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THE ENTRY OF THE WORLD SYSTEM INTO A NEW CRISIS-MILITARISTIC PHASE OF CYCLIC DEVELOPMENT

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SUMMARY

The relevance of the study is associated with the beginning of the crisis-militaristic stage in the cyclical development of the world- system, and therefore with the strengthening of militarization at the global and local-global levels. The current crisis-militaristic stage 2020-2050 is an integral part of the current long cycle of world politics, hegemony cycle, systemic cycle of capital accumulation, as well as Kondratiev cycle. In historical retrospect, this took the form of "thirty-year world wars" and entailed destabilization of socio-economic development. The purpose of the study is to substantiate the entry of the world-system into the mode of the crisis-militaristic phase of cyclical development, which is a cyclical change of periods of relative stability with periods of its loss, immersion in crisis-militaristic instability, and also to explore the influence of local-global cycles on this process. In our research we applied primarily logical and historical methods, as well as dialectical ascent from the abstract to the concrete, including general scientific methods of analysis and synthesis. Main results of the study: during the crisis-militaristic phases of global cycles, the geopolitical system of global capitalism is plunged into the strongest instability, at the same time it is tested for strength; since the second half of the twentieth century, the aggravation of geopolitical contradictions has led to the unleashing of local-global conflicts; in cyclical geopolitical processes, local-global cycles of countries playing process-forming roles in the world geopolitical system play an important role; there are sufficient grounds to assert that the modern world-system is entering a crisis-militaristic phase of cyclical development. The local-global conflicts taking place today initiate a new cycle of militarization on a global and local-global scale; so far, a trend towards a steady increase in arms sales has already formed.

Keywords: militarization, world-system, global military-economic cycles, local-global military-economic cycles, crisis-militaristic phases, sustainable development, instability, local-global conflicts

INTRODUCTION

The relevance of the study is conditioned by the beginning of a new crisis-militaristic stage in the development of the capitalist world-system, which is manifested both at the global and local-global levels. The modern crisis-militaristic stage (2020-2050) is formed by the unity of a variety of global cycles, among which the leading role is played by Kondratiev cycles, long cycles of world politics, hegemony cycles, and systemic cycles of capital accumulation. In historical retrospect, the crisis-militaristic stages of cyclical social development occurred in the form of "thirty-year world wars" and entailed a temporary increase in the instability of socio-economic development to the state of turbulence. The cyclical development of society may become sustainable if it acquires a form in which cyclical fluctuations of the economy, the severity of cyclical crises and all forms of social inequality are smoothed to the maximum extent possible, and the crisis-militaristic phases of military-economic cycles are transformed into non-militaristic phases of cyclical geopolitical processes, which makes it possible to avoid human casualties, economic and environmental damage from military actions.

The purpose of the study is to substantiate the entry of the world-system into the mode of crisis-militaristic phase of its cyclical development, which is a cyclical replacement of periods of relative stability with periods of its loss, plunging into crisis-militaristic instability, as well as to study the impact of local-global cycles on this process.

LITERATURE REVIEW

The unfolding of the crisis-militarist stage in the cyclical development of the modern world-system, which leads to its deviation from the trajectory of movement towards sustainable development, is studied in this article through the prism of theories of cyclicality of global political-economic and military-economic processes, in particular, the theory of long cycles of world politics by J. Modelski and W. Thompson (Modelski, 1995) and the theory of hegemony cycles developed by I. Wallerstein (Wallerstein, 1983). The influence of local-global cycles of the modern leader of the world-system on its cyclical development today and in the near future is substantiated based on the concept of J. Friedman (Friedman, 2021). The dynamics of military expenditures and arms sales is considered based on the statistical materials of the Stockholm International Peace Research Institute (SIPRI) (SIPRI, 2024; SIPRI, 2024a), the Institute for the Study of War (ISW) (Harward, et.al., 2024), the World Bank (World Bank, 2024), the State Web Portal "Budget for Citizens" (MFU, 2024).

RESEARCH METHODS

The methodological basis of this study is mainly general scientific methods. Within the framework of logical and historical methods, as well as dialectical ascent from the abstract to the concrete, including general scientific methods of analysis and synthesis, induction and deduction, the beginning of the crisis-militaristic stage in the cyclical development of the modern world-system, as well as the role of local-global cycles of individual countries in this process was substantiated. The problem-chronological method and system approach were also applied.

MAIN RESULTS

Crisis-militaristic phases in the cyclical development of the capitalist world-system are periods of resolution of deep geopolitical contradictions by means of large-scale wars. In the historical process of development of the capitalist world-system, i.e. starting from the "long XVI century", the crisis-militaristic phases of global cycles unfolded in the form of "thirty-year wars", the role of which in social development is substantiated in the works of leading researchers of its cyclicality, in particular in the works of I. Wallerstein. In his opinion, in each case hegemony was achieved through a thirty-year world war - a land war involving (not necessarily permanently) almost all major military powers of that era in large-scale clashes extremely devastating for the land and population (Wallerstein, 1983).

Since the second half of the 20th century, geopolitical contradictions have been partially resolved through diplomatic methods or local-global wars. Today, according to the chronology of unfolding of long cycles of world politics, the "macro-resolution" phase begins in the world-system, which in historical retrospect represented at least 30 years of intensified confrontation between competing leading actors of geopolitics (Modelski, 1995), having previously formed their geopolitical blocs during the "coalition building" phase, in which their allies and satellites are united.

The crisis-militaristic phase of each form of global cycles is a period of manifestation of extreme aggravation of contradictions in the system of interactions of certain competing social organisms, which leads to military-political conflict, the result of which determines the balance of power in a particular regional or global geopolitical system and creates the basis for overcoming the systemic crisis (Podliesna, 2024).

In the process of development of the capitalist world-system, the accumulated internal contradictions become more acute with a certain periodicity, which leads to its deep destabilization, that is, to the loss of the relative stability that allows it to develop without social catastrophes and large-scale manifestations of social violence. The unfolding of crisis-militaristic phases of global and local-global cycles causes a comprehensive militarization of the economy and public consciousness. A certain ecosystem of coexistence and constant interaction between the state; business, which provides for the needs of the military sphere; and civil society, whose consciousness becomes militaristically oriented under the influence of political and ideological instruments, is being formed.

In such an ecosystem, the actions of all actors are subordinated to the needs of the military sphere in its broadest sense, which includes the military economy and a special strictly regulated way of social life, limited by the requirements of the state of emergency conditioned by the ideology of war. Such a system is a mobilization form of social life, which ensures that society acquires relative stability, thanks to which it survives, mobilizes for the sake of achieving certain declared goals of the ruling class and creates an economic basis for overcoming cyclical socio-economic crises through the commercialization of war. In the twentieth century, the most successful example of the commercialization of war, which made it possible to overcome the Great Depression, was the application of the economic policy of military Keynesianism by the leading countries of the capitalist world-system.

A deep systemic crisis has been unfolding in the capitalist world-system since 2008; in the process of overcoming such crises of capitalism there is a partial resolution of its internal contradictions, which leads to the transformation of the capitalist system. Due to the current systemic crisis of capitalism, the world-system has critically approached the bifurcation point, i.e. a very important stage of the historical process for humanity is beginning.

At the current level of development of military technologies, the plunge of the world-system into the chaos of war, which corresponds to the established chronology of phases of global military-economic cycles, in particular such a form of them as long cycles of world politics (today the 10th long cycle of world politics is unfolding, which began in 1973 and should end in 2050 (Modelski, 1995)), poses threats to the existence of human civilization. Overcoming the systemic crisis of capitalism by means of a world war, which previously made it possible to reformat and stabilize the global geopolitical system, to overcome the economic crisis in the process of commercialization of war and to move to an upward wave in the long-term development of the capitalist economy, may, provided that nuclear weapons are used, throw humanity back to prehistoric times or destroy it altogether.

The current deep complex crisis of the world system indicates that it is about to enter the sixth Kondratiev cycle, which is impossible without large-scale

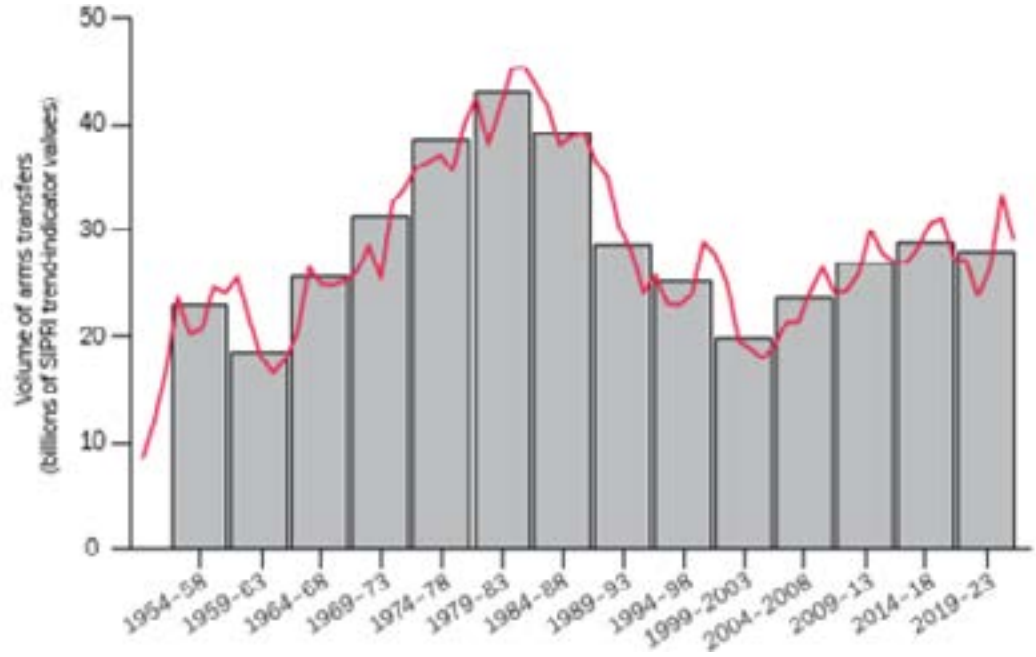
introduction of innovations, including military ones. The "macro-resolution" phase of the long cycle of world politics has already begun by now to intensify the processes of unleashing wars and armed conflicts, which means the intensification of militarization of the economy and society. The technical and technological basis of these global cycles is the fourth industrial revolution, which significantly increases the destructive power of military technologies and generates new, in particular hybrid, forms of warfare.

Today, under the conditions of aggravated confrontation between the leading actors of geopolitics and their allies, the capitalist world-system has embarked on the path of militarization, as evidenced by the growth of arms sales. In 2021, when the entire world was under constraints on economic activity and social life in general due to the pandemic, arms sales by the top 100 arms manufacturers and military services companies ("SIPRI Top 100") totaled $592 billion, up 1.9% from 2020 and maintaining an upward trend since at least 2015. This growth occurred despite the effects of the pandemic, most notably supply chain disruptions, labor shortages, and semiconductor shortages. The U.S. continued to dominate the ranking, being represented by 40 companies with total arms sales of $299 billion. The 2018-2022 arms sales volume was one of the highest since the end of the Cold War. Based on figures published by arms exporting states on the monetary value of their arms exports, SIPRI estimates the total value of the global arms trade in 2021 to be at least $127 billion, up from $95 billion in 2012 (in constant 2021 dollars) (Stockholm International Peace Research Institute, 2024). At the same time, there are strong indications of rising tensions in many regions, especially in Europe, so it is likely that demand for major weapons will increase further in the coming years and will largely be met by foreign supplies. SIPRI counted 63 states as exporters of major arms in 2018-2022, but most of these states are small exporters, with the top 25 suppliers of major arms in 2018-2022 accounting for 98% of total exports. The top five suppliers during this period - the United States, Russia, France, China and Germany accounted for 76% of total exports. In 2018-2022 the US strengthened their position as the world's largest arms supplier, and the gap between them and Russia widened. In 2018-2022, U.S. arms exports were 14% higher than in 2013-2017, and their share of global exports increased from 33% to 40% (Stockholm International Peace Research Institute, 2024).

Since the beginning of the global economic crisis in 2008, arms trade has been increasing (Fig. 1), which is an important argument for the assumption that militarization has been chosen as a solution to this crisis.

Figure 1

The trend in transfers of major arms, 1954 - 2023



Source: SIPRI. (2024). Armaments, Disarmament and International Security. https://www.sipri.org/sites/default/files/2024-06/yb24_summary_en_2_1.pdf

Note: The bar graph shows the average annual volume of arms transfers over a five-year period and the line graph shows annual volumes

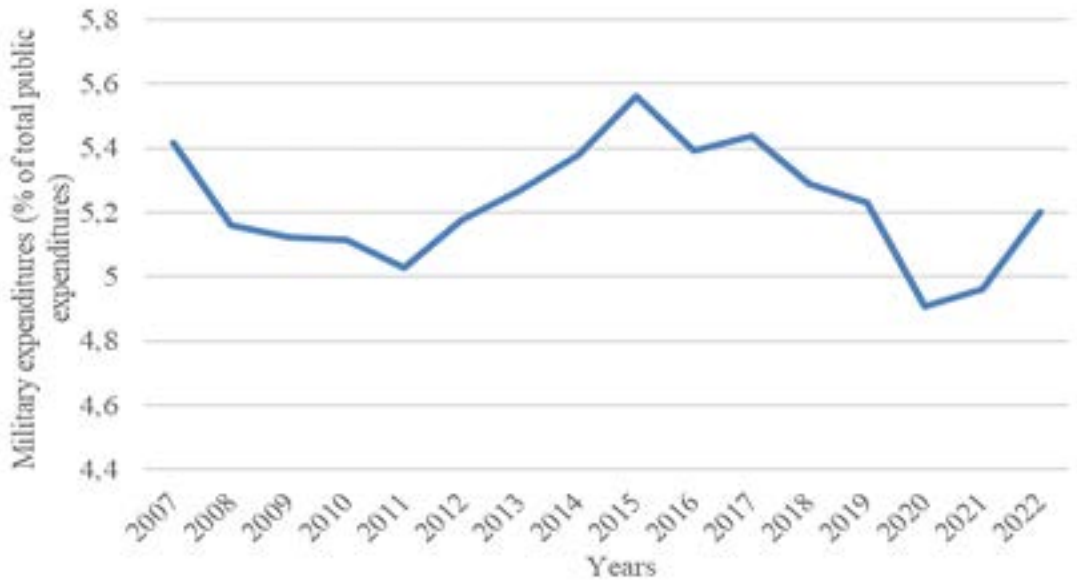
The fact that a new cycle of militarization of the global economy has been opened is also evidenced by the growth of global military expenditures. The aggravation of geopolitical contradictions and, as a consequence, the unleashing of local-global military conflicts caused an increase in global military expenditures in 2023 by 6.8%, which was the sharpest annualized growth since 2009 and resulted in global military expenditures reaching the highest level ever recorded by SIPRI. In 2023, global military spending increased for the ninth consecutive year, reaching a total of $2,443 billion. The global military burden, defined as military spending as a percentage of global gross domestic product (GDP), increased to 2.3% in 2023. In 2023, global military spending per person was the highest since 1990 at $306 (SIPRI, 2024a). The increase in global military spending in 2023 is primarily due to the ongoing war in Ukraine and escalating geopolitical tensions in Asia, Oceania, and the Middle East. Military spending increased in all five geographic regions.

Military expenditures as a share of public expenditures, which can be considered as an indicator of government priorities, increased in 2023 in 9 of the top 10 countries. Among the top 10 countries, the share of military expenditures in public spending was the highest in Ukraine (58%), followed by Saudi Arabia (24%) and Russia (16%). The most notable growth in 2023 was in Ukraine (+19%) and Russia (+3.2%) (SIPRI, 2024a). According to the State Web Portal "Budget for Citizens", which provides data from the Ministry of Finance of Ukraine, in 2023 defense spending in the state budget of Ukraine amounted to 52.25%; compared to the same indicator for 2021 (8.56%), the specific weight of defense spending increased 6.1 times (Ministry of Finance of Ukraine, 2024). The Institute for the Study of War predicts that the Russian government plans to spend 17 trillion rubles ($183 billion) on national security and defense in 2025 - about 41 percent of its annual expenditures (Harward, et.al. 2024).

From 2020, despite the socio-economic problems caused by the constraints justified by the spread of COVID-19, the share of military expenditures in public expenditures on a global scale is increasing (Figure 2). Such dynamics of this indicator indicates a change in institutional and economic priorities in favor of militarization.

Figure 2

Dynamics of world military expenditures (% of total public expenditures)



Source: based on World Bank. 2024. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators#

The main driving force of global cyclical processes of militarization is the competition between the leading states-actors of global geopolitics. Periodically, the aggravation of contradictions between geopolitical actors claiming the status of world leader leads to the unfolding of crisis-militaristic phases of global military-economic cycles. In the historical process of social development, the unfolding of crisis-militaristic phases of global military-economic cycles took place in the form of "proto-global" and "global" wars, which is substantiated in the theory of long cycles of world politics, revealing the essence of the cyclical process of gaining the status of world leader by certain states. In this process, the global wars of the new time performed the role of "macro-decisions"; in historical retrospect, the collective decisions adopted as a result of these wars became binding on the scale of the world system for a certain period of time (Modelski, 1995).

In cyclical geopolitical processes, an important role is played by local-global cycles inherent in the political-economic systems of countries, which perform at certain historical stages one of the following functions: leader (world hegemon); challenger for the role of the world-system leader or regional leader; the space of localization of the resolution of geopolitical contradictions. Today, the local-global cycles of the USA are the cycles of the leader of the world-system; of Germany - the regional leader, in the past the pretender to the role of the world leader; of Russia - the pretender to expand the space of its regional leadership and at the same time the space of localization of militaristic ways of resolving the aggravated geopolitical contradictions; of Ukraine - the space of localization of militaristic ways of resolving the aggravated geopolitical contradictions. In the unfolding of these cycles, periods of military violence play a cyclo-formative role.

Local-global military-economic cycles are intra-country cycles of certain countries, which perform in specific-historical conditions process-forming roles in the world geopolitical system, so these cycles have a significant impact on global cyclical dynamics.

Each form of local-global military-economic cycle has a crisis-militaristic phase. Such cycles should include, first of all: in the United States - institutional cycles, the unfolding of which in historical retrospect, according to J. Friedman, was triggered by wars: the War of Independence, the Civil War, World War II (Friedman, 2021); in Germany and Russia - local-global military-economic cycles, the first and at the same time cyclo-forming phase of which is the war, which allows assessing the effectiveness and viability of the political-economic system of the warring country.

The outbreak of the First and Second World Wars was largely due to the unfolding in Russia (later the USSR) and Germany, the countries that most clearly expressed the aggravation of contradictions in the world geopolitical system and claimed to increase their role in it, of a special local-global form of military-economic cycles, consisting of the following phases: 1) war, 2) post-war reforms of the political-economic system, and 3) socio-political transformations of a critical, often perturbational nature.

Germany played a special role in the cyclical dynamics of the capitalist world-system in the XIX-XX centuries, which was largely predetermined by its geopolitical position. According to H. Mackinder, the author of the "Heartland" theory, Germany occupies a central strategic position in Europe (Mackinder, 1904). The internal political and socio-economic processes that took place in Germany during this historical period became one of the most important prerequisites for the unfolding of large-scale wars, the results of which determined for quite a long time the balance of power in the world geopolitical space and influenced the economic situation on a global scale.

Germany acted as a Challenger (challenger for the role of global leader) during the 9th long cycle of world politics, which began in 1850. But in the "macro-solution" phase (1914-1945) of this cycle Germany was defeated (Modelski, 1995), as its political-economic system was unable to achieve the level of development necessary to attain the status of a global leader, as well as due to the presence of strong geopolitical competition from dynamically developing countries, particularly the United States. Germany has managed to take the place of a regional leader in the geopolitical system by the beginning of the 21st century, but in the process of unfolding of the modern world economic crisis, which began in 2008, the process of slow but inevitable decline of the German political-economic system began.

In Ukraine, the most relevant form of local-global cycles is the internal political cycle (Table 1), the cyclo-forming phase of which is a political crisis leading to social conflicts and violence. At the same time, the crisis phase of each subsequent internal political cycle is characterized by an increase in the scale of social conflict and intensification of social violence, which became more and more systemic and purposeful. The particular form of the internal political cycle in Ukraine consists of three phases: 1) political crisis; 2) presidential elections that do not correspond to the legally established chronology of the electoral process; 3) a relatively stable electoral process that includes the next presidential election (Table 1). Since 1993, three political cycles with an average duration of 11 years have been fully unfolded in Ukraine.

Socio-economic prerequisites of political crisis in each such cycle are the aggravation of contradictions within political-economic elites, the growth of dissatisfaction of the population with the pace and quality of socio-economic transformations, and political grounds are the competition of elites and the influence of the international political conjuncture. The entire historical retrospective of political cycles in Ukraine is a process of forming the grounds for its inclusion in the global military-economic cyclicality as a space of localization of the resolution of geopolitical contradictions (Podliesna, 2024). It was the unfolding of domestic political cycles in Ukraine in the form in which they occurred, when the crisis phase of

each subsequent domestic political cycle led to the growth of latent social confrontation and to the unbalancing of the Ukrainian political-economic system, that led this system to the state that allowed Ukraine to become a space of localization of processes of military resolution of deep civilizational and geopolitical contradictions, periodically aggravated in the course of cyclical social development.

The localization of global contradictions in the civilizational space of Ukraine with the subsequent unfolding of military conflict is largely due to the fact that in Eurasia, which, according to Z. Brzezinski, occupies an axial position in geopolitical terms, and "represents a chessboard on which the struggle for global domination continues", Ukraine is the geopolitical center, without control over which Russia is unable to recreate a Eurasian empire (Brzezinski, 2016).

Table 1

Medium-term political cycles in Ukraine

Cycle phase	Time period
First cycle	
Political crisis	1993-1994
Presidential elections that do not comply with the legally established chronology of the electoral process	1994
Sustainable electoral process, including regular presidential elections	1995-2003
Second cycle	
Political crisis	2003-2004
Presidential elections that do not comply with the legally established chronology of the electoral process	2004
Sustainable electoral process, including regular presidential elections	2005-2013
Third cycle	
Political crisis	2013-2014
Presidential elections that do not comply with the legally established chronology of the electoral process	2014
Sustainable electoral process, including regular presidential elections	2015-2024

Source: developed by the author

Today, a local-global conflict is unfolding on the Eurasian continent in the form of the Russian-Ukrainian large-scale military-political conflict, and the Israeli-Palestinian conflict has also resumed. These local-global armed conflicts have the potential for the beginning of military confrontation between military-political blocs, and they also contributed to the strengthening of militarization processes on a global scale to ensure the conduct of military operations at the local level with the prospect of expanding to the scale of global war.

After the outbreak of localized global conflict in 2022, Ukraine can sustain its annual budget only with a combination of tax increases, debt, and international financial assistance, with non-military financing deficits reaching approximately $40 billion in 2023. The financial aid packages provided to Ukraine by the EU and the US in 2022 and 2023 were crucial to free up the resources needed to finance its armed forces (SIPRI, 2024). The local-global conflict in Ukraine has not only destroyed its economy, but has also created deep social and environmental destructions that will hinder its sustainable socio-economic development for a long time to come.

The unleashing of hostilities in Ukraine has caused Western countries to increase supplies of military equipment, ammunition and related goods to Ukraine, as well as to increase their defense spending and investments in the military-industrial complex. In particular, the U.S. Department of Defense reports that support for Ukraine has mobilized the defense-industrial base in ways not seen in decades. Assistance has been provided either through presidential authorization, where weapons are removed from the military's arsenal and shipped overseas, or through the Ukraine Security Assistance Initiative (USAI), where the government directly contracts with industry to ship new weapons to Ukraine as soon as they are ready. When weapons are removed from existing U.S. arsenals, they must be replaced to ensure that U.S. military units maintain their own combat readiness. At the same time, defense contractors are busy building new weapons to replace what has been shipped overseas, as well as producing new capabilities to fulfill USAI orders. Overall, the Department of Defense's PDA replenishment commitments and USAI orders totaling more than $27 billion directly impact leading and critical suppliers in 37 states (Todd lopez, 2023).

The need to strengthen the defense industry has been recognized by the european parliament, arguing that it is russia's war with ukraine that has exposed the problems facing the european defense industry. Eu member states have increased their defense budgets, with the combined total expected to reach €350 billion in 2024. An ambitious action plan to strengthen security and defense policy until 2030 - the defense concept "strategic compass for security and defense" - was approved in march 2022. This defense concept focuses on increased investment and a more consolidated approach to defense spending, capability development and research. Eu member states agreed to significantly increase their defense spending and improve their defense budget expenditures by increasing interoperability and reducing fragmentation, especially by using existing instruments such as the european defense fund (edf) and permanent structured cooperation (pesco). Eu member states have committed to strengthen work on defense innovation by bringing together civil, space and defense research, and through initiatives such as the establishment of the hub for eu defense innovation (hedi). In march 2024, the european commission proposed the first-ever european defense industrial strategy and a program to implement it. At the meeting in june 2024 eu leaders adopted the "strategic agenda 2024-2029", which aims to improve the conditions for the expansion of the european defense industry by creating a more integrated european defense market and by facilitating joint procurement, also welcomes flagship projects and defense initiatives by member states, recognizing the need to strengthen the role of the european investment bank group in financing these processes (EP, 2024).

Today, the capitalist world-system is plunged into the strongest instability, the institutional practices of interaction between the actors of geopolitics, established after the completion of the "macro-decision" phase (1914-1945) of the next (9th) long cycle of world politics, are collapsing. In the modern world-system, the competitive struggle between the contenders for the role of world leader, as well as between the countries vying for the status of regional leaders, has become critically aggravated. This geopolitical situation corresponds to the logic and chronology of the unfolding of long cycles of world politics, as well as the institutional cycles of the modern world hegemon - the united states.

Large-scale destructive consequences are inevitable for the countries on whose territory the main events of crisis-militaristic phases of global cycles are localized, in particular for ukraine. During the war, ukraine continues to experience significant destructive structural, demographic, socio-economic, institutional and other social transformations. In particular, the trends of accelerated depopulation, large-scale migration of ukrainians abroad and the actual cessation of basic reproduction of the population in general and the labor force in particular have become more acute. The war had a profound shock effect on the socio-economic situation in ukraine. Overcoming these consequences and further reconstruction requires significant investment funds and efforts, the estimated total need for reconstruction funds in 2023-2026 is 128 billion dollars, and for 2023-2033 it is almost 411 billion dollars (Burlay, et.al., 2023).

Based on the chronology of unfolding of the "macro-resolution" phases of the long cycles of world politics, which in historical retrospect lasted at least 30 years, in the 2026-2050s there will be a militarization of the economy and society of the countries which are active participants in the geopolitical confrontation. As already noted, the US has recently strengthened its position as the world's largest arms supplier. In the National Security Strategy adopted in 2022, in order to achieve its main goals, the Biden administration considered it necessary to: invest in the main sources and instruments of American power and influence; create the strongest possible coalition of nations to strengthen collective influence in order to shape the global strategic environment and solve common problems; modernize and strengthen the U.S. military in order for it to be ready for the era of strategic competition (The White House, 2022). Also, a new cycle of economic militarization has begun in the EU, as evidenced by the European Commission's March 2024 program for strengthening the EU defense industry, which includes co-financing and ordering of weapons, modernization of the EU military-industrial complex, and other measures to strengthen defense companies. Under the new strategy, EU countries are asked to purchase jointly at least 40% of defense equipment by 2030 and to ensure the value of intra-EU defense trade to be at least 35% of the value of the EU defense market by 2030. From 2025 to 2027, €1.5 billion will be allocated from the EU budget to improve the competitiveness of the technological and industrial base of the European defense sector. Also, the European defense industrial strategy aims to encourage European arms manufacturers to increase investment, improve production efficiency, and, for the first time, collectively catalog their weapons in the long term (European Commission, 2024).

Thus, in the cyclical development of the capitalist world-system today there is a crisis-militaristic stage, which is manifested not only in the unleashing of local-global conflicts in the territories of countries on the civilizational fault lines, primarily the local-global conflict in Ukraine, as well as the renewed Israeli-Palestinian conflict, but also in the growth of arms sales on a global scale, as well as in the adoption by the leading actors of geopolitics of long-term strategic development plans for the development of the region.

DISCUSSION

Today, the cyclical development of the capitalist world-system begins to unfold the crisis-militaristic phases of modern global military-economic cycles, in particular: the "intermediate war" that stimulates the economy to move to the upward wave of the 6th Kondratiev cycle; the "macro-resolution" phase of the modern long cycle of world politics; the "thirty-year world war" phase of the modern cycle of hegemony, the phase of territorialism (material expansion) of the new systemic cycle of capital accumulation.

In the process of unfolding of crisis-militaristic phases of global military-economic cycles, and thus comprehensive militarization of the economy and social relations, the capitalist world-system is plunged into the strongest instability, its stability is significantly tested. After the completion of each crisis-militaristic stage of cyclical development of the capitalist world-system, it temporarily stabilizes due to the fact that the new leader of the world geopolitical system, or the old leader who has retained his dominance, establishes technical-technological, socio-economic, military-political, ecological and cultural guidelines of development for the whole world. In historical retrospect, it was the countries that achieved the status of hegemon that, during the period of their dominance in the world-system, determined the institutional practices of international relations for the long term. This ensured relative sustainability of social development on a global scale, although conditions for different countries were unequal and determined by their geopolitical status.

The beginning of the next crisis-militaristic stage of the cyclical process of development of the capitalist world-system initiates the transition to the war footing of the countries where local-global wars are taking place, as well as large-scale militarization of the political-economic systems of the countries - pretenders to the role of world leader and their allies. Any reformatting of the structure of the political-economic system, due to the change of strategic guidelines of its development, in particular, from the priority of building a "consumer society" to the priority of forming a militaristic society, leads to the destabilization of established socio-economic and institutional practices of social life. That is, the stability of the political-economic system is temporarily reduced, while at the same time transformation processes are taking place, forming a mobilization society as an intermediate form that provides relative stability of socio-economic development. Countries, on whose territory the militaristic processes of geopolitical confrontation are localized, should choose the most effective political-economic model for their survival and development, that is, make a fundamental decision: to create a militarized society of mobilization character, oriented towards decades of war, or to choose a model oriented towards stabilization and solidarization of society, turning towards the implementation of the concept of the social state.

Local-global cycles of countries that play process-forming roles in the world geopolitical system, have a determining influence on the cyclical development of the capitalist world-system. The strongest influence is exerted by local-global cycles of the modern world leader - the USA, first of all, the American institutional cycle. Based on the chronology of its unfolding, large-scale transformations in the world-system will begin as early as 2025 (Friedman, 2021). These transformations will take place during the "macro-resolution" phase of the current long cycle of world politics, the unfolding of which is stimulated by the local-global conflict in Ukraine and the Israeli-Palestinian conflict, which clearly outlined the contours of military-political blocs and their fundamental contradictions, as well as geopolitical and economic goals. The unfolding of the local-global military conflict in Ukraine chronologically coincides with the transition from the third to the fourth internal political cycle.

Germany as a regional leader is currently experiencing the deepest systemic crisis since the unification of East and West Germany. The political and economic system of the Russian Federation in modern conditions has also revealed many internal contradictions and disproportions, indicating a latent systemic crisis, the full-scale unfolding of which is restrained only by special historically established tools of institutional regulation of social processes. That is, in the unfolding of the local-global military-political cycles of Germany and Russia there has come another crisis-militaristic phase - the period of assessing the effectiveness and, in general, the viability of their political-economic systems. Involvement in military-political events in modern conditions can take place both in an explicit form and in the form of participation in hybrid warfare.

CONCLUSION

The local-global conflict in Ukraine and the current Israeli-Palestinian conflict have actualized and intensified the process of unfolding of crisis-militaristic phases of modern global military-economic cycles, as evidenced by the strengthening of militaristic rhetoric in the information space and diplomatic sphere (especially during 2021-2024), the commercialization of war, the growth of military sales, the adoption by the leading actors of geopolitics of long-term strategic plans to strengthen their defensive capabilities, in particular, to strengthen their arms industry.

The resolution of geopolitical contradictions by militaristic means, both in the form of "global" wars (crisis-militaristic phases of global cycles) and in the form of smaller-scale military-political conflicts (crisis-militaristic phases of local-global cycles) temporarily hinders the achievement of sustainable development goals, declared today by the leading actors of geopolitics as the most important guidelines for the development of human civilization. The unfolding of the crisis-militaristic phases of global and local-global military-economic cycles is a period of deviation from the benchmarks of sustainable development in the conditions of geopolitical turbulence, but it is precisely at this time economic, technical-technological, political and institutional grounds are being created to overcome the crisis of the geopolitical system and return to the trajectory of movement towards sustainable development.

Militarization of the economy and public consciousness is a rather effective tool for implementing the mobilization scenario of overcoming deep crises of the capitalist economy, but at the same time it generates contradictions and disproportions of social reproduction, destruction of public consciousness, which ultimately leads to even deeper crises. Therefore, militarization allows temporarily stabilizing the political-economic system, returning it to the path of achieving sustainable development goals, but creates grounds for destabilization of society in the long term, so it cannot be recognized as an appropriate way to overcome crises at the global and local levels.

Today, the direction and dynamism of global crisis-militaristic processes are largely determined by the nature of the unfolding of the local-global conflict in Ukraine and the Israeli-Palestinian conflict; their outcome largely determines the balance of power in the global geopolitical system and, in general, the nature and outcome of the next crisis-militaristic stage in the cyclical development of the world system. Upon completion of this stage, a new relatively stable form of civilizational development will be formed.

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THE DETERMINANTS OF INFORMAL ECONOMY IN EASTERN EUROPEAN COUNTRIES

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SUMMARY

This article addresses the problem of informal economy in 11 countries from Eastern Europe. The aim of the research is to identify macroeconomic and social determinants of high levels of informality in the region and to quantify their influence on the respective phenomenon. For this purpose we carried out an econometric analysis-pooled regression, fixed effects and random effects models in R software. The models include the informal output as dependent variable calculated with the method Multiple Indicators Multiple Causes model-based by International Labor Organization, and expressed as % of official GDP. As explanatory variables we included in the models employment in agriculture, personal remittances, GDP growth per capita, rural population and the opinion regarding cheating behavior on taxes. We used secondary data from World Bank and World Values Survey for the period 2000-2020. From the three models performed we chose the model with fixed effects applying the F-test for individual effects and Hausman test. The fixed effects model succeeds to explain 40% of the variation in the informal output determining a positive influence of the variables employment in agriculture, personal remittances and the opinion towards cheating behavior on taxes, the results being consistent with other studies on this topic. The strongest influence is that of the social variable – the opinion regarding cheating on taxes, with a coefficient of 1.89. The results of the analysis have theoretical as well as practical implications for policymakers offering valuable insights for tailoring the policies aimed at lowering the level of informality in these countries.

Keywords: informal economy, Eastern Europe, macroeconomic factors, cheating on taxes, regression analysis

INTRODUCTION

Informality is a widespread problem around the world, however the transition economies are particularly fragile to this issue. It is estimated at a global level that from the total employment approximately 2/5 represents informal employment, being more prominent in some regions such as Eastern Europe and Central Asia (Ohnsorge & Shu, 2022). High rates of informality are associated on the long term with lower productivity, decreased fiscal revenues, inequality and poverty, despite their benefits regarding flexible employment. Many studies on informality focuse on the methods to measure the size on the informal sector, however, understanding its determinants is equally important. The literature on the topic lack a consensus regarding the factors of influence for specific regions and economies (Buitrago, et.al, 2024).

In Europe and Central Asia, high levels of informality are considered to be the result of transition from planned economy to market economy. After 1980, many firms that entered the market were activating informally to avoid taxes, reglementations and corruption (Johnson, et.al., 1997). In the last two decades informal employment has decreased due to economic, social and political changes. Also, a decrease in the informal work was registered in the recent years, during the Covid-19 pandemic, because the working conditions changed and many jobs that were performed unofficially could no longer be carried out under the conditions imposed by the authorities (Alfaro, et.al., 2020).

Although there are some positive consequences of informal employment mentioned in the literature, such as the creation of new working places and an encouragement for the small firms to resist on the market in their harder periods, by paying less taxes, in general, this type of working relations is undesirable. From the point of view of salary, there is a gap between the salaries from the formal and informal sectors, the last one being in disadvantage (Liwiński, 2020). With the aim to eliminate any form of exploitation and inadequate working conditions, international and national authorities are trying to alleviate the informality. For example, in the country with the highest level of informality from the Eastern Europe - Republic of Moldova, the National Development Strategy "European Moldova-2030", adopted in 2022, proposes general and specific objectives to increase the living standard in Moldova by 2030. The first general objective of the strategy addresses the increase of income and the attenuation of inequalities. One of the specific objectives consists in the improvement of working conditions and reduction of informal employment by 7%, compared with 2020, to reach the level of 20% from the total employment by 2030. Measuring the magnitude of the informal sector is challenging, due to the many forms that informality can take and the illegal aspect of the informal activities.

This paper is structured in five parts. In the introduction we present the importance and the actuality of the topic. The literature review part covers the most important concepts related to the topic and the determinants of the informal employment. The third part- research methodology contains the data sources and indicators used for this research. The fourth section includes the graphical representation and explanation of results and highlights the main observed trends, the last part being reserved for conclusions.

LITERATURE REVIEW

Terms such as black, shadow, hidden or parallel economy are associated with the informal economy. One of the most common definitions of informality states that it comprises all economic activities that are accounted for when calculating the Gross National Product but are not registered, therefore are not taxed and can be considered black or clandestine (Schneider & Enste, 2000). The reason behind the choice of deliberately hiding from the government some market-based economic activities is to not face regulation and taxation.

Informal employment can take few forms: as a subordination working relationship in which the employer and employee are involved or independent work in which the worker is on his own and he is not declaring or partially declaring the work. In the case of subordination relationship, two situations can appear: one in which the employee does not have an working contract, therefore the salary is not reported, or he is legally employed, but the salary is under-reported, a practice called "envelope wages" (Horodnic, et.al., 2020).

Analyzing the situation with informal employment in Republic of Moldova, Pfau-Effinger (2017) concludes that high level of informality is strongly linked with traditional branches of agriculture, forestry and fishing. Also, Bernabe (2002) found that in transition economies, such as Georgia, the highest share of informal workers can be found in agriculture. A high level of remittances is considered to encourage informal employment, because they offer the necessary financial capital for opening small firms, which tend to activate in the informal sector, and offer supplementary financial support for employees, allowing more persons to take the risk of under-reporting the salary (Shapiro & Mandelman, 2016, Chatterjee & Turnovsky, 2018). Analyzing the shadow economy in newly accessed EU countries Mikulic & Nagyszombaty (2013) found that GDP growth rate has a significant impact on informal economy, because the economic downturns increase the unofficial economy. Khuong et.al. (2021) found that there is an inverse relationship between informality and economic growth, more precisely he argues that high levels of informal employment impede economic growth. However, there are studies claiming that the relationship between informality and GDP growth per capita depends upon the level of growth. In a study comprising 161 countries, over the period 1950-2010, Elgin and Birinci (2016) applied a panel data analysis and found an inverted U relationship between the size of the informal economy and GDP growth per capita. That is, little growth is associated with small and large sizes of the informal economy, while higher levels of growth correspond to medium size informal economies. Informal employment is more common in the rural areas (Flaquer & Escobedo, 2009). Belev (2003) argues that in the rural areas people have less job opportunities, being at risk of unemployment. For them the only solution is often to work in the informal sector just to maintain themselves above the poverty level. Besides the macroeconomic factors that have an impact on the size of the informal economy, there are also mentioned in the literature social and personal factors such as trust in institutions (Elgin & Solis-Garcia, 2012), attitudes, tolerance towards cheating on taxes or social norms. Trust in institutions shape people's attitudes and behaviors towards taxes. D'Hernoncourt and Meon (2012) affirm that in developing countries higher levels of trust determine lower levels of informality. Also, political stability is an important factor for the relationship between taxes and informal economy (Elgin, 2015). Weller (2022) mentions individual characteristics as another determinant of informality. Based on the studies mentioned above we propose the following hypotheses:

H1: Employment in agriculture positively influences informal output.

H2: Personal remittances positively influence informal output.

H3: GDP growth per capita negatively influences informal output.

H4: Rural population positively influences informal output.

H5: The attitute towards cheating on taxes positively influences informal output.

RESEARCH METHODOLOGY

The aim of this research is to identify and quantify the factors that influence informality in Eastern European countries. For this purpose we used secondary data, from World Bank and World Values Survey. In total, 11 countries were included in the analysis, namely: Bulgaria (BGR), Czechia (CZE), Estonia (EST), Hungary (HUN), Latvia (LVA), Lithuania (LTU), Moldova (MDA), Poland (POL), Romania (ROU), Slovakia (SVK) and Slovenia (SVN). The criteria for including the countries in the analysis consist first of all in the geographical location, but also in the similarities that these countries share, one of them being the experience with the communist regime, meaning that their economies passed through the transition from the planned economy to the market economy. The data covers the period from 2000 to 2020 and it is related mainly to the availability of data for all indicators included in the analysis.

We expressed informality through the variable informal output, which measures the economic result of the informal employment, calculated with the method Multiple Indicators Multiple Causes model-based (MIMIC) by International Labor Organization (ILO), and expressed as % of official GDP. In a meta-analysis comprising relevant articles for the topic of informal economy Elgin and Erturk (2019) affirm that the majority of studies express the size of informal output as % of formal GDP. The explanatory variables are:

- Employment in agriculture (% of total employment),
- Personal remittances, received (% of GDP),
- GDP growth per capita (annual %),
- Rural population (% of total population),
- Justifiable: cheating on taxes (measured on a scale from 1 to 10). World Values Survey asks whether cheating on taxes is justifiable (1 is “never justifiable” and 10 is “always justifiable”) and reports average responses at the country-year level. A higher level suggests that the country is more tolerant toward the informal sector. This variable was selected from the results of the questionnaires conducted by WVS from the wave 4 (2000-2004) to wave 7 (2017-2022). For the countries that did not participate in all the waves and data was not available for a specific period, the result from the previous wave was considered relevant also for the following unavailable years.

To analyze the data, we conducted a multiple regression analysis specific for panel data, using for this purpose R software, with R Studio interface. This approach is most common in the studies on informal economy that seek to approximate the influence of macroeconomic factors on informality (Elgin & Erturk, 2019). Vidovic and Ritan (2022) used a cross-section multiple regression analysis to explain the effects of GDP growth, unemployment rate and exports on the size of the informal labor market.

As recommended in the case of panel data, three types of regression were performed – pooled model (OLS), a model with fixed effects and a model with random effects, using “plm” package. The models are described by the following equations:

(1) Pooled (OLS) Model

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + u,$$ where

y = informal output

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ = parameters estimated by the model

x_1 = Employment in agriculture

x_2 = Personal remittances

x_3 = GDP growth per capita

x_4 = Rural population

x_5 = Cheating on taxes

u = error term

(2) Fixed effects model

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \beta_2 x_{it2} + \beta_3 x_{it3} + \beta_4 x_{it4} + \beta_5 x_{it5} + a_i + u_{it},$$

where i=1,2,...11, t=1, 2,...21, a_i is an unobserved individual effect constant over time.

$$\bar{y}_i = \beta_0 + \beta_1 \bar{x}_{i1} + \beta_2 \bar{x}_{i2} + \beta_3 \bar{x}_{i3} + \beta_4 \bar{x}_{i4} + \beta_5 \bar{x}_{i5} + a_i + \bar{u}_i,$$

where $\bar{y}_i$ is the average of y_{it}, $\bar{u}_i$ is the average of u_{it}.

$$\ddot{y}_{it} = y_{it} - \bar{y}_i = \beta_1 \ddot{x}_{it1} + \beta_2 \ddot{x}_{it2} + \beta_3 \ddot{x}_{it3} + \beta_4 \ddot{x}_{it4} + \beta_5 \ddot{x}_{it5} + \ddot{u}_{it}$$

(3) Random effects model

$\dot{y}_{it} = y_{it} - \theta\bar{y}_i = \beta_0(1-\theta) + \beta_1 \dot{x}_{it1} + \beta_2 \dot{x}_{it2} + \beta_3 \dot{x}_{it3} + \beta_4 \dot{x}_{it4} + \beta_5 \dot{x}_{it5} + \dot{v}_{it}$, where θ is a fraction of individual averages, $\dot{v}_{it} = a_i + u_{it}$

The final model was chosen with the specific tests conducted with "lmtest" package. The results of the analysis are presented in the following section.

RESULTS AND DISCUSSIONS

General descriptive results

A first look into the data reveals the descriptive statistics for the indicators included in the analysis (Table 1). The mean of the informal output for the 11 countries from Eastern Europe in the period 2000-2020 is 28.26 % of GDP. The minimum value 16.60 % of GDP was registered in Slovakia in 2018 and 2019, while the maximum value 45.10 describes the informal output in Republic of Moldova in 2000. With regard to the share of population working in the agricultural sector, the situation is very polarised, although the countries are situated in the same geographical location. The mean of the employment in agriculture represented 13.83 % of total employment, for all the countries considered for the analysis, with a minimum value of 2.29 % registered also in Slovakia in 2018 and a maximum value of 60.39 % - in Moldova in 2016. Personal remittances received in this area represented 3.89% of GDP, with a range between 0.06% (Slovakia, 2000) and a maximum value of 34.5% (Moldova, 2006). With respect to economic development, the variable GDP growth per capita shows that some countries encountered a negative value such as Estonia in 2006 (-14.46%), while others had opposite results – Latvia, 2006 (13%), the mean in the region being 3.67% per year. As expected, the rural population has an important share from the total population (37.92%), due to the predominance of the agricultural activities. The minimum value was registered in Bulgaria in 2020 (24.31%) and the maximum value of more than half of the total population was registered in Moldova, 2015 (57.51%). The variable which measures the tolerance towards cheating on taxes has a mean of 2.4 indicating a low degree of tolerance. The least tolerant were people from Hungary in the period 2017-2020 having a score of 1.52, while the most tolerant towards cheating on taxes were people from Moldova in the period 2000-2004 with a score of 4.19.

Table 1

Descriptive statistics

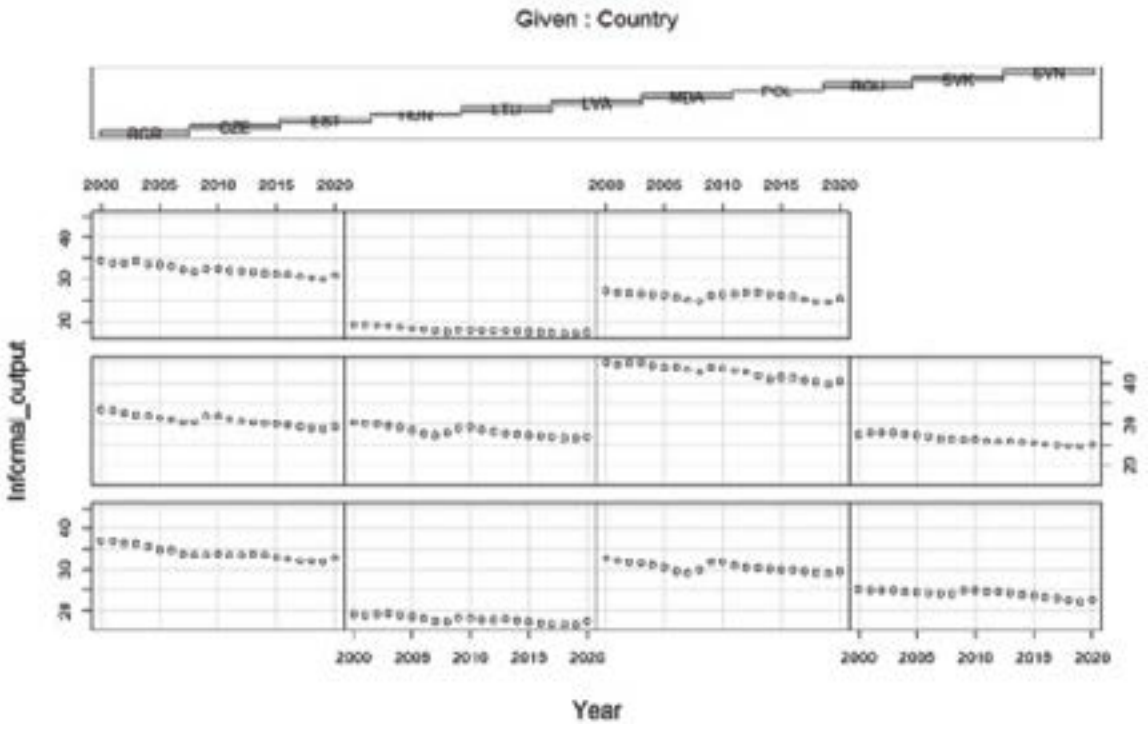
Variable	Unit	Min	Median	Mean	Max	Standard deviation
Informal output	% of GDP	16.60	28.02	28.26	45.10	6.97
Employment in agriculture	% of total employment	2.29	7.96	13.83	60.39	14.94
Personal remittances	% of GDP	0.06	1.89	3.89	34.5	6.36
GDP growth per capita	annual %	-14.46	4.11	3.67	13	4.26
Rural population	% of total population	24.31	33.26	37.92	57.51	9.44
Justifiable: Cheating on taxes	1 = never justifiable, 10 = always justifiable; simple country averages	1.52	2.34	2.4	4.19	0.51

Source: Author's calculations using R

Figure 1 presents the evolution of the informal output for every country in the period 2000-2020. We can note that during this period a descending trend is characteristic for all the countries, with a slight increase in 2020, the year when the pandemic started and the working conditions changed for many working places, allowing for a more flexible schedule and less control from the authorities, which determined the increase in informal output. Also from this figure we can classify the countries according to their levels of informal output: there is a group of countries with a low level of informality, less than 20% of GDP- Czechia and Slovakia; some countries registered a level of informal output between 20 and 30% of GDP- Hungary, Latvia, Poland and Slovenia, and few countries with a high level of informal output which overpasses 30 % - Bulgaria, Estonia, Lithuania, Moldova, and Romania.

Figure 1

The evolution of informal output in Eastern European Countries, 2000-2020. Bars at top indicate corresponding graph from left to right starting on the bottom row.

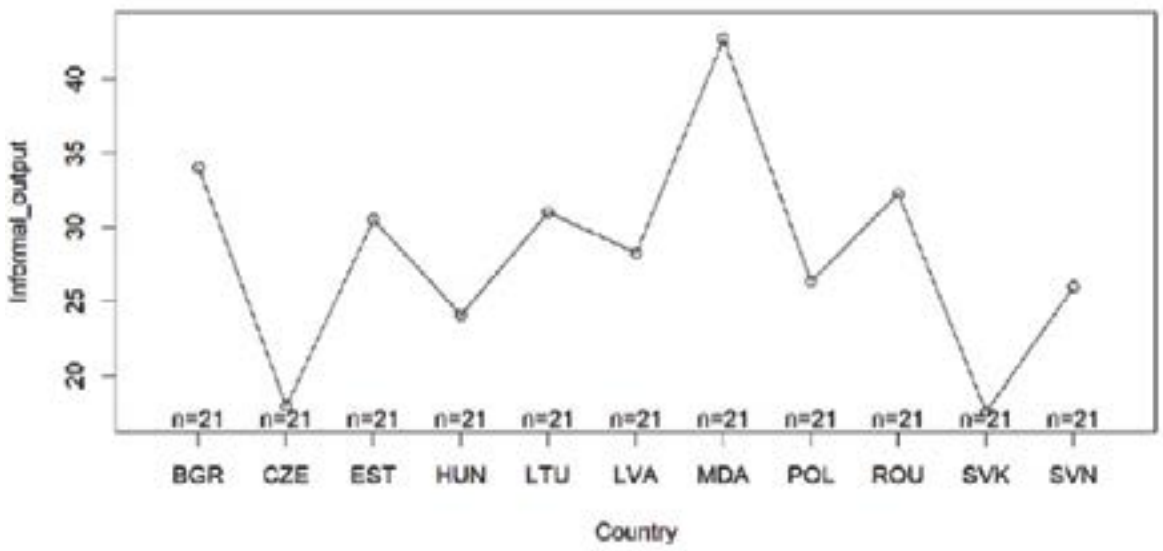


Source: Author's contribution using R

Figure 2, which represents graphically the heterogeneity accros countries was created by calculating the mean value of the informal output for each country in the period 2000-2020. The results show that the differeces are significant in the region with a minimum value registered in Slovakia and a maximum value in Republic of Moldova.

Figure 2

Heterogeneity across countries

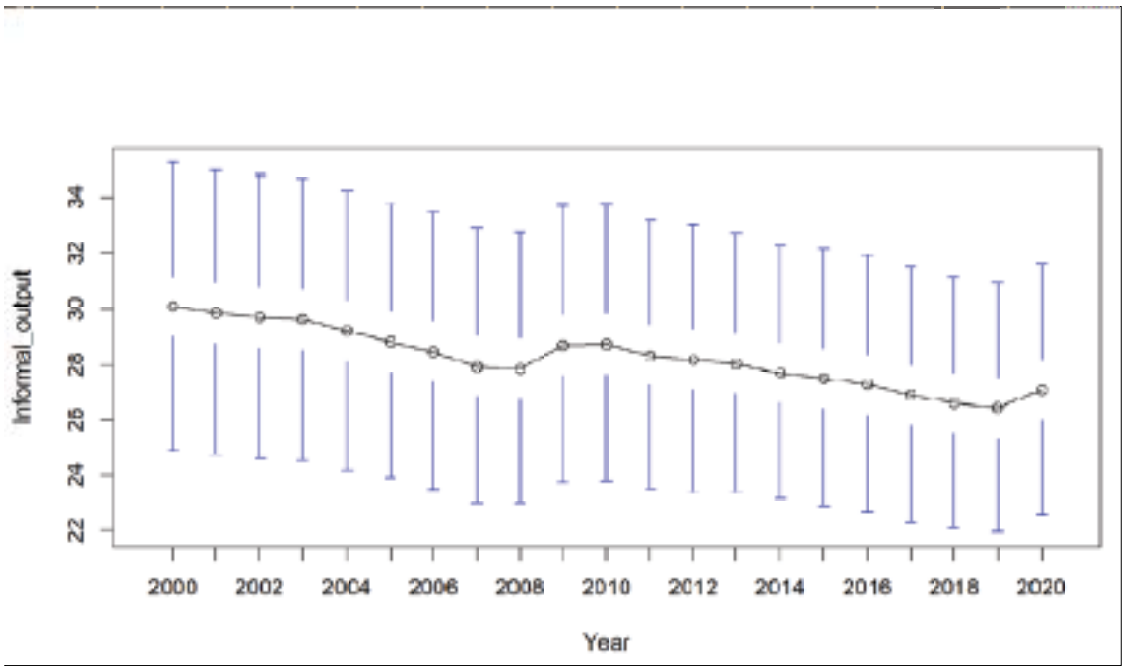


Source: Author's contribution using R

Figure 3 represents the heterogeneity across years and was created by calculating the mean value of the informal output for every year in all the countries included in the analysis. As we can note from the figure, the minimum value was registered in 2008 and the maximum value in 2000.

Figure 3

Heterogeneity across years



Source: Author's contribution using R

REGRESSION RESULTS

The results of the regressions performed are summarized in the table 2. The first, pooled model, has the highest explanatory power with a value of 66% for the R squared. From all the variables included in the models, employment in agriculture, personal remittances and rural population are statistically significant in this model. The second, fixed effects model has the lowest explanatory power of 40 % with three statistically significant variables: employment in agriculture, personal remittances and cheating on taxes. The random effects model has a slightly higher explanatory power than the fixed effects model- 42 % with the same variables accepted as statistically significant. Also, the results of the F-test indicate that all the models have a p-value less than 0.05, meaning that all the coefficients in the models are different than zero.

Table 2

Results of the regression analysis

Model	Pooled model	Fixed effects	Random effects
Variable	**Informal output**	**Informal output**	**Informal output**
Intercept	30.64 *** (t-value=14.71)	-	18.46 *** (t-value=7.95)
Employment in agriculture	0.39 *** (t-value=11.16)	0.2 *** (t-value=9.1)	0.2 *** (t-value=9.51)
Personal remittances	0.22 ** (t-value=2.82)	0.14 *** (t-value=4.43)	0.15 *** (t-value=4.65)
GDP growth per capita	0.05 (t-value=0.80)	-0.01 (t-value=-0.89)	-0.01 (t-value=-0.87)
Rural population	-0.27 *** (t-value=-6.33)	0.07 (t-value=1.23)	0.04 (t-value=0.86)
Cheating on taxes	0.62 (t-value=0.7)	1.89 *** (t-value=1.89)	1.93 *** (t-value=6.21)
R-Squared	0.66	0.4	0.42
Adj. R-Squared	0.65	0.36	0.40
F-statistic	87.56 (p-value: < 2.22e-16)	29.24 (p-value: < 2.22e-16)	159.9 (p-value: < 2.22e-16)

Source: Author's calculations using R

*Note: *, **,*** denote 1%, 5% and 10% confidence level. Standard errors in brackets.*

In order to decide which model performs better in explaining the variations in informal output, the specific tests were performed, detaliated in the table 3. F test for individual effects helps to choose between the pooled model and the fixed effects model. With a p-value less than 0.05 the test confirms that the fixed effects model explains better the informal output than the pooled model. To decide between fixed effects and random effects models we run a Hausman test. The null hypothesis of the test assumes that the unique errors are not correlated with the predictors, and the alternative hypothesis states that unique errors are correlated with the predictors, respectively. A significant p-value, less than 0.05 as in this case leads to the acceptance of the alternative hypothesis and the use of the fixed effects model.

Table 3
Robustness check

Name of the test	Result	Accepted hypothesis
F test for individual effects	424.67 (p-value < 2.2e-16)	Alternative hypothesis: significant effects
Hausman Test	3.2778 (p-value = 0.6572)	Alternative hypothesis: one model is inconsistent

Source: Author's calculations using R

The coefficients of the fixed effects model indicate how much the explained variable i.e. informal output changes overtime, on average per country, when the explanatory variable increases by one unit. In this case, the increase of employment in agriculture by 1%, keeping all other variables constant leads to an increase in the informal output by 0.2%. Personal remittances have also a positive effect on informal output: an increase by 1% in personal remittances leads to an increase by 0.14% in the informal output. The variable cheating on taxes has the strongest influence on informal output: an increase by one unit in the score cheating on taxes leads to an increase by 1.89% in the dependent variable. These three variables are statistically significant at 99.9% confidence level. The variables GDP growth per capita and rural population are not statistically significant in this model.

DISCUSSION AND CONCLUSION

The econometric analysis allowed us to confirm three out of five hypotheses stated in this article. We proved the positive influence on informal output of employment in agriculture, personal remittances and the opinion regarding cheating behavior on taxes. Overall, the results are consistent with studies on the topic that find evidence on the factors affecting informal economy (Torgler & Schneider, 2007; Beręsewicz & Nikulin, 2018). Among other variables, Torgler and Schneider (2007), using a large panel data set, found that the willingness to pay taxes has an important influence on the size of the informal economy. Relying on a fixed effects estimations model, they conclude that moral dimension, more precisely the tax morale is one of the main determinants of informality.

Although the econometric analysis was carried out respecting the specificities of regression models with panel data, the results could be influenced by lack of updated data on the variable "cheating on taxes" from the World Values Survey. Also, it is important to note that the score represents a characteristic for the whole population of a country. For a more accurate analysis, it would be recommended to apply a questionnaire and to measure the opinion towards cheating on taxes as a latent variable.

This research contributes to the understanding of the factors determining high levels of informality in the Eastern part of the Europe. One interesting result, that can be further analyzed and with potential for the topic is the influence of people's opinion towards cheating on taxes. This factor has the strongest influence on informal output from the factors included in the analysis and further research could bring into attention another important characteristics. For example, the application of the Theory of Planned Behavior, previously used to explain a wide range of economic behaviors (Onofrei, Cociorva & Paşa, 2022), could explain whether to cheat on taxes is an accepted social norm in this region, being one of the drivers of people's choice to under-declare their work.

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COUNTRY OF BIRTH, COUNTRY OF RESIDENCE AND MULTIMORBIDITY

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SUMMARY

Chronic diseases tend to accumulate into multimorbidity, with severe implications for health care needs, costs, and economic productivity, as well as for quality and duration of life. The accumulation of diseases may result from exposures and experiences concurrently and earlier in life. Objectives: We investigated multimorbidity among immigrant and native-born people across Europe, examining the importance of country of birth and country of residence for multimorbidity. Methods: We used the Survey of Health, Aging, and Retirement in Europe (SHARE), a cross-national, multidisciplinary panel survey representative of older adults in Europe (n=112,612 native-born and 11,266 foreign-born in 2002-2017). Self-reported chronic conditions used to define multimorbidity were: heart attack, high blood pressure, high blood cholesterol, stroke, diabetes, chronic lung disease, cancer, stomach ulcer, Parkinson's disease, cataracts, and hip fracture. We used multinomial logistic regression to identify patterns of multimorbidity and assessed interaction between country of birth and of residence. Results: More than a third of people living in Europe had multimorbidity, including 37.7% of migrants and 35.1% of native-born individuals. People living in Eastern Europe had the highest prevalence of multimorbidity. Across countries, compared to native-born people, multimorbidity was higher among migrants from Eastern Europe (OR:1.41) and Central and West Asia (OR:1.16), and lower among migrants from Asia (OR:0.66). Country of birth modified associations between county of residence and multimorbidity. Discussion: Country of birth and country of residence are each associated with multimorbidity, suggesting that early-life conditions can have different implications for health depending on later-life.

Keywords: *migration, health, multimorbidity, environment*

INTRODUCTION AND LITERATURE REVIEW

Multimorbidity, indicating that a person has multiple chronic conditions, is a global concern and is expected to increase due to population aging and changing lifestyles (Calderón-Larrañaga et al., 2017; Fortin et al., 2012; Kudesia et al., 2021; Palladino et al., 2016). It represents the progression and accumulation of chronic diseases across the lifespan, often leading to disability, high medical costs, and poor quality of life (Kudesia et al., 2021). The prevalence of multimorbidity increases with age and is higher among women and people with low socioeconomic status (Diaz, et al., 2015; Marengoni et al., 2011; Violan et al., 2014).

International migrants tend to be a healthy group in most populations, but limited access to care (ref) and repeated stressful exposures may leave migrants at risk of developing multimorbidity. Indeed, their health tends to worsen with time after migration, and health problems eventually resemble or even exceed those of the general population in their country of resettlement (De Maio, 2010; Diaz, Kumar, et al., 2015; Gimeno-Feliu et al., 2017; Gimeno-Feliu et al., 2020; Rechel et al., 2012). The process of migration can have both positive and negative implications for health: it can lead people to environments with lower risks of infectious diseases and better quality of living conditions and health care (Spallek et al., 2011); at the same time, it may also lead them to environments conducive to chronic disease due to eating patterns, smoking, and physical inactivity (Spallek et al., 2011).

Measuring multimorbidity among international migrants can also provide insights into how place affects health: if health varies with place of origin, then we may emphasize the importance of the long arm of childhood exposures, and habits, diets, and preferences developed early in life, affect us throughout our lives, regardless of migrant status. On the other hand, if health varies with place of current residence, then current exposures and behaviours may be most important for chronic disease trajectories, rather than occurrences and exposures earlier in life. If there is an interaction between current residence and place of birth, then early life exposures operate differently according to current exposures and thus some current circumstances can be expected to be more harmful for some people than for others; some people will be more vulnerable to current environments and behaviours than others. Using a large cross-national study that includes multiple measures of health across foreign-born and native-born people across Europe, we attempt to disentangle these associations between the role of places and the development of multiple chronic conditions. We characterize the prevalence of multimorbidity among foreign-born people across Europe and determine the importance of place of origin and place of resettlement in shaping risks for chronic disease.

RESEARCH METHODOLOGY

Data Sources and Study Design

The Survey of Health, Ageing and Retirement in Europe (SHARE) is a cross-national household-based panel survey that measures health, socio-economic status, and social and family networks (Börsch-Supan et al., 2013). SHARE has collected 7 waves of data on 140,000 individuals and covers 27 European countries and Israel. *easy*SHARE is a simplified version of the SHARE dataset that contains the same number of observations as the main release of SHARE, simplified data structure, and a selection of central SHARE variables.

In 2004-6, the first wave of SHARE was fielded in 11 countries: Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Italy, the Netherlands, Sweden, and Israel. In wave 2 (2006-2007), Czech Republic and Poland were added. Wave 3 was fielded in 2008-2011 and wave 4 in 2010-2012, adding Estonia, Hungary, Portugal and Slovenia. Wave 5 was fielded in 2013, adding Luxembourg, wave 6 in 2015, adding Croatia, and wave 7 in 2017 adding Finland, Lithuania, Latvia, Slovakia, Romania, Bulgaria, Malta and Cyprus; thus, all continental EU Member States were represented in wave 7.

SHARE represents people aged 50 and older living in Europe who have their regular domicile in the respective SHARE country. People who are incarcerated, hospitalized, out of the country during the entire survey period, unable to speak the country's languages. SHARE produces similar distributions of employment, income, education, and health with three other prominent European surveys: European Union Labour Force Survey (EU-LFS), the European Community Household Panel (ECHP), and the European Social Survey (ESS) (Brugiavini et al., 2005).

All SHARE respondents who were interviewed in any previous wave are part of the longitudinal sample, therefore all countries were used in the analysis. If they have a new co-residing partner, the partner is eligible as well, regardless of age. Proxy respondents are allowed for family, financial or household matters if physical or cognitive limitations make it too difficult for a respondent to complete the interview independently, as well as for end-of-life interviews. Age-eligible respondents are traced and re-interviewed if they move within the country.

Trained interviewers conduct face-to-face interviews in respondent's homes using a laptop with computer-assisted personal interviewing (CAPI). Interviews consist of questionnaires and physical exams. SHARE uses ex-ante harmonisation, with one common questionnaire translated and used throughout.

Variables

The main independent variable in this study is country of birth, collapsed into geographic regions. Country of birth was recorded by asking the respondent "In which country were you born? Please name the country that your birthplace belonged to at the time of your birth". The countries were classified based on the ISO (International Organization for Standardization) country codes created by the United Nations Statistics Division (UNSD), which also provides codes for countries that no longer exist (UNSD). Using UNSD categorizations, country of birth was categorized into regions using the UNSD classifications (UNSD; Walkden et al., 2018): (1) Western, Northern, & Southern Europe, (2) Eastern Europe, (3) Latin America & the Caribbean, (4) Central & West Asia, (5) Southeast, South, & East Asia, (6) Africa, and (7) North America & Oceania. Appendix Table 1 describes the ISO classifications used to categorize country of birth and country of residence and the countries contained in each category.

Respondents were asked, "Do you currently have any of the conditions on this card? With this we mean that a doctor has told you that you have this condition, and that you are either currently being treated for or bothered by this condition". The 11 conditions used for analysis were (1) heart attack, (2) high blood pressure or hypertension, (3) high blood cholesterol, (4) stroke or cerebrovascular disease, (5) diabetes or high blood sugar, (6) chronic lung disease, (7) cancer or malignant tumour, (8) stomach or duodenal ulcer, peptic ulcer (9) Parkinson disease, (10) cataracts, and (11) hip fracture or femoral fracture. We defined multimorbidity as the presence of 2 or more of these conditions, coding health as: 0 chronic diseases, 1 chronic disease, and 2 chronic diseases (multimorbidity). Variables analysed as possible confounders were age, sex, country of residence, education, working status, and household income. Country of residence was coded as the country where the interview took place and categorized into regions: Western Europe, Northern Europe, Southern Europe, and Eastern Europe. Education was a generated variable created with country-specific measurements and ex-post harmonization (Brothers et al., 2014); which we categorized into the 3-level variable, following previous studies that used SHARE: None or primary, Secondary, Post-secondary (includes still in school and other) (Walkden et al., 2018). Working status captured if respondents were retired, employed or self-employed (including working for family business), unemployed, permanently sick or disabled, homemaker, and others. For analysis, this was condensed into five categories: retired, employed, unemployed, permanently sick, and homemaker/other (Bono & Matranga, 2019). Household income was measured by asking the participant, "Thinking of your household's total monthly income, would you say that your household is able to make ends meet..." with the responses: with great difficulty, with some difficulty, fairly easily, or easily. These categorizations were used for analysis.

Statistical Analyses

The *easy*SHARE data are stored in long format, where one data line represents one wave in which each respondent participated. In order to capture each respondent once for a cross-sectional analysis, we restricted to the last (most recent) observation for each respondent. Additionally, we restricted the captured waves to 1, 2, 4, 5, 6, and 7, as wave 3 did not collect prospective data. We restricted ages to older than 50 years old at the time of interview, which excludes partners who were younger than 50 years old.

All analyses were conducted using SAS 9.1 using the *easy*SHARE dataset, which does not include survey weights.

The demographic and socioeconomic characteristics of the SHARE study in 2002-2017 are presented in Tables 1 and 2. Multinomial logistic regression was used to estimate association between country of birth and multimorbidity, with odds ratios and 95% confidence interval presented in Table 3. Respondents who reported 0 chronic diseases were treated as the reference category and were compared to respondents who reported 1 chronic disease and 2+ chronic diseases. For the minimally adjusted model, we controlled for age and sex. For the fully adjusted model, we additionally controlled for country of residence, education, working status, and household income. We tested for interaction between country of birth and residence country, with total effects presented in Table 4. We used the joint test, for an effect that all the parameters associated with that effect are zero, and Wald Chi p-value to assess the significance of the interaction term.

RESULTS

Characteristics of participants by country of birth are shown in Table 1. In the SHARE study, 9.09% of participants were born in a country other than their current country of residence. 54.98% were women and the mean age was 68 years. 73.62% of foreign-born people were born in Europe, with 41.91% in Eastern Europe and 31.71% Northern, Western, and Southern Europe. The largest number of foreign-born individuals resided in Western Europe (40.05%) and Northern Europe (25.65%). Foreign-born people had similar education levels to native-born, but were less often retired, and were more likely to report household income struggles. Foreign-born individuals born in Africa and Central & West Asia reported the lowest education levels and worst income struggles, while those from North America & Oceania reported the highest education levels and were least likely to report income struggles. Although foreign-born individuals born in Northern, Southern, and Western Europe and foreign-born individuals born in Eastern Europe both reported high education and high retirement levels, foreign-born individuals born in Eastern Europe were more likely to report income struggles than foreign-born individuals born in Northern, Southern, and Western Europe.

Table 1

Sample Characteristics of Survey of Health of Aging and Retirement in Europe (SHARE), aged 50 years and old, by Migrant Status as characterized by Country of Birth Geographic Region (N=123,878)

	Migrant Status		Country of Birth						
	Native-born	Foreign-born (All)	N, S, & W Europe	E Europe	LAC	Central & W Asia	SE, S, & E Asia	Africa	N America
Sex, %									
Female	54.89	55.84	55.92	58.03	59.08	50.21	52.96	50.82	59.66
Male	45.11	44.16	44.08	41.97	40.92	49.79	47.04	49.18	40.34
Age, %									
Mean (SD)	68.21 (10.22)	68.02 (10.40)	68.33 (10.23)	69.35 (10.44)	63.68 (9.14)	66.92 (11.03)	64.42 (9.50)	65.63 (9.89)	65.27 (10.23)
50-59	21.53	23.83	22.61	19.46	38.62	30.58	35.48	30.58	32.77
60-69	34.60	32.31	31.51	32.11	35.73	26.79	35.99	35.57	36.97
70-79	26.88	26.58	29.58	27.09	18.16	25.95	20.57	22.24	15.97
80+	16.99	17.27	16.29	21.35	7.49	16.69	7.97	11.62	14.29

Number of Chronic Diseases[a], %									
0	34.96	32.82	34.73	27.53	44.96	33.52	48.07	36.71	50.42
1	29.95	29.52	30.87	29.39	28.53	26.79	27.51	29.22	23.53
≥ 2	35.10	37.65	34.40	43.07	26.51	39.69	24.42	34.07	26.05
Country of Residence, %									
Western Europe	32.07	40.05	73.24	10.31	35.16	34.36	59.90	53.74	45.38
Northern Eur& Baltics	19.11	25.65	13.49	45.34	7.78	17.81	14.91	2.14	21.01
Southern Europe	27.19	15.32	6.30	22.81	45.53	5.75	6.43	13.54	8.40
Eastern Europe	21.63	18.98	6.97	21.54	11.53	42.08	18.77	30.58	25.21
Highest Level of Education, %									
None or primary	22.78	21.13	25.50	10.78	17.87	33.24	16.97	42.05	5.04
Secondary	57.37	51.71	48.95	60.48	49.28	42.64	50.13	36.71	30.25
Post-secondary	19.85	27.15	25.55	28.74	32.85	24.12	32.90	21.24	64.71
Working Status, %									
Retired	60.61	55.88	60.12	62.85	34.29	42.92	37.53	40.20	36.97
Employed	23.50	24.99	22.19	23.38	42.36	27.63	37.79	26.59	45.38
Unemployed	2.33	4.01	2.85	3.75	4.90	6.03	2.57	7.06	3.36
Permanently sick	3.39	5.33	4.73	4.11	4.90	9.12	7.71	8.70	2.52
Homemaker / Other	10.17	9.80	10.10	5.91	13.54	14.31	14.40	17.46	11.76
Household Income, % - Is household able to make ends meet?									
Easily	29.72	23.97	38.79	13.66	22.77	17.81	30.85	19.67	57.14
Fairly easily	30.35	27.56	31.54	26.28	31.99	21.74	30.85	23.16	21.85
With some difficulty	28.09	32.15	21.77	40.36	28.82	36.33	24.42	33.14	15.97
With great difficulty	11.84	16.31	7.89	19.70	16.43	24.12	13.88	24.02	5.04
Sample Size [b]	112612	11266	3573	4722	347	713	389	1403	119

[a] *Number of Chronic Diseases is measured as 2+ of the following chronic diseases: heart attack, high blood pressure, high blood cholesterol, stroke, diabetes, chronic lung disease, cancer, stomach ulcer, Parkinson disease, cataracts, and hip fracture.*

[b] *Values are unweighted counts and unweighted percentages from SHARE Wave 1-7 (2002-2017).*
Country of birth and country of residence regions were categorized based on the International Organization for Standardization (ISO) Geographic Region Classifications. Native-born refers to the country surveyed. Regions of birth are: Eastern Europe, Latina American and the Caribbean, Southeast, South, and East Asia, Africa, and North America.

The distribution of the number of chronic diseases by sample characteristics, categorized as 0, 1, and 2+ diseases, is shown in Table 2. Men, older people, those with lower education status, those not working due to permanent sickness, and those with income struggles were more likely to report multimorbidity. 37.65% of foreign-born individuals and 35.10% of native-born individuals reported 2+ chronic diseases. Reporting 1 chronic disease did not differ largely between foreign and native-born individuals (29.52% versus 29.95% for foreign-born and native-born, respectively). Foreign-born individuals born in Eastern Europe had the highest levels of multimorbidity (43.07%), followed by foreign-born individuals born in Central and West Asia (39.69%). Foreign-born individuals born in Latin America and the Caribbean and Southeast, South, and East Asia were on average younger than other regions and reported the lowest multimorbidity levels at 26.72% and 24.40.

Table 2

Sample Characteristics of Survey of Health of Aging and Retirement in Europe (SHARE)a (N=123,878)

	Overall (%)	Number of Chronic Diseases [b]		
		0	*1*	*2+*
Sample Size	n=12,3878	n=43,063	n=37,050	n=43,765
Sex				
Female	68,107 (54.98)	24,318 (56.47)	20,268 (54.70)	23,521 (53.74)
Male	55,771 (45.02)	18,745 (43.53)	16,782 (45.30)	20,244 (46.26)
Age				
Mean (SD)	68.19 (10.24)	64.33 (9.59)	68.31 (9.95)	71.90 (9.68)
50-59	26,935 (21.74)	15,078 (35.01)	7,313 (19.74)	4,544 (10.38)
60-69	42,602 (34.39)	16,218 (37.66)	13,540 (36.55)	12,844 (29.35)
70-79	33,260 (26.85)	7,788 (18.09)	10,186 (27.49)	15,286 (34.93)
80+	21,081 (17.02)	3,979 (9.24)	6,011 (16.22)	11,091 (25.34)
Country of Birth				
Native-born	11,2612 (90.91)	39,365 (91.41)	33,724 (91.02)	39,523 (90.31)
West, North, South Europe	3,573 (2.88)	1,241 (2.88)	1,103 (2.98)	1,229 (2.81)
Eastern Europe	4,722 (3.81)	1,300 (3.02)	1,388 (3.75)	2,034 (4.65)
Latin America & Caribbean	347 (0.28)	156 (0.36)	99 (0.27)	92 (0.21)
Central & West Asia	713 (0.58)	239 (0.56)	191 (0.52)	283 (0.65)
SE, South, & East Asia	389 (0.31)	187 (0.43)	107 (0.29	95 (0.22)
Africa	1,403 (1.13)	515 (1.20)	410 (1.11)	478 (1.09)
North America & Oceania	119 (0.1)	60 (0.14)	28 (0.08	31 (0.07)
Country of Residence				
Western Europe	40,629 (32.80)	15,354 (35.65)	12,437 (33.57)	12,838 (29.33)
Northern Europe	24,412 (19.71)	8,509 (19.76)	7,323 (19.77)	8,580 (19.60)
Southern Europe	32,342 (26.11)	10,480 (24.34)	9,797 (26.44)	12,065 (27.57)
Eastern Europe	26,495 (21.39)	8,720 (20.25)	7,493 (20.22)	10,282 (23.49)
Highest Level of Education				
None or Primary	28,033 (22.63)	7,092 (16.47)	8,202 (22.14)	12,739 (29.11)
Secondary	70,433 (56.86)	25,445 (59.09)	21,099 (56.95)	23,889 (54.58)
Post-secondary	25,412 (20.51)	10,526 (24.44)	7,749 (20.91)	7,137 (16.31)
Working Status				
Retired	74,547 (60.18)	19,646 (45.62)	22,930 (61.89)	31,971 (73.05)
Employed	29,280 (23.64)	16,357 (37.98)	8,363 (22.57)	4,560 (10.42)
Unemployed	3,078 (2.48)	1,520 (3.53)	852 (2.30)	706 (1.61)
Permanently sick	4,417 (3.57)	1,032 (2.40)	1,196 (3.23)	2,189 (5.00)
Homemaker /Other	12,556 (10.14)	4,508 (10.47)	3,709 (10.01)	4,339 (9.91)
Household Income - Is household able to make ends meet?				
Easily	36,174 (29.20)	14,196 (32.97)	11,119 (30.01)	10,859 (24.8)
Fairly easily	37,279 (30.09)	13,552 (31.47)	11,320 (30.55)	12,407 (28.35)
With some difficulty	35,254 (28.46)	11,166 (25.93)	10,501 (28.34)	13,587 (31.05)
With great difficulty	15,171 (12.25)	4,149 (9.63)	4,110 (11.09)	6,912 (15.79)

[a] *Values are unweighted counts and unweighted percentages from SHARE Wave 1-7 (2002-2017).*

[b] *Number of Chronic Diseases is measured as 2+ of the following chronic diseases: heart attack, high blood pressure, high blood cholesterol, stroke, diabetes, chronic lung disease, cancer, stomach ulcer, Parkinson disease, cataracts, and hip fracture.*
Country of birth and country of residence regions were categorized based on the International Organization for Standardization (ISO) Geographic Region Classifications. Native-born refers to the country surveyed.

Table 3

Multinomial logistic regression models for predicting multimorbidity among migrants in Europe, controlling for selected characteristics

	One chronic disease		Two or more chronic diseases	
	Reference: No chronic diseases			
Country of Birth (Native-born)	Minimally Adjusted OR (95% CI)[a]	Fully Adjusted OR (95% CI)[b]	Minimally Adjusted OR (95% CI)[a]	Fully Adjusted OR (95% CI)[b]
West, Northern, Southern Europe	1.03 (0.95, 1.12)	1.05 (0.96, 1.14)	0.98 (0.90, 1.06)	1.06 (0.97, 1.15)
Eastern Europe	1.22 (1.13, 1.32)**	1.20 (1.11, 1.30)**	1.50 (1.39, 1.61)**	1.41 (1.31, 1.52)**
Latin America & Caribbean	0.88 (0.68, 1.13)	0.90 (0.69, 1.16)	0.81 (0.62, 1.06)	0.89 (0.67, 1.17)
Central & West Asia	1.01 (0.83, 1.23)	0.99 (0.82, 1.21)	1.33 (1.11, 1.60)**	1.16 (0.96, 1.40)**
Southeast, South, & East Asia	0.76 (0.59, 0.96)**	0.78 (0.61, 0.99)**	0.64 (0.50, 0.83)**	0.66 (0.51, 0.87)**
Africa	1.03 (0.90, 1.18)	1.00 (0.88, 1.15)	1.12 (0.98, 1.28)	0.98 (0.85, 1.12)
North America & Oceania	0.60 (0.38, 0.95)**	0.69 (0.44, 1.09)	0.61 (0.39, 0.97)**	0.83 (0.52, 1.33)
Sex (Female)				
Male	1.07 (1.04, 1.10)**	1.07 (1.04, 1.11)**	1.12 (1.09, 1.15)**	1.16 (1.13, 1.20)**
Age (continuous)	1.05 (1.04, 1.05)**	1.03 (1.03, 1.04)**	1.08 (1.08, 1.08)**	1.06 (1.06, 1.06)**
Country of Residence (Western Europe)				
Northern Europe		1.04 (0.99, 1.08)		1.12 (1.08, 1.17)**
Southern Europe		1.03 (0.99, 1.07)		1.03 (0.99, 1.07)
Eastern Europe		1.01 (0.97, 1.05)		1.24 (1.19, 1.29)**
Highest Level of Education (Post-secondary)				
None or Primary		1.11 (1.06, 1.16)**		1.34 (1.28, 1.41)**
Secondary		1.04 (1.00, 1.08)**		1.14 (1.10, 1.19)**
Working Status (Retired)				
Employed		0.70 (0.67, 0.73)**		0.43 (0.41, 0.45)**
Unemployed		0.70 (0.64, 0.77)**		0.56 (0.51, 0.62)**
Permanently sick		1.35 (1.23, 1.47)**		2.14 (1.97, 2.32)**
Homemaker / Other		0.83 (0.79, 0.87)**		0.77 (0.73, 0.81)**
Household Income - Is household able to make ends meet? (Easily)				
With great difficulty		1.25 (1.18, 1.32)**		1.97 (1.87, 2.08)**
With some difficulty		1.17 (1.13, 1.22)**		1.45 (1.39, 1.51)**
Fairly easily		1.04 (1.01, 1.08)**		1.12 (1.08, 1.16)**

Note: Reference categories are shown in parentheses.

[a] *Minimally Adjusted Model: included country of birth, sex, age.*

[b] *Fully Adjusted Model: included country of birth, sex, age, country of residence, education, working status, and household income. Country of birth and country of residence regions were categorized based on the International Organization for Standardization (ISO) Geographic Region Classifications. Native-born refers to the country surveyed.*

***p<0.05*

Multinomial logistic regressions are shown in Table 3. After controlling for other characteristics, foreign-born individuals born in Eastern Europe (compared to native-born individuals) had significantly higher odds of reporting 1 chronic disease (OR: 1.20, 95% CI: 1.11, 1,30) and multimorbidity (2+ chronic diseases) (OR: 1.41, 95% CI: 1.31, 1.52) rather than no chronic conditions (Table 3). Foreign-born individuals born in Southeast, South, & East Asia were significantly less likely to report 1 chronic disease (OR: 0.78, 95% CI: 0.61, 0.99) or 2+ chronic diseases (OR: 0.66, 95% CI: 0.51, 0.87). While, in unadjusted models, foreign-born

individuals born in North America and Oceania were significantly less likely to report 1 chronic disease and 2+ chronic diseases, their odds for chronic conditions were similar to those of native-born people after adjusting for other characteristics. Foreign-born individuals from Central and West Asia were significantly more likely to report multimorbidity but not 1 single chronic disease. Foreign-born individuals born in Northern, Southern, and Western Europe, Latin America and the Caribbean, and Africa had similar chronic disease patterns to native-born people.

Even after controlling for place of birth, country of residence was associated with multimorbidity. Among both foreign and native-born individuals, those residing in Northern Europe and Eastern Europe, compared to Western Europe, had significantly higher odds of multimorbidity (OR: 1.12, 95% CI: 1.08, 1.17 (Northern Europe); OR: 1.24, 95% CI: 1.19, 1.29 (Eastern Europe). The total effect (OR and 95% CI) for the association between multimorbidity and country of birth and interaction between country of birth and country of residence are shown in Table 4. Interaction was observed with a p-value of 0.0002 under the joint test for the interaction effect. However, the individual total effects were not significant for any combination of country of birth and country of residence.

Table 4

Multinomial Logistic Regression Adjusted Odds Ratios (total effect) and 95% CI for predicting multimorbidity by country of birth modified by country of residence, controlling for selected characteristics [a]

	Residence Region							
	Western Europe		*Northern Europe*		*Eastern Europe*		*Southern Europe*	
(Baseline: 0 CD)	**1 CD**	**2+ CD**	**1 CD**	**2+ CD**	**1 CD**	**2+ CD**	**1 CD**	**2+ CD**
Country of birth (Native-born ref)								
Western, Northern, Southern Europe	1.08 (0.98, 1.19)	1.04 (0.94, 1.15)	0.95 (0.75, 1.20)	1.14 (0.91, 1.43)	0.84 (0.52, 1.34)	1.24 (0.78, 1.97)	0.74 (0.36, 1.51)	1.36 (0.67, 2.74)
Eastern Europe	1.16 (0.96, 1.42)	1.09 (0.88, 1.33)	0.87 (0.55, 1.38)	1.15 (0.73, 1.81)	0.65 (0.25, 1.66)	1.22 (0.48, 3.07)	0.48 (0.12, 2.02)	1.29 (0.32, 5.29)
Latin America & the Caribbean	1.26 (0.93, 1.69)	1.13 (0.83, 1.54)	0.79 (0.40, 1.59)	1.16 (0.59, 2.29)	0.50 (0.12, 2.06)	1.20 (0.30, 4.80)	0.32 (0.04, 2.72)	1.23 (0.15, 10.27)
Central & West Asia	1.36 (0.91, 2.01)	1.18 (0.78, 1.78)	0.72 (0.29, 1.83)	1.18 (0.48, 2.91)	0.39 (0.06, 2.55)	1.18 (0.18, 7.51)	0.21 (0.01, 3.67)	1.17 (0.07, 19.95)
SE, South, & East Asia	1.46 (0.89, 2.40)	1.23 (0.74, 2.05)	0.66 (0.21, 2.10)	1.19 (0.38, 3.70)	0.30 (0.03, 3.17)	1.15 (0.11, 11.76)	0.14 (0.00, 4.95)	1.12 (0.03, 38.75)
Africa	1.58 (0.87, 2.85)	1.28 (0.69, 2.37)	0.60 (0.15, 2.42)	1.20 (0.31, 4.70)	0.23 (0.01, 3.94)	1.13 (0.07, 18.40)	0.09 (0.00, 6.68)	1.07 (0.02, 75.31)
N. America & Oceania	1.70 (0.85, 3.40)	1.33 (0.65, 2.73)	0.55 (0.11, 2.79)	1.22 (0.25, 5.97)	0.18 (0.01, 4.89)	1.11 (0.04, 28.80)	0.06 (0.00, 9.00)	1.02 (0.01, 146.4)

a Adjusted for age, sex, education, working status, and income level.

b Chronic disease abbreviated as 'CD'.

c Country of birth and country of residence regions were categorized based on the International Organization for Standardization (ISO) Geographic Region Classifications. Native-born refers to the country surveyed.

***p<0.05*

DISCUSSION

The goal of this study was to investigate whether multimorbidity is associated with country of birth among migrants aged 50 years and older residing in Europe, and whether this association is modified by country of residence. The findings suggest that the risk of multimorbidity is associated both with early life experiences in the country of origin and with the post-migration circumstances and lifestyle in the country of resettlement.

Individuals born in Southeast, South, and East Asia, and North America and Oceania had lower odds of reporting one chronic disease and multimorbidity compared to native-born individuals in the European country where they were residing. Such differences could originate from the impact of social and structural environment in which people grew up. They could also be a result of selective migration, whereby people who are in good health are more likely to resettle in a different country. At the same time, people born in Eastern Europe and Central and West Asia had a higher odds of reporting multiple conditions than native-born people in their country of residence. Thus, there is great variability in health among migrants, even after accounting for the country where they resettled and for personal characteristics. These differences in health among migrants may result from differences in early life environments, socio-cultural and behavioural patterns associated with country of origin. They could also result in part from differences in selection of people into migration, that is, the more difficult it is to migrate, the more those who do migrate are better health and socioeconomic position. These findings are consistent with previous literature, for example, a study using national registries in Norway reported Eastern European migrants have higher odds of multimorbidity compared to foreign-born individuals from Western Europe, North America, Asia, Africa and Latin America (Diaz, Kumar, et al., 2015).

After accounting for country of origin, country of residence was also associated with multimorbidity, highlighting the additional importance of current living environments. Both migrants and non-migrants residing in Northern and Eastern Europe had higher odds of multimorbidity than those living in Western Europe; those residing in Southern Europe had similar multi-morbidity patterns to those in Western Europe. These regional differences in the prevalence of multimorbidity may relate to differences in age distribution of the population, differences in diagnosis of chronic conditions, as well as to living environments, lifestyles, and healthcare systems.

Additionally, among foreign-born people residing in European countries, there were differences in multimorbidity depending on their country of origin. Studies using SHARE data have identified ecological associations with frailty and country of residence, where people who have lived in relatively resource-poor countries of Southern and Eastern Europe during their late adulthood are more likely to be frail than people in the relatively resource-rich countries of Northern and Western Europe (Brothers et al., 2014; Santos-Eggimann et al., 2009). These patterns suggest that early life conditions can have different implications for health depending on later life circumstances. Barker and colleagues proposed that a mismatch between early life programming and adult circumstances can entail a high risk for chronic diseases, and these findings based on migrant health lend support to this idea (Barker et al., 2002). Exposure to harsh environmental conditions in early life and in utero in the host country will have lasting effects on health before, during, and after migration to a new host country. Those who make it through natural selection of hazardous early life exposures may exhibit deleterious effects during the aging process, due to antagonistic pleiotropy (Tan et al., 2003).

An important limitation of this analysis is that, using *easy*SHARE, we were unable to use sampling weights to adjust for study design. Without these, we cannot generalize to the population of the participating countries (Börsch-Supan et al., 2013). Previous studies using SHARE for migration-related analyses have noted that SHARE excludes migrants whose permanent residence is not in the country of interview, for example, transient workers and asylum seekers (Walkden et al., 2018). Because these types of migrants may have poorer health than resettled migrants, the findings presented here may indicate better health among migrants in Europe than is actually the case. Southern Europe especially houses a large population of undocumented migrants (Carta et al., 2005; Walkden et al., 2018), and we did not find evidence of interactions between country of birth and residence in Southern Europe. A related limitation is that, in using *easy*SHARE, we were not able to control for citizenship status or length of stay in the country of residence, which could relate to social integration and healthcare access (Diaz, Kumar, et al., 2015; Gimeno-Feliu et al., 2017; Gimeno-Feliu et al., 2020; Prados-Torres et al., 2018).

The measures of multimorbidity presented here are based on respondents' reports of chronic diseases in the first wave. Future studies using the full SHARE dataset can expand these analyses to also include other fractures; Alzheimer's disease, dementia, and memory impairment; affective or emotional disorders; rheumatoid arthritis; osteoarthritis, and chronic kidney disease. Lastly, because only the count of the chronic disease(s) for each respondent was included in the dataset, we were not able to examine the prevalence of each individual chronic disease or examine chronic disease combinations.

CONCLUSION

This study using a large multi-country dataset showed that there is heterogeneity in chronic disease multimorbidity across country of birth and country of residence. It also showed that the risks of multimorbidity are different for people born in one country according to which country they subsequently resettled. These findings have implications for our understanding of migrant health and resettlement programs. People resettling in the same environment may have different health vulnerabilities, of which they, and their healthcare providers, should be aware. These findings are also relevant to our understanding of how our living environments across life may contribute to health trajectories even for people who do not migrate. Because migrants are individuals who, by definition, have been exposed to multiple living environments, we can see from their health, as demonstrated here, that their early life and adult living environments each contribute individually to adult health, as well as interacting to create different health trajectories with changing living environments. Notably, changes in living environments can also occur in situ, with possible implications for migrants and non-migrants alike.

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APPENDIX

International Organization for Standardization (ISO) Geographic Region Classifications

Country of Residence	Country or Area
Northern Europe	Sweden, Denmark, Ireland, Estonia, Lithuania, Finland, Latvia
Western Europe	Austria, Germany, Netherlands, France, Switzerland, Belgium, Luxembourg
Southern Europe	Spain, Italy, Greece, Portugal, Slovenia, Croatia, Malta
Eastern Europe	Israel, Czech Republic, Poland, Hungary, Bulgaria, Cyprus, Romania, Slovakia
Country of Birth	
Eastern Europe	Bulgaria, Belarus, Chechnya, Cyprus, Czechoslovakia, Czech Republic, Hungary, Israel, Moldova, Republic of, Poland, Romania, Russian Federation, Slovakia, Ukraine, U.S.S.R.
Northern, Western, and Southern Europe	Albania, Austria, Belgium, Bosnia and Herzegovina, Croatia, Denmark, Estonia, Faroe Islands, Finland, France, Germany, Greece, Greenland, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Netherlands Antilles, Norway, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, Macedonia, The former Yugoslav Republic of, United Kingdom
Latin America and the Caribbean	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, French Guiana, Grenada, Guadeloupe, Haiti, Honduras, Martinique, Mexico, Curacao, Aruba, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, Venezuela, Virgin Islands (U.S.)
Central Asia and West Asia	Afghanistan, Azerbaijan, Bangladesh, Armenia, Georgia, Palestinian Territory, occupied, Iraq, Kazakhstan, Jordan, Kyrgyzstan, Turkey, Syrian Arab Republic, Tajikistan, Turkmenistan, Uzbekistan, Yemen, Afghan-Turkish, Turkish-Kurdish, Minor Asia, Kurdistan (region)
Southeast, South, & East Asia	Bhutan, Cambodia, Sri Lanka, India, Indonesia, Iran (Islamic Republic of), Lao People‘s Democratic Republic, Malaysia, Pakistan, Philippines, Singapore, Viet Nam, Thailand, Borneo Island China, Taiwan, Hong Kong, Japan, Korea, Republic of, Macau, Taiwan, Hong Kong, Japan, Korea, Republic of, Macau
Africa	Africa, Algeria, Angola, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Republic of, Congo, Democratic Republic of (was Zaire), Benin, Equatorial Guinea, Ethiopia (before Eritrea broke away), Ethiopia, Eritrea, Gabon, Gambia, Ghana, Guinea, Côte d‘Ivoire, Kenya, Lebanon, Liberia, Libyan Arab Jamahiriya, Madagascar, Mali, Mauritania, Mauritius, Morocco, Mozambique, Nigeria, Guinea-Bissau, Reunion, Rwanda, Sao Tome and Principe, Senegal, Somalia, South Africa, Zimbabwe, Sudan, Togo, Tunisia, Uganda, Egypt, Tanzania, United Republic of, Burkina Faso, Zambia, Congo (both), Former Protectorate of Northern Rhodesia
North America and Oceania	Canada, United States of America, Australia, French Polynesia, New Zealand

DIGITAL CURRENCY INVESTMENT AND VOLATILITY CONTROVERSIES – ETHICAL PERSPECTIVES AND EMPIRICAL EVIDENCE

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SUMMARY

Digital currencies and blockchain technology are viewed with scepticism in the financial sector and society, while the increasing popularity of some currencies, such as Bitcoin, has raised numerous ethical questions. With the growing popularity of cryptocurrencies, the demand for these assets has also increased as many investors see the potential for high returns in this new, bubbly, and rapidly developing market. However, investing in cryptocurrencies has significant risks as the market is highly volatile and still unregulated. In this article, we propose an analysis of the aspects related to investment and the volatility of digital currencies from a dual perspective: a) qualitative - a critical look at their pros and cons from an investment perspective, as well as the ethical implications for the economy and individuals; b) quantitative - based on empirical data on the issue of their volatility. The future of cryptocurrencies and blockchain technology is difficult to predict as it is characterized by high uncertainty. However, given the transformation process that the financial and currency markets undergo, the challenges posed by such innovations can no longer be ignored.

Keywords: *ethics, digital currencies, volatility, investments*

INTRODUCTION

The rapid spread of digital currencies has led to several ethical dilemmas, challenging legislators, and companies in the financial sector to find a balance between fostering innovation and ensuring adequate consumer protection. Bitcoin and blockchain technology are viewed with a degree of scepticism both in the financial sector and by the public. Opinions differ between those who see these innovations as an opportunity and those who view them with aversion or even fear.

The issues surrounding investment in cryptocurrencies have been analysed in numerous studies (Stubbs, 2021; Conklin and Ceballos, 2022; Hester, 2021). In an article published by Rutgers Business School, Scharding analyses the ethical perspective using the specific example of the cryptocurrency Bitcoin and asks whether this "star" of the industry can be considered an ethical currency (RBS, 2018). In addition, Stubbs (2021) examines the ethical concerns associated with investing in cryptocurrencies, while Conklin & Ceballos (2022) analyse the ethical pros and cons of such investments. Hester (2021) discusses the impact of cryptocurrencies from an environmental and social perspective, focussing on the example of Bitcoin.

There is a wealth of literature on the volatility of cryptocurrencies, especially Bitcoin, compared to other digital currencies, traditional currencies or stock indices.

Baur & Dimpfl (2017) show that the extremely high volatility of Bitcoin makes it difficult to use as a currency and limits its functionality as a medium of exchange, unit of account or store of value. In the same direction, Almagsoosi et al. (2022) point out that the high volatility makes Bitcoin a speculative and risky asset and emphasise the need for careful risk assessment before investing in cryptocurrencies. Doumenis et al (2021) analyse the volatility of Bitcoin compared to other financial assets. The results show that the volatility of Bitcoin is significantly higher than that of these traditional assets, suggesting that Bitcoin acts as a speculative asset rather than a stable store of value. He (2024) shows that Bitcoin's volatility is due to a combination of factors – the unpredictability of supply and demand, fluctuating market sentiment and the influence of the media – making it a speculative and volatile asset rather than a stable currency. Stråle Johansson & Tjernström (2014) analyse various factors that influence the volatility of the Bitcoin price, such as trading volume and the impact of certain events. They show that Bitcoin investors are often motivated by emotional and psychological factors, leading to investment decisions based on trends and speculation rather than economic reasons. Baur & Dimpfl (2021) Bitcoin's extreme price volatility negatively impacts its ability to function as a currency, rendering it ineffective as a medium of exchange and limiting its utility as a risk diversifier in portfolios. Shokri & Sahab (2021) have analysed the spillover effects of Bitcoin volatility on other cryptocurrencies and show a high interdependence between cryptocurrencies that can amplify volatility in times of market instability.

On the other hand, Kyriazis (2021) emphasises that the inclusion of Bitcoin in portfolios of conventional assets can significantly improve the risk-return ratio of investment decisions. However, the authors show that cryptocurrency markets are far from fully efficient, although they tend to become more efficient over time. Cermak (2017) also highlights the positives, showing that Bitcoin can act as a safe haven and that as the market matures, its volatility could decrease, paving the way for its use as a viable currency.

The main contribution of this article lies in the integration of a dual framework for analysing investments in digital currencies through a qualitative approach that examines the ethical implications and a quantitative approach based on empirical data on the volatility of these assets. This complements the existing literature by providing a more in-depth assessment of the risks and benefits associated with cryptocurrencies in the context of extreme volatility and ethical concerns of investors.

METHODOLOGY AND DATA

We propose to analyse the aspects related to the investment and volatility of digital currencies from a dual perspective:

- Qualitative - a critical examination of their pros and cons from an investment perspective, as well as the ethical implications for the economy and individuals;
- Quantitative - based on empirical evidence on the issue of volatility.

The qualitative approach consists of a documentary analysis of the specialised literature, in which we will critically examine the pros and cons of digital currencies and the associated costs and benefits. We will also analyse the opportunities, risks and, in particular, the ethical consequences and the impact on the economy, the users and the society as a whole.

The quantitative approach provides for the analysis of volatility indicators - Historical Volatility, Realized Volatility and ATR (Average True Range). For a period of 5 years (2019-08-05 to 2024-08-05), the fluctuations of parities in USD were analysed as follows:

- 2 Cryptocurrencies Bitcoin-USD (BTC-USD); ETH-USD (Ethereum-USD);
- 2 Stock indices NASDAQ Composite (^IXIC), NYSE Composite (^NYA);
- 3 fiat currencies: EUR-USD (Euro-US Dollar exchange rate), JPY-USD (Japanese Yen-US Dollar exchange rate), GBP-USD (British Pound-US Dollar exchange rate).

Research phases:

- Downloading data from Yahoo Finance; daily closing rates, daily high and low (Yahoo Finance, 2024);
- Calculation of indicators for a period of 5 years and at 1-year intervals:
  - Historical Volatility: calculated as standard deviation of daily returns, annualised;
  - Realised Volatility: estimated on the basis of the daily range (high - low);
  - ATR (Average True Range): Calculated over a 14-day period;
- Interpretation of the results.

RESULTS AND DISCUSSION

Ethical controversies [1]

Interest in investing in cryptocurrencies has increased during recent years as many investors have recognised their potential for high returns. In addition, it is clear that the investment also harbours great risks, as the markets are volatile and not yet regulated. Furthermore, critics (Medium, 2023) would even say that these are speculative bubbles. The main problem from this perspective is volatility, as the values of some cryptocurrencies fluctuate wildly, mostly as a result of speculative transactions. The inclusion of stablecoins, while tied to an external reference value and less volatile, raises other challenges (Torregrosa and Fontrodona, 2022).

Studies also point to cases of price manipulation, asymmetric insider trading or fraudulent initial offers – all problems that point to fraud as a result of a lack of regulation and transparency (Frankwitz, 2023). Ethical concerns are also expressed in the area of manipulation in connection with market manipulation. Frankwitz (2023) and Samuel-Ogbu (2022) point out that these are genuine speculative investments that should not be encouraged.

Investing in cryptocurrencies is ethically questionable, according to Kelly (2022), who argues that there are strong moral arguments against them from this perspective, particularly because of the impact that investing in cryptocurrencies has on individuals due

1 An extended version of the synthesis analysis contained in this subsection - ethical controversies, was published by the author in the book Sistemul international de plati in era banilor electronici, Chapter 6. Etică și controverse în sfera monedelor digitale private, Editura Universitară, Bucharest, 2024.

to the volatility of the currencies – people who do not understand the technology and the risks and are betting on it mainly for subjective and emotional reasons so as not to miss out on an opportunity and the prospect of profits. Furthermore, in this context, crypto markets appear as gambling due to their extreme volatility and large fluctuations within short periods of time, despite being advertised as investment instruments. Some authors (Stubbs, 2021) compare the marketing tactics of the crypto industry with those of companies offering quick loans. It is argued that the promotion of these active products can lead to financial losses and is ethically inappropriate (Hester, 2021).

From the classical utilitarian perspective, Conklin & Ceballos (2022) compares investments in digital currencies with those in traditional stocks and bonds and, based on the idea of opportunity cost (one of the effects of increased investment in cryptocurrencies is a reduction in other investments), concludes that investments in cryptocurrencies are unethical if they would lead to a dilution of investments in traditional securities.

Conklin & Ceballos (2022) also points out a pro component: the possibility of diversifying investments - they can play a valuable role in diversifying investment portfolios, and this diversification could reduce overall volatility in investment portfolios, thereby reducing risks and making the end result perceived as ethical. Scharding (2018) estimates that, on the one hand, volatility gives it the character of an interesting investment, but also ascribes to it the characteristic of a currency that is less suitable for the constant exchange of goods and services due to the uncertainty of its value (Scharding, 2018). On the other hand, if a cryptocurrency is adopted by a nation, it could become more ethical and thus provide a basis and a way to ensure stability and security of value (Scharding, 2018). In contrast, Hester (2021) talks about the adoption of cryptocurrencies in low-income countries (e.g. El Salvador) – this can have negative consequences as the purchasing power of residents is lost and an investment in this case is seen as unethical.

There is no universal standard to answer the question of whether investing in cryptocurrencies is ethical (Conklin and Ceballos, 2022). In the absence of a universal rating scale, one cannot compare gains with losses, and the evaluation of the ethics of cryptocurrency investments is ultimately context-dependent or even subjective.

Analysing volatility

Volatility of cryptocurrencies (Bitcoin and Ethereum). The annualised historical volatility of Bitcoin is 53.53%, which indicates significant price fluctuations over the 5 years under consideration. The realised volatility is also very high ($22,688.94), indicating large fluctuations between the daily highs and lows; the high ATR ($3,090.21) shows significant daily price fluctuations. Ethereum's historical volatility of 68.82 is even higher than that of Bitcoin. This confirms the high volatility of the cryptocurrency market, where price fluctuations can be very large. The realised volatility of $1,747.30 and the ATR of $192.09 show that Ethereum also experiences significant daily fluctuations, but the absolute values are lower than Bitcoin due to the relatively lower price of ETH compared to BTC.

Volatility of stock indices (NASDAQ Composite and NYSE Composite). The historical annualised volatility of the NASDAQ of 25.26% indicates a moderate but relatively high volatility for a stock index (specific to the US tech market, which is more prone to large swings due to the nature of tech companies). The realised volatility of $1,782.11 also confirms significant movements within the market. As for the NYSE, the historical volatility of 20.35% is slightly lower than that of the NASDAQ, indicating a somewhat more stable market. However, the realised volatility of $1,833.43 is comparable to that of the NASDAQ, suggesting that both markets have significant daily fluctuations. The NASDAQ and NYSE equity indices exhibit moderate to high volatility, which is to be expected given the diversity of the companies included.

Exchange rate volatility (EUR-USD, JPY-USD, GBP-USD). The historical volatility of the EUR–USD exchange rate of 7.28% is much lower than that of cryptocurrencies and equity indices, reflecting the relative stability of this currency pair, and the realised volatility of $0.0525 and ATR of $0.0072 confirm that fluctuations are relatively low in the short term. For JPY-USD, both the historical volatility of 8.89% and the realised volatility and ATR are higher than for EUR-USD. At 9.25, the historical volatility of GBP-USD is the highest of the currency pairs analysed and reflects the economic and political uncertainties associated with the British pound in recent years. However, the realised volatility of $0.0788 and the ATR of $0.0073 show moderate daily fluctuations. Currency pairs show much lower volatility compared to cryptocurrencies and stock indices.

Table 1
5-year volatility indicators

Asset	Historical Volatility (%)	Realized Volatility (USD)	ATR (USD)
Bitcoin-USD	53.53	22688.94	3090.21
ETH-USD	68.82	1747.3	192.09
NASDAQ Composite (^IXIC)	25.26	1782.11	481.96
NYSE Composite (^NYA)	20.35	1833.43	253.39
EUR-USD	7.28	0.05	0.01
ETH-USD	68.82	1747.3	192.09
JPY-USD	8.89	10.66	3.14
GBP-USD	9.25	0.08	0.01

Source: compiled by author, based on research, Yahoo Finance (2024) data

If we look at the development of the volatility indices for periods of one year, we see the following:

- Cryptocurrencies (Bitcoin and Ethereum) have the highest volatility compared to other asset classes, both in terms of historical and realised volatility; Bitcoin and Ethereum have similar volatility, but Ethereum has had periods of even higher volatility than Bitcoin; they are significantly more volatile than equity indices and currency pairs, which makes them suitable for investors with a high-risk appetite;

- Stock indices (NASDAQ Composite and NYSE Composite) are more volatile than currency pairs, but much more stable than cryptocurrencies. The NASDAQ has been more volatile than the NYSE due to its greater exposure to the technology sector;

- Currency pairs (EUR-USD, JPY-USD, GBP-USD) are significantly less volatile, reflecting the relative stability of major economies. Volatility between currency pairs is relatively similar, with JPY-USD slightly more volatile than EUR-USD and GBP-USD; much more stable than both cryptocurrencies and equity indices, suitable for investors looking to take lower risk.

Table 2

1-year volatility indicators

Asset	Indicators / Period*	2019-2020	2020-2021	2020-2021	2021-2022	2022-2023	2023-2024
Bitcoin - USD	Historical Volatility (%)	46.94	59.86	66.82	52.8	36.37	45.49
	Realized Volatility (USD)	3818.64	6587.41	25652.16	14808.83	9723.72	25126.41
	ATR (USD)	250.52	1401.85	1929.44	215.72	1354.14	3090.21
ETH-USD	Historical Volatility (%)	54.27	78.4	88.89	71.78	38.81	53.21
	Realized Volatility (USD)	79.99	235.41	2294.34	1235.33	579.62	1555.02
	ATR (USD)	5.59	43.93	164.89	21.49	93.99	192.09
NASDAQ Composite (^IXIC)	Historical Volatility (%)	14.45	35.5	18.01	31.94	17.38	17.85
	Realized Volatility (USD)	712.85	1784.17	1573.36	1910.87	1055.02	1709.44
	ATR (USD)	59.57	130.08	268.64	243.01	143.92	481.96
NYSE Composite (^NYA)	Historical Volatility (%)	10.99	34.65	12.91	20.84	12.45	10.46
	Realized Volatility (USD)	951.45	2430.53	1441.94	1834.72	1146.06	1297.81
	ATR (USD)	64.9	139.17	177.98	234.39	144.21	253.39
EUR-USD	Historical Volatility (%)	4.82	7.42	5.6	9.78	7.53	5.35
	Realized Volatility (USD)	0.03	0.06	0.03	0.06	0.05	0.04
	ATR (USD)	0.01	0.01	0.01	0.01	0.01	0.01
JPY-USD	Historical Volatility (%)	5.92	8.28	5.19	11.6	9.93	9.45
	Realized Volatility (USD)	4.58	7.56	3.46	13.43	9.33	13.78
	ATR (USD)	0.47	0.53	0.5	2.43	1.54	3.14
GBP-USD	Historical Volatility (%)	8.64	10.97	6.58	12.2	8.2	5.53
	Realized Volatility (USD)	0.07	0.09	0.05	0.1	0.06	0.05
	ATR (USD)	0.01	0.02	0.01	0.01	0.01	0.01

Note: 1-year period intervals starting with 5.08.2019

Source: compiled by author, based on research, Yahoo Finance (2024) data

CONCLUSION

As the qualitative analysis shows, there are a number of elements that speak against investing in cryptocurrencies, highlighting the challenges and confirming the warning signs: high volatility, the lack of specific regulations, their speculative nature. In addition, the widespread adoption of cryptocurrencies in low-income countries can lead to a loss of purchasing power. Of course, there are also some elements in favour of cryptocurrencies: the potential for high returns, the role they play in diversifying portfolios and the ability to create innovation in the financial system.

When analysed quantitatively, cryptocurrencies (Bitcoin and Ethereum) have the highest volatility both historically and in real terms, indicating the potentially higher risks and returns associated with them. Indices have moderate but significantly higher volatility than currencies, reflecting the nature of equities and the influence of economic and geopolitical factors. Currency pairs have the lowest volatility, making them a more stable choice for conservative investors or those looking to protect their capital.

To summarise, both approaches to analysis suggest that investing in cryptocurrencies can be ethically questionable, as their high volatility can affect individuals. Even though the lack of a generally recognised standard for ethical evaluation currently makes it difficult to analyse cryptocurrencies objectively, from an empirical perspective they can be considered attractive investment opportunities for risk-takers.

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INCLUSIVENESS AND GROWTH IN THE EU: A SHIFT FROM PRO-POOR TO PRO-EMPLOYED AT RISK OF POVERTY APPROACH

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SUMMARY

The importance of inclusive growth is widely acknowledged by academia, policymakers, and the public, yet debates persist about whether current policies effectively ensure that growth benefits all. While a pro-poor approach has been vital, focusing on those employed at-risk-of-poverty is increasingly important. Low wages can demotivate workers, pushing them to rely on safety nets and reducing the pool of human capital, a key driver of economic growth. This research shifts the perspective from a pro-poor to a pro-employed at-risk-of-poverty approach by constructing a benefit-sharing and participation inclusiveness index for EU-27 countries from 2010 to 2021, addressing a gap in traditional indices. Unlike methods using the poverty headcount ratio, this index incorporates the in-work at-risk-of-poverty rate, emphasizing job quality. The index was constructed using Principal Component Analysis (PCA) and analyzed through an Ordinary Least Squares (OLS) regression model with fixed effects for both country and year, ensuring robust control for unobserved heterogeneity. Findings reveal the inclusiveness index as a significant determinant of Real GDP per capita, with a strong positive correlation between inclusiveness and economic growth. This relationship is particularly strong in more inclusive countries, where improvements in benefit-sharing and participation are closely linked to higher economic performance. However, exceptions among socio-economically developed countries suggest the need for country-specific policies. The results emphasize the need to address income inequality, reduce in-work poverty, and increase job opportunities to promote sustainable and equitable growth in the EU, ensuring that those contributing to economic growth receive fair benefits and achieve a decent living standard.

Keywords: *Inclusiveness index, Inequality, Growth, Benefit-sharing, Participation, Fixed Effects analysis*

INTRODUCTION

Achieving inclusiveness, acknowledged as a moving target, is a central goal of the European Union, which rests on the social model described as a "unique achievement" (EESC, 2018). Established in 2017, the European Pillar of Social Rights focuses on three main areas: equal opportunities and access to the labor market, fair working conditions, and social protection and inclusion (Mailand, 2024). It advocates for fair wages, social protection, and equal opportunities to prevent in-work poverty and ensure a decent standard of living for all, designed to address challenges from societal, technological, and economic developments (European Parliament, 2021). However, some of the concerns that can be encountered in the literature are that the tools used by the EU to establish social rights, including the European Pillar of Social Rights, are primarily guidelines and not legally binding. Even if recent EU actions have focused on combating poverty and social exclusion through the European Semester and the 2020 European Strategy, these measures are often seen as insufficient (Bilbao-Ubillos, 2023).

This is obvious from the persistent disparities in in-work poverty rates and income inequality within the EU, highlighting a growing divide that undermines the EU's cohesion and economic stability. For instance, according to Eurostat data, the in-work at risk of poverty rates amounted to 8.3% across the EU in 2023, with higher rates in Romania (15%), Luxembourg (14.8%), Bulgaria (11.7%) and Spain (11.3%). These trends should be viewed in the context of the long-term objective for this indicator that is a value of 3.3 p.p. (Lafortune et al., 2024). These figures should raise concerns as they might bring about demotivation of people to work and choose to rather make use of safety nets then to have a job. Persistent in-work poverty can exacerbate social inequalities and lead to social unrest. While, economically, in-work poverty impacts the spending of individuals decreasing the economic growth. In 2023, as many as eleven EU member states exceeded the EU average in terms of in-work at risk of poverty (Eurostat, 2024a).

The income inequality across the EU also remains a significant concern. In 2023 it stayed at 29.6% as measured by Gini, with eleven countries exceeding the EU average, while Bulgaria, Lithuania, and Latvia recorded the highest levels of income inequality in the EU, with Gini coefficients of 37.2%, 35.7%, and 34%, respectively (Eurostat, 2024b). Although recent data shows a decrease in inequality between countries, the internal disparities within nearly half of the EU nations have actually expanded over the last decade (Neef & Sodano, 2022).

With regard to the employment rates, the European Pillar of Social Rights Action Plan provided a specific goal set for 2030 to achieve a 78% employment rate among people aged 20-64 (EC, 2021). Even though as of 2023, the EU's employment rate for this age group has reached 75.3%, 11 EU countries have employment rates between 70% and 78%, and three countries—Romania, Greece, and Italy—have rates below 70% (Eurostat, 2024c). As for the Employment to population ratio, 15+, total (%) (modeled ILO estimate), the average for the 27-EU member-states was about 54.4% in 2023. Seven countries ranked below the EU-average with 5 countries being at or exceeding just a bit the EU average (WB, 2024).

In addition to the European Pillar of Social Rights, the United Nations' Sustainable Development Goals also target goals that refer to "No poverty" (SDG 1), "Decent work and economic growth" (SDG 8) and "Reduced inequalities" (SDG 10) (UN, 2023). Moving towards achieving these goals is important not only for enhancing the living standards but also for ensuring that economic growth benefits all members of society, and even more so, those populations that are active on the labor market and directly contribute to the creation of these benefits.

The overall goal of this research is to understand the extent to which the EU countries are able to ensure inclusiveness on the benefit-sharing and participation dimension with the focus on the disadvantaged employed individuals as well as to understand the relation between the pro-employed at-risk-of-poverty tailored inclusiveness index with growth. While there are researches that analyze the benefit sharing and participation dimension of inclusiveness from the pro-poor perspective, there seem to be no studies to address this dimension from the pro-employed at risk of poverty perspective, which would narrow and make it possible for the policy-makers to intervene with targeted policies that encourage employment effort. In this research we attempt to address this gap.

This research addresses key questions about what the situation of the 27 EU countries is in terms of the benefit-sharing and participation dimension of inclusive growth from the pro-employed at-risk-of-poverty perspective and an answer is sought to whether the inclusiveness index is a correlation-based determinant of growth based on the EU-27 data. By exploring these questions, we aim to offer new insights into the interrelation between inclusiveness and economic performance in the EU, providing a basis for policy recommendations that encourage growth to be inclusive from the employed individuals' perspective.

The novelty of the research resides in the adjustment of the benefit sharing and participation inclusiveness index by Ramos *et al.* (2013) to shift from the pro-poor approach to the pro-employed at-risk–of-poverty perspective by replacing one of the variables and change the index construction method so as to make the interpretation of the inclusiveness index more intuitive. In addition, the relation between the computed index with growth is empirically analyzed which in our understanding has not been done using OLS with fixed effects.

LITERATURE REVIEW

The literature on measuring inclusiveness and inclusive growth is rich and varied, utilizing a range of indices to assess different facets of economic and social development across global and regional contexts. Notably, the Human Development Index (HDI) and its variants—including the Inequality-Adjusted HDI, the Gender Inequality Index, and the Multidimensional Poverty Index—offer insights into broader human well-being by considering life expectancy, education, and income. Similarly, the Inclusive Development Index (IDI) developed by the World Economic Forum integrates these elements to evaluate economic performance inclusively (Prada & Sánchez-Fernández, 2019). A comprehensive analysis of existing inclusive development indices at the global level has been provided by Dörffel & Schuhmann (2022), who introduced a Multidimensional Inclusiveness Index (MDI) to address certain conceptual shortcomings.

Specialized indices like the Islamic Inclusive Growth Index (i-IGI) focus on specific economic systems, while others target financial inclusion and inclusive growth within particular regions or demographic groups (Ghazal & Zulkhibri, 2019). The Europe Sustainable Development Report 2023/24 introduces the Leave-No-One-Behind (LNOB) Index, which measures inequalities within European countries by focusing on key dimensions such as extreme poverty, material deprivation, income inequality, gender inequality, and access to quality services (Lafortune et al., 2024). Within the EU, Zielenkiewicz (2020) applied the IDI to examine disparities among member states. Giambona and Vassallo (2014) crafted a composite indicator that includes the risk-of-poverty after social transfers, material deprivation, and other factors to measure variations in social inclusion.

Some attempts have been made to construct more targeted indices. This arises from the need for more targeted policies. For instance, Pisica's study (2024) compared inclusiveness in Moldova, Ukraine, and Georgia with EU-26 countries (2006–2019), using an index based on benefit-sharing proxied by Gini coefficient, poverty headcount ratio at $6.85/day and participation expressed by employment-to-population ratio. The study found different progress among candidate states in aligning with EU standards and alluded that the inclusiveness index can predict GDP per capita, stressing the need for tailored policies to reduce inequality and foster growth. Thus, the tendency to incorporate more and more elements into the inclusiveness indices and achieve a multidimensional nature of inclusiveness indices makes it challenging to develop targeted policies for specific dimensions of inclusive growth, therefore, the need for more indices to reflect more specific dimensions arises.
A number of studies collectively reveal the sophisticated relationship between in-work poverty, labour market dynamics, and economic indicators, pointing at the need for comprehensive policy initiatives. For instance, the increasing prevalence of precarious work in Europe shaped significantly by EU labour law has been highlighted in several studies where the authors explore the diverse rates of in-work poverty across EU countries, drawing attention to the various institutional, labour market, and social factors contributing to this phenomenon (Florczak & Otto, 2019).
The analysed literature points at the relevance of the in-work at-risk of poverty variable in the benefit-sharing and participation inclusiveness index, as this measure not only reflects income distribution but also employment quality.

DATA, METHODOLOGY AND RESEARCH RESULTS

Recognizing that inclusiveness and inclusive growth are comprehensive, multidimensional concepts, we disentangled the benefit-sharing and participation aspects of inclusive growth in line with Ramos et al. (2013). The channels via which benefit-sharing and participation could affect growth include enhancing aggregate demand through equitable income distribution and fostering social inclusion via broader employment opportunities and fair wages. Based on Ramos et al. (2013) and slightly adjusting the proxies to focus on pro-employed at risk of poverty, we construct the index for the EU countries.

The original index contained three equally-weighted components: poverty (poverty headcount ratio), income inequality (Gini coefficient), and employment participation (employment-to-population ratio). We use the in-work at-risk-of-poverty ratio for poverty and the Gini coefficient (equalized) as outcome measures, and maintain the employment-to-population ratio as a process-based estimate.

To address critiques regarding equally-weighted components (Meyer & Meyer, 2019), we use PCA to compute the index, assigning appropriate weights to each element. We invert the signs of the poverty and inequality elements for a more intuitive interpretation, where a higher score suggests better inclusiveness (more equitable benefit-sharing and participation).

The in-work at-risk-of-poverty rate (i.e. the share of persons who are employed and have an equalized disposable income below the risk-of-poverty threshold, which is set at 60 % of the national median equalized disposable income after social transfers as defined in Eurostat) captures whether employment lifts people out of poverty, indicating how well economic activity benefits reach workers. The Gini coefficient shows income inequality, helping to understand how economic benefits are shared across the population. The employment-to-population ratio indicates active economic participation, showing the percentage of the working-age population employed. High employment ratios can suggest inclusivity but require context regarding working conditions and wages.

We construct an inclusiveness index based on data from 2010 to 2021 retrieved from Eurostat and World Bank Database for the 27 EU member states, focusing on benefit-sharing and participation dimensions. The index is developed using Principal Component Analysis (PCA) to assign appropriate weights to the variables. We then apply an Ordinary Least Squares (OLS) regression with fixed country and time effects to analyze the relationship between the inclusiveness index and Real GDP per capita, using StataBE 18 software. This method allows us to control for unobserved heterogeneity across countries and over time. Descriptive analysis has been applied to draw conclusions based on the statistical data and the empirical analysis of the results.

The construction of the inclusiveness index follows a utilitarian approach to social welfare, focusing on maximizing total utility across the population (Baron, 1999). Our analysis seeks to validate that the inclusiveness index is a determinant of Real GDP per capita alongside other growth determinants. We aim to provide a nuanced view of economic disparities in the EU-27, analyzing short and medium-term perspectives.

A positive and statistically significant coefficient for the inclusiveness index would confirm that higher levels of inclusiveness are associated with higher Real GDP per capita, thus confirming that inclusiveness is related to growth (Hypothesis 1). Then we run the regression separately on the group of more and less inclusive countries classified according to the mean of the computed inclusiveness index. This helps get insights into the differences between the two group that we assume exist (Hypothesis 2). The OLS regression models that are conducted over different time horizons (short-term and medium-term) help observe the correlation of inclusiveness improvements with different growth spans we assume exist, indicating the association of inclusiveness with a sustainable growth (Hypothesis 3).

The limitations of this research stem from a limited number of observations as only a period of 12 years was analyzed for 27 EU countries, and the fact that the results of OLS regression with country and time fixed effects do not imply causality, which should be a step for further research.

The key empirical steps include the following: first we use the Principle Component Analysis (PCA) to compute the inclusiveness index based on three variables: GINI, Employment to Population Ratio (EPR), and In-work at Risk of Poverty (IWAP). The PCA with and without normalization gave the same results. Thus, the inclusiveness index is constructed based on the data without normalization.

We calculate the covariance matrix to see how the variables are related and where the data varies the most. From this matrix, we extract the eigenvalues and eigenvectors. As the first principal component (PC1) explains most of the variation, we calculate the index based on PC1. We calculate PC1 as a linear combination of the original variables, weighted by the coefficients from the eigenvectors. To construct an inclusiveness index where higher scores indicate more inclusivity, we invert the signs of the GINI and IWAP variables and recalculate the first principal component using the inverted variables. To validate the appropriateness of PCA for our data, we conduct Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. Then we classify the countries into more and less inclusive using the mean of the inclusiveness index score.

Hausman test is run to understand whether the fixed effects model or the random effects model is more appropriate for the data. After this, the OLS is run where we analyze the correlation between the constructed inclusiveness index and economic growth expressed as GDP per capita, considering both country and year fixed effects, controlled for proven determinants of growth. Then we run separate fixed effects (country and year) OLS regressions on groups of more and less inclusive EU member states. All OLS regressions are conducted for growth spans of 3, 5, and 7 years and as snapshot (at levels).

To construct the principal components, it is important to note that they are linear combinations of the original variables, weighted by the coefficients from the eigenvectors. The first principal component (PC1) is calculated as follows:

$$PC1=0.6274*GINI-0.4686*EPR+0.6219*IWAP \quad (1)$$

Where:

- GINI is the Gini coefficient
- EPR is the Employment-to-Population Ratio
- IWAP is In-Work at Risk of Poverty

Then, since we need to inverse the inclusiveness index to show that the increase of the score suggests more inclusivity, we inverse the sign of two variables (GINI and in-work at risk of poverty).

The inverted variables are calculated as follows:

$$GINI\ inv=100-GINI \quad (2)$$

$$IWAP\ inv=100-IWAP \quad (3)$$

Further, we run the PCA with the inverted variables to create the new composite indicator (composite_indicator_Comp1_new):

$$PC1'=0.6274 * GINI\ inv+0.4686 * EPR+0.6219 * IWAP\ inv \quad (4)$$

In addition, the Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy are run in line with Herman (2014). The Bartlett's Test of Sphericity with the results (Chi-square: 241.333, Degrees of freedom: 3 and p-value: 0.000) suggest that there is significant evidence of correlation among the variables, proving that PCA is appropriate for the data. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO: 0.609) is above the 0.5 threshold which indicates the suitability of the data for factor analysis (PCA).

In order to classify the EU-27 countries into more and less inclusive ones we calculated the overall average mean score of the composite indicator across all the listed countries using StataBE 18 software. The mean is approximately 126.07. Based on this average, the countries have been divided into two categories, as shown in **Table 1** below:

Table 1

More inclusive vs. Less inclusive EU-27 countries (2010-2021)

More Inclusive Category (Mean score above 126.07):	Less Inclusive Category (Mean score at or below 126.07):
Czech Republic (CZ): 133.69	Greece (IE): 115.57
Netherlands (NL): 133.68	Romania (RO): 116.34
Finland (FI): 132.25	Italy (IT): 118.00
Denmark (DK): 131.50	Spain (ES): 118.19
Slovenia (SI): 131.41	Bulgaria (BG): 119.33
Slovakia (SK): 131.38	Portugal (PT): 122.27

More Inclusive Category (Mean score above 126.07):	Less Inclusive Category (Mean score at or below 126.07):
Sweden (SE): 131.25	Lithuania (LT): 122.36
Austria (AT): 130.02	Latvia (LV): 122.49
Ireland (IE): 129.40	Croatia (HR): 123.74
Belgium (BE): 129.25	Poland (PL): 124.81
Malta (MT): 128.33	France (FR): 125.57
Germany (DE): 127.92	Luxembourg (LU): 125.76
Cyprus (CY): 126.97	Estonia (EE): 125.84
Hungary (HU): 126.58	

Source: Own calculation using Stata18 software with Eurostat and World Bank data

To check the robustness of the classification of EU countries in terms of inclusiveness, we compared our inclusiveness classifications with the socio-economic development classification provided by Laskowska (2021). Given that Laskowska provided the classification for only twenty-six EU countries, we included the 27th EU member state (Croatia) in the ranking as it appeared in the original source where EU countries were assessed according to their socio-economic development (Fura & Wang, 2017).

The comparison revealed a general trend where countries with higher socio-economic development also tended to be classified as more inclusive based on our inclusiveness index.

The descriptive statistics of the data for the OLS reveals significant variability across the EU-27 countries (Table 2).

Table 2

Descriptive statistics of the data, its general characteristics, distribution, and variability

Variable	Obs.	Mean	Std. dev.	Min	Max
L. Real GDP per capita (log)	297	25507.51	16745.92	5080	84750
GINI	324	29.80062	3.867312	20.9	40.8
In-work at risk of poverty	324	8.121914	3.199755	2.7	19.8
Employment to population ratio	324	53.11204	5.186987	37.72	62.59
Population by education attainment	324	74.64907	10.77261	32.7	89.2
Trade to GDP ratio	324	131.2103	69.04465	51.19729	388.1204
Inflation	324	1.52198	1.46769	- 2.096998	6.091417
Fixed investments to GDP	324	21.00973	4.188615	10.68721	54.30437
Government consumption to GDP	324	19.99576	3.181292	12.01403	27.36585
Fixed broadband subscriptions to high-speed access to the public Internet	324	5244133	7839921	125889	3.69e+07
Inclusiveness index (benefit-sharing and participation)	324	126.0704	5.452259	112.5259	135.5005
Crisis dummy	324	.1666667	3732545	0	1

Variable	Obs.	Mean	Std. dev.	Min	Max
Real GDP per capita (log) 3-year change	243	.0539541	.0676222	-.1919956	.2940426
Real GDP per capita (log) 5-year change	189	.1028322	.0939629	-.17589	.4406185
Real GDP per capita (log) 7-year change	135	.1439651	.1210147	-.1635408	.5875654
Initial growth_3 year (Real GDP per capita)	243	9.933086	.6381378	8.533067	11.34746
Initial growth_5 year (Real GDP per capita)	189	9.909118	.6447566	8.533067	11.34746
Initial growth_7 year (Real GDP per capita)	135	9.890936	.6506998	8.533067	11.3332
Inclusiveness dummy	324	.4845679	.5005348	0	1

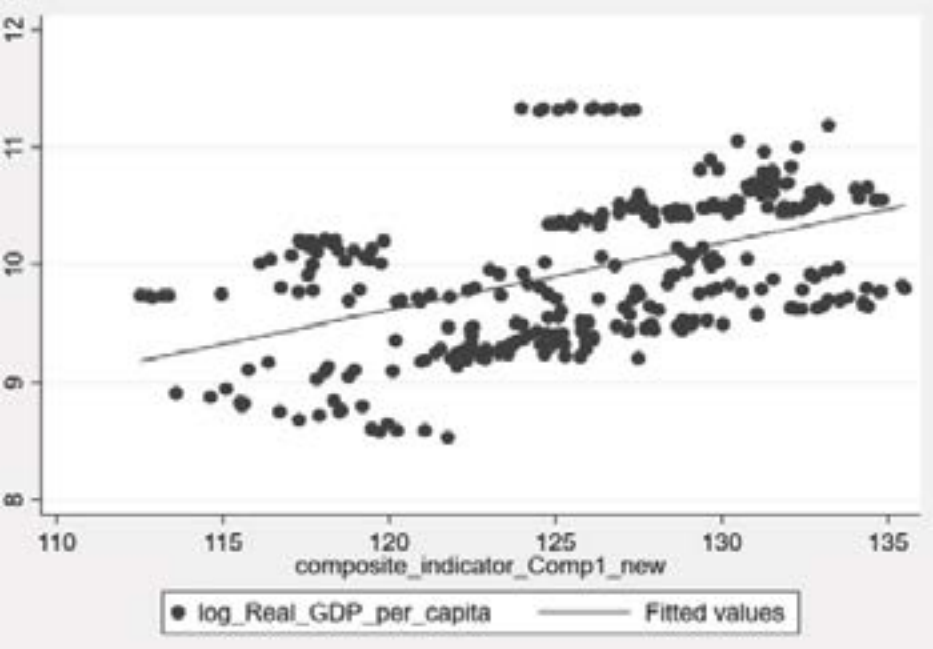
Source: Own calculation using Stata18 software based on Eurostat and World Bank data (2010-2021)

In order to understand whether the fixed effects model or the random effects model is more appropriate for the data, the Hausman test is run. The test statistic is 79.92 with 8 degrees of freedom. The p-value is 0.0000, which is highly significant. The Null Hypothesis (Ho) suggests the difference in coefficients is not systematic (i.e., the random effects model is appropriate). While the Alternative Hypothesis (Ha) suggests that the difference in coefficients is systematic (i.e., the fixed effects model is appropriate). Given the p-value of 0.0000, we reject the null hypothesis. This implies that the difference in coefficients is systematic, and thus the fixed effects model is more appropriate for the data than the random effects model. Therefore, we use the fixed effects model for the analysis as it is more consistent given the systematic differences in coefficients identified by the Hausman test.

As a starting point of our analysis we are looking at the correlation between the Real GDP per capita (log) and the inclusiveness index (composite_indicator_Comp1_new) (**Figure 1**).

Figure 1

Correlation between the Real GDP per capita (log) and the inclusiveness index (composite_indicator_Comp1_new) EU-27 member states for 2010-2021



Source: Own processing in Stata18 using Eurostat and World Bank data.

As seen in the skater plot, the output of a simple OLS shows that the inclusiveness index is positively associated with the Real GDP per capita. The relationship is statistically significant ($p < 0.001$) and is linear between these two indicators.

Given the above results, as a next step we proceed to considering how the inclusiveness index associates with Real GDP per capita. We consider the relatedness on short and medium term (3, 5, 7-year periods) and as a snapshot (at levels). As we suspect that the correlation between the Real GDP per capita change and levels and the built-up inclusiveness index might differ depending on whether the analysis is carried out on the group of more inclusive countries and less inclusive ones, we are running the OLS with country and time fixed effects for each of the two groups separately.

To run the OLS regression with fixed country and time effects to analyze if the inclusiveness index is significantly correlated with the GDP per capita (log) and if the inclusiveness index is a determinant of growth along with other proven determinants of growth we include the following variables: on the left-hand side the dependent varriable is Real GDP per capita (log) and on the right-hand side we use the lagged real GDP per capita that refers to initial income, the population by educational attainment level which is population by educational attainment level upper secondary, post-secondary non-tertiary and tertiary education (levels 3-8) (total, aged 15-64), openness which is the sum of exports and imports of goods and services measured as a share of GDP, inflation ratio which is consumer price index annual percentage change. Fixed investment is the gross fixed capital formation (% of GDP) formerly gross domestic fixed investment (unlike Barro & Sala-i-Martin (2004), in this analysis we are including fixed government investment to GDP ratio in line with Anand et al. (2013), the government consumption as share of GDP (General government final consumption expenditure (% of GDP)) and the fixed broadband subscriptions to high-speed access to the public Internet as a more nuanced measure of access to the ICT. Several studies have shown a correlation between the fixed broadband and the GDP (see Minges, 2015; Khandelwal & Agarwal, 2020). We also includ a crisis dummy to control for the COVID-19 pandemic period.

The general formula for the Ordinary Least Squares (OLS) regression model with country and time fixed effects is the following:

$$Yit = \beta 0 + \sum_{x=1}^{n} \beta x \times \mathrm{Var}xit + \mu i + \lambda t + \epsilon it \qquad (5)$$

Where:

Yit - dependent variable, representing various measures of growth for country i at time t

$\beta 0$ – intercept

$\sum_{x=1}^{n} = \beta x \times \mathrm{Var}xit$ - represents the sum of the products of the coefficients βx and their corresponding variables $\mathrm{Var}xit$

μi - represents the fixed effects for each country

λt - represents the fixed effects for each time period

ϵit - is the error term

Overall, the results prove that:

1. The composite indicator is significant across all time frames, indicating its strong influence on GDP per capita in the EU-27 (Table 3). This suggests that income distribution, poverty risk (in-work), and employment status computed as an index are crucial determinants of economic growth and lower inequality, reduced in-work and higher employment are associated with higher GDP per capita.

Table 3

Determinants of Real GDP per capita (log) change and levels (EU-27)

Variable	3-year change (b/se)	5-year change (b/se)	7-year change (b/se)	Levels (b/se)
composite_indicator	0.0141583*** (0.0035065)	0.0143465*** (0.0033698)	0.0182264*** (0.0027691)	0.0030832 (0.0024269)
Pop-by_education_avt	0.0017791 (0.0015759)	0.0048446*** (0.0015091)	0.0051239** (0.0020568)	0.016023** (0.0006551)
Trade%GDP	0.0008148 ** (0.0003523)	0.0000812 (0.000475)	0.0008643 (0.0008518)	0.0008611** (0.0003114)
Infl	0.0072376** (0.0029527)	0.0173573*** (0.0030709)	0.0130609*** (0.0040558)	0.0048029*** (0.0011502)
Fixed investment (~)	-0.0002343 (0.0010107)	0.0008326 (0.0009002)	-0.0009964 (0.0012508)	-0.0030037*** (0.0009077)
Gov_Consump(%GDP)	-0.0224461*** (0.0055341)	-0.0108797** (0.0051592)	-0.0096013 (0.0083675)	-0.0158806*** (0.003256)
ICT(FBS)	3.15e-09 (2.86e-09)	-4.89e-09 (4.50e-09)	-7.17e-09 (6.14e-09)	2.48e-09 (1.59e-09)
Crisis_dummy	-0.008844 (0.0171691)	-0.0082373 (0.0089429)	0.0096897 (0.0153049)	0.009211 (0.0093746)
initial_3growth_base	-0.2591594*** (0.0756342)			
initial_5growth_base		-0.4867816*** (0.0761869)		
initial_7growth_base			-0.5121642*** (0.0966403)	
L.log_Real_GDP_per				0.8729311*** (0.0507361)
Constant	1.024865 (0.7924083)	2.936252*** (0.6822139)	2.610869*** (0.8331436)	1.017191** (0.4354398)
Observations	243	189	135	297
Significance levels	* p<0.10 ** p<0.05 *** p<0.01			

Source: Own processing using Stata18 software based on Eurostat and World Bank data (2010-2021)

Notes: Both country- and time-effects are included. *, **, and *** denote significance at the, respectively, 10 percent, 5 percent, and 1 percent level. Robust t-statistics are in parentheses. The dependent variable is Real GDP per capita (log) 3,5,7-year change and levels. The composite_indicato~w is the computed inclusivity indicator that represents the benefit sharing and participation, Pop-by_education_a~t stands for the population by educational attainment level which is the highest level of education successfully completed by the individuals of a given population (total, aged 15-64). Trade%GDP stands for trade openness. Inflation is consumer price index annual percentage change. Fixed Investment is the gross fixed capital formation (% of GDP) formerly gross domestic fixed investment, followed by Gov_ Consump(%GDP) which denotes General government final consumption expenditure (% of GDP)). ICTFBS is the fixed broadband subscriptions to high-speed access to the public Internet. The Crisis_dummy controls for the years 2020-21 (COVID-19 pandemic), initial_growth_3, initial_growth_5, initial_growth_7 refer to initial income for 3,5 and 7 periods respectively and the Llog_Real_GDP_ per~a controls for the initial income for the levels analysis model.

2. The inclusiveness index is consistently significant across all models in the case of more inclusive countries (Table 4), indicating that in more inclusive states, income inequality, in-work at poverty risk, and employment significantly associate with GDP per capita change and levels. The positive coefficients suggest that higher inclusiveness leads to better economic outcomes.

Table 4

Determinants of Real GDP per capita (log) change and levels (more inclusive EU countries)

Variable	3-year change (b/se)	5-year change (b/se)	7-year change (b/se)	Levels (b/se)
composite_indicator	0.0219199*** (0.0027087)	0.0221776*** (0.0064028)	0.0173587*** (0.0051139)	0.0135313*** (0.0032994)
Pop-by_education_ avt	0.0014822 (0.0015071)	0.0057823 *** (0.0016721)	0.0111908 (0.0065348)	0.0027517* (0.0015272)
Trade%GDP	0.0010878 (0.0006674)	0.0000958 (0.0005529)	0.001161 (0.001304)	0.0009044** (0. 0003905)
Infl	0.0042806 (0.0033872)	0.0144464*** (0.0043933)	0.0158084** (0.0062746)	0.0044558** (0.0016195)
Fixed investment (~)	-0.0003272 (0.00163)	0.0003388 (0.000819)	-0.0022104 (0.0014286)	-0.0019286 (0.0013991)
Gov_ Consump(%GDP)	-0.0277632*** (0.0059808)	-0.0143725** (0.0049344)	-0.018198 (0.104953)	-0.0206299*** (0.0038856)
ICT(FBS)	5.13e-09** (1.86e-09)	9.54e-10 (2.54e-09)	1.44e -08 8.56e-09	7.23e-09*** (1.42e-09)
Crisis dummy	0.0174548 (0.0173732)	-0.0027758 (0.0119552)	0.192031 (0.0247155)	0.0213263* (0.0113698)
initial_3growth_base	-0.4856005*** (0.0700571)			
initial_5growth_base		-0.5348713*** (0.1301274)		
initial_7growth_base			-1.022524*** (0.1875016)	
L.log_Real_GDP_per				0.5818968*** (0.1008674)
Constant	2.442705*** (0.6126324)	2.471607 (1.644246)	7.571625*** (1.930821)	2.632434*** (0.6236995)
Observations	118	92	66	144
Significance levels	* p<0.10	** p<0.05	*** p<0.01	

Source: Own processing using Stata18 software based on Eurostat and World Bank data (2010-2021)

Notes: Both country- and time-effects are included. *, **, and *** denote significance at the, respectively, 10 percent, 5 percent, and 1 percent levels. Robust t-statistics are in parentheses. The dependent variable is Real GDP per capita (log) 3, 5, 7-year change and levels. The composite_indicator is the computed inclusivity indicator that represents the benefit sharing and participation, Pop-by_education_ avt stands for the population by educational attainment level upper secondary, post-secondary non-tertiary and tertiary education (levels 3-8) (total, aged 15-64). Trade%GDP stands for trade openness. Inflation is consumer price index annual percentage change. Fixed investment is the gross fixed capital formation (% of GDP) formerly gross domestic fixed investment, followed by Gov_Consump(%GDP) which denotes General government final consumption expenditure (% of GDP). ICTFBS is the fixed broadband subscriptions to high-speed access to the public Internet. The Crisis_dummy controls for the years 2020-21 (COVID-19 pandemic), initial_growth_3, initial_ growth_5, initial_growth_7 refer to initial income for 3, 5, and 7 periods respectively and the L.log_Real_GDP_per controls for the initial income for the levels analysis model.

3. The inclusiveness index in the countries from the less inclusive category shows significant results in longer-term changes but is negatively and statistically insignificantly correlated at levels (Table 5). This suggests that improvements in inclusiveness positively associate with GDP growth over time in the less inclusive EU member states and an immediate result is unlikely.

Table 5

Determinants of Real GDP per capita (log) change and levels (less inclusive EU countries)

Variable	3-year change (b/se)	5-year change (b/se)	7-year change (b/se)	Levels (b/se)
composite_indicator	0.008669** (0.0033272)	0.0097717*** (0.0025732)	0.0158012*** (0.003885)	-0.0016496 (0.0022237)
Pop-by.education_ avt	0.005431* (0.0026323)	0.0043454* (0.0023429)	0.0082403* (0.0039038)	0.0036342** (0.0014263)
Trade%GDP	0.0008373 (0.005824)	0.003195 (0.0008888)	0.0007323 (0.0010728)	0.0009026 (0.005114)
Infl	0.060809 (0.0035422)	0.0172781*** (0.0041261)	0.0121957*** (0.0039455)	0.0055277*** (0.0013149)
Fixed investment (~)	-0.0037329 (0.04713)	0.0032924 (0.0032823)	0.023671 (0.0045515)	-0.026539 (0.028972)
Gov_ Consump(%GDP)	-0.013148 (0.0108573)	-0.0039127 (0.0086358)	-0.0075506 (0.0107572)	-0.014005* (0.0068526)
ICT(FBS)	2.98e-09 (5.72e-09)	-5.65e-09 (8.10e-09)	-1.38e-08 (9.70e-09)	-1.71e-09 (2.51e-09)
Crisis_dummy	-0.0426349 (0.0267516)	-0.0234643 (0.0154041)	-0.0092035 (0.0160863)	-0.0034863 (0.0189575)
initial_3growth_ base	-0.1036766 (0.0906834)			
initial_5growth_ base		-0.445549*** (0.0509927)		
initial_7growth_ base			-0.3767756*** (0.0922287)	
Llog_Real_GDP_per				0.9694651*** (0.0359497)
Constant	-0.1974256 (1.049591)	2.852891*** (0.5936531)	1.270292 (0.8394868)	0.4618437 (0.4881986)
Observations	125	97	69	153

Source: Own processing using Stata18 software based on Eurostat and World Bank data (2010-2021)

Notes: Both country- and time-effects are included. *, **, and *** denote significance at the, respectively, 10 percent, 5 percent, and 1 percent levels. Robust t-statistics are in parentheses. The dependent variable is Real GDP per capita (log) 3, 5, 7-year change and levels. The composite_indicator is the computed inclusivity indicator that represents the benefit sharing and participation, Pop-by_education_ avt stands for the population by educational attainment level upper secondary, post-secondary non-tertiary and tertiary education (levels 3-8) (total, aged 15-64). Trade%GDP stands for trade openness. Inflation is consumer price index annual percentage change. Fixed investment is the gross fixed capital formation (% of GDP) formerly gross domestic fixed investment, followed by Gov_Consump(%GDP) which denotes General government final consumption expenditure (% of GDP). ICTFBS is the fixed broadband subscriptions to high-speed access to the public Internet. The Crisis_dummy controls for the years 2020-21 (COVID-19 pandemic), initial_growth_3, initial_ growth_5, initial_growth_7 refer to initial income for 3, 5, and 7 periods respectively and the L.log_Real_GDP_per controls for the initial income for the levels analysis model.

Generally speaking, the inclusiveness index is a significant predictor of GDP per capita growth over different periods, and the initial level of GDP per capita plays a crucial role in determining subsequent growth rates. The consistent patterns across various specifications hint at confidence in the robustness of the models.

CONCLUSION

The aim of the research was to explore the relationship between inclusiveness and growth within the EU-27 countries shifting the focus from the pro-poor to the pro-employed at risk of poverty perspective. To this end a new inclusiveness index was developed focusing on benefit-sharing and participation dimensions where the benefit-sharing is represented by income inequality and the in-work at risk of poverty and the participation is represented by employment ratio. Then, the correlation between the computed inclusiveness index and economic growth was analyzed, controlling for established determinants of growth in the case of the 27 EU countries as well as per groups of inclusiveness.

Thus, with regard to the set hypotheses, the following can be inferred. In the case of the first hypothesis the findings show that the developed inclusiveness index is positively associated with the logarithm of Real GDP per capita, thus validating hypothesis (H1). This shows that regions with higher inclusiveness scores usually enjoy greater economic prosperity.

The findings also reveal that more socio-economically developed EU countries tend to exhibit higher levels of inclusiveness, thus proving hypothesis (H2). However, there are exceptions.

We can consider hypothesis (H3) also valid given that the computed inclusiveness index has emerged as a significant correlation-based determinant of Real GDP per capita over both short and medium-term periods showing sustainability of fostering inclusive growth, strengthened by the noticed growth convergence trends.

At a large scale the findings suggest that enhancing inclusiveness by reducing economic disparities can be an effective strategy for sustainable economic growth. Increasing the employment ratio is important but it should come along with decent wages for the employees and by reducing income inequality. Disparities persist, requiring tailored interventions.

Future research directions could explore establishing causality to further understand the causal effect of inclusiveness index and economic growth, possibly on a larger set of data. This would potentially strengthen the argument for adopting inclusive policies as a tool to foster economic prosperity across the EU.

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KEY DRIVERS OF THE RUSSIAN ECONOMY'S RESILIENCE DESPITE POST-UKRAINE WAR SANCTIONS

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SUMMARY

Amid the current economic environment dominated by the widespread consequences of the Russian-Ukrainian war, the economy of the Russian Federation has shown surprising resilience despite the unprecedented international sanctions. These sanctions, imposed by the European Union, USA, and other Western economies, target numerous sectors, from energy to transport and banking. Nonetheless, Russian authorities have managed to revitalize the economy, overcoming a brief recession in 2022 and achieving recovery in 2023, with optimistic forecasts for 2024. Our research hypothesizes that the primary drivers sustaining the Russian economy are closely linked to its reliance on energy exports and strategic international partnerships. Furthermore, it posits that the current economic environment, characterized by sanctions and shifting global dynamics, has significantly reshaped the Russian Federation's patterns of international cooperation, including trade flows and foreign direct investment. By employing a mixed-method approach that integrates a comprehensive review of recent literature with quantitative analyses of international trade and FDI trends, this study seeks to validate these hypotheses and provide a nuanced understanding of the evolving economic landscape in Russian Federation. Our findings indicate that although the sanctions had a severe impact in the first year, reshaping the international partnerships of the Russian Federation, the current "Pivot to Asia" strategy and the partnership with China have opened new possibilities for international cooperation. Additionally, growing energy exports have successfully fueled Russian economic growth. Despite the initial exodus of foreign capital during 2022, recent legal initiatives and new regulations have slowed the drop in FDI.

Keywords: Russian economy, Russian - Ukrainian war, sanctions, international trade, FDI

INTRODUCTION

From 2022 (when the Russian authorities made the ill-fated decision to illegally invade Ukraine) until present, the economy of the Russian Federation has been "under siege" by unprecedented economic sanctions (imposed by a large part of the international community, but especially by the EU Member States and the USA). As a result, many of its international partnerships have faced serious challenges, especially those with Western democracies.

Between Western countries and the Russian Federation, there is now what can be called a true "frozen partnership." However, as a countermeasure to this phenomenon, which has negatively impacted Russian international trade, cooperation with "friendly" states has been expanded (according to the national ideology, this term refers to countries that chose not to impose sanctions on Russian Federation).

Against this background it should be noted that free trade plays a crucial role in sustaining economic growth from a theoretical perspective, as highlighted by the comparative advantage theory. This theory posits that nations thrive economically when they specialize in producing goods and services where they hold an efficiency edge and engage in trade with other countries. Developed by David Ricardo in the early 19th century, the theory of comparative advantage also asserts that countries gain by specializing in the production of goods and services. By trading these goods with other nations, countries can allocate resources more effectively, increase productivity, and foster economic growth. For the Russian Federation, free trade has been particularly significant due to its reliance on energy exports, which became a cornerstone of its post-Soviet economic growth. Sanctions targeting its energy exports, particularly the loss of the European Union as a major trading partner, have significantly undermined its economic performance, restricting access to critical revenues and markets. Similar trends can be observed in the case of Iran, another energy exporter, where trade sanctions have drastically limited its ability to engage in global trade, leading to stunted economic development and resource misallocation. These examples underscore the broader implications of trade disruptions on growth trajectories, especially for nations heavily reliant on a narrow export base. Moreover, from the perspective of Endogenous Growth Theory, which emphasizes the critical role of technology and innovation in fostering economic development, one could argue that the growth of the Russian economy has been significantly hampered by the trade bans imposed by the EU and the US. These restrictions, particularly those targeting technology imports crucial for energy drilling and other key sectors such as aviation, have severely limited Russia's ability to modernize and sustain economic expansion. Endogenous Growth Theory highlights that in a knowledge-based economy, investments in technology and human capital create spillover effects, leading to sustained economic returns. For the Russian economy, which has long depended on Western technological imports, this reliance has exposed a significant vulnerability under the strain of sanctions. These sanctions have restricted access to critical technologies, creating immediate challenges for sectors such as energy, aviation, and manufacturing. In response, Russian authorities have increased investments in domestic technological development and innovation to reduce dependency on external sources. However, this transition is inherently a long-term process, while the urgent technological demands of key industries require immediate solutions, exacerbating the strain on the economy.

Moreover, Dependency Theory that critiques the overreliance of economies on a single commodity sector, highlighting how such dependence exposes countries to external shocks and perpetuates structural vulnerabilities can be applied to explain why the sanctions had an important impact of growth in the Russian federation. In the case of the Russian Federation, its heavy reliance on energy exports—particularly oil and natural gas— has been significantly challenged by sanctions and, more critically, by the European Union's strategic efforts to reduce reliance on Russian energy imports.

Through initiatives such as the Green Deal and the REPowerEU strategy, the EU has not only prioritized the transition to renewable energy sources but also sought to diversify its energy supply to enhance energy security. These measures, aimed at achieving both climate goals and geopolitical independence, have drastically curtailed Russian Federation' access to its most lucrative energy market. This shift has further exposed the vulnerabilities of an economic model rooted in energy trade, forcing the Russian Federation to confront the pressing need for diversification and long-term economic restructuring. Without significant progress in reducing this dependency, Russia risks prolonged economic stagnation in a rapidly evolving global energy landscape.

Currently, the hierarchy of the Russian Federation's main trading partners is dominated by BRICS member states, reflecting the magnitude of the divide between Russian Federation and the West, a significant divide comparable with that of the Cold War. Nevertheless, the pivot of Russia's energy trade (the sector most affected by numerous embargoes) towards Asia, and especially China, is proving to be a slow process and one marked by high costs.

However, during the two years of sanctions and restrictions, despite pronounced isolation in global financial markets, the Russian Federation's "fortress" economy has proved its resilience and the ability to overcome severe crises. The strengths of the Russian economy have been, on one hand, its abundant natural resources (which support massive energy exports) and, on the other hand, low external debt and monetary policies that kept inflationary pressures under control while supporting the recovery of the rubble.

LITERATURE REVIEW

The ongoing Russian-Ukrainian conflict has ignited extensive debates in recent academic literature (Lin et al., 2023; Izzeldin et al., 2023; Maurya, Bansal & Mishra, 2023). While some analyses address the geopolitical implications for trade and regional cooperation (Kivalov, 2023), others focus on the domino effects of international sanctions on the global economic outlook (Thangavel & Chandra, 2024). Moreover, our investigation of recent literature, using the Web of Science Core Collection database, indicates a relatively low number of studies dedicated to the resilience of the Russian economy in the current geopolitical and economic context. Some studies show the implications of the conflict on the delay of sustainable development goals (Pereira, et al., 2022), while others highlight the various implications of the conflict on the Russia-China-India triangle (Luo, 2023). Some authors focus on the sanctions' impact on energy trade (Chen, et al., 2023; Ngoma, 2024), while others emphasize the risks to European energy security (Drăgoi, 2023).

Recent approaches (Clichici & Drăgoi, 2023) show how financial sanctions have reshaped the Russian monetary and banking systems, revealing their extraordinary resilience. However, few studies have been conducted on the global resilience of the Russian economy. Kuvalin (2022) discusses the risks and opportunities for the Russian economy under such tough external sanctions, stating that "under dramatic foreign policy pressure on Russia, it is necessary to significantly expand the scope of mobilization (planning) tools to provide a prompt solution to such structural problems as the full-fledged revival of key economic sectors, infrastructure development, and elimination of regional imbalances." While the majority of international analyses highlight the negative effects of sanctions, some scholars discuss the so-called "gift" of sanctions, which have allowed Russian authorities to pursue a large-scale reform process and shift international cooperation. For instance, Galbraith (2024) argues that "when applied to a large, resource-rich, technically proficient economy, after a period of shock and adjustments, sanctions are isomorphic to a strict policy of trade protection, industrial policy, and capital controls." The authors suggest that this is indeed the case for the Russian Federation, which, in the absence of the isolationism of sanctions, "could not plausibly have implemented protectionism on its own initiative," concluding that in this sense "sanctions were a gift to the Russian state and war effort."

Considering these factors, our research will focus on the tangible effects of the conflict on the Russian economy while highlighting the elements that have enabled its remarkable resilience in these challenging circumstances. We believe this provides a fresh and original analysis of the Russian economy's fluctuations in recent years.

RESEARCH METHODOLOGY

Our methodological design employs a mixed-methods approach, combining a solid literature review analysis with a quantitative approach to provide a comprehensive understanding of the Russian economy during the post-sanctions period. We utilize a comparative approach to examine the evolution of key macroeconomic indicators from 2022 to 2023, drawing on the latest national data (from Rosstat and the Bank of Russia) and international statistics (from the International Monetary Fund, World Bank, and European Commission).

To supplement this quantitative analysis, we conduct qualitative research focused on document analysis. This includes reviewing relevant literature on sanctions and countermeasures implemented by Russian authorities. Specifically, we will analyze the main measures taken by the Russian government and the Bank of Russia to mitigate the negative effects of sanctions and facilitate economic recovery.

The selected macroeconomic indicators aim to provide a comprehensive overview of the Russian economy, focusing on GDP growth in the post-sanctions era, inflationary pressures, trade dynamics under sanctions, and the fiscal-budgetary situation. We believe that these indicators are well-suited to reveal the Russian economy's evolution since the outbreak of the conflict.

Additionally, our concluding remarks will explore three potential scenarios for the future evolution of the Russian economy. These scenarios will be based on projections from prestigious international forums (such as the OECD, IMF, and World Bank) and will consider various factors, including potential developments in the conflict and the current international economic landscape. Each scenario will highlight the implications for the Russian economy, providing a nuanced perspective on future challenges and opportunities.

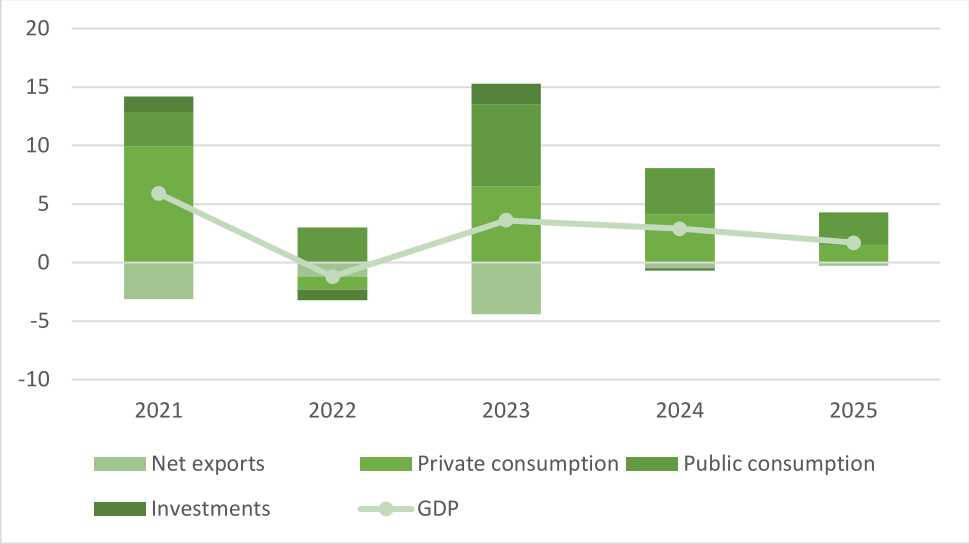
Finally, our analysis will include a discussion on the effectiveness of sanctions as they pertain to the Russian economy. We will evaluate the current sanctions' impact and propose necessary steps that could enhance their effectiveness, aiming to penetrate the defensive mechanisms of the Russian economic "fortress."

MAIN RESULTS

According to the latest report published by the Central Bank of the Russian Federation (Bank of Russia, 2024), in 2023, the Russian economy experienced a remarkable recovery, with a GDP growth rate of 3.6%. This revival, considered surprising by analysts from the European Commission (EC, 2024), is all the more impressive given that it followed the recession of 2022, triggered by multiple waves of sanctions imposed on the Russian Federation as punitive measures for launching the illegal and unprovoked military invasion of Ukraine. According to EU analysts, the economic recovery in 2023 occurred mainly due to increased private consumption, driven by rising wages and heightened consumer confidence (Figure 1). Additionally, the European Commission's analysis notes that higher government spending supported private consumption through payments and transfers to the families of Russian soldiers stationed on the frontlines in Ukraine, while also stimulating other public investments.

Figure 1

GDP Growth and Main Contributors (%)



Source: Author based on European Commission (2024). Spring Economic Forecasts. Russian Federation.

Note: The data for the year 2025 are forecasts by EU

After 2022, it is estimated that Russian Federation's military spending accounted for around 4-5% of its GDP, a substantial share that underscores the central role of defense spending in the country's economic activity. This trend highlights the degree to which the Russian economy is intertwined with military expenditures, with limited diversification into other sectors of the economy. While previous budget plans had anticipated a leveling-off of government spending in 2025, the latest framework sees a 10% increase in total government expenditure for the coming year. A substantial portion of this growth—nearly 20%—is allocated to defense, marking the fourth consecutive year of significant military spending hikes. In contrast, other major spending categories, including social policy, will see only modest increases of 2–5%, insufficient to even offset inflation. This shift underscores the growing dominance of military spending in the Russian budget, with education and other sectors receiving reduced funding.

Over the four-year period from 2022 to 2025, Russian Federation's direct budget spending on the war is estimated to total at least RUB 50 trillion (USD 280 billion), far outpacing spending on education and other critical areas. The sharp rise in military spending diverts resources from essential sectors, putting pressure on Russian Federation' broader economic stability. To finance this increase, the government is shifting the tax burden more onto businesses, especially those outside the oil and gas sector, with expected hikes in corporate taxes and VAT. However, this heavy reliance on military spending is fraught with risks. Oil and gas revenues, which remain a crucial budget source, could face volatility if global oil prices decline, exacerbating financial strain. With the government projecting a 2.5% GDP growth and 4.5% inflation for 2025, these assumptions appear overly optimistic, considering the economic challenges and uncertainties surrounding defense expenditure.

Against this background one should note that while military spending may offer short-term boosts to GDP growth, such a reliance on the defense sector is unsustainable and ultimately detrimental to long-term economic health. Non-trade growth, driven largely by domestic military investments rather than exports or productive innovation, tends to distort economic priorities. It diverts resources away from crucial sectors such as technology, infrastructure, and education, which are essential for fostering sustainable and diversified growth. Moreover, excessive military spending can lead to inefficiencies, as defense expenditures typically do not generate immediate economic returns in the same way that investments in other industries might. This form of growth, heavily dependent on state-driven military spending, risks stalling once the geopolitical environment shifts or external pressures, such as sanctions, curtail access to resources. Therefore, while military investments can provide temporary boosts to GDP, this type of growth is ultimately fragile and incapable of ensuring long-term economic stability or resilience.

As shown by Figure 1, the spectacular increase in domestic demand to 6.4% in 2023 (compared to the modest rate of just 1.2% in 2022) was driven not only by private consumption but also by measures implemented by the Russian government aimed at substituting goods previously imported before the sanctions, as well as new investments and subsidies for expanding the military-industrial sector.

Regarding the situation of foreign direct investment (FDI), it should be noted that, against the backdrop of sanctions and the isolation of the Russian economy, its attractiveness to foreign investors diminished significantly. Thus, according to UNCTAD (2023) data, in the first year of sanctions, the inward FDI flows into the Russian Federation experienced a dramatic decline (-15.2 billion dollars in 2022, compared to 38.6 billion dollars in 2021), while in the second year (2023), these flows showed a slight recovery, reaching 0.8 billion dollars (UNCTAD, 2024). The drop in FDI inward flows in 2022 occurred because the tense geopolitical climate prompted various Western companies to suspend or limit their activities in the Russian market, while the slight increase in 2023 was due to various restrictive measures introduced by the Russian authorities to halt the outflow of foreign capital.

Against this background, it should also be noted that, starting in 2023, the Russian authorities managed to slow down the outflow of foreign capital by continuously complicating bureaucratic procedures. A recent analysis (AK&M, 2024) reveals that the number of transactions involving asset sales by foreign companies decreased to 97 in 2023 (from 109 in 2022), with the total value dropping to 11.14 billion dollars (compared to 16.31 billion dollars in 2022). The decrease in the unemployment rate to 3.2% in 2023, down from 3.9% in 2022, was due to high labor demand, caused by the reduced influx of foreign workers (resulting from the decline in immigration to the Russian Federation) and the increased demand for labor in the military sector. These trends are expected to persist as long as the war in Ukraine continues.

In 2023, Russian authorities achieved a remarkable reduction in the inflation rate, bringing it down to 5.9% compared to the peak of 13.7% reached in the first year of sanctions (2022). It should be noted that targeting an inflation rate of a maximum of 4% has been a long-term goal for the Central Bank of the Russian Federation, but the sanctions made this endeavor highly challenging. However, restrictive monetary policies (see Box 1) and maintaining a high-interest rate allowed for a significant reduction in inflationary pressures in the second year of international sanctions (Bank of Russia, 2023).

Box 1: Measures implemented by the Bank of Russia during 2022-2023

Both during the pandemic crisis and in the immediate period following the outbreak of the war in Ukraine, the Central Bank of the Russian Federation consistently pursued its goal of reducing inflation, as it is well known that achieving sustainable economic growth is challenging under high inflationary pressures.

2022 - Restrictive Monetary Policy Combined with an Increase in the Key Interest Rate

Starting in 2022, the Russian authorities implemented restrictive monetary policies, introduced capital controls, and maintained a high key interest rate. In July, the Central Bank of the Russian Federation began raising the key rate by 3.5 percentage points (pp), followed by a further increase of 8.5 pp in August, reaching 16% by the end of the year.

Higher interest rates encouraged savings, and the expansion of lending gradually slowed to a more balanced pace. Moreover, Russian companies' motivation to accumulate foreign currency while using ruble loans to finance their current expenditures decreased. As a result, in September 2022, the ruble exchange rate stabilized, while by December, inflation was visibly trending downward.

These measures were all the more necessary given that, in the first months of sanctions, inflation accelerated significantly, driven by the devaluation of the national currency due to a lack of foreign capital (following the freezing of foreign currency assets of the Central Bank of the Russian Federation, Russian banks, and certain sanctioned oligarchs). These developments were also accompanied by a sharp contraction in exports (also due to sanctions). Inflationary pressures were further fueled by increased consumer demand as people sought to purchase goods targeted by embargoes before prices rose significantly. This trend led to rapidly rising prices and, consequently, to the ruble's devaluation, which fed the inflationary spiral.

2023 - Measures to Support the Business Environment and Increase Financial Sector Resilience

The year 2023 marked a shift in the Central Bank of the Russian Federation's approach from crisis-management measures to initiatives aimed at eliminating potential vulnerabilities and strengthening the financial sector's resilience.

Thanks to the effectiveness of the measures implemented in 2022, financial institutions recovered, and lending registered an upward trend starting from the first months of 2023. To prevent an unsustainable credit spiral and over-indebtedness of the population, Russian authorities tightened requirements for loans granted to borrowers with a high debt service-to-income ratio (DSTI).

Mortgage loans were also targeted by the Central Bank's measures, as by the second quarter of 2023, the real estate market was already showing signs of "overheating" due to widespread subsidized mortgage lending through some government programs. As a result, the conditions for subsidized lending were adjusted, and the first signs of market stabilization were observed by the end of 2023.

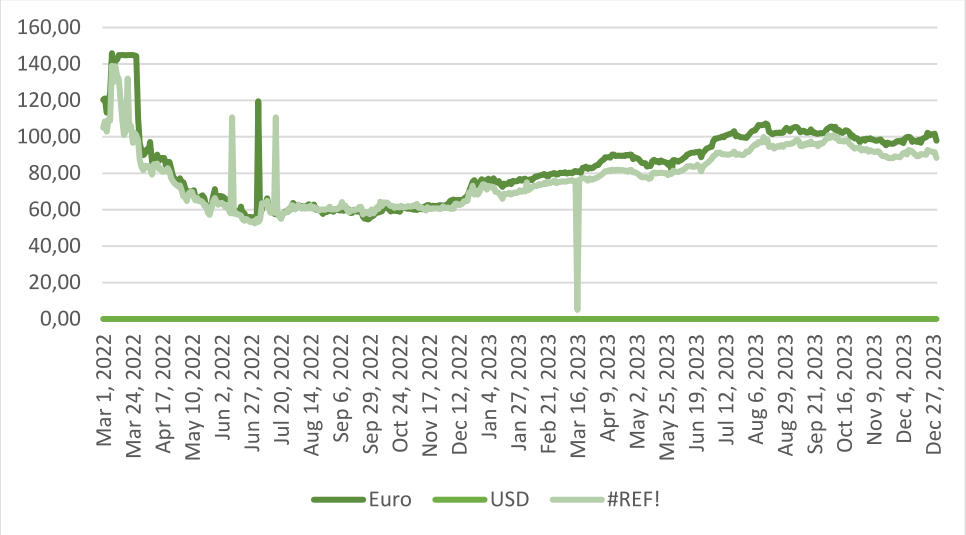
Many of the decisions taken by the Central Bank of the Russian Federation aimed to enhance the role of the financial market in the structural transformation of the national economy and to encourage long-term financing. Thus, new regulations were implemented to promote import financing, as well as projects for substitution and technological development. Companies began raising funds on the securities market again, and the stock market capitalization increased 1.5 times after the decline in 2022. The role of retail investors further expanded, as they now directly influence the growth of the securities market and the prospects for companies' initial public offerings (IPOs).

Source: Author based on Bank of Russia (2023). The Bank of Russia Report. Results in Brief. https://www.cbr.ru/

In 2023, Russian authorities successfully stabilized the ruble exchange rate against both the most representative currencies, the euro and the US dollar (USD), as mentioned earlier (Figure 2).

Figure 2.

Ruble Exchange Rate from March 2022 to December 2023



Source: Author based on data from the Central Bank of the Russian Federation (2024) and Moscow Exchange.

Note: *We chose to illustrate the post- March 2022 period after the imposition of the first waves of sanctions. We used some Moscow Exchange data because, starting from November 1, 2022, the Bank of Russia decided to stop publishing data on the euro/ruble and US dollar/ruble exchange rates on its website.*

As highlighted in Figure 2, in the first month after the sanctions (March 2022), the ruble experienced accelerated depreciation, trading at 120 rubles for one euro and 104 rubles for one US dollar. However, during the April-May 2022 period, Russian authorities managed to stabilize the national currency's exchange rate, and by December 2023, the exchange rate was 97 rubles for one euro and 88 rubles for one US dollar.

In November 2024, Russia's annual inflation rate rose to 8.9%, up from a five-month low of 8.5% in the previous month, surpassing market expectations of 8.7%. In response, the Bank of Russia kept its key rate at a high 21% in December 2024, a decision that reflects a more aggressive tightening of monetary conditions than initially anticipated in October. While the central bank argues that this measure is necessary to control inflation, the elevated interest rates have led to a significant cooling of credit activity, creating a tough environment for borrowers. The Bank of Russia maintains that these tight monetary conditions are essential for curbing inflation and returning it to the target of 4.5%, despite current price growth and high domestic demand.

However, in our opinion constantly raising the key rate poses a serious risk of overheating the economy. While the intention is to combat inflation, excessive tightening can stifle economic growth, reduce investment, and increase the burden on businesses and consumers. The current inflation rate remains far above the target of 4.5%, which highlights the challenge that Russian federation faces in achieving price stability. Despite the central bank's efforts to address inflationary pressures, the economic outlook remains uncertain, with high rates potentially exacerbating long-term risks and undermining the goal of sustainable growth.

Although the measures taken by Russian authorities were effective in stopping the devaluation of the national currency and rising inflation, the war effort and increased government spending took their toll on the public finances balance. In 2023, as in 2022, the Russian Federation continued to face a budget deficit. Moreover, in 2023, the budget deficit increased to 2.3% of GDP, compared to 1.4% of GDP in the previous year.

It should be noted that the increase in the budget deficit was a result of massive increases in public spending (especially those related to the war) and a decrease in revenues from oil and natural gas exports (a phenomenon resulting from multiple energy embargoes—described in Box 2—that came into effect as a consequence of the sanctions).

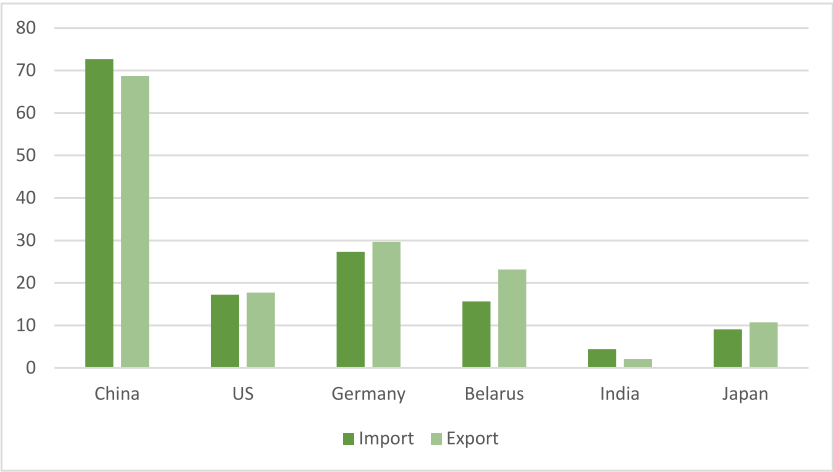
Box 2: Brief overview of the sanctions imposed on the Russian Federation during 2022-2023 that affected trade in energy products.

The state that imposed the sanctions	Effects of the sanctions
EU	Oil embargo: The EU imposed a gradual embargo on imports of Russian crude oil. By the end of 2022, the EU had eliminated nearly 90% of imports of Russian crude oil. • Restrictions on refined petroleum products: Imports of refined petroleum products from the Russian Federation, such as diesel and gasoline, were also banned. • Prohibition of insurance and reinsurance: Ships transporting Russian oil cannot obtain insurance from European companies, significantly limiting exports from the Russian Federation. • Price cap on oil: The EU implemented a price cap ($60 per barrel) for Russian oil exported to third countries.
US	Prohibition of energy imports: The US completely banned imports of oil, natural gas, and coal from Russia. • Secondary sanctions: Sanctions were imposed on non-American entities that do business with the Russian energy sector, including a ban on access to American financial markets. • Restrictions on energy technologies and equipment: The export of technologies and essential equipment for energy production and exploration from the Russian Federation was restricted.
These sanctions were intended to significantly reduce the Russian Federation's revenues from energy exports and limit its ability to finance the war in Ukraine.	

Source: Author's synthesis based on the studied documents.
Note: We chose to analyze the sanctions imposed by the EU and the US, given that they ranked among the top positions in the hierarchy of the Russian Federation's trading partners prior to the outbreak of the Russo-Ukrainian conflict.

As a result of the sanctions mentioned in Box 2, the growth rate of the Russian Federation's exports was significantly affected, recording -8.9% in 2023. Although there was a slight recovery compared to the previous year (-13.8% in 2022), it remains significantly lower than in the pre-sanction period. It is worth noting that the imposition of sanctions targeting Russia's energy trade led to a change in the hierarchy of the main countries that are the preferred destinations for these exports. In the first year following the imposition of international sanctions, EU countries no longer held supremacy as they did before the sanctions (Figure 3).

Figure 3.
Main trading partners of the Russian Federation in 2022 (billion dollars)



Source: Author based on "Russia trade data analysis." https://www.tradeimex.in/blogs/russia-export-and-import-statistics
Note: The year 2022 is the year for which we hold the latest available data.

When we look at historical data on both export and import one also noticed a substantial decrease for EU countries as preferred destinations compared with pandemic and even pre-pandemic levels (Table 1).

Table 1.

Export and import destination by country of the Russian Federation (% from total)

Year	Export (top 5 destination)	Import (top 5 destination)
2019	China: 13.9 Netherland: 9.92 Belarus: 4.95 Germany: 4.55 Italy: 3.98	China: 20.6 Germany: 12.4 Belarus: 5.66 Italy: 3.64 Poland: 3.32
2020	China: 15.2 UK: 7.6 Netherland: 6.7 Belarus: 4.7 Germany: 4.25	China: 23.1 Germany: 11.9 Belarus: 5.32 Italy: 3.5 Poland: 3.4
2021	China: 14,8 Netherland: 8.07 UK: 5.1 Italy: 4.27 Belarus: 4.2	China: 24.8 Germany: 11.4 Belarus: 5.79 Poland: 3.23 Italy: 3.17
2022	China: 20.7 India: 8.31 Turkey: 5.21 Germany: 5.7 Italy: 5.16	China: 31.6 Turkey: 4.74 Kazakhstan: 4.5 South Korea: 3.24 Japan: 2.22

Source: Author based on data from Atlas of Economic Complexity (https://oec.world/en/profile/country/rus?yearSelector1=2022&yearlyTradeFlowSelector=flow1)

Moreover, the impact of the sanctions, which have led to a significant geographical reorientation in the international trade of the Russian Federation, is evident in the fact that, according to Statista (2024), in 2023, revenues from trade between the Russian Federation and Asian countries amounted to $306.6 billion, while revenues from trade with European countries were only $85 billion.

If Russian exports were affected by sanctions, imports experienced a significant boom in 2023, with a growth rate of 12.5%, compared to the dramatic decline of 14.3% in the previous year. According to recent analyses (Astrov et al., 2024), the revitalization of imports, nearly reaching pre-war levels, occurred against the backdrop of accelerated imports from China and other countries that did not impose sanctions. At the same time, although imports of sanctioned goods from the EU were halted, member states continued to export goods not subject to sanctions, as indicated by the same analysis. Astrov et al. (2024) also noted that, in November 2023, imports to the Russian Federation from the EU amounted to $2.7 billion. Additionally, as a result of the sanctions, imports from other countries that did not impose sanctions increased, particularly from CIS member states (Commonwealth of Independent States), especially from Kyrgyzstan, Georgia, and Uzbekistan.

Against this background, it is worth mentioning that, according to Astrov et al. (2024), in August 2023, imports of aircraft from Armenia to the Russian Federation significantly increased, reaching $12 million. Before the war, these aircraft were exclusively supplied by EU-27 and other countries that imposed sanctions. Furthermore, it should be noted that since the beginning of the war, Russia's aerospace industry has faced major challenges in replacing old aircraft, and recent imports from Armenia represent the first notable purchase of this product in the post-sanctions period.

In 2023, the current account balance substantially decreased to 2.5% of GDP, compared to 10.5% of GDP in 2022, as a relaxed fiscal policy stimulated imports, while declining energy prices and the price cap imposed by the EU on Russian oil reduced export revenues, thus affecting the current account balance.

In 2023, the public debt of the Russian Federation remained low, although it increased slightly from the previous year to 19.5% of GDP, compared to 18.5% of GDP in 2022. The low level of indebtedness of the Russian economy has been an asset for its performance and stability in the second year following the imposition of international sanctions.

Overall, the evolution of key macroeconomic indicators reveals that the Russian economy demonstrated strong resilience in 2023, with its growth surpassing previous estimates from international analysts. Although the Russian economy faced a budget deficit for the second consecutive year, the balance of public finances was supported by the existence of the National Welfare Fund. For example, at the end of 2023, specifically in December, the Russian National Welfare Fund sold amounts totaling €537 million, 115 billion yuan, and 233 tons of gold to supplement budget revenues.

Most international analyses estimate that the recovery of the Russian economy will slow down in the 2024-2025 horizon, but the growth rate will be higher than in 2023. The European Commission's forecasts indicate a GDP growth rate of 2.9% in 2024 and 1.7% in 2025, while the latest IMF estimates are even more optimistic, predicting a GDP growth rate of 3.2% in 2024 (according to the World Economic Outlook Update data from July 2024).

According to a report published by the Bank of Russia in July 2024 (Bank of Russia, 2024), the Business Climate Indicator (BCI) remained at a higher level in the first half of 2024 (9.8) compared to 2023 (6.7), indicating a sustained stable growth rate in the business environment.

On the other hand, some analyses (Astrov, Kochenev & Stamer, 2024) suggest that the GDP growth rate could fall below 2% by the end of 2024 due to persistently high interest rates, which will negatively impact lending and somewhat diminish domestic demand. The same analysis points out that, given the lack of a foreseeable end to the Russia-Ukraine war in 2024, economic growth will continue to be supported by public consumption (especially military expenditures, which already accounted for 10% of GDP during 2022-2023). However, in the long term, the economy will be affected by various knowledge and technology gaps generated by the sanctions imposed. Additionally, these analysts believe that the long-term continuation of the war will deepen the economy's reliance on military expenditures, slowing or even stunting the development of other sectors not related to war efforts.

Regarding the maintenance of a stable economic climate, it is important to note that in 2024, the Central Bank of Russia will strengthen its restrictive monetary policy using a system of tools (auctions and standing facilities for providing and absorbing liquidity, as well as mandatory reserves) that take into account the specifics of the Russian economy and financial sector. This approach allows for keeping interbank lending rates (IBL) close to the key interest rate, regardless of the liquidity situation in the banking sector. IBL rates, in turn, influence other interest rates in the economy, enabling the Central Bank of the Russian Federation to communicate its monetary policy signals and influence inflation.

Despite such measures, international analysts' estimates indicate an increase in the inflation rate to 6.6% in 2024 (compared to 5.9% in 2023), followed by a possible decrease to 4.5% in 2025 if the measures taken by the Central Bank of the Russian Federation achieve the intended success.

In 2024, the Central Bank of the Russian Federation will continue to develop the digital ruble, which will be the third form of existence for the Russian ruble, in addition to cash and non-cash forms. In terms of its characteristics, the digital ruble will be similar to both cash and funds in bank accounts. Digital rubles, like cash, represent liabilities of the Central Bank of the Russian Federation issued in digital form, which is also typical for non-cash funds held by banks.

The introduction of the digital ruble will provide several benefits, such as better financial inclusion, even in remote and sparsely populated areas, the ability to access a digital wallet through any financial institution regardless of limited internet access, and the development of new payment infrastructure. The key advantage is that this third form of the Russian ruble will help optimize payment costs, reducing transaction expenses and supporting the competitiveness of the Russian economy. The introduction of the digital ruble will not affect the fundamental principles of the banking system's operation or the principles of monetary policy implementation.

Regarding the evolution of the budget balance, it should be noted that the Russian Federation will continue to face a budget deficit during the 2024-2025 period, estimated at 1.8% of GDP and 1.5% of GDP, respectively, although slightly reduced compared to 2023. To address this situation and return to a budget surplus, new regulations will be implemented to improve tax and revenue collection for the federal budget.

On May 29, 2024, the Ministry of Finance of the Russian Federation presented a package of legislative proposals to the Government of the Russian Federation aimed at improving the fiscal system. This package includes significant amendments to the Tax Code, the Budget Code, and the Budget Law for the period 2024-2026. Among the most significant changes is the revision of the progressive tax scale for personal income tax and the introduction of new tax rates based on an individual's annual income.

Additionally, the amendments include a revision of the approach to calculating the fixed profit tax for controlled foreign corporations (CFCs), a modification of the corporate profit tax rate, and adjustments to the simplified taxation system (STS). The legislative proposal modifies the procedure for determining the amount of fixed profit for a CFC according to Article 227.2 of the Russian Tax Code. The current version of the law stipulates that a controlling individual must pay a fixed annual fee of 5 million rubles, regardless of the number of CFCs they control. However, under the proposed new procedure, the amount due on the fixed

profit of a CFC will be a multiple of the number of CFCs controlled. Consequently, the taxpayer will be assigned the fixed profit of each foreign company they control, and the amount owed will increase proportionally with the number of foreign companies.

Furthermore, the legislative proposal foresees an increase in the corporate profit tax rate from 20% to 25%. It is not expected that this change will affect the conditions for applying various favorable tax incentive regimes, such as protection and investment support agreements, special investment contracts, and benefits for residents of special economic zones.

In 2024, a strong recovery of exports is estimated, with a growth rate of 4.5% (compared to a collapse of -8.9% in 2023), driven by the Russian economy adapting to sanctions and identifying new export destinations. This positive trend is likely to continue into 2025. Meanwhile, the growth rate of imports is projected to decrease in 2024 compared to the previous year (12.5% in 2023), down to 8.0%, with an even more significant deceleration anticipated in 2025 (5.2%). These developments could occur amid the imposition of new sanctions, as well as efforts by sanctioning countries to curb sanction evasion. Currently, many sanctions are being circumvented, with goods from the EU being imported by "friendly" countries and resold to the Russian Federation, evidenced by the remarkable increase in imports from CIS countries, with which there was no similar relationship prior to the sanctions.

DISCUSSION AND CONCLUSION

Analyzing the developments of key macroeconomic indicators from 2022 to 2024, along with the countermeasures against sanctions and economic stabilization efforts implemented by Russian authorities, we believe, based on the previously presented data, that three potential scenarios[1] could unfold for the Russian economy.

The first scenario is the continuation of the current status quo, with relatively stable economic growth, while sanctions remain unchanged. However, if the sanctions remains in their actual form, the pressures on the national currency are estimated to remain for the foreseeable future. One should note that the measures implemented by the Russian authorities in 2022, such as restrictive monetary policies and capital controls, combined with aggressive hikes in the key interest rate, aimed at stabilizing the ruble and curbing inflationary pressures in the wake of economic sanctions, proved effective in the short term by creating a more favorable environment for savings and tempering the pace of lending. However, replicating such a strategy in the current context might not yield the same level of success. The Russian economy, which has been subjected to sustained sanctions and growing isolation, faces deeper structural vulnerabilities and a shrinking fiscal space. An attempt to stabilize inflation through similar monetary tightening could risk exacerbating the economic slowdown, as it would further constrain access to credit for businesses and consumers alike, discouraging investment and dampening domestic demand. Additionally, while a high interest rate might temporarily support the currency, it could also deter the limited inflow of foreign capital and potentially push more companies to seek alternatives outside the formal financial system, undermining long-term stability. Given the heightened uncertainty and global economic headwinds, a strict monetary approach might therefore fail to strike a balance between stabilizing inflation and sustaining growth, making it a less viable tool for managing the current economic environment in Russia.

THE SECOND SCENARIO INVOLVES WORSENING CONDITIONS DUE TO STRONG FRAGMENTATION IN THE GLOBAL ECONOMY

In this scenario, we anticipate a high risk of new sanctions for the Russian economy, accompanied by recessions in many advanced economies, making the geopolitical and economic landscape even more challenging. Although the Russian Federation has successfully pivoted some of its energy trade towards Asia, particularly China, this shift comes at a significant cost. The deepening economic partnership has led to a growing dependence on Chinese markets, compelling Russia to accept lower energy prices and incur substantial expenses for the development of new infrastructure projects. For instance, while the Power of Siberia 1 pipeline is operational, it cannot fully accommodate the surplus natural gas that previously flowed to European markets, leaving Russia with limited alternatives to redirect its energy exports. The ongoing Power of Siberia 2 project, which aims to enhance this capacity, is both lengthy and expensive, adding to the strain. Although some European countries, such as Germany, have substantially reduced energy imports from Russia, finding new trading partners will be a complex, long-term, and costly endeavor for Russian authorities. While the emerging BRICS alliance could offer new avenues for economic cooperation, the impact of technological and trade restrictions imposed by Western economies will have enduring consequences on Russia's industrial and technological development.

[1] *Note: The presented scenarios are based on the author's conclusions regarding the potential evolution of the geopolitical landscape, particularly the threat of new sanctions, and the predicted and discussed evolution of key macroeconomic indicators. These scenarios are not derived from other papers in the literature reviewed but represent the author's specific contribution.*

In this scenario, the Russian Federation risks replacing its previous dependency on the European market with a new reliance on the Chinese market. Given the historical ups and downs in Sino-Russian relations, including past ideological rifts and the border conflict during the USSR era, this deepened dependency could place the Russian economy in a precarious position, making it vulnerable to shifts in Chinese strategic interests and reducing its economic autonomy in the foreseeable future.

A third more negative scenario for economic development suggests that the global economy will become more deglobalized, marked by divisions into various blocs among advanced economies due to deepening geopolitical tensions. This process has been visible since 2018-2019 and was exacerbated by the onset of the war in Ukraine after 2022.

If global fragmentation intensifies, countries will seek to localize their production capacities and establish partnerships with neighboring countries and geopolitical allies. In this case, the pressure from sanctions on the Russian economy could become more severe. The division into regional blocs will negatively affect global trade, hinder global economic growth, and decrease demand for Russian exports. Consequently, the Russian economy could contract in 2025, with the potential for economic growth to resume in 2026, albeit at a slower pace than currently observed.

Given all this possible future scenarios, our main finding shows that future developments in the Russian economy will undoubtedly hinge on the military and economic decisions made by the Russian government, with economic growth increasingly reliant on energy exports and government spending supporting military industries. Revenues from energy exports will depend on fluctuations in international oil prices and other raw materials exported by the Russian Federation. Furthermore, global pressure on Russia to cease military aggression in Ukraine will also impact economic growth, particularly if new sanctions are imposed. While the first two forces are beyond the direct control of Western democracies, the third force is certainly within their power.

Our second finding shows that a new approach on the sanctions should be enforced to increase their efficiency.

Firstly, sanctions, as a key element of economic policy, can be effective when they have clear and limited objectives, are targeted, difficult to evade, and are evaluated and adjusted as necessary. Therefore, sanctions are most effective when not imposed "at a slow or incremental pace, as in this case, they may simply strengthen the targeted government" (Hufbauer, 2009). At this juncture, a comprehensive cost-benefit analysis of the sanctions applied by the international community would be extremely beneficial in guiding the targeting and implementation of any future sanctions, should Russia's military aggression in Ukraine persist.

Secondly, some elements of future sanctions are becoming increasingly clear. First, the focus should be on energy exports that fuel the Russian war machine. It is impossible to undermine the macroeconomic stability of a commodity-exporting country during periods of explosive price growth unless decisive measures are taken to restrict export volumes. Second, Russia's integration into the global economy and ongoing support from countries like China necessitate a new collaborative approach from international actors who should identify the most effective channels for imposing sanctions and halting illegal evasion activities (including involving private sector entities in monitoring transactions and controlling supply chains).

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CHANGING PATTERNS OF TRANSITION TO ADULTHOOD IN MOLDOVA BEFORE AND AFTER THE 1990S TRANSFORMATION

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SUMMARY

The transition to adulthood (TA) patterns are often classified into two broad categories: traditional and modern. This classification is usually confirmed by the research of trends of the age of transition events in developed countries. Fewer studies concentrate on or cover post-socialist societies. Both case and comparative studies suggested a more complex picture and challenged a uniform move from traditional to modern TA. This study explores the Moldovan society by classifying the patterns of the cohorts born in the pre-Gorbachev Soviet Era. The Latent Profile Analysis is applied to the Gender and Generation Survey 2020. To account for the gender- and period-specific trends, the sample was divided into four subsamples and analyzed independently. This allowed us to detect the clusters of TA in the continuum between the modern and traditional patterns. The changes in the patterns' timing and frequencies were analyzed. The study detects a substantial gender difference in trends. The male TA patterns witnessed slow and robust modernization. At the same time, the female TA patterns saw traditionalization and its reversal for the last Soviet-born birth cohorts. The analysis also suggests that the trends started and developed before the 1990s transformation. The study adds to our understanding of TA patterns in developing Europe and gives several methodological suggestions for further research.

Keywords: Transition to adulthood, life course, gender, generations, Latent Profile Analysis, Moldova

INTRODUCTION

There are various approaches to transition to adulthood (TA). This paper contributes to the line that focuses on the timing of events. Classically, the list has six positions: partnership, marriage, and childbirth, which are parts of the demographic transition (Mitrofanova, 2019), and finishing education, first employment, and leaving the parents, which are parts of the socio-economic transition. The list is not universal. The individuals also value them unequally (Nelson, 2009). For the reasons discussed in the methodology section, this study focuses on education, marriage, and childbirth. The research questions are as follows. What were the types of TA in Moldova among those born between the Interbellum and Perestroika? What were the trends in timing for the types? What are the trends in frequencies?

The means are the most usual way to analyze trends. For example, Billari and Liefbroer (2010) suggested that the TA in Europe can be analyzed with two poles: the traditional and the modern one. The traditional TA is defined as "early, contracted, and simple" (p. 60), and the modern one is "late, protracted, and complex" (p. 60). These findings were also supported by theoretical considerations, specifically, the Second Demographic Transition theory (Lesthaeghe & Van de Kaa, 1986). The theory links the overarching changes in demographic behavior, primarily fertility, with the large-scale values shift towards individualism, post-materialism, and the worldviews that allow for greater uncertainty (Lesthaeghe, 2014, Lesthaeghe, 2020; Sobotka, 2008). While the theory is criticized for its poor applicability to developing countries outside of Europe and "new Europes" a presupposition that the changes happen between long-term stable stages of development, and blinds spots linked with the sustainability of the traditional values or re-traditionalization, it is agreed that the theory is at least partially correct (Zaidi & Morgan, 2017). Other definitions of traditional and modern TAs exist, but they typically overlap. For example, in the post-Soviet context, Mitrofanova (2019, pp. 189–190) defined female traditional TA as a condensed demographic transition that is done to the detriment of the economic transition (i.e., the former is short and intense, while the latter is typically postponed, especially if there was a child). The male traditional TA consists of early economic transition and postponed demographic one, with both intense. Thus, Mitrofanova defined TA modernization as the convergence of the patterns rather than postponement for both genders.

However, the trends in means are undesirable for several reasons. First, they may erase the less pronounced but existing trends. Even if a new pattern overtakes an old one, both persist for some time (Raz-Yurovich, 2017 argues for it theoretically; Sobotka, 2008 shows it regarding the Second Demographic Transition). The trend in means may not show the earliest signs, as they would only be outliers. The less pronounced trends are erased this way. The cluster analysis allows for evading this problem. While TA is a priori unpredictable (Dennison, 2016), classifying it has three major advantages. First, events frequently happen in sets. Shotgun marriages and failure to continue education due to early pregnancy are one of the examples. In the context of the theory of TA modernization, it would correspond to determining the timing and the variation of the event. Second, aggregating similar TA patterns will show changes in TA composition over time. Some trends can be overarching, e.g., attributed to the structural environment (e.g., raising costs of having children, Werding, 2014) or related to the changes in individuals' values (Sobotka, 2008). However, they may have differing effects on the individuals. For example, economic hardships are known to put contradictory pressure on the values of traditional men and women (Enneli & Enneli, 2017). Third, TA has several strong predictors, including the parental socio-economic position (SEP). Billari et al. (2019) exhaustingly showed that SEP influences not only the opportunities but also the desires and motivation of the individuals. Overall, it can be said that these mechanisms were found

in every country under consideration (France, Austria, and Bulgaria).

The rest of the paper is organized as follows. In the literature review, the results of the previous cluster analyses of TA in other societies are listed. Next, in the Methodology section, the data, its subsampling, and the choice of the clustering methods are discussed in detail. Next, the results are presented, and the trends that they reveal. Finally, the profiles and trends are compared to those in other countries. The limitations of the method and the alternatives are also covered in the last section.

LITERATURE REVIEW

In this section, the profiles from the previous research are reviewed. The findings are scarce for Moldova, especially due to the data availability, but the research on the other countries to the East of the Hajnal line (Hajnal, 1965) may add context.

Crismaru (2024) is the only researcher who classified TAs in Moldova. She based her study on the GGS survey and focused on the socio-economic positions of those aged 35 and younger. She primarily focused on the (un-) privileged positions of the youth and the (binary) facts if, as of the moment of the interview, they were married, had a child, had a job, etc. She found four types of youth. Those having *complex transitions* are predominantly employed and tend to be men, live in an urban area, and have university degrees. On the other pole, there is *precarious transition*. On average, this cluster's members have lower education and are unemployed. The third pattern holds an intermediate position regarding education but also has a majority of women on maternity leave. Finally, the fourth class predominantly consists of female homemakers. The gender compositions of the contemporary TA clusters show that gender differences also exist in Moldova. For example, an average male with uncertain transition graduates by the age of 18, marries 6 years later, and has a firstborn in less than a year. An average female with uncertain transition graduates when 19 years old, marries in 2.5 years, and gives birth in less than a year. Crismaru achieves this by stressing the individuals' socio-economic position. Note that in this case, the female graduations happen almost 1.5 years after the male ones, which is the reverse of the classical gender gap in events' timing. In the context of patterns' classification by timing alone, these two patterns may be viewed as separate and distinct. It is thus more plausible to divide the sample by gender.

On the Russian data, Mitrofanova (2019) showed that the TA differs by the area of residence (rural vs. urban) and by the level of education. She suggested that the convergence with the West European (modern) TA can be found among those born in the 1980s, but those from urban and more educated strata exhibited it earlier. She also suggested three types of transition. The 1930s-1960s birth cohorts exhibited traditional TAs, the 1980s having the modern ones, and the 1970s having the transitional type of TA with the risk of marriage significantly rising due to norms and laws shifting overnight. The TAs were different for different genders. Women tended to have a fast demographic transition to the detriment of the socio-economic one. For men, the socio-economic transition preceded the demographic one. At the same time, for both genders, prolonging and postponement existed, which means that the Russian TA modernization was about inter-gender convergence. While its beginning, overall, shifted for the later generations, the transition became more and more intensive, with the 1970s generations having it the shortest (many of the 1980s generations had not finished their TA by the moment of the data collection). Earlier, economic hardships were found to intensify TAs (Enneli & Enneli, 2017), but even though the 1970s generations experienced the 1990s economic crisis, the intensification these individuals experienced looks like a part of a trend.

Lesnard et al. (2016) have similar findings for some post-socialist countries. There, especially in Bulgaria, Slovakia, and to lesser extents Poland, Hungary, and Estonia, shift towards the patterns that skip the period of living alone, having a job, or the whole socio-economic transition. At the same time, most of the Central and Northern European countries converge towards the patterns that value independence, i.e., leaving the parents, finding a job, and finishing education. A later comparative study of TA confirmed that the post-socialist countries (Russia-Estonia) are still relatively closer to each other than to the Western countries in spite of cultural differences (Mitrofanova, 2023; Mitrofanova & Makarov, 2023). The researchers allow for the possibility of East-West non-convergence because of the cultural and social differences (Billari et al., 2019) but generally accept that Europe to the East of the Hajnal line participates in the Second Demographic Transition (Sobotka, 2008; Zakharov, 2008). If the traditional vs. modern duality is accepted, the comparative European studies show that in the 1930-1950s birth cohort, the average TA was becoming more traditional. At the same time, for some genders, countries, and events, the cohort with the earliest and the most uniformly invariant timing could be the 1940s or 1960s birth cohort.

To sum up, the literature review shows that the patterns of TA substantially changed for the 1940-1980s birth cohort. Even accounting for the variance, two poles can be found. The traditional TA is early and short, and the modern TA is late and protracted. Overall, the countries moved in the direction of the second type of TA. However, the comparative studies also showed that the trends are different in different cultures. The TAs in the post-socialist countries are earlier and more congested compared to those in the West. The studies also show that the genders must have different paths to the modern transition to adulthood, with the female TA having to

change more drastically. The Moldova-specific study showed that the women may have drastically diverging paths, with some having radically traditional and others having radically modern TA.

Overall, it is hypothesized that the Moldovan 1940-1980s generations will show no less than two TA patterns: traditional and modern. The modern patterns happen later and are longer than the traditional ones. As the more chaotic TA pattern, the variance of the events' timing should also be higher for the modern profile. There may be two objectives. First, the modern TA of past generations can overlap with the traditional TA of the contemporary generations. This is the case if the modern TA also existed in the earlier cohorts and both modern and traditional poles were under the influence of the trends. The probability of this happening increases if one accounts for gender (i.e., modern female TA of the past can overlap with traditional TA of the present). This suggests dividing the sample by gender and generation. Second, I also expect the set of patterns to not be limited to two because of the generations that had their TA during the 1990s transformation.

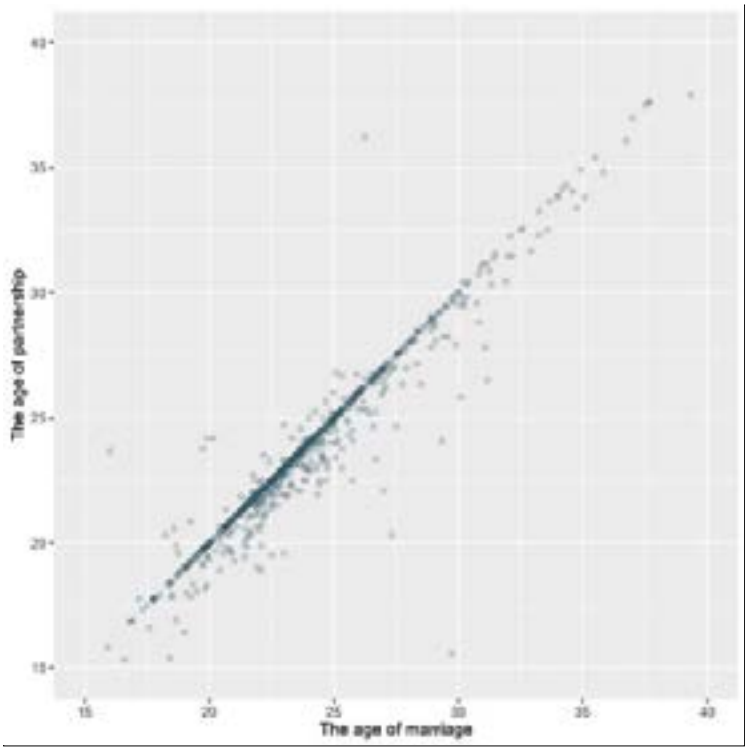
METHODS

To check the hypothesis, I used the Gender and Generation 2020 Survey (GGS, 2020) in Moldova. The oldest individuals were aged 79, which corresponded to the 1941 birth year. The cut-off point for the youngest generation was set at 35 years old, corresponding to the 1985 birth year cohort. In this sense, the study is complementary to the one by Crismaru (2024), who considered individuals aged 35 or younger. The cut-off point was introduced due to the issue of self-censorship, which is described to a greater extent below. As the literature review showed, for each TA profile, there is a gap between men and women vis-à-vis the timing of their events. Thus, the sample is divided into four by gender and the birth cohort. This allows dividing between those who experienced the 1990s economic and political crisis during their TA and those who did not. To do this, I used the share of people whose last event happened after December 31, 1991. January 1, 1961, was chosen as the division date as for the 1960 birth cohort, the share was 9%, and for the 1961 cohort, it was 13%, i.e., exceeded 10%. For shortness, the 1941 – 1960 cohort will be referred to as *Early,* and the 1961 – 1985 cohort will be referred to as *Late*.

GGS in Moldova gives information on four events of the respondents: the first partnership (with the exception of several special cases, it is coded as lhi04_1 or dem30b), the first marriage (dem_28b or lhi_05b), the first childbirth (lhi29 with a condition on childbirth lhi26), and the education ending (dem_08). The data on the first partnership were not used as a result for three reasons. First, it is highly correlated with the data on marriage, with Pearson's correlation varying between 0.81 and 0.92 for some subsamples (see Fig. 1 for one of the correlation plots). This leads to the lack of convergence[1] of the models that take correlation into account and additional weight to marriage for the other models. Second, it is incomplete, and due to the way the questionnaire was constructed, we do not know when some of the respondents had their partnership started (specifically, in the cases when the respondent lives separately from their spouse). Third, partnerships were stigmatized in the Soviet Union (Mitrofanova, 2019), which implies that the event was not a milestone for the older generations (and was united with marriage), and the data on it is subject to (deliberate or unconscious) self-censorship. Even though two other very useful milestones (first employment and separation) are not covered here, one can still spot and classify patterns of transition with education, marriage, and childbirth.

1 Specifically, the model with 30000 iterations and 3000 steps for each iteration did not converge, whereas it is more standard to use models with 7000 iterations and 300 steps (Spurk et al., 2020).

Figure 1. Scatter Plot of the Age of Partnership and the Age of Marriage. Pearson correlation = 0.92.

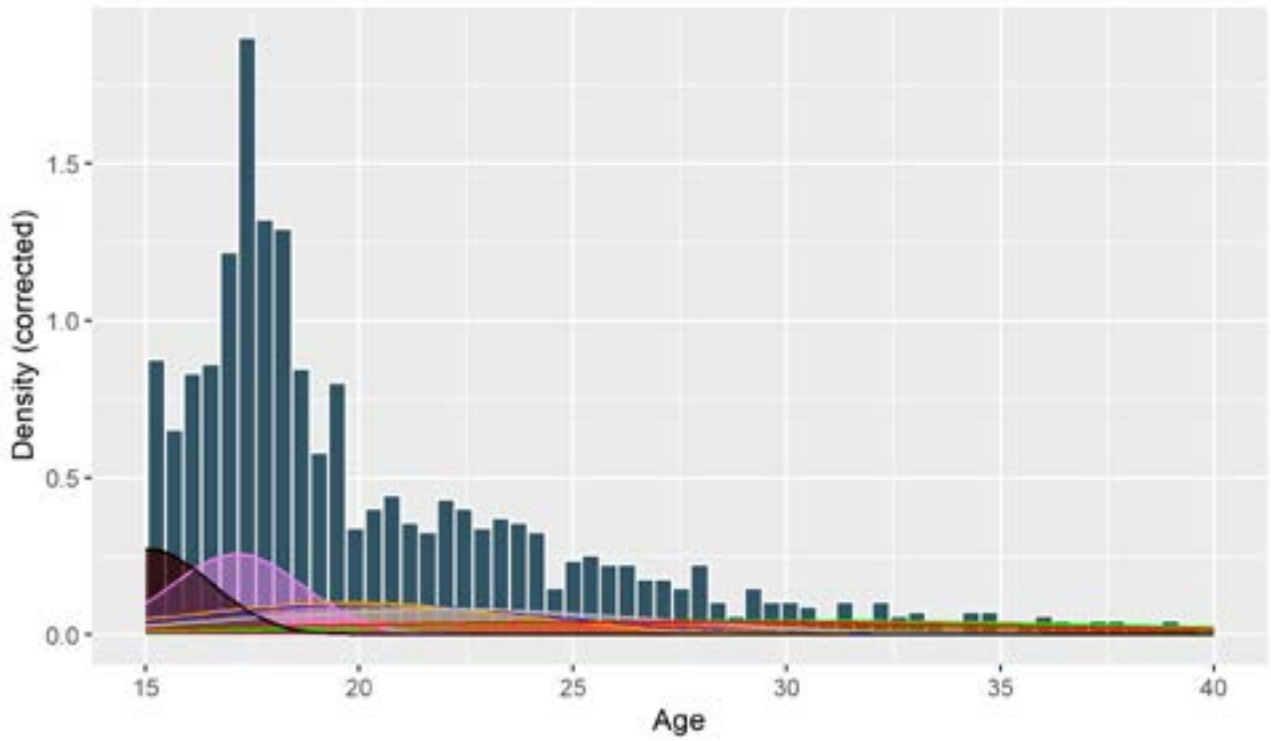


Source: Author's Own Calculations Based on Gender and Generation Survey, 2020, for 1941 – 1960 Males.

The Latent Class family model was chosen because it consistently performs better than other clustering techniques, including K-means and HCPC (Nadeekantha et al., 2023; Preud'homme et al., 2021). It is a more classical approach to use longitudinal versions of Latent Class Analysis (Helske & Helske, 2019). The greatest disadvantage of the Hidden Mixture Markov Chains is the assumption of the independence of events. In many instances, this is not the case. Covariances are also likely to be different for different transition patterns. For example, marriages are likely to have a stronger link with childbirth in traditional patterns than in modern ones. Latent Profile Analysis Model 6 (Rosenberg & Van Lissa, 2018) allows for this flexibility. As I show in the Analysis section, this addition sometimes leads to ambiguity but is generally well-founded.

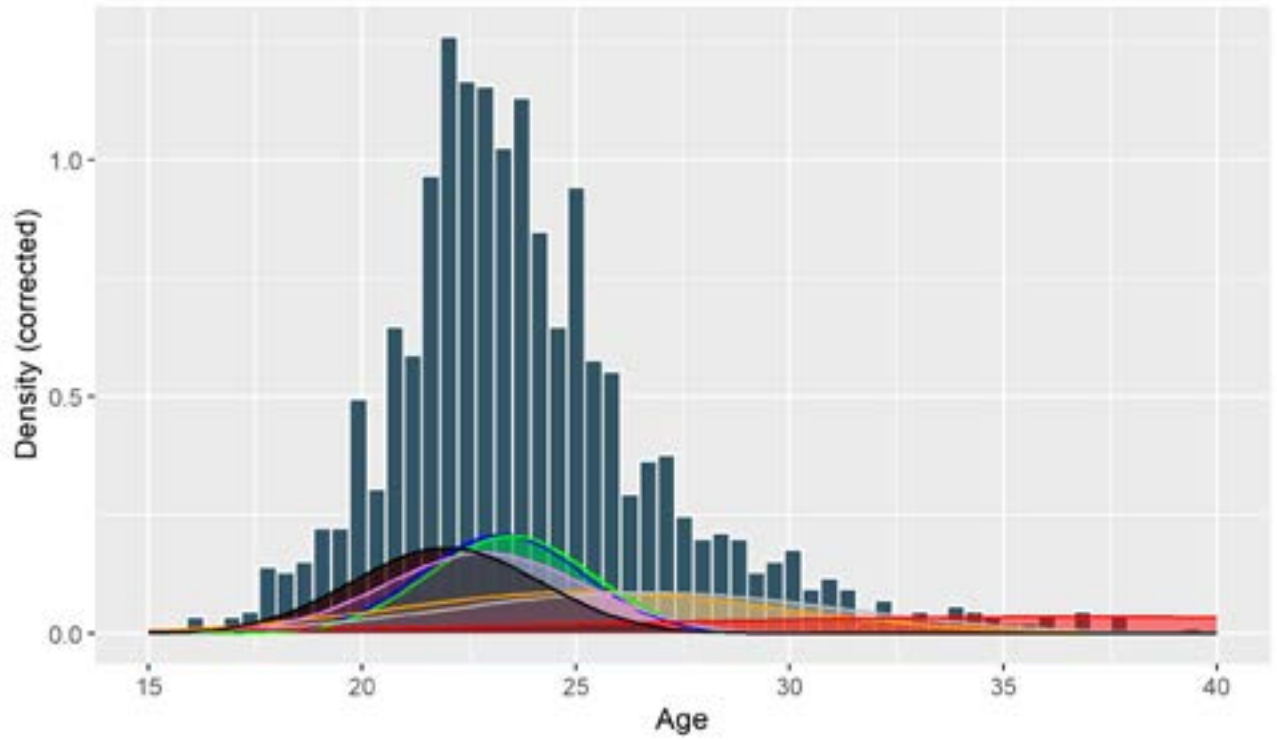
There are two problems arising from the Latent Profile Analysis. First, the number of profiles is likely to be overinflated due to the skewness of the data. LPA assumes that the distribution of variables (inside one profile) is normal (non-skewed), which is sometimes impossible. This is exemplified below, in the Fig. 2 and 3, which show the data for the early male cohort. Specifically, the pink and the red profiles (closer to the lower values) represent a traditional TA: early graduation (the age of 15 for the red one, the age of 17 for the pink one), marriage at 22, and childbirth two years later (for both profiles). In the scope of this study, this is a substantial reason to treat them as one. An additional argument in favor of it is the fact that the red profile accounts for 4% of the subsample, which is acceptable but quite undesirable. Finally, when facing such profiles, I also account for the events' variance and timing distribution. In the context of the study, any event's variance higher than 40 means that the event's timing is unpredictable.

Figure 2. An Example of Profile Overinflation. Bars: Graduation Dates. Distribution Functions: Hypothetical Seven Profiles Model.



Source: *Author's Own Calculations Based on Gender and Generation Survey, 2020, for 1941 – 1960 Males.*

Figure 3. An Example of Profile Overinflation. Bars: Marriage Dates. Distribution Functions: Hypothetical Seven Profiles Model.



Source: *Author's Own Calculations Based on Gender and Generation Survey, 2020, for 1941 – 1960 Males.*

Second, it does not allow for missing data, and the data for the three events had to be imputed. The data are unlikely to be missing at random (i.e., it is more likely that people who never marry are from the modern profiles), which leads to a bias (Heymans & Twisk, 2022). This was also the reason for cutting off the individuals aged 34 or younger. The data on their TA should be imputated to a far greater extent, and it will be based on the previous cohorts' data alone. It will thus lead to a bias and add less substantial information. Recognizing that it can skew the results, the data on the missing variables is presented in Table 1.

With the algorithm exemplified above, the number of profiles was chosen for each subsample (see Table 2 for the fit indices). In every case, AIC suggests more profiles. However, for each subsample, the models with seven profiles and more had at least one unacceptably small profile (i.e., the size is 3% or less, which could only be acceptable if the entropy was 80% or more (Spurk et al., 2020)).

Table 1. Missing Values Distribution Across Subsamples.

Subsample	Education	Marriage	Childbirth
Early male	0.8%	13.4%	9.8%
Early female	0.9%	21.6%	9.3%
Late male	0.6%	23.2%	7.7%
Late female	0.5%	17%	17.3%

Source: Author's Own Calculations Based on Gender and Generation Survey, 2020.

Table 2. Fit indices for the Latent Profile Analysis Models with Covariates for Four Subsamples.

Cohort	Gender	Number of classes	AIC	AWE	BIC	Entropy	Size of the smallest class, %	Size of the biggest class, %
early	male	1	24307,9	24445,5	24355,2	100	100	100
		2	21239,2	21532,4	21339,1	83	19,9	80,1
		3	20717,8	21166,3	20870,2	70,5	13,5	55,5
		4	20520	**21124**	20725,1	62,2	10,7	35,9
		5	20405,1	21164,1	20662,7	63,5	5,7	46,7
		6	20341,9	21256,1	**20652,1**	63,5	3,8	45,4
		7	**20306,8**	21376,1	20669,6	65,8	2,3	46
	female	1	40422,1	40569,4	40474,3	100	100	100
		2	35198,5	35511,9	35308,5	81,6	25,7	74,3
		3	34530,1	35009,5	34698	69,7	10,6	62,4
		4	34200,6	**34845,9**	34426,4	66,8	5,5	57,3
		5	34088	34899,1	34371,7	61,2	4,1	40
		6	33998,2	34975,2	**34339,8**	63,9	1,9	40,9
		7	**33942,1**	35085	34341,6	57,6	1,7	23,6

Cohort	Gender	Number of classes	AIC	AWE	BIC	Entropy	Size of the smallest class, %	Size of the biggest class, %
later	male	1	25093,2	25231,8	25141	100	100	100
		2	22495,1	22790,2	22595,9	77,4	25,3	74,7
		3	22137,3	22588,8	22291,3	68,8	12,6	61
		4	21899,7	**22507,5**	22106,7	61,2	12,9	52,9
		5	21807,2	22571,2	22067,3	62,7	6,6	54,7
		6	21732,1	22652,2	**22045,3**	66,3	5	53,2
		7	21687,5	22763,7	22053,8	66,1	4,2	42,5
		8	21658,3	22890,7	22077,7	68,9	0,6	51
		9	**21634,1**	23022,7	22106,6	66,6	1,7	41,1
	female	1	37347,8	37493,4	37399,1	100	100	100
		2	32400	32710	32508,3	82,1	29,7	70,3
		3	31832,6	32306,9	31998	72,2	14,6	63,3
		4	31486,3	**32124,7**	31708,7	66,3	7,5	40,6
		5	31335,9	32138,4	31615,3	64,8	7,4	42,6
		6	31219,6	32186,1	31556	65,7	4,5	44,4
		7	31156,2	32286,8	31549,6	61,3	4	39,9
		8	31092,9	32387,5	**31543,4**	66,2	3,4	35,4
		9	**31047,6**	32506,1	31555	66,1	3,6	33

Source: Author's Own Calculations Based on Gender and Generation Survey, 2020.

Analysis

Tables 3 and 4 depict the means and the variances of the events for men and women, by profile and generation. Figures 5 and 6 display them, aggregated by five-year cohorts. In most cases, the covariances were only significant between the marriages and childbirth, and the data on them is not provided here.

Table 3. Profiles of TA for men. Mean values of the events' timing are without parentheses and the variance of the events' timings are in parentheses. Note that these are the events' variances, and not the means' variances.

1941 – 1960 cohort				1961 - 1985 cohort			
Class name	Education	Marriage	Childbirth	Class name	Education	Marriage	Childbirth
Early School	17.1	23	24.4	Early School	16.9	24.8	25.8
(Traditional)	(2.9)	(6.6)	(7.2)	(Traditional)	(1.9)	(11.9)	(12)
Intermediate	19.3	23	23.9	Intermediate	19.3	23.3	24.1
	(12.6)	(3.4)	(3.4)		(14.1)	(3.6)	(4.1)
Resuming education	26	25	26.1	Resuming education	23.1	26.3	28.2
	(66.2)	(11.5)	(12.1)		(71.8)	(19.2)	(22.3)
Unpredictable	21.3	28.9	29.8	Great Delay	17.6	29.1	29.1
	(40.4)	(75.7)	(47)		(7.2)	(62.2)	(46.1)

Table 4. Profiles of TA for women. Mean values of the events' timing are without parentheses and the variance of the events' timings are in parentheses. Note that these are the events' variances, and not the means' variances.

1941 – 1960 cohort				1961 - 1985 cohort			
Class name	**Education**	**Marriage**	**Childbirth**	**Class name**	**Education**	**Marriage**	**Childbirth**
Early School	17.3	20.4	21.4	**Early School**	17.3	19.5	20.4
(Traditional)	(5.6)	(3.4)	(3.6)	**(Traditional)**	(2.8)	(2.2)	(2.4)
Intermediate	17.8	22.9	24.5	**Intermediate**	18.6	22.2	23.4
	(11.2)	(13.6)	(15.4)		(12.7)	(9.6)	(9.9)
Resuming Education	23	22.5	23.6	**Resuming Education**	28	22.6	23.6
	(49.9)	(8.2)	(8.3)		(97.9)	(13.4)	(16.9)
Unpredictable	22.9	30.3	28.9	**Great Delay**	17.9	27.4	27.7
	(72)	(82.4)	(44.4)		(10.4)	(41.5)	(43.3)

Source: Author's Own Calculations Based on Gender and Generation Survey, 2020.

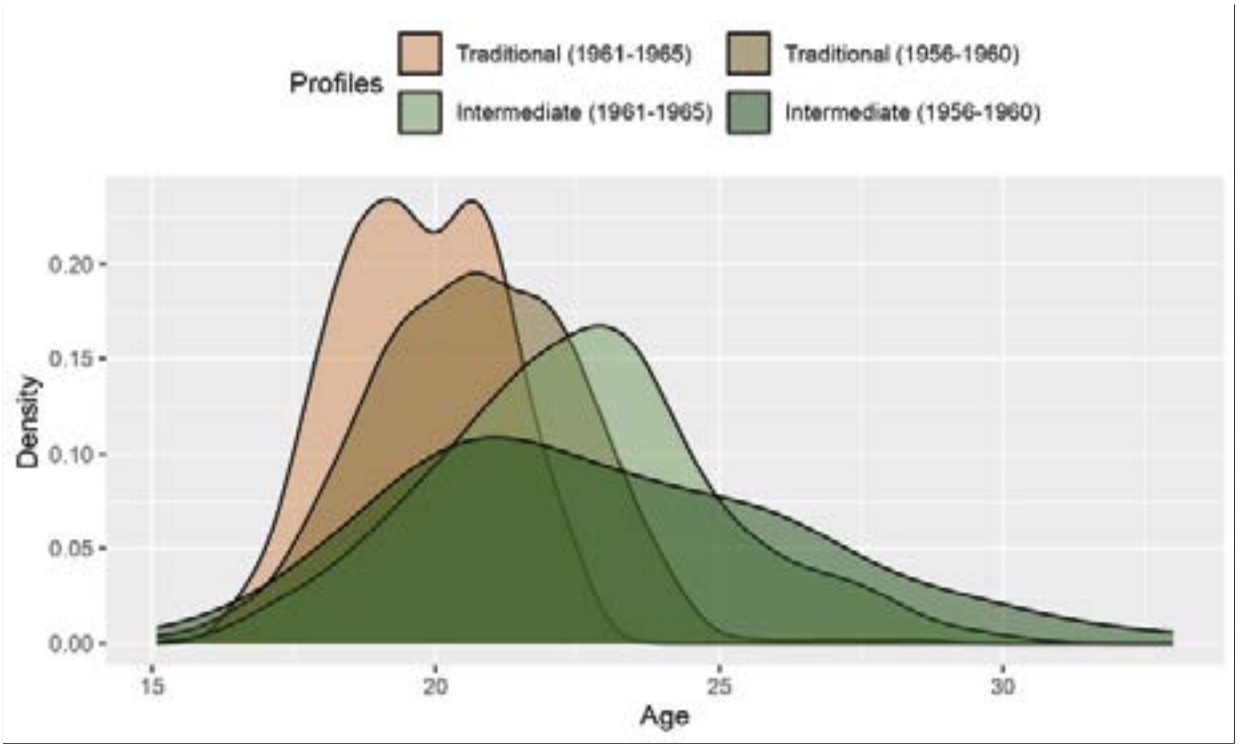
The most standing out profiles are the Unpredictable ones, whose demographic transition was very late and uncertain. The variance of their education timing was also relatively high for both genders. While it is suggested to primarily consider the profile as technical (i.e., there may be many patterns inside of it, but the number of individuals does not allow for detecting them), the profile shows that in the earlier cohorts, there was a great number of paths that one could have turned to. One of such diversities is suggested by the fact that the mean timing of childbirth for the Unpredictable women born in 1941-1960 is 1.5 years lower than the timing of their marriage.

For both genders, one can find corresponding profiles in both cohorts by the timing and the timing's variance. In some cases, the indicators virtually did not change. For example, in both cohorts, the intermediate male profile is finishing education at 19, marrying in early 23, and having a child by the age of 24. For some profiles, the variance was the only criterion to classify an individual. For example, the Great Delay profile consists of those having a high variance of demographic events and a low variance of (typically, secondary) education. The Resuming Education profile unites those with the average timing of demographic transition and highly unpredictable timing of education. Notice that the profile is quite different for men and women. For the former, the mean age of re-education fell from 26 to 23.1, while for the latter, the mean age rose from 23 to 28. The Unpredictable profile unites those with high variance for all the events and without a well-defined pattern of TA.

The Unpredictable profile is the only profile that does not have a corresponding profile in the later generation. For both genders' late cohort, there is a profile without a clear pattern of demographic transition, but their education timing was rather stable and early. This suggests that the Unpredictable ones are actually delaying the demographic transition, but this group contains those who finished school early and those who resumed their education. For men, the latter subgroup vanished. Combined with the fact that the female Resuming education profile declined significantly after the 1960/1961 boundary, this highlights the decline in the number of those coming back to education among women.

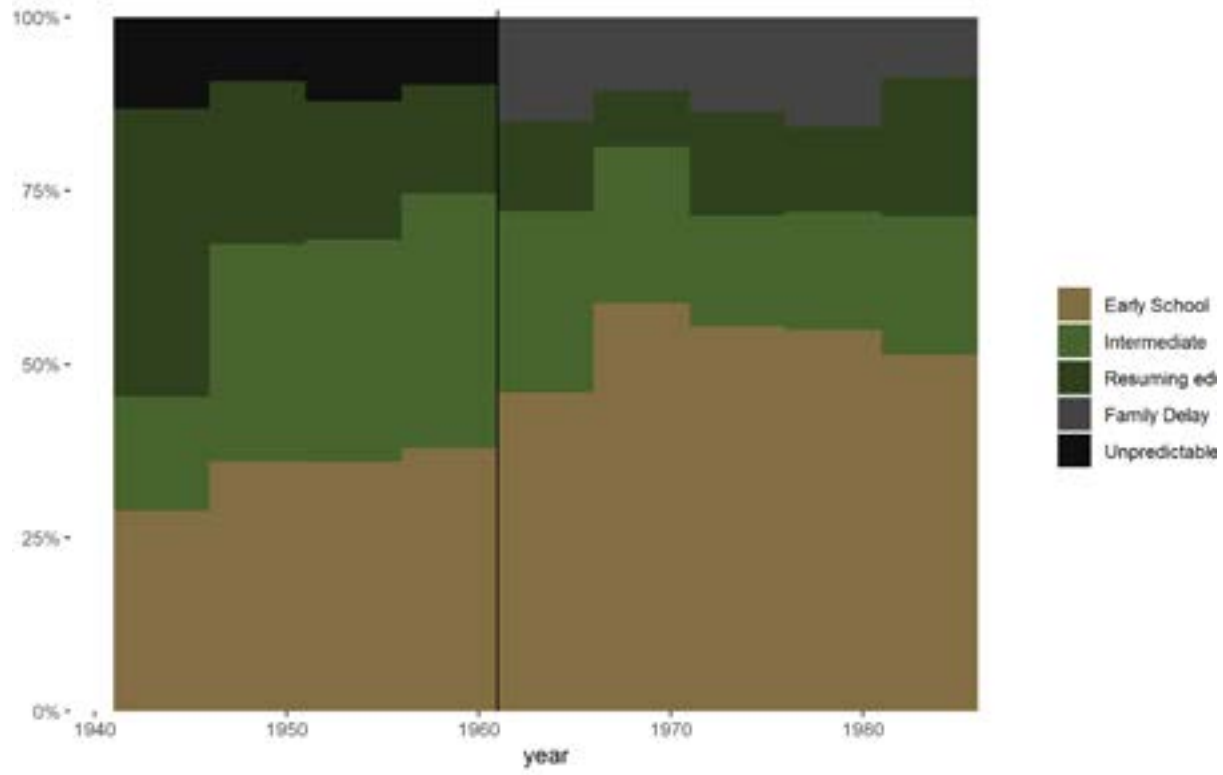
When evaluating the changes in the corresponding profiles, one can highlight several trends. For men, the timing of the demographic transition rose for the Early School and Resuming education profiles by 1.5-2 years. At the same time, there were no changes for the Intermediate ones, which makes them the most stable male profile. Note that if, for the early cohort, the Intermediate profile was in between what can be called the Traditional profile and the more uncertain ones, this position disappeared in the late cohort. On the contrary, for the Late cohort, there was an inter-profile negative correlation between the timing of graduation and the timing of the demographic events, as the profiles that have early graduations have relatively late marriages and childbirths and vice versa. For women, on the contrary, the timing of the demographic events, on average, fell for the Traditional and Intermediate profiles by around 1 year. To some extent, this change was compensated by the changes in the composition, as the share of the Intermediate TA rose and the share of the Traditional TA fell after the 1960/1961 boundary (see Figure 6). In other words, there is a substantial share of TAs that can be labeled as Traditional before the 1960/1961 boundary that are labeled as Intermediate after it. However, the changes are not a side effect of a methodological nature (see Figure 4, which shows that the distributions for both Intermediate and Traditional profiles shift towards younger ages). Such changes show that it was reasonable to divide between men and women and to expect different trends.

Figure 4. The Distribution of the Marriage Timing for the Five-Year Cohorts to Both Sides of the 1960/1961 Boundary.



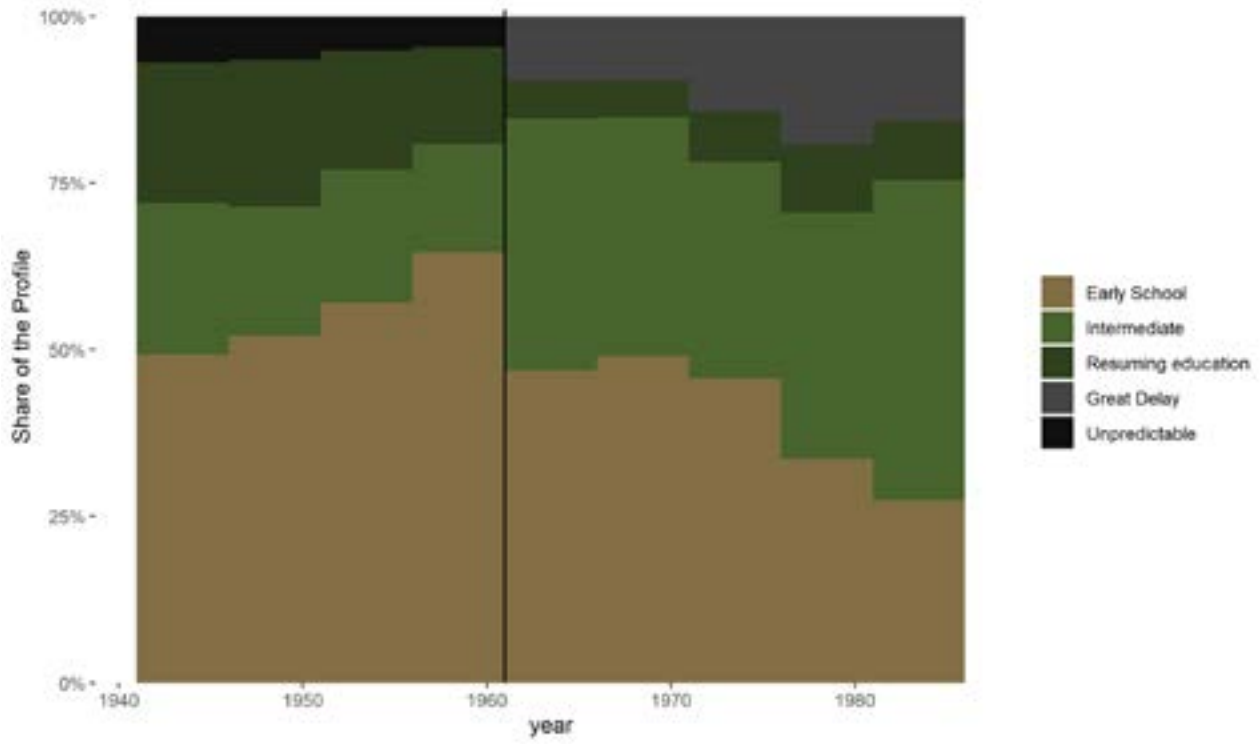
Source: *Author's Own Calculations Based on Gender and Generation Survey, 2020.*

Figure 5. Shares of the Male Profiles, 1941-1960 and 1961-1985 cohorts.



Source: *Author's Own Calculations Based on Gender and Generation Survey, 2020.*

Figure 6. Shares of the Female Profiles, 1941-1960 and 1961-1985 cohorts.



Source: *Author's Own Calculations Based on Gender and Generation Survey, 2020.*

The female Resuming education and Intermediate patterns are the only patterns with a growing age of graduation. On average, the index fell for men (20.3 years in the first cohort vs. 18.5 years in the second cohort) and stayed the same for women (19 years). While this can be explained by the shifts in the Soviet re-education policies (see above), this can also be the result of sampling (i.e., the cutting-off of the youngest generations) and migration.

When analyzing the changes in profile composition, one can notice that the male profiles show a greater level of continuity than the female ones. While the people born in 1960 and those born in 1961 can be expected to have very similar profiles of TA, they are analyzed together with different peer groups: the former are analyzed together with those born in the 1940s and the latter are analyzed with those born in the 1980s. For men, this did not influence the profiles' composition, and the 1960/1961 boundary was passed without visible discontinuity (see Figs. 4 and 5). For women, the composition changed more visibly. The Early School pattern was split. Most of this profile's members had their demographic transition earlier, shifting both marriage and childbirth one year towards lower ages. Note that in both cohorts the events' timing is quite low-variance; together with mean timing, this allows classifying them as the traditional profiles. Similarly, the Resuming Education profile split and the mean timing of their education shifted towards higher ages. Overall, while there is a justification for such a shift, this suggests that one needs a greater number of female sub-cohorts for further analysis.

One can find the trends in the popularity of certain transition patterns. For example, the number of those re-educating sharply fell for men from 41.5% to just 15.6% between 1940 and 1961 and continued to fall further to just 8.1% for those born in 1966-1970. The share then slowly grew to 20% for the 1981-1985 cohort. The last two cohorts were 25 between 1991 and 1995 and between 2006 and 2010, correspondingly, and thus had differing re-education opportunities. However, the sharp decline in the beginning must correspond to the changes in the Soviet education policy. This early decline is virtually non-existent for the female "Resuming education" profile, and, as discussed above, the profile virtually evaporates.

CONCLUSION AND DISCUSSION

In this study, the Transition to Adulthood for the Moldovan 1941-1985 birth cohorts was analyzed. Rather than accepting that society uniformly moves from one pole (traditional TA) to another (modern TA), the TA patterns were classified by the events' timing and the timings' uniformity. The TA patterns were classified for two genders and two cohorts (1941-1960 and 1961-1985) separately, and for each subsample, four patterns were found, including early school, intermediate, and re-educational ones. The main novelty of this study is that it assumes that varying profiles existed in every birth cohort and that the profiles could have experienced varying trends, including (but not necessarily) modernization. The study showed that modernization happened indeed for some male profiles, but some other strata were unaffected by it. It also showed that the female pattern experienced traditionalization of their demographic patterns with one unsubstantial exception. At the same time, the composition of TA between the birth cohorts changed significantly over time, and the inter-gender differences in trends could have been hidden by such complementary compositional changes.

For both men and women, there was a noticeable group of people without a certain Transition to Adulthood pattern. For both genders, there was a stabilization of this pattern's graduation timing at earlier ages, but the timing of their marriage and childbirth was still uncertain. For men, the timing of education declined for all profiles. The share of the education-intensive profiles also declined until the 1981-1985 birth cohort. At the same time, the timing of the demographic events grew for the traditional and the resuming education profile. The Intermediate profile was the most stable for men whose transition, on average, spanned for five years. For women, the inter-generational continuity was less pronounced. Still, one can observe an increase in the graduation timing for all profiles (except for the Unpredictable one) and a fall in the demographic events' timing (except for those resuming education).

In some respects, the results of the study are in agreement with the previous studies' results. It shows that the most traditional birth cohort in Moldova was those born in the 1960s. After that, the proportion of those graduating and marrying in the later ages grew. The Russian data also shows that the earlier generations had a catch-up education for both genders but especially for women (Mitrofanova, 2019; Zakharov, 2008). Both genders enjoyed re-education in Moldova as well, but it was more popular among men of the 1940s birth cohort, and the share of women participating in the programs fell drastically after 1960. It also suggests that there is modernization of TA in Moldova, although the matter of the degree of convergence is out of the scope of the paper.

In this study, there was an attempt to differentiate between those virtually unaffected by the 1990s transformation and the rest. This delimitation of the cohorts naturally affected the profiles' calculations. It is plausible to suggest that those born in 1960 bear little difference from those born in 1961. However, the former were aggregated with those born in the 1940s and defined together with them, and the latter were aggregated with those born in the 1980s. This had a limited effect on the male profiles calculation, e.g., one can see that those finishing their education early started delaying it, but overall, one can also see continuity. It had a far more visible effect on the female profiles. While this is a natural part of the method, this result indicates that the aggregation proposed in this research should be revisited. One of the possible ways to do so is to subdivide them into ten-year groups. Note that some of the profiles had an unequal distribution over the years. If one divides the generations further, there is a risk the profiles become invisible.

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THE PARADOX OF EDUCATIONAL INVESTMENTS: A COMPARATIVE ANALYSIS OF WESTERN AND EASTERN EUROPE

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SUMMARY

Education is widely recognized as a key driver of economic growth, yet the effectiveness of public spending on education varies significantly across different economic and institutional contexts. The study examines the impact of lagged government investments in education, including higher and secondary education, on GDP per capita based on purchasing power parity (PPP) across European countries in the 21st century. The study differentiates between Western Europe, Eastern European EU member states, and Eastern European non-EU countries, analyzing investment trends and their effects on economic growth. Using a cross-country regression analysis based on data from the World Bank and the International Monetary Fund (2001–2023), the study incorporates lagged variables to establish causality. The findings reveal that while investments in education positively influence GDP growth per capita in Western European countries, their effects in Eastern Europe are more complex. In non-EU Eastern European countries, higher government spending on education does not necessarily translate into economic growth and, in some cases, correlates with lower growth rates. These disparities stem from differences in institutional efficiency, labor market structures, migration patterns, and the extent to which education systems align with economic demands. By providing a comparative perspective, this study contributes to the ongoing debate on the role of education in socio-economic development and highlights the need for tailored educational policies that account for country-specific economic and institutional conditions.

Keywords: *economic growth, education investments, causality, regression model, lagged variables*

INTRODUCTION

Education is one of the key factors of socio-economic development, affecting the level of labor force qualification, labor productivity and competitiveness of the national economy. The question of the degree of impact of public investment in education on economic growth has attracted the attention of researchers since the middle of the 20th century, when the first theoretical justifications of the relationship between the level of human capital and well-being of society appeared. Economists, starting with the theories of Gary Becker, Theodore Schultz and Hirofumi Uzawa, actively investigated the contribution of education to economic development, emphasizing the long-term effects of investment in human capital.

In the second half of the 20th century, research in this area focused mainly on assessing the impact of the overall level of education, as well as the significance of investment in higher education for economic growth. In countries with a high level of industrialization and technological development, it was educational investments that became the basis for the formation of a highly skilled workforce that ensured innovative progress and modernization of production (Schultz, 1961; Becker, 1964). At this time, there was a clear correlation between increased spending on education and GDP growth, which was confirmed by empirical studies (Denison, 1966; Psacharopoulos, 1981). Romer (1990), developing the theory of endogenous growth, emphasized that investment in human capital plays a key role in innovative development and productivity growth.

In the 21st century the very nature of access to knowledge has changed due to the digital transformation and the spread of the Internet. In the industrial era, formal education with well-defined levels was the primary method of acquiring knowledge and skills. Today, information technologies have made knowledge more accessible beyond the traditional educational system. In this regard, a debate has arisen in the academic community about how effective public investment in education is in the current context, especially in terms of its impact on economic growth.

On the one hand, proponents of continuing investment argue that education remains a critical factor in development, as it provides not only basic knowledge but also the skills needed to adapt to changes in the labor market. Studies show that investment in education contributes not only to GDP growth, but also to lower unemployment and improve public welfare (Bloom, Canning & Chan, 2006). On the other hand, several economists point to the need to reconsider traditional models of investment in education, arguing that new, more flexible forms of education and training may be in demand in the digital economy. For example, Goldin & Katz (2018) argue that traditional educational systems do not always have time to adapt to the rapid development of technology, leading to a gap between the supply and demand of skilled labor. It is also emphasized that the growth of the digital economy necessitates a rethinking of educational approaches, emphasizing the development of skills related to analytical thinking, adaptability and digital literacy, rather than just traditional academic education (McMillan & Rodrik, 2011).

Therefore, the need to reconsider the role and structure of government investment in education is relevant, especially in countries of the European region, where there are significant differences in funding levels, educational reform strategies and their economic impact. This study aims to analyze the relationship between government investment in education and economic growth in Western and Eastern Europe in the 21st century, as well as to identify the factors determining the effectiveness of these investments in the context of modern socio-economic transformations.

THEORETICAL AND CONCEPTUAL FRAMEWORK

The most important theories of economic growth in the mid-twentieth century - the Keynesian Harrod-Domar model (Harrod, 1939; Domar, 1946) and the neoclassical Solow model (Solow, 1956) - are models of exogenous economic growth, so they did not take into account the impact of investment in education on economy. However, by then economic science had already recognized the importance of education for the development of countries. The establishment of gross domestic product (GDP) as a generally accepted macroeconomic indicator of growth became one of the foundations for the development of endogenous economic growth models, including public investment in education. The first quantitative studies in this direction appeared in the 1960s. Along with the development of economic and mathematical models, qualitative analysis assessing the impact of educational expenditures on the economy was actively used. These studies laid the foundation for further research on the relationship between investment in education, labor productivity growth, and sustainable economic development.

Gary Becker (1964) laid the foundations for the concept of human capital, according to which education and training are key factors in economic growth and productivity growth. The benefits of investing in education manifest gradually, but they represent the most important factor for sustainable economic growth. Hirofumi Uzawa (1965) was one of the first to propose a model of endogenous economic growth that considers investment in education a major factor in sustainable development. Subsequently, studies by Nelson & Phelps (1966) showed that the returns to education are higher the more advanced a country's level of technological development. They also emphasized the existence of positive externalities of education, contributing to the acceleration of innovation processes and the diffusion of new technologies.

Lucas (1988) proposed a model of human capital accumulation, emphasizing its crucial role in long-term economic growth. Expanding on this idea, Romer (1990) introduced a model explaining long-term growth through investment in education, research, and technological innovation. He viewed education not only as an independent production factor, but also as a necessary condition for research and progress. In subsequent works, Romer (1994) emphasized that the impact of education on the economy is largely determined by the level of technical and technological development.

Shaw (1992) noted that developing countries can grow faster than developed countries through technological borrowing, as importing and mastering new technologies is less costly than creating them. However, he argued that public funding of education plays an important role in both developed economies (stimulating innovation) and developing economies (technology adaptation and imitation). Judson (1998) found that countries with high GDP per capita have a higher proportion of human capital formed through education compared to physical capital.

Katchanovski (2000) investigated the divergence of economic growth in post-socialist countries between 1990 and 1998 due to geographical factors. His analysis showed that the economic recession was less severe and reforms were more consistent in Central European countries compared to most of the former Soviet republics, with the exception of the Baltic states. He concluded that macroeconomic stability, political commitment to reform, and cultural proximity to Western Europe contributed to sustainable growth, while military conflicts significantly slowed economic development.

Monteils (2002) criticized endogenous growth models, arguing that while they emphasize the importance of educational expenditures, the empirical evidence does not always support this relationship. In his study, he showed that increased years of schooling in the 19th and 20th centuries did not always lead to accelerated growth of human capital, and in some cases even contributed to its slowdown. Monteils thus questioned the hypothesis of endogenous growth driven by accumulated knowledge.

Modern studies demonstrate a more critical approach to the role of education in economic development. It is noted that the effectiveness of government investment in education varies depending on the level of development of countries. In developed economies, increased funding for all levels of education contributes to GDP growth, with the largest effect observed from investments in secondary and tertiary education. In developing countries, investments in primary and secondary education provide the greatest economic impetus, providing basic training and expanding opportunities for further economic development (Kolosnitsyna and Ermolina, 2021).

A separate example is presented by the countries of Eastern Europe, where, after the collapse of the USSR, significant investments in education did not lead to sustainable economic growth. One of the reasons is the high level of emigration of qualified personnel ("brain drain"), which leads to the fact that investments in education do not pay off within the country, but work for the economy of other states. In this context, Vracic (2018), examining the brain drain in the Western Balkans, argues that the region is likely to remain a donor of highly skilled human resources for many years to come. However, the author notes that migration also stimulates knowledge transfer, increased remittances, and the spread of advanced technologies, which supports economic growth in the long run.

However, given the population decline and demographic aging that most Eastern European countries are facing, researchers emphasize the need for investment in human capital to mitigate the effects of these changes. According to research findings, education has a greater impact on economic growth than demographic factors, and investment in education creates a cumulative effect, promoting sustainable growth through intergenerational knowledge transfer (Lutz et al., 2019).

Agasisti & Bertoletti (2020), in their study of 284 European regions (NUTS 2) for the period 1995–2017, found that the quality of university research has a significant impact on economic growth. The largest effect is associated with the number of universities, especially in the fields of science, technology, engineering and math (STEM). Coman et al. (2022) examined the impact of government investment in education on GDP growth in 11 post-socialist EU countries. The study found a positive relationship in Bulgaria, Croatia, Czechia, Estonia, Hungary and Latvia, but its absence in Lithuania, Poland, Slovakia, Romania and Slovenia. In the long run, investment in education maintains a positive impact in Czechia and Hungary, while it turns out to be negative in Latvia. For Lithuania, although government spending on education is slightly higher than the EU average, no long-run relationship was found between the variables. Although Lithuania has sufficient government investment in education, the level of student training in Lithuania is significantly lower than in other countries. In addition, the large number of educational institutions no longer aligns with the demographic situation, as the number of young people is continuously decreasing.

Bah (2023), analyzing data from 89 countries for 2002-2020, concluded that education has a stronger impact on economic growth in low- and middle-income countries than in developed economies. However, a bidirectional causal relationship between higher education development and economic growth was identified by using BRICS countries as an example. This means that investment in higher education contributes to economic growth, and economic growth in turn stimulates the development of the higher education sector (Mussaiyib, & Pradhan, 2024). Other studies also emphasize the relationship between higher education and economic growth (Apostu et al., 2022).

Thus, the study of the impact of investment in education on economic development has gone through several phases, the most significant of which was the period from the 1960s up to and including the 1990s. During this time, key theoretical models were developed and empirical evidence generally confirmed the significant contribution of education to the economic development of individual countries and regions.

In the 21st century, this relationship is becoming more ambiguous. Modern researches focus on identifying the relationship between investment in education and economic growth in individual countries or groups of countries, taking into account the specifics of their economic and institutional development. Although the most influential models of economic growth of the second half of the 20th century are not always confirmed empirically, they remain the basis for further research and development of new concepts of the impact of education on economic growth.

This study aims to analyze the impact of government investment in education on economic growth in European countries, taking into account the differences between Western Europe, EU and non-EU Eastern European countries. Special attention is paid to identify differences in the efficiency of investment in secondary and tertiary education.

HYPOTHESES OF THE STUDY

Hypothesis H1. Government investment in education, particularly in higher and secondary education, has a positive impact on per capita economic growth rates in Western European countries because these countries have stable institutions, high quality educational programs and effective integration of graduates into the labor market.

Hypothesis H2. In Eastern European countries, the impact of total government investment in education and government investment in tertiary education on GDP per capita growth rates in PPP terms is insignificant, while government investment in secondary education has a positive effect because secondary education builds the basic competencies of the labor force, while tertiary education may not yield the expected economic returns due to the outflow of university graduates abroad.

DATA AND METHODS

To determine the dependence of the impact of government investment in education on the growth rate of the level of development at the cross-country level, the growth rate of GDP per capita at purchasing power parity (PPP) is used as the dependent variable. This indicator is calculated based on PPP GDP per capita in 2021 US dollars for each country of the European region for which data are available from the "World Development Indicators" database (World Bank). PPP GDP per capita is used as the primary data for the dependent variable because it is one of the most important socio-economic indicators, reflecting both the living standards of a country's population and the efficiency of its economy in comparison with other countries, regardless of the absolute size of the economy. In this article, the term 'level of socio-economic development' is sometimes used instead of 'GDP per capita PPP,' and 'level of economic development' is sometimes used instead of 'GDP at PPP.'

The data on government investment in higher and secondary education as a share of GDP were used in the study. They are calculated based on the indicators 'Government expenditure on tertiary education as % of GDP (%)' and 'Government expenditure on secondary education as % of GDP (%)', respectively, from the database "Education Statistics - All Indicators" (World Bank). The shares of total government investment in education of GDP are calculated based on 'Government expenditure on education, total (% of GDP)' from the "World Development Indicators" database (World Bank), which is more comprehensive and includes data up to and including 2023, as opposed to "Education Statistics - All Indicators" World Bank database.

In this study, Western European countries are defined as those that have never been socialist nor part of a socialist country. Eastern European countries are defined as those that were either socialist or part of a socialist country. Germany is categorized as a Western European country. This study excludes Russia, Turkey, and Kazakhstan, which, in addition to having part of their territory in Europe, are also located in Asia. Cyprus, as a member of the EU, and Georgia are included in the study.

Malta, San Marino, and Ireland, where the relationship between investment in education and GDP per capita growth (PPP) deviates significantly from patterns observed in other Western European countries, were excluded from the analysis. All other countries in both Western and Eastern Europe are included in the analysis of the relationship between GDP per capita growth rates at PPP and government investment in education or government investment in the considered levels of education at the cross-country level, except for those countries for which relevant data are missing from World Bank databases.

When examining data at the cross-country level, a paired linear regression is used. The dependent variable is the geometric mean of GDP per capita growth (PPP) in 2021 US dollars over 2006–2023, and the independent variable is either the arithmetic mean of the share of government investment in education of GDP over 2001–2023, the arithmetic mean of the share of government investment in secondary education of GDP over 2001–2023, or the arithmetic mean of the share of government investment in tertiary education of GDP 2001–2023.

The geometric mean of GDP per capita growth (PPP) was chosen as the dependent variable, since this parameter reflects the real average growth of wealth of a country per year, as well as the rate at which the inhabitants of a given country became richer or poorer in a given period of time.

The arithmetic mean of government investment in education or its level was chosen as the independent variable for two main reasons. First, the significance of government investment in education in any randomly selected year of the period is usually not equal to its significance in any other year within the period when determining the impact on per capita economic growth in the year following the end of the multi-year period. This is one of the reasons why using an alternative indicator, such as the weighted average share of government investment in education as a share of GDP, does not seem necessary as the dependent variable. Second, applying the weighted average share of government investment in education as a percentage of GDP in practice may lead to a reduction in government investment in education during years of economic recession or zero growth, with the intention of compensating for it in years of economic expansion. This approach, however, could negatively impact socio-economic welfare

To study the factors affecting GDP at PPP in a single country, the Cobb-Douglas model, expressed by the following formula, is used as the basic model:

$$Y = AK^{\alpha}L^{\beta} (1),$$

where Y is the GDP in US dollars at 2021 PPP, K is the capital stock in US dollars at 2017 PPP, L is the number of workers in the economy of the country, α and β are coefficients characterizing the impact of capital and labor, respectively, on the GDP at PPP of the country, A is the level of technology development or progress in the country.

A can take different values across models; however, in this study, its values are defined exclusively or mostly by lagged variables of government investment in education or its levels.

To investigate the factors affecting the level of economic development in an individual country, the value of K

(capital stock) was calculated from IMF (International Monetary Fund) data, the value of L (total number of workers in the economy) of a country from the "World Development Indicators" database (World Bank), the variables characterizing government investment in education from the "World Development Indicators" database (World Bank) or from the "Education Statistics - All Indicators" (World Bank), depending on which indicator was considered as an independent variable similar to cross-country models, and the value of high-tech exports (ht) was calculated from the "World Development Indicators" database (World Bank).

Different values of A were used for the study, for example,

$$A = \kappa E5^{\gamma} (2),$$

where E5 is the arithmetic mean of the shares of government investment in education of the GDP of the country over the 5 years preceding the year for which E5 is calculated in natural logarithms in order to create a regression equation,

γ is the coefficient characterizing the influence of the arithmetic mean of the shares of government investment in education on the GDP of the country,

κ is the numerical coefficient such that Ln(κ) = ε, used in all considered models of A value calculation.

Table 1 presents all variables used in the calculation of A. Each of the models considered includes either a single variable representing total government investment in education over a five- or ten-year period, or two variables representing government investment in secondary and tertiary education over the same period.

Table 1

List of variables used to calculate the level of technology development of European countries

Variable	Description of variable
E_5	Arithmetic mean of the shares of government investment in education of the GDP of the country over the 5 years preceding the year for which E_5 is calculated in natural logarithms to create a regression model
$E_{5,sec}$	Arithmetic mean of the shares of government investment in secondary education of the GDP of the country over the 5 years preceding the year for which E_5 is calculated in natural logarithms to create a regression model
$E_{5'tert}$	Arithmetic mean of the shares of government investment in tertiary education of the GDP of the country over the 5 years preceding the year for which E_5 is calculated in natural logarithms to create a regression model
E_{10}	Arithmetic mean of the shares of government investment in education of the GDP of the country over the 10 years preceding the year for which E_{10} is calculated in natural logarithms to create a regression model
$E_{10,sec}$	Arithmetic mean of the shares of government investment in secondary education of the GDP of the country over the 10 years preceding the year for which E_{10} is calculated in natural logarithms to create a regression model
$E_{10,tert}$	Arithmetic mean of the shares of government investment in tertiary education of the GDP of the country over the 10 years preceding the year for which E_{10} is calculated in natural logarithms to create a regression model
h_t	Share of high-tech exports of the country's total exports in the year *t*

So, if $A = \kappa E_{10,s}{}^{\gamma}$ ecγ $E1_{0,tert}{}^{\nu}$„ then the regression model, the coefficients of which are to be found to identify the factors affecting the level of economic development in a single country, takes the following form:

$$Ln(Y) = \gamma Ln(E_{10,sec}) + \nu Ln(E_{10,tert}) + \alpha Ln(K) + \beta Ln(L) + \varepsilon \quad (3)$$

The use of arithmetic averages of the share of government investment in education or its levels for the considered models of the level of economic development of a country is due to the same reasons as the use of arithmetic averages of the share of government investment in education or its levels to identify the impact of investment in education on the rate of socio-economic development at the cross-country level.

In this study, non-EU Eastern European countries were considered separately because, based on cross-country analysis, the government investment in education or in certain levels of education could show a negative correlation with the levels of economic development in these countries. The countries included in the analysis are Albania, Belarus, Georgia, Moldova and Serbia. Since the necessary data are not available for Bosnia and

Herzegovina, Montenegro and Northern Macedonia, these countries were not included in the study. Data for Ukraine up to and including 2021 were considered for the cross-country analysis for Eastern Europe, but models of the level of economic development as a function of government investment in education were not built for this country.

For Moldova, linear regressions were first developed after logarithmization of all the above-described models based on Cobb-Douglas model to select only those in which at least one coefficient for a variable characterizing government investment in education was significant at least at the 10% significance level for subsequent comparison of the results with the results of similar models for other countries selected for analysis.

As a result, only one model was selected for Moldova, which is given by the formula:

$$Ln(Y) = -0.4554Ln(E_{10}) + 2.1613Ln(K) + 0.6970Ln(L) - 40.0157 \ (4), \ R^2 = 0.9355$$

The natural logarithm of the arithmetic mean of the share of government investment in education over the 10 years preceding the current year for which K and L were calculated is significant at the 10% level, as is the natural logarithm of the working population. The natural logarithm of the capital stock is significant at the 0.1% level.

In order to test whether mean arithmetic share of government investment in education over the 10 years preceding the year for which it is calculated actually exhibits causality with the level of economic development in that year of selected countries, or the effect found is due to the correlation of investment in education with random error, the 2SLS method is used.

As instrumental variable for each of the countries under consideration, the arithmetic mean of the shares of government investment in education over the period from the 11th to the 20th year preceding the current year is used. This variable is assumed to effectively explain the arithmetic mean of government investment in education over the 1st to 10th years preceding the current year, while not directly affecting GDP at PPP in the current year. The instrumental variable, the level of capital stock K and the number of workers in the economy L are treated as exogenous variables in the 2SLS model, uncorrelated with random error.

The statistical package R was used to build the models and test their significance both at the cross-country level and at the level of individual countries.

Missing values for certain years in the 21st century (from 2001 to 2023, inclusive), both in the cross-country models and for individual countries, were estimated using linear regression with a single independent variable: year.

MAIN RESULTS

In Western Europe, investments in education have a long-term positive effect on economic development. There is a statistically significant relationship between the geometric mean of GDP per capita growth (PPP) for the period of 2006–2023 and the arithmetic mean of the shares of government investment in education of GDP for 2001–2023 (Fig. 1). The share of government investment of GDP is a significant variable in the regression equation at the 5% significance level.

Germany and several Northern European countries (Sweden, Denmark, Iceland) demonstrate a consistent positive relationship between government investments in education and rates of economic growth per capita. These countries are characterized by a strong orientation of the educational system toward practical training and integration with the labor market, as well as a high or very high (in the case of the Scandinavian countries) share of government expenditure on education of GDP.

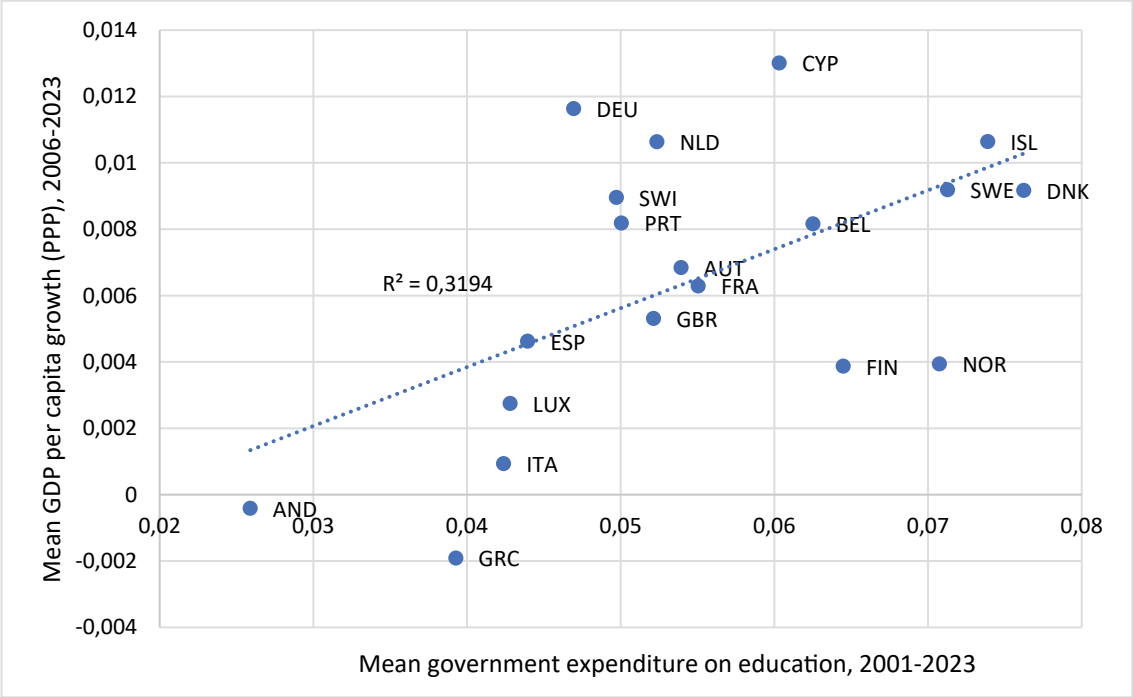
The two largest Benelux countries (the Netherlands, Belgium) show relatively high returns on educational investments, which may be associated with the high degree of digitalization of the educational process and the flexibility of educational programs tailored to economic needs.

France and Spain exhibit a moderate correlation, possibly due to specific characteristics of national education strategies, including varying levels of private-sector involvement in funding different educational programs.

Italy and Greece demonstrate a weaker correlation between educational investments and economic growth, which is linked to challenges in youth employment and the insufficient alignment of educational programs with current labor market requirements. This issue is particularly acute in Greece, where declining economic activity and the emigration of highly skilled workers have persisted since the 2008 crisis.

Figure 1

Relationship between GDP per capita growth rates in Western European countries (2006–2023) and total government investment in education (2001–2023)

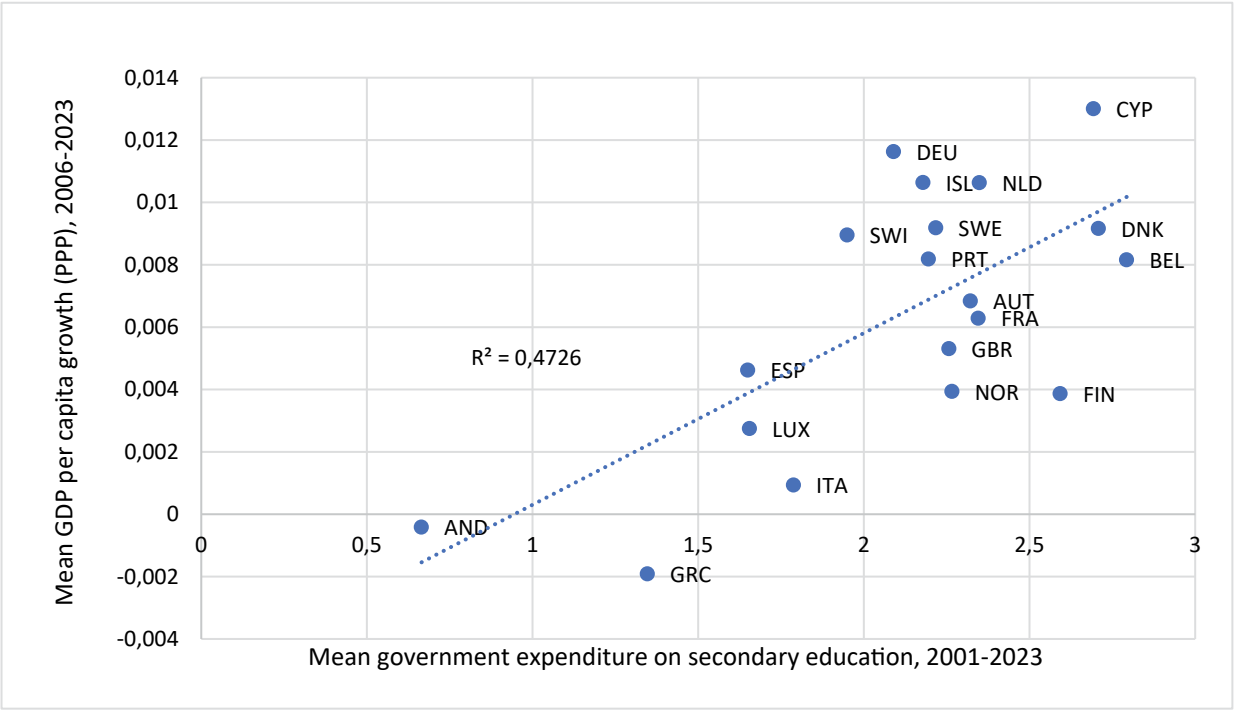


Source: Calculated by the authors

The high significance of investments in secondary education emphasizes its key role in developing foundational skills and knowledge necessary for subsequent professional growth and socio-economic development. Investments in secondary education are statistically significant at the 0.1% significance level, indicating an extremely strong influence on the level of socio-economic development (Fig. 2). Secondary education lays the foundation for a skilled workforce, which is particularly crucial in a highly competitive economy.

Figure 2

Relationship between GDP per capita growth rates in Western European countries (2006–2023) and government investment in secondary education (2001–2023)



Source: Calculated by the authors

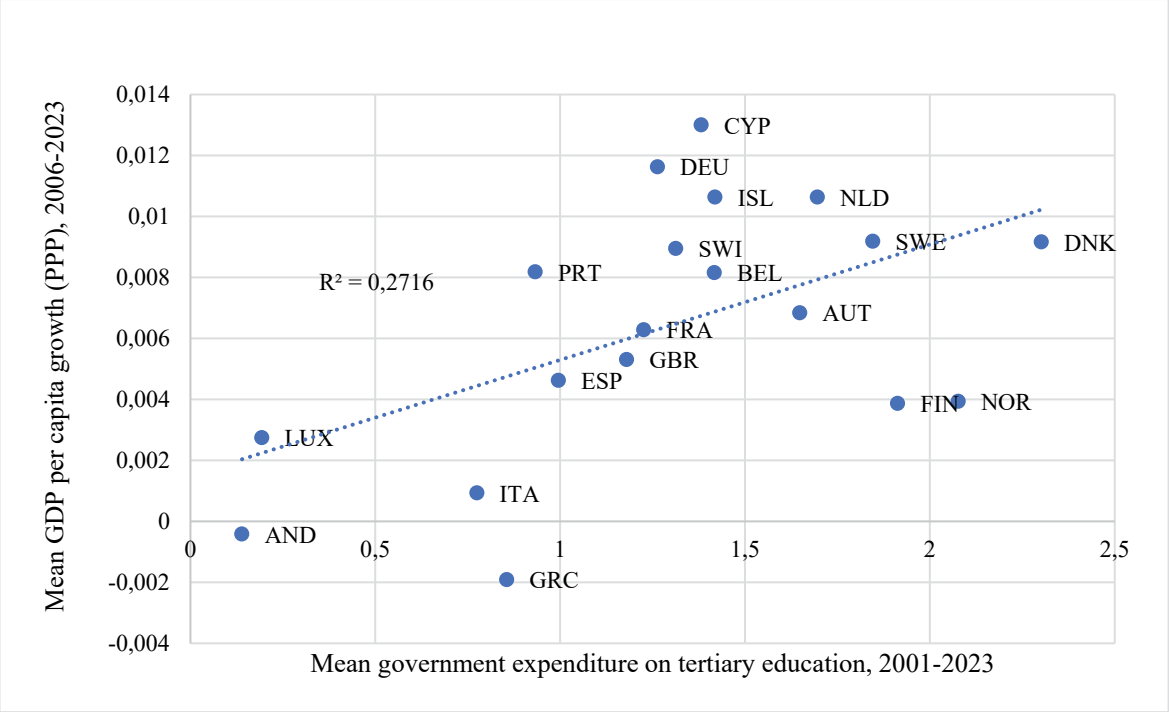
An analysis of the relationship between investments in higher education and economic growth indicated that, in Western European countries, the significance of investments in higher education is slightly lower compared to secondary education. The share of government investment in higher education is statistically significant at the 5% significance level (Fig. 3). Higher education, while a significant growth factor, typically has a more delayed economic impact, particularly in countries with lengthy educational programs and a high proportion of academically oriented education, which is not always directly linked to market demands. Additionally, not all graduates find employment in their field, reducing the effectiveness of investments in the educational system. In countries with high labor mobility (such as within the EU), graduates often relocate to other countries, benefiting economies elsewhere.

The strongest impact from investments in higher education is observed in countries with strong integration between education and business, a high proportion of applied research, and a well-developed innovation sector (Sweden, Denmark, the Netherlands). The Netherlands and Belgium demonstrate a stronger correlation, possibly due to the widespread presence of public-private partnerships in higher education funding and a strong emphasis on international standards for professional education.

France, Spain, and the United Kingdom exhibit a moderate correlation, likely due to a substantial proportion of university programs being academically rather than practically oriented toward economic applications. For Italy and Greece, the impact of higher education investment on economic growth is less pronounced, possibly due to high unemployment rates among university graduates.

Figure 3

Relationship between GDP per capita growth rates in Western European countries (2006–2023) and government investments in higher education (2001–2023)

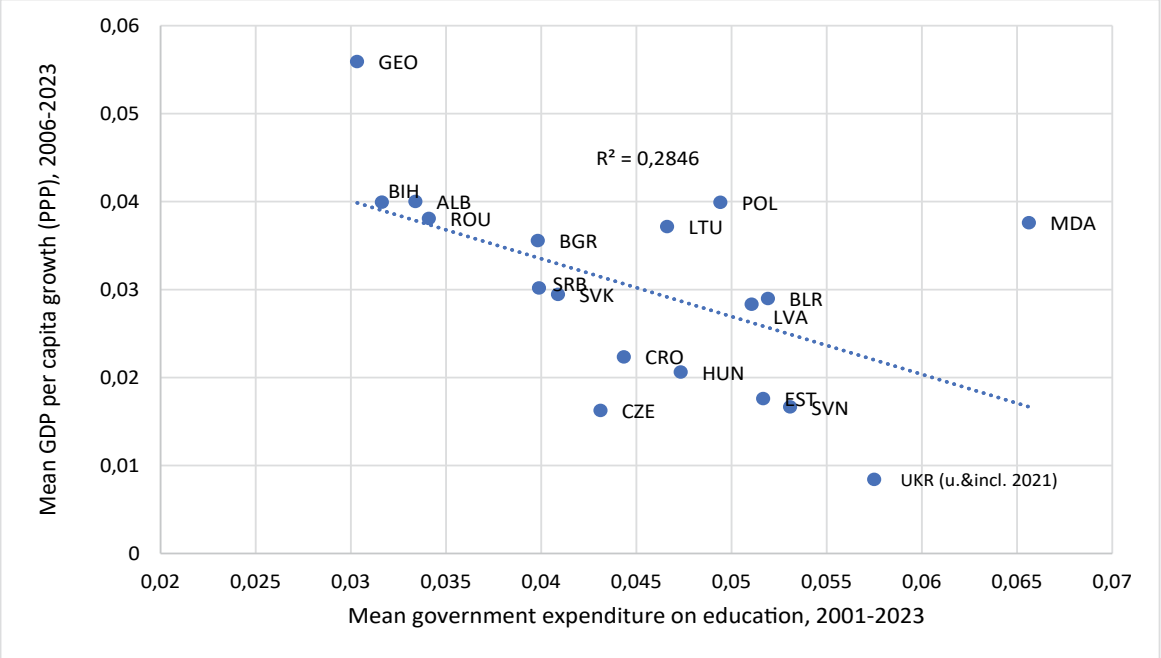


Source: Calculated by the authors

The analysis results presented in Figure 4 demonstrate that government investments in education do not translate into economic growth in Eastern European countries. The share of government expenditure in education of GDP is statistically significant at the 5% significance level.

Figure 4

Relationship between GDP per capita growth rates in Eastern European countries (2006–2023) and total government investment in education (2001–2023)

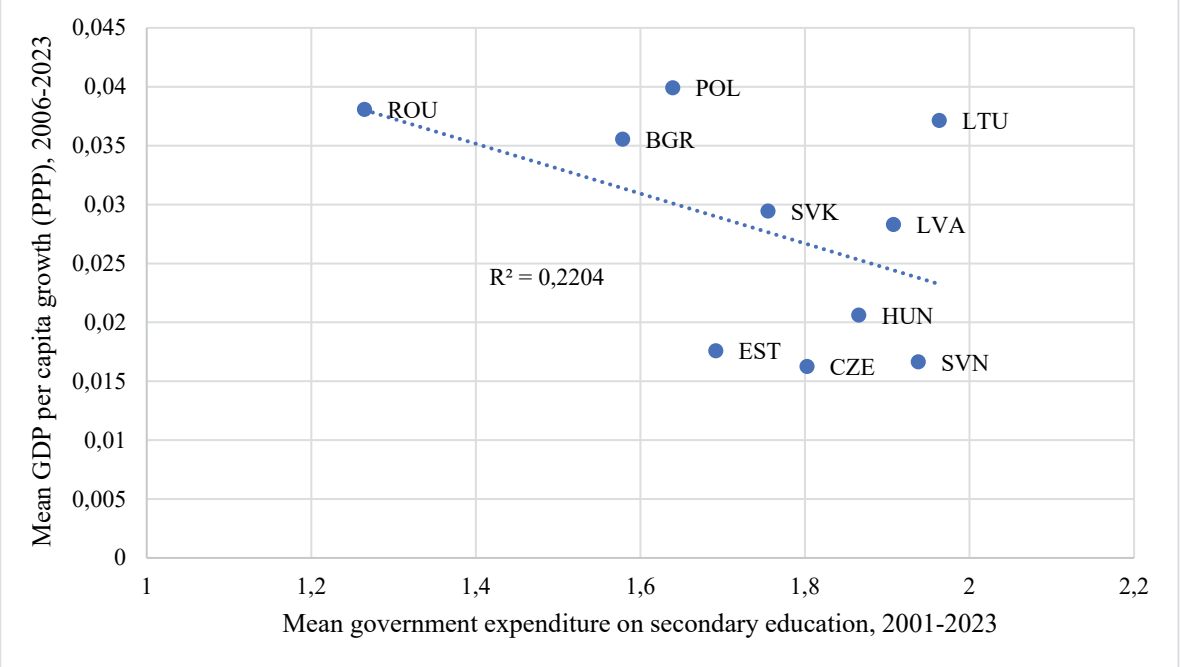


Source: Calculated by the authors

The lack of significance of expenditure in secondary education in Eastern European countries may indicate issues regarding educational system efficiency or inadequate alignment between education and the labor market. The regression itself is significant, but the share of government investment in secondary education of GDP is not a significant variable in the regression equation for Eastern European countries, even at the 10% significance level (Fig. 5). Adding non-EU Eastern European countries to this model reduces the coefficient of determination. This reduction, when including data from non-EU countries, reflects their economic and institutional heterogeneity, complicating the interpretation of the results.

Figure 5

Relationship between GDP per capita growth rates in Eastern European EU member states (2006–2023) and government investment in secondary education (2001–2023)



Source: Calculated by the authors

For Eastern European countries, no significant cross-country relationship was found between government investment in secondary and higher education and GDP per capita growth rates.

The results of the econometric analysis for Moldova and other examined countries where $Ln(E_{10})$ is significant are presented in Table 2. For Serbia and Belarus, the Ln(E10) variable is not significant even at the 10% significance level. For Albania and Moldova, a significant negative correlation was identified between the average share of government investment in education and GDP (PPP). In Georgia, the impact of the average share of government investment in education on economic development is positive.

Table 2

The impact of total government investment on GDP (PPP) in non-EU European countries

	Ln(L)	Ln(K)	$Ln(E_{10})$	ε	R-squared	Number of obs.
Albania	0.41253**** (0.000856)	0.83205**** (3.24*10^(-7))	-1.27810** (0.014463)	-6.68156*** (0.071927)	0.9835	13
Georgia	0.5178 (0.35980)	0.6253* (0.05374)	1.3115*** (0.00147)	6.0898 (0.62286)	0.9746	13
Moldova	0.6970* (0.09101)	2.1613**** (5.92*10^(-5))	-0.4554* (0.05541)	-40.0157*** (0.00142)	0.9355	13

****, ***, **, * denote significance at the 0.1%, 1%, 5%, and 10% levels, respectively.

Note: The first row represents the coefficient; the second row (in parentheses) represents the p-value.
Source: Calculated by the authors

The results obtained from the 2SLS model calculations are presented in Tables 3 and 4.

Table 3

The impact of instrumented total government investment in education on GDP (PPP) in non-EU European countries

	Ln(L)	Ln(K)	$Ln(E_{10})$	ε	R-squared	Number of obs.
Albania	0.4509*** (0.00198)	0.8970**** (1.77*10^(-5))	-1.8302* (0.06160)	-10.7272 (0.12752)	0.9804	13
Georgia	0.4566 (0.42597)	0.4817 (0.15090)	1.4710*** (0.00129)	11.1905 (0.40349)	0.9738	13
Moldova	0.7195* (0.08846)	2.1460**** (7.02*10^(-5))	-0.4739* (0.05674)	-40.0118*** (0.00143)	0.9354	13

*****, ***, **, * denote significance at the 0.1%, 1%, 5%, and 10% levels, respectively.*
Note: The first row indicates the coefficient; the second row (in parentheses) indicates the p-value.

Source: Calculated by the authors

Table 4

Relevance of instrumental variables in assessing the impact of total government investment on GDP (PPP) in non-EU European countries

	Weak instruments	Wu-Hausman
Albania	0.0878*	0.4374
Georgia	4.63*10^(-5)****	0.199
Moldova	4.82*10^(-6)****	0.792

*****, ***, **, * denote significance at the 0.1%, 1%, 5%, and 10% levels, respectively.*

Note: The table presents p-values.

Source: Calculated by the authors

Based on the p-values for weak instruments, the average level of government expenditures on education from years 11 to 20 preceding the current year effectively explains the level of government expenditures on education for the previous 10-year period (years 1 to 10) at the 10% significance level for Albania and the 0.1% significance level for Moldova and Georgia. According to the Wu-Hausman test results for Albania, Georgia, and Moldova, there is no statistically significant difference between the impacts of the average level of government investments in education from years 11 to 20 and from years 1 to 10 on GDP at PPP. Consequently, the estimated effect of the average share of government investment in education over the 1 to 10 years preceding the current year on the level of economic development in these countries is unbiased.

DISCUSSIONS

The research findings indicate a clear relationship between government investment in education and GDP growth per capita (PPP) in Western European countries that never belonged to the socialist bloc. In particular, positive effects are observed from both total government investment in education and investment specifically in secondary education. This aligns with the endogenous growth theory, which identifies human capital accumulation as a key driver of long-term economic growth (Romer, 1990).

The relationship between government investment in higher education and economic development appears weaker, potentially due to the high mobility of graduates, who utilize their skills domestically and abroad. Investments in secondary education have the greatest impact, yet investments in higher education remain important. This aligns with findings by Barro (1998) and Coman et al. (2022), who highlighted not only the significance of higher education investment for highly developed Eastern European countries but also the importance of reforming school education for socio-economic development. Investments in higher education positively influence socio-economic growth, albeit to a lesser extent, due to the high mobility of university graduates who seek employment both domestically and internationally.

Thus, Hypothesis H1, suggesting a positive impact of education government investment on per capita economic growth in Western European countries, is fully confirmed. Long-term investments in human capital promote sustainable growth, especially when supported by a well-developed institutional environment and effective educational programs.

Hypothesis H2 is only partially confirmed: the results did not reveal a significant impact of government investment in higher education on per capita economic growth in Eastern European countries. Investment in secondary education showed no significant impact on economic growth for Eastern Europe EU members at the cross-country level, while total government investment in education in Eastern European countries exhibits a significant negative correlation with per capita GDP growth at PPP.

An analysis of five non-EU Eastern European countries revealed a complex scenario. In two countries (Moldova and Albania), higher levels of government education investment correlated with decreased economic development. In this context, the negative impact of educational expenditures contradicts the researchers' initial expectations. Educational systems in these countries fail to ensure a sustainable relationship between education investments and economic growth. For instance, Moldova has numerous educational institutions, particularly at secondary and tertiary levels, which emerged during rapid demographic growth among younger generations in the late 1990s and early 2000s. Currently, their number does not match the ongoing demographic decline. The quality of secondary and higher education is significantly lower than in other countries, as indicated by international PISA assessments (2022). Under these conditions, financial allocations, despite being high, become ineffective (Jin et al., 2019).

Albania faces similar issues concerning the efficiency of educational investments. Despite substantial government education expenditures, educational

quality remains low, as also confirmed by PISA (2022). The emigration of qualified personnel to EU countries is one of the key reasons why education investments do not translate into anticipated economic growth. Young professionals educated domestically emigrate in search of better economic opportunities, reducing the domestic returns on investment. These findings align with research by Ramallari and Velaj (2023).

It should be noted that such results are not uncommon in the scientific literature. Similar conclusions have been reached by Simionescu et al. (2017), Kolosnitsyna and Ermolina (2021), among others. For example, despite Lithuania's education investments surpassing the EU average, this has not resulted in long-term economic growth (Coman et al., 2022). The example of North Macedonia, where education investments did not foster economic growth, is also illustrative (Shapkova Kocevska, 2023).

Possible reasons for this effect include structural economic problems that hinder the translation of educational investments into sustainable growth. As Bah (2023) noted, insufficient institutional resilience can lead to low returns on educational investments. Additionally, the high emigration rate of skilled professionals, resulting in a "brain drain," decreases domestic returns on human capital investments. This situation effectively leads national economies to subsidize labor markets abroad. Under these conditions, higher education investment may be ineffective if significant emigration prevents the domestic absorption of skilled graduates.

Georgia demonstrates that a modest level of government education spending (increase from 1.9% of GDP in 2012 to 3.7% of GDP in 2023) does not necessarily prevent positive economic returns from education. Moldova, despite reducing government investments in education from 9.5% of GDP in 2009 to 6.25% in 2023, still allocates more funding to education than Georgia. However, the economic efficiency of government investments in education in Moldova leaves much to be desired. Georgia's moderate increases in education funding, combined with comprehensive education reforms—including curriculum modernization, increased university autonomy, improved funding structures, and an emphasis on quality—have successfully enhanced professional training and reduced structural mismatches between the education system and the labor market. In contrast, Moldova and Albania have not achieved similar outcomes, largely due to continued emigration of educated graduates seeking better opportunities abroad, thus reducing the effectiveness of domestic educational spending.

Therefore, Eastern European post-socialist countries require a balanced approach to educational expenditures. Reducing investments due to fear of a "brain drain" could undermine long-term growth prospects, while excessive spending without ensuring efficiency is unlikely to yield desired economic outcomes. Optimally, educational investments should align closely with institutional quality and labor market demands.

CONCLUSIONS

This study used data on lagged government investments in education across European countries, which allowed to demonstrate the positive impact of government education investments, particularly in secondary and higher education, on the growth rates of socio-economic development.

The research findings suggest that classical endogenous growth models effectively explain long-term economic growth in developed Western European countries but are less applicable to countries characterized by high migration and significant international remittances. Although Georgia aligns more closely with traditional endogenous growth model predictions, Moldova and Albania exhibit a limited role for educational investments, based on average government education spending value as indicated by the derived economic level of development models. For Moldova and Albania, GDP formation is significantly influenced by migration flows and international financial transfers, overshadowing domestic education investments. This raises questions about traditional models linking human capital to economic growth and highlights the necessity for new modeling approaches that incorporate migration and international financial flows.

Moreover, the research underscores the importance of not reducing educational spending solely due to concerns over the brain drain, as this could negatively affect long-term economic growth prospects. Simultaneously, excessively increasing educational expenditures without ensuring efficiency will likely fail to achieve the desired economic outcomes. Consequently, it is essential to optimize educational investment strategies based on the effectiveness of resource utilization.

The study emphasizes the need for future research to determine which educational programs—such as vocational, technical, higher education in IT, economics, or medicine—most effectively foster economic growth, particularly in Eastern European countries where migration and remittances play substantial roles. Determining optimal educational investment strategies under these conditions remains an open question requiring further investigation.

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APPENDICES

Appendix 1. List of Western European countries considered in the study of the relationship between per capita economic growth rates (2006–2023) and government investment in education (2001–2023)

Country	Outlier Status	Country	Outlier Status
Austria	No	Germany	No
Andorra	No	Greece	No
Belgium	No	Ireland	Yes
Cyprus	No	Iceland	No
Denmark	No	Italy	No
Finland	No	Luxembourg	No
France	No	Malta	Yes

Country	Outlier Status
Netherlands	No
Norway	No
Portugal	No
San-Marino	Yes

Country	Outlier Status
Spain	No
Sweden	No
Switzerland	No
United Kingdom	No

Appendix 2. List of Western European countries considered in the study of the relationship between per capita economic growth rates (2006–2023) and government investment in secondary education (2001–2023)

Country	Outlier Status
Austria	No
Andorra	No
Belgium	No
Cyprus	No
Denmark	No
Finland	No
France	No
Germany	No
Greece	No
Iceland	No

Country	Outlier Status
Italy	No
Luxembourg	No
Netherlands	No
Norway	No
Portugal	No
Spain	No
Sweden	No
Switzerland	No
United Kingdom	No

Appendix 3. List of Western European countries considered in the study of the relationship between per capita economic growth rates (2006–2023) and government investment in tertiary education (2001–2023)

Country	Outlier Status
Austria	No
Andorra	No
Belgium	No
Cyprus	No
Denmark	No
Finland	No
France	No
Germany	No
Greece	No
Iceland	No

Country	Outlier Status
Italy	No
Luxembourg	No
Netherlands	No
Norway	No
Portugal	No
Spain	No
Sweden	No
Switzerland	No
United Kingdom	No

Appendix 4. List of Eastern European countries considered in the study of the relationship between per capita economic growth rates (2006–2023) and government investment in education (2001–2023)

Country	Outlier Status
Albania	No
Belarus	No
Bulgaria	No
Bosnia and Herzegovina	No
Croatia	No
Czechia	No
Estonia	No
Georgia	No
Hungary	No

Country	Outlier Status
Latvia	No
Lithuania	No
Moldova	No
Poland	No
Romania	No
Serbia	No
Slovakia	No
Slovenia	No
Ukraine (up to and including 2021)	No

Appendix 5. List of Eastern European countries, EU members, considered in the study of the relationship between per capita economic growth rates (2006–2023) and government investments in secondary education (2001–2023)

Country	Outlier Status
Bulgaria	No
Czechia	No
Estonia	No
Hungary	No
Latvia	No

Country	Outlier Status
Lithuania	No
Poland	No
Romania	No
Slovakia	No
Slovenia	No

Authors' contributions

· Conceptualization: GAGAUZ Olga, SAMOHVALOV Artiom

· Methodology: SAMOHVALOV Artiom

· Formal analysis: SAMOHVALOV Artiom

· Investigation: GAGAUZ Olga, SAMOHVALOV Artiom

· Writing – original draft: GAGAUZ Olga, SAMOHVALOV Artiom

· Writing – review & editing: GAGAUZ Olga, SAMOHVALOV Artiom

· Supervision: GAGAUZ Olga

· Project administration: GAGAUZ Olga

TOWARDS BETTER POLICY MONITORING: OPERATIONAL SURVEY RESULTS ON THE IMPACT OF AGRICULTURAL SUBSIDIES IN MOLDOVA

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SUMMARY

Agricultural sector of Moldova is of particular importance in the context of the benefits and added value that it brings to the development of the national economy. Its proper development is conditioned, inclusively, on the public support allocated to farmers, via the subsidy program. The broad discussions on the efficiency of subsidies have been fueled by the necessity to evaluate their impact on the development of agri-food sector in particular and economy, in general. Therefore, monitoring and evaluation represent essential elements of agricultural and rural policies. The aim of the paper is to present an example of the practical and operational policy monitoring tool (survey and indicators) for assessing the short-term efficiency of subsidies in Moldova. The tool is based on the use of non-representative survey performed once or two times per year in order to inform decision makers about the impacts of the subsidies on farm performance in terms of productivity, production, employment, size, but also the opportunity to obtain the feedback from subsidies recipients. The survey is intended for beneficiaries of all categories of subsidies, thus being useful for midterm review of budget support. The results of the first-time implementation of the tool present an increased efficiency in investments, profits, land productivity, labor productivity and mechanization. The survey represented itself as a useful tool for monitoring the short-term efficiency of subsides, capable to assess the specific impacts on the sector. At the same time, the paper presents a series of further improvement needed for a better operation of this policy monitoring tool in order to make it more functional, user-friendly, less time consuming, requiring a limited number of case studies for confirmation of the obtained results.

Keywords: Policy monitoring, policy evaluation system, agricultural policy, operational survey, subsidies, Republic of Moldova

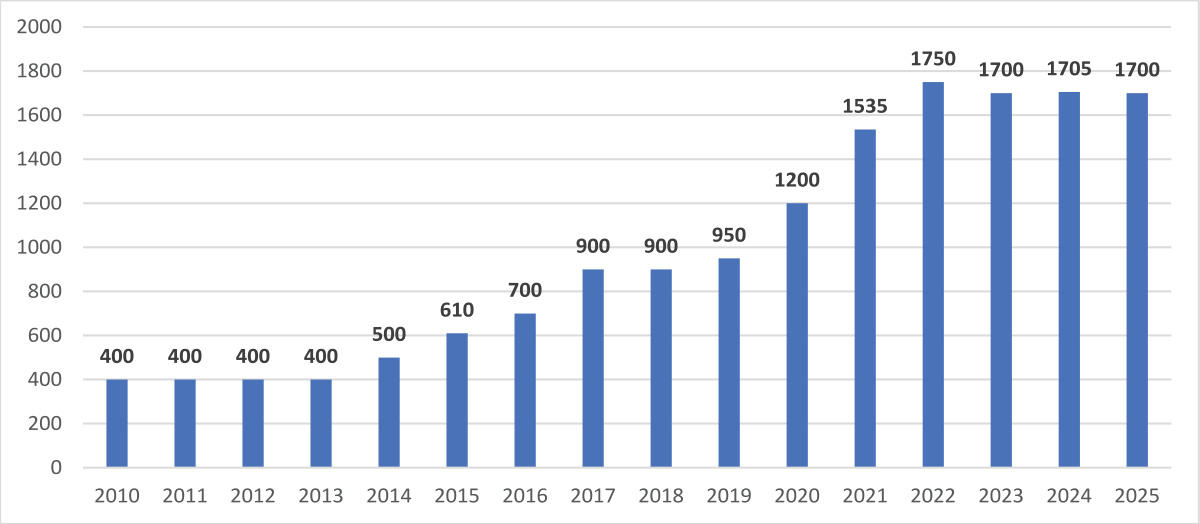
INTRODUCTION

Agricultural sector of the Republic of Moldova plays an important role in the socio-economic development of the country. In the recent years, it has been affected by a series of challenges, including the increase in input prices, supply chain disruptions, severe droughts, Russian-Ukrainian war, etc. These circumstances put an additional pressure on both, the sector in general and on farmers in particular. Public support for farmers is intended not only for the sector modernization and transformation, but also for overcoming the existing challenges and represents a significant precondition for their success and further involvement in the agricultural business. At the same time, the assessment of the effects of public support through subsidies on the sector's performance represents an important aspect for the development of public policies in the field of the agricultural sector.

Until March 2023, the subsidy policy carried out by the Ministry of Agriculture and Food Industry (MAFI) was regulated by Law no. 276/2016 on the principles of subsidies in the development of agriculture and the rural environment (Parliament of the Republic of Moldova, 2017). Taking into account the new challenges faced by the sector like adverse climate conditions, shifts in foreign trade partners and the war from Ukraine, on March 31, 2023, a new subsidy policy was approved that aims to increase the competitiveness and sustainable development of the agro-industrial sector, to ensure the sustainable management of natural resources and sustainable socioeconomic development in rural areas (Parliament of the Republic of Moldova, 2023). According to this Law, the distribution of the National Fund for Development of Agriculture and Rural Environment (NFDARE) is being approached, taking the shape of the following forms of subsidies: payments in advance; post-investment payments; investment payments in stages; direct payments; complementary payments. The new introduced subsidy priorities and measures support farmers and aim to increase efficiency, competitiveness and productivity of the agri-food sector. The introduction of additional measures such as advance subsidies or direct payments per head of livestock are in line with EU provisions and will contribute to the modernization of the agricultural sector. At the same time, it becomes necessary to connect the documents to the provisions of CAP and to the community regulatory framework.

During the period 2010 to 2024, the total value of the National Fund for the development of agriculture and rural environment (NFDARE) has increased from 400 mil. MDL to 1,7 bil. MDL, while the number of received applications improved from 1906 in 2010 to 16334 requests in 2023.

Figure 1
Dynamics of the value of NFDARE, mil. MDL



Source: AIPA, 2025

Monitoring and evaluation are essential elements of agricultural and rural policies. They are carried out to verify whether the objectives of policy intervention are reached and develop recommendations on possible improvements and political priority setting. While monitoring represents a continuous task of reviewing information and, in particular financial flows, evaluation involves a judgement of interventions according to their results, impacts, and needs they aim to satisfy (Kusek, Rist, 2004).

One of the fundamental instruments applied by the EU member States helping to measure the efficiency and effectiveness of budget support is farm data collected from represented samples (Farm Sustainability Data Network, FSDN). Once collected, it is then applied in ex-post and ex-ante evaluations. Moldova does not possess such an instrument, however its budget support to the farmers is substantial and of particular importance and there is a data available on subsidies' recipients. Therefore, in 2019, an instrument was requested by the Agency of Intervention and Payments in Agriculture (AIPA) as a simple tool for annual monitoring of the operational implementation of the national support schemes applied under the National Strategy on Agriculture and Rural Development. A tool in the form of a farm questionnaire allowing to better understand subsidies' recipients before and after the subsidy has been developed, trying to measure the immediate impacts of the subsidies on production or employment, but also collecting some valuable feedback from farmers regarding rural lifestyle, as well as a process to apply and receive subsidy on the account.

In this paper the analysis is presented from the data collected by such a tool (questionnaire is available in the annex of the paper). Therefore, a survey was implemented with the objective to provide MAFI and AIPA with monitoring and some evaluation data in order for MAFI – on an ongoing basis – to improve the measure design and thus increase effectiveness and efficiency of the measures implemented under the National Strategy on Agriculture and Rural Development. The survey covering beneficiaries from 2017 and 2018 is intended to be considered as an operational tool for ongoing collection of effect data from beneficiaries. In the administrative cycle of the agency, the tool can be applied regularly during the year.

Therefore, we show that it brings more understanding about key characteristics of the subsidies' recipients, but also clarity about the impact of the subsidies received by the farmers, providing valuable feedback to AIPA and MAFI. It brings additional information on how to improve processing of the subsidies, differently address conditionalities or perhaps, propose amendments to the particular support measure. The analysis supports with evidence the discussions on how e-application and/or feedback systems for direct support should be developed to improve the efficiency of the application, evaluation, payment execution and reporting processes. The tool feels the vacuum of analytical tools and yet, with its caveats (not represented sample, only beneficiaries are included), should be considered an *operational policy monitoring tool* that feeds the discussions of mid-term policy reviews or contributes to the ex-post evaluations. The authors are also hopeful about the prospects for a full-fledged FSDN will be developed in Moldova, providing more data for the fundamental analysis of the impacts of budget support.

Aiming to present an example of the practical and operational policy monitoring tool (survey and indicators) that could be applied with randomly selected farmers for assessing the short-term efficiency of subsidies in Moldova, several theoretical approaches that are crucial for understanding how subsidies impact agricultural productivity, efficiency, or sustainability are shown in the paper.

One theoretical approach is related to the use of *econometric models* to evaluate the effectiveness of agricultural subsidies. Thus, the model applied by Li et al (2022) evaluates the agricultural subsidy effectiveness from the three aspects of farmers' total sown area, total grain output, and total income, highlighting the importance of equilibrium conditions in assessing policy effectiveness. Similarly, another study uses a theoretical framework to analyze the effects of production uncertainties on the efficiency of agricultural subsidy policies, emphasizing the role of food security and environmental protection as constraints (Chen et al, 2019).

The use of combined algorithms and *data envelopment analysis* (DEA) represents another theoretical approach for evaluating agricultural subsidies. This approach measures the relative efficiency of regional financial subsidies and evaluates their implementation direction, aiming to enhance government finance benefits and promote sustainable agricultural development (Tang et al, 2017).

The theoretical approaches also consider the broader policy implications of subsidies by using a *Stochastic Frontier Analysis* (SFA) approach to assess its impact on farm productivity and efficiency (Houari et al, 2023).

The *survey* method has been approached by Sha et al (2024), emphasizing its important role in assessing the effects of subsidies on the increase of income of farmers and their impact on food production. Moreover, the survey method has been applied by Daugbjerg et al (2005) in Germany, Portugal and the United Kingdom assessing the perception of farmers related to the dependence level on public support. Another survey was used in Czech Republic that concluded on the importance of subsidies in diminishing loses, increase farmers' income and reducing income variability (Mazankova et al, 2025).

Thus, theoretical approaches for designing policy monitoring and evaluation instruments in the agricultural sector involve a combination of econometric models, data envelopment analysis, surveys and nonparametric methods. These approaches provide a comprehensive framework for assessing the short-term efficiency of subsidies, considering factors such as production uncertainties, technical efficiency, and sustainability. By employing these theoretical models, policymakers can better understand the impacts of subsidies and design more effective agricultural policies.

Nevertheless, for the Republic of Moldova, the operational policy monitoring tool provides for additional benefits and advantages, as it implies a relatively simple form of analysis, available to be carried out either by research organizations or organizations responsible for the agricultural policy implementation and distribution of subsidies. It can also be repeated with the assessment of the same indicators (and additional ones), for a continuous evaluation and gives the possibility to provide for recommendations for policy makers. Moreover, farmers are acquainted with surveys, many of them participating yearly in different survey procedures. Results of the implementation of the survey as an instrument to assess the short-term efficiency of subsidies will allow to develop targeted public policies in the field of agriculture, based on the bottom-up approach and taking into account suggestions of farmers.

LITERATURE REVIEW

Even the importance of the topic is unquestionable, there are still a few approaches to assessment of public support as a component of the agricultural policy, especially in the Republic of Moldova. Overall, the assessment of the short-term efficiency of subsidies for the agrifood sector represents a complex interplay of theoretical frameworks and applied methodologies. The literature review carried out presents some developing approaches that need for not only wide-ranging policy evaluations, but also adaptive monitoring systems to ensure that subsidies fulfill their intended purposes, with as less as possible inefficiencies.

An analysis on the impact of subsidies on the technical efficiency of dairy farms has been performed by Latruffe et al (2017). The results of research present that the positive, negative or null effects depend on the country and less efficiency is observed as a result of the introduction of decoupling payments. Additionally, the application of methodology such as nonparametric efficiency analysis by Minviel and Witte, offers frameworks to evaluate the impacts of subsidies more robustly (Minviel & Witte, 2017). Their findings highlight the necessity for diverse methodologies in assessing the effectiveness of subsidy policies in agriculture, enabling policymakers to make informed decisions based on empirical evidence.

Subsidies as an instrument in agriculture finance has been approached by Meyer (2011), mentioning that a watchful development of products, policies, institutions, and supportive infrastructure has led to greater success. Subsidies also play an important role in transition towards a sustainable agricultural system (Heyl et al, 2022).

On the other hand, the discourse extends into the realm of economic resilience, presented by Yang et al., who state that decoupled subsidy policies can enhance agricultural resilience in China's corn-producing regions (Yang et al., 2023). Another relevant aspect is the impact of public resource allocation on agricultural growth. Brad et al. emphasize the correlation between financing measures and short-term efficiencies, suggesting that a deeper understanding of the dynamics between agricultural unit financing and subsidy impacts can stabilize relations and enhance overall efficiency (Brad et al., 2018). A specific type of subsidies – input subsidies – mainly, subsidies for fertilizers, have been assessed by Dorward et al (2008) and Chirwa and Dorward (2012).

A similar instrument as used in this paper, of a survey – Chinese Social Survey - is being used in China in order to evaluate the impact of agricultural subsidies on the farmers' prosperity. The results of the research carried out by Sha et al (2024) point on the increase of per capita income as a result of received subsidies and raise of the income as a result of land transfer. Economic experiments represent another direction of evaluating the agricultural policy and intervention programs. They represent important tools of assessment and have a great potential for further development (Colen et al, 2016).

With respect to Moldovan scholars engaged in research on the impact of subsidies on the development of agrifood sector, one can mention the most recent works of Cimpoies (2021), Cimpoies & Sarbu (2020), Dombrovschi (2020), Lucasenco (2021) have analyzed the dynamics on allocation of subsidies for the agricultural sector, with a general assessed positive impact based on increase of allocations and beneficiaries. Shik et al (2016), Stratan et al (2018), Herzfeld et al (2022) have assessed the public support through the use of OECD methodology, concluding on the market distortions, low levels of Producer Support Estimate indicator and the importance of the allocations to General Services.

A more complex analysis was performed by Mollers et al (2022) who carried out an impact assessment study based on 800 beneficiaries and non-beneficiaries of subsidies, analyzing the effectiveness of the existing policy measures. The impact assessment underlined that the investment subsidies had measurable positive effects on labor, farm production and economic success. Nevertheless, due to the complexity of the methodology approach, and limited capacities to carry out such an extensive research, the current proposed instrument is more suitable, viable and not very consuming in terms of involved resources.

DATA SOURCES AND USED METHODS

Monitoring the implementation and impact of agricultural policies under the National Strategy on Agriculture and Rural Development is increasingly important as the value of the NFDARE and number of beneficiaries increases continuously.

Therefore, a simple tool for annual monitoring of the operational implementation of the national support schemes applied under the National Strategy on Agriculture and Rural Development has been designed. The instrument aims to collect data through a survey. The requested data is related to achieved outputs, results and impacts of the investments. The tool is forecasted as a survey carried out on a regular basis and collected data can be compared with baseline. Therefore, the aim of the tools is to provide the Ministry of Agriculture and Food Industry (MAFI) and the Agency for Intervention and Payments in Agriculture (AIPA) with additional monitoring and evaluation data in order for MAFI – on an ongoing basis – to improve the measure design and thus increase effectiveness and efficiency of the measures implemented under the National Strategy on Agriculture and Rural Development.

The survey is designed to collect data, which are not included in the AIPA database today and intended to be considered as an operational tool for policy monitoring and evaluation based on the collection of data from beneficiaries. The questionnaire included questions on general data of respondents, membership of an association, quality certifications holders, subsidized measures, investment objects, use of insurance mechanisms and promotion instruments, export potential, types of financing the business (own sources, grants, subsidies, etc.), area, investment costs, financial data related to income from sales, costs, profit, production capacity, number of job places, use of innovations, reinvestment of subsidies, etc.

The survey targets in principle all measures and beneficiaries supported in 2017 and in 2018 in order to be able to track the effects after two years of the investment, in this case in 2019. A sample of beneficiaries had been selected, with a number of planned surveyed beneficiaries of 400, distributed on measures. The table below presents the measures and the number of planned and realized beneficiaries recruited to the survey.

Table 1

Measure overview, planned and realized number of beneficiaries included in the survey, % of realized to planned

Number	Name	Planned number of beneficiaries included in survey	Actual number of beneficiaries included in survey	% of realized to planned number of beneficiaries
1	*Investments in agricultural holdings for restructuring and harmonization to European Union standards*			
1.1	Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels)	6	8	133
1.2	Stimulating investments for the establishment, modernization and deforestation of multiannual plantations, including vineyards and fruit plantations	84	72	86
1.3	Stimulating investments for the procurement of conventional agricultural machinery and equipment	91	75	82
1.4	Stimulating investments for the equipment and technological renovation of livestock farms	21	13	62
1.5	Stimulating the procurement of breeding animals and maintaining their genetic background	5	0	n.a.
1.7	Stimulating the lending of agricultural producers by commercial banks and non-banking financial institutions	41	12	29
2	*Investments in processing and marketing of agricultural products*			
1.6	Stimulating investments for the development of post-harvest and processing infrastructure	98	33	34
3	*Preparation for the implementation of actions related to the environment and rural area*			
2.2	Stimulating investments for the purchase of irrigation equipment	17	3	18
2.3	Stimulating agricultural producers to compensate irrigation costs	2	0	n.a.
2.4	Stimulating investments for the purchase of no-till and mini-till equipment	30	1	3
2.5	Supporting the promotion and development of organic agriculture	0	6	n.a.
4	*Improvement and development of rural infrastructure*	*5*	*0*	*n.a.*
5	*Consultancy and training services*	*0*	*0*	*n.a.*
Total		*400*	*118*	*30*
Statistical validity with a total number of beneficiaries of 5652		Planned	Realized	
		+/- 4.7%	+/- 9.0%	

Source: developed by authors

The planned number of surveyed beneficiaries would have given a statistical validity of +/- 4.7%, but the realized number of beneficiaries with validated data is 118, leading to a statistical validity of +/- 9.0% at the overall level of the survey. This is considered acceptable under the circumstances taken into consideration, especially in the context of first-time piloting of the survey. Moreover, the questionnaires were filled in by 182 respondents, but financial data necessary for the assessment was extracted from 118 answers, based on assessment of its viability and reliability. For the survey purpose, an online questionnaire was elaborated.

The survey was uploaded electronically and sent to 400 recipients of public support in 2017 and 2018 under The National Strategy for Agricultural and Rural Development. 182 filled in questionnaires were returned electronically. Data validation was further performed in order to ensure that data in the survey are correct regarding investments and financial data. 118 filled in replies have been used for the analysis. The survey period was the year of 2021.

THE RESULTS OF RESEARCH AND DISCUSSIONS

The table below presents the investments covered in the survey distributed on some of the main background categories[1].

Table 2

Investments distributed on farm size, legal type of farm, gender, age of farmers, membership of association and measures

Background category	Sub category	Total Investment 2017+2018, Million MDL	% of total investment	Average investment per beneficiary, million MDL
Type of agricultural producer	Large	277.6	36.7	1.725
	Medium	223.9	29.6	6.051
	Micro	75.2	10.0	5.01
	Small	179.1	23.7	3.58
Legal type of farm	Agricultural cooperative for entrepreneur services	10.6	1.41	10.6
	Agricultural production cooperative	22.9	3.04	5.725
	Cooperative	13.1	1.74	4.37
	Cooperative of entrepreneurs	66.5	8.81	33.25
	Individual enterprise	1.6	0.22	0.8
	JSC	77.2	10.22	12.867
	LLC	511.6	67.75	7.11
	Peasant farm	48.5	6.43	1.87
	Production cooperative	1.9	0.26	1.9
	State enterprise	0.9	0.12	0.9
Gender	Female	101.5	13.44	3.5
	Male	653.7	86.56	7.34
Age	Younger than 39 years	151.5	20.07	6.06
	40 - 49 years	127.9	16.94	6.09
	50 - 59 years	291.5	38.61	8.57
	Older than 60 years	184.1	24.38	4.84
Membership of an association	No	35.8	4.74	2.56
	Yes	719.4	95.26	6.92

[1] *The statistical validity of the findings in the survey are acceptable at the overall level, but when data and findings are broken down on lower levels: sub-measures, gender, age etc., the number of beneficiaries is low, and the solidity of data will be reduced. This should be taken into consideration, when the findings are discussed.*

Primary sub-measure 2017	Sub-measure	Investment 2017, million MDL	% of investment in 2017, 410 million MDL	Average investment per beneficiary, million MDL
	1.1	9.1	2.2	1.5
	1.2	193	47.1	4.7
	1.3	87.5	21.3	2.5
	1.4	23.4	5.7	2.9
	1.6	84.5	20.6	4.7
	1.7	5.6	1.4	1.9
	2.2	4.4	1.1	1.5
	2.4	1.5	0.4	1.5
	2.5	0.8	0.2	0.3
Primary sub-measure 2018	Sub-measure	Investment 2017, million MDL	% of investment in 2018, 159 million MDL	Average investment per beneficiary, million MDL
	0 (no investment in 2018)	0	0	0
	1.1	1.1	0.7	0.6
	1.2	58.4	36.7	1.9
	1.3	47.1	29.6	1.2
	1.4	10.5	6.6	2.1
	1.6	40.6	25.5	2.7
	1.7	1.0	0.6	0.1
	2.5	0.8	0.5	0.3
Total investment		755.2	100	6.4

Source: developed by authors

The population of beneficiaries in the survey analysis represents 755 million MDL in total investments in 2017 and 2018.

INVESTMENT EFFICIENCY

For the purpose of the analysis, investment efficiency is calculated as the relative increase in profit per invested MDL measured as a percentage from the year before the investment (2016) to the year after the investment (2019). This is a key indicator in this survey, where we relate the investments to the development in income and profit. It is obvious that the development in the performance of the farms depends on many other factors than just the investment. Weather, market trends, prices etc. all can influence the profits of the farmers. However, we do not find any big variations or changes in the sector environment during the period from 2016 to 2019, which are important and even can be decisive reasons for mentioning that the relationship between investments and performance cannot be used.

The investment efficiency is calculated as the relative increase in profit per invested MDL. The profit in 2016 was estimated to be 209 million MDL, increasing with 107 million MDL to 317 million MDL in 2019. With total investments of 755 million MDL in 2017 and 2018, the increase per invested MDL is 14.2 MDL. (317 million MDL - 209 million MDL/755 million MDL=14.2). With a ratio of 14.2% at the level of the total population of the survey (+/- 9% statistical validity), each invested MDL generates 0.142 MDL in increased profit per year. This is equal to an average payback time of the investment of 7 years.

Small farms have demonstrated the highest investment efficiency measured on profits with 19.9%. Large farms have 14.9% in efficiency, medium farms have an efficiency of 12.4%, while micro farms have an efficiency of 3.3%.

Younger farmers have had a difficult time with negative investment efficiency of -4.2%, while the farmers in the category of 40 - 49 years have 25.9% in profit per invested MDL, farmers between 50 and 59 years have 20.8% per invested MDL, and older farmers above 60 years have 10.9% in efficiency per invested MDL. The most efficient category of farmers is then the farmers between 40 and 49 years old.

With respect to gender in the sample, the female farmers

have generated an efficiency of 18.1%, while their male colleague farmers have generated only 13.6%.

Membership of an association has also shown to be important. We have asked the beneficiaries, if they are members of an association of farmers, processors etc. The idea was that there would be positive effects for beneficiaries being members of an association compared to beneficiaries not being members. The members have generated 14.6% in efficiency, which is in compliance with the overall average of the population, while the non-members only have generated only 7.1% in investment efficiency.

The biggest sub-measure in value in 2017, as well as in 2018 is sub-measure 1.2 Stimulating investments for the establishment, modernization and deforestation of multiannual plantations, including vineyards and fruit plantations with a total of 196 million MDL (2017) and 101 million MDL (2018) in total investments with the own sources as the biggest funding source. The efficiency was a bit low of 7.1% in 2017, but 14.9% in 2018, as average. The volume of investments under this sub-measure makes the findings more robust than in sub-measures with lower volume and fewer beneficiaries.

Sub-measure 1.3 Stimulating investments for the procurement of conventional agricultural machinery and equipment was second biggest in value in 2017 with a negative efficiency of -1% and third biggest in value in 2018 with a much better efficiency of 17.3%.

The most efficient sub-measure in 2017 is sub-measure 2.2 Stimulating investments for the purchase of irrigation equipment with 238%, but only 3 beneficiaries in the survey have used the sub-measure with a total investment of 4 million MDL. This makes the finding a bit fragile.

The investment efficiency related to profit is summarized in the tables below together with the total investment costs of the individual measures and their share of total investments in 2017 and 2018 respectively.

Table 3

Investment efficiency at sub-measure level and share of total investment, 2017

Sub-measure	Investment efficiency, profit, %	Total investment, million MDL	Share of total investment, %
2.2 Stimulating investments for the purchase of irrigation equipment	238	4	1
1.1 Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels)	40	9	2.2
1.6 Stimulating investments for the development of post-harvest and processing infrastructure	35.5	53	12.9
2.5 Supporting the promotion and development of organic agriculture	17.3	1	0.2
1.4 Stimulating investments for the equipment and technological renovation of livestock farms	17	23	5.6
1.7 Stimulating the lending of agricultural producers by commercial banks and non-banking financial institutions	5.6	34	8.3
1.2 Stimulating investments for the establishment, modernization and deforestation of multiannual plantations, including vineyards and fruit plantations	7.1	196	47.8
1.3 Stimulating investments for the procurement of conventional agricultural machinery and equipment	-1.0	87	21.2
2.4 Stimulating investments for the purchase of no-till and mini-till equipment	-146	2	0.5
All sub-measures	n.a.	410	100

Source: developed by authors

From a share of investment point of view, the most important sub-measure in 2017 is sub-measure 1.2 with 47.8% of total investments in 2017 and an efficiency of 7.1%. In 2018, the share for this sub-measure is still high,29.3%, and the efficiency has increased to 14.9% which is close to the overall average of 14.2%. The quantitative survey approach is not suited to provide qualitative information about the reason to the finding that the sub-measure in 1 2017 has a relatively low efficiency, although still positive, and why it in 2018 has increased. An in-depth case analysis of the findings in the survey, supplemented with case interviews may be relevant to shed more light on this question.

The same approach can be used to identify the reasons to the extreme high and low efficiency for sub-measure 2.2 and sub-measure 2.4 respectively in 2017, and sub-measure 1.1 in 2018.

Table 4

Investment efficiency at sub-measure level and share of total investment, 2018

Sub-measure	Investment efficiency, profit	Total investment, million MDL	Share of total investment, %
1.4 Stimulating investments for the equipment and technological renovation of livestock farms	23.6	4	1.2
1.6 Stimulating investments for the development of post-harvest and processing infrastructure	17.9	82	23.8
1.3 Stimulating investments for the procurement of conventional agricultural machinery and equipment	17.3	73	21.2
2.5 Supporting the promotion and development of organic agriculture	17.3	1	0.3
1.2 Stimulating investments for the establishment, modernization and deforestation of multiannual plantations, including vineyards and fruit plantations	14.9	101	29.3
1.7 Stimulating the lending of agricultural producers by commercial banks and non-banking financial institutions	1.0	64	18.6
1.1 Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels	-18.7	1	0.3
All sub-measures	n.a.	345	100

Source: developed by authors

FUNDING SOURCES

Access to capital is important for potential beneficiaries of investment support schemes. Own sources are the most important source for funding for all categories of farms. It is first and foremost the case for micro farms with 67.4%. Large farms use own sources for funding of 61% of the investments, while medium farms use own sources for 52.5%. Small farms use own sources for 48% of investments in 2017 and 2018. Subsidies from AIPA and MAFI is the second most important source of capital for funding of investments. For medium farms it is 24%, for small farms it is 23.4%, for micro farms it is 22%. For the large farms it is only 11%. Bank credits are most important for large farms with 27% and play only a minor role for micro farms with only 10%. Small farms use bank credits to 24.4% of the funding and medium farms 22%. Grants from donors play no decisive role for any of the size categories of farms.

Table 5

Funding source, farm size categories

Farm size category	Funding source	2017, Million MDL	%	2018, Million MDL	%	Grand Total	%
Large	*Total Investment*	*151.6*	*100*	*125.1*	*100*	*276.8*	*100*
	Bank Credits	46.3	30.54	28.8	23.06	75.1	*27.16*
	Grants	0.6	0.41	1.0	0.79	1.6	*0,58*
	Own Sources	86.9	57.31	81.8	65.42	168.7	*60.97*
	Subsidies	17.8	11.73	13.4	10.73	31.2	*11.28*
Medium	*Total Investment*	*123.6*	*100*	*100.2*	*100*	*223.9*	*100*
	Bank Credits	21.7	17.57	27.8	27.74	49.5	*22.13*
	Grants	2.7	2.18	0.2	0.20	2.9	*1.30*
	Own Sources	70.7	57.26	46.6	46.53	117.4	*52.46*
	Subsidies	28.4	22.99	25.5	25.52	54.0	*24.12*
Micro	*Total Investment*	*41.5*	*100*	*33.7*	*100*	*75.2*	*100*
	Bank Credits	6.1	14.76	1.4	4.36	7.6	*10.10*
	Grants	3.5	0.85	0	0.00	0.3	*0.47*
	Own Sources	26.2	63.24	24.4	72.52	50.7	*67.40*
	Subsidies	8.7	21.15	7.8	23.12	16.5	*22.03*
Small	*Total Investment*	*93.0*	*100*	*86.1*	*100*	*179.1*	*100*
	Bank Credits	24.0	25.81	19.7	22.92	43.7	*24.42*
	Grants	6.5	7.08	1.1	1.32	7.7	*4.32*
	Own Sources	42.6	45.79	43.0	50.01	85.6	*47.82*
	Subsidies	19.8	21.31	22.1	25.75	42.0	*23.44*

Source: developed by authors

JOB CREATION

For the agricultural producers participating in the survey, the average employment before the investment was 40 full time workers, increasing in 2019 to 46 full time. It is a growth of 15.7% from 2016 to 2019. This means that 703 full time jobs have been created. The growth in female workplaces was 18%. Furthermore, seasonal employment is generated, but the volume of this employment effect is not calculated here.

LABOUR PRODUCTIVITY

Labour productivity provides information about the value generated per full time worker in the sector. Investments will typically lead to an increase in total factor productivity as well as in labour productivity. In this survey we use income as a proxi indicator instead of gross value added (GVA), when we estimate the labour productivity. The increase in employment from 4470 fulltime jobs in 2016 to 5173 jobs in 2019 is equal to 703 fulltime jobs, while the income from agricultural activities increased with 38.9% or 847 million MDL from 2177 million MDL to 3024 million MDL in 2019. The labour productivity was 487,025 MDL in 2017 and increased to 584,574 MDL in 2019. This leads to an increase in labour productivity of 20%.

Table 6

Labour productivity 2017 and 2019 and increase

	2017	2019	Increase	%
Total income, million MDL	2177	3024	847	38.9
Employment, FTE	4470	5173	703	15.7
Labour productivity (proxi) MDL/FTE	487025	584574	97549	20.0

Source: developed by authors

LAND PRODUCTIVITY AND MECHANIZATION

The beneficiaries had in 2019 around 92000 ha more in operation than in 2017 before the investments took place, which represents an increase of 6.8%. At the same time, the survey findings related to mechanization are also solid. The beneficiaries have been asked to indicate the number of equipment younger than 2010 for the years before investment (2016) and 2019. Thus, the number of equipment units increased from 2017 to 2019 with 30%, and the average per farm increased 14.5% leading to the expectation that the overall factor productivity has increased as a consequence of the investments.

Table 7

Agricultural equipment, units

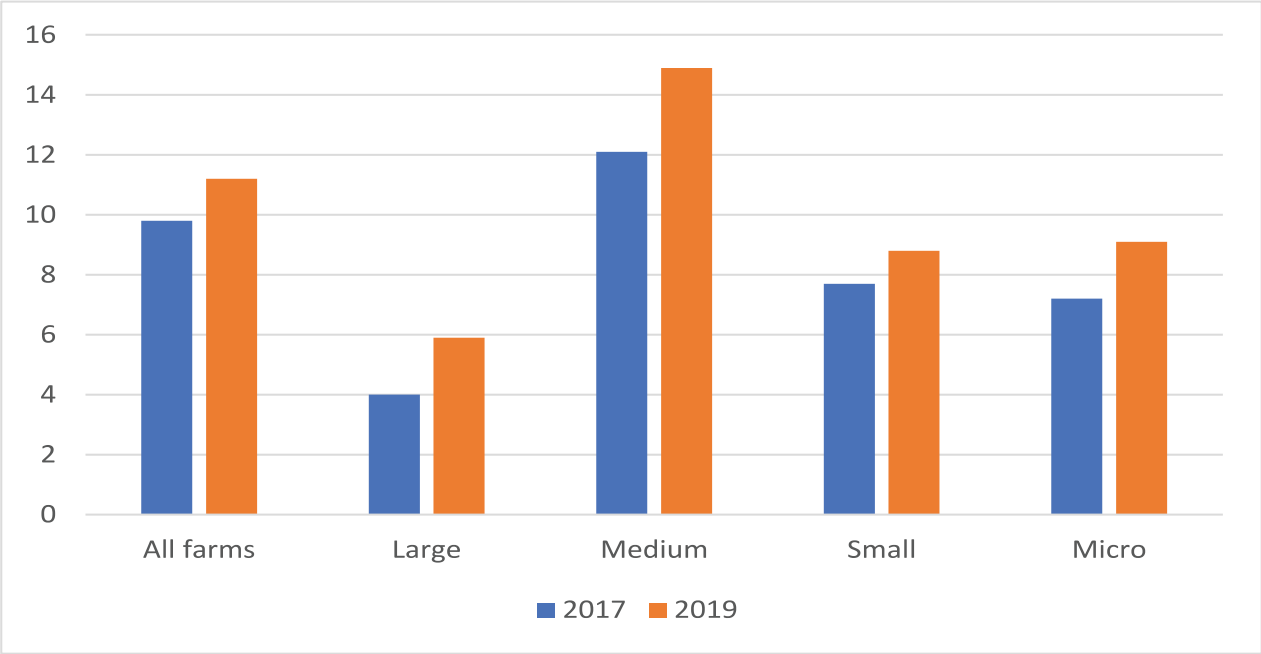
Topic	2017	2019	Increase	%
Numbers	1443	1874	431	29,9
Farms	104	118	14	13,5
Average	13,9	15,9	2	14,5

Source: developed by authors

PRODUCTIVITY

The productivity is measured as tons/ha as an average of the commodity crops of the producers. It is typically wheat, corn, sunflower, potatoes, bulk table grapes etc. The yield per hectare is thus artificial and not representing one single crop, but the average productivity of all crops produced. We can observe from the findings that for all groups of farms the number of farms reporting a productivity level in 2019 has increased form 2017 with 25%. That means that 55 farms have a production of commodity crops in 2019, while the in 2017 it was only 44 farms in the survey. The average productivity has increased from 9,8 tons/ha to 11,2 tons/ha or 14,3%.

Figure 2
Average productivity, tons/hectares, main crops, 2017 and 2019, growth



Source: developed by authors

QUALITY SCHEMES

Quality schemes are considered to contribute positively to the performance of the agricultural producers. According to the findings from this survey, the ratio of agricultural producers having quality certificates is 32% (31 beneficiaries out of 98 providing an answer to the questions). Large and medium sized producers are using the schemes more frequently than small and micro farms.

For the beneficiaries with quality certificates, the investment efficiency is 29% and two times higher than the average for the surveyed population. Profits increased with 111 million MDL from 2016 to 2019 and with investments of 388 million MDL in 2017 and 2018.

The most used quality certificates are ISO22000, Global Gap, HACCP and a few others.

USE OF INSURANCE

Only 18 beneficiaries have indicated in the survey that they use insurance, while 73 do not do it. The small farms use insurance more frequently than the other size groups (22%): Large farms with 20%, medium farms with 17% and micro farms with 20%. All in all, 19.8% of the beneficiaries use insurance.

USE OF PROMOTIONAL INSTRUMENTS

The total investments of the beneficiaries using promotional instruments is 62 million MDL in 2017 and 2018. They have increased their profit with 263% (4.8 million MDL) from 2016 reaching 6.3 million MDL in 2019.

Table 8
Use of promotional instruments

Farm size	Yes	No	Total
Large	1	9	10
Medium	4	26	30
Micro farms	3	11	14
Small farms	8	37	45
Total	16	83	99

Source: developed by authors

EXPORT

None of the beneficiaries in the survey had any export before the investment in 2016, and only 8 beneficiaries (7%) have made export after the investment.

If we look at the increase in income and profits for the agricultural producers now exporting, we see an increase in profits in 2019 compared to the situation before investment with 38%, which is less than the increase in profits of the total population (51%).

Income from sales increased 46% from 37.8 million MDL in 2016 to 55.3 million MDL in 2019. The 46% increase in income is higher than the increase in income for the full population of producers, which is 39%.

Difficulties encountered during the survey process were mainly related to:

- Moldovan farmers are not very acquainted with online types of survey. Some of them encountered difficulties in accessing the form, filling it in and submission.
- The questions that created some difficulties were mainly related to financial and investment data.
- Answering financial questions required the involvement not only of the farm manager, but also of the accountant. This made difficult for some farmers to fill in the survey form, as in some cases, accountant has a remote work and was not present in the office.
- Some farmers complained about the complexity of the survey, necessity for many exact numbers, and considerable amount of time spent for filling it in (according to observations of the local expert, time for completion of one questionnaire ranged between 1.5 – 4 hours, depending on data availability at the moment).
- No compulsory or motivating mechanism has been developed in order to encourage farmers to take a more active part in the survey, this resulting in a lower number of observations.
- Russian speaking farmers encountered some difficulties in filling in the survey, due to language barrier.
- Some questions related to technical topics and not only financial topics were difficult for the farmers to answer precisely.

Based on the piloting carried out, the following **recommendations** are applicable in order to improve the relevance and utility of the survey and its operationalization as an instrument:

1. Better information to beneficiaries about how to enter correct data in the questionnaire in the future.
2. Better training of beneficiaries about how to use data from their balance sheets.
3. Improvements of the survey questionnaire is needed, for example regarding data on employment before the investments.
4. A more focused and precise questionnaire could be useful in order to increase the response rate.
5. Personal interviews or telephone supported interviews could increase the response rate and improve the data quality.
6. Involvement of territorial offices of AIPA in contacting the potential respondents and distribution of the questionnaire.
7. Utilization of massive qualitative data is resource demanding and should be avoided, unless qualitative studies should complement the quantitative analysis provided here.
8. Translation of the questionnaire in the Russian language in order to reach the Russian speaking population.
9. Further analysis of the collected data can take place with the help of a case approach, where cases (beneficiaries) selected among the participating beneficiaries in the survey can be explored in more details. The in-depth analysis can take advantage of personal interviews in order to collect additional information about the specific design of the sub-measures, both regarding content of the sub-measure (eligibility criteria, selection criteria, prioritization

of sectors, aid intensity etc.) and the administration of the sub-measure (application procedures, administrative controls and payment procedures etc.). This combined approach using a quantitative survey to collect information of the general level and using case studies to collect qualitative information on in-depth issues, is common procedures in international evaluations of programs and policies.

CONCLUSIONS

The paper presents the analysis of the data collected by a policy monitoring tool. A survey was implemented with the objective to provide MAFI and AIPA with monitoring and some evaluation data in order for MAFI – on an ongoing basis – to improve the measure design and thus increase effectiveness and efficiency of the measures implemented under the National Strategy on Agriculture and Rural Development.

The findings reveal both the positive impacts of subsidies on agricultural productivity and efficiency, as well as areas requiring improvement for future policy development. The results highlight that the subsidies granted through NSARD have had a generally positive impact on agricultural production, profitability, and efficiency.

The main findings of the tool implementation are summarized below:

- Income generation of the investments is 39% on farm income and 51% on profits. This is high, compared to the development in the agricultural sector in general in the period.
- Investment efficiency is 14.2% for profit and considered high compared to the sectoral growth in value of production and gross value added (GVA).
- Investment efficiency is highest for small farms (20%) and lowest for micro farms (3%).
- Farmers in the age category from 40 years to 49 years has the highest investment efficiency with 25.9%
- Female farmers have a higher investment efficiency than male farmers with 18.1% against 13.6%.
- 700 new fulltime jobs have been generated with an average investment cost of 0.9 million MDL
- Labour productivity has increased with 20% from 2016 to 2019.
- Farm mechanization has increased with 30%
- Land under operation has increased with 7%
- Productivity (tons/hectare) of the main commodities has increased with 14.3%
- Export is not playing any big role in the survey population. Only 8 producers out of 118 have export after the investments
- Promotional instruments are not used a lot (only of 16% of the beneficiaries) and they do not demonstrate high efficiency
- Quality certificates provide positive effects to the agricultural producers. 32% of the beneficiaries use different types of quality certificates and demonstrate an investment efficiency on profits of 29%, which is double the efficiency of the total population in the survey.

- The most successful agricultural producer measured in investment efficiency (indicated in brackets for each category) is:
  - small scale producer (19.9%)
  - female producer (18.1%)
  - age between 40 and 49 years (25.9%)
  - member of and association (14%)
  - has invested in measure 1.1 Stimulating investments for the production of vegetables and fruits on protected land (winter greenhouses, solariums, tunnels) in 2017 (40.2%) and
  - measure 1.4 Stimulating investments for the equipment and technological renovation of livestock farms in 2018 (23.6%)
  - is a quality certificate holder (29%).

Notably, the efficiency of certain subsidy measures varied significantly across different types of farms. Despite the positive impact observed, the analysis also identified certain gaps in the monitoring and evaluation of subsidy effectiveness. The findings underscore the need for more robust data collection and analysis tools, which can provide policymakers with a clearer understanding of subsidy outcomes and guide adjustments to the subsidy framework. Thus, an ex-ante assessment could inform decision makers whether formulated policy objectives are sufficiently specific and whether instruments intended could be effective in achieving policy objectives. As a base for an ex-post evidence-based policy development, sound and representative information sources are a prerequisite. FADN-like farm survey serving an impact assessment study of farm-specific subsidies was supported by FAO in 2021. However, the development of a monitoring and evaluation system on a continuous basis is required to assess the potential impacts of the budgetary transfers to the agricultural sector including mid-term effects.

Administratively, it is recommended to assign a policy analysis and monitoring function in MAFI by providing additional capacities (economists, statisticians) with a plan to pursue on policy monitoring and evaluation including value chain analysis studies, price monitoring,

independent product specific studies and general impact assessment (at least once in two years) based on farm survey. Such a unit should have access to detailed statistical databases of the different authorities across the Republic of Moldova in order to produce even more consistent estimates of support indicators taking into account differences in product quality and uses.

At the same time, the number of existing support measures is relatively big and findings also point to areas where further refinement of the subsidy system may be needed. It is resource demanding for MAFI and AIPA to monitor and evaluate a big number of support schemes. If subsidies are focused on a smaller number of measures, it will be possible to conduct full review of these support measures. These reviews can be coupled with open and interactive policy dialogue with agricultural producers and NGOs, consumers and based on discussion to prioritize budget support.

As Moldova's agricultural sector continues to evolve, the operational policy monitoring tool will ensure that public support is better aligned with the diverse needs of farmers and contributes more effectively to the long-term sustainability and competitiveness of the sector. The operational tool proposed in this research provides a valuable foundation for future evaluations, enabling ongoing improvements in the design and implementation of agricultural support measures.

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[2] The views and findings are the authors' own and don't imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the UN

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Annex 1. Survey

Background data

Data about the economic agent	
Type of agricultural producer micro/small/medium/large	
Type of farm LLC, JSC, peasant farm, individual enterprise, etc.	
Administrator woman / man	
Administrator's age	
Type of employment of the founder (main / additional occupation)	
Membership of an association, YES / NO	
Certificate of Quality Holder (HACCP / Global Gap / ISO22000 / GMP)	
Measure	*Reply*
2017	
Measure(s) (for example measure 1)	
Sub-measure(s) (for example sub-measure 1.2)	
Operation (for example sub–measure 1.2.S)	
Investment object	
2018 (is only filled in, if beneficiaries from 2017 also received some subsidies in 2018)	
Measure(s) (for example measure 1)	
Sub-measure(s) (for example sub-measure 1.2)	
Operation (for example sub–measure 1.2.S)	
Investment object	
Use of the insurance mechanism: Yes / No	
- If Yes, which investment object / products are insured?	
Use promotional instruments: Yes / No	
- If yes, how big a share of investments is dedicated to promotion activities, %	
- Which types of promotional instruments are being used	

Indicators	2017 – The year of the investment	2019 – Two years after the investment	Comments, if relevant
Total operated / utilized land, number of hectares			
Land in ownership, ha			
Leased/rented land, number of hectares			
Land related to the investment, ha			
Agricultural machinery, equipment, units			
Animals, number of livestock units			
Equipment of livestock farms, units			
Post harvest infrastructure: area, m2, tons, no. of equipment, etc.			

Indicator	*Reply*
Total investment costs, MDL (2017 - 2018)	
Own sources, MDL	
2017	
2018	
Total	
Bank credits	
2017	
2018	
Total	
Grants	
2017	
2018	
Total	
Amount of received subsidy, MDL	
2017	
2018	
Total	
Degree in which there is respected the implementation of proposed deadlines from the business plan, % (Fully respected = 100%, Not respected at all = 0%	

Output data

Output data refer to the operational delivery of the investment such as a tractor, a new irrigation system, increased warehouse and cooling facilities etc. The data relates to the individual beneficiary and can only be aggregated to the extent that the same indicators are used, for example m2 green houses, m2 irrigation capacity etc.

Indicator and measurement unit	*Capacity indicator (select from column 1)*	*Before investment*	*2017 – Immediately after investment*	*2019 – 2 years after investment*	*Comments, added by interviewer, if relevant*
Capacity of production, numbers (ha of land, number and m2 of tunnels and greenhouses etc., number of animals, post-harvest infrastructure such as storage and cooling facilities, irrigation infrastructure m2 covered)	For example: number of green houses, and m2 of green houses	For example: 3 green houses, of a total of 90 m2	For example: 5 green houses, of a total of 200 m2		For example: 2 new green houses and 3 renovated.
Productivity of production, yield (tons/ha; kg/m2; liter wine/kg produce; liter milk/animal, kg. meat/animal	For example: Kg of product/ m2 green house	For example: 3 kg of table grapes/m2	For example: 3.5 kg of table grapes/m2		
Diversity of production		For example: basic product apples / grapes		Juice / jams / dry fruits	
Export		Poland, Romania		Poland, Romania, Czechia, etc.	

Result and impact data

Results and impacts relate to the effects of using the output delivered with the investment, such as using the tractor, benefitting from using the irrigation system and the post–harvest facilities in terms of increased employment, increased turnover and gross value added. The data can be aggregated at sector level, since the indicators are common and horizontal covering all measures.

Indicator and measurement unit	*Registration from the year prior to the investment*	*2017 –Immediately after investment*	*2019 – 2 years after investment*
Turnover (value of produced output sold on the market), MDL *(code 010 from balance sheet)*			
Gross Value Added (turnover minus intermediate costs for input to the specific production, such as fertilizers, pesticides, animal feeds, petrol, rented machinery services etc. If you have no fixed costs, NVA is equal to GVA) MDL *(code 110 minus sum of codes 060,070,080,090,110 from the balance sheet)*			
Net Value added (GVA minus fixed costs to payments for houses and machinery not linked to any specific production) MDL (*GVA minus code 100 from balance sheet / or code 140 from balance sheet)*			
Income (value of earnings of the farm or beneficiary is defined as Value of output minus Intermediate costs minus fixed costs plus subsidies) MDL			
Jobs, permanent, maintained, men (Full time job = 1960 working hours per year)			
Jobs, permanent, maintained, women(Full time job = 1960 working hours per year)			
Jobs, seasonal maintained, men (Half time job = 980 working hours per year)			
Jobs, seasonal maintained, women (Half time job = 980 working hours per year)			
Jobs, new, men (Full time job = 1960 working hours per year)			
Jobs, new, women (Full time job = 1960 working hours per year)			
Jobs, new seasonal, men (Half time job = 980 working hours per year)			
Jobs, new seasonal, women (Half time job = 980 working hours per year)			

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FLEXIBLE WORK MODELS AND FEMALE EMPLOYEE PREFERENCES

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SUMMARY

New arrangement models have quickly become the most common work organization for many companies, offering employees a better work-life balance and higher job satisfaction. The COVID-19 pandemic has accelerated the adoption of these models without a clear understanding of emerging hybrid forms and the support needed to ensure a sustainable and efficient transition. The lack of clear regulatory frameworks and adequate infrastructure has created challenges for both employers and employees, highlighting the need for strategic policies and investments to support the sustainable development of the new forms of work.

This study explores the determinants of the acceptance of the new working models and female employee satisfaction in post-pandemic Moldova. Using a questionnaire survey and an Ordinary Least Squares (OLS) regression model, the research evaluates employees' preferences for traditional, hybrid, and remote work arrangements. The findings indicate a growing inclination toward hybrid work models, which offer flexibility and work-life balance. However, full adaptation remains hindered by limited digital infrastructure, employer concerns over productivity, and insufficient policy support. While remote work is valued for its flexibility, employers in Moldova express reservations about its impact on oversight and collaboration. By focusing on female employees—who represent the majority of the workforce sample—this study offers a gendered perspective on evolving work preferences and provides evidence-based recommendations for designing inclusive and adaptive work policies. The findings contribute to understanding workforce transformation in Moldova and support efforts to align labor market practices with broader trends in digitalization and gender equity.

Keywords: flexible work arrangements, hybrid work culture, remote work, future of work, labour market

INTRODUCTION

The COVID-19 pandemic, which emerged in early 2020, triggered a profound global crisis that disrupted economic systems and labor markets worldwide. Supply chain interruptions, declining commercial activity, reduced working hours, and widespread sectoral shutdowns led to a severe recession across countries. One of the most transformative effects of the pandemic was the rapid and large-scale shift toward remote work, particularly during lockdown periods when physical presence at the workplace became impossible.

Before the pandemic, remote work was relatively rare, typically reserved for specific professional roles or individual circumstances. The crisis forced organizations to adopt digital solutions for virtual collaboration and to reconfigure their operational models almost overnight (Mitchel, 2023). According to the International Labour Organization (ILO, 2020), approximately 81% of the global workforce experienced mandatory workplace closures during the early stages of the pandemic. Teleworking, initially perceived as a temporary solution, quickly became a necessity, fundamentally reshaping how work was organized and perceived.

Although remote work offers greater flexibility and autonomy, it also brings new challenges. These include blurred boundaries between professional and personal life, increased stress levels, and unequal access to adequate infrastructure. Many employees struggled with combining household responsibilities and professional duties, while employers expressed concerns about productivity, oversight, and maintaining team cohesion (Bolino et al., 2020; Hajal, 2022). Despite such challenges, remote and hybrid work models are likely to persist beyond the pandemic, becoming integral to the future of work (Carroll & Conboy, 2020; Bloom, 2020).

The post-pandemic era is marked by experimentation with flexible arrangements—ranging from full-time remote work to hybrid models that combine office presence with telecommuting. However, the shift to these models has outpaced the development of regulatory frameworks, infrastructure, and managerial practices needed to support them sustainably. Although literature increasingly addresses the opportunities and limitations of hybrid work, few studies systematically examine its impact on employee productivity, satisfaction, and gender-specific needs—particularly in countries with emerging economies, such as Moldova (Williams & Shaw, 2025).

In this context, understanding employee preferences is critical for designing adaptive and inclusive work policies. This is especially important in Moldova, where labor market structures, digital readiness, and organizational cultures differ significantly from those in more advanced economies. Moreover, gender plays an essential role in shaping work experiences, as women often bear a disproportionate burden of unpaid care responsibilities.

This study aims to explore how Moldovan employees—especially women—perceive traditional, hybrid, and remote work models in the aftermath of the pandemic. Drawing on a nationally representative survey and applying an Ordinary Least Squares (OLS) regression model, the research seeks to identify the key factors influencing preferences for different work arrangements. The novelty of this study lies in its focus on gendered experiences within Moldova's evolving labor landscape and its contribution to evidence-based policy recommendations for building a more resilient and equitable workforce.

LITERATURE REVIEW

The emergence of flexible work arrangements has fundamentally reshaped traditional employment structures. Hybrid and remote work models allow employees to perform their tasks across multiple physical and digital spaces, blending professional and personal environments (Halford, 2005). While these models offer advantages in terms of flexibility and autonomy, they also introduce challenges related to communication, coordination, and performance management.

A growing body of research highlights the benefits of remote work for employees. Numerous studies point to increased job satisfaction, enhanced productivity, and improved work-life balance when employees have control over their schedules and workspaces (Charalampous et al., 2018; Barath & Schmidt, 2022a; Yang et al., 2021). Home-based work can reduce commuting time and associated stress, provided workers have adequate privacy, technological support, and minimal distractions (Gratton, 2021; Haines et al., 2002).

However, flexible arrangements are not universally positive. Remote work may lead to social isolation, blurred boundaries between work and personal life, and extended working hours that negatively affect health and well-being (Tavares, 2017; Smoder, 2021; Pulido-Martos et al., 2021). Employees may face reduced access to informal learning, limited career advancement opportunities, and diminished team cohesion (Cooper & Kurland, 2002; Sewell & Taskin, 2015). Organizational cultures also face challenges in adapting oversight and performance evaluation mechanisms to remote or hybrid contexts.

Traditional office-based work environments, despite being less flexible, continue to offer benefits such as structured routines, direct supervision, immediate access to infrastructure, and stronger social integration (Iqbal et al., 2021; Zwanka & Buff, 2021). These advantages help explain the enduring preference for in-office work in many organizational cultures, particularly in sectors requiring face-to-face interaction and real-time decision-making.

Recent literature has also emphasized the importance of employee autonomy and results-based work structures as emerging trends in future work models. Ragan Decker and Daroon Jalil (2024) outlines eight flexible models, including task autonomy, compressed workweeks, location flexibility, gig-based contracts, and the integration of artificial intelligence (AI) and augmented reality (AR) tools. These models reflect a broader shift toward employee-centered work design and digital transformation.

Despite global attention to flexible work, research remains limited in several areas. First, there is a need for context-specific studies that examine how flexible work arrangements function in emerging economies with limited digital infrastructure and evolving labor policies. Second, existing literature often overlooks gendered dimensions of work model preferences, particularly in countries where traditional gender roles persist. Women frequently face additional constraints in balancing professional and domestic responsibilities, making their perspectives crucial for designing inclusive work systems (Dien, et al., 2023; Buonomo et al., 2023).

Finally, there is a lack of empirical research focused on post-pandemic employee preferences in Moldova, a country navigating both economic transition and digital transformation. This study addresses these gaps by analyzing how Moldovan employees—especially women—perceive and evaluate different work models and by identifying the structural barriers to broader adoption of flexible arrangements.

RESEARCH METHODOLOGY

Data Collection and Sampling. The data for this study come from Moldovan employee satisfaction work model survey conducted by the authors in 2024 among nationally representative samples of resident population. The sample size were 422 employed individuals in Moldova from urban and rural areas. To ensure balanced demographic representation, the data were weighted by age and gender. Of the total respondents, 74% were women and 26% were men, reflecting the research focus on female employee preferences.

The questionnaire comprised 25 items, covering demographic characteristics, work arrangements, satisfaction levels, and perceived challenges and preferences related to work models. The study utilizes weighted data based on age and gender criteria to ensure the sample is adequately representative, which enables a detailed analysis of employed individuals. The survey was conducted using online auto-administration method through Google forms platform. The survey contained 25 questions. The participants were from different sectors, mainly education, science and culture (29.7%), trade (23%), and services (16.2%).

To investigate the determinants of female employees' preferences the Ordinary Least Squares (OLS) regression method was used. OLS is widely recognized in empirical economic and social sciences for estimating linear relationships between a dependent variable and one or more independent variables. In this study, the dependent variable is a binary indicator reflecting the preference for the traditional work model, while the independent variables include age, residence (urban/rural), sector of activity, job position, and currently practiced work model. OLS was selected for its interpretability, computational efficiency, and its compatibility with

similar studies conducted in other international contexts. The estimated coefficients provide direct insights into the marginal effects of each explanatory variable on the probability of preferring traditional work arrangements.

The model's goodness of fit is assessed through the R-squared value, F-statistic, and the significance levels (p-values) of individual coefficients. Further will provide variables description:

1. *Dependent variable:* Traditional_Work_Model (binary: 1 = preference for traditional model; 0 = otherwise);
2. *Independent variables*: Age: continuous variable (years), Residence: binary variable (1 = urban, 0 = rural), Sector of activity: categorical (transformed into dummy variables), Job position: ordinal (hierarchical level), Work model practiced: binary (1 = traditional, 0 = hybrid/remote).

Statistical analyses were performed using Gretl (Gnu Regression, Econometrics and Time-series Library), an open-source econometric software suited for linear models. The interpretation of results relies on coefficient values, standard errors, and associated p-values to determine statistical significance.

LIMITATIONS OF THE STUDY

This study has several limitations that should be acknowledged. First, the data were collected through a self-administered online survey, which may have excluded individuals with limited digital access or low technological literacy, particularly from rural areas or less digitized sectors. As such, the findings may not fully capture the preferences of all categories of employees in Moldova.

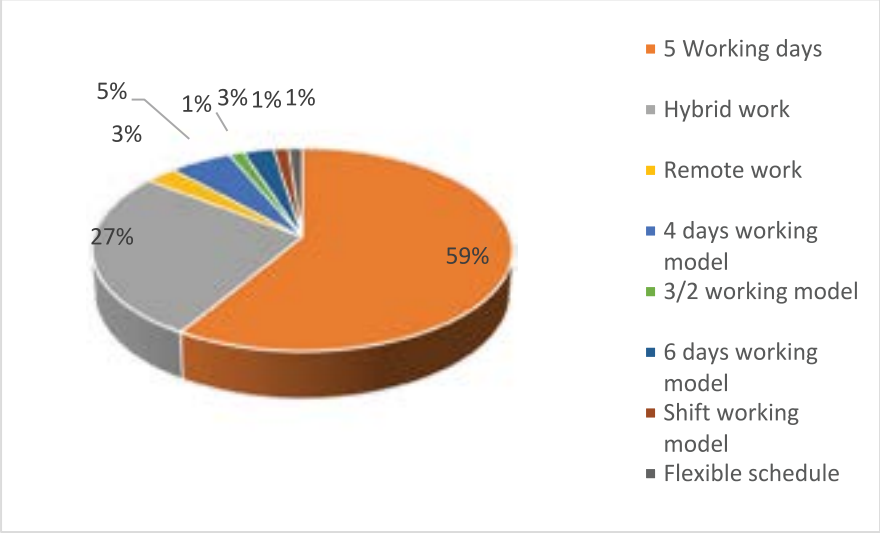
Second, although the sample is nationally representative and weighted by gender and age, the predominance of women in the respondent pool (74%) could influence the generalizability of the results to the entire working population. This gender imbalance, while intentional for analytical purposes, limits the ability to make strong comparative inferences between male and female employees.

Third, the study relies on cross-sectional data, which prevents drawing causal inferences. Employee preferences and practices may evolve over time, especially in response to changing organizational policies or external shocks. Longitudinal studies would be necessary to observe how these preferences develop and to better understand causality.

DESCRIPTIVE STATISTICS

The survey analysis reveals that 58.7% of respondents adhere to the traditional work model, requiring physical presence in the office for five days a week. Meanwhile, 26.7% follow a hybrid model combining remote work and physical presence (Figure 1).

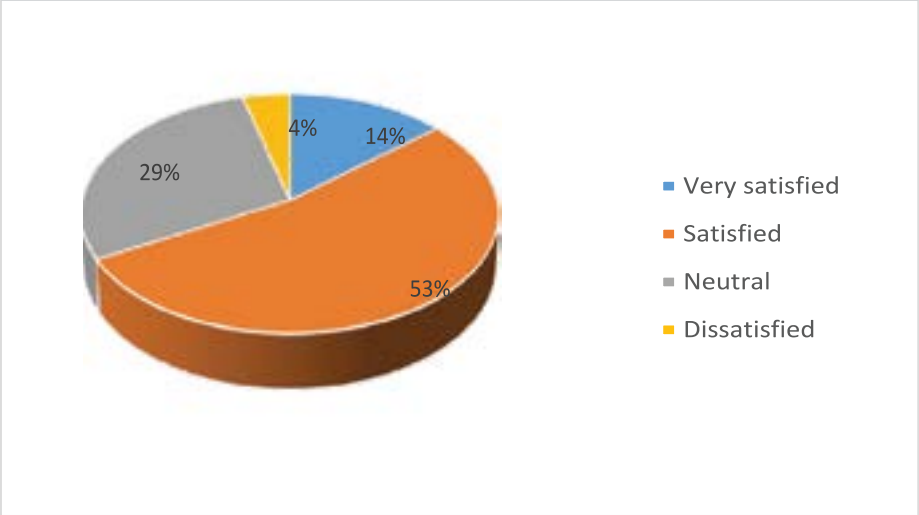
Figure 1. Types of Work Models Used by Employees



Source: Moldovan employee satisfaction work model survey, 2024

The work model satisfaction rate shows that 53.4% of respondents are satisfied while 13.7% express very high satisfaction. Neutral opinion have 28.8% of participants and only 4.1% expressed dissatisfaction (Figure 2).

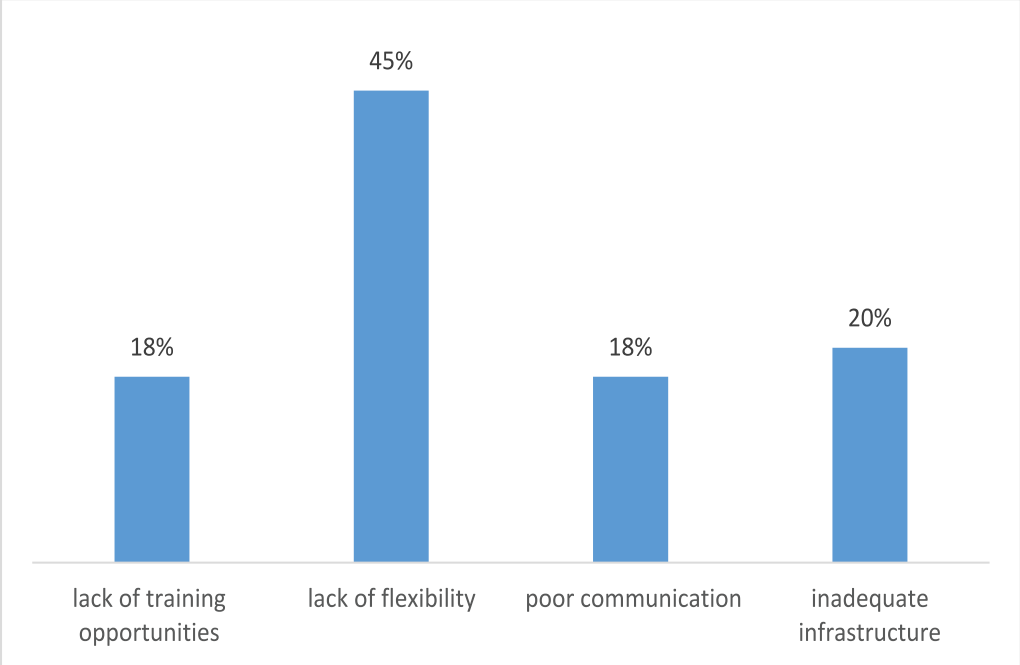
Figure 2. The work model satisfaction rate



Source: Moldovan employee satisfaction work model survey, 2024

The workforce encounters multiple difficulties during their work model due to insufficient flexibility (44.6%), inadequate training opportunities and communication problems (17.55% each) and insufficient infrastructure (20.3%) (Figure 3).

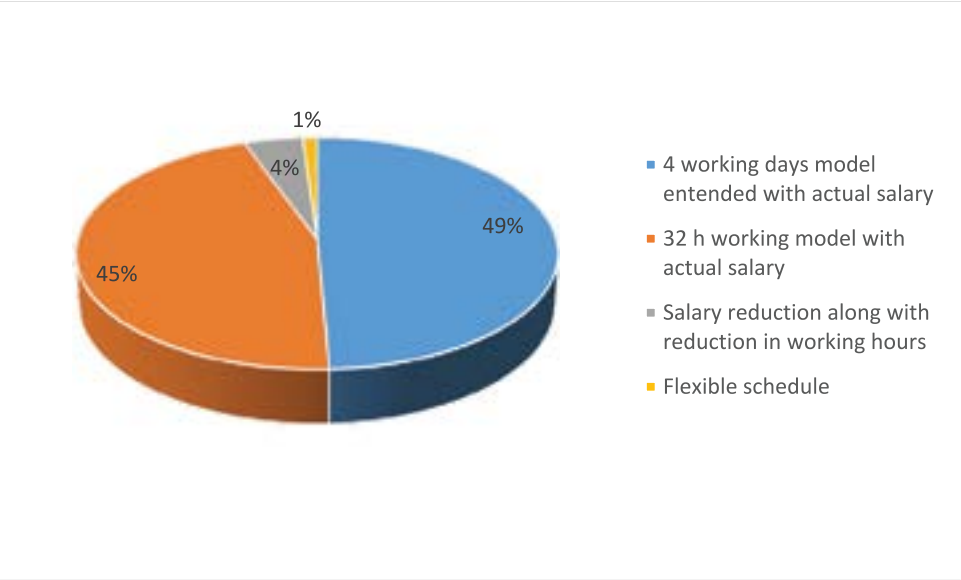
Figure 3. Key challenges in new work models adoption



Source: Moldovan employee satisfaction work model survey, 2024

Regarding changing work patterns, 49.3% of respondents prefer keeping their current salary with an extended schedule over four days, while 45.2% prefer maintaining their salary with a reduced 32-hour workweek (Figure 4).

Figure 4. Employee preferences on switching to a 4 working days model



Source: Moldovan employee satisfaction work model survey, 2024

The main barriers to implementing alternative work models were insufficient financial resources (41.34%), resistance to change (36.33%), and lack of necessary skills (22.33%).

DETERMINANTS OF FEMALE WORK MODEL PREFERENCES

The analysis investigates the determinants of the preference for the traditional work model by female employees. The model explains 23% of the variation in the dependent variable, which is a moderate predictive capacity. The statistical significance of the model is confirmed by an F-statistic of 3.057 with a p-value of 0.0173, which means that at least one explanatory variable has a statistically significant effect on the adoption of the traditional work model.

Dependent variable: Traditional_Work_Model

	Coefficient	Std. Error	t-statistic	p-value	
constant	1,66258	0,490226	3,391	0,0014	***
age	−0,319714	0,114598	−2,790	0,0074	***
residence	−0,487811	0,247487	−1,971	0,0542	*
sector	0,0254072	0,0538103	0,4722	0,6388	
position	0,0369216	0,0719228	0,5134	0,6099	
work model practiced	0,270952	0,0977489	2,772	0,0078	***

Mean dependent variable	1,649123	Std. dev. dependent variable	0,767445
Sum squared residuals	25,37714	Model standard error	0,705401
R-squared	0,230587	Adjusted R-squared	0,155154
F (5, 51)	3,056854	p-value (F)	0,017287
Log-likelihood	−57,81723	Akaike criterion	127,6345
Schwarz criterion	139,8928	Hannan-Quinn criterion	132,3984

Excluding the constant, the highest p-value was obtained for variable 4 (sector of activity).

Source: Developed in Gretl (Gnu Regression, Econometrics and Time-series Library)

The estimated regression equation is:

Traditional_Work_Model = 1.6626 - 0.3197 * Age - 0.4878 * Residence + 0.0254 * Sector + 0.0369 * Position + 0.2710 * Work_Model

where:

Constant (1.6626, p-value = 0.0014) – the positive value of the constant suggests a general predisposition of the examined population towards the traditional work model.

Age (-0.3197, p-value = 0.0074) – the significant negative relationship between age and the traditional work model indicates that older female employees are less likely to prefer the traditional model. This result can be explained by older women's preference for a more flexible schedule as it helps them better manage fatigue and stress accumulated over the years. As they age, their tolerance for prolonged effort decreases, and a rigid 9-to-5 schedule can become physically and mentally exhausting. Flexibility allows them to distribute their tasks according to their energy levels and avoid overexertion. Additionally, professional stress increases with age, especially in dynamic work environments. An adaptable schedule gives them more control over their work pace, reducing pressure and the risk of burnout.

Residence (-0.4878, p-value = 0.0542) – the negative coefficient suggests that individuals living in rural areas are less likely to adopt the traditional work model; the effect is at the statistical threshold (p = 0.0542, close to 0.05). This can be explained by the fact that in cities there are more traditional jobs that require physical presence, while in rural areas there may be more opportunities for flexible work (e.g. freelancing, agriculture, self-employment).

Sector (0.0254, p-value = 0.6388) – this factor does not significantly affect the preference for the traditional model.

Position (0.0369, p-value = 0.6099) – the position within the company does not significantly influence the preference for the traditional model.

Work Model Practiced (0.2710, p-value = 0.0078) – the positive and statistically significant relationship indicates that employees currently practicing a traditional work model are more inclined to prefer this model. However, this association should not be interpreted as causal. Rather, it may reflect underlying factors such as organizational culture, job type, or individual familiarity, which reinforce existing preferences. Further longitudinal or experimental research would be necessary to establish causality.

The physical presence of employees at the workplace facilitates communication, collaboration, and timely decision-making. It also supports organizational culture and provides access to essential resources. These aspects may explain why some employees continue to prefer traditional work arrangements.

DISCUSSION

The findings of this study confirm that the traditional five-day, in-office work model continues to dominate Moldova's labor market. Over half of the surveyed employees remain in traditional arrangements, reflecting persistent cultural norms and employer preferences for direct oversight and structured routines. Despite international trends promoting flexible work, Moldovan organizations appear cautious in embracing alternative models such as hybrid or remote work.

A significant share of respondents—particularly older women and those residing in rural areas—demonstrate openness to non-traditional arrangements. The regression analysis revealed that age and currently practiced work model are the strongest predictors of preference for traditional work, with older women more inclined to favor flexibility due to accumulated work-related fatigue and competing personal responsibilities. Rural residents, although only marginally significant, tend to prefer non-traditional models, possibly due to more limited access to formal employment or the need to reconcile work with household or agricultural duties.

The hybrid model is viewed favorably by many employees for its flexibility and potential to improve work-life balance. However, its full implementation is hindered by several systemic barriers: insufficient digital infrastructure, limited employer readiness, and lack of supporting policies. These constraints are particularly pronounced outside urban centers, further reinforcing geographical inequalities.

While remote work offers substantial benefits, including autonomy and reduced commuting, many employers in Moldova remain concerned about potential declines in productivity and challenges related to oversight and collaboration. This hesitance is exacerbated by the limited availability of digital tools and insufficient organizational experience with remote management practices.

Another important insight emerging from this study is the relevance of gender-specific perspectives in understanding work model preferences. By focusing on female employees—who represent the majority of the sample—the study highlights the particular challenges women face in balancing professional and domestic responsibilities. This reinforces the importance of promoting flexible and inclusive work arrangements. Moreover, the concentration of female workers in sectors

such as education, healthcare, and social services—where remote and hybrid work options are less widespread—further limits their access to alternative work models.

The results also highlight employees' divided views on the four-day workweek. Nearly half (49.3%) would accept longer daily hours for an additional day off, while 45.2% prefer a reduced 32-hour week at the same pay. This division reflects broader tensions between income security and time autonomy and should be considered by employers exploring alternative scheduling options.

CONCLUSION

The results of the survey confirm that the traditional work model continues to dominate the labor market in Moldova. Nevertheless, there is a growing openness to hybrid arrangements, especially among women, older employees, and those residing in rural areas. Although satisfaction with current work models is generally high, respondents emphasized the need for increased flexibility, more accessible training opportunities, and stronger organizational communication.

Regression analysis method identified age, residence, and the currently practiced work model as key factors influencing preferences for traditional arrangements. These findings underscore the importance of demographic and contextual variables in shaping work model acceptance, particularly among women balancing professional and caregiving responsibilities.

The adoption of alternative work models in Moldova is constrained by several barriers, including limited financial and technological resources, institutional resistance to change, and gaps in digital and managerial competencies. Overcoming these obstacles will require a coordinated effort by employers, policymakers, and educational institutions.

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