2021 that "*During the 13th FYP period the central government's investment in science and technology increased by 70% and the investment in basic research doubled, exceeding for the first time 6% of the total RDI spending in 2019*". It is estimated that basic research spending reached 6.16% in 2020. Moreover, according to prime minister Li Keqiang's Annual Report and to the documents of the 14th FYP (2021-2025), in the coming five years the country will strive for above 7% annual growth in RDI spending and a raise of basic research expenditures to 8% of the total research and development funding. To accelerate basic research growth and development, in 2021 the central government expenditures will get boosted by 10.6%, according to premier Li. However, considering the force of the American competition and their technological strength, some Chinese experts consider the 8% target still insufficient[3] (Global Time, 2021).

In the 2021 Agenda – which is part of the Government's 2021 Work Report –, two issues stand out more specifically stressed upon: China's urge to climb up the technological ladder and its focus on self-reliance in key technologies development. These two challenges have become once again top priorities for Chinese economy, as they used to be in the MLP. To facilitate success, larger funding will be accompanied by a number of R&D system reforms: research institutes will have more say about funds allocation, researchers will be relieved from undue burdens so that they only focus on scientific activities and their incomes will become really high by introducing flexible tax mechanisms. Researchers will be able to take sabbaticals of up to 6 years to join manufacturing activities or to set up start-ups, continuing to receive their salary and other benefits, having the output obtained in the meantime recognized as academic work and taken into account for personal evaluation and promotions. Research itself will be channelled to sophisticated areas such as: brain science, artificial intelligence, quantum information, genomics, clinical medicine, deep space and deep-sea exploration etc., in order to create a "*strategic research force for the nation*". Additionally, China will place less emphasis on researchers publishing a great number of scientific papers, shifting interest to evaluations on the basis of their work's impact (Mallapaty, 2021). The blueprint detailed in the governmental Report is expected to determine a big step forward in the volume and structure of R&D spending, a reinforced focus on core technologies in key industries and on finding solutions to the current bottlenecks in the supply of certain American-made or designed inputs (especially semiconductors), leading as such to a narrowing of the still substantial technological gap between China and the US.

3 Chasing technology transfers at all costs

The US-China trade war that started in 2018 and the Covid-19 pandemic declared in 2020 uncovered the deep vulnerabilities that both the US and the Western countries on the one hand, and China on the other hand, suffer from in a tightly integrated global world where the actors are very different in terms of values, political views, economic models, structures, levels of development, national interests and goals and, especially in challenging times such as these, inclined to distrust each other, dislike the dependency of one another and fight with one another for the supremacy they think they need in order to inflict on the rest of the world their own rules, values, model of governance and ways of functioning as communities. Against this backdrop, while China saw clearer and understood better the dimensions and the risks of its vital dependency on the American and, more generally, on the Western technology, the United States and the other developed economies also discovered the magnitude and the perils of having transferred too much of their own productive and innovative activities, their knowledge, know-how and technology, to China. Consequently, all these actors are at present trying some degree of decoupling from the others; all of them are attempting to limit and counter the others' actions while also trying to boost their own high technology capabilities, some of them even at all costs (mainly China, but certainly others too).

3.1 When foreign multinationals accept 'forced technology transfers'…

China is already a country with significant technological capabilities, most of them obtained through the channel of foreign investment inflows and industrial capacity relocations, against the larger backdrop of the industrial policy and of the investment-and-export-driven development model devised by the Chinese state. While high domestic investments and the industrial policy of traditional type – including subventions, cheap financing and inputs, tax exemptions, currency manipulation, protected markets, infant industry and national champions regimes etc. – did play a crucial role in the country's industrialization and modernization, it was the

[3] While in 2019 the US invested USD 105 billion in basic research, China invested just USD 19.7 billion (Global Time, 2021).

technology transfers by the foreign MNCs and especially their errors of judgment in deciding on their business model for the Chinese market that have been decisive for China's success in its swift technological advancement.

Eager to enter the Chinese market and make big profits, more and more foreign MNCs accepted the technology transfers to which the Chinese legislation forced them: they agreed to set up the compulsory joint-ventures with Chinese partners stipulated by the local laws and accepted to license their core technology to those partners, as laws demanded. At the time, the local partners were quite small, apparently harmless firms, too technologically backward to pose any threat to the big Western multinationals, while the technologies transferred were not the most recent ones available. Soon the receipts from the licensed technology would rise year by year to increasingly higher levels and foreign MNCs would cash huge amounts of money which they used to develop other new, more sophisticate and innovative technologies. That seemed a very profitable and well-functioning business model, which brought huge profits and helped foreign companies progress, expand and thrive. Moreover, it was self-feeding and it seemed to be able to continue functioning like that ceaselessly (Capri, 2020a).

In that stage, American giant companies such as *Lucent Technologies* and *AT&T*, or European ones such as *Alcatel* unleashed a trend of information and telecommunications technology (ITC) transfers to the Chinese nascent manufacturers and, as the gains from licensing were enormous, MNCs in the entire high tech sector followed, adopting predominantly the same business model. According to the US Department of Trade, between 2009 - 2019 the American technology companies earned USD 65 billion from the licensing taxes of their intellectual property rights (IPRs), but that amount is considered largely undervalued (Capri, 2020b).

Gradually, as GVCs have naturally found the most profitable locations of their component links, more and more production capacities have been relocated from the US and other OECD countries to China, especially after China's WTO accession. In less than two decades almost all the US production capacity and capabilities in ITC, as well as the IPRs over technologies and products have been transferred to China and today, Silicon Valley innovations can be put in production only in China. In the recent two decades the US lost to China not only millions of jobs, but also much of the knowledge to manufacture.

What happened can be summarized in two short sentences: 1. Chinese laws were intelligently designed, to the benefit of the local industry. 2. Foreign MNCs have been greedy and reckless. In other words, blinded by the market access premium and by the huge receipts they could get from IP licensing, foreign licensor companies unwisely overruled the liberties that the Chinese laws had given to the local licensees. The first one was that they could not be stopped by the foreign IP owner to make changes to the licensed technology or product. Second, in case a Chinese licensee brought any improvement or small change to the licensed technology or product, he could legally register the "new" patent in his name and become the new IP owner of the whole technology or product, no matter how insignificant or minimal the changes made by him had been. Finally, the ownership over the IP was in this way legally transferred to the Chinese company and, according to Chinese legislation, the foreign company had no possibility of recourse in court in order to regain its IP rights. They were simply lost (Capri, 2020a,b).

Forced technology transfers have been at the heart of the US-China trade war started by the Trump administration in 2018, when the US has openly accused China of theft of American intellectual property. Forced transfers have also been present and escalating in China's relationship with the EU companies. According to a survey by the European Chamber of Commerce in China (ECCC), the number of respondent companies that recognized that they had been forced to transfer technology has doubled in only two years reaching 20% in 2019 vs. 2017. It has come out that the pressure to hand over their technology and sensitive information was more intense in the case of cutting-edge technologies: 30% of the respondents to the survey that had been active in the chemicals and petroleum industries, 28% of those in the medical devices companies, 27% in pharmaceuticals and 21% in the auto industries reported compelled tech transfers. Those practices breach the WTO rules and they also violate both the Chinese FDI law stipulation that no administrative measures could be taken to force technology transfers, and China's State Council Document 19, which is forbidding governmental officials to force such transfers (Martina, 2019; Lappin, 2019; Wernau, 2019). On the other hand, besides compelled high-tech transfers, some EU companies chose to voluntary transfer technology and know-how to the local Chinese firms, in order to improve the quality of the products delivered by local suppliers and make them more reliable.

3.2 … and when China transfers foreign technology in aggressive ways

Despite all the progress, Chinese firms still operate far from the frontier of innovation in most industries. Obviously, that is not compliant with the targets set by the country's political leadership, which have planned that China becomes the equal of the big industrial powers of the world by 2025 and then the leading industrial manufacturer and technological force globally, by 2050 (MC2025). As such, the country is under the pressure to meet those deadlines, a pressure that keeps increasing due to the drastic switch - from engagement to suspicion,

disapproval and even to decoupling attempts - in the Western countries' attitudes to China. The reason of that switch rests in China's perpetual way of bending or breaching both the international rules and its own promises and commitments, to the disadvantage of the other countries. Also, it is the comprehension of the reality that China will never become a Western-style liberal democracy, but on the contrary, it will develop and strengthen its own, rival system, dangerous to the West. According to the US-China Economic and Security Commission's 2017 Annual Report "*The Chinese government is implementing a comprehensive, long-term industrial strategy to ensure its global dominance… Beijing's ultimate goal is for domestic companies to replace foreign companies as designers and manufacturers of key technologies and products, first at home, then abroad."* The White House Office of Trade and Manufacturing Policy (OTMP) Report of June 2018, titled "*How China's economic aggression threatens the technologies and intellectual property of the United States and the World"*, severely qualifies China's global actions as *economic aggression* that threatens not only the US economy, but the global economy as a whole, and identifies six categories of the aggression types by their main goals (OTMP, 2018):

- Protection of China's home market from imports and competition;
- Expansion of China's share of the global markets;
- Securing and controlling core natural resources, globally;
- Domination of traditional manufacturing industries;
- Acquiring the key technologies and intellectual property from other countries;
- Capturing the emerging high-technology industries that will drive future economic growth and advancements in the defence industry.

The OTMP Report focuses on the last two categories of economic aggression - that are pertaining to foreign technology and IPRs appropriation -, documenting the ways and methods used by Chinese state-supported companies with a view to getting access to, and ownership of foreign cutting-edge technologies, in considerably easier, cheaper and faster ways than toiling to create them themselves, as summarized hereunder (Table 1). One way or another, these are all forms of economic aggression to the targeted victims, companies that spent time and money, took high risks innovating and could not capitalize on their efforts because they have been stripped off their intellectual property rights and sometimes even pushed out of the markets, in unfair competition with the rivals that have come to own their former IP.

Table 1: Vectors of China's economic aggression in the technology and IP space

1. Physical theft and cyber-enabled theft of technologies and IP	• Physical theft of technologies and IP through economic espionage; • Cyber-enabled espionage and theft; • Evasion of US export control laws; • Counterfeiting and piracy; • Reverse engineering;
2, Coercive and intrusive regulatory gambits	• Foreign ownership restrictions (in China); • Adverse administrative approvals and licensing requirements; • Discriminatory patent or other IPRs restrictions • Security reviews that force technology and IP transfers; • Secure and controllable technology standards; • Data localization mandates; • Burdensome and intrusive testing; • Discriminatory catalogues and lists; • Government procurement restrictions; • Indigenous technology standards that deviate from international norms; • Forced research and development; • Antimonopoly law extrusion; • Expert review panels that force disclosure of proprietary information; • CCP members in corporate governance; • Placement of Chinese employees in foreign joint-ventures;
3. Economic coercion	• Export restraints that restrict access to raw materials • Monopsony purchasing power,
4. Information harvesting	• Open source collection of science and technology information; • Chinese nationals in US as non-traditional information collectors; • Recruitment of science, technology, business and finance talent.

5. State-sponsored, technology-seeking investment	• Chinese state actors involved in technology-seeking FDI; • Chinese investment vehicles used to acquire and transfer US technologies and IP o Mergers and acquisitions o Greenfield investments o Seed and venture funding

Source: The White House Office of Trade and Manufacturing Policy Report (OTMP, 2018).

Each of these forms of accessing significant foreign information, technology or IPRs can be substantiated in detail and completed with examples, but we will include here just a few relevant data and examples regarding some of the vectors listed above.

For instance, in terms of ***Chinese cyber espionage and theft,*** according to recent declarations by the FBI director Christopher Wray, the US people are victims of Chinese theft that amounts *"…to a scale so massive that it represents one of the largest transfers of wealth in human history."* "*We've now reached* a *point where FBI is opening a counterintelligence case almost every 10 hours. Of the nearly 5000 active cases currently underway in the country, almost half are related to China." "…over the past decade, we've seen economic espionage cases with a link to China increase by approximately 1,300 percent."* (Wray, 2020). In the US case, the costs of trade secrets theft alone is estimated to be in the range of USD 180 billion - USD 540 billion annually, the equivalent of 1%-3% of the American GDP (OTMP, 2018). For Europe, a 2018 PricewaterhouseCoopers (PwC) study found out that of all the cyber-attacks, 94% had been in the category of industrial espionage and cyber theft of trade secrets. The most affected country was Germany where 17% of the companies reported sensitive-data theft between 2015-2017; in the UK cyber-attacks were on the rise, with a focus on the financial sector, while in Italy cyber espionage targeted mainly the luxury sector and in Spain it envisaged ITC, defense, chemicals and healthcare industries. According to the European Institute for Security Studies, cyber theft has increasingly affected European academia and research institutes. Cyber espionage is costing Europe EUR 60 billion in economic growth yearly and the trend is upward. Most of the European reports mention Beijing as the most active government in the world in terms of cyber espionage. (PwC, 2018; Cerulus, 2018).

Regarding the ***evasion of US export control laws,*** a telling example is that of Amin Yu, a Chinese who had become permanent US resident and who managed - according to her own declaration in court - to obtain and export to China, between 2001-2012, systems and components for marine submersible vehicles to be used by the Harbin Engineering University and by other state-controlled entities for the development of marine submersible vehicles, unmanned underwater vehicles, remotely operated vehicles and other dual use, civil and military, equipment.

Interesting and quite surprising findings of the US research into the vectors of Chinese economic aggression in high tech and IP fields are making reference to the ***collection of scientific and technical information from open sources.*** While open sources are widely used almost everywhere in the world, most probably nowhere else are they the object of a systematic, large-scale collection, selection, analysis, matching and repackaging, as it happens in China, where more than 400 specialized research institutes employing over 60,000 staff[4] have the mandate of providing to industry, universities and research institutes comprehensive information sourced from collecting and processing of *"…millions of doctoral theses and government reports, hundreds of thousands of reference books along with thousands of foreign journals, monographs and conference proceedings."* By capitalizing on the valuable stock of scientific, commercial and technical information found from open source collection the research costs are reduced by 40 to 50 percent and the research time by 60 to 70 percent (OTMP, 2018).

4 Final remarks

China ranked the 14th in this year's *Global Innovation Index* published together by Cornell University and the United Nations' World Intellectual Property Organization. Switzerland ranks first, followed by Sweden (2nd), the US (3rd) and UK (4th). Best ranked in Asia are Singapore (8th), South Korea (10th) and China (14th), ahead of Japan (16th), Malaysia (33rd) and India (48th). China's performance is impressive given its still low ranking by GDP per capita (56th) and its late-comer statute. Besides its improving rankings as a innovative nation, its achievements in terms of fostering powerful high-tech, innovation-competitive companies are also remarkable, with Huawei ranking the 8th among the 50 most innovative companies in the world – just behind the

[4] 1985 data (OTMP, 2018).

top five Apple, Alphabet/Google, Amazon, Mirosoft and Tesla - and followed by the some other Chinese giants: Alibaba (14th), Lenovo (25th), Tencent (25th), Xiaomi (31st).

China is definitely advancing towards the statute of a great technological power, but it still has a long way to run before it can override the US and other Western countries in technology prowess and innovation. It still has to invest huge amounts of money, time and effort in basic research - which it has neglected -, as well as in technologically sophisticated sectors such as the semiconductors, which are vital for any industry of the future. It also needs to find solutions to its slowing productivity growth - as it cannot become a true innovation powerhouse without a high productivity performance (West, 2021)- and has to tame its excessive propensity to economic aggression. It is also advisable that it gives up mercantilist policies, which are proved to erode market shares, reduce revenues and, consequently, reduce investments in the next round of global innovation, curbing future development (Atkinson, 2021).

While fair competition is healthy and incentivizing, ruthless rivalry is damaging in every respect and produces no winners. Great powers should be wise enough to find the best ways to both cooperate and compete honestly.

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The Evolution of Oil Prices and the Role Played by OPEC+

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Abstract: After the two oil shocks of the 1970s when OPEC was able to strongly increase the prices at the expense of economic recessions, a collapse followed in 1986, the so called oil counter-shock, due to the disagreements within OPEC and the decisions taken by Saudi Arabia to strongly increase oil supply. After that the prices fluctuated under $ 50/barrel and the periods of declining prices were more numerous than those of the boom, but each boom created the conditions for a subsequent fall in prices**.** The oil's price volatility has increased dramatically in the last two decades, and in late 2016 a larger alliance/group OPEC+ was formed between OPEC and some non OPEC countries (13). OPEC + is an alliance of 13 OPEC members and 13 non-OPEC members, which together control over 50% of the world's crude oil supply and hold about 90% of certain oil reserves. OPEC+ alliance, based on close cooperation between Saudi Arabia and Russia, was able to reach an agreement in April 2020 and to cut oil supply by 10 million barrels/day and to extend the agreement in 2020 and in 2021, to stabilize the market and increase the prices, also with the support of other producers, such as the USA, Canada, but mainly due to the recovery of consumer demand in developed countries. In view of all those mentioned evolution my article aims to assess OPEC+ role in assuring the stability of oil prices while maintaining a balanced growth for the total global production.

Key Words: price volatility, boom, supply, demand, OPEC+ cooperation, agreement
JEL Classification: Q 31, Q 35, Q 41, Q 42

1. Introduction

Crude oil is a raw natural resource, a type of fossil fuel, extracted from the earth and refined into petroleum products used for all kinds of transport, petrochemicals, industry and electricity, other purposes. Crude oil is also a global commodity, maybe the most important one in the world, which is traded in spot markets and in commodity exchanges, like those from New York and London. Crude oil represents the primary source of energy production and the heavy dependence of this sector on fossil fuels is one of the main causes of global warming, which has particularly negative effects on human societies.

Crude oil remains fundamentally different from other commodities from both an economic and national security perspective. Oil supply is not simply a function of demand. Demand for oil, especially refined, is inelastic in the short term but on long term some changes may occur and may lead to the reduction of oil consumption (Toprani, 2019). If supply, depending on extraction, cannot meet demand, price increases are inherent. On long term the most important factor to stimulate long-term supply is the price of oil, not its demand. The price of oil is not simply a function of existing demand, but also depends on a multitude of factors, like geopolitical events. The prestigious weekly magazine The Economist recently assessed that there is a high volatility of oil prices on short and medium term but no discernible/clear trend on long term and no forecast model can be used (Economist, 2020).

2. The evolution of oil prices in the last decades

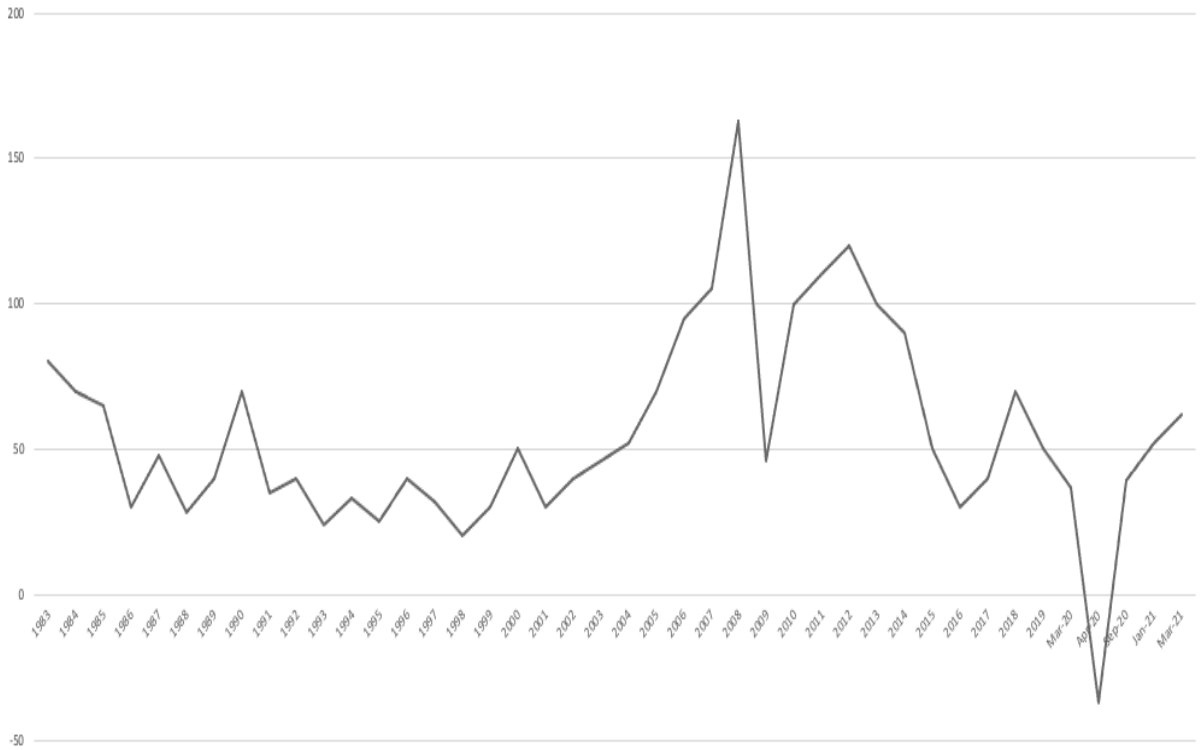
In the graph no.1 one can see the evolution of WTI price in the last 38 years. One may see that periods of declining prices were more numerous than those of the boom, but each boom created the conditions for a subsequent fall in prices. After the two oil shocks of the 1970s oil prices collapsed in 1986 due to the disagreements within OPEC and amid the decisions taken by Saudi Arabia to strongly increase oil supply (oil counter-shock). From 1991 to 2004 oil prices fluctuated under $ 50/barrel and since 2005 a sharp upward trend began to take shape until the financial crisis and afterwards. Due to the fear of a major supply deficit and subsequent price increases, fiscal incentives granted in USA led to the introduction of hydraulic fracturing and the impressive development of shale oil. But after financial crisis from 2008-2009 it was the strong increase of

demand in Eastern Asian countries, especially in China, that led to an impressive boom of oil prices which lasted for 4 years. The oil prices declined in 2015 and 2016 due to high imbalance between supply and demand and recovered partially in 2018.

The new decline of oil prices started in 2019 before the Covid 19 Pandemic and intensified in the spring of 2020 when the rapid decrease of oil demand led to the collapse of prices. Since the 1970s, the key player in the market has become OPEC cartel, that ensured a certain price stability, but price volatility has increased dramatically in the last two decades, and in late 2016 a larger alliance/group OPEC+ was formed between OPEC and some non OPEC countries (13). OPEC+ is an alliance of 13 OPEC members and 13 non-OPEC members, which together control over 50% of the world's crude oil supply and hold about 90% of certain oil reserves.

The evolution of crude oil prices in the 2010-2020 period, in the form of annual averages is presented in the table no.1, where it is observed the record levels attained in the period 2011-2014 caused firstly by the strong increase in the consumer demand from East and South Asia (China and India) and secondary by the influence of the economic recovery after the financial crisis and also by the stock market operations of hedging funds and other funds. But it followed a period of sharp decline in 2015 and 2016 due to strong growth in crude oil production and supply of shale oil from the USA and the increased production/supply of crude oil from Canada, Iraq, South American states, offshore operations. The partial price recovery in 2017-2018 was driven by the tighter supply control of the new OPEC+ alliance, which meant co-opting important non-OPEC producers, especially Russia, in the policy framework of limiting oil production and supply.

Graph.no1: Evolution of US WTI future prices, in constant dollars, between December 1983 and March 2021 ($/barrel)



Source: Adapted by the author after Bloomberg Finance LD, 2020

3. The evolution of oil prices in 2020 and 2021

In the table no.2 it is shown the evolution of oil prices, in the form of monthly averages, between January 2020 and March 2021, which reflects the major impact of the Covid-19 Pandemic and the measures taken by major oil producers from the OPEC+ alliance to limit the level of supply and counteract the downward trend in prices. In early February 2020, when slightly downward trend in oil prices became obvious, Russia did not agree with the proposed reduction of the alliance production by another 600,000 barrels/day. In early March when the effects of the Coronavirus Pandemic began to become apparent OPEC has proposed a further reduction of the OPEC+ supply by 1.5 million barrels per day, a measure that was rejected by Russia. Russia did not accept Saudi

Arabia's proposal to further restrict supply, arguing that the market had fallen into a demand trap, when any supply cut is unable to save prices because global demand collapsed suddenly (the somewhat exaggerated estimate was 20-30 million barrels/day). This opposition from Russia has triggered a genuine oil price war with Saudi Arabia due to the announce of significant increases in oil production which affected oil prices, stock and commodities exchanges, financial situation of oil exporters. Subsequently, the March and April collapse in prices severely affected US shale oil producers and prompted the Trump Administration to put pressure on Russia and Saudi Arabia to reach an agreement and cut oil supply by 10-15 million barrels/day. The agreement reached by the OPEC+ alliance in April 2020 to cut supply by 10 million barrels/day in May and June was a rescuing one, especially since US and other crude oil inventories were at record levels, and it was extended in the following months while the production/supply of other large producers such as the USA and Canada also decreased significantly.

The volatility in crude oil prices rose in April 2020, on April 13 the price of WTI crude oil at the New York Stock Exchange (NYMEX) was $ 22.41/barrel, it fell to $ 18.27/barrel on April 17, and on Monday April 20 completely collapsed into a negative margin, as the contract for May was going to expire on April 21, and there was no demand at all, but there was a massive supply, including of Saudi crude oil (37 million barrels in oil supertankers), very large inventories and massive overproduction in the US. The price dropped by $ 55.90/barrel in one day to $ -37.63/barrel, but the spot price (immediate delivery) reached the same level. Holders of contracts with delivery at the end of May had to either sell them or take over the goods in time, but they had no storage facilities and had to lower the price even in negative territory, because neither the refineries nor other customers wanted to take over these contracts.

Table no.1: Evolution of oil prices in 2010-2020 period

Year/Annual average	Brent, London, ICE $/barrel	WTI, New York, NYMEX $/barrel
2010	80.18	79.39
2011	111.04	94.90
2012	111.76	94.07
2013	108.77	97.63
2014	99.53	93.81
2015	53.37	48.88
2016	45.01	43.37
2017	54.82	50.99
2018	71.48	64.75
2019	64.13	57.13
2020	43.21	39.62

Source:Calculated by the author based on data from http://www.wtrg.com/index.html

Table no.2: Evolution of oil price in 2020 și 2021 (first quarter)

Year/Monthly average	Brent, London, ICE $/barrel	WTI, New York, NYMEX $/barrel
2020		
-January	63.71	57.65
-February	55.48	50.63
-March	33.73	30.45
-April	26.63	18.57
-May	32.41	28.78
-June	40.77	38.58
-July	43.22	40.74
-August	45.02	42.39
-September	41.84	39.54
-October	41.52	39.55
-November	43.98	41.52
-December	50.23	47.07
2021		
-January	55.32	52.10
-February	62.27	59.11
- March	65.65	62.32

- April	65.33	61.71

Source: Calculated by the author based on data from http://www.wtrg.com/index.html

NYMEX panic also affected the price of Brent crude oil, which fell by 6% on April 20, and by 20% on April 21, reaching the level of $ 18-20/barrel, after which it rose slightly in the next days. Some varieties of Canadian crude oil also entered a negative territory on April 20 and 21 in terms of prices, as did the price of the Mexican basket. While the global supply of crude oil was planned to decrease by a record level of 12 million barrels/day in May, the level of demand in April was estimated to be 29 million barrels/day lower than a year ago, to a monthly level last recorded in 1995.

At the beginning of May, oil prices doubled in just over a week in the context of declining supply and hopes of a demand recovery. Global oil production would have fallen by 17 million barrels/day in the second quarter, the largest decline in history, to which not only the states in the OPEC+ alliance but also the US and Canada have contributed consistently. On June 6, OPEC President Mohamed Arkab announced the extension of the OPEC+ agreement for the third quarter, following talks by Saudi Arabia with other OPEC members and Russia, Kazakhstan and Azerbaijan. After oil prices continued to rise in the second half of June, in July they stabilized slightly above $ 40/barrel. Oil prices remained virtually stagnant at around $ 40/barrel for WTI oil and $ 43/barrel for Brent oil, pending several directions/signals of future developments, more related to OPEC+ decisions and these low levels have become familiar to the market in July and August. The economic stimulus measures announced by the US and the EU, the data published by the Energy Information Administration on the level of US oil stocks, the IEA estimates for the global market, the evolution of the dollar exchange rate and the announcements from OPEC+ and Saudi Arabia were the main factors influencing the price level.

After they firstly declined and then increased in September, crude oil prices were falling at the end of the month and at the beginning of October amid a sharp resurgence of the pandemic and its impact on economic activity, the dispute between US presidential candidates, the uncertain situation of China's import demand, the uncertainty regarding the OPEC+ supply reduction policy. In December 2020 and January 2021, crude oil prices rose amid Saudi Arabia's commitment to further cut its supply by 1 million barrels/day. At the same time, there were other elements, including the decrease of dollar exchange rate, the prospects for a deeper fiscal stimulus in the US and the optimism induced by the appearance of the Covid-19 vaccine. In mid-January 2021, oil prices rose to a 10-month high, gaining new advances from the supply cuts announced by OPEC+ alliance, but prices were also boosted by the falling dollar.

OPEC+ surprised the world in 2021 with its determination to finally raise prices. Using its position as one of the world's top three crude oil producers and its undisputed position as the world's largest low-cost producer, Saudi Arabia has unilaterally chosen to withdraw another 1 million barrels/day from global markets beyond its commitments within OPEC+. This action brought oil market prices above $ 50/barrel for the first time since early March 2020, strongly suggesting the OPEC cartel nevertheless resumed its traditional role as a decisive influence actor on global crude oil price dynamics. In addition, the decline in US crude oil production/supply, where production fell from 13 million barrels/day in 2019 to 11 million barrels/day in 2020, with definite effects on global supply, has helped to firmly restore price-fixing capacity of OPEC+ alliance. The $ 50/barrel level, which was subsequently exceeded, will probably be a minimum price in the future. The supply surplus that the market has faced in recent years will continue to dissipate as the retention for capital investment by US shale oil producers will maintain the general downward trend in supplementing oil supply. OPEC+ really has a single mission, to ensure high revenues and profits for its members by balancing supply with demand. The current policy of developed countries to promote climate changes is less a motivating factor for the key countries that make up OPEC+, because their economies are primarily based on crude oil exports and they all want higher prices and higher incomes.

After mid-January, crude oil quotations on international futures markets declined slightly, with Brent crude oil falling below $ 55/barrel and WTI crude oil below $ 52. Increasing travel restrictions have led to market pessimism regarding the level of demand, and a temporary rise in the dollar exchange rate has also left its mark on price developments. As expected, President Biden has signed several executive orders on energy and climate, including the cancellation of the Keystone XL project, re-accession to the Paris Climate Agreement and the start of the process of cancelling a long list of regulatory actions taken under the Trump Administration. The United States will be firmly committed to the priority development of renewable energy at the expense of fossil fuels. The US re-entry into the Paris Climate Agreement will only exacerbate this trend. Fossil fuels will become less used and this induces optimism about the evolution of their prices.

Price forecasts released by the IEA and the IMF at the end of January were invalidated by subsequent price developments. The International Energy Agency (IEA) has set up a Global Commission to manage the impact on human societies of the transition to renewable energy. The global summit organized by IEA will try to address the consequences of the decline in fossil fuels, especially as the Biden Administration puts an end to overseas financing of fossil fuels. The pandemic did not break, but intensified the global energy trends that emerged on the eve of the COVID-19 Pandemic, whether it was the collapse of coal production, the growing surplus of crude oil production and supply, or growing global interest for renewable energy sources.

In the first half of February, oil prices rose under the influence of declining oil inventories in the US and China, the reduction of the supply of the OPEC+ alliance, the financial incentives granted by the Biden Administration. The Energy Information Administration estimated that US shale oil production would increase. The EIA said that once WTI crude oil exceeded $50/barrel, the American shale production will return to growth again later this year. EIA increases its US supply forecast for 2022 to 11.53 million barrels/day, up from 11.49 million barrels/day in January. In mid February, unusual winter conditions in South Texas, USA, led to a 40% decrease in US oil production, eliminating 4 million barrels/day of crude oil and helping the price of Brent crude to reach over $ 65/barrel for the first time in more than a year. The interruption in oil supply was strong enough to raise prices, which gained 6% in just one week, continuing a rally of almost 19% recorded in February. Any serious climate shock calls into question energy security involving green energy, and the great frost in the Southern United States has been serious enough to shake the global oil market. Towards the end of February, oil prices rose moderately, mainly reflecting the fact that US crude oil production and refineries were still affected by the strong cold snap.

At the beginning of March 2021, the quotations of crude oil on the representative international futures markets registered a slight decline. Crude oil prices fell, despite the fact that OPEC+ decided to give up the intended decreases in supply reduction. OPEC+ extended the existing cuts until April, except for a slight increase of production allowed for Russia and Kazakhstan, due to seasonal consumption pattern. US shale oil production is not expected to pick up again, and total US crude oil production is likely to see “very little growth” in the future, after remaining largely constant in 2021 at around 11 million barrels/day, said Scott Sheffield, CEO at Pioneer Natural Resources. The further rise in prices in March could significantly slow down demand recovery. While the unexpected decision to maintain OPEC+ production cuts brought Brent crude oil prices to $ 70/barrel, higher oil prices in more than a year could slow the recovery in world oil demand and affect the supply/demand balance, which the OPEC+ group still considers to be fragile. While the biggest oil trader Vitol believes that OPEC+ has a strong control over oil market, investment bank Standard Chartered declared that OPEC+ applies an excessive and surprising supply control which may continue and it will only be corrected after a significant gap.

OPEC+ is looking for a "fair" price for its crude oil, Saudi Arabia's Foreign Minister Prince Faisal bin Farhan said in March after a meeting with his Russian counterpart Sergei Lavrov. "I would like to assure you that we and Russia want a fair price for oil for consumers and producers," said Faisal bin Farhan, adding: "This is what OPEC+ aims to achieve and there is good coordination in this initiative and we continue to work to support the benefits of the global economy”. Lavrov, for his part, noted that the OPEC+ alliance is strong and there is nothing that can undermine the good working relationship between Russia and Saudi Arabia. Lavrov also said the aim of the OPEC+ agreement was to restore balance in global oil markets and reduce volatility, stressing that he hoped the extended alliance would "find a way to coordinate actions in a way that balances the interests of both producers and of consumers ".

After midMarch crude oil quotations on international markets in the long term showed a slight to moderate decline due to profit-making by commodity market speculators through massive sales of long positions, appreciation of the dollar and diminished hopes around the pace of vaccinations in Europe, after which oil prices resumed their slightly upward cycle that continued in early April. OPEC+ has decided to add over 2 million barrels day in the next few months, relying on increased demand. The agreement provides for an increase of 350,000 bpd in May, followed by the same amount in June, then 450,000 bpd in July. At the same time, Saudi Arabia will diminish its voluntary reductions by 1 million barrels/day in July. But a price war is not ruled out, if American producers, especially shale producers, increase production too much, then OPEC+ may decide to significantly increase its supply and flood the market with plenty of oil, and prices may fall again (Paraskova 5, 2021). In April 2021, crude oil prices rose and fell amid strong volatility due to various influencing factors, such as lockdowns, vaccination progress, increased oil supply, including shale oil, inventory levels, high uncertainty related to the future of oil market.

4. The short term perspectives of oil prices

On March 17, the IEA invalidated the assessments of Wall Street bankers, led by Goldman Sachs, referring to a period of dramatic increases in oil prices. Raising the price of Brent to $ 70/barrel has led to speculations about a new price supercycle and a close supply deficit, but IEA data and analysis suggest otherwise (IEA, 2021). Those who support a return to prices of $ 100/barrel from 2011-2014 period rely on the effects of huge fiscal incentives that would increase demand and fuel a long-term upward trend. In March 2021, the Brent average was double compared to May 2020, the optimism about the effects of vaccines and the reductions in supply of large exporters being the explanation. The IEA showed that oil inventories are still very high, although the surplus accumulated in 2020 is gradually dissipating. The recovery in demand and the narrowing of supply by OPEC+ may lead to a sharp decline in oil inventories this year, but only towards the end of the period. In April, there were enough inventories in tanks and underground to ensure an adequate supply on the market. OPEC+ hasn't rushed to cut the reductions and increase the supply so as not to affect prices. A high degree of uncertainty persists regarding the evolution of prices, which will remain volatile, and regarding the demand situation, the global demand was 100 million barrels/day (5 billion tons) in 2019, and will not return to this level until in 2023, and in 2026 it will reach 104.1 million barrels/day (5.2 billion tons).

In April, analysts at the Oxford Institute for Energy Studies estimated that markets are not heading for a new oil price supercycle, and a level of $ 100/barrel or above is unlikely, provided major unforeseen shocks occur in the market (Paraskova 6, 2021). Increased prices and optimistic expectations for rising demand are not supporting the hypothesis of a new price supercycle, although JP Morgan and Goldman Sachs launched it in February. On the contrary, there is talk of a possible price war if shale oil producers in the Permian Basin significantly increase production (Kimani, 2021).

OPEC+ continues to bet on boosting consumer demand. The cut of OPEC+ production reductions shows that the group/alliance believes the demand will continue to grow. The oil market and oil prices are recovering on a stronger economic outlook. The IMF has updated in April its GDP forecast for 2021 after that from January, noting the speed at which vaccines are being launched. The US is now, along with China, the focal point and engine of the global economic recovery with a rapid launch of vaccination and substantial fiscal incentives. The pandemic could continue to have an impact on global oil demand until 2024, while decarbonisation plans in major European economies could emerge as a new threat to the oil industry, especially to traditional EU suppliers such as Russia. This year, however, world oil demand is expected to increase by 5.9 million barrels/day compared to last year's demand, which was 90.4 million barrels/day, according to OPEC estimates in its monthly March market report.

Ahead of the April 1 OPEC+ ministerial meeting, the Joint Technical Committee (JTC) has forecasted in its latest baseline scenario an increase in demand of 5.6 million barrels/day for 2021, lower by 300,000 barrels/day than it estimated in March OPEC report. Oil inventories in OECD countries fell for the seventh consecutive month, but remained above the 2015-2019 average. The meeting welcomed the positive performance of the participating countries. Overall compliance reached 115% in February 2021, reinforcing the trend of high aggregate compliance by participating countries. Ministers noted that since the April 2020 meeting, OPEC+ and other states have contributed to the downward adjustment of the global oil supply by 2.6 billion barrels of oil (356 million tonnes) by the end of February 2021, which accelerated the rebalancing of the oil market. On 26 April, 2021, it was the meeting of Joint Technical Committee (JTC) where it was forecast global oil consumption to rebound by 6 million barrels/day this year.

Morgan Stanley recently estimated that oil prices are likely to remain in the range of $ 65-70/barrel this summer, tempering its previous forecast for a price of $ 70/barrel, due to increased US drilling activity and against the potential return of Iranian exports (Paraskova 7, 2021). Instead, Goldman Sachs persists in forecasting a price of $ 80/barrel for the third quarter of 2021 (Ashcroft, 2021), perhaps also under the influence of the increase in gasoline deliveries to the US market at the level of 8.9 million barrels/day. In mid-April, the IEA and OPEC revised upwards their forecasts for the increase in global crude oil demand for 2021 to 5.7 million barrels/day and 5.95 million barrels/day, respectively, and the EIA reported a notable decrease of the previous week's inventories by 5.9 million barrels in the US, noting that on the East Coast the level of inventories was quite low. In oil market report released April 13, OPEC raised its demand forecast by 190,000 barrels/day from its March estimate, expecting consumption to average 96.46 million barrels/day this year, citing economic stimulus programs and a further easing of COVID-19 lockdown measures.

Vitol Group CEO Russell Hardy, the world's largest independent oil trader who handled more than 7 million barrels/day of crude oil and petroleum products in 2020, said in April he expected crude oil demand to

rise in 2021 and 2022, as the world emerges from the pandemic (Hoffman, 2021). Demand for crude oil will increase by 7 million to 8 million barrels/day by the end of 2022, compared to the level in the first quarter 2021, and producers will be in a difficult position to cope with these increases. "We believe that a price of 70 to 75 dollars/barrel is a completely possible result for the third quarter," said Russel Hardy.

5. Conclusions

A slow recovery in demand and prices is forecast for the next 3-4 years, Rystad Energy, a London consultant, predicted relatively recently that global demand for crude oil (99.6 million barrels/ day in 2019 and 89.3 million in 2020), will be 100.1 million in 2023 and 102 million (5.1 billion tons) in 2028. Prices for Brent are estimated to evolve in the range of $ 50-60/barrel. In its last report from February 2021 consultant McKinsey envisages an OPEC-control scenario on long term, under which OPEC maintains its market share, and foresees a $ 50 to $ 60/barrel equilibrium price range in the long term (McKinsey, 2021), which may support a production of 10-11 milion barrels/day of US shale oil and a deepwater production of 11-13 million barrels/day related to pre-financial-investment-decision (FID) projects.

In the medium and long term, competition from natural gas and renewable energies, the last ones advancing extremely fast, is seen as an important driver in the energy transition and is announced as a major factor influencing the oil market and prices. Bio-methane, hydrogen and carbon capture technologies could play an important role in decarbonizing sectors of the economy. The proliferation of electric cars will drastically reduce fuel consumption but it will significantly increase electricity consumption.

Major oil companies are increasingly turning to natural gas, including LNG, and renewable energy, with a stronger trend in the EU than in the US. For example, the French Total, which today has an operational mix focused on oil (55%), natural gas (40%) and less electricity from renewable sources (5%), intends that in 2050 its operations will be divided as follows: 20% oil, 40% natural gas and 40 % renewable energy. The thorny issue for both oil and natural gas is related to greenhouse gas emissions, with carbon capture being a key issue for an emissions-free future, an EU target for 2050.

High price volatility, commodity market speculations, new economic crises and important geopolitical events, heavy oil and petroleum products oversupply will continue to characterize and influence the oil market and in the current economic environment, any price forecast has a high dose of uncertainty.

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The Path to Euro Adoption: a Case Study of Slovenia and Slovakia[1]

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Abstract: By the terms of their treaties of accession, the financial integration and the adoption of the euro became binding on all new Member States of the European Union. Once they meet the convergence criteria and ensure their laws are compatible with the euro area, they are legally obliged to adopt the euro. This paper aims to track the integration path into the euro area of Slovenia and Slovakia, and to find out the main lessons from these stories. The results revealed that the process of adopting the euro in both countries has been very smooth and rapid, due to a general political and public consensus driven by an efficient communication strategy. Thanks to the emphasis on macroeconomic stability throughout the pre-accession period and due to clear economic policy priorities, Slovenia managed to remedy the economic imbalances and to meet the nominal convergence criteria. In the same time, fundamental institutional reforms and foreign direct investment have allowed Slovakia to adopt an export-oriented growth model that made this country one of the most notable examples of the catching-up process in recent decades.

Key-Words: Euro adoption, Slovenia, Slovakia, big-bang scenario, dual circulation, nominal convergence, real convergence
JEL Classification: E30, E58, E61, F15

1 Introduction

Slovenia and Slovakia took part in the largest expansion of the European Union (EU) in May 2004. They have managed to adopt the euro in a quite short period after the EU accession, being considered two successful stories due to their smooth and rapid transition.

The Republic of Slovenia was very determined to join the euro area. Between 2004 and 2006, the Slovenian authorities focused all their economic policies on meeting the Maastricht criteria while setting a target date for the adoption of the single currency. The efforts of the Slovenian authorities have been successful, so that it became the first of the ten new EU countries to adopt the single currency. The steady pace of economic growth and the lack of major macroeconomic imbalances during the transition period have allowed Slovenia to easily meet the accession criteria. The speed and the success of adopting the euro by Slovenia has been associated with a general consensus between political parties, public opinion and the social partners, but also with a gradual transition model to a market economy, the emphasis on macroeconomic stability throughout the pre-accession period and clear economic policy priorities (Lavrač, 2010). Moreover, an appropriate communication strategy gave to Slovenian citizens the opportunity to better understand the benefits of joining the euro area. In this context, Slovenia has been mentioned by the European authorities as a successful example in the adoption of the euro (European Commission, 2013a).

The Slovak Republic became part of the euro area five years after joining the EU. This economy is considered one of the most notable examples of the catching up process in recent decades (European Commission, 2009a). Performance has been made possible by a consistent economic policy and, in particular, by the implementation of economic reforms, investor-friendly legislation and effective measures to adopt the euro. Access to the single market and the adoption of the acquis have significantly contributed to the success of

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Slovakia. On the one hand, the elimination of trade barriers and the application of European standards have significantly reduced business costs, encouraging trade and the country's participation in European value chains (Blind et al. 2018). On the other hand, a stable and predictable regulatory environment has increased the level of investment security, helping to increase the flow of foreign investment and providing Slovakia with the necessary resources to ensure a high level of competitiveness. Fundamental institutional reforms and foreign direct investment have allowed Slovakia to move to a functioning market economy and to adopt an export-oriented growth model, supporting nominal and real convergence with the euro area.

The trajectory of euro adoption was quite similar in these two countries. In both cases the authorities concluded that the benefits of joining the euro area outweigh the costs and that their negative effect was to be mitigated by appropriate economic policies.

2 Institutional arrangements of euro adoption

The Slovenian authorities have carried out an active and thorough preparation of the entire euro area accession process, which has taken place in several steps (Table 1). The first step towards the euro was taken before becoming an EU member, by defining its National Strategy for Adoption of the Euro in November 2003. In the same year, the Bank of Slovenia and the government developed the Program for accession to the European Exchange Rate Mechanism II (ERM-II) and adoption of the euro, which was the cornerstone of the whole process. This Program included a detailed plan for Slovenia's accession to the ERM-II as soon as possible, setting the target date for the adoption of the euro in January 2007. According to the program, the priority of all economic policies became meeting the convergence criteria. The second step that brought Slovenia closer to the euro area was a rapid entry into the ERM-II in June 2004. The EU Council set an irrevocable exchange rate between the Slovenian tolar and the euro of 239.640, corresponding to the official exchange rate on Slovenia's accession to the exchange rate mechanism. Slovenia's participation in ERM-II was surprisingly smooth, so that for two years the market exchange rate remained extremely close to the official exchange rate and there were no tensions in the foreign exchange market. Lavrač (2010) argues that Slovenia's successful experience in ERM-II was the result of a combination of wisdom and luck, the right choice of macroeconomic policy measures and favourable internal and external circumstances. In 2005, was made the third step, the Slovenian government and the Bank of Slovenia drew up the Euro Transition Plan, which detailed the steps for a smooth transition to the euro. To this end, the Coordinating Committee for Technical Preparations of Euro Changeover has been set up, coordinated by the Ministry of Finance and the Bank of Slovenia. Also in 2005, the Bank of Slovenia and the Slovenian government adopted the Communication Strategy on the introduction of the euro for the period 2005-2007, on the basis of which a broad information campaign was launched under the slogan "Euro for all of us". Within the communication program, in 2006, a special website was created, which presented to the general public details of the entire process of conversion to the euro (http://www.evro.si). This strategy and the support of the project through a social pact proved to be important elements of the Slovenian success in euro adoption (Lavrač, 2010). According to the Eurobarometer opinion poll (European Commission, 2006), the support for the euro adoption by Slovenians has consistently been among the highest of all ten new Member States, exceeding 60% in 2006. In 2006, Slovenia managed to meet both nominal and legislative convergence conditions. Thanks to effective macroeconomic stabilization policies, it managed to remedy the economic imbalances and maintain a remarkably resilient economy.

Similar to Slovenia, the Slovak authorities expressed their official intention to join the euro area through the Strategy for adoption of the euro developed in July 2003. The basic argument for euro adoption was that Slovakia could reap the full benefits of European integration only if it joined the euro area. After a detailed analysis of the nominal and real convergence of the Slovak economy with the EU, the authorities concluded that Slovakia could join the ERM-II in 2005 and join the euro area between 2008-2010 (NBS, 2003). In addition, the authorities noted that a credible strategy for adopting the single currency will send a strong positive signal to foreign investors, accelerating economic restructuring. Only six months after EU integration in September 2004, the National Bank of Slovakia and the Ministry of Finance drew up the Specification of the strategy for adopting the euro, which included: (1) the assessment of the Slovak economy's ability to join the euro area (2) the stages of the transition to the euro and (3) the direction of economic policies that should support overall economic and financial stability in the pre-euro area period, in particular in the ERM-II, but also post-accession period (NBS, 2004). This time, in view of the prospects for meeting the Maastricht criteria, the authorities have set an exact date for the adoption

of the single currency, 1 January 2009. In November 2005, Slovakia joined ERM-II and initiated a comprehensive and thorough preparation process for accession to the euro area. The central parity of the crown was set at 38.4550 crowns for one euro at the time of accession to ERM-II, being revalued starting from March 2007, at the rate of 35.4424. In 2007, the Ministry of Finance, in collaboration with the National Bank, the Ministry of Economy and the Ministry of Justice, developed the National Euro Changeover Plan (NBS, 2007a). In this context, the Government appointed the Ministry of Finance as the National Coordinator for the process of introducing the euro and set up the National Coordination Committee for the euro changeover.

Table 1: The main institutional arrangements of the euro adoption in Slovenia and Slovakia

Main steps	Slovenia	Slovakia
Formal commitment	**November 2003** National strategy for adoption of the euro Program for accession to the ERM-II Target date for adoption of the euro - January 2007	**July 2003** Strategy for the adoption of the euro Target date for joining the ERM-II - 2005 Target period for the euro adoption – between 2008-2010 **September 2004** Specification of the strategy for adopting the euro Target date for the euro adoption - January 2009
Entry into the ERM-II	**June 2004** The European Council set an irrevocable exchange rate between the Slovenian tolar and the euro of 239.640	**November 2005** The central parity was set at 38.4550 crowns for one euro at the time of accession to ERM-II, being revalued starting from March 2007, at the rate of 35.4424
Changeover Plan	**2005** Plan for euro adoption Coordinating committee for technical preparations to introduce the euro	**2007** National euro changeover plan National coordination committee for the euro changeover Plenipotentiary of the Government for the introduction of the euro (during the ERM-II).
Communication campaign	**2005** Communication strategy on the introduction of the euro for the period 2005-2007 Dedicated website - http://www.evro.si	**2007** Communication strategy on the euro introduction Working committee on communication Dedicated website - www.euromena.sk
Fulfilment of convergence criteria	**2006** Fulfilment of all convergence criteria and the full legal compatibility European Council decision allowed Slovenia to join the euro area from 1 January 2007	**2008** Fulfilment of all convergence criteria and full legal compatibility European Council gave its green light to the adoption of the euro by Slovakia on 1 January 2009

Source: Author's adaptation based on the studied literature.

In order to inform as many citizens as possible in a timely manner about the process of switching to the euro, the Slovak authorities developed the Communication Strategy on the Euro Introduction in 2007 (NBS, 2007b). In addition, under the leadership of the National Bank, was set up the Working Committee on Communication. Individual communication activities were carried out by the National Bank, the Ministry of Finance, the government and other public administration institutions. The communication campaign was very active, through television and radio, a dedicated website (www.euromena.sk) and a hotline for information on the euro, conferences and seminars, but also through the distribution of millions of copies of publications and materials. In addition, citizens received information directly by email related to the changeover to the euro and the

conversion tools (European Commission, 2013b). As a result of this campaign, 54% of Slovaks surveyed were in favour of adopting the euro in 2006 (European Commission, 2006).
Slovakia has managed to successfully meet all nominal convergence criteria at the time of the adoption of the euro. It became one of the European economies with the highest GDP growth rate per capita during the 2000-2008 period. In addition, it accounted for the largest foreign direct investment inflows as a share of GDP in the region. Havlat et al. (2018) argues that foreign direct investment was one of the main factors of economic growth in Slovakia in the pre-accession period, as they were channelled mainly in export-oriented sectors.

3 Preparation stages of the euro changeover process

The euro changeover process has started with a thorough preparation by the Slovenian and Slovak authorities well in advance the target date. Both countries have established dual display of prices rules, developed Price Codes and adopted the Big-Bang scenario, i.e. the euro was introduced simultaneously in cash and scriptural form without a transitional period. The compliance with rules was carefully monitored by the authorities in both cases (Table 2).

Table 2: The main stages of the euro changeover in Slovenia and Slovakia

Stage 1	Stage 2	Stage 3	Stage 4
Dual display of prices	**Monitoring the prices**	**The Big-Bang scenario**	**The dual circulation**
Slovenia - nine months before accession and six months after the introduction of the euro.	Slovenia - the Bureau of Statistics, the Ministry of Economy and the Association for Consumer Protection have signed an agreement to monitor the prices. The Chamber of Commerce and Industry was involved in the price surveillance process, and required Slovenian companies to adhere to a Price Code.	Slovenia - the euro entered circulation on 1 January 2007.	Slovenia - only two weeks. The tolar could be exchanged free of charge at commercial banks until March 2007, while the Bank of Slovenia continued to do so until the end of 2016.
Slovakia - five months before accession and lasted until December 2009.	Slovakia - the Slovak Trade Inspectorate carefully monitored the prices. The price monitoring scheme run by the Slovak Consumers' Association. The Price Code of Ethics, by which the signatories undertook to convert prices accurately, without exploiting the situation.	Slovakia - the euro entered circulation on 1 January 2009.	Slovakia - only two weeks. The banknotes could be exchanged free of charge at commercial banks until the end of 2009 and at the Bank of Slovakia indefinitely.

Source: Author's adaptation based on the studied literature.

In order to avoid unjustified price increases when switching to the euro, the Slovenian authorities have decided that the prices of all goods and services must be displayed in both tolar and euro (dual display of prices), nine months before accession and that this process should continue for six months after the introduction of the euro. In addition, in order to closely monitor the evolution of prices before and after the euro adoption, the Bureau of Statistics, the Ministry of Economy and the Association for Consumer Protection have signed an agreement on how to monitor the prices. To this end, the Statistical Office undertook to present in its monthly reports the list of goods and services which had justified and specific price increases. The Chamber of Commerce and Industry was also involved in the price surveillance process, which required Slovenian companies to adhere to a Price Code, by which they undertook not to increase prices in the process of introducing the single currency. The euro entered circulation on the same day that it officially became the country's new currency, on 1 January 2007.

The dual circulation period was very short, only two weeks, during which the population was able to make payments using the Slovenian tolar and euro. Slovenians had the opportunity to exchange the tolar free of charge at commercial banks until March 2007, while the Bank of Slovenia continued to do so until the end of 2016. All amounts deposited with banks, including money in current accounts, were automatically converted into euro on 1 January 2007. As a result, the transition to the euro in Slovenia has taken place successfully. The opinion poll reflected the positive public perception of the changeover to the euro in Slovenia. According to Eurobarometer data, 95% of Slovenes surveyed considered the introduction of the single currency to be smooth and efficient and 56% considered price conversions to be correct (European Commission, 2007).

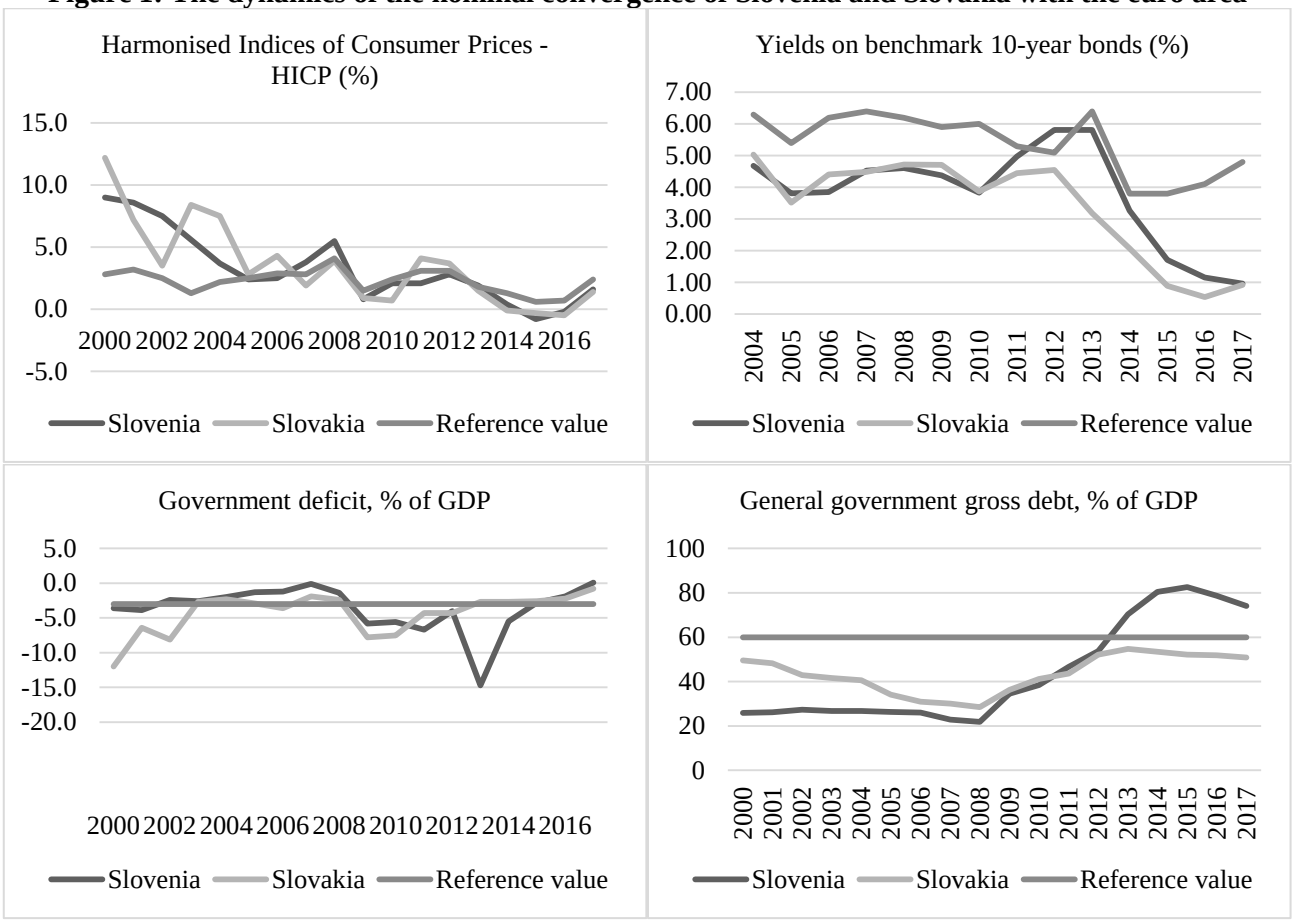
In the same vein of avoiding unjustified price increases with the changeover to the euro, the Slovak authorities have initiated a series of strategic actions. Firstly, the double display of prices became mandatory five months before accession and lasted until December 2009. The compliance of shops and service providers with this rule was carefully monitored by the Slovak Trade Inspectorate, which visited more than 15,000 economic units throughout this period. As a result, the share of commercial units that displayed prices accordingly increased from 54% to 85% between August and November 2008 (European Commission, 2013b). Secondly, these actions were complemented by the price monitoring scheme run by the Slovak Consumers' Association. Thirdly, citizens were encouraged to report any suspicious price increases to the price monitoring institutions or to the Government Plenipotentiary. Throughout that period, all the complaints were fully investigated. Fourthly, Slovakia has implemented the Price Code of Ethics, by which the signatories undertook to convert prices accurately, without exploiting the situation. Approximately 16,000 stores, service providers and local and regional administrative offices have signed this code. Unlike other countries that have joined the euro area, Slovaks have had the lowest level of concern about possible price increases following the adoption of the euro (European Commission, 2009a). According to the Eurobarometer opinion poll, almost all Slovaks felt well informed about the changeover to the euro and a large part felt very happy to adopt the euro as their national currency. As a result, inflationary pressures related to the changeover have been limited and have not led to significant price increases since the introduction of the euro. Moreover, most companies in Slovakia have started preparing for the changeover to the euro well in advance. According to the July 2008 opinion poll (European Commission, 2008), around 80% of businesses started the preparations more than 6 months before the introduction of the single currency. At the same time, public administration institutions have prepared all the necessary legislation for the changeover to the euro, trained staff (especially those in direct contact with the public) and arranged for IT systems to be compatible with the euro. The euro entered circulation on 1 January 2009. As in the case of Slovenia, the dual circulation period lasted only two weeks. At the same time, the banknotes could be exchanged free of charge at commercial banks until the end of 2009 and at the NBS indefinitely. For a faster withdrawal of the national currency, commercial banks have been supplied with euro since September 2008, and over 6,500 companies have been replenished in December 2008. A few months earlier, banks had encouraged the public to deposit excess cash in their bank accounts and use payment cards to reduce the amount of cash to be exchanged after 1 January. In addition, some banks offered citizens the opportunity to exchange the Slovak koruna for free at the official conversion rate in the last weeks of 2008. All these actions determined 91% of Slovaks surveyed in 2009 to believe that the introduction of the single currency was smooth and efficient (European Commission, 2009b).

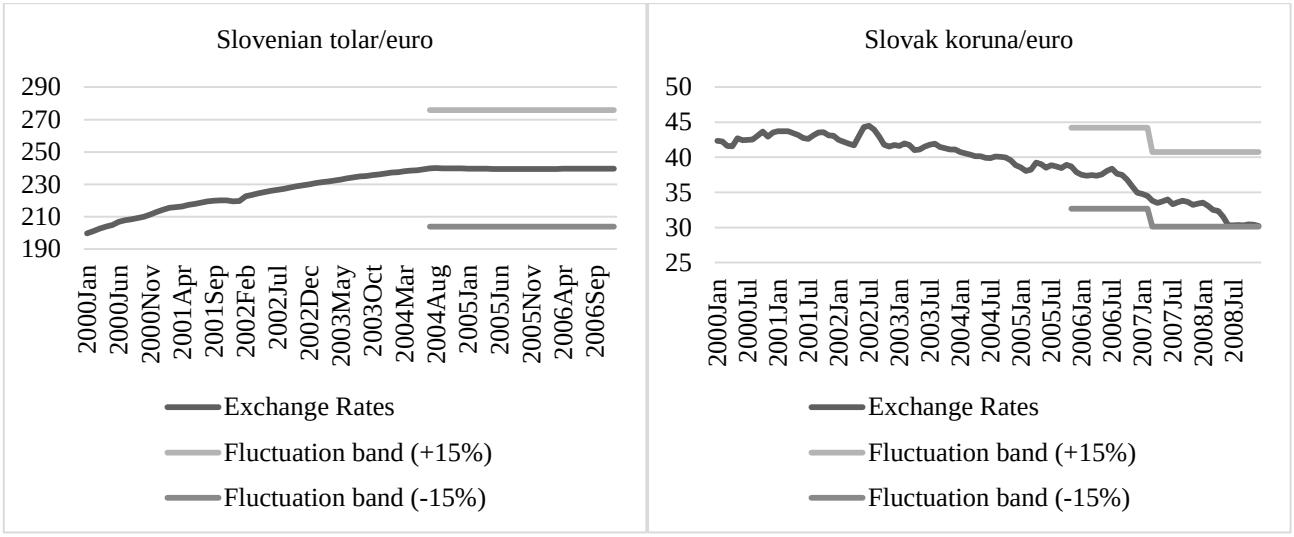
4 The dynamics of nominal and real convergence with the euro area

The steady pace of economic growth and the lack of major macroeconomic imbalances during the transition period have allowed Slovenia to easily meet the accession criteria. Due to coordinated and consistent action of monetary and fiscal policy in that period, the country has recorded a marked decrease in the inflation rate, from a level of 9% in 2000 to only 2.9% in 2006. Thus, the criterion of price stability met the reference established by the Maastricht Treaty in the pre-accession period (Figure 1). The sustainability of public finances has been ensured since 2002 until the euro adoption. It is worth noting about the countercyclical fiscal policy which has reduced constantly the budget deficit since 2004, from 2% to 1.2% in 2006. The public debt as a share of GDP was well below the reference value during the whole period of accession. Long-term interest rates in Slovenia have consistently shifted towards the average yield on euro area bonds. This development reflects investors' confidence in the monetary policy promoted by the central bank and the general economic and fiscal developments in Slovenia. Slovenia's current account surplus, recorded during the transition period, led to the appreciation of the national currency. In this context, the central bank established the managed floating exchange rate regime and promoted a foreign exchange policy aimed at depreciating the nominal exchange rate in the period 2000-2004. In 2004, Slovenia joined the ERM-II, managing to maintain a volatility of the tolar against the euro well below the fluctuation margin of less than 0.1%.

In the case of Slovakia, fundamental institutional reforms and foreign direct investment have allowed it to move to a functioning market economy and adopt an export-oriented growth model, supporting nominal and real convergence with the euro area. In 2004, Slovakia joined the EU with an inflation rate of 8.5%, reaching ERM-II in 2005 with a rate of only 2.8% (Figure 1). Following the Maastricht criteria, Slovakia recorded an inflation rate of 3.8% in 2008, in line with the benchmark. The early 2000s were characterized by a budget deficit of about 13%, caused by the economic recession of that period. The situation of public finances has improved markedly in the coming years. However, in 2004, Slovakia was subject to the excessive deficit procedure by the European Commission, which lasted until 2008, when it finally met the Maastricht criterion. The public debt as a share of GDP was maintained at around 50% throughout the whole period. The evolution of the long-term interest rate reflects investors' confidence in the policies promoted by the Slovak authorities, it is well below the reference value. The Slovak koruna's exchange rate against the euro has shown a steady trend of appreciation, driven by the high pace of economic growth. In view of the appreciation trend of the koruna, at the request of Slovakia, the central parity of the koruna against the euro in ERM-II has been revalued since March 2007, from 38.4550 to 35.4424.

Figure 1: The dynamics of the nominal convergence of Slovenia and Slovakia with the euro area

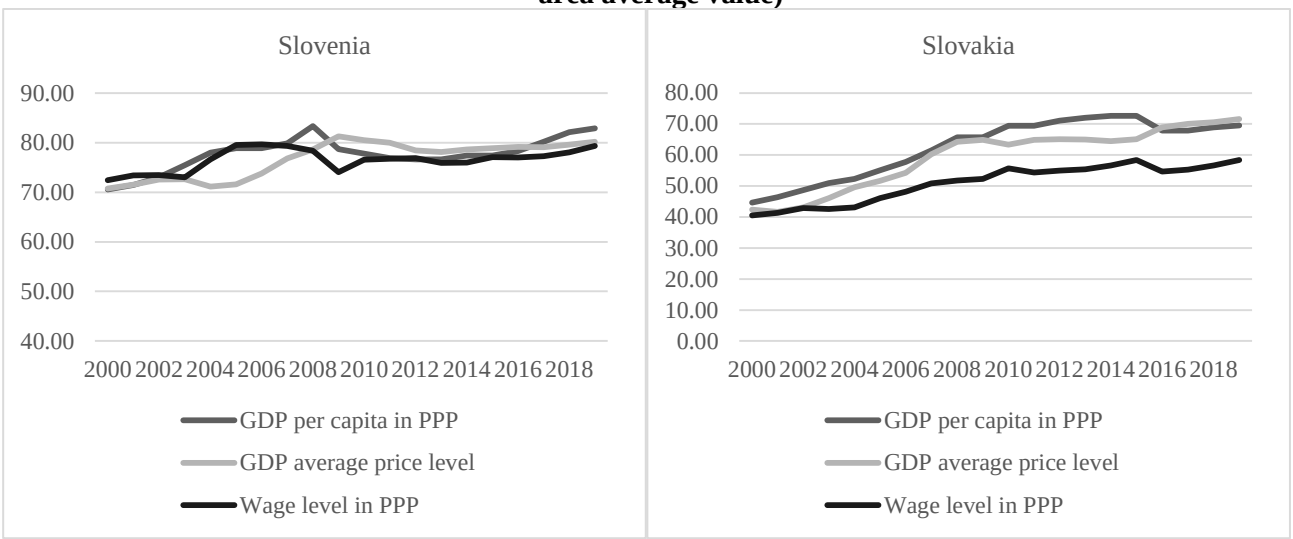




Source: Author's elaboration based on Eurostat (2020).

Slovenia has joined the EU with a particularly high convergence of GDP per capita and prices, of 78% and 71%, respectively, of the euro area average. It reached even higher convergence of GDP per capita and prices when it joined the euro area in 2007. Purchasing power parity (PPP) wages reached 79% of the euro area average in 2007, remaining at the same level to date (Figure 2). In the same time, Slovakia recorded a high rate of GDP growth per capita in the 2004-2008 period, being considered one of the most notable examples of the catching up process in recent decades. This country has joined the EU with a GDP per capita relative to the euro area of only 53% and with a price level of 46%. It reached a level of GDP per capita and prices convergence of 66% and 64% upon accession to euro area. The PPP wages have recorded a positive trend also.

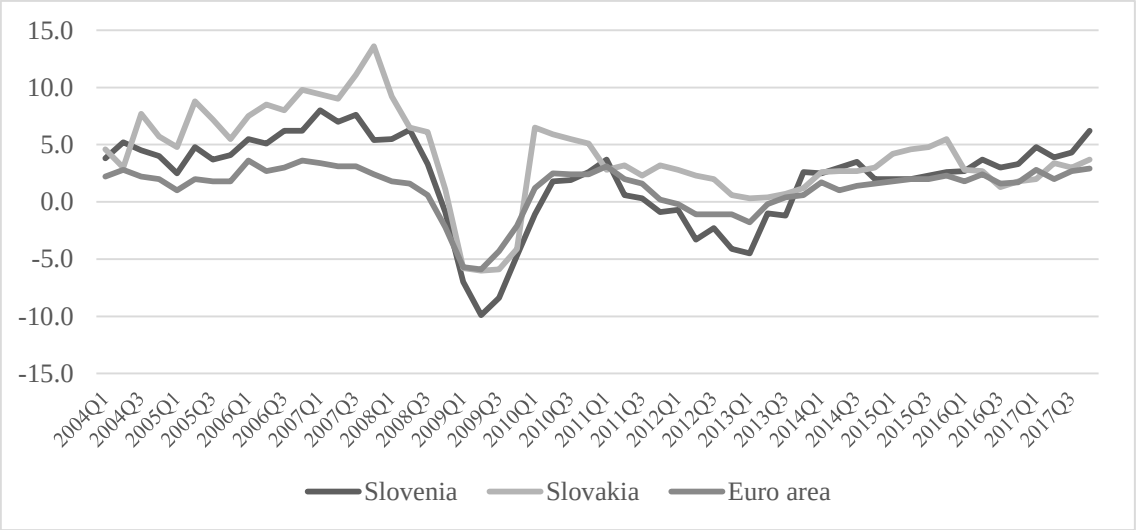
Figure 2: The dynamics of the real convergence of Slovenia and Slovakia with the euro area (% of euro area average value)



Source: Author's elaboration based on Eurostat (2020).

Another key element that reflects the economic convergence of Slovenia and Slovakia with the euro area is the degree of their economic cycles' synchronization. Both countries have quite a high degree of synchronization with the euro area (Figure 3). It can also be noticed that both the Slovenian and the Slovak economies have grown more sharply compared to the euro area in positive cycles. This development allowed them to close the gap on convergence with the euro area.

Figure 3: Economic cycle synchronization (GDP annual growth rate, %)



Source: Author's elaboration based on Eurostat (2020).

4 Conclusion

The paper aimed to analyse the integration path into the euro area of Slovenia and Slovakia, and to draw out the main conclusions from these two stories. Our results have shown that the process of adopting the euro in both countries has been very smooth and rapid, due to a general political and public consensus and an efficient communication strategy. In both cases the determination of the authorities to adopt the single currency was argued by the benefits of joining the euro area which outweigh the costs.

The trajectory of euro adoption was quite similar in Slovenia and Slovakia. The euro changeover process started with a thorough preparation by the Slovenian and Slovak authorities well in advance the target date. Both countries have established dual display of prices rules, developed Price Codes and adopted the Big-Bang scenario, i.e. the euro was introduced simultaneously in cash and scriptural form without a transitional period. The compliance with the rules was carefully monitored by the authorities in both cases. All these actions helped to avoid unjustified price increases when switching to the euro and created the positive public perception of the changeover in both countries.

Furthermore, upon the accession to the euro area, both Slovenia and Slovakia managed to meet nominal and legislative convergence conditions. Thanks to a gradual transition model to a market economy, the emphasis on macroeconomic stability throughout the pre-accession period and clear economic policy priorities, Slovenia managed to remedy the economic imbalances and to maintain a remarkably resilient economy. Moreover, it reached a high convergence of GDP per capita and prices when it joined the euro area in 2007. In case of Slovakia, fundamental institutional reforms and foreign direct investment have allowed it to move to a functioning market economy and adopt an export-oriented growth model, supporting the catching up process and assuring nominal and real convergence with the euro area.

These two stories have shown that integration to the euro area should be a political decision, which must enjoy the widest democratic support of the citizens. Moreover, careful and pro-active preparation of the euro adoption pays off. All the preparations should have to start at a very early stage. The introduction of euro notes and coins needs to be swift and carefully prepared. The same applies to the period of dual circulation, which should preferably be short. A series of measures should be taken to avoid any impact on prices. An important element is the mental changeover that takes considerably more time than the physical one. This is why a communication strategy is of major importance for a smooth transition. Simply meeting nominal criteria is far from enough for a country to benefit from adopting the euro, real sustainable convergence is a key precondition.

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Traditional Cryptocurrencies And Fiat-Backed Digital Currencies

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Abstract: The digital payments space saw vigorous investment activity during 2020 and there have been a plethora of announcements about account based Central Bank Digital Currencies. The cryptocurrency market can be roughly divided into two segments: traditional cryptocurrencies and fiat-backed digital currencies, including stablecoins and central bank digital currencies. 2021 may be the year we see the world's first sovereign digital currency. China's digital yuan or DCEP (short for Digital Currency/Electronic Payments) looks to be nearing completion. DCEP allows China to push forward into the digital era, while still retaining control over its financial instruments. The European Commission and European Central Bank are working together to investigate the policy, legal and technical questions emerging from a possible introduction of a digital euro. But creating a digital currency is actually the easy part. What is more important is how it is linked into the wider ecosystem to ensure the circulation of money and cash flows. Digital currencies are likely to have big implications for the role of central banks and retail lenders and could change the face of the entire financial system.

Key words: Central Bank Digital Currencies, cryptocurrencies, stablecoins, digital payments, digital euro.

1 Introduction

Market dynamics and infrastructure vary greatly per country and region but the direction of innovation and change is converging on the same outcome: digitisation and cashlessness. As the world adopts digitalisation in all sectors and societies, there is greater demand for unbanked communities to be banked and for digital banking to enable better choice and control for consumers, greater opportunities for merchants and business, increased cross-border trade and benefits for governments.

As the White paper from Finextra in association with HPS (january 2021) puts it, the reasons for the transition away from cash and towards digital include enabling connection between unbanked consumers, merchants and services through mobile money; greater visibility and view on liquidity for merchants, including real time confirmation and settlement; reduction in fraud and crime by implementing a digital trace and, hence, audit system; financial inclusion;for banks, greater volumes and transactions are welcomed also.
Cashless society initiatives bring greater transparency to governments, including better regulated tax systems and stronger control on fraud.

On the other hand, there are many who argue that this must be resisted with every fiber of our being because traditional currencies replaced with number on a computer screen will be another step towards total Government control over every aspect of your life. Every purchase you make will be recorded. If you have any outstanding debts eg, fines the money will be removed from any savings you may without consent. Governments will have the power to Confiscate/Suspend/Freeze your account with a few key strokes.
One of the big challenges with digital currencies is the amount of data that comes with them, said recently Raghuram Rajan, former Reserve Bank of India governor. "We need some sort of broader global rules of the game. What are countries going to do with data collected from abroad on who uses their currency? How do you make sure that the usual safeguards on that use are there? If somebody uses a foreign digital currency to buy certain services which could compromise them, can they be liable to espionage and blackmail, et cetera? And those are concerns that are not farfetched in today's world," Rajan told CNBC.

Digital currencies are likely to have big implications for the role central banks and retail lenders play in the world and could change the face of the entire financial system.

While the idea is still being debated, central banks would likely issue digital versions of fiat currencies. The People's Bank of China is already doing pilots while other central banks are considering whether to issue their own.
The cryptocurrency market can be roughly divided into two segments:
-the first segment includes traditional cryptocurrencies, which, in essence, are assets and are used as an investment tool.
- the second segment includes fiat-backed digital currencies, including stablecoins, and central bank digital currencies.

2 Traditional cryptocurrencies

2.1 Cryptocurrency market

The total value of all the digital currencies exceeded $1 trillion for the first time ever after the leading crypto asset, bitcoin, continued its bull run to the next all-time peak.
Bitcoin, which accounts for around 70 percent of the value of the entire cryptocurrency market, has been deemed *"digital gold,"* attracting more and more large and institutional investors who consider it as a hedge against inflation and the weakness of the dollar. With some critics insisting that the cryptocurrency is a massive bubble, others still bet on its rising value.

Bitcoin could more than double in price by the end of the year as more firms allow customers to use it to make purchases, says Michael Novogratz, the founder of cryptocurrency investment firm Galaxy Digital. The price of the crypto coin blew past an all-time high driven by Tesla's announcement that it had bought $1.5 billion worth of bitcoin. The company also said it will allow customers to buy its electric cars with the coins.
A long-time crypto enthusiast and investor, Novogratz said that other companies would consider moving excess reserves into bitcoin, perhaps as a hedge against inflation or against a falling US dollar. In a world where central banks issue digital currencies, bitcoin and Libra may find a place

Cryptocurrency bitcoin and Facebook-backed Libra could play a role in a world where central banks globally begin to issue their own digital currencies, Raghuram Rajan, former Reserve Bank of India governor, told CNBC.

Rajan called bitcoin a "speculative asset" while Libra has been designed for transacting. Both could have different roles to play when central banks begin to issue digital currencies.
Bitcoin is a "decentralized" cryptocurrency meaning it has no central authority governing its issuance, unlike fiat currencies. It is built on so-called blockchain technology, which at its simplest level, is an immutable public ledger of bitcoin transactions. Bitcoin has often been criticized as being a speculative asset. Legendary investor Warren Buffett said earlier this year that it has "no value."

Libra takes a more centralized approach. It is a project that was proposed by a Facebook-led consortium of companies last year. But Libra drew heavy criticism from regulators, particularly because of its ties to Facebook and its murky track record of data privacy.

The idea is for Libra to be a so-called "stable coin" which would be backed by a basket of global currencies. That would keep its value stable in contrast with the volatility that has been seen in bitcoin. Libra has scaled down some of its ambitions. Earlier this year, the Libra Association applied to obtain approval from regulators to issue a digital currency backed by one currency. That would mean the consortium's digital coin may be equivalent to a euro or a U.S. dollar, for example.

Rajan said that bitcoin is a "speculative asset" rather than one that is used for transactions on a large scale. He said investors have often flocked to bitcoin when traditional assets such as bonds are less attractive. "In that sense, bitcoin is a little bit like gold, in fact, gold has some value because we value it for jewelry, but bitcoin you can't even do that. Nevertheless it has value because others think it has value," Rajan said.

"On the other hand, Libra is an attempt to create a currency which is used for transacting. And that, the whole idea is not to hold it as a speculative asset which increases in value … but use it for transactions. So the ultimate underlying value is going to be from the central banks, they're going to preserve the value, not of Libra but of what Libra can be exchanged into," he added.

But ultimately there will be competing private digital currencies with different roles. "So the bottom line I think is different private currencies will do different things and it may be bitcoin has value going forward just as a store of value, or as a speculative asset. While Libra may be the kind of currency which is used more for transacting," Rajan said.

Cryptocurrencies, particularly bitcoin and ethereum, started gaining more institutional support last year, triggering another massive rally. Payments companies Square and PayPal have recently backed cryptocurrencies, along with influential hedge fund heads such as Paul Tudor Jones and Stan Druckenmiller. International payment system Visa is moving towards allowing its cardholders to buy and sell cryptocurrencies in countries where it does not contradict the local legislation According to the company, it has partnered with the First Boulevard neobank in the United States, which would allow Visa clients to buy, store and sell digital assets via the Anchorage cryptocurrency bank.

Visa's announcement follows rival credit card major Mastercard, which announced last week it will begin allowing clients to make payments in certain cryptocurrencies on its network this year.

The key change is that Mastercard's current crypto partners, which include Wirex and BitPay, have to convert the digital asset into traditional currencies before making a transaction. The credit card major now wants to support digital assets directly instead. "This change will also cut out inefficiencies, letting both consumers and merchants avoid having to convert back and forth between crypto and traditional to make purchases," Mastercard said.

2.2. Fiat-backed digital currencies

China

The cashless, digital revolution is on its way, and while the West has so far failed to come up with any comparable scheme of its own, China's is almost at the finish line already.

China's central bank is nearly ready to issue its own sovereign digital currency, according to Mu Changchun, deputy director of the People's Bank of China's payments department. Researchers at the bank have been working on the currency for five years. According to reports, China's central bank would launch its digital token through a two-tier system, under which both the PBOC and commercial banks are legitimate issuers.

But according to crypto-expert Simon Dixon's theory, if your account is full of digital currencies that are backed by the government then, if the bank fails, the deposits are guaranteed because they are in the wallet. "So, this could be a major contentious moment between banks and governments"and "the governments are getting ready to allow banks to fail," Max Keiser says. .

The PBOC said it wouldn't rely on blockchain exclusively, and would instead maintain a more neutral stance on which technology it decides to use. Blockchain, otherwise known as distributed ledger technology, is the framework that underpins cryptocurrencies like bitcoin. The digital yuan will be linked to the holder's smartphone number, with transactions taking place through an app. Users will be able to transfer money between accounts by tapping phones, much like having physical cash change hands. The currency will be legal tender, so it could be exchanged without needing a bank as an intermediary. The size of transactions would be limited based on identity verification. A phone number alone would permit only small transactions, while providing proof of identity or a photo of a debit card would raise the limit. Speaking with a bank representative in person could allow for the cap to be removed entirely. Suspected criminal activity will be uncovered via transaction histories.

China is expanding trials of its sovereign digital currency in the capital Beijing, the nation's most populous city of Shanghai and leading tech hub Shenzhen this year. The digital currency was projected to replace cash in circulation. But China's new sovereign digital currency could also transform cross-border trade due to its ability to process payments and handle foreign exchange transactions simultaneously. That's according to the former head of the People's Bank of China, Zhou Xiaochuan, who told the Shanghai Financial Forum that one of the major benefits of using a digital system is that it allows both payments and currency conversions to happen in real time.

"If you are willing to use it, the yuan can be used for trade and investment," he said. "But we are not like Libra and we don't have an ambition to replace existing currencies." The Digital Currency Electronic Payment (as it is formally known) was not intended as a replacement for globally accepted fiat currencies like the US dollar and the euro. According to Zhou, rather than challenging foreign exchange regulatory frameworks and monetary systems, Beijing wanted to persuade consumers and overseas merchants to gradually accept digital yuan payments.

The digital yuan will be the first national currency which will not exist in physical form, but entirely online. While currencies of old were traditionally based on something tangible – such as the gold standard – the digital yuan is built on computer engineering. This means the way it is utilized and regulated differs from a normal currency. A digital currency is more easily managed by its parent government, and more traceable and observable. With a government-controlled digital currency, financial crimes such as money laundering and tax evasion become more difficult. It provides increased security for users, even if it reduces privacy. But even more

striking to international observers than the implications for personal use is the potential geopolitical impact it could have.

Many are speculating that this new currency will have global ramifications, with Facebook's Libra executive David Marcus noting that China will create a digital currency system that can be entirely out of reach for US authorities, meaning America's financial sanctions would have little effect. He added that if the digital yuan gets widely adopted across the world, many countries could opt for renminbi as an alternative to the dollar for international clearing and settlement services.

While launching studies on its own digital unit as far back as 2014, Beijing has cracked down on the use of all cryptocurrencies, such as bitcoin. Cryptocurrency trading has been halted on some 100 exchanges in the country since 2017, in compliance with regulation on fraud and money laundering. But elsewhere, the Chinese currency is not a threat to bitcoin because it's a highly-centralized digital currency.

The emergence of a digital yuan, as opposed to the standard yuan, is an international gamechanger. As the first currency of its kind, China has the potential to pioneer it as a new global standard in its own transactions and, by using the country's economic muscle, persuade other countries and financial institutions to use it, too. The potential outcome is clear; it may have a serious impact on the US dollar.

At present, the dollar is the hegemonic currency of the world. It is the preferred medium of transaction for many sectors and commodities alike, not least in the realm of finance. Due to its widespread use and the dominance of American financial institutions, the US government has the power to weaponize the dollar as a form of 'extraterritorial jurisdiction' against countries that it doesn't like. If the US sanctions a company or individual, it effectively cuts them off from the global financial system. The banks who serve these individuals rely on the dollar, and thus face penalties if they violate the sanctions.

This demonstrates the global strength of the dollar, but also shows how the digital yuan may change the current landscape. The creation of a new international medium of transaction means that financial institutions, companies and governments now have a new avenue to do business without having to use dollar transactions. This will reduce its global reach. For countries like Iran and Venezuela, heavily targeted by US sanctions, it is an obvious way out. Of course, such a system will be met with a mixed response throughout the world. While beneficial to some countries, it is inevitable that others will not accept their financial systems being re-written and dominated by China.

The digital yuan is set to face political resistance from the US, which is likely to respond by eventually creating a digital currency of its own (even though it's well behind at present). The European Union is also likely to move towards a 'digital euro' to safeguard its own interests.

On the other hand, the digital yuan should be expected to gain traction in countries strongly integrated with China, particularly in Asia, Africa and Latin America. There are many nations who will see the opportunity to diversify from the US dollar as a positive development.

And so arguably, the rise of the digital yuan will prove to be an innovation which will truly hasten a multipolar world. It has the potential to effectively break the monopoly of the dollar as a unilateral, extraterritorial weapon and rewrite the rules of the global financial system in a way which will be shaped by China. It could set off a digital currency race with many other major powers too, fragmenting the existing order whereby the US dollar serves as the underbelly of all things.

The People's Bank of China has agreed a partnership with the global interbank settlement organization SWIFT, as part of an effort to internationalize the yuan and develop a digital Chinese currency.The new entity, Finance Gateway Information Service, was registered in Beijing on January 16, 2021 with €10 million ($12 million) as incorporation capital, according to the National Enterprise Credit Information Publicity System, the Chinese government's enterprise credit information agency. SWIFT is the largest shareholder, with 55 percent of the capital owned via a Hong Kong subsidiary, while the China National Clearing Centre, a wholly-owned domestic settlement subsidiary of the PBOC, owns 34 percent. The joint venture emerged after concerns were raised that the US might cut off China or Hong Kong from the SWIFT financial payment network as a result of the Trump administration's sanctions over the Hong Kong autonomy issue. Calls have also been growing from within China for Beijing to reduce its reliance on the US dollar by increasing the global use of the yuan amid worsening relations with Washington.

Also, the central banks of China and the United Arab Emirates are joining their counterparts in Thailand and Hong Kong on a CBDC project investigating cross-border foreign currency payments. The Multiple CBDC (m-CBDC) project will see a proof-of-concept prototype developed designed to support real-time cross-border foreign exchange payment-versus-payment transactions in multiple jurisdictions, operating 24/7. It will analyse business use cases in a cross-border context with both domestic and foreign currencies. The project was first

developed by the Hong Kong Monetary Authority and the Bank of Thailand and is being run with the BIS Innovation Hub in Hong Kong.

Experts say China's plans have triggered concerns about a new threat to US financial dominance. According to Aditi Kumar and Eric Rosenbach of the Harvard Kennedy School, the digital version of the Chinese renminbi could eventually allow Iran and other countries to more easily evade US sanctions or move money without it being spotted by Washington. They explained in an article for Foreign Affairs that one day it might be possible to transfer the digital currency across borders without going through dollar-based international payment systems.

Former US Treasury Secretary Henry Paulson has argued that the threat to the dollar's status as the world's preferred currency is "not a serious concern." He claimed that even if a digital yuan proves to be highly mobile around the world, the US dollar is widely trusted, and oil and other key commodities are still priced in it. However, according to the CEO of Sino Global Capital Matthew Graham, digital yuan could encourage other countries and people overseas to get on board with China's technology and currency.

With Beijing pushing for greater use of the yuan internationally, the Chinese currency could rise to the status of the world's third-largest reserve currency in 10 years, according to a forecast by Morgan Stanley.The share of the yuan in global foreign exchange reserve assets could more than double from its current level of two percent and surpass the share of the Japanese yen and the British pound, the bank's analysts said in a report released on Friday, cited by CNBC. According to their estimates, the Chinese currency, officially known as the renminbi or RMB, could reach five to 10 percent of reserve assets by 2030.

"This target is not unrealistic in light of the financial market opening in China, the growing cross border capital market integration we see across equities and fixed income and an increasing proportion of China's cross-border transactions being denominated in RMB," Morgan Stanley international strategist James Lord said. More and more central banks worldwide have been gradually stockpiling yuan in their coffers. According to Morgan Stanley, at least 10 regulators added the currency to their forex reserves last year, with the total number of holders reaching 70.

International Monetary Fund (IMF) data shows that the renminbi share in global reserves has doubled since it was included in the IMF's basket of major reserve currencies in October 2016. Back then, the share of the yuan amounted to one percent, and now it stands at 2.02 percent. Its main rivals – the yen and the British pound – have a 5.7 percent and 4.43 percent share respectively. The US dollar accounts for almost 62 percent of global forex holdings and the euro for over 20 percent.

Russia

After discussing the launch of the digital ruble with local banks, the country's financial watchdog says it will present a more detailed concept for the national digital currency by summer.

Russia's central bank initially revealed that it was assessing the possibility of creating a digital form of the Russian national currency in its report published in October 2020. The digital ruble is meant to exist along with cash and non-cash rubles and will allow private and corporate users to freely transfer digital rubles to their electronic wallets and use them on mobile devices.

The head of the Central Bank of Russia, Elvira Nabiullina, said on the 18th of February, that the regulator received detailed feedback from the banking community in its October report, in which the regulator introduced the digital ruble as a possible new form of national currency. According to the official, most lenders support a two-level model of the digital ruble, which allows banks to open wallets for their clients on the central bank's platform and conduct operations.

"We will develop a more detailed concept and start discussing it with the public, market participants, and banks at the beginning of summer," Nabiullina said. She added that the next step will be launching and testing a special platform. The adoption of the new form of the currency will also require amending legislation. The new form of the Russian currency is to be test-launched as soon as 2021 in the Crimea. Earlier this year, Russia's central bank said that the digital ruble may be used for international money transfers, but only after its global peers establish their sovereign digital currencies.

More than 30 financial regulators are currently working on their national digital currencies, according to First Deputy Governor of the CBR, Olga Skorobogatova. Given the pace of the development, several countries may launch the new form of currencies over the next 5-7 years, the official added.

The development of digital currencies may challenge the SWIFT international banking payment system and could eventually make it redundant, the Central Bank of Russia (CBR) has said. "Then we can deal with direct integration issues. In this case SWIFT it may not be necessary, because it will be a different kind of

technological interaction," Skorobogatova said at an online meeting earlier this week. However, the global banking network may become one of the platforms for the new form of national currencies, she added.

Meanwhile, Russia's largest lender, Sberbank, has applied to the national financial regulator to set up a blockchain platform for its own digital token called Sbercoin. The project may be launched as early as this spring.Sberbank sent the application for the platform to the Central Bank of Russia at the beginning of the year, Director of the Transaction Business Division Sergey Popov revealed earlier this week. He said that the registration was required by the law on digital financial assets, which came into force in Russia on January 1,2021.

However, Sberbak still has to resolve some issues linked to the digital currency, such as the taxation of digital financial assets as well as how the token can be used. According to the bank's top manager, Sbercoin can be used as a "digital promissory note," as this form can open "new opportunities" if it replaces the paper one. Sbercoin could actually be a stablecoin. Unlike bitcoin and other cryptocurrencies, stablecoins are pegged to fiat currencies, and Sberbank's token will be pegged to the Russian ruble.

The most commonly used stablecoin is issued by Tether. By March 2020, Tether's market capitalisation was more than USD 4.6 billion, but its use is almost entirely limited to the crypto-asset market. Other examples include Fnality and JPM Coin. Facebook recently announced that it was launching a new stablecoin named Libra in cooperation with a group of multinational corporations, with the currency being operated by an umbrella organisation called the Libra Association.

India

The Indian government plans to introduce a bill to prohibit "private cryptocurrencies," paving the way to outlaw the likes of bitcoin. The law is set to facilitate the creation of the nation's own official digital currency. The legislation moves to prohibit what it calls "all private cryptocurrencies in India," but allows "certain exceptions" to promote blockchain, the underlying technology of cryptocurrency and its uses. It also aims to provide a framework to set up an official digital coin, issued by the Reserve Bank of India.

India has previously tried to ban virtual currencies, including bitcoin. In 2018, its monetary policy regulator alerted banks that they must stop dealing with them, citing "various risks associated in dealing with such virtual currencies." However, the move was subsequently overturned by India's Supreme Court, bearing in mind that there are millions of crypto investors in India and, as Rahul Pagidipati, the head of a leading exchange, ZebPay, said "Crypto assets and digital government currency can co-exist and together, they can bring tremendous benefits to the Indian economy"

European Union

The European Commission and European Central Bank are working together to investigate the policy, legal and technical questions emerging from a possible introduction of a digital euro.

Having just closed a public consultation on the subject, the ECB says it will now consider whether to start a digital euro project towards the middle of the year as it looks to answer design and technical questions ahead of any decision to actually issue the CBDC. Now, the ECB and the EC have created a joint technical group to look at the policy, legal and technical aspects of the possible introduction of a digital euro. The EC says that one of the reasons a digital euro is appealing is that it could help promote global use of the currency. However, the Commission has also stressed that there are significant issues to address relating to financial stability, financial inclusion, and anti-money laundering and counter-terrorism financing. The public consultation was launched on 12 October 2020, following the publication of the Eurosystem report on a digital euro. Among respondents to the ECB's public consultation, privacy of payments ranked highest among the requested features of a potential digital euro (41% of replies), followed by security (17%) and pan-European reach (10%).

"A digital euro solution should not crowd out solutions that come from the private sector. In the ECB report, it is highlighted that such a solution would be complementary to private sector opportunities. There should not be rivalry or competition." ECB president Christine Lagarde said "A digital euro will never be a substitute for cash. It is a very good supplement and a very good partial substitute for what was being done physically."

"Technology and innovation are changing the way we consume, work and relate to each other," says Fabio Panetta, member of the ECB's executive board and chair of the task force. "A digital euro would support Europe's drive towards continued innovation. It would also contribute to its financial sovereignty and strengthen the international role of the euro.

The Italian Banking Association is to kick of a techncial feasibnility study on the use of distributed ledger technology for a future digital euro. The initiative comes at the urging of the European Central bank for EU

nations to contribute to the public policy debate around the creation of a central bank digital currency (CBDC) covering the Euro-zone.

The experimentation project is divided into two work areas: one involving the infrastructure and distribution model to analyse technical feasibility, and the second focusing on programmability to experiment with use cases that can differentiate the central bank's digital euro from the electronic payments already available.

The European Central Bank is stepping up its analytical investigations into the potential for creating a central-bank backed digital currency for retail customers, a move which would be "a game changer" for the banking industry, says ECB exec Yves Mersch. "A wholesale CBDC, restricted to a limited group of financial counterparties, would be largely business as usual," says Mersch. "However, a retail CBDC, accessible to all, would be a game changer. So a retail CBDC is now our main focus. "The creation of a retail CBDC would need to address the currency's legal tender status and the relationship between a CBDC and euro banknotes and coins, along with the process by which one could be exchanged for the other.

Mersch describes two different ways to design a CBDC - operating either as a decentralised digital token, or based on deposit accounts lodged with the central bank. Of the former, he says: "We are currently looking into the legal questions raised by the potential use of intermediaries to facilitate the circulation of a CBDC and also the processing of transactions in a CBDC. To what extent are we permitted to outsource public law tasks to private entities? And what would be the appropriate extent of supervision over such entities?" The latter approach raises serious policy questions relating to the potential disintermediation of commercial banks and the possibility of digital bank runs, as consumers cash out their accounts in favour of a central bank-issued currency.

What, then, could be done to mitigate the impact of a CBDC on the financial system? asks Mersch."One option could be to remunerate CBDC at below-market rates in order to create incentives for non-banks to rely more on market-based alternatives rather than on central bank deposits. The drawback would be that, in times of crisis, it may become necessary to apply highly negative rates, which could generate criticism from the public and substantially undermine public confidence in the central bank as well as in the basic values of saving which underlie our societies.

"Another option is a tiered remuneration system. In line with the functions of money, the first tier could serve as a means of payment. The central bank would have to refrain from setting a lower or a negative interest rate in order to keep a CBDC attractive to the public as a means of payment. While the second tier could serve as a store of value, the central banks could discourage people from using it as such by setting unattractive interest rates. However, such schemes should draw from the experience of multiple exchange rate regimes. And the repercussions of the intentional use of such schemes need to be subjected to an additional comprehensive investigation." For the moment, the ECB's investigation is purely analytical.

Bank for International Settlements (BIS)

In its annual economic report (June 2020), BIS says that while central banks play a pivotal role in safeguarding the payments system, they also need to foster innovation.

One significant way in which they are looking to innovate is through the investigation of Central bank digital currencies (CBDCs) which "deserve consideration" as an additional means of payment.

Last year, BIS surveyed 63 central banks, finding that 70% are currently, or soon will be, engaged in CBDC work. Since then, Canada, Italy and Thailand, among others, have taken significant steps on the issue. The central bankers' bank has previously urged caution on the subject but it now says such digital currencies "could offer a new, safe, trusted and widely accessible means of payment". Benoît Cœuré, head, BIS Innovation Hub, says: "Central banks around the world are stepping up their efforts to study CBDCs and, whether wholesale or retail, the goal is to create safe and reliable settlement instruments for transacting in the digital economy."

A group of seven central banks together with the Bank for International Settlements (BIS) have published a report laying out the key requirements for creation of a central bank digital currency.

The report, 'Central bank digital currencies: foundational principles and core features', was compiled by the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, the Federal Reserve, Sveriges Riksbank, the Swiss National Bank and the BIS.

It highlights the key principles and core features of a CBDC, but does not give an opinion on whether to issue, although the race is clearly on to catch up with China's trailblazing exploits and beat off private initiatives such as facebook's Libra.

The document stresses that any introduction should support wider policy objectives and do no harm to monetary and financial stability. Coexistence with cash and other types of money is considered essential, as well

as core features that promote innovation and efficiency. "This report is a real step forward...in agreeing the common principles and identifying the key features we believe would be needed for a workable CBDC system," says Jon Cunliffe, deputy governor of the Bank of England. "This group of central banks has built a strong international consensus which will help light the way as we each explore the case and design for CBDCs in our own jurisdictions."While there will be no 'one size fits all' framework due to national priorities and circumstances, a workable CBDC should at a minimum, be:

- Resilient and secure to maintain operational integrity
- Convenient and available "at very low or no cost" to end users
- Underpinned by appropriate standards and a clear legal framework
- Have an appropriate role for the private sector, as well as promoting competition and innovation.
- Benoît Cœuré, working group co-chair and Head of the BIS Innovation Hub, says: "A design that delivers these features can promote more resilient, efficient, inclusive and innovative payments.

3 Conclusions

The digital payments space saw vigorous investment activity during 2020 and there have been a plethora of announcements about account based Central Bank Digital Currency (CBDC). Whilst some emerging markets have announced that they have either launched or are launching a CBDC, what many do not realise is that creating a digital currency is actually the easy part.

What is more important is how it is linked into the wider ecosystem to ensure the circulation of money and cash flows. Without it, it is a cart without a horse. It looks like the likes of China are making good progress having understood this construct and other major nations will not stand by watching and as such here will be some interesting developments with numerous pilots in 2021 starting to develop.

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The Relevance of Measuring Performance Using Financial Statements

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Abstract: When we evaluate the performance of companies that seek ways to measure the financial and economic aspects of decisions relating to investments, operations and finance. Our approach proposes an analysis of financial performance based on the financial summary. These are the most accessible source of data, although not the most "economic" way of presenting such data. We present also, and most important metrics that can contribute to financial performance. As we will see, there is a wide variety of solutions, and measurements of individual reports, some other purely financial and economic content. No indicator or measure will be considered predominant. We will focus on relationships and indicators, which allow measurement of past performance and estimating future performance, we emphasize the significance, and inherent limitations.

Keywords: performance measurement, indicators, financial statements, profitability

1 Introduction

Recent years are marked by the appearance of numerous concepts regarding definition, classification and highlighting ways of enhancing performance in an organization.

Enterprises increasingly emphasizes the importance of their relationship with external partners, customers, investors, the foundation of their success in business.

The way in which a company measures the financial performance affects the financial decisions of users (shareholders, managers, creditors). Performance indicators should serve to assessing the economic value of creating value and future earnings potential. Financial statement can contribute to more effective communication of opportunities and challenges of economic, environmental and social facing enterprise than simply reply to requests for information of interested partners. These goals are in line with the IASB approach to guide decisions in normalization.

Thus, it creates a bridge between financial statement and economic interpretation in terms of enterprise performance.

Why is the studied matter important?

Because there are many tools for measuring performance, we should note that different techniques often lead to very stringent assessment and as narrow a definition. Our system of evaluation and measurement of crumbling under the burden of rigidity, lack of relevance and reliability. But, surprisingly, conservative accounting is the first wake.

Methodological arsenal or be adopted to new requirements. Near them, or even at confluence, the imperatives of financial performance on an updated name.

Specialists in the field give their account of the crucial moment of the start and to put question (question we put them us): if company resources are used efficiently, if the profitability of the business is expected and if the financing options are chosen properly and prudently?

As we will see, there are a variety of solutions for individual measurements and reporting, some purely financial, while more economic content.

In this context, we believe that performance measurement and reporting of both the past and of the anticipated method of management is essential in today's interconnected world, "the world news 24 hours" in which it circulates with a maximum speed.

Based on the hypothesis according the which the interests of measuring performance, selected references, measuring instruments are located in close connection with the objectives of the company and its partners, we chose to build the discussion around the most important categories of users: managers, shareholders (investors) and creditors, and the way in which they are interested in business success, each from a particular point of view.

Our study result from a review of literature on the topic raised. This review has helped us to structure elements relating to: the way in which a performance measure, the selection of indicators of financial performance, performance evaluation based on the financial decisions of users of financial information.

Efforts conducted under the current trends and analysis of literature suggests that performance is a concept used in theoretical approaches and also a permanent concern in business practice; it is influenced by the economic and political modes of governance of an enterprise.

Perception is different depending on the specific interests of each user of financial accounting information, but also represents a direction of priority for international normalized accountants.

Currently, financial performance of companies know a degree of complexity, and for defining the content, you have to consider several sides of an enterprise activity.

In this context, we thought we build our vision of the three categories of users mentioned above, along with the most commonly used methods of measuring performance.

2 Literature review

An enterprise is a dynamic environment, which has as its principal objective of adding value. But it urges the study of performance through the effective management of resources.

You can approach this without a thought to have managed without enough to know the company, its structure and strategies.

In this sense, to develop this material were required to use the knowledge of accounting related areas such as economic and financial analysis, management and finance. Also, the materials studied in the literature, we have helped to structure the information required to prepare this article.

They relate mainly to those aspects of performance measurement and analysis that are subject to debate and approaches for which no set answer or solution to be accepted by scientific community or practice.

An analysis of the relevant subject (and also an interesting source of inspiration for us) was made by Stefan Bunea (2006) in "Monocromie si policromie in proiectarea politicilor contabile ale intreprinderilor" who will express their views on assessment relevant financial performance of enterprises.

View is that " *how a company measures the financial performance, affect the financial decisions of users the financial statements of users (shareholders, members of the administration, financial managers, or creditors) and the effectiveness of management systems influenced by the selection of performance indicators"* (S.Bunea, 2006, p.191).

Another source of inspiration for us was a work of Erich A. Helfert (2006) *"Tehnici de analiza financiara"* where, during a whole chapter done a comprehensive analysis of company performance. Presenting the most important categories of users of financial accounting information together with their fields of interest, he groups in a table. We thought the new approach interesting, therefore, we took the table in our paper.

Analysis of literature found that users of financial accounting information si presented descriptive, in a static vision. Supreme approach through the categories of users that should be used by beneficiaries for the decision.

Consider pertinent remark *"that very little was written about what users of financial accounting information deemed to be useful in practice and the reasons for their selection" (Dutescu, 2000, p.27).*

The size of the static presentation is outdated when the authors focus on the relationships are established between the various users of financial accounting information (eg. Minu, 2002).

In our turn, we preferred to present the dynamics in the three categories of users chosen, namely, dynamic relationship that is created between them.

To clarify issues of the chosen theme, we can remember and other authors and works of reference that we were really helpful in our development: *: N.Albu, C. Albu (2003) in "Instrumente de management al performantei", V.Avram (2003) in "Managementul crearii de valoare si guvernarea intreprinderii", Cohen E. (2000) in Analyse financiére et comptabilité, Encyclopédie de Comptabilité, Contrôle de Gestion et Audit, Ristea (2000) in "Metode si politici contabile de intreprindere"*.

Other sources of documentation and have been online we have allowed the study of and publications in the field, such as: Business Week (www.businessweek.com), Virtual Finance Library, Ohio State University (www.cob.ohio_state.edu/dept/fin/overview.htm) , an excellent source of information about the views of specialists in the field.

Because our research is both a heuristic approach and one reason we try to seed answers or solutions to immediate problems of practice organization.

3 Tools for measuring the performance

By definition, a link to an indicator of economic value to another, possible combinations are limited only by the imagination of everyone. Each indicator or measure is useful only in relation to the starting point was a hypothesis and objectives. If there is such a correlation, the measurement may become a standard for comparison (N.Albu,C.Albu,2003:p.236).

Helfert (2006:p.111) says*:" moreover, indicators are not absolute criteria, but serve only to reflect the financial and operational performance for certain time periods compared with other similar businesses. The indicator help to illustrate trends and structure of these changes, in turn, may indicate a risk analysis or business opportunity."*

To sketch a structure consistent use of indicators, we will build the discussion around three major points of view of financial performance analysis. Although there are a number of individuals or groups interested in the success or failure of a business, the most important categories of users: managers, shareholders (investors) and creditors.

Areas of interest in the management, investors and creditors are listed on the table below, together with the most commonly used methods of measuring performance.

Table 1. Performance indicators and perspectives segment

Management		**Investors/Shareholders**	**Creditors**
Operational analysis		**ROI**	**Liquidity**
Gross margin Profit margin Value added Gross exploitation surplus The net result of exploitation Analysis of operational costs Structural analysis Operating leverage Comparative Analysis		Return on net assets Return on capital Profit per share Cash flow per share Increased stock shares Total return to shareholders	Liquidity Overview Acid test Liquidation value
Resource Management		**Taking profit**	**Financial indebtedness**
Rotation assets Capital management Stock rotation Rotation receivables Rotation suppliers		Dividend per share Dividend rate Rate distribution Degree coverage dividends Dividend/ Total assets	The degree of indebtedness Financial stability (Debt/Capitalization) Financial autonomy (Debt/Capital and reserves)
Profitability		**Market Performance**	**Debt service**
Economic profitability (net) Gross Return Return an net assets Economic value added Economic Profit Return on cash-flow map Free cash-flow		PER Degree of multiplication of cash-flow map Market value/book value Relative movements of stock Vectors of value Company value	The degree of coverage of interest Coverage of debt Coverage of fixed costs Cash-flow analysis will

Source: Erich A. Helfert – "Tehnici de analiza financiara ", 2006 :p.113

3.1 Managerial perspective

Management has a dual interest in analyzing financial performance:

- to improve efficiency and profitability of operations;
- to assess the effectiveness of using company.

Interpretation of a business operations are conducted primarily through analysis of the Income Statement , while analyzing the efficiency of resource utilization is based on both the Balance Sheet and the Income Statement (Minu,2002:p.186).

In order to deliver economic judgments, it is often necessary to convert the financial data available to reflect the current economic conditions. An initial evaluation of the operational efficiency of the business is generally done through an analysis of the percentage of the Income Statement. Individual costs are normally related to sales, which means that gross revenues from sales are adjusted to returning any products or discounts offered. Nature of sales allow fair comparison between the costs of key sales from one period to another in a long time and the company's competitors or industry in which it belongs.

Operational Analysis

Two of the most common indicators are operational analysis for calculating the cost of goods sold and gross profit margin as a percentage of sales.

These indicators show, in fact, share the cost of goods purchased or produced or services rendered in connection with the sales and gross margin remaining to cover operational expenses and achieve profit.

A change of gross margin is due to changes in combination:

- the selling price of the product;
- the cost of manufacturing products;
- any variations in the mix of products.

Any changes in the cost of goods sold by a company or a margin gross obtained it in a period of time requires a thorough analysis of the causes which led to these changes.

The period envisaged for such a trend analysis depends on the nature of business. For example, many businesses have seasonal fluctuations normal, while other are affected by economic cycles lasting.

This indicator serves as a signal rather than the absolute measure, as most of those which we present below.

The relationship between net profit after tax (net profit) and sales value indicates the ability of management to drive the business profitability.

In this case, success means not only recovering the cost of goods sold or services rendered, the operating expenses (including depreciation) and cost of borrowing, but also maintaining a satisfactory margin of reward investors for placing their capital under risk.

The Net Profit/Sales actually expressed overall cost effectiveness value for the company's operations.

A variation of this indicator using the net profit before interest and tax (EBIT), in other words net operating profit (net to reduce depreciation) . This value is obtained operating profit before payment of any obligations to creditors of the company. It will also calculate the profit before tax due the state, which usually is based on an amount as profit, according to non-deductible expenses and non-taxable income.

This indicator gives a much clearer picture on operational efficiency, not distorted by the financial or the tax.

An indicator often used by financial analysts and is modified and adjusted EBIT of established provisions and depreciation recorded (Bunea,2006:p.196).

This is an attempt to reflect any profits tax free and no allocation of expenses recorded in the form of provisions and depreciation.

Niculescu (2003) make a solid argument can be made is that tax should be considered an expense of the course work. Thus, the formula may be adjusted EBIAT by using a net operating profit after tax, noted EBIAT, which requires an adjustment to the tax impact of interest expense. As an expression of the ability to create operating profit after-tax, becomes a night of calculating the economic value added – EVA.

Analysis of contribution

This type of analysis was used primarily as a internal management tool. It involves linking sales with margin contribution of individual products or product groups, form all company.

May exist significant differences between to contribution margins of different industries, due to variation needs capital investment required and the cost-volume involved. Even if a company namely, the different production lines may contribute differently to cover fixed costs and obtain profits (Bunea,2006:p.270).

Be noted that the indicator is sensitive to three key elements: volume, price and direct costs, which are combined in the management of company operations.

Contribution margins are derived from financial statements and are useful as a general but limited to understanding the risk characteristics of business.

Measure suggests the ability of management to use the price you have the ability to control costs in the different moments of the economic cycle.

Resource Management

At this stage we are interested in evaluating the effectiveness with which management has used the assets that they have been provided by the shareholders of the company. In a view of *Helfert (2006),* when analyzing a company's balance sheet, can make certain conclusions regarding the size, nature and value of existing assets, can analyze the relative proportions of assets and may determine the existence of a solid in terms of company assets. Indices, such a high level of accumulated depreciation from the value of entry, may suggest that there is an "aging" of the company's assets that my require investment. Similarly, a significant increase in the level of available cash may suggest a postponement of new investment and an accumulation of excess funds in cash. Increases of circulating active elements, such as stocks or claims may suggest the existence of problems in inventory management and credit policy promoted by the company.

A statement of cash flows provides a useful variation on the allocation of resources, which are induced by variations in the balance sheet items. (Feleaga,Malciu,2004:p.88).

In broader sense, there are a number of indicators that measure the general trend of resource use. These indicators essentially involves rotation evaluation of assets and reflection in various forms, the relative amount of capital used to support transactions.

Capital management

Indicators used in the analysis of key elements of working capital (stocks and claims) tend to express the relative efficiency with which stocks are managed and the company claims. These indicators help to detect the signals of deterioration or excessive accumulation of inventories or receivables.

Amounts included in the balance sheet are generally reported in the most general level of activity, such as turnover or cost of goods sold, assuming that there is a close relationship between the asset and that are reporting.

The stocks can not be accurately assessed only by a current measuring, a check and an estimate of current value.

The most appropriate is to report the accounting of stocks to turnover or cost of goods sold, to see if there is a change in this indicator over time.

Moreover, it is necessary to observe closely the methods of accounting records of inventories, such as LIFO (last-first came out), FIFO (first come-first out) or weight average cost of stocks, any change to these policies may affect the results analysis, the impact of these accounting policies on balance sheet are significant.

Although a simple relationship with the level of stocks, gives an overview on the performance management, usually more accurate reporting of stocks at the cost of goods sold.

Just as the two elements of the indicator are reported on a similar conceptual and economic.

Use turnover creates a distortion, because the value of sales also includes a profit margin of the company, no margin in the accounts and balance sheet stocks.

We need to have in mind that there are problems related to accounting measurements, as encountered, in using analytical methods, whereas the book value of stocks may be seriously affected by the method of assessment of their chosen company.

Electronic links and deliveries on "just-in-time" have significantly improved the management of stocks in recent years.

Claims analysis is based on sales.

The question to ask is whether the claims at the end of period approximates quite accurately the amount of sales on credit estimated to remain received within agreed trading terms. For example, a company that sells products with the value of the collection to 30 days, would expect that normally, the level of its claims to be equal to sales recorded in the previous month. If the value and values are not listed for 40 or 50 days means that there is a difficult of clients to pay maturing obligations or there is an abuse of trust from those customers.

There are certain situations is which sales are made under conditions of extended payment terms compared to normal.

An exact analysis of claims can be achieved only by examining the claim that the age recorded in the company.

Ranking claims by age, involves a classification of them in the time intervals of days 10.20.30.40, etc., attached this analysis and the terms applicable to commercial credit company said.

This analysis assumes access to detailed information on the analytical accounts of clients, will resort to an approximation using general balance sheet receivables and sales volume in determining the duration in days in claims against the company's customers.

The problem of interpreting the basic conditions for capital is related cash flow, believes (*Bunea, 2006:p.210).*

In time, all the capital is converted to cash and must assess the nature and quality of the conversion cycle of a company's cash. Excessive spread between debt and a steady increase in the level of stocks can significantly affect the normal cash conversion and lead to distortions of the financial system of the company.

Profitability

In the opinion of *Niculescu (2003) -The simplest form of analysis of profitability is to report net profits derived from the total assets in the balance sheet.*

Can be used and the net assets (total assets-current liabilities), noting that current liabilities are the company to involve virtually no cost of financing assets. This profit is directly affected by the proportion of debt in capital structure due to interest costs involved in this debt, expenses have been deducted from taxable profit.

A more significant result obtained if we remove both interest and tax of the net profit and use the result of exploitation.

This rate of return adjusted to reflect gross earnings capacity of capital invested, irrespective of the mode of financing of capital or income tax deducted by the tax authorities.

Another measure of profitability, is the concept of economic profit or economic value added – EVA. *(Bunea, 2006:p.194).*

Determination is based on the assumption that to create value for shareholders, the profits obtained from use of resources must be allocated to higher cost of capital to finance these resources.

To determine cost of capital, it is necessary to define the assets involved, which usually are not assets and to calculate the weighted average cost of capital invested. Then, the asset is multiplied by the weighted average cost of capital, cost of achieving the value of capital, which decreased net income operational resulting the economic benefits obtained by the company. If the value obtained is positive, to create value for shareholders, if the result is negative, the value has been destroyed, consumed.

In conclusion, the various indicators available to assess the performance operations, capital allocation efficiency and profitability from the exploitation of assets.

These measures are only affected in a particular way of uncertainties related to accounting methods and evaluation, but used together can provide relevant clues about a company's performance, while suggesting directions for future analysis.

3.2. Perspective of investors/shareholders

A second relevant perspective in analyzing company performance is the business owners. They are ones to which managers are responsible for the company . It is clear that managers must be fully responsive to the views of investors and their expectations in terms of time, obtain and evaluate operational results.

These elements are based on creating value for shareholders (Avram, 2006:p.62).

Similarly, managers must be responsive to the position and perspective of the creditors. Key point of interest to business owners is return on investment. We refer to the return obtained by the lead management, on the resources invested by owners.

Are planning a series of indicators reflecting the performance of the company in connection with the investment shareholders.

Two of these indicators, profitability and return on equity capital are measures of profitability total investment of shareholders, while the third, the profit per share, measure the proposition of each unit of investment in company profits in a given period.

Investors are also concerned and how the distribution of profits which they belong, that is what the profit is invested over the distributed as dividends or in some cases, the ransom of shares issued, investors are concerned about the company's results and future expectations concerning the market value of the investment especially in the case of companies listed on stock exchanges (eg.Malciu,1998:p.19).

In short, the indicators relevant to the perspective of investors on business performance are those that measure profitability form shareholders and distribution cash received by them in the form of dividend and expectations regarding future performance.

These results depend on the ability to profit of the company, management policies, decisions regarding the use and indebtedness reinvestment profits and exploitation vectors of creating value in the company.

After all, all management decisions affecting the economic value of capital invested by shareholders, a fact reflected in market prices of company shares.

3.3. Creditors' perspective

Although the managers and owners is the main orientation business continuity, it is necessary for creditors dual approach. Creditors are interested in financing a profitable company needs in terms of a performance.

At the same time, they should consider the option and the failure or liquidation of the company.

Choosing between not benefit from the success of the business and receive regular payments of interest and principal, creditors should evaluate carefully the risks involved in the recovery of capital advanced on loan, especially in the case of the lending period longer.

Part of this assessment is the liquidation of claims of creditors in the event of a failure of the business.

There are a number of indicators that are used to evaluated the protection of creditors, testing the liquidity of the business. Another set of indicators to assess the relative exposure of debt, called the degree of indebtedness of the company to determine the ratio between the position of shareholders and creditors of the company.

Finally, there are so called coverage indicators, which measure ability to meet debt service on the funds generated from continuing operations (www.cob.ohio_state.edu/dept/fin/overview.htm).

4 Conclusions

Since there are many tools for measuring economic performance, we should have
in mind that different techniques often lead to very stringent assessment and "narrow" as a way of defining. However, few correlations will yield information that analysts and managers need for substantiation decision.

In the performance analysis can not draw firm conclusions. Any inquiries can be made that are relative, as business conditions vary form company to company and from industry to industry.

Comparisons and standards based on past performance are difficult to interpret global. An example are companies with large field of activity in which information about a given activity is limited.

Performance evaluation based on the financial situations is a task oriented past; it is difficult to make extrapolations future. However, any decision is the result of such analysis of performance that can only affect the future, the past is unrepeatable (Ristea, 2000:p.121).

In the performance analysis can not draw firm conclusions. Any inquiries can be made that are relative, as business conditions vary form company to company and from industry to industry.

Comparisons and standards based on past performance are difficult to interpret global. An example are companies with large field of activity in which information about a given activity is limited.

We tried, through this article, to present key aspects of the main financial statements as a basis for evaluating financial performance, although the process of creating real value for shareholders is based on cash-flow.

In this context, we demonstrated that the performance of the business makes sense only if viewed from the perspective of each particular group interested in the company.

We chose to focus on individual perspectives of the three categories of users – managers, shareholders, creditors – which are essential to the operation of business. . All groups are interested in basic business success, each from a particular point of view.

I understand that the present range of indicators, crucial test of the business is return of capital invested and its effect on capital owned by shareholders.

These indicators are best interpreted when tackling a correlation system, sensitive to managerial decisions, which involved the development of specific vectors of value creation.

Many indicators are individual in nature and only static elements can not be interpreted in context with rigor business dynamics.

Drawbacks are related to the limitations of traditional accounting principles.

In this sense, it emphasized the need for managers to adopt an economic perspective, based on cash-flows, for the substantiation and take decision, which long term will cause a performance – based accounting information.

In conclusion, we believe that there is no definitive and reliable method of balancing these issues of measurement, making the analysis of financial instruments comparison of actual economic performance.

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The Connection between Research and Concept Development in Accounting and Other Management Sciences

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Abstract: - In this paper the attention is focused on the close connection between the research process and the application of its elements in accounting and other management sciences, leading to the formation of new concepts. These concepts aim at developing the existing specialized literature, starting from the theoretical structure and substantiating with applicative elements that forms a whole at a practice level. The paper includes notions and concepts presented from the general level to the particular level, exemplifying the information described through the prism of one's own experiential research.

Key-Words: - accounting, management sciences, research, concept, development, innovation

1 Introduction

The idea of writing this article has emerged after several debates at which we attended, debates between theoreticians, practicians and academics. The main discussion topic is centered on the idea that in accounting the process of creation and introduction of concepts is slow, difficult to realize. Through this article we do not fully contest these statements, but we want to show that at least a part of these processes is realizable. In the end, we wish to exemplify concepts that we have proposed, concepts that emerged from ample research of the PhD thesis and research included in scientific articles. The concepts have been shared in the academic environment and also to the wide public.

These concepts are based directly on accounting notions but we will add and exemplify also concepts that are correlated to accounting and management sciences – financial management, financial analysis, strategic analysis).

2 General framework

This paper represents a synopsis of the research process carried over 9 years and is presently continued. We will present the creative concepts what we have developed so far in a concentrated manner, exemplified and we will also highlight briefly the research methods that we have used and the steps that led to the creation of new ideas. These ideas have been and are meant to provide an added value, a new vision over an environment that is considered rigid, without extended malleability.

3 Research methods

In the research we have focused on elements from accounting and management sciences and have searched for multiple approach angles for the information, an approach of content and concept, therefore providing an unique, original vision based on our steering and trajectories we have carried as researches and also based on the leads we have followed.

The general research method involved a whole hypothesis validation process of the study's research, the multiple hypotheses being established using „general methods of knowledge highlighted through deduction, induction and abduction" (Niculescu & Vasile, pg. 110).

Through this article we exemplify a theoretical conceptualization of some parts from the results we have obtained, switching from the veridical observation of reality to a subjective idea filtering. Therefore, the whole process has generated a reevaluation of existing concepts and theories and has led to the creative working of notions and to the emergence of new notions.

The theoretical research contained the analysis of scientific and specific research in the domain, of materials related to the subject of the research and the study of all elements emerged as ramifications from the subject domain that influence the results of the research.

The theoretical approach has been comprehensive due to the pluri-disciplinary character of the notions in study, including books, treaties, manuals, magazines, encyclopedias, courses, local and international papers from the specific literature, particularized studies of accounting and management sciences, regulations, international and national standards, and also other materials with adjacent valences to the proposed thematic that has led to associations that state a high originality character (materials from domains like psychology, education, management, etc).

The documentation process supported the complex construction of the proposed research leading to the formation of new conceptual contributions, to the descriptive and explanatory exposal of the research's content related to the proposed objectives.

After taking into consideration the theoretical demarches, we have the followed the empirical demarche through setting meetings with specialists that have a well-defined role in coordinating the notions of economic and financial analysis, and the financial and accounting elements (academicians, domain experts, accountants, etc). through the communication with these specialized persons, we have accumulated a significant portfolio of information that has supported the scientific activity. Also, within the empirical demarche, we mention the transmission and explanation of a questionnaire issued in order to establish the perception over certain concepts in our area of purpose, the results obtained having a high importance in building our research.

At a qualitative level, we have carried qualitative researches through interviewing financial analysts that have provided a significant addition in the determination of the information that form the concepts we will exemplify in the content of the article.

Other qualitative demarches have been carried over the research through the realization of interpretations and analysis of content and through the proposal of new concepts and own constructions.

An important aspect of the present article refers to the application on a complex vision on the research, beside the applicative, explicative, descriptive, predictive and correlative visions in the process of the creation and description of concepts.

4 Concepts regarding the „economic and social mutations - interacting with the subject and paradigms of management sciences" (Stefan-Duicu & Stefan-Duicu, 2013 pp. 1509-1513)

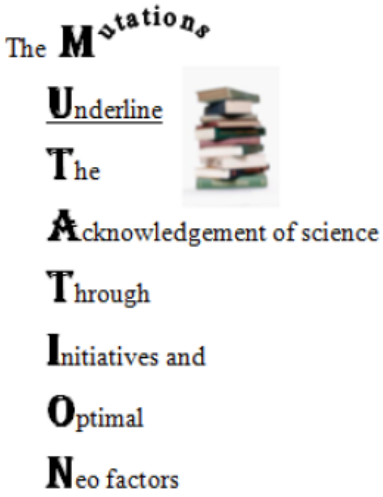
From the study we have carried and presented below, we extract the following concepts we have created as researchers (Stefan-Duicu & Stefan-Duicu, 2013, pp. 1509-1513):

- the factors leading to the emerging of economic-social mutations (Inherent Evolutionary Factor, The Gnoseological Factor (base knowledge), The Creative Factor;
- the classification of the mutations (Initial base mutations, Evolutionary mutations, Mutation of concept relocation, Initial base mutations, Evolutionary mutations with inclusive vision, Evolutionary mutation with non-inclusive vision).

The mutations, regardless their classification into the above stated framework, represent an important phenomenon into the global emergent knowledge.

In the social and economical environment, but not limited to, mutations generate effects for present and also for the future. Thus, it shows future directions of the phenomenon's evolution. Therefore, we can state that mutations represent a development and creation process within all domains we have encountered and will always remain a decisive element in the universal evolution.

Fig.1 Mutations



Source: created by authors

(Stefan-Duicu, V. M., & Stefan-Duicu, A. (2013). Economic and Social Mutations-Interacting with the Subject and Paradigms of Management Sciences. *Ovidius University Annals, Series Economic Sciences*, 13(1). Vol. 13 Issue 1, pp. 1509-1513)

5 Concepts regarding the „trans-boarding the doctrinal phenomenon within the management sciences towards a creative dimension" (Stefan-Duicu & Stefan-Duicu, 2015 pp. 259-263)

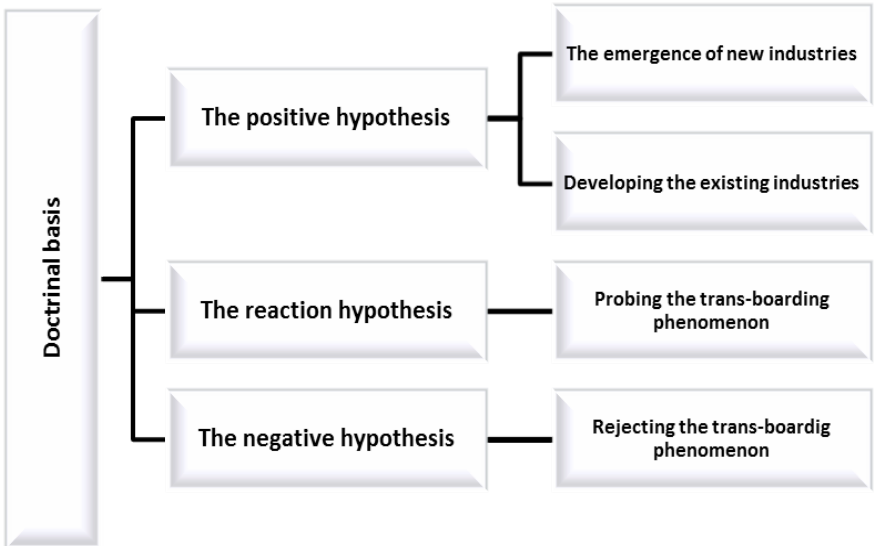
From the study named as above, we present some of the concepts we have elaborated: (Stefan-Duicu & Stefan-Duicu, 2015, pp. 259-263):

- The doctrines as an archetypal structure;
- The scenarios of doctrinal phenomenon affecting the economic dimension

(Doctrinal basis – the positive hypothesis, the reaction hypothesis, the negative hypothesis).

„The emergence of such a phenomenon is essentially due to the capitalization of scientific research and encouraging the human collective towards reaching new knowledge and new work environment" Stefan-Duicu & Stefan-Duicu, 2015).

Fig. 2. Scenarios of doctrinal phenomenon impacting the economic dimension



Source: created by authors

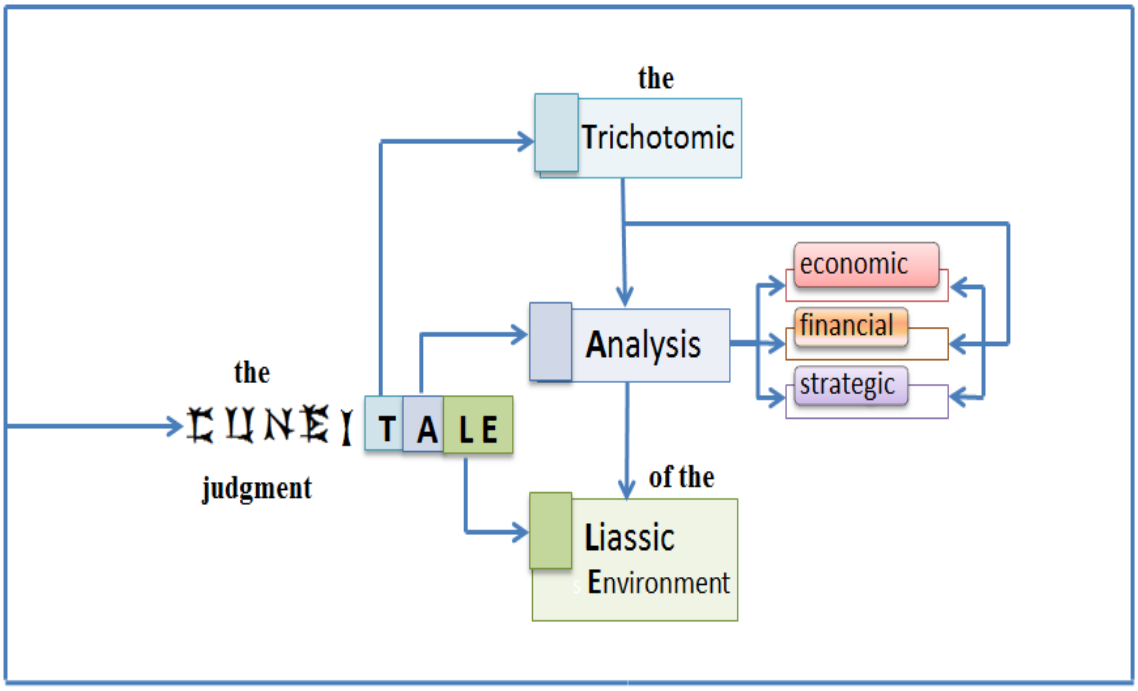
(Stefan-Duicu, V. M., & Stefan-Duicu, A. (2015). Trans-Boarding the Doctrinal Phenomenon within the Management Sciences Towards a Creative Dimension. *Procedia-Social and Behavioral Sciences*, 188,pp. 259-263)

6 Concepts regarding the „presentation of a futuristic concept: „THE *CUNEITALE* JUDGMENT" (Stefan-Duicu & Stefan-Duicu, 2016, pp. 130-135)

Within our research we have elaborated a vanguardist theoretical concept, along with such similar ideas that can be a starting point for other future ideas of researchers, academicians and others. We name the following concepts:

- The representation of the positive current – the passive role of the researcher;
- The representation of the constructivist current – the active role of the researcher;
- The layout of the research's demarche within a concatenated vision;
- The representation of the CUNEITALE JUDGMENT.

Fig. 3. The representation of the CUNEITALE JUDGMENT



Source: created by authors

(Stefan-Duicu, V. M., & Stefan-Duicu, A. (2016). Short Presentation of a Futuristic Concept: „The CUNEITALE Judgment", *Global Economic Observer Journal*, No. 1, vol. 4, pp. 130-135)

The „cuneitale" term is composed of three elements:

1) the first component refers to the construction of „cunei" that is related to the cuneiform writing through the use of the descriptive processes and the capacity of interpretation in order to present the stocked memory information at a certain point.

2) the second component of the term „*CUNEITALE*", namely „*TALE*" represents an acronym: the ***T**richotomic **A**nalysis of the **L**iassic **E**nvironment.*

The trichotomy refers to the classification in three parts of a concept, therefore sharing the analysis into financial analysis, economic analysis and strategic analysis.

The word „Liassic", in the context of proposing „*THE CUNEITALE JUDGMENT*" sets this type of judgment within the current context and refers to it as being an element that belongs to the contemporary environment.

„Marking the correlations of each term, the concept of „*CUNEITALE JUDGMENT* of the financial analysts" incorporates the judgment based on a systematic mechanism, rigorous and consistent, built gradually, starting

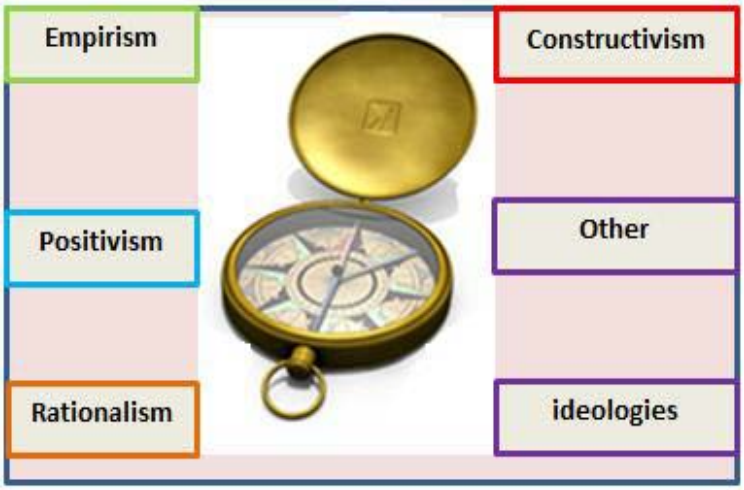
from the trichotomic footprint of the economic, financial and strategic analysis and using cases, elements and specific indicators of these types of analysis taking into consideration the current dominant theories." (Stefan-Duicu & Stefan-Duicu, 2016).

7 The „conceptual and regulatory delimitations of the professional judgment within an economic environment" (Stefan-Duicu & Stefan-Duicu, 2016, pp. 747-751)

From the study named as above, we present some of the concepts we have elaborated:

- The axiological defragmentation of the content of the professional judgment (explain the determining factors, the composing elements and also the modulatory purpose in issuing and forming the decisions);
- The spectral value of the professional judgment;
- The determining factors of the professional judgment (Professional training, Deontological factors);
- The purpose and the valences of the professional judgment.

Fig. 4 The spectral value of the professional judgment



Source: created by authors
(Ștefan-Duicu, V. M. (2017). *Conceptual and regulatory delimitations of the professional judgment within an economic environment*. Challenges of the Knowledge Society, pp.747-751)

8 Concepts regarding the „correlative notions of the „professional judgment" and the „professional behavior" (Stefan-Duicu & Stefan-Duicu, 2014, pp. 173-177)

From the study named as above, we present some of the concepts we have elaborated:

- General acceptances of professional judgment (The deontological vision of the professional judgment);
- Correlative notions of the professional judgment and the behavior (The link between concepts).

„This paper aimed at exposing the correlative notions between the professional judgment and the professional behavior through a creative and interdisciplinary approach." (Stefan-Duicu & Stefan-Duicu, 2014).

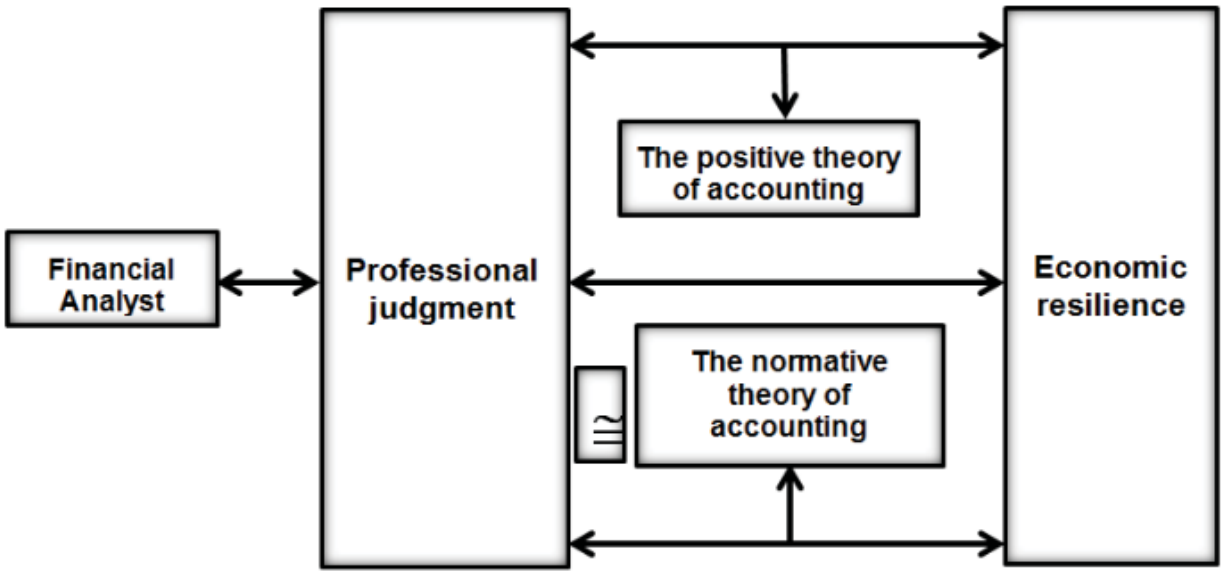
9 Concepts regarding the „professional judgment of the financial analyst in the context of normative and positive theories of accounting directed by the economic resilience" (Stefan-Duicu & Stefan-Duicu, 2014, pp. 1003-1006)

In this paper we have described the positive and normative theories of accounting, the professional judgment, economic resilience and the bond that has created between it.

We exemplify the following research demarches we carried:

- The process of resilience in an environment with a readjusting character;
- Considerations regarding the professional judgment of the financial analysts in the context of positive and normative accounting theories.

Fig. 5. The flow of judgment in economic resilience



Source: created by authors

(Stefan-Duicu Viorica, M., & Stefan-Duicu, A. (2014). *Professional judgment of the financial analyst in the context of normative and positive theories of accounting directed by the economic resilience*, The second world congress of resilience: From Person to Society, pp.1003 – 1006)

10 Conclusions

Our efforts are materialized in results that have an innovative form, in paradigms adjusted by the pluri-disciplinarity of the economical processes, in the concepts logically built aiming at providing an added value to the proposed research, at providing a neat logical framework due the quality of the writings from the domain literature.

The research methods fulfill the purpose of guiding the research to achieving the initially established objectives and to the validation or invalidation of the hypothesis that form the conjuncture of formulating the answers regarding the central question and secondary questions.

Development is a process of improving the economic and social situation of a country that improves the well-being of the entire population. Development is based on technical, cultural, social and institutional changes (Stoica, Sudacevschi, 2019, pp. 1116).

Recent theoretical developments seek to find solutions to conflicts of interest and information between the various internal and external partners in the life of the company, by negotiating contracts that best cover the uncertainty and risks (Grigore, 2005, pp. 5).

The conclusion forming from the cumulus of carried scientific processes through the use of research methods represent the result of all efforts carried by the researcher, whom benefited in this way from the confirmation of his effort form a new recognition of the problematics brought to attention. This article represent the first part of the synopsis we have presents within our research and explains the emerging need of showing to the academic world concepts that can exist further than itself or that can be modified by the practicians, researchers and academicians that can in this way bring new elements into the pluri-disciplinary area that we refer to.

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The Impact of Social Media in the Digitization Process

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Abstract: Digitization is the use of digital technologies to change a business model and provide new revenues and opportunities to produce value. The concept of the Fourth Industrial Revolution was first introduced in 2011 by a team of scientists who developed a high-tech strategy for the German government. In the case of sustainability, resilience is the relationship between different types of urban hazards, including ecological resilience, the resilience of urban and regional economies or institutions. In this paper we present a comparative analysis between the "Digital Economy and Society Index" (DESI) at the level of developed and least developed countries a composite index that summarizes relevant indicators of Europe's digital performance and tracks the evolution of EU Member States in terms of digital competitiveness.

Key-Words: social media, digitalization, Industry 4.0, resilience, "The Digital Economy and Society Index" (DESI).

1 Introduction

Several definitions of digitization are proposed. From an academic perspective, (Brennen and Kreiss 2014) define digitalization as "digital communication and the impact of digital media on contemporary social life."

In the Gartner IT Glossary, digitalisation is defined as "the use of digital technologies to change a business model and provide new revenue and value opportunities; it is the process of moving to a digital business ". (Information Technology / Digitalization 2021)

Along with business innovation, digitalization - the development of digital innovations - is one of the most important business trends for the future of the economy. Companies need to develop digital strategies and focus on what are the key success factors of digital transformation. Digitization increases productivity and efficiency, while reducing costs. Digitization improves an existing business process or processes, but does not change or transform them. That is, it takes a process from a human-driven event or a series of events to software-driven.

Digitization is crucial for the processing, storage and transmission of data, as it "allows information of all types in all formats to be transported with the same efficiency and also mixed." Digital preservation is a principle that also applies to digital born materials. One such example is "a Microsoft Word document saved as a .docx file or a post on a social networking site. Instead, digitization applies exclusively to analogue materials. Digital-born materials present a unique challenge for digital preservation not only due to technological obsolescence, but also due to the inherently unstable nature of digital storage and maintenance. Most websites last between 2.5 and 5 years, depending on the purpose for which they were designed." (Crestodina 2017)

Social networks (Hudson 2020) „refers to websites and applications that are designed to allow people to share content quickly, efficiently, and in real-time. While many people access social media through smartphone apps, this communication tool started with computers, and social media can refer to any internet communication tool that allows users to broadly share content and engage with the public."

„The ability to share photos, opinions, and events in real-time has transformed the way we live and the way we do business. Here are the basics of understanding social media and how it can be used to help promote your business. Social media is any digital tool that allows users to quickly create and share content with the public. Social media encompasses a wide range of websites and apps. Some, like Twitter, specialize in sharing links and short written messages. Others, like Instagram and TikTok, are built to optimize the sharing of photos and videos."

What makes social networks unique according to (Hudson 2020) „is that they are both broad and relatively uncensored. While many social media companies impose certain limitations - such as removing images that

display violence or nudity - there are far fewer limitations on what one can share than there are with other mass media, such as newspapers, radio stations and television channels."

Anyone with internet access can sign up for a social media account that can be used to share any content they want to share, and the content they share reaches anyone who visits that page or profile, except for the restrictions set by the account holder.

2 Implications of social networks in the process of digitalization and evolution of industry 4.0

The concept of the Fourth Industrial Revolution was first introduced in 2011 by a team of scientists who developed a high-tech strategy for the German government. The fourth industrial revolution, also known as Industry 4.0, is characterized as the continuous automation of traditional industrial and manufacturing practices, which involves the use of modern and intelligent technology.

Large-scale machine-to-machine (M2M) communication, which involves wired or wireless communication channels, and the Internet of Things (IoT) are integrated for increased automation, resulting in improved communication and self-monitoring. The aim is to develop technology at a high level, without the need for human intervention. The digital industrial revolution is developing a number of combinations of advanced digital technologies, such as:

Source: Gazeta Afacerilor - "About Industry 4.0 and the implementation of the concepts it promotes within the Romanian foundry industry"

Industry 4.0 integrates its own technologies and terms, such as the Internet of Things (IoT), Big Data, **Cloud computing, etc.**

The Internet of Things (IoT) is "the concept of connecting any device with a switch on and off the Internet (and / or each other)." (www.headland.com.au 2020) This includes mobile phones, coffee makers, washing machines, headphones, lamps, wearable devices. Machine components are also included, such as an aircraft jet engine or an oil rig drilling. If it has a on and off switch, then it is possible to be part of the IoT.

The term Big Data (big data, metadata) refers to "the extraction, manipulation, and analysis of data sets that are too large to be routinely processed." (Sfetcu 2019)

Cloud computing is "a distributed set of IT services, software, applications, access to information and data storage, without the user needing to know the location and physical configuration of the systems that provide these services" (gazeta-afacerilor.ro 2018)

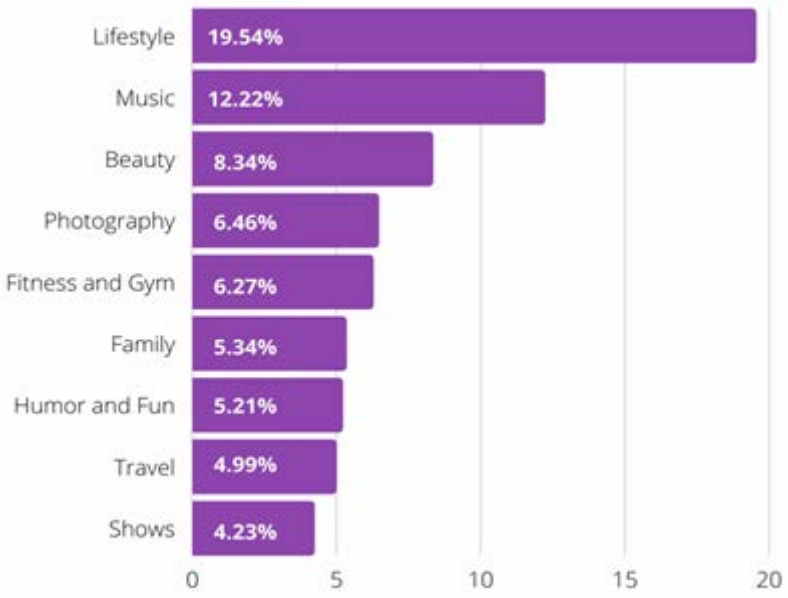
2.1 The level of use of social networks in Romania

Starcom Romania has made through the Social Media Stars Index, a top of the most watched content creators in the field of entertainment. For the elaboration of this ranking, "the online activity of over 900 accounts from Romania and their communities was analyzed and followed, in order to provide a unitary image of the social media activity."

The top analyzes the presence of the most followed accounts on the three major online platforms - Facebook, Instagram and Youtube - but also the size of the channel and the engagement of the communities of each account. Thus, in the Top 10 most watched accounts in December 2020 we find: Inna, Andra Măruță, Adelina Pestriț̦u, Andreea Bălan, Selly, Smiley, Flick Domnul Rimă, Mircea Bravo, MaxINFINITE and Andrei Zbir. ” (Starcom 2021)

Nr	Social Media Star	Social Media Points	Overall Rank	Facebook Rank	Instagram Rank	Youtube Rank
1	Inna	1.86	1	14	1	7
2	Andra Măruʔă	1.83	2	5	6	63
3	Adelina Pestriʔu	1.82	3	6	3	264
4	Andreea Bălan	1.52	4	4	15	99
5	Selly	1.36	5	158	14	2
6	Smiley	1.33	6	12	12	128
7	Flick Domnul Rimă	1.32	7	2	28	379
8	Mircea Bravo	1.24	8	1	117	40
9	MaxINFINITE	1.15	9	331	103	1
10	Andrei Zbir	1.15	10	685	2	24
11	Andreea Marin	1.14	11	3	70	475
12	Antonia	1.12	12	41	5	132
13	Andreea Mantea	1.10	13	25	8	156
14	Delia	1.05	14	62	4	236
15	IAN	1.03	15	9	39	411
16	Mihai Morar	1.02	16	8	46	539
17	Vlad Munteanu	0.99	17	647	7	18
18	Dorian Popa	0.97	18	129	13	6
19	Elena Gheorghe	0.94	19	18	17	135
20	Jamila Cuisine	0.85	20	11	254	91
21	Eduard CRBL	0.85	21	10	138	367
22	Alina Eremia	0.84	22	59	11	144
23	Exploit	0.84	23	480	105	3
24	Mihai Trăistariu	0.84	24	7	269	408
25	Nicole Cherry	0.75	25	107	9	369
26	Lora	0.72	26	32	21	278
27	Tudor Chirilă	0.69	27	13	158	374
28	Cristina Almăʔan	0.66	28	359	10	108
29	Adela Popescu	0.65	29	45	20	471
30	Vlăduʔa Lupău	0.65	30	17	139	86
31	Anda Adam	0.64	31	40	24	539
32	Chef Florin Dumitrescu	0.63	32	16	114	487
33	Cătălin Măruʔă	0.62	33	30	45	139
34	3 Chestii	0.62	34	20	214	35
35	Loredana Groza	0.61	35	19	84	403
36	Alex Velea	0.60	36	63	37	37
37	BRomania	0.58	37	127	23	31
38	Diana Condurache	0.55	38	452	16	59
39	Alex Dima	0.55	39	15	274	539
40	Mimi	0.51	40	269	19	78

Source: https://cutt.ly/Alfj8tD accesat pe 18 Feb 2021, ora 7:37 PM



The most popular content niches of Romanian influencers on Instagram according to: https://www.startupcafe.ro/afaceri/influencer-femei-frauda-instagram.htm accesed at 18 Feb, 8:17 PM

Studies indicate that "the number of Internet users had largely the same growth rate in 2020 and 2019 - 7.3% last year; 7% two years ago. However, social media had a faster growth in 2020 (13%) compared to 2019 (9%), a sign that the pandemic kept us at home and on social networks.

In Romania, we can say that in 2020 the time spent on average on the Internet daily increased by 5 minutes from 7:21 hours to 7:26. The number of social media users in our country has increased significantly. Last year, 62.6% of Romanians used social networks compared to 57% in 2019. "In January 2021, there were 12.00 million social media users in Romania. The number of social media users in Romania increased by 1.0 million (+ 9.1%) between 2020 and 2021. The number of social media users in Romania was equivalent to 62.6% of the total population in January 2021." (Kemp 2021)

2.2 Digitization - a strategy to increase resilience and sustainability

Resilience is "the ability of a system to absorb disturbances and reorganize itself so as to retain its functions, structure, and identity." (Elmqvist, et al. 2015) In the case of sustainability, resilience is the relationship between different types of urban hazards, including ecological resilience, the resilience of urban and regional economies or institutions.

Factors that have an influence on resilience and sustainability

Economic influencing factors refer to "the capacity of urban systems to implement resilience and sustainability programs. The general level of income, the initial economic structure or the consumption patterns associated with a large part of the population are all fundamental elements. " (Iojă, et al. 2016) Sustainable transport, economic growth and, implicitly, jobs are the main factors influencing the resilience and sustainability that are influenced by economic factors are related to the promotion of sustainable transport and growth and jobs.

Social influencing factors include social, ethnic, religious categories. Resilience and sustainability measures "must be adapted to the specifics of the existing structure. Resilience is measured on different scales, from individual, household, community, municipal. Sustainability and resilience are interconnected in multiple ways with phenomena such as health and well-being, social cohesion and lifelong learning ". (UNDP 2014)

Administrative influencers refer to "the ability of system actors to make deliberate decisions and actions, as well as strategic choices that contribute to resilience through their ability to learn and responsiveness." (Iojă, et al. 2016)

Environmental influencing factors target "different categories of measures aimed at protecting and improving heritage, protecting landscapes and geodiversity, conserving biodiversity or adapting to climate change." (Iojă, şi alţii 2016)

Cyber resilience refers to "the ability of an entity to continuously deliver the desired result, despite adverse cyber events." (Björck, et al. 2015) The concept essentially brings together the areas of information security, business continuity and organizational resilience.

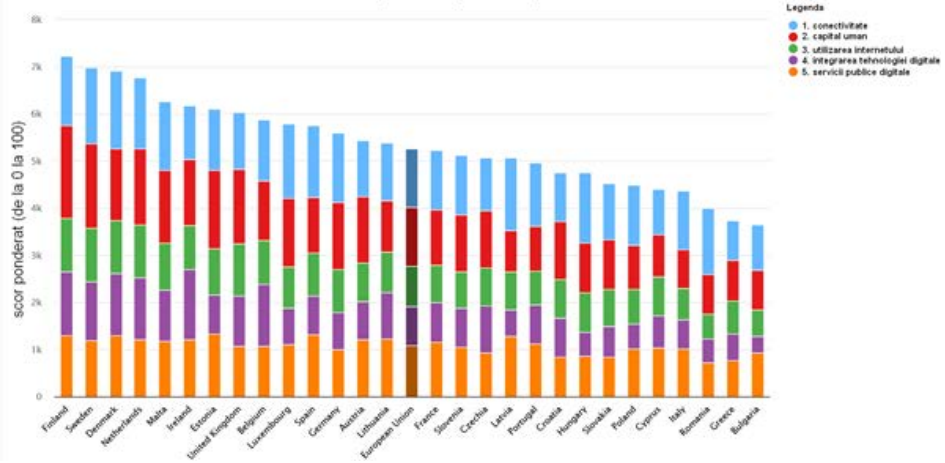
3. Comparative analysis between the "Digital Economy and Society Index" (DESI) at the level of developed and least developed countries

Digitization is the use of digital technologies to change a business model and provide new revenues and opportunities to produce value.

The Digital Economy and Society Index (DESI) is "a composite index that summarizes relevant indicators of Europe's digital performance and tracks the evolution of EU Member States in terms of digital competitiveness." ((DESI) 2020)

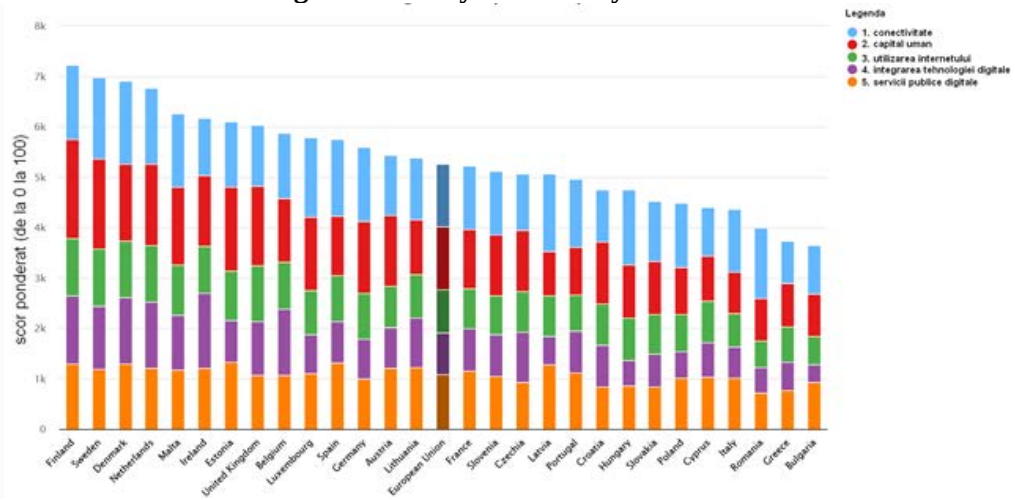
We will perform a comparative analysis at the level of developed and least developed countries, based on the DESI report from 2020, whose data are based on the evolution and involution of countries in 2019. In 2019, Romania falls at the level of less developed, so the case study will focus on developed countries.

Digital Economy and Society Index 2020 (DESI)



Source: DESI composite index 2020 https://bit.ly/3u6StCU

Digital Economy and Society Index 2019



Source: DESI composite index 2019
https://bit.ly/3u6StCU

The global DESI index is "calculated as a weighted average of the five main DESI dimensions with the weights selected by the user: 1 Connectivity, 2 Human capital, 3 Internet use, 4 Integration of digital technology and 5 Digital public services." ((DESI) 2020)

Through connectivity, the social connections forged through mediated communication systems are approached. The concept of connectivity developed with the development of the Internet, first with the introduction of Web 1.0 and later Web 2.0. Social networks, websites that provide access to user-generated content, trading and marketing web pages, and gaming sites have become an essential part of everyday life. As mentioned above, connectivity is built on the principles of Web 2.0. and creates the vision of empowering the user in generating new content and coordinating the flow of information on the Internet.

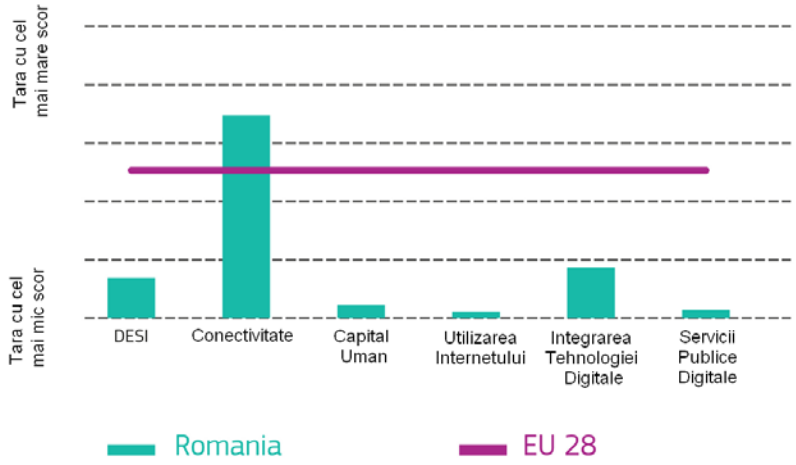
Human capital is the economic value of the skills and qualities of work that influence productivity. The investment in these qualities generates a high economic production. Human capital is divided into three categories, namely intellectual capital, social capital and emotional capital.

The Internet has various functions, and is currently used for learning, entertainment, work, to socialize. The most common uses are for: sending emails, doing research, downloading files, discussion groups, games, for educational and self-improvement purposes, to make friends, or meetings, to read online newspapers, for employment and shopping.

The integration of digital technology covers two topics: business digitization and e-commerce. DESI divides the digitalization of the business into five indicators: “electronic information sharing, radio frequency identification (RFID), social media, electronic invoices and cloud solutions. E-commerce has three indices: the

percentage of small and medium-sized enterprises (SMEs) that sell online, the turnover of e-commerce as a percentage of the total turnover of SMEs and the percentage of cross-border online sales of SMEs. " (Digital Economy and Society Index Report, 2018)

The integration of digital technology is a "composite index that summarizes the relevant indicators of Europe's digital performance and tracks the evolution of the digital competitiveness of UN member states."



(Europe's Digital Progress Report 2017)

Sursa: Shaping Europe's digital future European Commission 2020 https://ec.europa.eu/digital-single-market/en/scoreboard/romania[1]

Romania ranks 26th out of 28 EU member states in the 2020 DESI report. According to the study published by (Purice 2020) the data refer to the period before the pandemic. Romania has recorded a relatively similar path for four of the five dimensions of DESI measured, which is based on „slow progress, but also caused by political developments, as it has had four different governments in the last three years."[2]

In terms of connectivity index, Romania recorded the best performance, "thanks to the high take-up of ultra-fast broadband and the wide availability of very high-capacity fixed networks, especially in urban areas. 49% of Romanian homes subscribe to ultra-fast broadband (at least 100 Mbps), the fifth highest figure in the EU " (Preda 2020)

Romania ranks 27th out of 28 European Union countries in terms of human capital, a position it has stagnated compared to the previous year. Less than a third of Romania's population of people aged 16 to 74 have at least basic digital skills, compared to 58% in the EU as a whole, while 35% have at least basic software skills, compared with an EU average of 61%.

Romania ranks last in the EU in terms of basic digital skills, only 10% of people with knowledge in this field. Compared to the previous year, there was a slight increase in the percentage of information technology specialists.

In terms of ICT graduates, Romania rises and ranks 5th among the Member States of the European Union, with 5.6% of all graduates. "The Ministry of Education and Research implements the national strategy 2014-2020 for strengthening public administration. In addition, the Ministry is implementing an administrative simplification project for the national education system, with a budget of RON 28 million (approximately EUR 6 million) from SIPOCA (Structural Instruments under the administrative capacity operational program). " (Purice 2020)

In contrast to connectivity, for the index of use of internet services Romania occupies a leading place among EU member states. This index may, however, be directly related to the low level of basic digital skills across the country. 18% of people aged 16 to 74 have never used the internet, compared to the EU average of 9%. However, Romania ranks 6th in the EU for two online activities: the use of social networks, where Romania registers an average of 82%, compared to the EU average of 65%, but also video calls (67%; EU average: 60 %). Romania remains on a stable position compared to last year, registering almost no change in the case of this indicator.

[1] Conectivity, Human capital, Internet use, Integration of digital technology, Digital public services

[2] https://outsourcing-today.ro/?p=2340

Romania occupies a place at the end of the ranking in terms of the integration of digital technology by enterprises, ranking 27th out of 28 among EU countries. Compared to the previous year, Romania's ranking remained stable in terms of digital technology index. 23% of Romanian companies share information electronically and only 8% use social networks, the European Union average being 25%. "Romania does not have a national strategy for digital transformation for enterprises. Romania supports the ecosystem of start-ups through the Start-up Nation program, including start-ups that produce innovations or integrate them into new products and services. ” (Purice 2020)

For the index of digital public services, Romania ranked, both in 2019 and in 2020 on the last place among the EU member states. Romania ranks 8th for users of e-government platforms, with 82% of internet users, compared to an EU average of 67%. The high level of online interactions between public authorities and citizens refers only to those internet users who have to submit forms.

"The lack of interoperability of IT systems in public administration is a problem for years, which no government has yet managed to solve. In June 2019, a public consultation was launched on the draft law establishing a national reference framework for achieving ICT interoperability (CNRTIC). The aim is to fulfill the vision expressed in the government's 2017-2020 program (especially in the chapter *Communications Policies - Digital Convergence*), in order to simplify procedures and reduce bureaucracy through e-government." (Purice 2020) One of the problems facing the state is the high cost of a qualified digital signature (40 EUR / year per user).

Other problems that Romania faces in facilitating "digital public services are: lack of coordination between public institutions in establishing these services, migration of IT specialists from the public sector to the private sector or even in other countries, and the general lack of digital skills.” A well-implemented e-government solution would help businesses to operate easily in relation to the government.

Romania has not made significant progress in 2020 compared to 2019 and continues to face many problems at the level of digitization. An average of the five indices places Romania on the 26th place out of 28 EU member states, being followed only by Greece and Bulgaria, both in 2019 and in 2020.

4 Conclusion

Integrated communication uses all marketing channels and strategies, interconnects them, and then merges them into a single message. Social media marketing complements the integrated marketing strategies of many organizations. The involvement of social networks is particularly oriented towards social and environmental issues.

Digitization is the use of digital technologies to change a business model and provide new revenues and opportunities to produce value. We conducted a case study through which we evaluated Romania in relation to the EU using the Digital Index of Economy and Society (DESI).

The five DESI indices are connectivity, human capital, internet use, digital technology integration and digital public services. Regarding the connectivity index, Romania registered the best performances, but did not register progress for the other indices and is placed at the end of the ranking compared to the rest of the EU member states. Romania has not made significant progress in 2020 compared to 2019 and continues to face many problems at the level of digitization. An average of the five indices places Romania on the 26th place out of 28 EU member states, being followed only by Greece and Bulgaria, both in 2019 and in 2020.

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The Importance of Social Networks in the Process of Supporting Sustainable Development

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Abstract: The problems and ideas we classify today under the concept of sustainability have their origins thousands of years ago. The search for a balance between the demand for raw materials for food, clothing, shelter, energy and other goods, as well as awareness of the environmental limits of ecosystems have been a constant concern throughout human history. The emergence of social networks has created huge opportunities for communication and direct interaction with the public, which has proven to be a great advantage in spreading sustainability as a lifestyle among some of the social media users.. Resilience as the ability of a system to annihilate disturbances and to reorganize itself in an attempt to preserve its functions and structure represents, when we talk about sustainability, the relationship between different types of urban hazards, implicitly ecological resilience, resilience of urban and regional economies or of institutions. But people are obliged to help nature in its efforts to reorganize in the face of environmental, social or economic problems. In this sense, in this paper we analyze the role of social networks in the process of supporting sustainable development by presenting a case study for which we used the qualitative research method, and as a technique we used the semi-directional interview.

Key-Words: sustainable development, social media, environmental protection, social protection, #InfluencerPentruRomânia

1 Introduction

The major involvement in the concept of sustainability was developed in 1987, at the initiative of the United States of America, by convening the Brundtland Commission. The environment showed strong signs of degradation, which led to the need to develop a sustainability plan. At the same time, the definition of sustainability was offered for the first time, as "development that seeks to meet the needs of the present, without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, UN. Secretary-General, 1987). The Commission has successfully combined environmental, social and economic needs on the global development agenda.

First, the term "sustainable" is often used in conjunction with the term "development." Thus, both terms constitute a whole - “sustainable development / sustainable development” - which should be considered a unitary term and represent a certain concept that is based on specialized definitions and defining principles” (Zaccaï, 2002).

Second, the term "sustainable" can also be used separately from the term "development", for example "sustainable agriculture", "sustainable education", "sustainable forestry", "sustainable fishing", "sustainable business". and so on. In this case, the adjective usually refers to “sustainable development” and offers the possibility to integrate the fundamental principles of the concept in a series of fields of application (Zaccaï, 2002) .

And third, we are talking about the term "sustainability", which is used as a synonym for "sustainable development". However, a distinction is sometimes made between "sustainable development" and "sustainability". Some researchers say that "sustainable development" refers primarily to economic development / growth, while "sustainability" gives priority to the environment. The common denominator is that both terms consider environmental issues. The difference is that the first refers to the "improvement" of economic growth,

considering the environment, while the second is about the "challenge" of economic growth, focusing on the ability of humanity to live within the environmental limits of the planet. (Zaccaï, 2002).1

Resilience is "the ability of a system to absorb disturbances and reorganize itself so as to retain its functions, structure, and identity." (Elmqvist, et al., Benefits of restoring ecosystem services in urban areas, 2015) In the case of sustainability, resilience is the relationship between different types of urban hazards, including ecological resilience, the resilience of urban and regional economies or institutions.

2 The role of social networks in supporting sustainable development

Today, the evolution of social media platforms plays an important role in all areas of life, finding them deeply involved in sustainability issues. Information circulates very quickly through Instagram, TikTok, Facebook, Twitter, vlogs, and events that affect any of the three pillars of sustainability reach consumers in real time. In addition, the social media user generation is modern and open to everything new, with a high tolerance and an increased interest in making a better world.

Integrated communication uses all marketing channels and strategies, interconnects them, and then merges them into a single message. These strategies include everything from direct mail and public relations to social media and digital. Social media marketing complements the integrated marketing strategies of many organizations. The involvement of social networks is particularly oriented towards social and environmental issues. From a social perspective, it is known that the phenomenon of Black Lives Matter, an anti-racism campaign, spread extremely quickly on all platforms listed above, influencers posted in colossal numbers on the subject and the echo of the campaign was unprecedented. Gender equality has strong voices supporting it, and the subject enjoyed immense popularity a few years ago and launched the #MeToo movement, a campaign that wanted to draw attention to the abuses some women are subjected to.

LGBTQ acceptance is increasingly promoted online, both by influential people who advocate for social equality, but especially by LGBTQ members, who are confident that in the 21st century they will publicly expose themselves and advocate for equality.

I believe that social sustainability is the main channel for popularizing social networks and, although social sustainability is often the most disadvantaged branch, receiving considerably less attention than economic and environmental sustainability, I believe that the present and the future come with strong change and a contribution of attention to social welfare, given the fact that it has so many strong voices behind it through Instagram, Facebook, TikTok, and I believe that influencers are gaining more and more importance and attention, being in the near future the more heard voices.

Also, environmental sustainability is a topic strongly debated and promoted by the biggest influencers. *Conscious shopping* is intensely promoted in the online environment, there are many strong voices on social networks urging us to recycle, pollute less and have a more balanced life from a sustainable point of view.

More and more influences promote environmental protection, the use of biodegradable products, all through their own example and through campaigns in this regard.

We meet in social networks initiatives that could be integrated into the economic pillar of sustainability, mainly during the COVID-19 pandemic. In this sense, a commendable example in Romania is that of the actor Cosmin Seleşi who developed the campaign #InfluencerPentruRomânia, through which he aimed to help and support the Romanian economy during a pandemic. The hashtag of the campaign gathered over 500 posts, meant to bring to the attention of social network users Romanian brands and their products.

3 The functions of social networks

The emergence of social networks has created huge opportunities for communication and direct interaction with the public. People feel much more comfortable watching an influencer[2] because they consider him closer than a public figure, a TV star. The interaction on social media is in direct time, and the information circulates live. As noted (Porter, et al., 2007) since 2007, "people who use social media consider themselves to have more power in making changes than those who do not use these platforms." Let's remember the #rezist campaign,

[1] The paper quotes from Robinson, J. Squaring the circle. Some thoughts on the idea of sustainable development. Ecol. Econ. 2004, 48, 369–384; Dresner, S. The Principles of Sustainability, 2nd ed .; Earthscan: London, UK, 2008.

[2] A definition of what an Influencer can be: opinion leader with skills, charisma, authority, responsibility, involvement and persuasion that aims to spread and amplify promotional messages on behalf of companies and brands, in exchange for a reward. (https://www.jurnaldedigitalmarketing.com/digital-marketing/social-media/ce-este-un-influencer-si-cum-poti-deveni-unul/ accessed on 16.02.2021, 2 pm)

launched on Facebook and of a colossal scale. Voices online are indeed heard quickly and have the potential to go viral if the topic is of interest.

There are many organizations, including higher education institutions that use social media to communicate. Also, embassies, state institutions, companies that choose to distribute information through social networks. As a result, some researchers seek to understand the means of use and the effects of using social platforms.

One of the few conceptual frameworks about the use of social media by communicators within organizations is a theoretical lens, as presented (Lovejoy & Saxton, 2012). Following an analysis, they identified three functions: the information function, the action function and the Community function. The information function involves one-way communication in which information is published on social media for the purpose of sharing. The action function refers to the use of social media to encourage donation, volunteering and participation in events. Finally, the community function involves using the social environment and stimulating engagement in conversations with other social media users.

Many researchers have adopted this framework to see if communicators within organizations make full use of social media as a communication tool. Next, we will analyze in detail the three functions proposed by Lovejoy and Saxton.

3.1 Information function

"The social media information function involves a one-way messaging strategy, in which organizations simply share information with the sole intention of informing the public" (Lovejoy & Saxton, 2012). Similar to more traditional content, such as newspapers, television and press releases, the social media platform allows the organization's leaders to disseminate information such as the organization's activities, news, reports. For example, those in charge of communication could inform students, employees, members of the institute, as well as ordinary users of these platforms, depending on the context, about sustainability policies and progress.

The desire to increase the awareness about sustainability is one of the goals that bring the greatest challenges to sustainability communicators. Effective communication of information is a first step in raising awareness and changing behaviors.

3.2 Action function

The second main function of social media strategies is action. Leaders advocating for sustainability can use social media to inspire behavioral changes, such as obtaining donations online or offline demonstrations. An impressive example is that of Chiara Ferragni, who raised donations of over four million euros through her Instagram account to make a new ATI section for patients with Corona virus. With an online community of more than 22 million followers, the famous Italian influencer used her power of influence to support a humanitarian cause.

The social media action function involves the development of messages designed to encourage followers to engage in specific action to help the organization fulfill its overall mission. This perspective reflects the organizational perception that social media followers should be seen as a source that can be mobilized to help the organization achieve the sustainable changes it proposes. (Lovejoy & Saxton, 2012) found that "people who communicate for non-profit organizations, however, rarely use the action function in their socialization efforts." I tend to deny the statement of the two and I consider that many sustainability measures are taken due to opinion leaders, influencers. They changed people's perception of pollution, of reducing waste that is difficult to decompose, they influenced people to be willing to recycle, but also to consume sustainable products. Social media also plays a key role in social sustainability, which is why I do not agree with the statement that this branch of sustainability is the one that receives the least attention.

3.3 Community function

The community function is unique for social platforms. This involves applying social media to build and support member participation around points of interest, which include dialogue to facilitate community building around the same cause.

Organizational leaders traditionally broadcast news about their latest event on television, distribute the annual progress newspaper, send messages to subscribers to encourage them to donate. However, the interactivity characteristic of social networks differentiates them from traditional media, offering the increased potential to build relationships between organizations / public figures and stakeholders. Through social networks, followers feel closer to influencers, they have the impression that they are bonding because they apparently have access to

100% of their lives. Organizations also get closer to their followers and give them access to their daily activities. This also plays an important role in the issue of sustainability.

An eloquent example for the community function of social networks is Andreea Balaban, who films daily vlogs through which she gives her followers access to her daily life, but also to her areas of interest. Recently, Dove chose to promote its new range of sustainable products through it, precisely because of the close relationship that Andreea has with her community, a facility that only through social media would have managed to acquire, as I mentioned already above.

The dynamic and interactive functions of social networks make them an ideal channel for followers to engage in dialogical communication with opinion formers. Communicators can post messages designed to initiate conversational responses and receive responses to messages from stakeholders on the topic and thus encourage close links with followers. For example, on Facebook, Intagram, Youtube, Tik Tok you can start conversations in the comments section of each post. Also, by using @, the person whose username is denied can be evoked.

4 Qualitative research on the importance of social networks in the process of supporting sustainable development

Investigating people's lifestyles and how they live their life experiences offers the opportunity to analyze and describe different subjective realities. Qualitative research seeks, by contrast, to render a unique reality in the variety of personal and individual experiences.

4.1 Advantages, disadvantages and limitations of research

Qualitative research is based on "the assumption that people attribute certain meanings to the world in which they live, and these meanings are to some extent different from one person to another."(Myers, 2000)

The difference between a "quantitative and a qualitative research begins with the formulation of the research problem." (Kumar, 2011) The quantitative approach is based on a specific formulation, in which both the variables and the relationships between them are mentioned precisely (hypothesis). Often, the research is confirmatory, seeking to verify one or more hypotheses. In the qualitative approach, the research problem is often formulated in general terms, thus leaving room for a flexible, exploratory investigation process.

Relying in particular on the analysis of the meaning of words to the detriment of the meaning of numbers, the qualitative method offers the advantage of a broad understanding of the research topic, implicitly leads to a more complex explanation of it. The qualitative approach proposes the analysis of the whole and the fluid dynamics of the relations between phenomena, as opposed to the quantitative method, which studies by decomposition into constructs and transversal relations. After all, this is also the objective of the quantitative method, it only tries to reach it in an indirect way, mediated by measurement and statistical analysis of data.

A simplified approach to the specifics of the approach, both quantitative and qualitative, can be highlighted by the difference between the answers to the question: "How satisfied are you with your job?". In a quantitative research, the answer options to this question could range from 1 = "very dissatisfied" to 7 = "very satisfied", and the answer provided by one of the participants could be 5 = "somewhat satisfied". The answers obtained to this question to a sample of participants can be translated into an average value (eg 3.48). In a qualitative research, however, the same person might answer: “It's not bad where I work, the boss is quite understanding, with most colleagues I get along well, but the work I do is rather boring, and the hopes that in the future I will be able to promote are quite low ”.

The difference between the two approaches is that between a one-dimensional answer, precise and easy to process statistically, in the first case, and a complex, multidimensional answer (relationship with the boss, relationship with colleagues, work appreciation, development possibilities) and difficult to process, in the second case. In other words, the qualitative data capture the lived experience, in all its richness and dynamics.

In his opinion (Miles, 1994) “one of the strengths of the qualitative approach is precisely that they capture real events, which occur in natural conditions, and the context, whose influence is usually isolated in the quantitative approach, here is taken into consideration. But this advantage is in the shadow of a disadvantage that cannot be neglected: the exploitation of qualitative data depends on the skills, competence and analytical depth of the researcher, to a much greater extent than in the case of the quantitative method."

Quantitative data are generally easy to process, but have a limited depth, and qualitative data are more complex, implicitly more difficult to process due to their depth. A possible source of confusion between the two approaches may arise due to the fact that “there are qualitative data even in quantitative research, when we have variables measured at nominal or ordinal level, as opposed to variables measured at interval or ratio level. On the

other hand, qualitative research, as we will see later, is not completely devoid of quantitative analyzes." (Popa, 2016)

Qualitative research is a procedure for collecting empirical data that addresses a relatively small number of cases (sometimes only one case), given the close interaction between the researcher and those cases.

Above we have addressed the challenge of qualitative research, and we want to show what is not qualitative research, because in some situations you can find research that is declared qualitative, but does not meet the necessary characteristics.

The most common mistake is to consider that a research is qualitative when "it does not contain any data and statistical analyzes. The qualitative approach of research is not defined by what is missing, but by what it has specifically. As we will see below, qualitative research requires a certain specific methodological rigor, as well as specific data collection techniques and interpretations, which support the attribute of scientific knowledge, based on empirical data." (Popa, 2016)

Another error from the point of view of the qualitative approach is to declare as qualitative a research in which, "although quantitative data were collected, they are not subject to statistical procedures for analysis and testing of hypotheses. Usually, in such situations questionnaires are applied whose answers are analyzed simplistically, question by question. Sometimes the data are even analyzed and presented in the form of descriptive statistical indicators (average, standard deviations, percentages), or in graphical form (histograms, pie charts, etc.), which are described verbally." (Popa, 2016) Situațiile de acest gen nu evidențiază lipsa capacității de analiză statistică și așa zisa analiză calitativă capătă un caracter simplist, fără profunzime.

4.2 Establishing research objectives

In order to qualitatively research on the importance of social networks in the process of supporting sustainable development, we used the interview as a research method. In designing the research we established the research objectives, based on them we identified the researched population and we proceeded to its sampling according to sex, age groups, passive or active users of social networks.

Considering the purpose of the research, the proposed objectives, on the basis of which the interview will be performed, refer to:

- Preferences for social networks;
- Identifying the attitude towards social networks;
- The way in which the information transmitted through social networks is perceived;
- Identify the degree to which social networks influence the sustainable behavior of the interviewed population.

4.3 Identification of the researched population

The researched population is represented by people who passively or actively use social media networks, aged between 18 and 35, in Romania.

By people who actively use social networks, we have defined those people who, as a rule, have a large number of followers, regularly publish on at least two social networks and who are called content creators.

By people who use social networks passively we have defined people who are not interested in the number of their own followers, who rarely publish, but who are interested in following those in the first category.

The interview was attended by 80 people, classified as follows:

Classification criteria	Categories of participants	Number of participants
By age	18 – 24 years	30
	25 – 34 years	50
According to the way of involvement in social networks	Actively users	20
	Passively users	60
By sex	Actively users	5 M
		15 F
	Passively users	10 M
		50 F

4.4 Modal, spatial and temporal coordinates of the research

To carry out the case study we used the qualitative research method, and as a technique we used the semi-directed interview.

In preparing the interview, I outlined a set of questions that will be asked to the interviewed subjects in the form of a conversation. These will have an indicative role, and can be completed when the situation requires it. No questions will be asked about age and gender, as they are in the description of the user of social networks. The meetings will take place online.

4.5 The proposed questions.

The set of basic questions will be preceded by a preliminary conversation in which the purpose of the conversation is presented and will include at least the following directions:

a)What are your favorite social networks?

b) What kind of influencers are you looking for: beauty, travel, cooking, fashion, gossip, music / music criticism, comedy?

c) To what extent do they find the information provided by social networks useful? (Suggested answers: large; medium; little useful, useless)

d) To what extent were they influenced by social networks in sustainable behavior, in the choices they make in everyday life but also as customers? (Suggested answers: large measure; medium; small measure, no influence)

e) Have they been influenced by social networks to behave in support of environmental protection?

f) How often do they use tutorials offered by social networks? (Suggested answers: Very often; medium; sometimes; never)

g) For those who use tutorials: What types of tutorials do they use?

4.6 Research results

The result of the survey is presented below in the form of tables.

a) What are your favorite social networks?

The first option of the respondents was considered, even if some of them use multiple platforms. Among the favorite social media networks of Romanians are Instagram, Facebook, Tik Tok and Youtube.

Classification criteria	**Categories of participants**	**Number of participants**	**Favorite social networks**
By age	18 - 24	30	15 Tik Tok
			15 Instagram
	25– 34	50	35 Instagram
			15 Facebook
According to the way of involvement in social networks	Actively users	20	15 Instagram, 5 Tik Tok
	Passively users	60	35 Instagram 25 Tik Tok
By sex	Actively users	5 M	5 Tik Tok
		15 F	15 Instagram
	Passively users	10 M	5 Instagram 5 Tik Tok
		50 F	15 Tik Tok 35 Instagram

b) What kind of influences are you looking for: beauty & fashion, travel, cooking, music / music criticism?

The interests of the respondents are varied, for many of them it is difficult to decide on a single interest.

Classification criteria	**Categories of participants**	**Number of participants**	**Content types**
By age	18 - 24	30	5 music / music criticism 20 beauty & fashion 5 cooking
	25– 34	50	5 music / music criticism 15 beauty & fashion 15 travel 15 cooking
	Actively users	20	5 music / music criticism

According to the way of involvement in social networks			10 beauty & fashion 5 travel
	Passively users	60	10 travel 5 music / music criticism 25 beauty & fashion 20 cooking
By sex	Actively users	5 M	5 music / music criticism
		15 F	10 beauty & fashion 5 travel
	Passively users	10 M	5 travel 5 music / music criticism
		50 F	25 beauty & fashion 5 travel 20 cooking

c) To what extent do they find the information provided by social networks useful? (Suggested answers: large; medium; little useful, useless).

The people I interviewed said that they initially followed several content creators, but stopped at those with whom they resonated in their areas of interest and from whom they believe they find information that helps them in their daily lives and not only.

Classification criteria	**Categories of participants**	**Number of participants**	**Large**	**Medium**	**Little useful**	**Useless**
By age	18 - 24	30	15	5	0	0
	25 – 34	50	20	20	10	0
According to the way of involvement in social networks	Actively users	20	20	0	0	0
	Passively users	60	25	25	10	0
By sex	Actively users	5 M	5	0	0	0
		15 F	15	0	0	0
	Passively users	10 M	5	0	5	0
		50 F	20	25	5	0

d) To what extent were they influenced by social networks in sustainable behavior, in the choices they make in everyday life but also as customers? (Suggested answers: large measure; medium; small measure, no influence)

Online opinion formers play an important role in the decisions that followers make in their daily lives. From the discussions with the interviewees, it is observed that they are influenced in their areas of interest, some of the interviewees acknowledging that they have changed their behavior towards the environment in particular. They also participate in influencers' social campaigns when they seek help for people with social problems. Often, when choosing products, they take into account the advice of content creators on smart, sustainable shopping.

From the free discussions with the people participating in the study we can mention the main areas of sustainability in which they are influenced by social media:

- in choosing cosmetics, they prefer those for which no animals were used for tests,
- they don't do impulsive shopping,
- they recycle,
- buy second hand merch,
- reuse what can be reused,
- participate in social camps developed by influencers.

Classification criteria	**Categories of participants**	**Number of participants**	**Large**	**Medium**	**Little useful**	**Useless**
By age	18 - 24	30	30	0	0	0
	25 – 34	50	25	15	0	10
	Actively users	20	15	5	0	0

According to the way of involvement in social networks	Passively users	60	40	10	0	10
By sex	Actively users	5 M	0	5	0	0
		15 F	15	0	0	0
	Passively users	10 M	0	5	0	5
		50 F	40	5	1	4

e) Have they been influenced by social networks to behave in support of environmental protection?

Interest in sustainability has grown considerably due to the involvement of content creators in this field. Also, social sustainability campaigns have seen an impressive increase in recent years, given the discriminatory events. Some respondents said that they in turn get involved in these campaigns and help with sharing or even financially.

Classification criteria	**Categories of participants**	**Number of participants**	**Yes**	**No**
By age	18 - 24	30	20	10
	25 – 34	50	37	12
According to the way of involvement in social networks	Actively users	20	19	1
	Passively users	60	35	25
By sex	Actively users	5 M	5	0
		15 F	13	2
	Passively users	10 M	2	8
		50 F	36	14

f) How often do I use tutorials offered by social networks? (Suggested answers: Very often; medium; sometimes never)

On social networks you can find makeup, cooking and other tutorials. Through the interview we aimed to find out what is the interest of the followers to receive advice from the content creators they follow.

Classification criteria	**Categories of participants**	**Number of participants**	**Very often**	**Medium**	**Sometimes**	**Never**
By age	18 - 24	30	27	3	0	0
	25 – 34	50	40	7	3	0
According to the way of involvement in social networks	Actively users	20	20	0	0	0
	Passively users	60	45	12	3	0
By sex	Actively users	5 M	5	0	0	0
		15 F	15	0	0	0
	Passively users	10 M	7	2	1	0
		50 F	40	8	2	0

g) For those who use tutorials: What types of tutorials do they use?

Classification criteria	**Categories of participants**	**Number of participants**	**Beauty % fashion**	**Cooking**	**Life Hacks**	**IT**
By age	18 - 24	30	10	5	6	9
	25 – 34	50	25	10	10	5
According to the way of involvement in social networks	Actively users	20	12	2	6	0
	Passively users	60	25	15	10	10
By sex	Actively users	5 M	0	0	4	1
		15 F	11	2	2	0

	Passively users	10 M	0	3	0	7
		50 F	25	10	10	5

5 Conclusions

Qualitative research is an inductive process, and in this case was conducted to identify the views and interests of social network users.

We interviewed 80 young people, from two age categories, namely 18-24 and 25-34 years old, both active users of social networks - content creators and passive, ie followers of opinion formers. Of the 80 participants interviewed, 15 respondents are male and 65 female.

The conclusions of the study are limited by the fact that in the qualitative research the questioned group consists of a small number of people without claiming to be a representative sample.

Following the interview, it was concluded that young people prefer to use Instagram and Tik Tok as their first choice when it comes to social networks, these being their first interests, followed by Facebook and YouTube. Respondents aged 18-24 prefer Tik Tok, and those in the second age group participating in the interview choose Instagram.

In terms of interests towards content creators, a larger number of female followers prefer to follow influencers in the field of beauty & fashion, and male ones have shown interest in music, but also travel.Respondenții găsesc, în mare parte, folositoare informațiile oferite de rețelele sociale și sunt influențați de sfaturile pe care le primesc de la content creatorii pe care îi consideră relevanți. Se observă că persoanele din categoria de vârstă 18-24 sunt, majoritar, puternic influențați în deciziile de cumpărare de recomandările găsite în mediul online, iar cei din categoria 25-34 se arată mai reticenți, dar majoritar sunt și ei puternic impactați de informațiile oferite de către influenceri.

Social media tutorials are a strong source of inspiration, with 65 of the 80 respondents responding to follow them constantly, while only 15 claiming to follow them occasionally and absolutely no respondents denied the level of interest in them. The tutorials that arouse the most interest among male respondents are the IT ones, and for male interviewees, beauty & fashion tutorials are important. 15 of the 80 respondents say they are interested in cooking tutorials.

Following the qualitative research, it is observed that social media plays a strong role in daily life and is an important factor in everyday decision making. Content Creators have the power to influence the sustainable behavior of followers, but also play an educational role through the tutorials.

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The impact of food quality and safety on consumer perception and attitude to food choices in Romania. Opportunities under Green Deal

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Abstract: - Consumer attitude and perception on food quality in general have caused and continue to cause a great deal of controversy, sparking the interest of food researchers and not only in studying the impact of food quality and safety on consumer behaviour. Assessing the level of knowledge on quality nutrition among consumers is of great importance on the metabolic benefits with a primary impact in ensuring and improving health and quality of life. According to EU Green Deal objectives, especially those highlighted in the Farm to Fork action, food quality is a key driver for enhancing organic farming as an important long term goal of the Common Agricultural Policy (CAP). Taking into consideration those realities our paper aims to assess the impact of food quality and safety on consumers' choices in Romania, while underlying progress on the main food-related indicators in Romania. The research methodology is based on a quantitative analysis using the questionnaires on quality of life as a whole for achieving relevant answers for the aspects regarding the perception on food quality in stages. Our main conclusion is showing that in Romania the whole system of achieving food security and safety of food consumption with a certain level of quality must start with food production and distribution system. Thus, it is necessary that this system responds to all the specific demands of food security without omitting the current impact of climate change on agriculture and the adaptation of agriculture to procedures meant to reduce the future impact on the environment. Also the indicators related to food quality in Romania are showing that the higher share of employed population in agriculture per total employed workforce in the context of small farms and subsistence agriculture, means that the goods produced are being largely designed for the self-consumption household, hence EU food quality standards are not always applicable to such products.

Keywords: food quality**,** consumer perception, food safety, consumer behaviour, Romania, CAP, Green Deal, Farm to Fork action
JEL Classification: Q, Q00, Q18

1 Introduction

Food quality is one of the main strategic goals of the reformed CAP, while achieving this objectives must always take into account the Green Deal approach concerning the impact of agriculture on the climate change. The so called "greening" of the Common Agricultural Policy has allowed to the European farmers to focus on developing eco-friendly agricultural products but also on increasing the food quality produced with high environmental, biodiversity and animal welfare standards (Drăgoi, Bâlgăr, 2015).

The impact of organic farming on increasing the food quality in the EU is viewed by many studies as fundamental (Kahl et al., 2012). The Farm to Fork action is also presenting a great importance to enhance food quality especially through some key-actions related to the reduction of the use and risk of pesticides by 50%, and the dedication of 10% of the agricultural area to high-diversity landscapes, hence facilitating alternatives to

chemical pest control as required in organic farming.

While European farmers are increasingly open to the concept of organic farming and its benefits for maximizing their economic success, the consumers are also playing an important role in boosting the food quality all over EU, their choices being fundamental for sustaining the increase of food quality on the internal market. Currently there is a wide consensus in the literature in the field concerning the role of consumers for boosting food quality in EU (Aprile et al., 2012; Zander et al., 2015).

Prompted mainly by environmental concerns and in spite of the higher price of organic products, food quality through organic production is currently supported across EU through an overall system of farm management and food production that aims at sustainable agriculture, high-quality products and the use of processes that do not harm the environment, or human, plant or animal health and welfare. The importance of organic farming as a crucial goal of the greening process of CAP has been highlighted in various research papers (Siderer et al., 2005; Nasir et al., 2014). Presently, while organic farming is a type of farming supported by the CAP and the EU's aquaculture policy it may also help deliver on the Green Deal ambition. Organic farming is important for both environmental protection in the rural areas as for playing an essential part in the transition to sustainable food production and consumption, while increasing the protection of nature and reversing the degradation of ecosystems.

There are studies that are pointing out the important differences existing across the Member States concerning consumers' choices regarding food quality and organic product (Thøgersen, 2010). Such studies are showing that organic food's share of total food consumption depends heavily on political regulation, including legal definitions and standards, financial support to farmers, and a national labeling system, those macro and structural factors being more important for the sustainability of food consumption than are individual-level attitudinal variables.

In Romania like in other EU Member States the impact of food quality on consumer choices is mostly stimulated by behavioral predisposition rather than by organic logo or national policies supporting organic farming. While some studies have underlined the importance of organic logo on stimulating consumer choices (Argyropoulos, 2013), in Romania, consumers' knowledge of the EU organic logo remains low. Currently, organic farming as main driver of increasing food quality needs state subsidies that may be granted as part of CAP regulation.

Taking into consideration all those realities, our paper aims to assess consumers' attitude and preference regarding the diversification of the current range of quality food based on a questionnaire, but also the link between the main agricultural indicators as crop production and farm structure and the food quality of agricultural products in Romania. Our article aims not only to present the current status-quo in the field but also to identify some possible new policy action for increasing food quality in Romania mainly in the light of the new actions included in Green Deal plan (such is the case of the Farm to Fork action).

2 Problem Formulation and Methodology

In order to conduct this study by the questionnaire method, we have resorted to several general and social methods that highlight the perception and attitude of certain socio-professional groups in the context of the analysed subject.

The questionnaire method consisted of a random sample that expressed as accurately as possible the socio-professional structure and the structure of consumers' perception and attitude regarding the quality and the safety of food consumption. Attitudes and food preferences can be defined as behavioural predisposition, known in advance, a result of the inner senses, which shows the favourable or unfavourable path, depending on the subject addressed.

In assessing consumers' attitude and preference regarding the diversification of the current range of quality food based on the questionnaire, we took into account the analysis of the frequency of responses and of the correlation between different types of variables depending on respondents' socio-professional grouping. The questionnaire was designed to provide anticipated-true, usable answers that provide quantifiable data, thus pursuing the objective of the survey. Thus, it is known that the answer to the questions depends essentially on the respondents who belong to a certain socio-professional group.

In this study, we applied our own questionnaire, conceived according to the rules provided by the literature on the information intended to be obtained according to the objectives of the present study. The questionnaire was designed to know respondents' attitude and preference to sustainable foods. The questionnaire, addressed electronically, contained a set of questions of different forms so as to reproduce as accurately as possible the level of consumers' understanding of food quality who should ultimately feel safe and secure from eating a food.

The set of questions referring to the level of understanding food quality on the nutrition label was designed to lead to measurable results on consumers' concerns about the quality of the products they buy and consume. Consumers' perception on the safety of several products throughout the supply chain and the different practices that can reduce the risks posed by food insecurity were also assessed. The role of labels and of different ways of informing about the consumption habits of quality food was also studied.

Our study also relies on the official database provided by the National Institute of Statistics (National Institute of Statistics 2019) at NUTS3/County level. The indicators taken into account are the following: i) Employment in agriculture (share of employees in agriculture of total employees, %); ii) active enterprises in agriculture (total number of active enterprises in agriculture of total active enterprises, %); iii) total crop production (the values of crop production, lei/inh.); iv) total animal production (the values of animal production, lei/inh.). Our research is also based on exploring key f**ood safety related socio-economic indicators such as employment in agriculture, total number of active enterprises in agriculture and total crop and animal production.**

Employment in agriculture is a critical issue for Romania, over 2/3 of the employed population in the rural area are engaged in self-employed activities and/or unpaid work in the household. These categories of rural labour are vulnerable in terms of lacking social and health insurances and struggling at the limits of survival. The rudimentary character of the Romanian agriculture is proved also by the smallest share of wage employment in agriculture (5.2%) (Zamfir and Stănescu 2007). The national average of population employed in primary sector was 20.6% in 2019 in a decreasing trend compared with 2012 when the value was 29.3%. The maximum values are registered in the Teleorman, Călăraşi and Giurgiu Counties (over 40% of employees in agriculture) related to the extended agricultural terrains and potential, where the subsistence agriculture and self-consumption household is dominant (figure 1). In the category between 30 and 40% are included nine counties with a high degree of rural population (Vaslui, Olt, Ialomiţa, Mehedinţi, Vrancea, Suceava, Neamţ, Buzău and Dolj)(Mitrică et al. 2019). Our analysis is showing that 32 counties register higher shares of employment in agriculture than the national average. The lowest values are registered in Bucharest Municipality (0.22%) and Braşov County (9.01%). While in the Bucharest Municipality the low share are explained by the small surface of agriculture land and by the tertiary functions, the Braşov County has a diversified economic profile and is covered of large mountains regions. The higher share of employed population in agriculture per total employed workforce in the context of small farms and subsistence agriculture, means that the agricultural activities in these communes rely increasingly on the traditional household (peasant's or agricultural) and on the contributing family worker, thus the goods produced being largely designed for the self-consumption household (Bălteanu et al 2013, Dumitraşcu et al 2017). The contributing family worker's labour does not involve costs for wages, this accounting for the low prices maintained for agricultural products and for the low level of quality of life in the peasant's households; in fact, in many cases, this status in employment assured only the survival of the farm and its members (assimilated with the poor working category) (Ciutacu and Chivu 2007).

The overview of the county level of the ***total number of active enterprises in agriculture*** could provide a useful correlation to food safety. The values are ranging from a minimum value of 0.37 enterprises/1,000 inh. in the case of Bucharest Municipality to a maximum of 2.78 enterprises/1,000 inh. in Tulcea County. The highest values are registered in Ialomiţa and Călăraşi (over 2.0 enterprises/1,000 inh.) and Brăila, Arad, Teleorman and Giurgiu Counties. These counties are on the one hand specialized in agricultural activities and with diversified economies as in the case of Arad County on the other hand. Half of the counties registered values over the national values (enterprise/1,000 inh.). In the category of low values (between 0.5 and 0.7 enterprises/1,000 inh.) are included seven counties (Iaşi, Dâmboviţa, Gorj, Prahova, Mehedinţi, Vâlcea and Bacău), most of them with a large mountain areas (figure 2).

Figure 1: Share of employees in agricultural sector

Figure 2: Active enterprises in agricultural sector

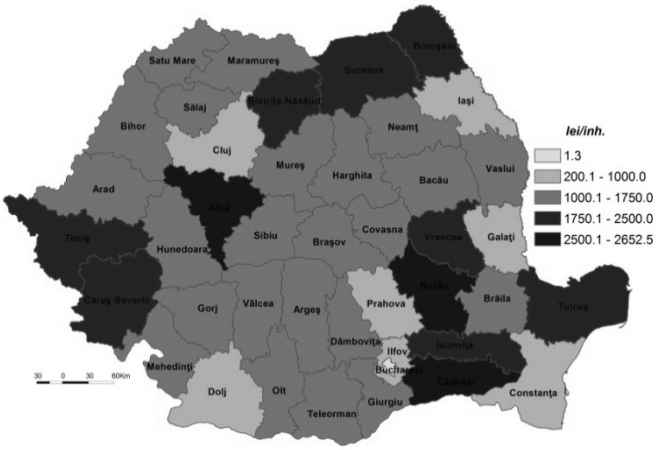
Source: Authors calculations.

The total agricultural production could also reveal the important role played for food safety. The common efforts involved in the complex chain of food production, including agricultural production, processing and transport, and product traceability to consumer would lead to quality and safe items production (Răbonţu 2010).

Total crop production varies between 6.6 lei/inh. in Bucharest Municipality and 8169.4 lei/inh. in Arad County. The counties from the South (Teleorman, Olt, Giurgiu) and South-east of Romania (Brăila, Tulcea and Buzău) have the highest values due to the large arable land, while the Timiş County is characterized by a high productivity of the main crops (Bălteanu et al 2016). The lowest values are registered in the counties with a tertiary or industrial profile (Braşov, Ilfov, Sibiu, Cluj, Hunedoara, Iaşi, Argeş, Prahova) or in whose covered by a large mountain area (Bacău, Maramureş, Harghita, Bistriţa-Năsăud)(figure 3).

Figure 3: Total crop production

Figure 4: Total animal production



Source: Authors calculations.

The total animal production overlapping partially the previous indicator, the minimum values being in Bucharest Municipality (1.3 lei/inh.) and the maximum in Buzău County (2652.5 lei/inh.). The highest values of animal production include counties from the Southern and South-eastern part of Romania (Călăraşi, Ialomiţa, Tulcea, Vrancea) (figure 4). High values have also Alba, Bistriţa-Năsăud, Botoşani, Suceava, Caraş-Severin counties based on sheep and cattle breeding. The low values (less than 1,000 lei/inh.) registered some counties with diversified economic activities (Ilfov, Iaşi, Constanţa, Cluj, Galaţi, Prahova). It is interesting to note that 29 counties have value over the national average (1302 lei/inh.).

3 Results

The results of the socio-professional analysis are necessary in order to obtain conclusive results through the questionnaire method. Thus, respondents were analysed in terms of income, level of education, age and gender. These factors have led to the observation that people of different ages have different attitudes and

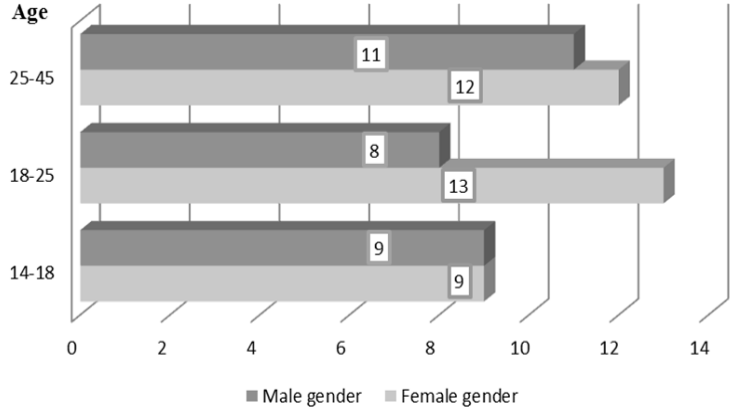
preferences, male respondents have different attitudes and preferences than female respondents regarding food quality.

In terms of respondents' gender, 54.84% were female and 45.16% were male.

In terms of respondents' age, 29.03% were young people aged 14-18 years, 33.87% were respondents aged 18-25 years and 37.09% were respondents aged 25-45 years.

The graphical representation from Figure 5, regarding the structure of the population by age groups and gender, shows that the surveyed sample consisted mainly of female respondents.

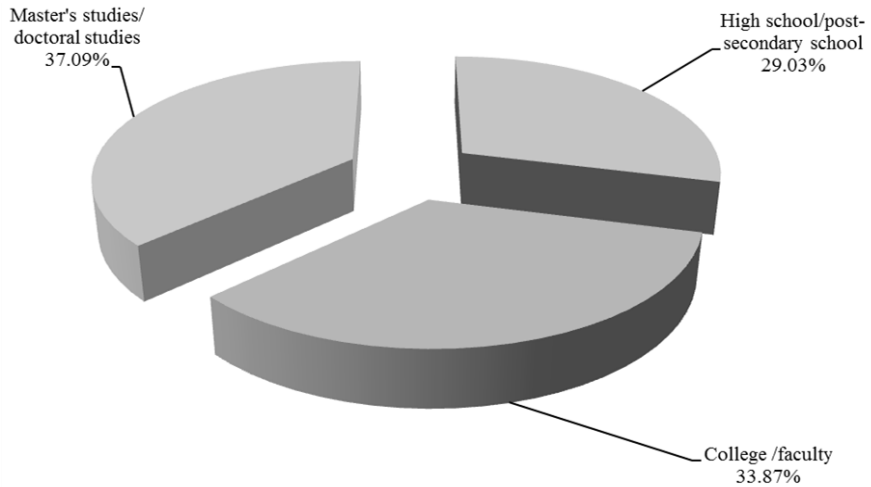
Figure 5: Distribution of respondents by age and gender



Source: Authors calculations.

The distribution of the respondents who participated in the study on the analysis of consumers' perceptions and attitudes to food quality by level of education (Figure 2) is as follows: 29.03% of the respondents had high school/post-secondary studies (pupils in the 11th and 12th grades), 33.87% of the respondents had college /university studies (students) and 37.09% of the respondents had higher education (faculty and/or master's and doctoral studies).

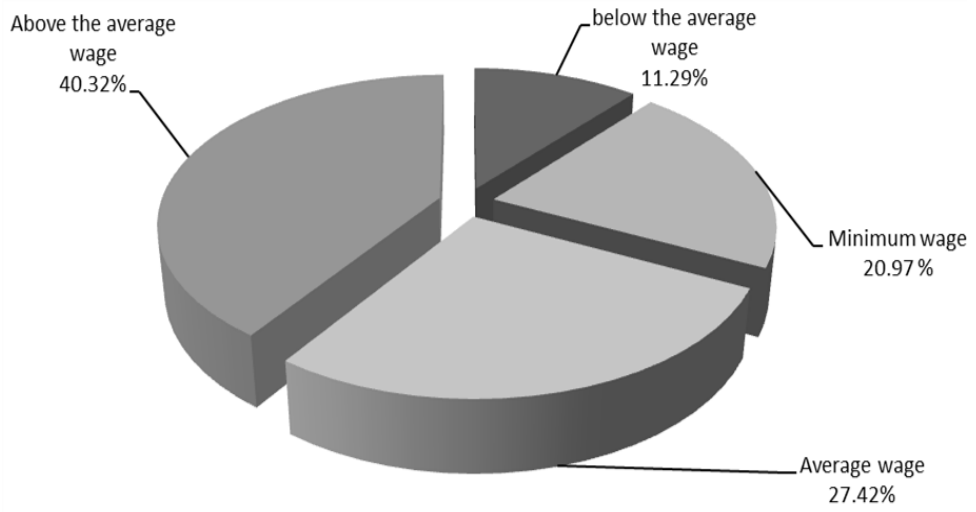
Figure 6: Distribution of respondents by level of education



Source: Authors calculations.

A pertinent analysis of the respondents in the study according to income shows that 11.29% earn below the minimum wage, 20.97% earn the minimum wage, 27.42% earn the average wage and 40.32% earn above the average wage (Figure 7).

Figure 7: Distribution of respondents by income



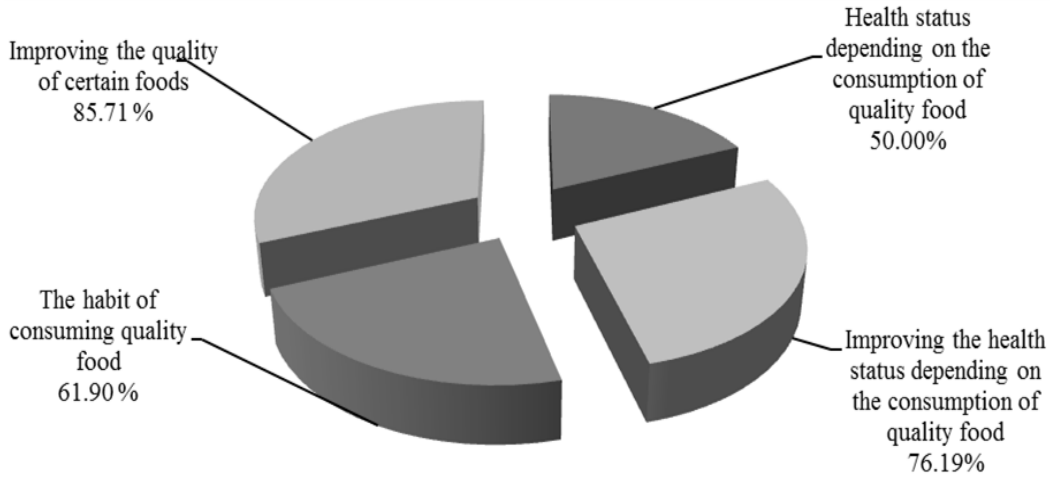
Source: Authors calculations.

According to the survey, the presentation of the empirical results was divided into four parts.

The first part presents consumers' specific attitudes regarding food quality and safety in terms of nutrition, health and food price as well as consumers' confidence in the manufacturing process. Thus, 50% of the respondents consider that their current state of health was largely due to the consumption of quality food purchased on the Romanian market. 76.19% believe that their health could be improved by eating high-quality food.

In terms of quality food consumption, the results of the study show that 61.9% of the respondents frequently consume quality food. 85.71% believe that some products should be withdrawn from the market and/or replaced with products of much improved quality.

Figure 8. Distribution of respondents by consumer preference and attitude to food quality

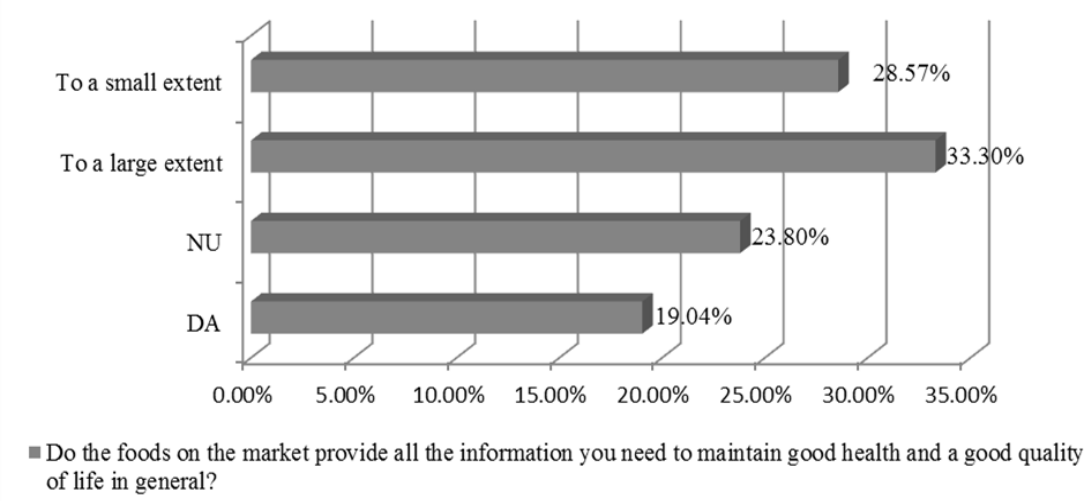


Source: Authors calculations.

Respondents' attitude (Figure 8) regarding the impact that food quality has and/or may have on health status shows a segmentation of the answers correlated both with the price of high-quality products and with the

level of information on the effect of quality food on health.

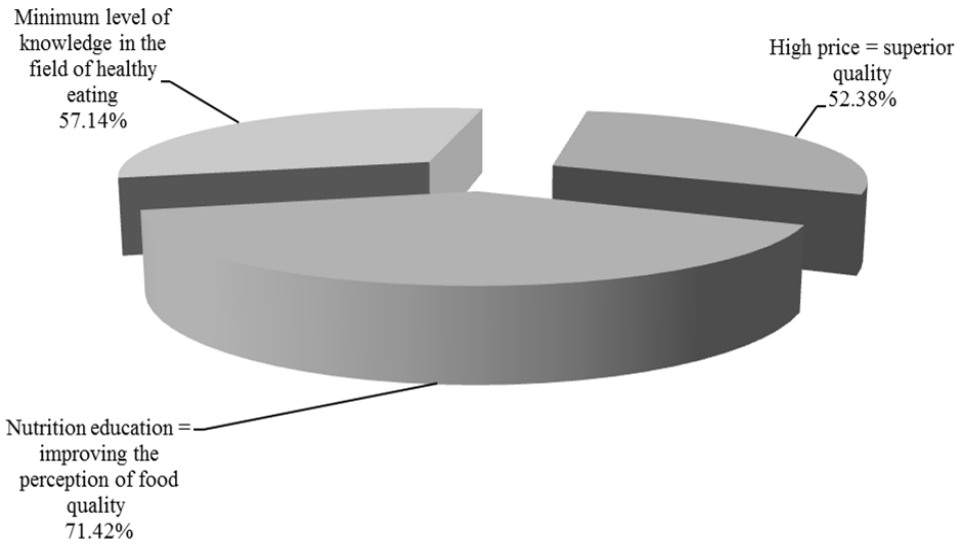
Figure 9: Respondents' attitude to the efficiency of the information necessary to maintain health status



Source: Authors calculations.

Respondents' attitude (Figure 9) to “The food label provides all the information necessary to maintain good health status and a good quality of life in general” divides the answers into the four classes of answers. Thus, at the level of the whole group, 19.04% of the respondents consider that this information is beneficial, 23.80% consider that this information is sometimes incomplete or is presented in a way that is little understood. Regarding the usefulness of food quality information, 33.3% of the respondents believe that it is largely useful and 28.57% believe that food quality information is only beneficial to a small extent for ensuring good health status. An important share of 52.38% of the respondents (Figure 10) consider that the influence of price on food quality and the frequent association of price with higher quality are true. This result is important for the implementation of projects on the significance and impact of healthy, rational, diversified and balanced nutrition on health and quality of life in relation to price. Also, an increased frequency of the taste - price - quality association was observed.

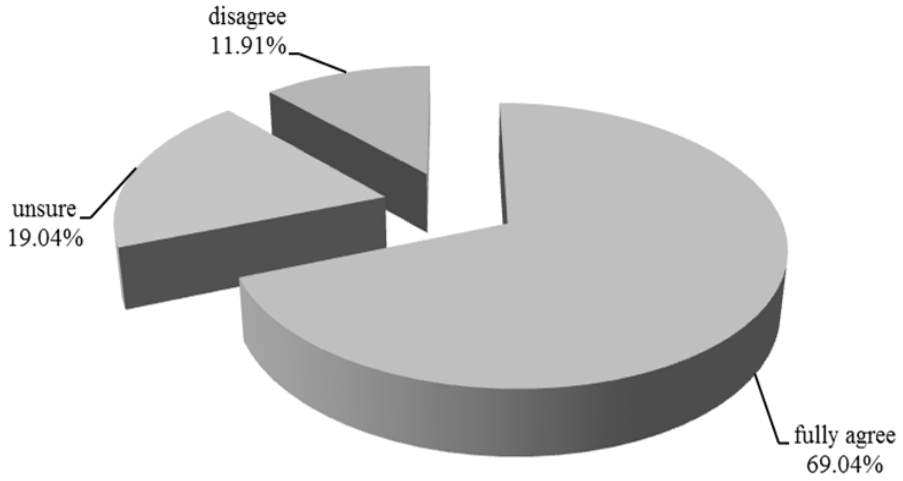
Figure 10: Respondents' perception on the importance of nutrition education on food quality in relation to price



Source: Authors calculations.

Study participants (71.42%) believe that improving the perception of food quality through nutrition education is important in developing healthy eating habits (Figure 10). Respondents believe that nutrition education can be achieved both through scientifically proven remedial courses on healthy eating held in schools by specialists - specialized academic teaching staff and through educational projects implemented by higher education institutions in collaboration with pre-university education institutions. These considerations are based on the fact that 57.14% of the respondents consider that their level of knowledge in the field of healthy eating is minimal which makes them feel insecure in assessing food quality and choose food based, in most cases, on psychosensory properties related to taste and smell and on packaging aesthetics and design.

Figure 11: Respondents' preference for organic food consumption

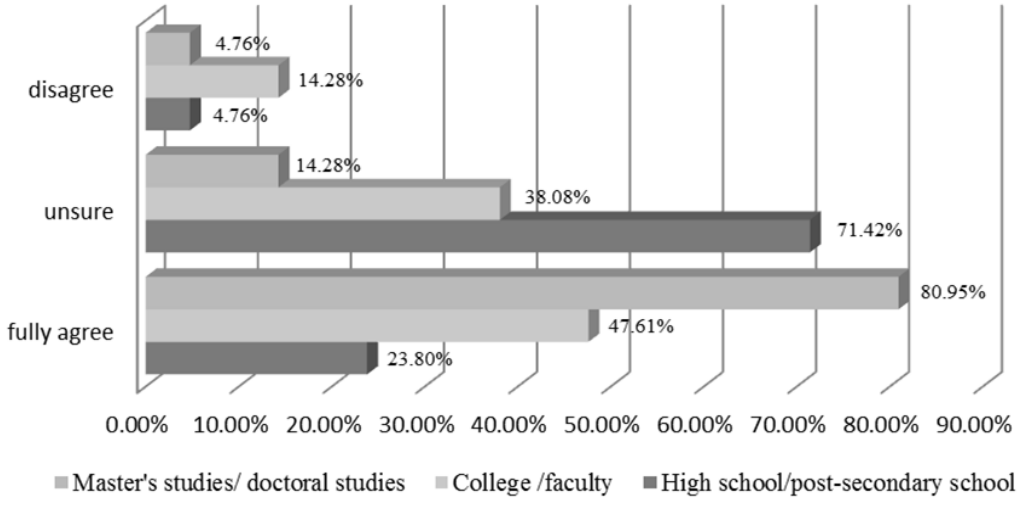


Source: Authors calculations.

Respondents' preference for the consumption of organic food and of high-quality food has led to a classification of the answers at the level of the entire surveyed group as follows: 69.04% agree and fully agree, 19.04% are unsure and 11.91 % consider that organic products do not guarantee that they are healthier for the human body (Figure 11). The positive answers were correlated with the income level, people with average and above average income provided most answers in terms of percentage.

The data obtained at the level of the surveyed sample show respondents' interest and concern for health. Thus, 80.95% of the respondents agreed that food produced using organic technology processes is qualitatively superior to highly processed food (Figure 12).

Figure 12: Personal considerations on organic food quality depending on the level of education



Source: Authors calculations.

The correlation between the answer to the questions “Do you consider that organic products are healthier?”and “I consider that the level of pesticides in vegetables not included in the Bio quality category is

high" shows a certain segmentation of the answers depending on respondents' level of education.

4 Conclusion

In Romania, consumer perceptions on food price indicate a high degree of annoyance on the grounds that most high-quality foods are not always affordable in terms of quality – price. Most consumers argue that food security achieved by marketing quality food at an affordable price is vital, making it possible to adopt a balanced and healthy diet. A qualitatively balanced diet leads to improved health that is considered closely linked to the consumption of high-quality food. Innocuous phrases and messages frequently presented by the media may have an impact on the consumer, leading to greater concerns about food quality even if, in many cases, consumers are not entirely convinced by the food quality. The degree of confidence in food quality shows a downward trend. But the degree of confidence in food quality shows an upward trend in terms of the level of concerns about food choices that ensure a healthy diet and increased food security. Consumers' understanding of the quality and safety of food consumption on the market correlated with the level of education, income and gender highlights the fact that nutrition education is stringent and achievable through educational projects for both pupils in schools and adults.

Consumers' choices could and should do more to contribute to the success of food quality policy in Romania, especially since consumers' attitudes towards organic certification and labelling could be improved through public policies designed to emphasize the trustworthiness of the organic certification and labelling system. The role of such policies in boosting trustworthiness of consumers in organic certification has been underlined by various EU documents and regulations (European Parliament, 2015; European Parliament, 2019).

Our analysis shows that in Romania, the common efforts involved in the complex chain of food production, including agricultural production, processing and transport, and product traceability to consumer would lead to quality and safe items production, but the higher share of employed population in agriculture per total employed workforce in the context of small farms and subsistence agriculture, means that the agricultural activities in these communes rely increasingly on the traditional household and on the contributing family worker, thus the goods produced being largely designed for the self-consumption household and not being distributed to the vast majority of consumers.

Hence, the new funding paradigm of the Farm to Fork strategy could address this imbalance by helping Romanian authorities to stimulate both supply and demand of organic products, while ensuring consumer's trust through promotion activities and green public procurement. Moreover, a series of key actions could allow to Romanian authorities to further support organic agriculture and consumers preferences for high quality products: create a simpler and easier certification system for small farmers while also ensuring tighter precautionary measures and robust checks along the entire supply chain, encouraging, through national RPD plan of the increase of organic farming area in total national production and also simplifying the rules of organic farming according to the Farm to Fork Strategy.

Acknowledgments:

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Impact of the COVID-19 Pandemic on the Romanian Electricity Consumption

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Abstract: In the paper we analysed the electricity consumption in Romania, during the period between March and December 2020. The SARIMAX econometric models are used in order to estimate the contrafactual for monthly electricity consumption during the COVID-19 pandemic. The research findings show that the total domestic electricity consumption fell between March and August 2020 and registered a slow recovery by the end of the year. This dynamic is explained by a drastic drop in non-household electricity consumption, while the electricity consumption of household customers is systematically above the long-term trend.

Keywords: Electricity consumption, SARIMAX models, COVID-19 pandemic
JEL Classification: C22, Q41, Q47

1. Introduction

The COVID-19 pandemic had a tremendous impact on almost all economic (and social) activities, all over the world. Energy production and consumption have not been bypassed by the impact of the pandemic. The International Energy Agency (IEA) estimates that, statistically, global energy demand has fallen on average by 5% in 2020 compared to 2019, and energy investment has fallen by 18% (International Energy Agency (IEA), 2020, p. 61) and, moreover, "the worst effects are felt among the most vulnerable" (p. 18).

Zong et. al. (Zhong, et al. 2020) tried to perform "a comprehensive review of the impacts that the pandemic has caused on the electricity sector" (p. 489). On the background of the general decrease in demand, they identified an increase in the share of renewable energy in total energy production and consumption, a reduction in investment and a higher pressure on system operators, generated by increasing uncertainty about the evolution of demand. Bahmanyar, Estebsari, & Ernst (2020) detects a strong impact of the COVID-19 pandemic on electricity consumption and production, maintenance of facilities, operational activities and development plans in some EU countries (Belgium, Italy, Netherlands, Spain, Sweden and UK). Studies show a sharp drop in demand for large energy consumers (factories, commercial buildings) and extra energy demands for residential sector (Zhong, et al. 2020, 490), (Jiang, Fan and Klemeš 2021, 2), (Bahmanyar, Estebsari and Ernst 2020, 3). García, et. al. (2021) showed that in Huelva (Spain) "residential customers have increased their consumption around 15% during full lockdown and 7.5% during the reopening period. In contrast, globally, non-residential customers have decreased their consumption by 38% during full lockdown and 14.5% during the reopening period" (García, et al. 2021, 1).

In the paper we analysed the impact of the COVID-19 pandemic on electricity consumption in Romania, between March and December 2020. First, the analysis was performed globally (monthly dynamics of domestic electricity consumption). Second, to explain the global dynamics, we conducted structural studies: the evolution of the pandemic consumption behaviour of household customers, on the one hand, and, on the other hand, the monthly dynamics of electricity consumption of non-household customers.

2. Data and methodology

To analyze the impact induced by the COVID-19 pandemic on electricity consumption, we used data published by Romanian National Energy Regulatory Authority (Autoritatea Națională de Reglementare în Domeniul Energiei, ANRE) in *Monthly Electricity Market Monitoring Reports*[1]. The data series analysed refer to "Domestic

[1] Data available at: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica (accessed on March 21, 2021)

electricity consumption", "Household consumption" and "Non-household consumption" in Terawatt-hour (TWh).

Usually, the impact analyses directly compare the data recorded for 2020 with the consumption data for 2019, or possibly with the average consumption of the two or three previous years (García, et al. 2021, 5). Unlike these approaches, in this paper we have estimated electricity consumption for 2020 under normal conditions using SARIMAX models (**S**easonal **A**utoregressive **I**ntegrated **M**oving **A**verage with e**X**ogenous factors). And the prospective estimates were considered as a benchmark (as counterfactual) for monthly electricity consumption and were compared with the data recorded in the special conditions induced by COVID-19 pandemic. To specify the structure of SARIMAX models, we examined, through HEGY seasonal unit root tests (Hylleberg, et al. 1990), the existence of seasonal and nonseasonal unit roots in a monthly time series related to electricity consumption in Romania (domestic consumption, household consumption, respectively, non-household consumption). The tests were applied both for the level data series and for the series from which the polynomial trends were eliminated.

The definition of the notions used in the paper is in accordance with the national practice, described in the *Law on electricity and natural gas* no. 123/2012. According to art. 3 of the respective law:

- ✓ *final customer* is "any natural or legal person who buys electricity for his own consumption" (paragraph 13);
- ✓ *household customer* is "the customer who buys electricity for his own household consumption, excluding consumption for commercial or professional activities (paragraph 15), and the
- ✓ *non-household customer* is "any natural or legal person who buys electricity that is not for his own household consumption; this category also includes electricity producers, network operators and wholesale customers" (paragraph 14).

2.1. Domestic electricity consumption

Domestic electricity consumption is calculated in Terawatt-hour (TWh), through a balance relationship:

$$\text{Domestic consumption} = \text{Electricity supplied} + \text{Import} - \text{Export} \quad (1)$$

The monthly dynamics of domestic electricity consumption, between 2011-2020, is presented in Fig. 1.

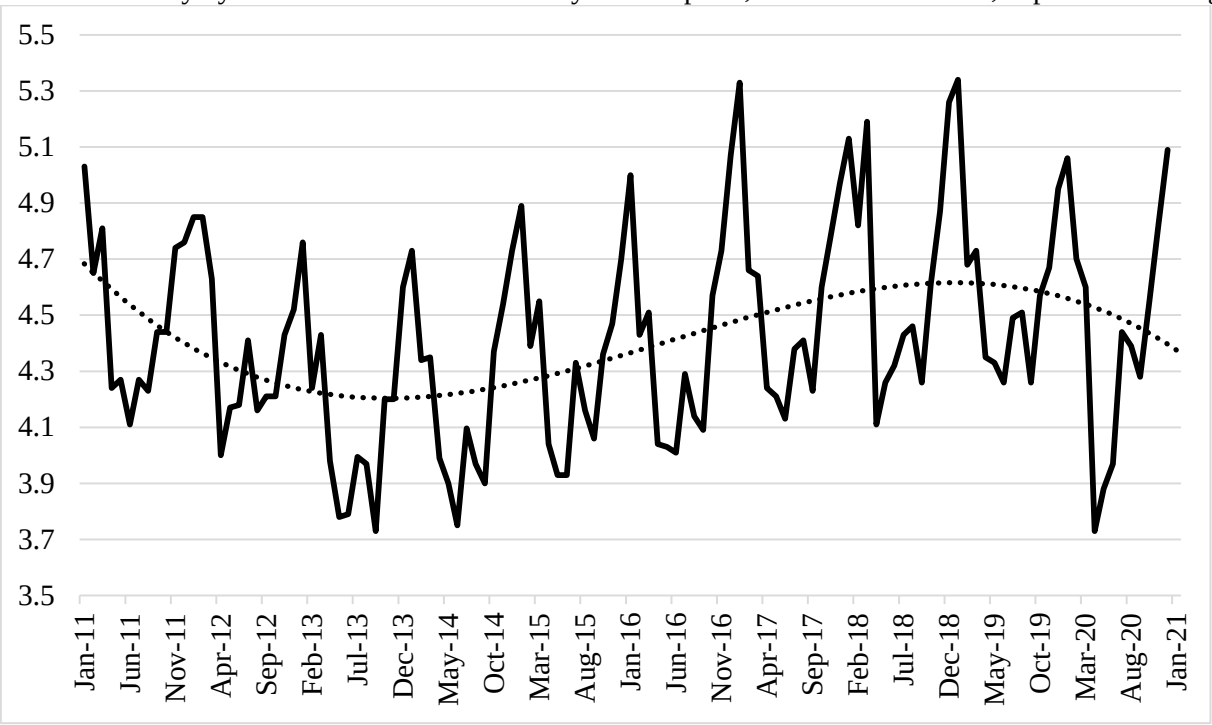

Figure 1. Domestic electricity consumption (TWh)

Source: National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica.

Figure 1 suggests the presence of a polynomial long-term trend, a strong seasonal fluctuation and the relative decrease in domestic electricity consumption between March and June 2020. Annex 1 details the results of the application of a HEGY type test for seasonal and nonseasonal unit roots in a monthly time series regarding the domestic electricity consumption in Romania between 2011 and 2020. The test results show both the existence of a non-seasonal root (at zero frequency) and the presence of seasonal unit roots with 3 and respectively 12 months per cycle. Similar conclusions are drawn if the polynomial trend is removed from the initial series.

2.2. The electricity consumption of household customers

The electricity consumption of household customers, in the period 2011-2020, is presented in Figure 2. The graph of the series suggests the presence of significant seasonal fluctuations, on the background of a polynomial trend, which is maintained in the conditions of the COVID-19 pandemic.

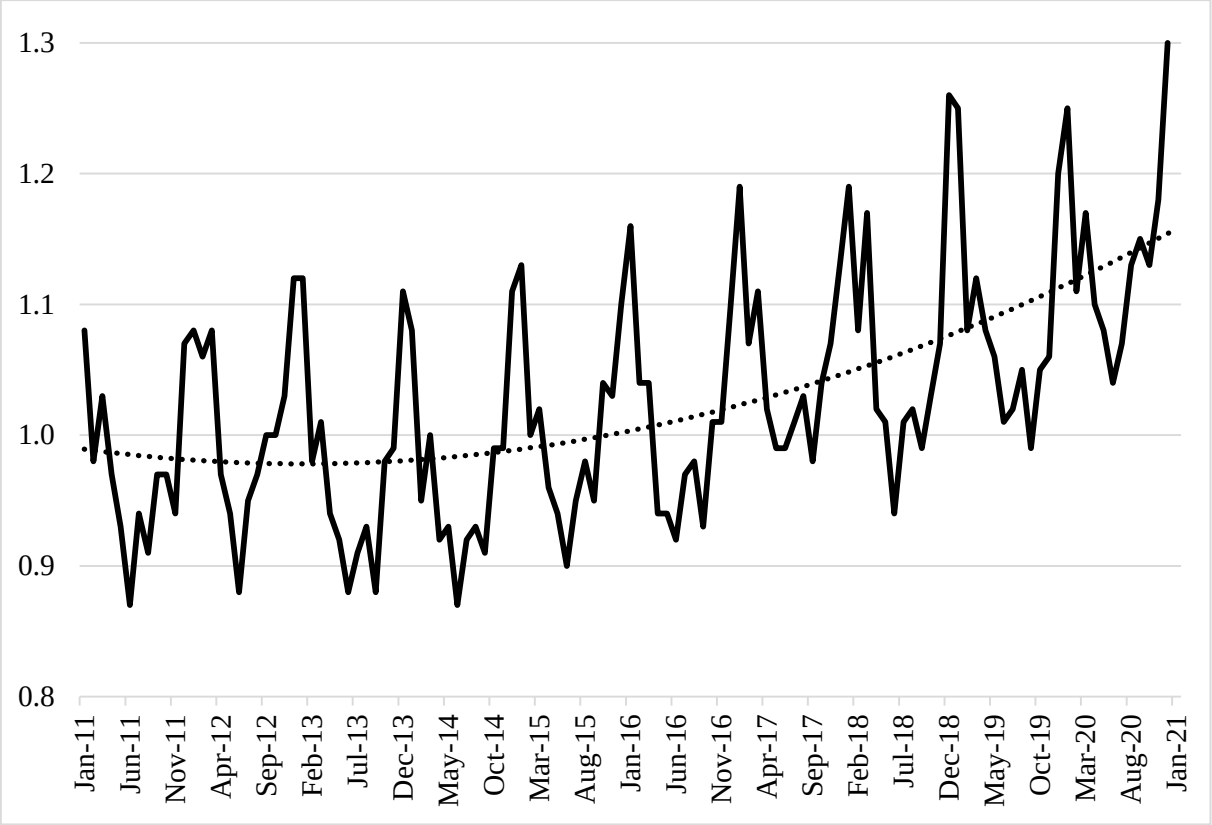

Figure 2. Electricity consumption of household customers

Source: National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica.

Annex 1 details the results of the application of a HEGY type test for seasonal and nonseasonal unit roots in a monthly time series regarding the electricity consumption of household customers. The HEGY test shows the existence of a non-seasonal root (at zero frequency), for the level series and the presence of seasonal unit roots with 12 months per cycle. If the polynomial trend is removed from the initial series, then the HEGY test identifies only seasonal unit roots with 12 months per cycle.

2.3. The electricity consumption of non-household customers

The behaviour of *non-household customers regarding electricity consumption* during the 2011-2020 period is shown in Figure 3. The graph of the non-household customers regarding electricity consumption series suggests the presence of significant seasonal fluctuations, against the background of a polynomial trend. Also, atypical values (outliers) appear in October 2018 and April, 2019.

Annex 1 details the results of applying a HEGY type test for seasonal and nonseasonal unit roots in a monthly time series related to non-household electricity consumption.

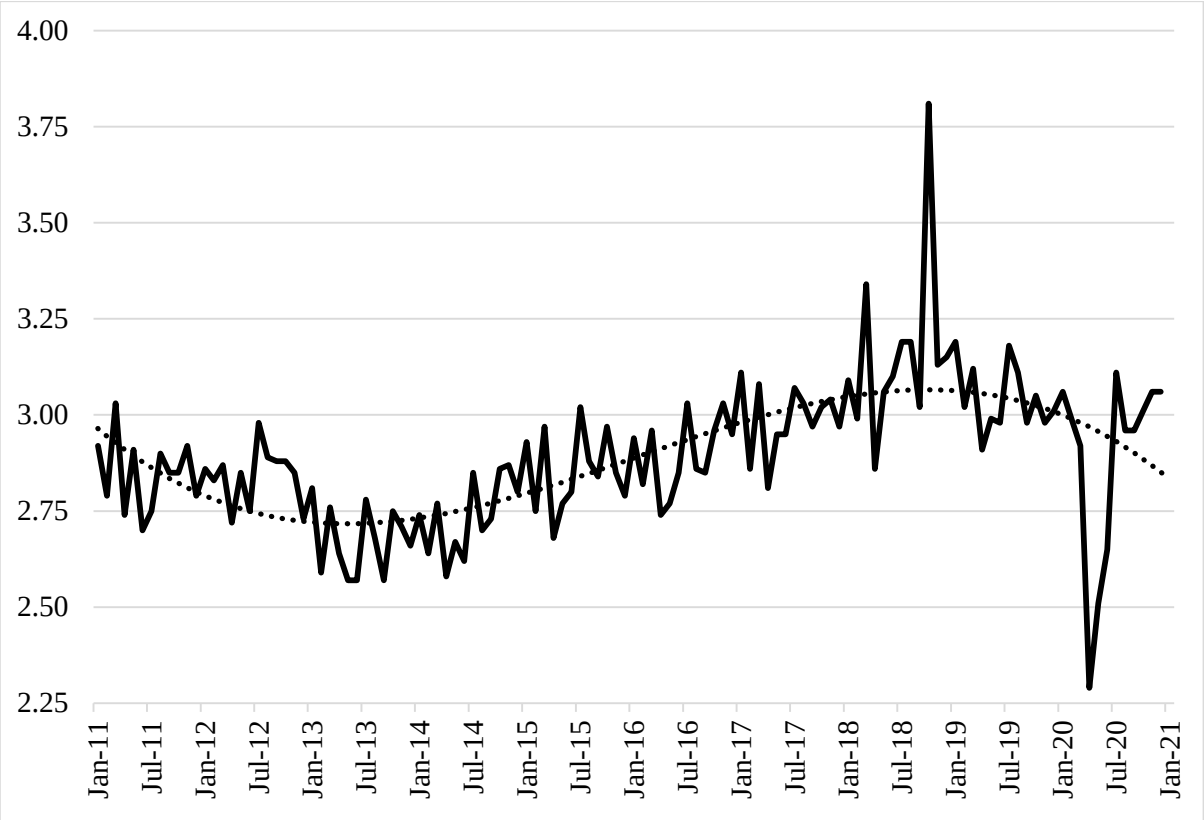

Figure 3. Non-household electricity consumption

Source: National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica.

The HEGY test does not signal the existence of an off-season root (at zero frequency), which means that the series is stationary in level. Instead, it identifies the presence of seasonal unit roots with 2.4, 4 and 12 months per cycle. The HEGY test identifies the same data structure (seasonal unit roots with 2.4, 4 and 12 months per cycle) also when the polynomial trend is removed from the initial series.

3. Econometric models

3.1. Domestic electricity consumption

Based on the results regarding the structure of the data generating process, we build the following model:

$$(1 - \phi_0 L)\,(1 - \phi_1 L - \phi_2 L^2 - \phi_3 L^3)\,(1 - \phi_{12} L^{12}) \cdot (\text{domestic consumption})_t = \\ = a_0 + [a_1 \ln(t) + a_2 \ln(t)^2 + a_3 \ln(t)^3] + \text{dummy}_{\text{months}} + \text{dummy}_{\text{outliers}} + e_t. \qquad (2)$$

In above equation, *dummy* $_{months}$ means 12 dummy variables corresponding the months (that take the value 1 for one of the months and zero for all the other months). $\text{Dummy}_{\text{outliers}}$ take the value 1 for some outliers. The symbol e_t means the error variable.

The model was solved by the Weighting Least Squares Method, in order to control for heteroskedasticity errors. Coefficients of terms with lag from 2 to 4 and from 14 to 16 are not significantly different from zero and have been removed from the model specification. For the same reason, the dummy variables for February, May and June have been removed.

$$\begin{aligned}(\text{Domestic consumption})_t = &\underset{(3.5186)}{17.2990} + \underset{(0.0572)}{0.4530}(\text{Domestic consumption})_{t-1} - \\ &- \underset{(0.0791)}{0.1290}(\text{Domestic consumption})_{t-12} + \underset{(0.0624)}{0.1216}(\text{Domestic consumption})_{t-13} \qquad (3) \\ &- \underset{(2.8682)}{11.8637}\cdot\ln(t) + \underset{(0.7703)}{3.0229}\cdot\ln(t)^2 - \underset{(0.0681)}{0.2502}\cdot\ln(t)^3 + \text{dummy}_{\text{months}} + \text{dummy}_{\text{outliers}} + u_t.\end{aligned}$$

The symbol u_t stands the error variable. Below estimators, in parentheses, standard error. The results are detailed in Annex 2.1. The remaining coefficients in the model are significantly different from zero, and the residues are independent and identically distributed (according to the BDS test, Annex 3). Based on these results, we forecast the monthly dynamics of domestic electricity consumption, for the period March - December 2020. The estimated values based on the model were compared with the statistically recorded values. The difference is explained by the impact of the COVID-19 pandemic. The results are shown in Table 1 and Figure 4.

Table 1. Impact of COVID-19 pandemic on domestic electricity consumption from March to December 2020

	2019	2020		Delta %
		statistic	forecast	
January	5.34	5.06		
February	4.68	4.70		
March	4.73	4.60	4.76	-3.4%
April	4.35	3.73	4.29	-13.1%
May	4.33	3.88	4.26	-8.8%
June	4.26	3.97	4.25	-6.5%
July	4.49	4.44	4.50	-1.2%
August	4.51	4.39	4.41	-0.6%
September	4.26	4.28	4.27	+0.2%
October	4.57	4.55	4.65	-2.2%
November	4.67	4.82	4.80	+0.4%
December	4.95	5.09	5.06	+0.5%

*) *delta % = (Statistic data – Forecast)/Forecast*
Source: our calculations based on econometric model

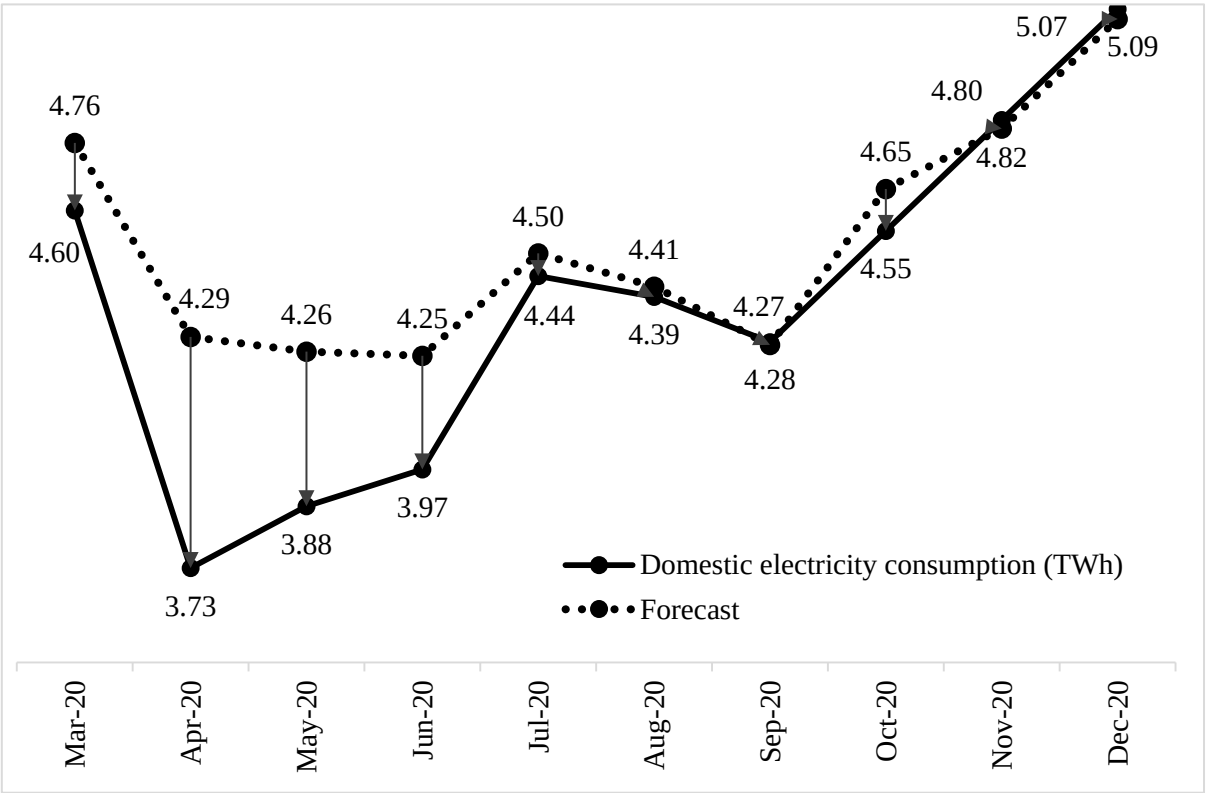

Figure 4. Impact of COVID-19 pandemic on domestic electricity consumption from March to December 2020

Source: our calculations based on econometric model

Domestic electricity consumption decreased by 13.1% in April, by 8.8% in May and by 6.5% in June. The decreases can be explained by the imposition of the state of emergency on the Romanian territory in the middle of March, the instituting of national lockdown (March, 24, 2020), of travel restrictions, closing of some activities, work from home, online school and others. The restrictions were gradually relaxed, starting with the second half of May (on May 14, a state of alert was declared for a period of 30 days, which implied less stringent measures than those imposed during the state of emergency). Since August 2021, domestic electricity consumption has returned to normal seasonal values.

3.2. Electricity consumption of household customers

Based on the results regarding the structure of the data generating process, we build the following model:

$$(1 - \phi_1 L)\,(1 - \phi_{12} L^{12}) \cdot (\text{Household consumption})_t = \\ = a_0 + [a_1 \ln(t) + a_2 \ln(t)^2 + a_3 \ln(t)^3] + \text{dummy}_{\text{month}} + e_t. \quad (4)$$

In above equation, $\text{dummy}_{\text{months}}$ means 12 dummy variables corresponding the months (that take the value 1 for one of the months and zero for all the other months). The symbol e_t means the error variable.

The model was solved by the Weighting Least Squares Method, in order to control for heteroskedasticity errors. Coefficients of terms with lag 12 and 13 are not significantly different from zero and have been removed from the model specification.

The results are detailed in Annex 2.2 and, in summary, are as follows:

$$\left(\text{Household consumption}\right)_t = \underset{(0.0940)}{0.3718}\left(\text{Household consumption}\right)_{t-1} + \underset{(0.0390)}{0.1434}\cdot \ln\left(t\right) \\ - \underset{(0.0165)}{0.0584}\cdot \ln\left(t\right)^2 + \underset{(0.0021)}{0.0076}\cdot \ln\left(t\right)^3 + \text{dummy}_{\text{months}} + u_t. \quad (5)$$

The symbols u_t stands for the residual variable. Below estimators, in parentheses, standard error. The remaining coefficients in the model are significantly different from zero, and the residues are independent and identically distributed (according to the BDS test, Annex 3). Based on these results, we forecast the monthly dynamics of electricity consumption of household customers, for the period March - December 2020. The estimated values based on the model were compared with the statistically recorded values. The difference is explained by the impact of the COVID-19 pandemic. The results are shown in Table 2 and Figure 5.

Table 2. Impact of COVID-19 pandemic on electricity consumption of household customers, from March to December 2020

	2019	2020		delta %*)
		statistic	forecast	
January	1.25	1.25		
February	1.08	1.11		
March	1.12	1.17	1.15	+1.4%
April	1.08	1.10	1.08	+1.9%
May	1.06	1.08	1.03	+4.3%
June	1.01	1.04	0.97	+6.8%
July	1.02	1.07	1.04	+2.9%
August	1.05	1.13	1.02	+10.6%
September	0.99	1.15	1.07	+7.8%
October	1.05	1.13	1.08	+4.5%
November	1.06	1.18	1.07	+10.4%
December	1.20	1.30	1.19	+9.1%

*) *delta % = (Statistic data – Forecast)/Forecast*

Source: our calculations based on econometric model

Household electricity consumption was above normal values, which means that the COVID-19 pandemic led to additional residential electricity consumption due to lockdown measures, work from home expansion and online education.

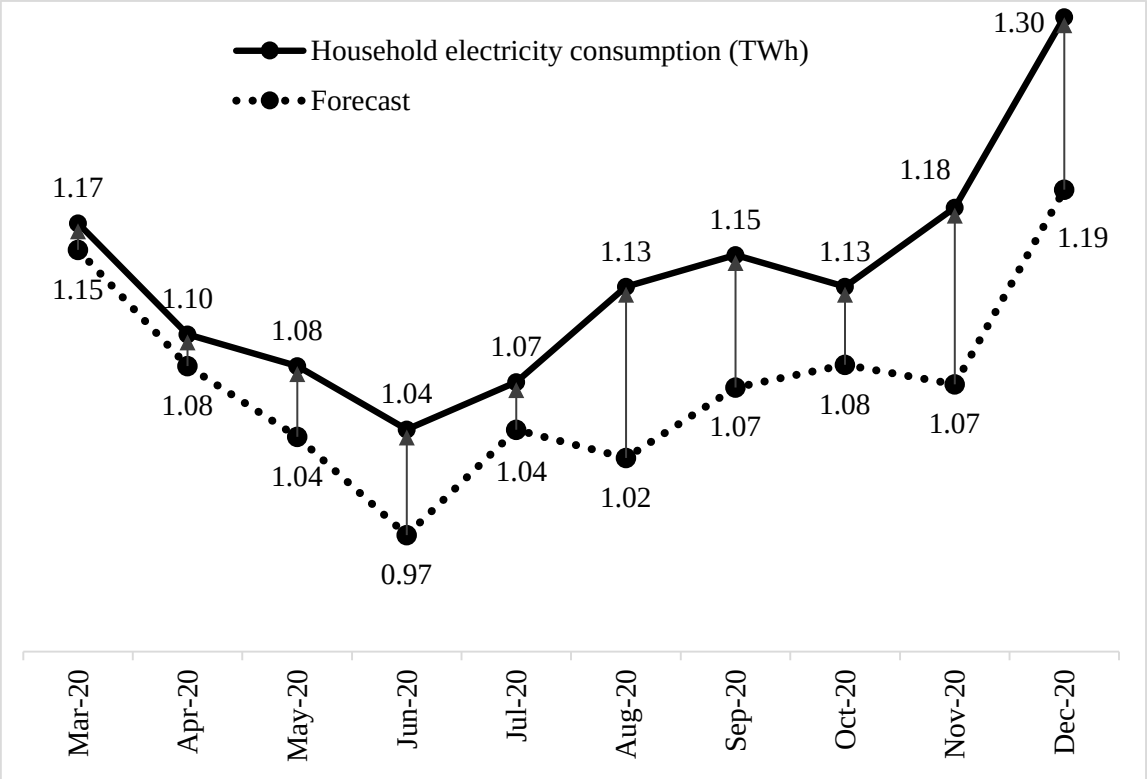

Figure 5. Impact of COVID-19 pandemic on electricity consumption of household customers, from March to December 2020

Source: our calculations based on econometric model

3.3. Non-household electricity consumption

Given the results of the HAGY test, we build the following model, for *non-household electricity consumption*:

$$(1 - \phi_3 L^3)\,(1 - \phi_4 L^4)\,(1 - \phi_{12} L^{12}) \cdot (\text{Non-household consumption})_t = \\ = a_0 + [a_1 \ln(t) + a_2 \ln(t)^2 + a_3 \ln(t)^3] + \text{dummy}_{\text{months}} + \text{dummy}_{\text{outliers}} + e_t. \quad (6)$$

In above equation, $\text{dummy}_{\text{months}}$ means 12 dummy variables corresponding the months (that take the value 1 for one of the months and zero for all the other months). $\text{Dummy}_{\text{outliers}}$ take the value 1 for some outliers. The symbol e_t means the error variable. Below estimators, in parentheses, standard error.

The model was solved by the Least Squares Method (the errors are homoskedastic). Coefficients of terms with lag 7, 15 and 16 are not significantly different from zero and have been removed from the model specification. The results are detailed in Annex 2.3 and, in summary, are as follows:

$$\begin{aligned}(\text{Non-household consumption})_t = & \underset{(0.0589)}{0.2124}(\text{Non-household consumption})_{t-3} \\ & + \underset{(0.0588)}{0.1556}(\text{Non-household consumption})_{t-4} \\ & - \underset{(0.0625)}{0.1230}(\text{Non-household consumption})_{t-12} \\ & - \underset{(0.0624)}{0.1875}(\text{Non-household consumption})_{t-13} \\ & - \underset{(2.8682)}{5.5021}\cdot\ln(t) + \underset{(0.7703)}{1.2734}\cdot\ln(t)^2 - \underset{(0.0681)}{0.0913}\cdot\ln(t)^3 \\ & + \text{dummy}_{\text{months}} + \text{dummy}_{\text{outliers}} + u_t.\end{aligned} \quad (7)$$

The symbols u_t means the residual variable. Below estimators, in parentheses, standard error. The coefficients in the model are significantly different from zero, and the residues are independent and identically distributed (according to the BDS test, Annex 3). Based on these results, we forecast the monthly dynamics of

electricity consumption of non-household customers, for the period March - December 2020. The values estimated based on the model were then compared with the statistically recorded values. The difference is explained by the impact of the COVID-19 pandemic. The results are shown in Table 3 and Figure 6.

Table 3. Impact of COVID-19 pandemic on non-household electricity consumption from March to December 2020

	2019	2020		delta %*)
		statistic	forecast	
January	3.19	3.06		
February	3.02	2.99		
March	3.12	2.92	3.14	-7.4%
April	2.91	2.29	2.95	-22.5%
May	2.99	2.51	3.05	-17.6%
June	2.98	2.65	3.06	-13.4%
July	3.18	3.11	3.25	-4.2%
August	3.11	2.96	3.16	-6.3%
September	2.98	2.96	3.11	-4.9%
October	3.05	3.01	3.24	-7.2%
November	2.98	3.06	3.24	-5.6%
December	3.01	3.06	3.18	-3.8%

*) *delta % = (Statistic data – Forecast)/Forecast*
Source: our calculations based on econometric model

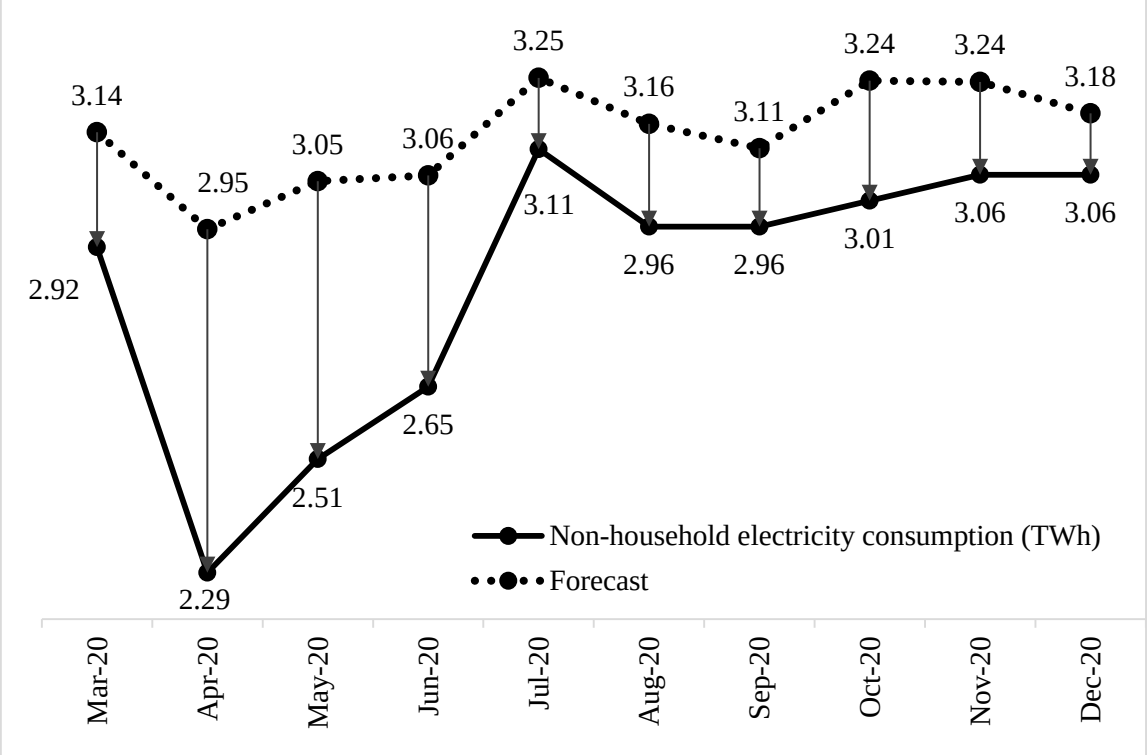

Figure 6. Impact of COVID-19 pandemic on non-household electricity consumption from March to December 2020

Source: our calculations based on econometric model

Non-household electricity consumption was below expected values under normal conditions, due to lockdown measures, quasi blocking of certain activities (e.g., tourism industries - especially accommodation, restaurants and food service activities, travel agencies, tour operators and other reservation services), the sharp

reduction in other activities (e.g., transport of people and goods) and, in general, due to the national economic recession. In fact, in 2020, there is a strong statistical correlation between the dynamics of industrial production and non-household electricity consumption (Figure 7). The linear correlation coefficient (Pearson) is 0.88.

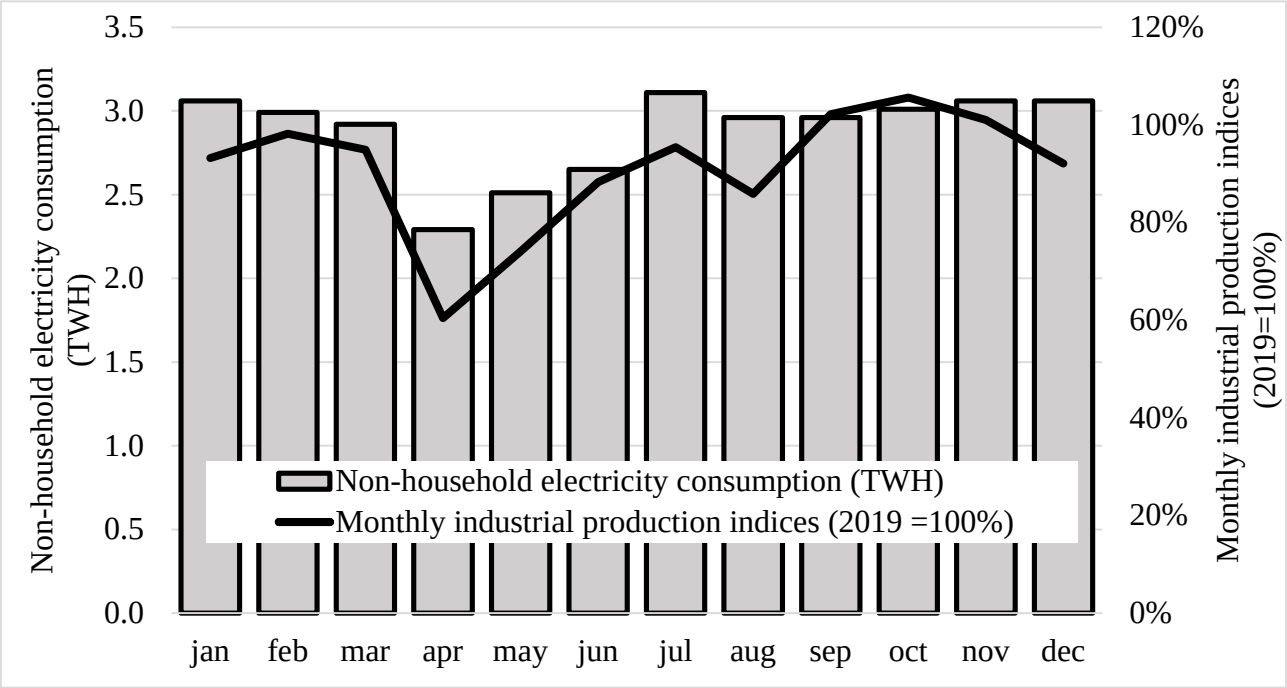

Figure 7. Relationship between non-household electricity consumption and monthly industrial production indices in 2020

Sources:

- ✓ for *non-household electricity consumption*: National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring: main data on the physical balance of electricity*, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica;
- ✓ for *monthly industrial production indices*: our calculations based on data from National Institute for Statistics, Tempo Online, table IND104K – *Monthly industrial production indices by industrial activities CANE Rev.2 - unadjusted series - base year 2015*. Retrieved March 21, 2021, from: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table.

Compared to normal values, the decrease in non-household electricity consumption was strong in April (-22.5%), in May (-17.6%) and June (-13.4%), and the dynamics remained negative throughout the analysed time interval.

Conclusions

The COVID-19 pandemic has severely affected the entire economy. In Romania, the gross domestic product decreased in 2020 by 3.9%, compared to 2019 (National Institute for Statistics 2021) and, globally (as a monthly average) the energy industry registered a decrease of 4.6% (National Institute for Statistics, 2021. Tempo Online, table IND104K). On this background, statistically the domestic consumption of electricity between March and December 2020 decreased by 4.1% against the same period of 2019 (-1.37 TWh).

In analysing the impact of the pandemic COVID-19 we tried to overcome the purely statistical approach, i.e., simply comparing the data recorded between March - December 2020 with the data recorded in the corresponding period of 2019. We started from the hypothesis that, under normal conditions, electricity consumptions (domestic consumption, household and non-household consumption) would have followed the growth trends recorded between 2011 and February 2020. To estimate those trends, we used type models SARIMAX (**S**easonal **A**utoregressive **I**ntegrated **M**oving **A**verage with e**X**ogenous factors). And the prospective estimates were considered as a benchmark (as counterfactual) for monthly electricity consumption and were compared with the data recorded by electricity consumptions in the special conditions induced by COVID-19 pandemic.

For *domestic electricity consumption*, we identified a decrease compared to the normal level by 13.1% in April, by 8.8% in May and by 6.5% in June. The decreases can be explained by imposing a state of emergency on the territory of Romania, in March, 16, 2020, for 30 days, (extended in April, 14 with another 30 days), the instituting of national lockdown (March, 24, 2020), travel restrictions, closing activities, work from home, online school, etc. Although the restrictions have been gradually relaxed starting with the second half of May, domestic electricity consumption has returned to normal seasonal values only since August 2021. *Household electricity consumption* was above normal values every month from March to December 2020, which means that the COVID-19 pandemic led to additional residential electricity consumption due to lockdown measures, the extension of work from home and online education. In contrast, *non-household electricity consumption* was below expected values under normal conditions, due to lockdown measures, sudden reduction going as far as blocking certain economic activities and, in general, due to the national economic recession (there is a statistical correlation between the dynamics of industrial production and non-household electricity consumption).

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Annexes

Annex 1. HEGY Seasonal Unit Root tests on electricity consumption series

	Simulated P-values (Monte Carlo simulations, 1000 replications)					
	Domestic consumption		Consumption of household customers		Non-household consumption	
Null hypothesis	Level	Without trend	Level	Without trend	Level	Without trend
Nonseasonal unit root	0.642	0.573	0.836	0.041	0.031	0.007
Seasonal unit root (2 months/cycle)	0.012	0.028	0.102	0.122	0.066	0.046
Seasonal unit root (4 months/cycle)	0.009	0.016	0.276	0.168	0.223	0.246
Seasonal unit root (2.4 months/cycle)	0.011	0.080	0.082	0.172	0.167	0.152
Seasonal unit root (12 months/cycle)	0.305	0.101	0.429	0.800	0.169	0.661
Seasonal unit root (3 months/cycle)	0.303	0.443	0.221	0.154	0.000	0.000
Seasonal unit root (6 months/cycle)	0.139	0.069	0.000	0.000	0.010	0.005

Selected lag using AIC

Source: our calculations based on National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica

Annex 2: Outputs of SARIMAX models

A2.1. Outputs of model on Domestic electricity consumption

Dependent Variable: Domestic consumption
Method: Least Squares
Sample (adjusted): 2012M04 2020M02
Included observations: 97 after adjustments
Weighting series: LOG(T)
Weight type: Inverse standard deviation (average scaling)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.29902	3.518570	4.916492	0.0000
$(\text{Domestic consumption})_{t-1}$	0.452967	0.057195	7.919734	0.0000
$(\text{Domestic consumption})_{t-12}$	-0.128967	0.079118	-1.630051	0.1071
$(\text{Domestic consumption})_{t-13}$	0.121585	0.062413	1.948070	0.0550
ln(t)	-11.86372	2.868260	-4.136207	0.0001
$\ln(t)^2$	3.022908	0.770309	3.924280	0.0002
$\ln(t)^3$	-0.250164	0.068105	-3.673190	0.0004
$D_{2012m5} - D_{2012m12}$	0.153762	0.080062	1.920547	0.0584
$D_{2012m9} - D_{2012m10}$	0.272225	0.079717	3.414886	0.0010
$D_{2018m3} - D_{2018m4}$	0.371621	0.057624	6.449115	0.0000
January	0.654850	0.058075	11.27596	0.0000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
March	0.333544	0.046305	7.203173	0.0000
April	-0.221802	0.041349	-5.364089	0.0000
July	0.292392	0.040419	7.233971	0.0000
August	0.074079	0.033020	2.243424	0.0277
September	-0.065223	0.033720	-1.934264	0.0567
October	0.449822	0.046457	9.682567	0.0000
November	0.401014	0.043470	9.225058	0.0000
December	0.625795	0.054297	11.52535	0.0000
Weighted Statistics				
R-squared	0.962926	Mean dependent var		4.4310
Adjusted R-squared	0.954370	S.D. dependent var		0.8157
S.E. of regression	0.080553	Akaike info criterion		-2.0446
Sum squared resid	0.506122	Schwarz criterion		-1.5403
Log likelihood	117.2639	Hannan-Quinn criterion		-1.8407
F-statistic	112.5485	Durbin-Watson stat		1.8842
Prob(F-statistic)	0.000000	Weighted mean dep.		4.4490
Unweighted Statistics				
R-squared	0.958026	Mean dependent var		4.4127
Adjusted R-squared	0.948340	S.D. dependent var		0.3698
S.E. of regression	0.084061	Sum squared resid		0.5512
Durbin-Watson stat	1.853854			

Source: our calculations based on National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica

A2.2. Outputs of model on electricity consumption of household customers

Dependent Variable: Household consumption
Method: Least Squares
Sample (adjusted): 2011M02 2020M02
Included observations: 109 after adjustments
Weighting series: T
Weight type: Standard deviation (average scaling)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$(\text{Household consumption})_{t-1}$	0.371810	0.094012	3.954895	0.0001
log(t)	0.143451	0.038997	3.678473	0.0004
$\log(t)^2$	-0.058397	0.016520	-3.535028	0.0006
$\log(t)^3$	0.007585	0.002147	3.532553	0.0006
January	0.578952	0.098847	5.857023	0.0000
February	0.504757	0.099079	5.094500	0.0000
March	0.567930	0.090225	6.294607	0.0000
April	0.477611	0.094712	5.042755	0.0000
May	0.459342	0.088957	5.163671	0.0000
June	0.413165	0.085568	4.828499	0.0000
July	0.501660	0.080361	6.242607	0.0000
August	0.458323	0.086158	5.319566	0.0000
September	0.508553	0.084568	6.013526	0.0000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
October	0.505531	0.088163	5.734037	0.0000
November	0.486884	0.089300	5.452201	0.0000
December	0.613308	0.088100	6.961524	0.0000
Weighted Statistics				
R-squared	0.942378	Mean dependent var		0.50798
Adjusted R-squared	0.933084	S.D. dependent var		0.84267
S.E. of regression	0.011891	Akaike info criterion		-5.89128
Sum squared resid	0.013149	Schwarz criterion		-5.49622
Log likelihood	337.0747	Hannan-Quinn criterion		-5.73107
Durbin-Watson stat	1.902545	Weighted mean dep.		0.97956
Unweighted Statistics				
R-squared	0.831887	Mean dependent var		1.01560
Adjusted R-squared	0.804772	S.D. dependent var		0.08476
S.E. of regression	0.037451	Sum squared resid		0.13044
Durbin-Watson stat	2.219666			

Source: our calculations based on National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica.

A2.3. Outputs of model on Non-household electricity consumption

Dependent Variable: Non-household consumption
Method: Least Squares
Sample (adjusted): 2012M02 2020M02
Included observations: 97 after adjustments
Weighting series: LOG(T)
Weight type: Inverse standard deviation (average scaling)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$(\text{Non-household consumption})_{t-3}$	0.212420	0.058941	3.603948	0.0006
$(\text{Non-household consumption})_{t-4}$	0.155590	0.058783	2.646830	0.0099
$(\text{Non-household consumption})_{t-12}$	-0.122960	0.062470	-1.968298	0.0527
$(\text{Non-household consumption})_{t-13}$	-0.187462	0.062630	-2.993150	0.0037
log(t)	-5.502097	1.589273	-3.462022	0.0009
$\log(t)^2$	1.273406	0.441536	2.884038	0.0051
$\log(t)^3$	-0.091330	0.040618	-2.248495	0.0274
$d_{2018m10}$	0.262556	0.055802	4.705091	0.0000
d_{2018m3}	0.662260	0.057310	11.55568	0.0000
January	10.20052	1.853097	5.504578	0.0000
February	10.03520	1.850140	5.424022	0.0000
March	10.19774	1.848483	5.516815	0.0000
April	9.984045	1.850644	5.394904	0.0000
May	10.05059	1.851712	5.427729	0.0000
June	10.05049	1.852880	5.424256	0.0000
July	10.27470	1.849433	5.555592	0.0000
August	10.22031	1.848488	5.529011	0.0000
September	10.12362	1.850419	5.470989	0.0000
October	10.19344	1.851606	5.505187	0.0000

Variable	Coefficient	Std. Error	t-Statistic	Prob.
November	10.18177	1.850454	5.502309	0.0000
December	10.13187	1.851079	5.473496	0.0000
R-squared	0.940900	Mean dependent var		2.9023
Adjusted R-squared	0.925348	S.D. dependent var		0.1894
S.E. of regression	0.051761	Akaike info criterion		-2.8954
Sum squared resid	0.203616	Schwarz criterion		-2.3380
Log likelihood	161.4251	Hannan-Quinn criterion		-2.6700
Durbin-Watson stat	1.604397			

Source: our calculations based on National Energy Regulatory Authority (ANRE), Monitoring Directorate, *Report on the results of electricity market monitoring*: main data on the physical balance of electricity, pp. 8-9. Retrieved March 21, 2021, from: https://www.anre.ro/ro/energie-electrica/rapoarte/rezultate-monitorizare-piata-energie-electrica.

Annexes 3: BDS Tests for Residuals in models on electricity consumption

BDS Test for RESID. Null Hypothesis: IID
Sample: 2011M01 2020M12
Included observations: 120
Raw epsilon: 1 - standard deviation
For bootstrap: 5000 repetitions

	Domestic consumption		Consumption of household customers		Non-household consumption	
Dimension	BDS Statistic	Bootstrap Prob.	BDS Statistic	Bootstrap Prob.	BDS Statistic	Bootstrap Prob.
2	0.006924	0.3162	0.003612	0.5028	-0.002779	0.8776
3	0.006481	0.3964	0.000151	0.8476	-0.002431	0.9894
4	0.007428	0.3096	0.000704	0.7572	-0.000454	0.8456
5	0.005137	0.3596	-0.000725	0.9256	0.001398	0.6846
6	0.003485	0.3846	0.001816	0.5100	0.001397	0.6302

Source: our calculations based on econometric models.

Renewable Energy Sources and Technologies for the Transition to a Climate Neutral Economy

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Abstract: The paper focuses on the feasibility of the transition to a climate neutral economy from the point of view of existing technologies, the surface occupied by renewable energy power plants, the materials needed and the cost of energy production. Based on the existing situation and using rather conservative estimates regarding the energy supply from renewable sources as compared to the energy demand of the global economy, the conclusion is that this transition is fully feasible and that already some renewable sources of energy are cost-effective compared to the use of classical fuels, such as coal. The paper also highlights the importance of consistent political decisions in favour of this decade-long transition and the leading role of the European Union in this respect.

Key words: renewable energy sources, climate neutral economy, feasible technologies
JEL Classification: O33, O44, Q42, Q56

1. Overview

The transition to a climate neutral economy has become an increasingly acute priority during the past decade, as result of the clear manifestations of the impact of human activities on the environment. This impact is so significant that there is almost universal agreement among scientists that humankind has entered a new geological era, named the Anthropocene (Stromberg, 2013). The name of this era suggests that the characteristics of the environment on planet Earth have changed significantly due to human activity, this modification including the pollution of the soil, water, and air with plastic materials and other substances, even in the most remote corners of the world, including at the two poles. At the same time, climate change is distinctly visible and undeniable, even if it is difficult to assess the exact contribution of human activity to this change.

In this context, the majority of large (and even some smaller) economies have already presented plans and strategies in an attempt to became climate neutral until 2050 (2060 in case of China), with a progress of evaluation in 2030. The European Union is one of the most ambitious actors in this process, having already defined detailed strategies for energy system integration, the use of hydrogen to support decarbonisation, circular economy, just transition and others (European Commission, 2020).

The awareness of the impact and implications of human activities on the environment at a global scale started in the early 1970s but concrete actions appeared in the late 1980s, with the adoption of the Montreal Protocol in 1987 regarding the banning of substances that negatively affect the Earth's ozone layer (chlorofluorocarbons - CFCs) and thus expose people to harmful UV radiations. The implementation of this protocol has been a success, as almost 99% of these substances used as aerosols and refrigeration agents have been eliminated. In 2016, the Kigali Amendment to the Montreal Protocol added a new category of substances with similar utilizations and effects to this interdiction (hydrochlorofluorocarbons – HCFC). The success of these first attempts to globally regulate the use of substances harmful for the environment can be explained first of all by the fact that alternatives were available without modifying the technologies and therefore without involving huge costs and the harmful effect for people was clearly understood (UNEP, 2021).

The much larger and complex issue of climate change has been gradually recognized during the 1980s and led to the adoption of an international treaty on climate change under the aegis of the United Nations Organization: The United Nations Framework Convention on Climate Change (UNFCCC). This treaty was signed in 1992 and entered into force in 1994. The signatory countries meet annually during the Conference of Parties (COP) to evaluate progress and adopt further protocols reflecting the new developments in the climate change domain.

Key moments of the UNFCCC have been the signature of the Kyoto Protocol (which established emission reduction obligations only for developed countries) in 1997 and of the Paris Agreement (which established

emission reduction obligations for all countries) in 2015 (UNCC, 2020). These two international agreements are important steps in controlling the negative impact of human activities on the environment, but they are far from being fully adopted by all signatory states. An example of this long and difficult process of adoption and entering into force, not to mention implementation, is the position of the United States who signed the Paris Agreement, then withdrew from it in November 2020 and re-joined in February 2021 (UNCC, 2021).
While at present there is a broad consensus that all countries have to make efforts to maintain the increase of global temperature below 2 degrees Celsius compared to the pre-industrial era (1850 – 1900) the adoption of concrete steps in this respect is much more difficult. The difficulties arise from the following characteristics:
- the large-scale change of technologies in almost all domains of activity is objectively a long-term process, requiring huge funds, qualified people and logistic support;
- the economic, social and political implications of such changes are enormous, even difficult to quantify. There are significant risks that technological changes may lead to unemployment or increased inequality within countries and among countries (OECD, 2019);
- in order to be successful and fair, such a transition has to be implemented simultaneously at a global level, a fact that raises numerous challenges (as not all countries have the technologies and resources to undertake the transition, not all countries can cope with the economic and social implications, strict measures have to be implemented in order to avoid unfair competition from the part of those who will not observe the emission reduction obligations and will have lower production costs, etc.).

2. The technical dimensions of the transition to a climate neutral economy. Is this transition feasible?

While a lot of attention has been directed towards the international agreements related to limiting climate change, the technical dimensions of this transition's feasibility have been less present in the public eye. The transition to a climate neutral economy refers to a lot of aspects but, in our view, first and foremost, this transition refers to energy because energy is involved in all human activities, be they professional or personal.
From the perspective of energy generation and utilization, as well as from the perspective of the impact on the environment, energy sources can be classified into:

- Clean and renewable sources of energy (solar, wind, hydro, geo-thermal, tidal energy, etc.). Status: Available;
- Sources with low or moderate impact on environment (nuclear energy). Status: Available and improving;
- Sources with moderate impact on environment (carbon capture technologies using coal, methane, natural gas, oil). Status: Available and improving;
- Sources with high levels of impact on environment (coal). Status: Available;
- Clean and practically infinite source of energy (nuclear fusion). Status: Unavailable yet but under development based on numerous international and national projects (World Nuclear Association, 2021).

The technical dimensions of the transition to a climate neutral economy relate to how much clean energy we need to generate at present and in the future in order to satisfy human needs and to what extend we can generate this amount of energy using available technologies. From a practical point of view, these aspects refer to:

- How much energy in all forms is consumed at a global level at present and will be at given time horizons such as 2030 or 2050?
- What is the estimated potential of renewable sources of energy at global level and how much of this potential can be used with existing technologies?
- Would it be possible to satisfy 100% of the global energy requirements using only renewable energy sources and existing technologies?

As mentioned above, a global solution for lowering climate change and the soil, water, and air pollution requires the participation of all countries because such a solution must include all human activities. Also, due to the characteristics of globalization, including a high mobility of production factors, if the emission reduction requirements are not implemented by all countries, then the economic activities will simply migrate from the countries where the requirements are strictly implemented (such as the European Union) towards developing countries where the implementation may be less strict. This is not a hypothesis; it is a phenomenon that has already taken place for decades.

Given these considerations, one question may refer to the capability of large economies and of the world economy as a whole to support such a large-scale transition in a relatively limited time frame. The change of technologies to obtain a climate neutral economy is so huge that it can be compared to the first industrial revolution. In any case, this comparison may lead to both similarities and differences.
Similarities concern changes related to the sources of energy used, the management of human activities, values and social implications; differences relate to the scale of processes and the time frame. The first industrial revolution started at the end of the 18th century and the beginning of the 19th century in England and gradually included several other countries (France, Germany, and the United States). It was a long-term process and it developed at a time when human activities were too limited in scale to pose a threat to the global environment. Nowadays, the transition has to encompass the whole world economy and it is expected or, at least, desired to be completed until 2050, meaning in about 30 years from now as compared to about 200 years for the first 3 stages of the industrial revolution (if we begin counting from around 1760 when the first industrial revolution started, and end around the early 1970s (Kellogg., 1987) when the scientific community and public opinion became more aware of the environmental impact of human activity).
On a positive note, and based on the review of international literature on the subject, one can say that answers already exist for all these questions and they offer reasons for optimism. A study carried out in 2009 by Scientific American provided some figures in support of the idea that all human energy needs for the present and for the future can be met using renewable sources and existing technologies. That approach took into consideration as clean and renewable the primary sources of energy such as water, sun and wind while electricity and hydrogen were the main presumed energy carriers (Jacobson and Delucchi., 2009). Further studies have confirmed and updated in a favourable sense the findings of the 2009 research.

2.1. Feasibility of the supply of clean sources of energy

In order to provide a clear picture of the feasibility of a transition to a climate neutral economy, the following data can be used to compare the global consumption of energy and the global potential of renewable energies:

- The global consumption of energy in 2009 was of 12.5 TW (terawatts or trillion watts). In 2021 it is estimated at 17.7 TW (The World Counts, 2021). The energy represented by 1 TW is enough to light 10 billion 100 W electric bulbs simultaneously.
- According to International Atomic Energy Agency (IAEA, 2020) by 2030 the global consumption of energy will be of about 20.35 TW (an increase of 15% compared to 2019) and by 2050 it will be of about 24.6 TW (an increase of 39% compared to 2019).
- The global potential of the wind energy is of 1700 TW, of which 40 – 85 TW in easily accessible areas.
- The global potential of solar energy is of 6500 TW, of which 580 TW in easily accessible areas (Jacobson and , 2009).

It is obvious that such estimates are not very accurate and that they imply a number of hypotheses (like the number of days and hours of solar exposure or the wind intensity based on previous meteorological records, or the efficiency of conversion of solar panels and wind turbines at a given time) and different calculation methods. Nevertheless, however approximate such calculations may be, the order of magnitude between the needs and the potential demonstrates that renewable sources are more than enough for covering the existing and future energy needs. In this respect, it suffices to mention that the sun transmits more energy to the Earth in an hour than the global population consumes in one year (Center for Climate and Energy Solutions, 2021). At the same time, the sun is expected to exist for at least another 5 billion years.

A recent study from April 2021 pointed out that if applied on large scale solar and wind energy may supply, using the existing technologies and the most accessible places, about 765 TW per year, a figure that is about 100 times higher than the global consumption of electricity and about 43 times higher than the global consumption of energy in all forms which is estimated at 17.7 TW for 2021 (Carbon Tracker, 2021).
At this point certain comments are particularly important:

- The energy consumption at a global level will increase only moderately or even decrease with the larger adoption on a large scale of renewable sources of energy. This will happen because the energy efficiency is higher or much higher in case of a large-scale adoption of these technologies. For instance, cars with internal combustion engines transform only 17 – 20% of energy into motion, while the electric cars transform about 75 – 86% of energy into motion.

- The existing energy generation units have a limited and planned life cycle and some of them need to be replaced anyway in the coming decades. Therefore, significant costs (that can be estimated) are needed anyway, even without a transition to new technologies for energy generation.

2.2. A possible mix of clean sources of energy for satisfying global demand

Limiting the primary energy sources to solar, wind and hydro the global energy needs for 2030 (estimated above at 20.35 TW) could be satisfied by the following possible mix:

- *About 50%* of the global energy needs could be satisfied by wind energy (a hypothetical case may be represented by 2 million turbines of 5 MW each, representing 10 TW. In 2020 the total installed wind power capacity was of about 743 GW (Statista, 2021). The number of wind turbines necessary to obtain the 10 TW capacity presumed above can vary substantially if the power of wind farms increases substantially. For instance, in 2021 the largest wind farm in the world had a capacity of 20 GW resulting from 7000 wind turbines (Construction Review Online, 2021). If we extrapolate only for a reference purpose the capacity of this largest wind farm existing today, we can conclude that only 500 wind farms of the same capacity could generate the 10 TW mentioned above.
- *40 %* of the global energy needs could be satisfied by solar energy (a hypothetical case may be represented by 80000 solar power stations of 1000 MW each, representing 8 TW. For reference, in 2020 there were 5 solar power stations with over 1GW each, the largest having 1.54 GW (Power Technology, 2020).
- *10%* of the global energy needs could be satisfied by hydro energy generated by 900 hydro power stations, representing 2 TW. It is important to note that by 2021 the installed hydro power was of 1.307 TW which means that about 65% of the projected capacity is already installed (Power Technology, 2021).

2.3. The feasibility of the transition to a climate neutral economy from the point of view of inputs (land, materials, costs)

The feasibility of using 100% renewable sources of energy for the global energy demand can be determined considering elements like:

- The surface needed for solar panels, wind turbines, other energy generating installations (like tidal waves generators) compared to the surface of the Earth;
- The types and quantity of materials needed to build the above-mentioned equipment and installations;
- The cost of implementation.

According to some estimates the surface needed by wind turbines located on land may represent around 0.48% of the surface of the Earth while other wind turbines will be located on water surfaces as more and more large wind farms are located in the coastal areas (Jacobsen et al., 2019). For the solar energy the surface covered will represent between 0.166-0.33% of the surface of the Earth and a part of this surface will be represented by the roofs and facades of buildings that already exist. At the same time, important solar farms can be located in deserts where the sun is abundant and the surface of land has no other uses. In a hypothetical example, if all the surface of Sahara Desert were covered with solar panels the energy received from the Sun would be of 2511.4 TW, that is more than 7,000 times than the electricity consumption of the entire Europe (Al-Habaibeh, 2019).

The construction of energy generating equipment based on solar, wind and hydro sources implies some common materials such as cement and steel for turbines, elements or compounds of silicon, cadmium and others for solar panels and certain rare metals for generators in wind turbines. Some categories of materials are abundant. And even if other chemical elements are in relative short supply or their sources are in countries that may control or limit their export (such as rare earth metals), research is well underway to discover new resources or to replace those materials with more abundant ones.

From the point of view of utilization, the energy power stations based on renewables are more efficient because they require less downtime for maintenance compared to energy power stations based on coal (2-5% of time per year as compared to 12.5% of time per year). One usual weakness that is mentioned referring to power stations based on renewables is that their functioning depends on weather conditions (presence of sun illumination or wind). But this shortcoming is being increasingly avoided by storing energy using hydrogen (that can be used in fuel cells to generate electricity again when needed), large batteries or even compressed air.

As for the cost of implementation of such a global scale project of transition to climate neutral sources of energy until 2050, a Stanford research group estimated it at USD 73 trillion. A positive aspect resulting from the research

was that the investment can be recovered in less than 7 years as result of an estimated USD 11 trillion per year in savings, while more than 28.6 million new jobs can be created (Wade., 2019). A previous study from 2009 indicated an amount of USD 100 trillion for carrying out the transition in 20 years (Jacobson and Delucchi, 2009). While such an amount may seem impressive, some aspects must be taken into account:

- The transition to clean sources of energy in order to obtain an environment neutral economy will be a gradual process that will take time, at best 20-30 years. Therefore, there is no need for a huge amount of capital from the very beginning.
- At the same time, once power stations based on renewable sources enter into operation, they already start to recover the investment through the sale of electricity.
- Large scale implementation of technologies for using renewable sources of energy determine both the improvement of the respective technologies and the discovery of new ones and, in this way, the reduction of the cost per unit of the energy produced.
- Existing power stations that use classic fuels such as coal are gradually ending their life cycle and have to be replaced. Therefore, investments in new power stations are necessary anyway.
- Putting in perspective the amount of USD 73 trillion for the complete transition to climate neutral sources of energy, it means about USD 2.43 trillion per year for the next 30 years (until 2050). This amount is already comparable to the world military spending of almost USD 2 trillion in 2020 (Stockholm International Peace Research Institute - SIPRI, 2021).

An important aspect which is, in our opinion, of enormous help in supporting the transition to the use of renewable resources for energy is that already the cost for building a solar or wind power station is lower than building a power station using fossil fuels. In March 2021 Bloomberg announced that the renewable sources of energy are the cheapest form to produce energy for 71% of the global GDP and 85% of the global energy production (Moore and Bullard, 2021). As most of the economic decisions are cost-based this fact may have a much more significant immediate impact in reorienting the construction of new power stations towards renewables than public urges for decreasing global warming and pollution of environment.

When analysing the cost of implementation of energy generating technologies based on renewables, we have to take into account not only the cost of building the energy generating equipment but also the cost of production per unit of energy. From this point of view, during the period 2010 – 2019, due to technological improvements, the costs of energy production have been reduced by (International Renewable Energy Agency - IRENA, 2020):

- 82% for photovoltaic cells;
- 47% for concentrated solar energy;
- 40% for terrestrial wind energy;
- 29% for sea-based wind energy.

As result, the costs for producing electricity from hydro, wind and geothermal sources are at present in the range of 4-7 US cents per kW/hour (5 US cents per kW/hour for terrestrial based wind turbines). These costs are already lower than the production costs for coal-based power stations. At the same time, the costs for producing electricity from solar panels are already under 7 US cents per kW/hour (IRENA, 2020). According to the estimates until 2030-2035 the costs for producing electricity from solar panels will be in the range of 1-2 cents per kW/hour.

3. Conclusions

The significant impact of climate changes has determined both political decision makers and leaders of big businesses to adopt strategies and programs to cut emissions and reach a climate neutral status. According to Credit Suisse representatives, the world economy is at the beginning of a transition period towards renewable sources of energy that will take place over the next 30 years. An argument supporting this trend towards renewable sources of energy is represented by the fact that in only one year, from March 2020 to March 2021 the commitments of states for reaching carbon neutrality until 2050 increased from 23% to 60% of the global emissions (Ng, 2021).

Although the transition towards renewables will imply numerous costs, difficulties and adaptation efforts, the good news is that the renewable energy from solar, wind, geo-thermal, tidal waves, bio-mass and other origins is more than enough for satisfying the global demand. At the same time, existing technologies are already competing from a cost point of view with the use of classical fuels, such as coal.

The seriousness of the implication of states and big economic players in the transition to climate neutral sources of energy can be demonstrated by the fact that investments in clean energy increased 10 times between 2000-2020, from about USD 33 billion per year to about USD 300 billion (Bullard, 2021).
The transition towards a climate neutral economy and climate neutral energy sources will accelerate in the coming years as result of a concerted action from the part of political decision makers, big economic players and the civil society. The European Union is one of the most active players, setting standards for the speed of the transition and very ambitious goals. Under these circumstances it is advisable that Romania adopts a pro-active attitude, based on a good knowledge of best international practices, aiming to fully participate in the European Union initiatives. The Romanian position should be based on the best capitalization of its competitive advantages represented by both natural and human resources.

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Modelling the Relationship between Final Energy Consumption, Share of Energy From Renewable Sources and Greenhouse Gases in the EU and Romania

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Abstract: - The EU has to reduce greenhouse gas emissions by 55% compared to the levels recorded in 1990 by 2030, despite the higher level of ambition suggested by the European Parliament, namely 60%. It is a very optimistic goal considering the different levels of compliance to the intermediary targets by the EU member states. Reducing energy consumption or increasing the share of green energy seems to be the directions to follow to meet the requirements set by the Commission; energy consumption is the highest generator of such gases that are detrimental to all life forms and the planet. In our paper, we are modelling the relationship between final energy consumption, greenhouse gas emissions and the share of energy from renewable sources in the EU and Romania to assess their statistical significance in order to identify how the energy sector could turn into a lever in the transition towards the green economy. We identify a strong statistically significant relationship between final energy consumption and greenhouse gas emissions in the EU27, as opposed to Romania`s case, in which the correlation coefficient is extremely weak. We also find out that the correlation between the share of energy from renewable sources and greenhouse gas emissions is stronger and more statistically significant in Romania than in the EU27, explaining somehow the first findings. For our analysis, we use the database of Eurostat and several statistical tools.

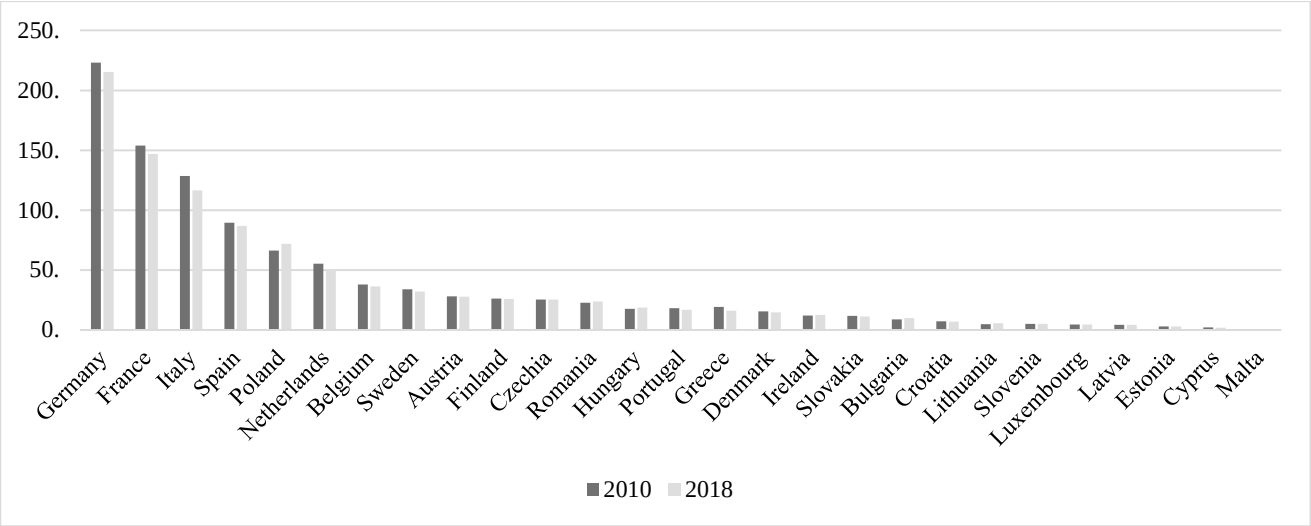
Key-Words: - renewable energy, energy consumption, greenhouse gases, correlation
JEL Classification: Q00, Q01, Q5, Q53, Q59

1 Introduction

In the EU, final energy consumption measures energy consumption levels by end-users, such as households, industry, and agriculture. It excludes the energy used by the energy sector, including for deliveries and transformation. It also excludes fuel transformed in the electrical power stations of industrial auto-producers and coke transformed into blast-furnace gas, where this is not part of overall industrial consumption but of the transformation sector (Eurostat, 2021a)

The advantages of energy efficiency are manifold. The energy-saving could improve the security of the energy supply by reducing the dependence on fuel imports. The improvement in energy efficiency also improves the competitiveness of European industry and services; for households, it reduces the energy bill. Energy-saving could also contribute to reducing greenhouse gas (GHG) emissions from fuel combustion. (Eurostat, 2021b).

Chart 1: Energy efficiency in the EU27 - Final energy consumption (Europe 2020-2030), Million tonnes of oil equivalent (TOE)



Source: Eurostat, 2021b

According to Eurostat (Chart1), between 2010 and 2018, final energy consumption decreased in the EU27 by 3.32%, 34.2 million TOE. In the majority of the EU member states (16 countries), the energy consumption decreased, but in other (10 countries) it increased. The highest percentage decrease in energy consumption was recorded by Greece (-15.42%), followed by Italy (-9.39%) and Netherlands (-8.46%).

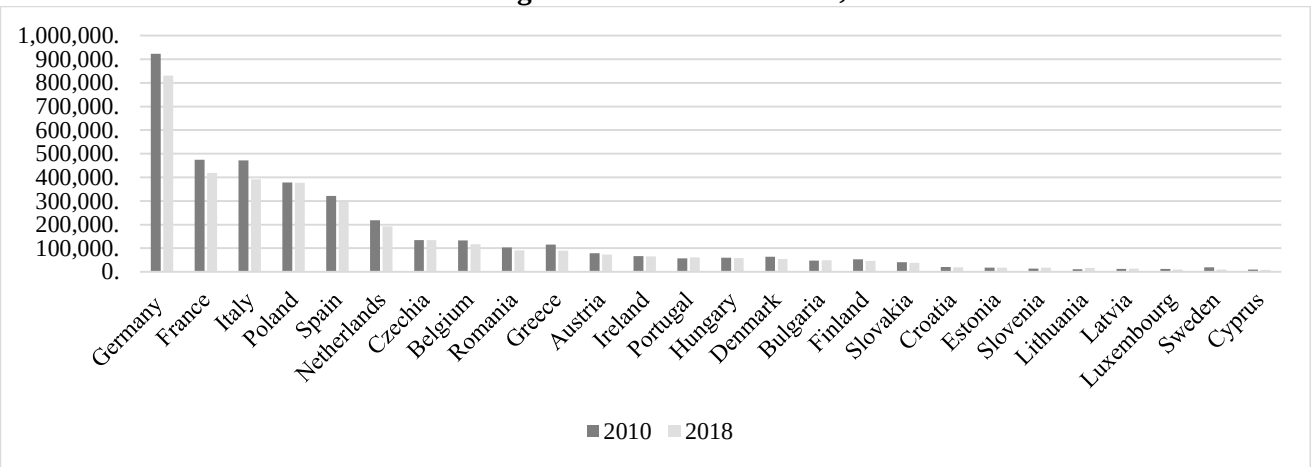
The highest percentage increase in energy consumption was registered in Malta (32.00%), followed by Lithuania (15.80%) and Bulgaria (12.23%). Romania ranked seventh (+4.66%) among the EU countries that increased energy consumption in the same timeframe.

In terms of quantity dynamic, Italy ranks first in the EU27, with a cut in final energy consumption of 12.07 million TOE, seconded by Germany (-7.56 million TOE), and France (-7.56 million TOE). The highest quantitative increase in final energy consumption was recorded in Poland (+5.57 million TOE), followed by Bulgaria (+1.08 million TOE) and Hungary (+1.06 million TOE) and Romania (+1.05).

Overall, in terms of consumption expressed in TOE in 2018, Germany was by far the EU27 leader with 215.46 million TOE (21.77% of total EU27 energy consumption, almost a quarter), followed by France (146.84 million TOE), and Italy (116.44 million TOE). Romania ranked 12th (23.59 million TOE). Estonia (2.96 million TOE), Cyprus (1.86 million TOE) and Malta (0.66 million TOE) closed the EU27 hierarchy regarding final energy consumption.

According to Eurostat (2021c), the greenhouse gas emissions inventory contains data on carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3).

Chart 2: Greenhouse gas emissions in the EU27, Thousand tonnes



Source: Eurostat, 2021c

As per the data provided by Eurostat (Chart 2), between 2010 and 2018, greenhouse gas emissions decreased in the EU27 by 9.36%, 361,571.86 thousand tonnes, respectively (22 countries reduced GHG emissions). The highest percentage decrease in GHG emissions was recorded by Sweden (-49.46%), followed by Malta (-26.66%) and Greece (-22.72%). The highest percentage increase in GHG emissions was registered in Lithuania (54.68%), followed by Slovenia (32.13%) and Latvia (9.21%). Romania ranked 12th among the EU countries that decreased GHG emissions (-11.41%) in the same timeframe.

Between 2010-2018, in terms of quantity dynamic, Germany ranks first in the EU27, with a cut in GHG emissions of around 91 thousand tonnes, followed by Italy (-81 thousand tonnes) and France (-55 thousand tonnes). Romania ranks eighth among the EU countries that diminished their GHG emissions (-12 thousand tonnes. Lithuania ranks last in the EU27, with an increase in GHG emissions of 5,797.36 thousand tonnes, being followed by being Slovenia (4,315.53 thousand tonnes) and Portugal (3,381.76 thousand tonnes) in the top of the EU countries that increased their emissions.

Overall, in terms of GHG emissions, in 2018, Germany was by far the EU27 largest polluter with 831,436.95 thousand tonnes (23.74% of total EU27 GHG emissions), followed by France (419,118.49 thousand tonnes) and Italy (391,263.13 thousand tonnes). Romania ranked ninth (91,656.49 thousand tonnes). Sweden (9,785.28 thousand tonnes), Cyprus (8,411.15 thousand tonnes) and Malta (2,190.45 thousand tonnes) closed the EU27 ranking regarding GHG emissions.

2 Problem Formulation

As a methodology, based on the Eurostat database, Pearson`s r correlation coefficient is used to investigate if, in the EU27 and Romania, there is a linear relationship between final energy consumption and greenhouse gas (GHG) emissions. If there is such a relation, the goal is to find out how strong it is and test its statistical significance at a level of confidence of 95%. If there are divergent results between EU27 and Romania, the analysis introduces a new indicator, namely the share of energy from renewable sources, to explain the eventual divergence.

3 Problem Solution

The data needed to calculate the Pearson correlation coefficient (Pearson`s r) between final energy consumption and (GHG) emissions were collected from the statistical office of the European Union (Table 1).

Table 1: Final energy consumption and Greenhouse gas emissions in the EU27 and Romania between 2010 and 2018,

Year	EU27 - Final energy consumption, Million tonnes of oil equivalent (TOE)	EU27 - Greenhouse gases, Thousand tonnes	Romania - Final energy consumption, Million tonnes of oil equivalent (TOE)	Romania - Greenhouse gases, Thousand tonnes
2010	1,023.79	3,862,747.61	22.54	103,455.22
2011	984.35	3,755,309.45	22.74	109,533.32
2012	982.28	3,674,289.61	22.76	104,815.28
2013	980.29	3,588,728.61	21.80	94,683.20
2014	938.88	3,473,826.7	21.69	93,878.21
2015	958.47	3,535,584.01	21.85	94,488.55
2016	977.71	3,541,154.42	22.24	91,182.74
2017	989.66	3,601,730.63	23.33	95,195.44
2018	989.77	3,501,175.75	23.59	91,656.49

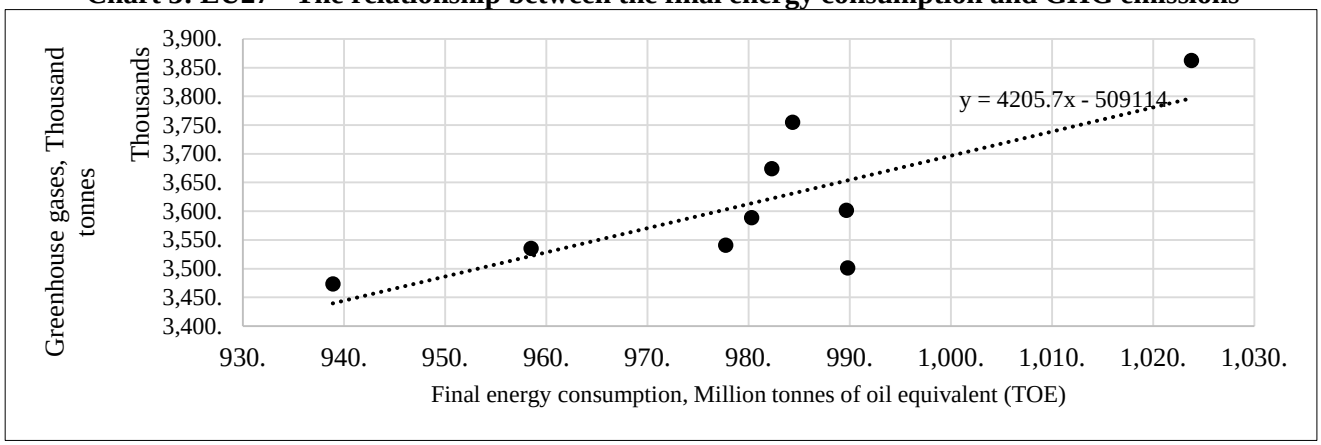
Source: Author`s based on data provided by Eurostat (2020b).

The sample Pearson`s r is calculated with the following formula (1):

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - (\sum x)^2}\sqrt{n\sum y^2 - (\sum y)^2}}$$

Using Microsoft Excel, we calculated the value of Pearson`s r for the EU27 data. The value of r is 0.763487. It means that there is a strong linear relationship between the analysed indicators, with a positive slope. Therefore, if one indicator increases, the other one increases too (See Chart 3).

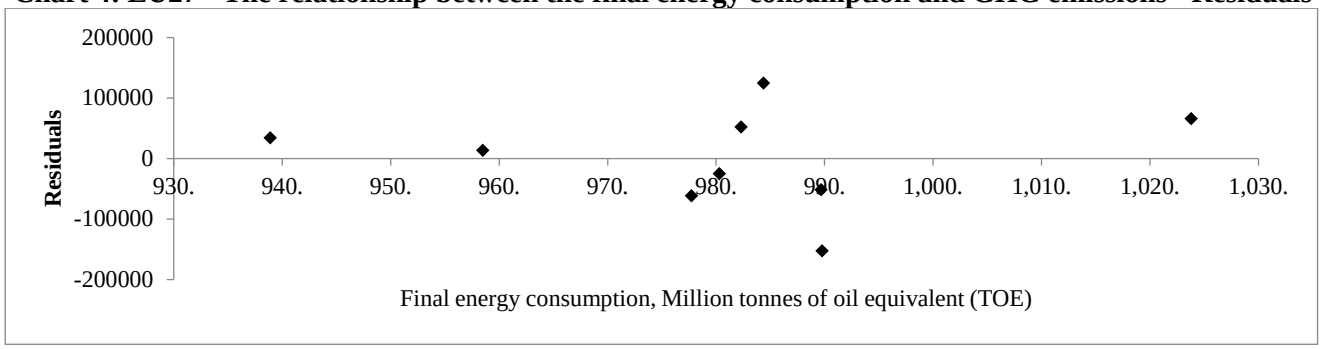
Chart 3: EU27 - The relationship between the final energy consumption and GHG emissions



Source: Author`s representation based on data provided by Eurostat

The residual plot displays a somewhat random pattern that indicates that a linear model provides a decent fit to the data (Chart 4).

Chart 4: EU27 - The relationship between the final energy consumption and GHG emissions - Residuals



Source: Author`s representation based on data provided by Eurostat

The coefficient of determination (r^2) is 0.5829127. That implies that the relationship between the analysed variables explains 58.29% of the variation in the GHG emissions. It does not mean that one variable causes the other.

The linear relationship between the analysed indicators is tested at a 95% level of confidence to see if it is statistically significant.

The null hypothesis (H_0), implies no statistically significant linear relationship in the EU27 between the final energy consumption and GHG emissions.

The alternate hypothesis (Ha) is that there is a statistically significant linear relationship in the EU27 between the final energy consumption and GHG emissions.

$$\begin{cases} H_0: \rho = 0. \\ H_a: \rho \neq 0. \end{cases}$$

While Pearson`s r is the sample correlation coefficient, ρ is the population correlation coefficient.
The ***t-distribution*** is used to test the hypotheses.
Given data:

$$\begin{cases} \text{Level of confidence: LOC=95\%.} \\ \text{Level of significance: } \alpha = 0.05. \end{cases}$$

Number of observations: n=9.
Degree of freedom: Dof=7.

Calculations:

Since there is a two-tailed test, the value of $\frac{\alpha}{2}$ it is calculated, given α = 0.05.

$$\frac{\alpha}{2} = \frac{0.05}{2} = 0.025$$

The goal was to find the value of t that gives the area of 0.025 to the right tail of the t-distribution, namely, $t_{\frac{\alpha}{2}}$ or $t_{0.025}$. T-distribution table was used to find the value of $t_{0.025}$. Taking into consideration the degree of freedom (7) and the level of significance α, the value of $t_{0.025}$ = 2.365 and consequently, since t-distribution is symmetrical, -$t_{0.025}$ = - 2.365 (the value of t that gives the area of 0.025 to the left of t-distribution).

The t-test was calculated using the formula:

$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$ => $t = \frac{0.763487}{\sqrt{\frac{1-0.763487^2}{9-2}}}$ = 3.127788199 (2)

Placing the value of t in the rejection region since the value of t > $t_{\frac{\alpha}{2}}$. Therefore, the null hypothesis (H_0) is rejected. Therefore, there is a statistically significant linear relationship in the EU27 between the final energy consumption and GHG emissions with a 95% level of confidence.

Since the relationship of the variables is statistically significant, it was aimed to finding the equation of the linear regression line, or "the least-squares regression line", which minimises the squares of the distances between the data points and the line (See Chart 1).

To this end, we calculate the regression statistics with Excel (Table 1, Table 2 and Chart 3).

The formula for the least-squares regression line is:

y= $b_0 + b_1 x$ (3)

where:

$b_1 = \frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - (\sum x)^2}}$ (slope) (4)

$b_0 = \frac{\sum y}{n} - b_1 \frac{\sum x}{n}$ (y - intercept) (5)

Table 2: Regression Statistics

	Coefficients	**Lower 95%**	**Upper 95%**
b_0	-509114.2336	-3627700.315	2609471.847
b_1	4205.748866	1026.180707	7385.317025

Therefore, the equation of the regression line for our sample is: *y = 4205.7x - 509114* as displayed by Excel in Chart 3.

The goal is to find out how much additional y is generated by one additional unit of x. According to the model, for one additional million TOE, the EU27 GHG emissions could increase by 4205.75 thousand tonnes.

The equation of the population regression line is:

$Y = \beta_0 + \beta_1 x$ (6)

The confidence interval for the slope (β_1) and y-intercept (β_0) of the population regression line can be constructed based on the data provided by Table 2.

In the case all the population data is known, and a regression line is drawn through it, that the line will have β_0 ∈ [-3627700.315, 2609471.847] and β_1 ∈ [1026.180707, 7385.317025] with a 95% level of confidence.

The same steps were followed for the indicators regarding Romania. The value of r is 0.148435476, meaning that there is no linear relationship between final energy consumption and GHG emissions. The aim was to find out

why? Therefore, the percentage of renewable energy sources (PRES) in Romania as compared to the EU27`s was analysed.

Table 3: Percentage of renewable energy sources in the EU27 and Romania between 2010 and 2018,

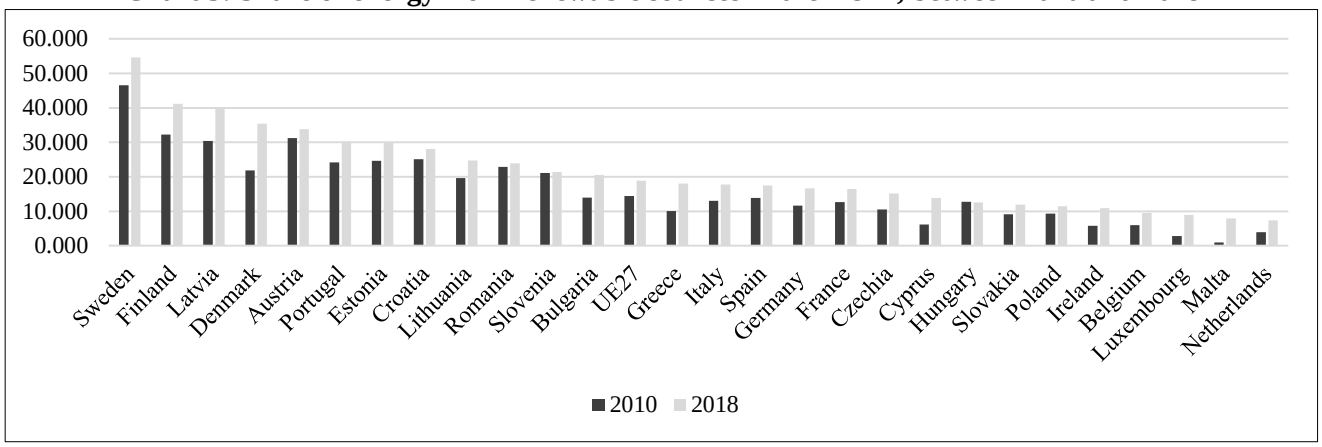
Year	EU27	Romania
2010	14.421	22.834
2011	14.551	21.186
2012	16.024	22.825
2013	16.697	23.886
2014	17.463	24.845
2015	17.841	24.785
2016	18.029	25.032
2017	18.467	24.454
2018	18.909	23.875

Source: Eurostat, 2021d

In all the years of the analysed interval, Romania had a better percentage of renewable energy sources than the EU27 as a whole.

Intuitively, that means the influence of final energy consumption on GHG emissions should be less important in the countries with greener energy production.

Chart 5: Share of energy from renewable sources in the EU27, between 2010 and 2018



Source: Eurostat, 2021c

According to Chart 5, in 2018, Sweden recorded the highest percentage of renewable energy sources (54.65%), followed by Finland (41.16%) and Latvia (40.02%). The last three countries in the ranking were Luxembourg (8.97%), Malta (7.96%) and Netherlands (7.34%).

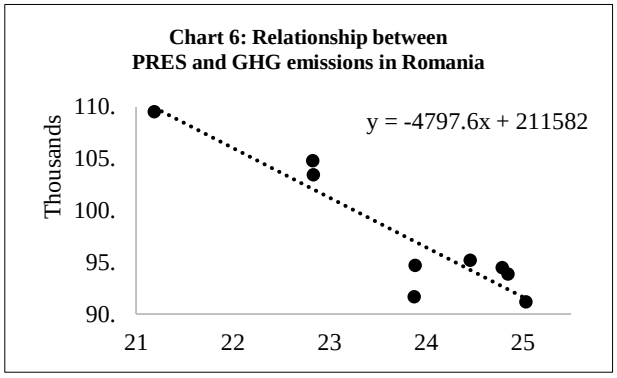
We follow the same procedure to see the correlation strength between the percentage of renewable energy sources and GHG emissions in Romania and the EU27, using the data in tables 1 and 3.

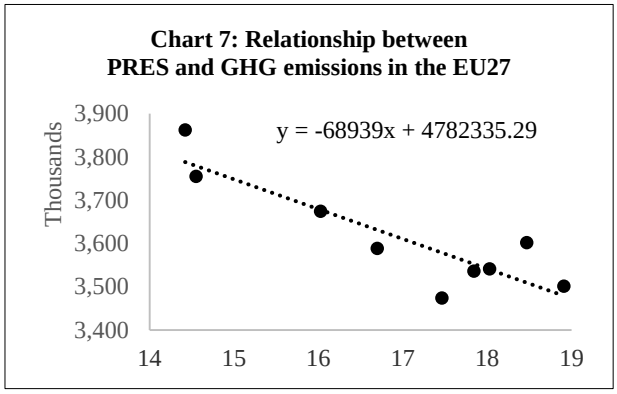
Table 4: T-Distribution indicators for our analysed pairs of variables

	Percentage of renewable energy sources / GHG emissions in the EU27	Percentage of renewable energy sources / GHG emissions in Romania	Percentage of renewable energy sources /Final energy consumption in the EU27	Percentage of renewable energy sources /Final energy consumption in Romania
r	-0.8848	-0.9235	-0.4363	-0.3175
r^2	0.7829	0.8529	0.1903	0.1008

Number of observations (n)	9	9	9	9
Degree of freedom (Dof)	7	7	7	7
$t_{0.025}$	2.365	2.365	2.365	2.365
$-t_{0.025}$	-2.365	-2.365	-2.365	-2.365
Test statistic t	-5.024	-6.371	-1.2827	-0.8860
$t < -t_{0.025}$ or $t > t_{0.025}$	yes	yes	no	no
Statistical significance	(H0) is rejected. There is a statistically significant linear relationship between GHG emissions and the percentage of renewable energy sources in the EU27, with a 95% level of confidence.	(H0) is rejected. There is a statistically significant linear relationship between GHG emissions and the percentage of renewable energy sources in the Romania, with a 95% level of confidence.	(H0) failed to be rejected. There is no statistically significant linear relationship between the percentage of renewable energy sources and final energy consumption in the EU27.	(H0) failed to be rejected. There is no statistically significant linear relationship between the percentage of renewable energy sources and final energy consumption in Romania.

A robust correlation between GHG emissions and the percentage of renewable energy sources in Romania and the EU27 was identified, with negative slopes. Therefore, if the percentage of renewable energy sources increases, the GHG emissions decrease (Charts 6 and 7).





According to the models displayed in charts 6 and 7, for the analysed samples, for one additional percentage point in PRES, the Romanian GHG emissions decrease by 4797.6 thousand tonnes, and the EU27 GHG emissions decrease by 68939 thousand tonnes.

Romania has a higher Pearson coefficient -0,9235, revealing a stronger negative correlation, than in the EU27 (-0,8848). That partially provides an answer to our question. The coefficient of determination (r^2) is also higher in Romania than in the EU27, the relationship between the analysed variables explaining 85.29% of the variation in GHG emissions, in Romania, against 78.29% in the EU27. Therefore, what was intuitively believed, namely that the non-linear relationship between final energy consumption and GHG emissions in Romania compared to the EU27, could be related to the percentage of renewable energy sources in Romania, which is higher than the EU, can be partially supported by statistical evidence. Briefly, energy consumption can even increase without boosting GHG emissions as long as green sources provide that energy.

4 Conclusion

The analysis proves that, in the EU27, there is a strong linear correlation between the final energy consumption and GHG emissions, with a positive slope and a high determination coefficient. We also find that the relationship between the analysed indicators is statistically significant at a high level of confidence. That is not the case for Romania, where the correlation between the two variables is weak and not statistically significant.

This result could be partially explained by the share of renewable energy sources, which is higher in Romania than in the EU and correlates better with GHG emissions, with a negative slope, and is more significant statistically in Romania than in the EU.

Romania ranks 10th in the EU27 regarding the percentage of renewable energy sources, performing better than countries such as Germany, France, Italy and worse than Sweden, Finland, and Austria.

Therefore, decreasing the final energy consumption or increasing the percentage of renewable energy sources could represent an essential driver of the circular economy from the GHG emissions perspective.

Hence, in our opinion, the transition to green energy should be of paramount importance for the transition towards the circular economy, decision-makers and companies being forced by the climate targets to tilt the energy mix in this direction.

Acknowledgments:

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Dominant Contribution of the Developing Countries to the Renewable Energy Sector[1]

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Abstract: Several developing countries have become world leaders in the field of renewable energy, of which China, but also Brazil and India stand out. This research paper focuses on the positions they occupy in the world rankings of hydro, wind, solar and bio energy capacities, as compared to the developed countries. At the same time, the investigation points to specific catalysts or, on the contrary, deterrents of the "green revolution" in the developing world. Hydropower is the most important form of renewable energy in all the three countries included in this evaluation. It is underscored that China is the first one in each of the four world rankings, taking into account the total installed capacity of renewable energy: hydro, wind, solar and bio. It is also the largest investor in renewable energy capacity worldwide. Brazil ranks second as regards hydropower and bioenergy capacities, while India ranks fourth in wind and bioenergy.

Key-Words: renewable energy, green economy, installed capacity, national energy policies
JEL Classification: Q 42, Q 48

1. Introduction

Developing countries have gradually become dominant players in the demand and supply of renewable energy. Among them, China, Brazil and India stand out, with a cumulative installed capacity of renewable energy of over 1,000 GW, representing more than 40% of the world total. The three mentioned countries are also among the top five ranking actors according to the number of jobs generated by the renewable energy technology industry, along with the EU and the USA (REN21, 2019).

National energy policies, international initiatives, associated with protectionist trends culminating in trade wars and more recently the Covid-19 pandemic are among relevant factors with a strong impact on developments in the field of renewable energies, even though with different intensities.

On the one hand, the abundance of fossil fuels in some regions and revenues obtained from their exploitation, sale and consumption are an impediment of the energy transition in countries such as the Russian Federation. Conversely, scarce resources as compared to high domestic energy demand represent an incentive for other players, such as China and Brazil to stimulate their renewable energy sector. About a quarter of Russia's fiscal revenues are provided by taxes levied on fossil fuel production, as compared to 18% in India, 7% in Brazil and South Africa, and 4% in China (IISD, 2019).

On the other hand, energy security and the goal of reducing dependency on certain import sources, but also the political will to express a firm commitment to decrease greenhouse gas emissions are among major determinants of the current energy transition worldwide. However this transition is only gradual, as long as economic development continues to be based on coal consumption in many countries, for instance in China and India. By contrast, renewable energy accounts for almost 45% of Brazil's primary energy demand, making its energy sector one of the least carbon-intensive in the world (IEA, 2021).

[1] Analysis included in the study „Development of Renewable Energy Sources within the Energy Union in the Context of the Paris Agreement Commitments", coordinator Dr. Petre Prisecaru, Institute for World Economy, research plan of the Romanian Academy, 2020.

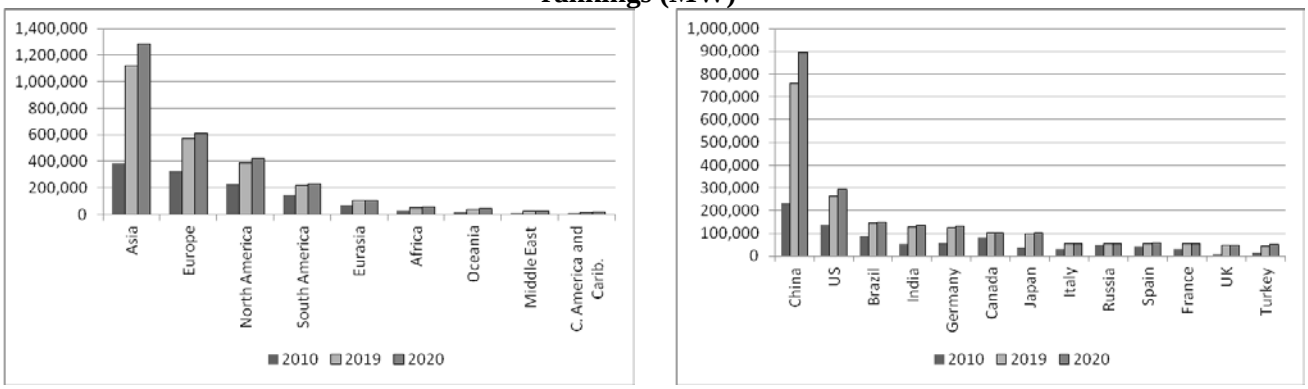
2 China, the undisputed leader in terms of total installed capacity of renewable energy

Strongly committed to implementing the Paris Agreement on climate change, ***China*** is currently the largest producer and consumer of renewable energy, promoting the ***energy revolution*** on multiple levels (demand, supply, technology, security) (MEE, 2019).

Taking into account its total installed capacity of renewable energy (almost 900 GW in 2020, as compared to 760 GW in 2019 and less than 300 GW in 2011), China holds about 70% of the Asian total and 32% of the world total, ranking first in the international hierarchy (IRENA, 2020; IRENA 2021). In comparison, the EU plus the UK concentrates almost 21%, and the US over 10% of the total, so China's total installed capacity is equivalent to that of the EU, the US and the UK taken together.

Chart 1 shows the rankings by regions and countries according to the total installed capacity of renewable energy in 2019-2020, as compared to 2010. There is almost a tripling of the capacity in Asia, with an increase of more than three times the installed capacity in China in 2010-2020.

Chart 1: Total installed capacity of renewable energy in 2010, 2019 and 2020, regional and global rankings (MW)

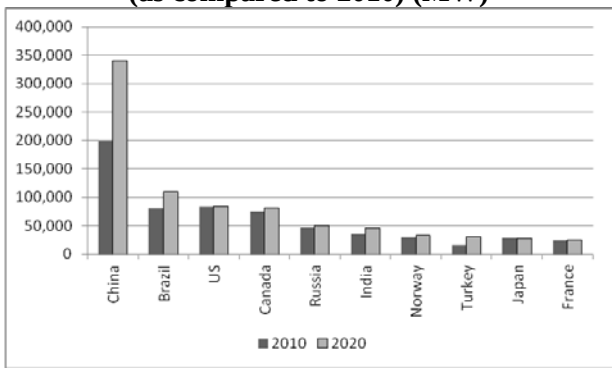


Source: Chart elaborated by the author, based on IRENA (2020; 2021).

In 2019, China's total installed renewable energy capacity was distributed as follows: 326 GW ***hydropower*** (43% of the total), 210 GW ***wind energy*** (28%), 205 GW ***solar energy*** (mainly photovoltaic) (27%) and almost 17 GW ***bioenergy*** (2%). Comparatively, worldwide, the percentages were as follows: 47%, 25%, 23% and 5%, respectively (IRENA, 2020). Compared to the previous year, in 2020 the share of wind energy in China increased to 31.5% and that of the solar energy to 28.4%, while the hydropower share reduced to 38% (IRENA, 2021). Worldwide, in 2020 as compared to 2019, the shares of solar energy and wind energy increased approximately by 2 percentage points each.

During the analyzed period, China increased its renewable hydropower 1.7 times (from 200 GW in 2010 to almost 340 GW in 2020), wind energy more than 9 times (from 30 GW to almost 282 GW) and bioenergy more than 5 times (from 3.5 GW to 18.7 GW) (Charts 2, 3 and 5). As regards the solar energy, the jump was spectacular, from 1 GW to 254 GW (Chart 4).

Chart 2: Ranking of the top ten countries according to the total installed hydropower capacity in 2020 (as compared to 2010) (MW)



Source: Chart elaborated by the author, based on IRENA (2020; 2021).

China ranks first in each of the four rankings, taking into account the total installed capacity of renewable energy: hydro, wind, solar and bio (Charts 2, 3, 4 and 5). The lowest share in the world total is recorded by China in bioenergy, and the highest in wind energy (Table 1).

Table 1: Shares of the top three leaders in each renewable energy category in the world total in 2020, as compared to the EU plus UK plus US (%)

Energy type	Countries/groups of countries	Shares (%)
Hydro	***1. China***	***28.1***
	2. Brazil	9.0
	3. US	6.9
	EU+UK+US	17.8
Wind	***1. China***	***38.5***
	2. US	16.1
	3. Germany	8.5
	EU+UK+US	43.5
Solar	***1. China***	***35.6***
	2. US	10.6
	3. Japan	9.4
	EU+UK+US	32.0
Bio	***1. China***	***14.8***
	2. Brazil	12.4
	3. US	9.8
	EU+UK+US	42.8

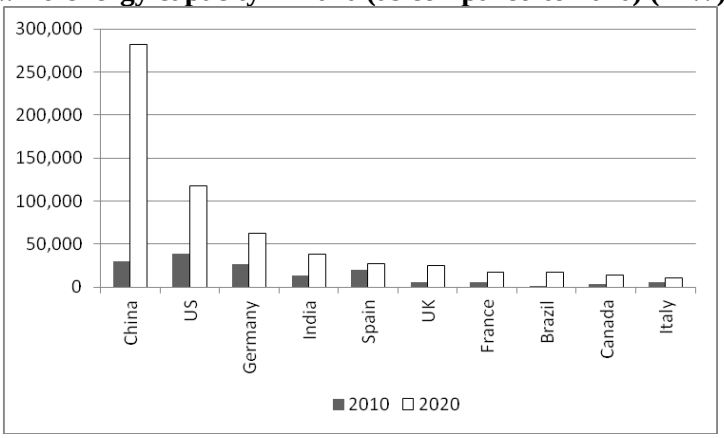
Source: Table elaborated by the author, based on IRENA (2020; 2021).

Developed countries play a much more important role in wind and bio energy than in solar and hydro, taking into account their shares in the world renewable energy capacity. Although there are various rankings of major solar panel companies, depending on capacity sold, they all have in common that most are from China (Jinko Solar, JA Solar, Trina Solar, Longi Solar Technology, Risen Energy, SunTech, in some including Seraphim Energy Group and Must Solar), along with those from Canada, USA, Germany, Japan and South Korea (Solar Power Nerd, 2021; PV Magazine, 2020).

3. India and Brazil in world rankings

The positions occupied by ***India*** in the four hierarchies of 2020 (depending on the total installed capacity of hydro, wind, solar and bio renewable energy) are as follows: sixth (almost 4% of the world total), fourth (5.3%), fifth (5.5%) and the fourth (8.3%), respectively. ***Brazil*** is not in the top ten countries in the world in terms of installed solar energy capacity, but it is second in hydropower (9% of the world total) and bioenergy (12%) and eighth worldwide in terms of the total installed capacity of wind energy (2.3%) (Charts 2, 3, 4 and 5).

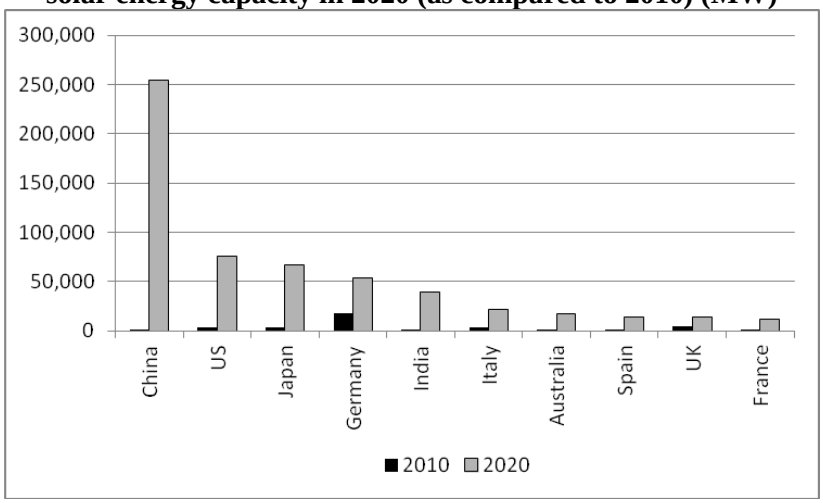
Chart 3: Ranking of the top ten countries according to the total installed wind energy capacity in 2020 (as compared to 2010) (MW)



Source: Chart elaborated by the author, based on IRENA (2020; 2021).

It is noteworthy, therefore, that in Brazil, hydropower is the most important (109 GW in 2020), wind and bio energy capacities are almost equal (17.2 GW and 15.7 GW, respectively), while Brazil has an installed capacity of solar energy of only 7.9 GW.

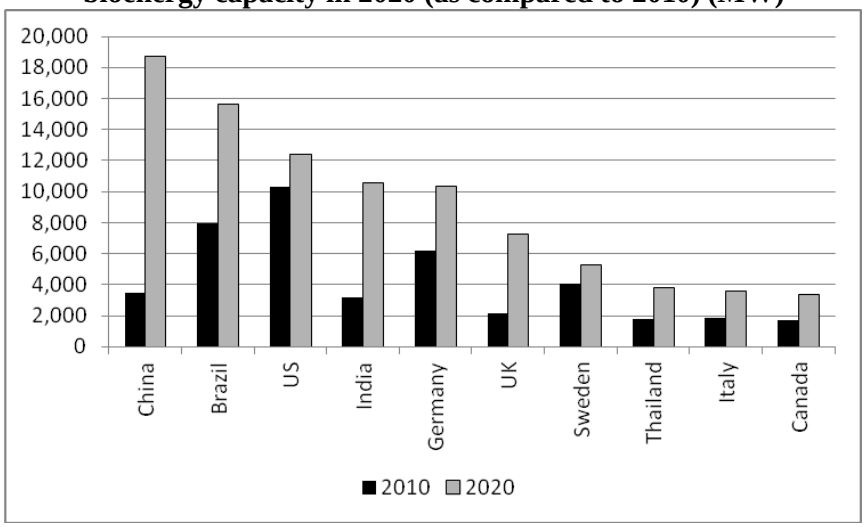
Chart 4: Ranking of the top ten countries according to the total installed solar energy capacity in 2020 (as compared to 2010) (MW)



Source: Chart elaborated by the author, based on IRENA (2020; 2021).

The distribution of the four categories of renewable energy in ***India*** is as follows: hydro about 34.2% (installed capacity of 45.9 GW), wind 28.7% (38.6 GW), solar 29.2% (39 GW) and bio 7.8% (10.5 GW) (IRENA, 2021).

Chart 5: Ranking of the top ten countries according to the total installed bioenergy capacity in 2020 (as compared to 2010) (MW)



Source: Chart elaborated by the author, based on IRENA (2020; 2021).

4 China, leading in the new wind energy capacity

In 2020 ("the best year in history for the global wind industry", recording a year-over-year growth of 53%, with a total new installed capacity of 93 GW, in spite of disruptions at the level of global supply chain and project construction), China remained the world's largest market for new ***onshore*** additions. Similarly, in the ***offshore*** market, a capacity of 6.1 GW was added worldwide in 2020, and China installed half of that new capacity (GWEC, 2021).

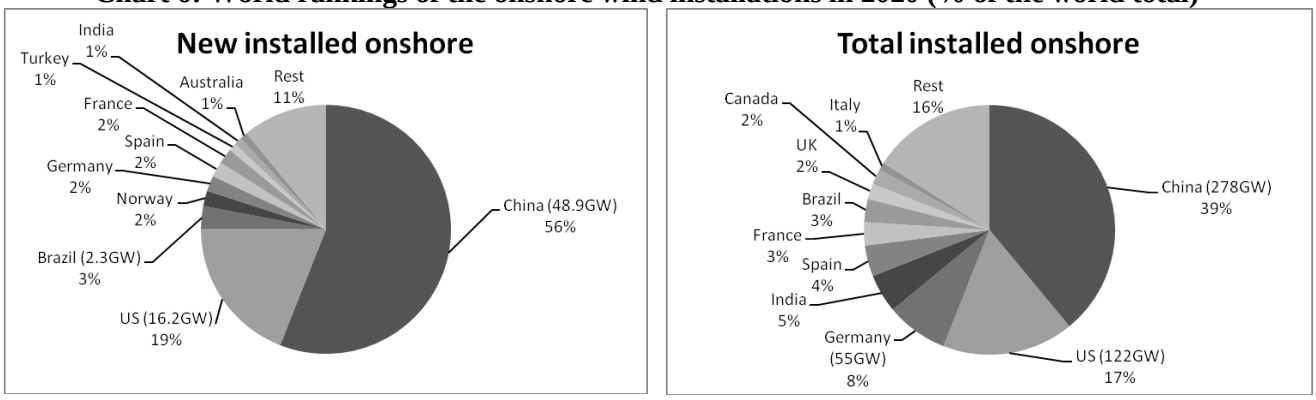
Total new onshore installations in China were 48.9 GW (out of which grid connected new installations of 42.3 GW). One significant impetus was the new policy released by the National Development and Reform

Commission (NDRC), including a roadmap towards "subsidy-free" onshore wind energy.[2] China pledged to peak CO2 emissions before 2030 and reach carbon neutrality by 2060. In December 2020, President Xi Jinping presented the target of 1,200 GW of wind and solar installed capacity and 25% share of non-fossil fuels in a primary energy consumption by 2030. In accordance to those commitments, the wind industry released the "Beijing Declaration on Wind Energy", targeting to install 3,000 GW of wind power by 2060 (GWEC, 2021; 2020; 2019).

The EU used to be the dominant investor in renewables, however it was overtaken by China in 2013, "as the solar booms in Germany and Italy cooled off dramatically and China raised its ambitions in both photovoltaics and wind". China invested in renewable energy capacity USD 83.4 billion in 2019, followed by the US (USD 55.6 billion) and the EU (around USD 55 billion) (Frankfurt School-UNEP Centre/Bloomberg NEF, 2020).

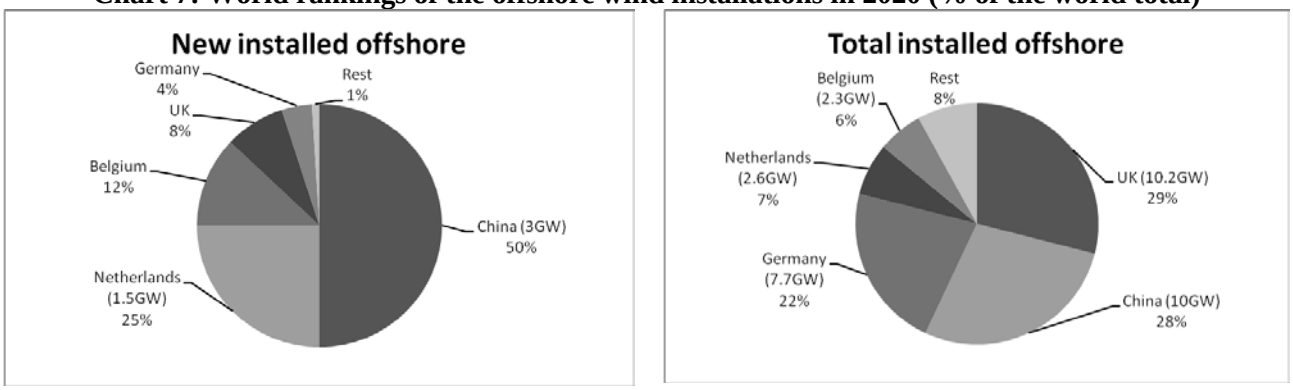
The following charts show China's positions in the 2020 world rankings of the wind installations onshore/offshore. The offshore market is much more concentrated as the onshore one, and China ranks second only as regards the total offshore wind installations.

Chart 6: World rankings of the onshore wind installations in 2020 (% of the world total)



Source: Chart elaborated by the author, based on GWEC (2021).

Chart 7: World rankings of the offshore wind installations in 2020 (% of the world total)



Source: Chart elaborated by the author, based on GWEC (2021).

5 Legislative framework for renewable energy in China

Since 2006, when it has overtaken the United States, China ranks first worldwide in terms of its share of global carbon dioxide emissions. It currently accounts for about 27-28% of the world total, followed by the US (15%), the EU (10%) and India (7%). In comparison, Brazil ranks 13th – 14th (1.2%) (IEA, 2020a; Fleming, 2019; Sandalow, 2019).

China consumes about half of the world's coal used each year, and between 2000 and 2018, its carbon dioxide emissions nearly tripled. With an economy continuing to be based on coal consumption (with a share of 59% of total energy consumption in 2018), ***China's energy transition is a long-term process***. That is why, given the risks associated with excessive pollution, China is one of the countries strongly committed to reducing

[2] Projects already approved until 2018 will continue to receive the Feed-in-Tariff if they are grid-connected before the end of 2020.

greenhouse gas emissions, and it is ***currently the largest clean energy market in the world***. At the same time, its investments in renewable energy projects abroad have intensified, with China being the main investor in clean energy in the nine years from 2009-2018 (Larson, 2019; MEE, 2019).

Schuman and Lin (2012) point out that since 2006, China has seen a rapid increase in the use of renewable energy resources, facilitated by the ***Renewable Energy Law*** (in force since January 1, 2006, amended in 2009). The Medium and Long-Term Renewable Energy Development Plan was adopted in 2007, with a number of "green" objectives. In the aftermath of the international financial and economic crisis of 2008, the manufacturing industry was severely affected by declining global demand. For this reason, the ***renewable energy equipment sector*** has been included in the category of emerging industries of strategic importance. With substantial financial support, this sector has become a formidable engine of economic growth (Chen, 2019), and China is currently the largest supplier of renewable energy equipment. Therefore, the development of this industry has a double role, first of accelerating economic growth and second of reducing long-term greenhouse gas emissions.

The ***Paris Agreement on Climate Change***, signed and ratified by China in 2016, was an additional impetus for the development of the renewable energy sector at the national level. In June 2015, China presented its national targets (the so-called Intended Nationally Determined Contribution, INDC) to the Secretariat of the United Nations Framework Convention on Climate Change, with its commitments for 2030 including: (1) reaching the peak of carbon dioxide emissions at the latest in 2030; (2) reduction of carbon dioxide emissions per unit of GDP (energy intensity) by 60% -65% compared to 2005 levels; (3) increasing the share of non-fossil fuels in primary energy consumption to about 20% and (4) expanding the volume of forest stock by about 4.5 billion cubic meters compared to 2005 level.

In November 2016, the NDRC and the National Energy Administration (NEA) published the ***13th Five-Year Plan for the development of the energy sector*** (the previous plan dedicated to energy being that of January 1, 2001, as a part of the Tenth Five-Year Plan). A ***specific NEA Renewable Energy Plan*** followed on December 10, 2016, with clear objectives. Those included: increasing the share of energy based on non-fossil fuels (renewable and nuclear) in total consumption to 15% by 2020 and 20% by 2030; increasing the installed capacity of renewable energy to 680 GW by 2020 (target already exceeded); increasing the installed capacity of wind energy to 210 GW (target already exceeded); stimulating innovation in the field of renewable energy technologies; providing support to the renewable energy industry and reducing dependence on foreign companies in the field; solving the problem of interruption of electricity supply from renewable sources (IEA / IRENA, 2018, CNESA, 2016). In 2017, China adopted the Emissions Trading Scheme (ETS), which started operating in 2021 (ICAP, 2021).

In 2018, the NDRC revised the share of energy based on non-fossil fuels (renewable and nuclear) in total consumption by 2030, from 20% to 35%, proposing a system of penalties for companies that do not meet the targets, penalties that will partially offset the volume of subsidies granted. China has invested more in clean energy infrastructure than the US and EU taken together so far. In 2019, the first projects for solar and wind energy without subsidies were approved, the period 2019-2020 being one of test and analysis, in order to eliminate subsidies starting from 2021. Considering that there are no restrictions regarding capacities, and the costs for the projects of solar and wind energy are on a downward trajectory, experts estimate that the solar and wind energy will be able to compete with coal-based energy in terms of costs until 2026 (Renewable Energy World, 2019).

The Ministry of Ecology and Environment (MEE) has included five explicit tasks in the 14th National Plan for Economic and Social Development for the period 2021-2025: (1) encouraging local governments and major industries to formulate objectives, roadmaps and clear plans related to the carbon footprint; (2) achieving a stable and efficient mode of operation on the national carbon dioxide market; (3) improving climate change legislation and strengthening the capacity of local authorities; (4) upholding the principles of equity, common but differentiated responsibilities in terms of global governance, while providing support to developing countries; and (5) mitigating and adapting to climate change, and updating China's national adaptation strategy.

These proposals must be linked to: the three-year action plan for "winning the blue sky defence battle" (July 2018), the National Plan for the Modernization of Agriculture 2016-2020, the 13th Forest Development Plan 2016-2020 and 13th Five-Year Plan for the control of greenhouse gas emissions.

Although China has the lowest share of total installed renewable energy capacity in the world in terms of bio-energy compared to hydro, wind and solar energy, significant progress has been made in this area in the last 15 years. In 2003, about 20% of China's total greenhouse gas emissions came from agricultural production and waste from fields and livestock farms. In about 15 years, the percentage has been halved. Renewable energy law promotes biomass-based energy production (Zhang *et al.*, 2010). At the same time, a national strategy on

biomass energy has been adopted, and the Ministry of Agriculture has clear objectives on specific technologies for the production of biomass energy in rural areas (biogas, liquid and solid biofuels).

The above-mentioned measures and proposals are part of the "energy revolution" called for by President Xi Jinping in June 2014, with the major objective of reducing the share of coal in the energy mix, while increasing the share of non-fossil fuels in the country's energy mix, in parallel with increasing energy efficiency. Gradually, the subsidies granted in the field of renewable energy are also given up, an example in this regard being the "subsidy-free" onshore wind energy (GWEC, 2019).

6 Renewable energy prospects in China and other developing countries

Uncertainties in the renewable energy industry have intensified recently, beginning with the protectionist "America first" strategy (reflected for example by additional tariffs imposed by the US in 2018 on imports of solar panels and photovoltaic cells produced in China) and ending with the disruption of supply chains amid the Covid-19 pandemic (Sunrun, 2020).

In the electricity sector, during the period of isolation, energy demand fell considerably, by 20% or even more in some countries that resorted to total isolation (IEA, 2020b). The increase in demand in the residential sector was far outweighed by the drastic reduction in demand in the commercial and industrial sectors. The International Energy Agency forecasts a 20% drop in energy investment in 2020, but the renewable energy sector is considered more resilient, so the decline in investment in renewable energy projects is estimated at 10% in 2020.

However, renewable energy production in developing countries continues to be encouraged. The new policies have a number of major objectives. In China, for example, price reductions are being considered (in this regard, with a system of auctions being introduced in 2018), energy trade between provinces is stimulated and companies are encouraged to purchase renewable energy. In May 2019, the Renewable Portfolio Standard (RPS) was adopted, which sets a minimum level of renewable energy consumption in Chinese provinces. Cai *et al.* (2019) points out that since 2006, when the guaranteed purchase system (feed-in tariff FIT) was introduced, the capacity to generate renewable energy has increased considerably. There are also negative effects, as the financial burden borne by the state has increased, reaching an unsustainable level. To eliminate distortions, China's National Energy Administration adopted the RPS system on May 15, 2019, which can have a significant impact on the market structure, consumer behavior and economic performance. However, this requires a transition period, so that investors can adapt, in order to be able to choose the optimal alternative.

The Paris agreement on climate change was an additional impetus for the development of the renewable energy sector in most countries worldwide. In turn, the highly ambitious EU Green Deal has the potential to inspire other countries, including China, to adopt progressive targets in the field of renewable energy, all the more so as the EU and China have been cooperating intensively since 2005 on the climate change (Kuo, 2020).

China dominates each of the four rankings taking into account the total installed capacity of renewable energy: hydro, wind, solar and bio, and Chinese companies are the most numerous in the rankings of major manufacturers of wind turbines and solar panels. This analysis does not detail the factors that propelled these companies among the world leaders, but it is obvious that rigorous national economic policies and partnerships with developed countries are the key incentive.

National energy policies will continue to be intertwined with the major countries' goal of reducing excessive dependence on certain import sources, with the political will to diminish greenhouse gas emissions, but also with growing protectionist trends of some countries and with the effects of the Covid-19 pandemic.

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Climate Change Mitigation in the EU – Targets and Achievements

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Abstract: - Climate change is one of the greatest challenges of the 21st century. The European Union seeks to become the world leader in combating this phenomenon, setting high objectives, implementing ambitious policies and working closely with the international partners involved. This article aims to analyze the European Union's performance in the fight against climate change. Therefore, in the first part of the article, the EU targets for 2020, 2030 and 2050 will be exposed, and in the second part I will analyze the degree of achievement of the targets for the main indicators, namely greenhouse gases emissions, the share of renewable energy sources in the final energy consumption, the share of renewable energy used in the transport sector and the increase in energy efficiency.

Key-words: climate change, greenhouse gases (GHG) emissions, policies, renewable energy sources (RES)
JEL Classification: Q28, Q48, Q54

1. EU climate change objectives

1.1. 2020 climate and energy package

In the 2010 European Commission Communication entitled "Energy 2020. A strategy for competitive, sustainable and secure energy", the EU aims to reduce greenhouse gases emissions by at least 20% by 2020, to increase the share of renewable energy to at least 20% in the final consumption, to achieve energy savings of 20% or more. All EU countries had to reach a 10% share of renewable energy in their transport sector. By achieving these goals, the EU can help combat climate change and air pollution, reduce dependence on imported fossil fuels and provide reasonable energy to consumers and businesses (EC, 2010).

To achieve these goals, the 2020 Energy Strategy has established five priorities:

- a more efficient EU by accelerating investments in energy efficient buildings, goods and transport.
- building a pan-European energy market through the construction of the necessary power lines, pipelines, LNG terminals and other infrastructures.
- protect consumer rights and achieve high safety standards in the energy sector.
- implementation of the Strategic Plan for Energy Technologies, the EU strategy to accelerate the development and implementation of low-carbon technologies.
- to promote the development of good relations with external suppliers of the EU and energy transit countries.

1.2. 2030 climate and energy framework

In October 2014, the European Council agreed on a new climate and energy framework for 2030, including political goals and targets at EU level for the period 2020-2030. These goals were intended to contribute to a more competitive, safer and more sustainable EU energy system in order to achieve its long-term goal of reducing greenhouse gas emissions by 2050 (EC, 2014).

The 2030 targets were as follows:

- a 40% reduction in greenhouse gases emissions compared to 1990 levels;
- a share of at least 27% of renewable energy in the final consumption;
- an indicative target for an EU-wide energy efficiency improvement of at least 27%;
- supporting the completion of the internal energy market by achieving the 10% electricity interconnection target by 2020, with a view to reaching 15% by 2030.

In September 2020 the Commission proposed raising the objective of reducing GHG emissions by 2030 to at least 55%, as part of Europe's Green Deal (EC, 2020). The Commission analyzed the necessary actions in all sectors, including energy efficiency and renewable energy, and began the process of developing detailed

legislative proposals to implement and achieve the new goal. Thus, the new targets for the period up to 2030 are as follows:

- reduction of GHG by at least 55% (compared to the 1990 level);
- share of at least 32% for renewable energy sources;
- increasing energy efficiency by at least 32.5%.

All three aspects of climate legislation will now be updated to meet the net goal of reducing greenhouse gas emissions by at least 55%. The Commission will submit proposals by June 2021.

1.3. 2050 Energy Roadmap

The EU had set a long-term target of 80-95% reduction in GHG emissions from 1990 levels by 2050. The 2050 Energy Roadmap examines the transition of the energy system in line with the goal of reducing GHG emissions while increasing competitiveness and security of supply. Achieving these goals requires significant investment in new low-carbon technologies, renewable energy, energy efficiency and grid infrastructure. Since investments are made over a period of 20 to 60 years, policies that promote a stable business climate that encourage investment in reducing carbon emissions should start as soon as possible (EC, 2011).

2. Climate change objectives achievement

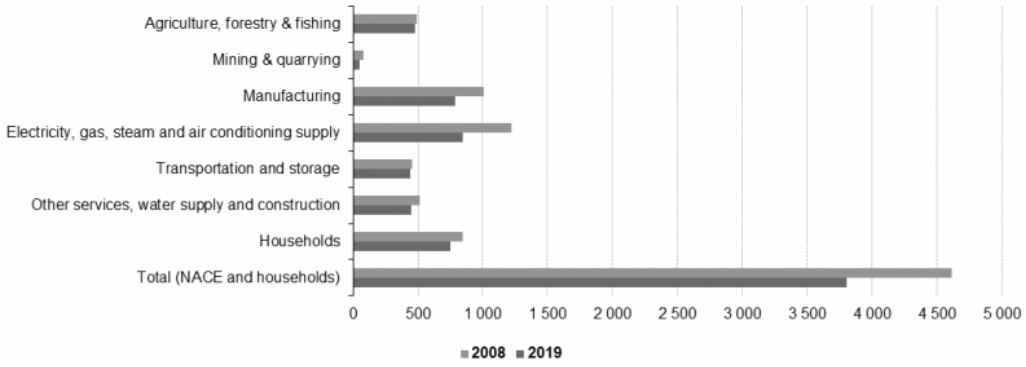
2.1. Greenhouse gases emissions

2.1.1. Greenhouse gases by economic activity

In the following, GHG emissions in the EU are analyzed by economic activity (industry and household). The greenhouse gases category includes carbon dioxide, nitrous oxide, methane and fluorinated gases (hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride and nitrogen trifluoride).

In 2019, industrial and household greenhouse gases emissions in the EU-27 amounted to 3.8 billion tonnes of CO2 equivalent. In the period 2008-2019, GHG emissions from electricity, gas, steam and air conditioning systems decreased by 381 million tonnes of CO2 equivalent, representing a decrease of 31% in relative terms. In both absolute and relative terms, the greatest decrease was recorded among the studied activity groups. This group of activities is also one of the largest generators of greenhouse gases. It accounted for 20% of total GHG emitted by industry and households in the EU in 2019. During the same period, the second largest reduction in GHG emissions occurred in manufacturing (-220 million tonnes CO2 equivalent). According to figure no. 1, the second largest relative decline was 30% and was recorded in deep and shallow mine workings. Households in the EU-27 reduced their emissions by 93 million tonnes of CO2 equivalent (11% reduction) between 2008 and 2019 (Eurostat, 2021a).

Figure no. 1: Greenhouse gas emissions by economic activity, EU-27, 2008 and 2019



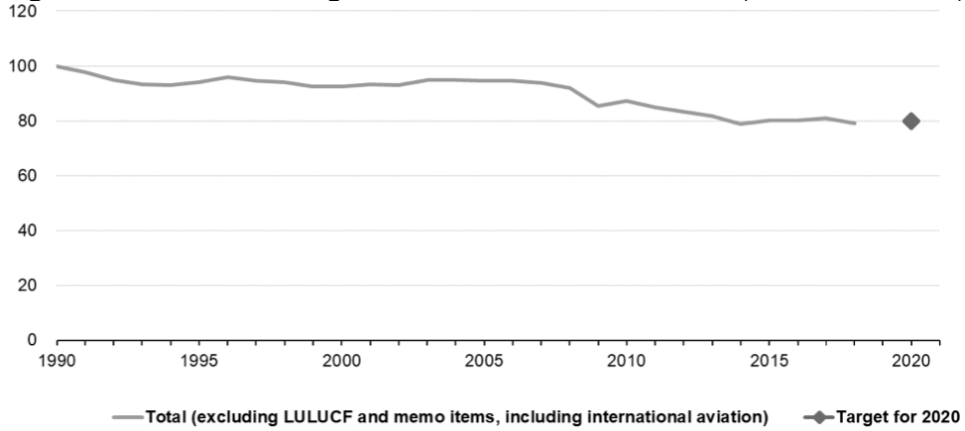
Source: Eurostat, 2021a (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Figure_1_Greenhouse_gas_emissions_by_economic_activity,_EU-27,_2008_and_2019.png)

2.1.2. Greenhouse gases by country

In 2018 greenhouse gases emissions in the EU-27 have dropped by 21% since 1990. The main reason for the reduction in total greenhouse gases emissions is the increased energy efficiency and improvement of the structure of energy consumption. Thanks to technological change and innovation, less energy was consumed for the production of more goods and services. Furthermore, the energy consumed was relatively less dependent on

carbon-intensive fuels and more on RES. As a result, the EU has managed to disconnect its economic growth from greenhouse gas emissions, as these technological advances drive economic growth while decreasing greenhouse gas emissions. The largest reduction occurred in 2009, when emissions fell sharply by 324 million tonnes of CO2 equivalent or 7.2%, respectively. This sharp decline is partly due to the impact of the overall economic crisis, as emissions declined across all sectors of activity (Eurostat, 2020a).

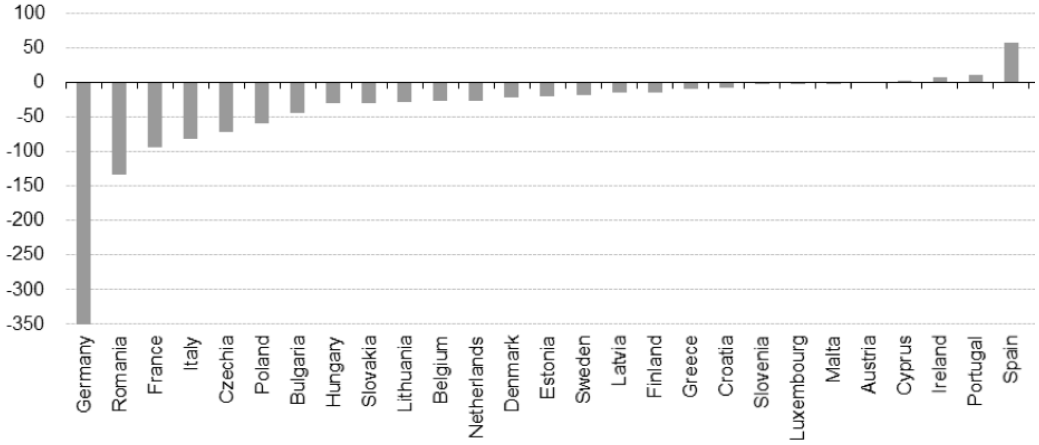
Figure no. 2: Greenhouse gas emissions, EU-27, 1990-2018 (index 1990 = 100)



Source: Eurostat, 2020a (https://ec.europa.eu/eurostat/statistics-explained/pdfscache/9273.pdf)

The general trajectory of total greenhouse gases emissions is in the right direction. In 2018, total greenhouse gases emissions were 3.9 billion tonnes of CO2 equivalent, down by 1 billion tonnes or 21% from 1990. Figure no. 2 shows that the European Union is on track to reduce greenhouse gas emissions and has already exceeded its 20% reduction target by 2020. However, achieving a large-scale reduction in the EU by 2030 means that this downward trend has to continue and even intensify. It seems that the permanent reduction in greenhouse gas emissions should not be considered as being certain.

Figure no. 3: Greenhouse gases emissions by country, absolute change 1990-2018 (million tonnes)



Source: Eurostat, 2020a (https://ec.europa.eu/eurostat/statistics-explained/pdfscache/9273.pdf)

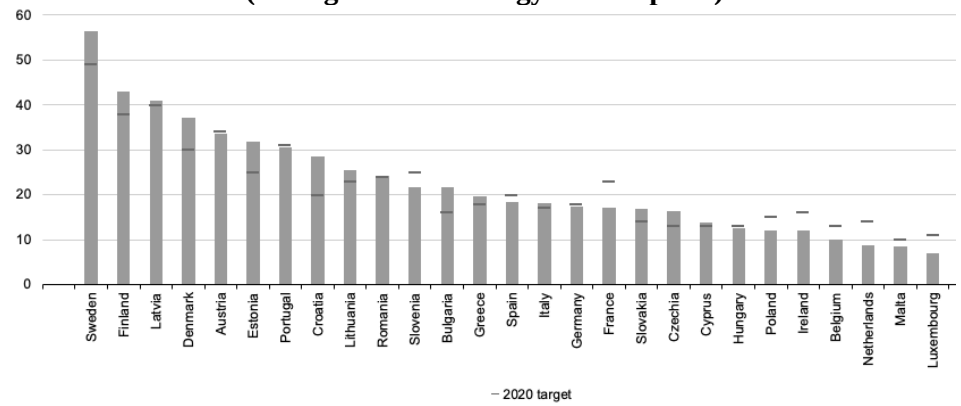
Approximately every five years, there are one to two years during which total greenhouse gases emissions increase slightly over the previous year. In addition, greenhouse gas emissions increased slightly in 2015, 2016 and 2017 compared to the previous year. Although the largest increase in 2015 was only 1.4%, greenhouse gases emissions must be significantly reduced to meet the 2030 and 2050 objectives. The difference between EU Member States in terms of the absolute change in greenhouse gas emissions is presented in figure no. 3, with an indication of the absolute change interval (Eurostat, 2020a).

2.2. Renewable energy sources

2.2.1. Energy from renewable energy sources in the gross final consumption

The European Union aimed a 20% share in its gross final consumption of renewable energy by 2020, this objective being distributed among the Member States with national action plans aimed at creating a path for the development of RES in each state. Figure no. 4 presents the latest available data on the share of RES in gross final consumption and the objectives for 2020. The share of RES in gross final energy consumption was 19.7% in the EU-27 in 2019 (latest year for which data are available), up from 9.6% in 2004 (Eurostat, 2020b).

Figure no. 4: The share of energy from renewable sources and the 2020 objectives, (% of gross final energy consumption)



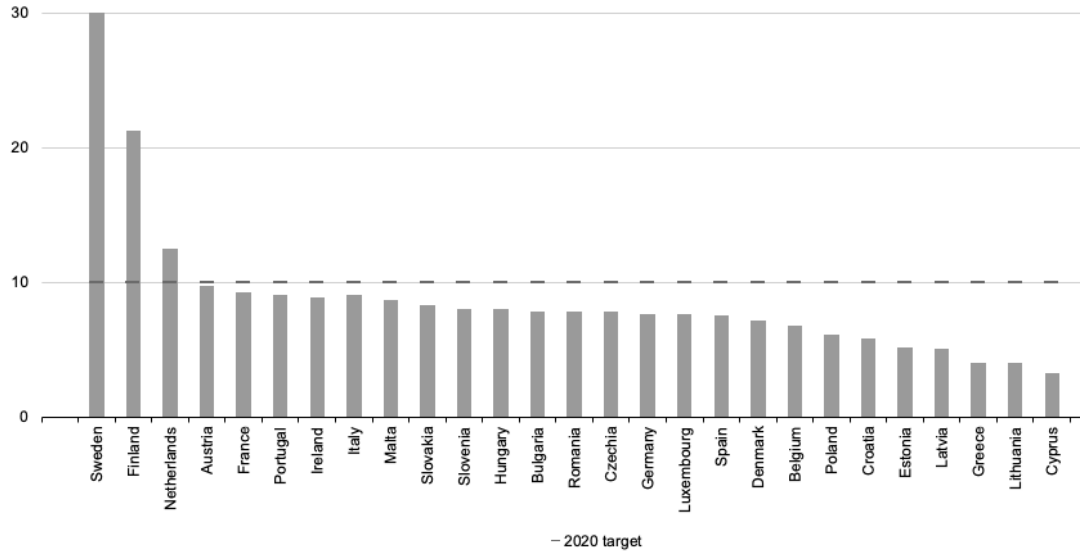
Source: Eurostat, 2020b (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019)

Sweden had the highest share among EU member states in 2019 with 56.4%, ahead of Finland (43.1%), Latvia (41.0%), Denmark (37.2%) and Austria (33.6%). The lowest share of energy produced from renewable energy was recorded in Luxembourg (7.0%), Malta (8.5%), the Netherlands (8.8%) and Belgium (9.9%). In analyzing national targets, one may observe that 14 of the Member States exceeded their 2020 objectives. Six countries approached their objectives: Hungary, Austria and Portugal with 0.4 percentage points (p.p.) of their national objectives, Germany (0.6 pp), Malta (1.5 pp) and Spain (1.6 pp). On the contrary, France (5.8 pp), the Netherlands (5.2 pp), and Ireland and Luxembourg (4.0 pp each) are still very far from national targets.

2.2.2. Renewable energy in transport

The European Union set an overall objective of 10% for the share of RES (including liquid biofuels, hydrogen, biomethane, green electricity, etc.) used in transport by the end of 2020 (Eurostat, 2020b).

Figure no. 5: The share of energy from renewable sources in transport, 2019 (% of gross final energy consumption)



Source: Eurostat, 2020b (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics#Share_of_renewable_energy_more_than_doubled_between_2004_and_2019)

As may be seen in figure no. 5, the average share of RES in transport raised from 1.6% in 2004 to 8.9% in 2019. Among the Member States, the share of RES in fuel consumption in transport varied from 30.3% in Sweden, 21.3% in Finland and 12.5% in the Netherlands to 4% or less in Greece and Lithuania (both 4.0% each) and Cyprus (3.3%). EFTA member Norway also reported a high share of RES in fuel consumption in transport (27.6%).

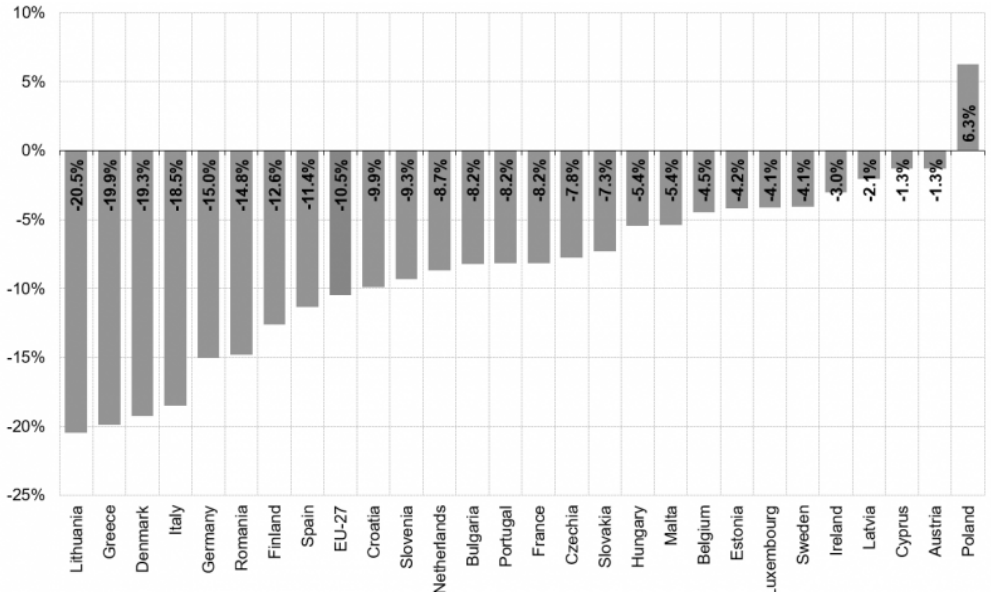
In 2019, 22 Member States saw a growth in the average share of RES in transport in comparison to 2018, with the largest growth recorded in Finland (+3.6 p.p.), Croatia (+3.3 p.p.), Netherlands (+2.9 p.p.) and Slovenia (+2.5 p.p.). Norway also showed significant growth (+6.1 p.p.).

2.3. Energy efficiency

The EU is committed to reducing energy consumption by 20% by 2020 from baseline projections. These projections indicated a primary energy consumption of 1,853 Mtoe and a final energy consumption of 1,357 Mtoe in 2020. Therefore, the EU is committed to reducing consumption by 20% compared to these projections, ie to have a primary energy consumption of no more than 1,483 million tonnes of oil equivalent and a final energy consumption of no more than 1,086 Mtoe in 2020. By 2030, the mandatory target is to reduce it at least by 32.5% compared to the baseline projections. This means that the primary energy consumption will not exceed 1273 Mtoe, and the final energy consumption will be up to 956 Mtoe in 2030. With the UK leaving, the Union's energy consumption figures for 2020 and 2030 should be adjusted to reflect the situation. Technical adaptation of the targets leads to primary energy consumption of no more than 1312 Mtoe in 2020 and 1128 Mtoe in 2030, and final energy consumption does not exceed 959 Mtoe in 2020 and 846 Mtoe in 2030 (Eurostat, 2021b).

The consumption of primary and final energy in the European Union reached its peak in 2006. Below we show the evolution from the highest to the most recent year for which data is currently available. In the period from 2006 to 2019, primary energy consumption increased only in Poland (6.3%). In the rest of the Member States, it decreased, with the largest decline recorded in Lithuania (-20.5%), Greece (-19.9%), Denmark (-19.3%), Italy (-18.5%).

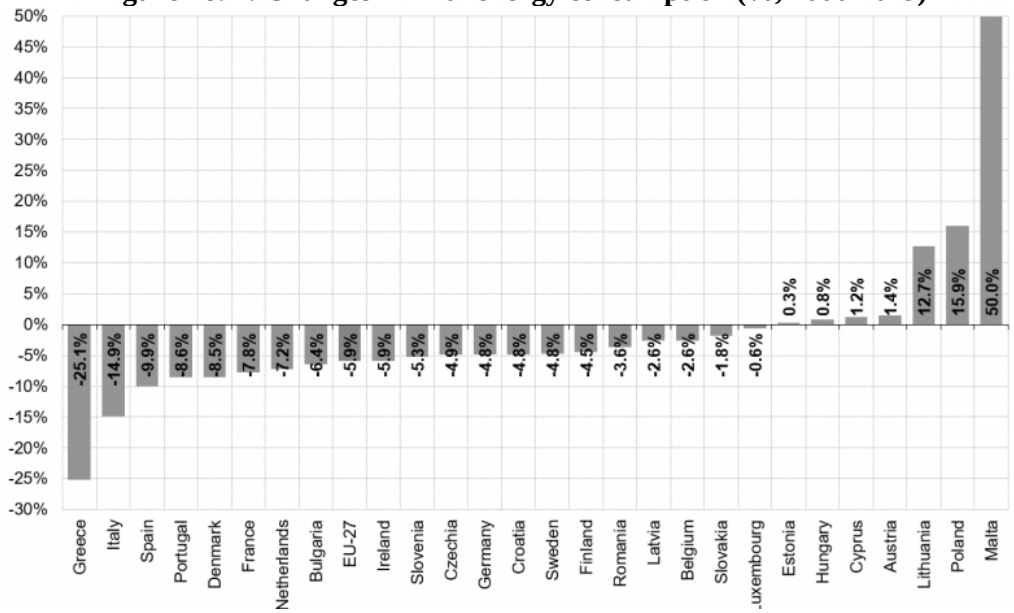
Figure no. 6: Changes in primary energy consumption (%, 2006-2019)



Source: Eurostat, 2021b (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_saving_statistics&oldid=513477#Primary_energy_consumption_and_distance_to_2020_and_2030_targets)

The final energy consumption has increased in seven Member States. The most important growth was observed in Malta (50.0%), Poland (15.9%) and Lithuania (12.7%), and the greatest decrease was observed in Greece (-25.1%), Italy (-14.9 %), Spain (- 9.9%).

Figure no. 7: Changes in final energy consumption (%, 2006-2019)



Source: Eurostat, 2021b (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_saving_statistics&oldid=513477#Primary_energy_consumption_and_distance_to_2020_and_2030_targets)

Diverging trends between primary and final energy consumption are often the result of fundamental changes in the energy system, in particular the shift from fossil fuel and nuclear power generation (low efficiency) to wind and solar photovoltaic power (100% efficiency, according to data). As an example, Lithuania closed a nuclear power plant, and in 2019 Lithuania imported more electricity or produced it directly from RES. The consequence of this is that there are practically no transformer losses in the production of electricity in Lithuania. In terms of final energy consumption, the trend reflects the actual consumption by the final users, excluding energy conversion losses. As an example, final consumption in Malta has increased significantly due to increased energy consumption by road transport, international aviation and the service sector (Eurostat, 2021b).

3. Conclusions

The European Union's main objective is to be the world leader in the climate change mitigation. Strategic objectives were set for 2020, 2030 and 2050 for greenhouse gas emissions, renewable energy and energy efficiency, involving investments and financial, technical and technological, management and policy implementation efforts.

The Renewable Energy Directive, together with proposals for the structure and management of the new electricity market, will create a regulatory framework that will give investor confidence and ensure a level playing field for all technologies without compromising climate and energy goals. The Clean Energy Package will also guide national support, setting a framework to promote a cost-effective and market-oriented approach. These principles include openness of cross-border support systems, non-retroactivity, and long-term visibility of support.

The Commission proposes a solid governance of the Energy Union to ensure that the objectives of the Energy Union Strategy are met in all five dimensions, in particular the energy and climate targets for 2030. A partnership has been set up with Member States to monitor progress towards the 2030 target. This system of governance leads to a regular surveillance process, in which the Commission assesses the national energy and climate plans to be drawn up by the Member States. If the Commission finds that there are shortcomings, in particular as regards renewable energy and energy efficiency, it may propose the necessary measures to avoid and fill any such emerging shortcomings.

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Comments Regarding the Book *How To Avoid A Climate Disaster*

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Abstract: Climate change and the growing and more frequent global disasters caused by them over the last 30 years have led to the initiation and deployment of global and European climate change strategies based on large-scale research. The COVID- 19 pandemic has not stopped concerns in this field, moreover, those have intensified, with many countries setting the target of achieving climate neutrality by 2050. The European Union, through the European Green Deal, is not only a promoter, but also a leader of the global climate change movement. In this context, our article presents some comments regarding a book that was recently published (February 2021), "How to Avoid a Climate Disaster" written by Bill Gates, based on research made by a large group of multi-disciplinary experts, brought together by the Bill & Melinda Gates Foundation and with the financial support of internationally renowned investors. Of the 12 chapters of the book, the author presents synthetically a) the premises from which the research began; b) the solutions to achieve the planet's climate neutrality, and c) the recommendations of the author of the book to reduce the costs involved in combating climate change and achieving zero net carbon in 2050. The recommendations are concrete, as a Medium-Term (2030) and Long-Term (2050) Action Plan and are addressed to governments, parliaments and people around the world.

Key-Words: Global Warming, Environment and Development, Technological Innovation, Government Policy

*JEL Classification:*Q54, O44, O33, Q58

1. Planet health- the biggest challenge of the 21st century

Climate change threatens both humankind and the environment. A lot of international research studies concluded that human activities based on fossil fuels consumption contribute to climate change by eliminating greenhouse gas emissions (GHGs) in the atmosphere and rising temperatures globally. Natural disasters caused by climate change have become more frequent and increasingly intense since the 1980s, causing more and more loss of lives, as well as economic damages around the world. Under these circumstances, environmental sustainability is no longer optional, but has become a global imperative, even in the time of the COVID - 19 pandemic (during the 2020-2021).

The importance of reducing pollution and to adopt responsible measures for fighting climate change was emphasized in various studies in the field (Downar et al., 2019; Sovacool & Brown, 2009)). Environmental concerns and sustainable development are not new. In the last 30 years, the definition of sustainable development and climate change strategies has marked continuous progress at global (Table 1) and European level. For the first time in history, the Paris Agreement brought all nations — including the top emitters of greenhouse gases — together in 2015 to fight the climate crisis. The Paris Agreement (2015) concluded that combating the climate change and achieving a transition to a clean and fair energy are the biggest global challenges of the 21st century.

Table 1: The key moments in defining global strategies for climate change, 1992-2021

Year	Global level
1992	Global Summit, Rio de Janeiro
1992	UN Framework Convention on Climate Change (186 signatory countries, incl.EU)
1997	Kyoto Protocol: GHG reduction by 1% / year until 2020/1990 (incl.EU)
2000	Millennium Development Goals (UN)
2015	The Paris Agreement (incl.EU)
2021	Investing in Climate Action - The Make-or-Break Decade (UN Development Programme, UN on Climate Ambition and Solutions, USA, EC, WIB, ECB).

Source: Representation of the article/s author based on the international documentation, 2021

These are also the main priorities of the European Green Deal (European Commission, 2019), a new strategy for green and sustainable growth by 2050 with the aim of 55% greenhouse gas (GHG) emissions cut by 2030 and achieving climate neutrality by 2050 (Table 2).

Table 2: EU strategies to combat climate change, 1992-2021

Year	EU level
2001; 2006	Sustainable development strategies
2008	The energy-climate change package 2020: Objectives 20/20/20
2015	Strategy for a resilient Energy Union (includes de-carbonizing the economy)
2019	Climate target plan 2030 - GHG reduction by at least 55% by 2030/1990
2019	**European Green Deal**
2020	Towards a clean and just energy transition - Combating climate change. Climate neutrality by 2050.
2020	EU strategy on energy system integration
2020	EU Hydrogen strategy
2020	EU Methane gas strategy
2020	EU Annual Sustainable Growth Strategy 2021 (Green Transition, Digital Transition and Productivity, Equity, Macroeconomic Stability)

Source: Representation of the article/s author based on the international documentation, 2021

After a break of several years, international cooperation in combating climate change is recovering in 2021. The new US administration has returned to the Paris Agreement, preparing its own strategy and financial plan related to the Agreement (Earth Justice, 2021). The Europeans have begun to unite on the basis of a common climate agenda. On both sides of the Atlantic, some studies are now recognizing that the action to combat climate change is not only an environmental issue, but also a geopolitical one (Manzo, 2010; Beringer, 2019). The climate challenge requires determined action and significant investment in each country, far exceeding current levels.

The steps taken from now to 2030 will determine whether we can avoid the most devastating effects of climate change in the future. Moreover, it is considered that now we need a concrete, step-by-step plan that turns all this momentum into a practical achievement of saving the Planet.

2. How to avoid a climate disaster – a book with a very comprehensive approach

The goal of our article is to present a structured synthesis of a book written by a well-known but also controversial author in the world, whose background is in the software, not climate science, but who united around him scientists, entrepreneurs, environmentalists and experts from around the world to draw the most practical ways to achieve zero net emissions.

The author is Bill Gates and his book "*How to avoid a climate disaster: The solutions we have and the breakthroughs we need"* was first published in USA, February 16, 2021. The book attracts attention especially because it presents a plan, a path to follow, a series of steps to provide the best chance of avoiding a climate disaster. In his opinion, Gates states that "we have a number of solutions that we need to implement on a large scale now and we also need a lot of innovation to be developed and spread around the world over the next few decades".

In the early 2000s, Bill Gates[1] founded the Bill & Melinda Gates Foundation, donated large sums of money and refocused on global health, development, and U. S. education and finally on a problem that affects the entire planet - energy and climate change. In this last field, he has been joined not only by experts but by global big-name investors (such as Amazon, Bloomberg, LinkedIn, Bill & Melinda Gates Foundation, Virgin Group, Alibaba Group, African Rainbow Minerals, HRH Prince Alwaleed bin Talal-Alwaleed Philanthropies, Tiger Management, Soft Bank Group Corp., SOHO China and the list is much larger).

Within next few years, Gates became convinced of three things: 1) To avoid a climate disaster, we have to get to zero greenhouse gas emissions; 2) We need to deploy faster and smarter the tools we already have, like solar and wind energy sources, and 3) We need to create and roll out breakthrough technologies that can take some decades (Gates, 2021).

[1] In 1975, Bill Gates with Paul Allen founded Microsoft and led the company to become the worldwide leader in business and personal software and services. In 2008, Bill transitioned to focus full-time on his foundation's work.

2.1 Research premises: why zero

The author of the book started his research considering the following premises:

- *Greenhouse gases were making the Planet's temperature rise*, and as long as humans kept emitting any amount of greenhouse gases, temperatures would keep going up. Gates explains why we need to get to zero emissions, including what we know about how rising temperatures will affect people around the world.
- *Annual GHG emissions and global population growth*: 51 billion tons of GHGs are added every year to the atmosphere; global population will increase to 10 billion inhabitants to the end of this century (about 7.7 billion today); as the global standard of living improves, energy demand will increase by 50% by 2050 and, if nothing changes, GHG emissions will follow the same trend. To avoid a climate disaster, we need to go from 51 billion tons of GHGs to zero in just 30 years, providing at the same time more food, more vehicles and more housing to accommodate the entire population (Gates, 2021).
- *The global top sources of GHGs:* the 5 main sources of the most current global GHG emissions are: industrial production (31%), electricity (27%), agriculture (19%), transport (16%) and buildings (7%).

Our comparative data analysis of some countries highlights (in Bold) the sources of GHG emissions that exceed the world average (Table 3), which means that the countries should focus in a first stage, especially on the sources that exceed the world average. Then, to reach zero net emissions, each country has to address all these five major challenges.

Table 3: Main sources of GHGs globally and in some countries (%)

GHGs sources	**Global**	**Developed countries**			**Emergent country**	**Central and Est European (UE-27 MSs)**		
		USA	**Germany**	**France**	**China**	**Poland**	**Hungary**	**Romania**
Industry	***31***	24	20	18	**45**	20	24	30
Electricity	***27***	**28**	**34**	10	**34**	**37**	19	23
Agriculture	***19***	11	8	**22**	10	14	18	**22**
Transport	***16***	**29**	**22**	**32**	7	16	**21**	16
Buildings	***7***	**8**	**16**	**18**	4	**13**	**19**	**9**

Source: Representation of the article/s author, 2021 based on the data found on: https://www.breakthroughenergy.org/our-challenge/the-grand-challenges

2.2 The solutions to achieve neutrality

Gates (2021) believes that there is *no single solution* for any of the 5 economic sectors - sources of GHGs, but the cycle of innovation and attracting strong, resilient and risk-tolerant capital must be accelerated. This means more investments in research and development, creating market demand for clean technologies and design public policies to encourage consumers and businesses to make green choices in all five major sectors.

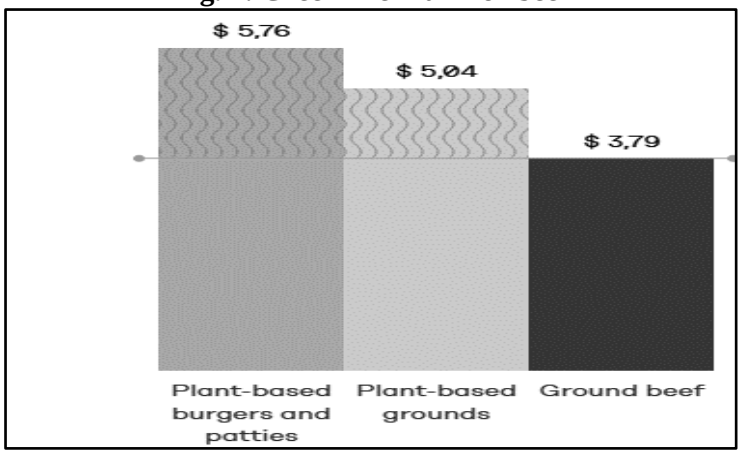
✓ Establishing an Action Plan based on Green Premium

Clean solutions are more expensive now than high-emission ones, in part because the prices do not take into account the real economic and environmental costs of existing energy options, such as fossil fuels.

This cost difference between current practices and clean, green practices that will lead to zero net carbon is called Green Premium by Bill Gates.

To better understand what is the Green Premium we will see the case of ground beef (with high GHGs emissions) versus plant - based ground and burger, where Green Premium with low GHG content is 52% more expensive than ground beef as in Figure 1 ($ 5.76- $ 3.79 = $ 1.97 or + 52%).

Fig. 1: Green Premium for beef



Source: Gates, 2021

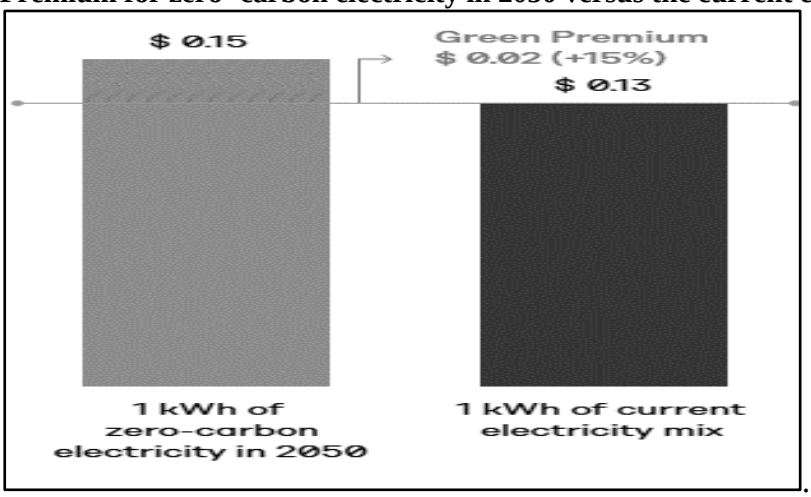
✓ **Green Premium as a decarbonization roadmap tool**

In setting the roadmap for decarbonising the planet, there are several solutions that need to be widely implemented now, and other solutions based on innovation and extensive investment are also needed to be developed and spread around the world over the next few decades (Gates, 2021).

a) Priority now: Small Green Premium Technologies

In the US, priority should be given to zero-carbon electricity, mainly due to lower renewable energy costs. The costs of onshore wind and solar energy have decreased by 44% and 87%, respectively, from 2005 to the present time, due to technological advances and political incentives.

Fig.2: Green Premium for zero- carbon electricity in 2050 versus the current electricity mix



Source: Gates, 2021

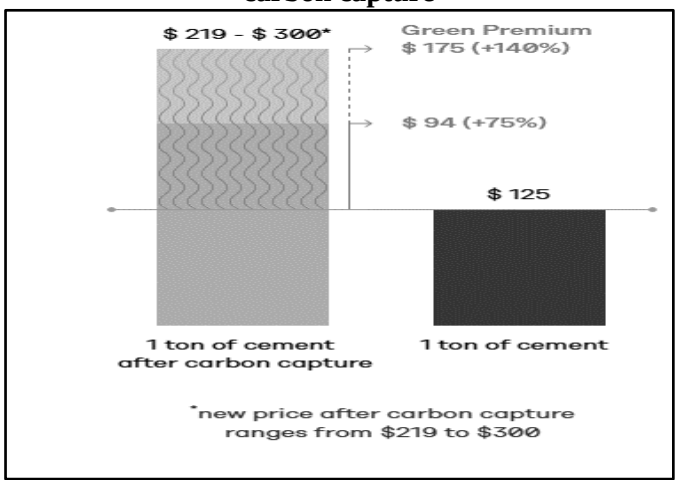
According to Gates's assumptions, Green Premium of zero-carbon electricity would be only $0.02 (Fig.2). So, clean electricity would increase costs for most US household consumers by only 15% or $ 18 each month. Such a low premium - Green Premium - shows that renewable energy sources can play a substantial role in bringing the US to zero net- carbon and should take place quickly wherever it is economical.

b) Long-term innovations and investments: High Green Premium technologies

Among the technologies with high Green Premium, which could become clean, green only with innovations and large cost and investments in the coming decades, Gates takes into consideration as example some products such as cement, steel and liquid fuels.

- *Cement*: each ton of cement creates one ton of carbon dioxide. The USA produces over 96 million tons of cement / year, almost 300 kg / person. Nowadays, the only way to completely eliminate CO_2 from the production process is to use carbon capture technology, which adds a cost estimated at 75-140% per ton of cement (very high Green Premium, Fig.3) (prices in the USA).

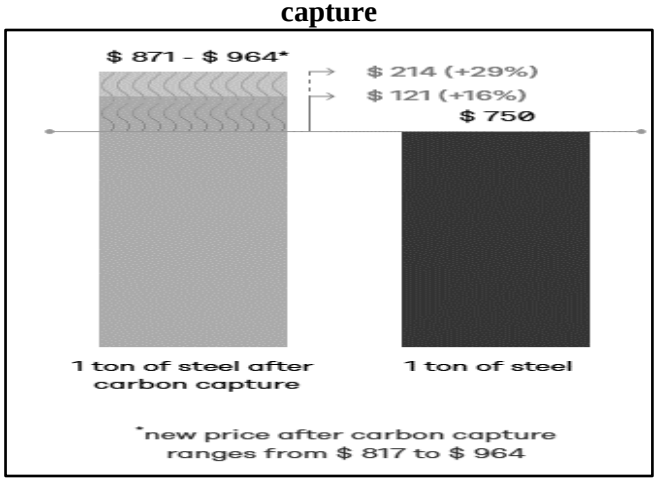
Fig. 3: Green Premium for cement. The cost of a normal ton of cement compared to a new price after carbon capture



Source: Gates, 2021

- *Steel*: each ton of steel creates 1.8 tons of carbon dioxide. Green Premium for 1 ton of clean steel after carbon capture would be $121-$214 (Fig.4).

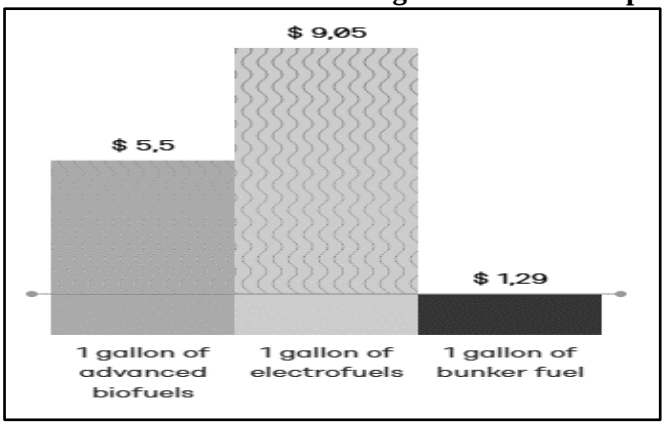
Fig.4: Green Premium for steel. The cost of a normal ton of steel compared to a new price after carbon capture



Source: Gates, 2021

- *Biofuels:* one of the highest Green Premium is computed for the biofuels. The new technologies for advanced biofuels and electrofuels are very expensive, requiring large innovations and investments on a long term (Fig.5).

Fig. 5: Green Premium for biofuels. The cost of a normal gallon of fuels compared to new clean products



Source: Gates, 2021

3. Recommendations for reducing Green Premium and moving to zero net carbon

3.1 General recommendations

Bill Gates (2021) has some general recommendations for:

- Governments: to apply economic policies either to make the carbon version more expensive or to make the clean version cheaper - or, ideally, both.
- Companies and investors: buy cleaner alternatives, invest in R&D, support clean energy startups and advocate for useful government policies.
- Population: to hold the elected responsible.
- World leaders: We need to reward people who have the courage to take difficult steps.

3.2 Recommendations for federal, state and international lawmakers

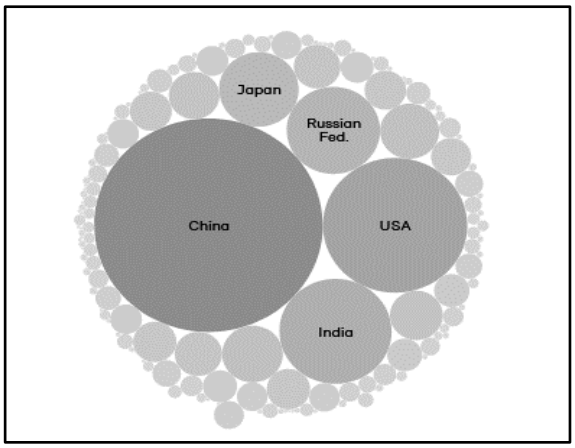
The policy recommendations cover the five major sources of GHGs and are designed to reduce Green Premium of clean technologies, to expand R&D infrastructure, to support the demonstration and early adoption of innovations and to encourage market signals, consumer choices and positive feedback loops that accelerate the decarbonisation of the entire global economy.

It should be noted that the set of smart, practical and ready-to-implement solutions, as each part of the global economy decarbonizes, was made by Gates with the support of experts from Breakthrough Energy (US).

We further briefly present the 5 major sources of GHGs - electricity, transport, industry, agriculture and buildings. For each source are identified the main GHGs emitting countries worldwide and Bill Gates' policy recommendations that should be addressed by governments and parliaments (Gates, 2021).

3.2.1 Electricity - source of GHG

Fig.6: The top 5 major GHG emitting countries in the world



Source: Gates, 2021.

Although solar and wind energy is used more than ever (7% of global consumption), they are not always available, so we still rely heavily on fossil fuels and other technologies that emit greenhouse gases.
New ways need to be found to generate, store and use low-carbon electricity around the world, while expanding existing technologies such as wind and solar, advanced nuclear power, geothermal energy and carbon capture generation.

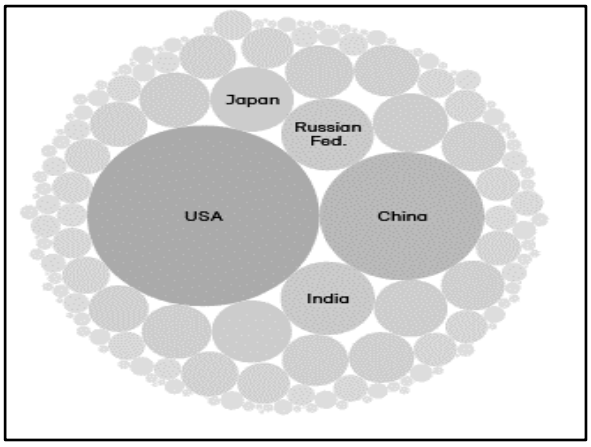
Recommendations on areas of interest for reducing GHG emissions focused on electricity policies:

• Carbon purification of energy, by types of resources.
• High voltage transmission infrastructure to efficiently move electricity from where it is generated to where it is used.
• Renewable energy: Continuing trends in reducing the costs of onshore wind and solar energy (PV) through innovation in design, production, location and operation.
• Storage of wind and solar energy for long periods of time.

There are already a range of options, including different types of batteries, underground pumped hydroelectricity and storage in molten salt. The implementation of these technologies, on a large scale, requires political innovations and reforms of market rules.

3.2.2 Transport -source of GHG

Fig.7: The top 5 major GHG emitting countries in the world



Source: Gates, 2021.

While GHG emissions from transportation account for only about one-sixth of the total global, burning fossil fuels in cars, trucks, trains, planes and ships is the main source of emissions in the United States. And, as transport infrastructure continues to improve in developing countries, transport emissions will increase by 50% by 2040. From electric vehicles to low-carbon fuels, zero-GHG transport will require a complete transformation of the way goods and people move from one place to another.

Recommendations on areas of interest for reducing GHG emissions focused on transport policies:

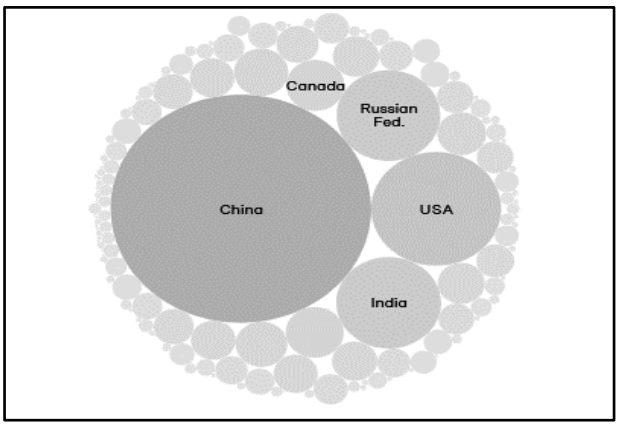
• Electrification: Electric vehicles need to be further supported by technological innovations (longer range batteries), market reforms and smart public policies and investments (eg. in battery charging infrastructure).

• Efficient mobility: Policies and technologies that increase fuel economy and reduce vehicle weight and distance traveled.

• Low carbon fuels: In the long - distance transport sectors (aviation, naval) low carbon liquid fuels are needed (advanced biofuels and Electro-fuels). While advanced biofuels cost about twice as much as gasoline (with 106% Green Premium), electric fuels have 237% Green Premium. However, these two innovations require more attention and funding to reduce costs.

3.2.3 Industry- source of GHG

Fig.8: The top 5 major GHG emitting countries in the world



Source: Gates, 2021.

Industrial goods and materials account for almost a third of global greenhouse gas emissions. To bring this sector to zero GHG emissions, clean electricity and production processes are needed whenever possible. If we do not have them, the technology that captures and stores carbon must be expanded so that it does not enter into the atmosphere.

Recommendations on areas of interest for reducing GHG emissions focused on industrial policies:

• Electrification: New heat pumps, boilers and ovens powered by clean electricity can offer a low or zero emission alternative.

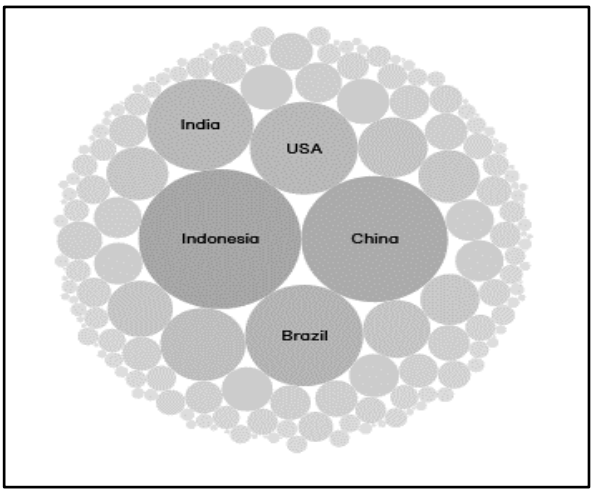
• Energy and material efficiency: Strategies to increase production efficiency include the use of intelligent energy management systems to shut down equipment when not in use.

• Low carbon fuels: biofuels, hydrogen and electro-fuels have the potential to replace conventional fossil fuels. Policies to stimulate investment and reduce the cost of low GHG fuels.

• Carbon capture: can be stored underground or used for other products. Sustainable public policies must encourage companies to invest and implement the necessary equipment on a large scale.

3.2.4 Agriculture- source of GHG

Fig.9: The top 5 major GHG emitting countries in the world



Source: Gates, 2021.

Some emissions from agriculture are generated by nitrogen oxides from the soil (49%). Other sources (44%) that emit methane gas come from animals (cattle, sheep) that are raised for meat and dairy products. Bringing these emissions to zero while meeting growing global demand for food will require significant changes in the way agriculture is practiced and in the way people are feeding. This means reducing the use of chemical fertilizers, improving soil management, reducing methane emissions from animals and minimizing the consumption and waste of high-carbon foods, by expanding new technologies, such as meat and vegetarian dairy products, based on plants.

Recommendations on areas of interest for reducing GHG emissions focused on agricultural policies:

• Soil and nutrient management: better soil health management systems can help sequester carbon and reduce GHGs.

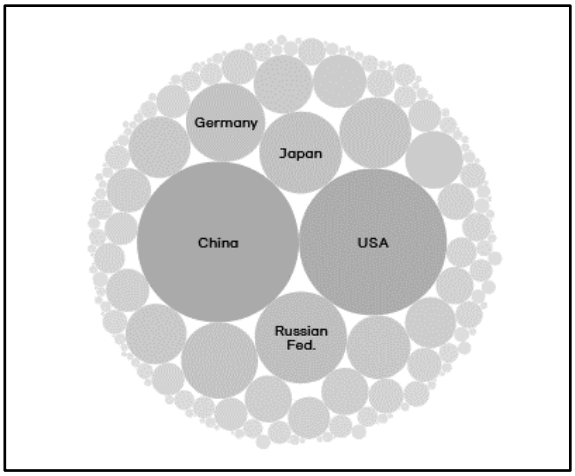
• Alternative proteins: meat and dairy products will remain the foods with the highest GHG emissions per plate; plant pork and chicken could reduce emissions by 30-36%, and plant vegetarian burgers could reduce emissions by 80-90% compared to beef. Cell-based meat or laboratory-grown meat can drastically reduce GHG emissions.

• Reducing agricultural methane: Both animals and waste plant emit methane gas, which is 30 times more harmful than carbon dioxide. Policies to reduce agricultural methane include adjusting feed practices, implementing methane recovery technologies in landfills and increasing recycling and composting rates.

• Wasted food: In the US, approx. 40% of all food - enough to fill a semi-trailer every 20 seconds - becomes waste that generates extremely high methane emissions. Strategies to reduce these emissions refer to improving the efficiency of operations and supply chains and finding uses for edible by-products.

3.2.5 Buildings- source of GHG

Fig.10: The top 5 major GHG emitting countries in the world



Source: Gates, 2021.

Buildings emit carbon in two ways: when we build them (using cement, concrete, steel and iron) and when we use them (with heating and air conditioning-HVAC). The construction should be considered that 1 ton of cement generates 1ton of CO_2 and 1ton of steel generates 1.8 tons of CO_2. Between 2000 and 2016, for example, China used more concrete than the United States throughout the 20th century (Gates 2021). When using buildings, 1.6 billion air conditioners are currently used worldwide. Most of them operate in rich countries, not in the warmest places in the world. It is estimated that by 2050 the number of HVACs will increase to 5 billion, and by 2060, the global stock of buildings is expected to double. In fact, a new New York City will actually be added to the planet every month for the next 40 years. From greener materials to cleaner industrial processes, ways must be found to build and use buildings without emitting carbon.

Recommendations on areas of interest for reducing GHG emissions focused on building policies:
• Electrification: Heat pumps with air source for heating and cooling, electrified appliances and electrification of buildings with clean energy can accelerate the achievement of zero net emissions.
• Low-carbon building materials: Smart low-carbon design strategies (optimization and reuse of materials) can further reduce these emissions.
• Energy efficiency: Building efficiency strategies include replacing old equipment and using sensors and energy management software to optimize a building's emissions and energy use.

4. Conclusions

In the book "*How to avoid a climate disaster*", Bill Gates sets out a wide-ranging, practical and accessible plan for how the world can get to zero greenhouse gas emissions just in time to avoid a climate catastrophe. With the help of experts in the fields of physics, chemistry, biology, engineering, political science, and finance, he has focused on what must be done in order to stop the planet's slide toward what is a certain environmental disaster.

The main conclusions of Bill Gates expressed in his book are included in the following message:

"If there's one idea I want the world to take from the book, it's this: we need to cut Green Premium. The higher the Green Premium for a particular product, the more expensive it will be to eliminate emissions from that product - and the harder it will be to achieve. Reducing these premiums, which will take some time, is the only way to reduce emissions to zero without making things significantly more expensive" (Gates, 2021). According to Gates, "to prevent the worst effects of climate change, we have to get to net-zero emissions of greenhouse

gases. This problem is urgent, and the debate is complex, but I believe we can come together to invent new carbon-zero technologies, deploy the ones we have, and ultimately avoid a climate catastrophe."

As Bill Gates demonstrated in his book, but also from the recent strategies of the European Union, it results that in order to save the Planet, zero net GHG emissions have to be a must to be reached by 2050. Like the European Union in the Europe Green Deal (2019), Gates is advancing an action plan with recommendations, which involves globally major changes in economic and social life, at enormous cost.

The question that arises in many circles of experts is whether politicians and big producers in those parts of the world enriched by carbon-emitting companies will volunteer for a reduction in living standards. Moreover, there is the problem of those in parts of the world who are not yet rich to sacrifice the chance to become so in the future. In this case, it is logical to focus on doing things that affect neither the comfort of the former nor the aspirations of the latter. But, technological changes that move economies away from the use of fossil fuels as primary energy sources could achieve this in the long run.

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