THE IMPACT OF DEMOGRAPHIC DYNAMICS ON INCOME INEQUALITY AT REGIONAL LEVEL: THE INTRIGUING CASE OF ROMANIA

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Abstract

Income inequality, reflecting the uneven distribution of wealth across a country's population, poses a significant challenge for most of countries. In the current international context Romania is an intriguing case, taking into account the trend of increasing the wage share in GDP while faster growth of salaries compared to labour productivity enhances inflation that is already at high level. This paper addresses the income inequality in Romanian regions, with the main objective of assessing the impact of demographic factors on income inequality in the 42 (NUTS3) counties in the 2014-2021 period based on linear regressions with bootstrap standard errors and dynamic panel data model. The results indicate a direct impact of the proportion of population of 65 years and more on income inequality measures, while fertility rate and employment reduced the wage share in GDP. These results suggest policy measures aimed at promoting active aging and sustainable pension system, family-friendly policies, job creation, upskilling workforce.

Keywords: Income inequality, Wage share, Fertility rate, Employment

1. INTRODUCTION

While advances have been made, Romania continues to rank among the European Union nations with the starkest disparities in income distribution. This widening income gap can be partially attributed to the shift towards a market-driven economy, which has fostered wealth concentration among a few people because of demographic pressures such as declining birth rates and an aging population. Romania has experienced rapid population ageing since 1990. The share of the population aged 65 and over is projected to increase more by 2050. This is due to a combination of factors, including low fertility rates, high emigration rates, and increasing life expectancy. On the other hand, the low fertility rate contributes to the decline of the population. However, these factors have also impact on income inequality.

Acknowledging the crucial role of income inequality in Romania, this study delves into the regional nuances of demographic factors and their impact on income disparity. Employing a dynamic panel data model to address endogeneity issue, the analysis encompasses all 42 Romanian NUTS 3 regions (including Bucharest) for the period 2014-2021.

While the wage share of GDP (wage share) is commonly used as a proxy for income inequality due to data limitations, this study acknowledges its inherent limitations and countercyclical nature. Higher wages indeed

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lead to increases in the wage share, and it is well documented that global trends have seen declines in developed countries due to factors like globalization, technological advancements, and weakening unions (Mandel, 2017).

However, Romania presents a unique case study where the wage share has seen notable increases in recent years. Lupu et al. (2023) attribute this specific trend to post-crisis policies implemented by key leaders focusing on wage increases to stimulate demand and economic growth.

Given this unique context of a high wage share and its link to specific demographic factors in Romania, this study poses the following research questions:

- Does population ageing enhance the wage share of GDP?
- Does fertility influence the wage share of GDP?
- Does employment influence the wage share of GDP?

Unveiling the interplay between income inequality and demographic factors in Romania requires a thorough investigation that marries theoretical insights from the literature review with empirical evidence gleaned from regional data. After the introduction, the study culminates in a comprehensive understanding of the issue, while highlighting avenues for further research identified within the literature. To substantiate the proposed hypotheses, subsequent sections delve into detailed data descriptions, methodological approaches, empirical results, insightful conclusions, and actionable policy recommendations.

2. LITERATURE REVIEW

This section gravitates around directions of research dealing with indicators used to measure income inequality, demographic factors that determine income inequality and its consequences, empirical evidence on the impact of demographic factors on income inequality.

Income inequality, reflecting the uneven distribution of wealth across a population, poses a significant challenge for many societies (Ravallion, 2014). Various metrics exist to quantify this disparity, such as the Gini coefficient, Lorenz curve, and wage share of GDP (Silber, 2012). While acknowledging the limitations of using a single indicator, this study focuses on wage share because of limited data availability. This choice holds particular relevance for Romania, where post-crisis policies aiming to stimulate demand through wage increases have demonstrably impacted this measure (Lupu et al., 2023). It is crucial, however, to understand the specific factors driving this rise in wage share, a gap unaddressed in previous research on Romania. This study's novelty lies in identifying the regional factors influencing wage share across Romanian counties, offering valuable insights into income distribution dynamics within the country.

The seminal paper of Kuznets (1955) has opened the field of research for many studies analysing the connection between income inequality and various aspects of economic, social, and technological development (economic growth, well-being, changes in the education system, the status of females on labour market, population ageing, fertility, technological change, industrialization) that might act like drivers of income inequality. Aspects relating to population have received less attention compared to economic factors that influence income inequality. Most of the studies in this field were focused on developed countries where population ageing is more advanced compared to emerging economies and drew the conclusion that population ageing enhances income inequality, but to a lower extent compared to other factors (Bishop et al., 1997; Jatti, 1997; Barrett et al., 2000). Older people are expected to leave the labour market, which will reduce their average household income and consequently will enhance income inequality. Some studies reported no significant impact of population ageing on income inequality or a negative effect. For example, Gustafsson and Johansson (1999) identified no significant impact of population ageing on income inequality in OECD countries. However, Chu & Jiang (1997) concluded that population ageing contributes to the alleviation of the income inequality in Taiwan and China.

The studies made on developing countries like Romania are almost inexistent. For example, Koochakzadeh et al. (2021) showed that population ageing intensified income inequality in Iran in the period 1970-2018. Therefore, the novelty of this study is the empirical evaluation of the impact of demographic factors on income inequality for Romania, knowing the acceleration of population ageing and fast decline of fertility in the last decade in this country. According to Lam (1997), baby boomers that enter the job market and high fertility rate could enhance the income inequality. On the other hand, Pestieau (1989) concluded that the evaluation of the impact of fertility rate on income inequality is conditioned by the size of the population and the measure of income inequality. Romania is a relevant case for both aspects: it is the sixth largest country of the EU in terms of population and experienced a strong baby boom phenomenon – still felt on the labour market - as a result of a decree issued by the communist government in 1966 for banning abortion.

Given the limited data availability, this study explains income inequality based on the demographic indicators available at regional level: employment, fertility rate, population aged 65 years and over. Understanding the factors driving income inequality is crucial because of its various negative consequences. Studies have shown that higher income inequality can deter investment and innovation, hindering economic growth (Lerman & Yitzhaki, 1985). It can also exacerbate social unrest, manifesting as increased crime and political instability (Alesina & Perotti, 1996). Furthermore, income inequality can hinder social mobility, making it more challenging for individuals to climb the economic ladder (Andrews & Leigh, 2009).

Unveiling the key drivers of income inequality empowers policymakers to craft targeted interventions aimed at narrowing the gap. For instance, policies promoting equal pay and affordable childcare access could help level the playing field for women in the workforce, as evidenced by their positive impact on reducing gender income inequality (Abdullah et al., 2015; Mitra & Tripathi, 2024). Similarly, fostering job creation in high-wage sectors has been shown to generate more opportunities for workers across income brackets (Mandel, 2017). Additionally, enhancing pension schemes can alleviate poverty and inequality among older populations, while expanding social welfare programmes provides a crucial safety net for vulnerable individuals and families (Muntaner & Lynch, 2020).

The suitable policies to reduce income inequality are designed depending on the impact of various factors on income inequality. In this study, we will focus only on the impact of those factors for which empirical evidence from literature is provided. For Romania, we expect to have these factors as drivers of income inequality measured through wage share of GDP.

Building upon the theoretical foundation established in the literature review, the subsequent section delves into the empirical realm by detailing the data and methodology employed to evaluate the hypothesized influence of aforementioned factors on income inequality.

3. DATA AND METHODOLOGY

This study utilizes wage share of GDP, commonly known as wage share, as a key metric to examine income inequality. Defined as the portion of national income allocated to labour, it is calculated by dividing total employee compensation by gross domestic product (GDP). A higher wage share indicates a greater income share going to workers, while a lower share implies a larger portion going to capital owners. This research introduces a novel approach by employing inflation-adjusted average monthly net real salary as a proxy for total employee compensation. This value is then divided by real GDP to obtain the wage share.

Standard income inequality indicator (Gini index) is not available at the regional level in Romania. This study proposes using "wage share of GDP" as an alternative indicator. Wage share is calculated by dividing total employee compensation by a region's GDP. Higher wage share indicates a larger portion of income going to workers, potentially signifying lower inequality. Conversely, a declining wage share suggests shrinking worker income and potentially rising inequality.

Wage share does not show distribution within the workforce (high earners might benefit more even with a steady overall share). High unemployment can reduce the share even if employed worker wages have not fallen. It ignores income from government transfers (social security, welfare) which can impact inequality.

A high wage share might mean most workers get paid, but it does not show if the pay is evenly distributed. There could still be a significant gap between high and low earners. Wage share only considers wages and salaries, not income from profits, rents, or interest. A rising wage share could simply mean a smaller share for these other income sources, not necessarily less inequality among people.

Additionally, the analysis incorporates the impact of several demographic factors. The total fertility rate denoted as fertility is provided by Eurostat and demographic measure of the average number of children that would be born to a woman over her lifetime if she were to experience the current age-specific fertility rates throughout her lifetime. It is calculated by summing the age-specific fertility rates for all reproductive ages (15-49 years).

Proportion of population aged 65 years and more denoted by pop65 is reported by Eurostat and it is a demographic measure of the share of the population that is aged 65 or older. It is typically expressed as a percentage of the total population.

Employment (thousand persons) is a statistical measure of the number of people who are employed in a given country or region. Its series is provided by Eurostat and is a key indicator of the health of an economy. A high employment rate indicates that the economy is growing and that there are opportunities for people to find work. A low employment rate, on the other hand, can be a sign of a recession or economic slowdown.

It is important to analyse the influence of these factors in the demographic context of Romania. Since the 1989 revolution, Romania has been a source of emigration, particularly towards Western Europe seeking better job opportunities and living standards. There has been a slight increase in immigration in recent years, but Romania remains a net emigration country. Romania faces challenges related to an aging population and a shrinking workforce. The government might need to consider policies that encourage higher birth rates, attract skilled immigrants, and ensure a sustainable social security system.

Romania has a Gini coefficient (a measure of income inequality) that is significantly higher than the EU average. This indicates a more unequal distribution of income, with a larger share going to the wealthy.

Income inequality exists not only between rich and poor, but also geographically. Some regions in Romania have significantly lower average incomes compared to others. Many retirees in Romania receive low pensions, which can contribute to poverty, especially for those with short contribution periods or low past wages. The causes are various. The shift from a planned economy to a market economy in the 1990s led to a widening income gap as some sectors thrived while others struggled. The labour market does not effectively match the skills of the workforce with the demands of employers. This can leave some workers trapped in low-paying jobs while others struggle to find qualified employees. The tax system in Romania is not sufficiently progressive, meaning high earners do not necessarily contribute a proportionally larger share of their income in taxes. Income inequality limits social mobility, making it harder for people from disadvantaged backgrounds to move up the economic ladder. High inequality can hinder economic growth as it reduces the purchasing power of a large segment of the population. A large gap between rich and poor determined many social tensions in Romania and instability.

This study delves into regional approaches by analyzing data from all 42 Romanian counties (NUTS 3 regions) spanning the period 2014-2021. As shown in Table 1, the minimum wage share recorded during this timeframe was 0.023 in Prahova during 2017, while the highest value was observed in Ilfov in 2020. Notably, the COVID-19 pandemic significantly impacted public expenditures across all counties due to government and local authority measures implemented to mitigate its effects. These measures included increased direct spending on healthcare to expand testing and treatment capacity, procure personal protective equipment, and cover vaccine and treatment costs. Additionally, economic support measures such as furlough schemes, business loans, and tax breaks were enacted to bolster businesses and individuals. Furthermore, social safety nets were expanded to support vulnerable populations like the unemployed, elderly, and disabled.

The fertility rate varies from 1.19 in Cluj (2014) to 3.01 in Vaslui (2020), with an average below 2. This average is lower than the replacement rate of 2.1 that it is the level of fertility required to maintain a population size over time.

TABLE 1 – DESCRIPTIVE STATISTICS

Variable	Mean	Standard deviation	Minimum value	Maximum value
wage share	0.414	0.235	0.023	1.104
fertility	1.784	0.278	1.190	3.010
pop65 (%)	18.375	2.436	12.600	27.500
Employment (thousand persons)	204.019	152.911	71.100	1079.670

Note: own calculations in SPSS

If the division in clusters depends on the overall situation of each year, one may observe a tendency of improvement in fertility rate, but not enough to counterbalance the descending trend of the Romanian population (see Table 2).

TABLE 2 – CLUSTERS BASED ON FERTILITY RATE IN ROMANIAN COUNTIES (2014 AND 2021)

Fertility rate	Number of counties in the cluster		Final Cluster Centers	
	2014	2021	2014	2021
Low	20	7	1.59	1.47
Medium	21	33	1.93	1.84
High	1	2	2.71	2.59

Note: own calculations in SPSS

Despite the low fertility rate in the entire EU, Romania, France and Czech Republic are the countries with the highest values of this indicator according to the latest data reported for 2021. In both analyzed years, 2014 and 2021, Vaslui county presents the highest fertility rate, which places this region among those from developing countries (see Figure 1).

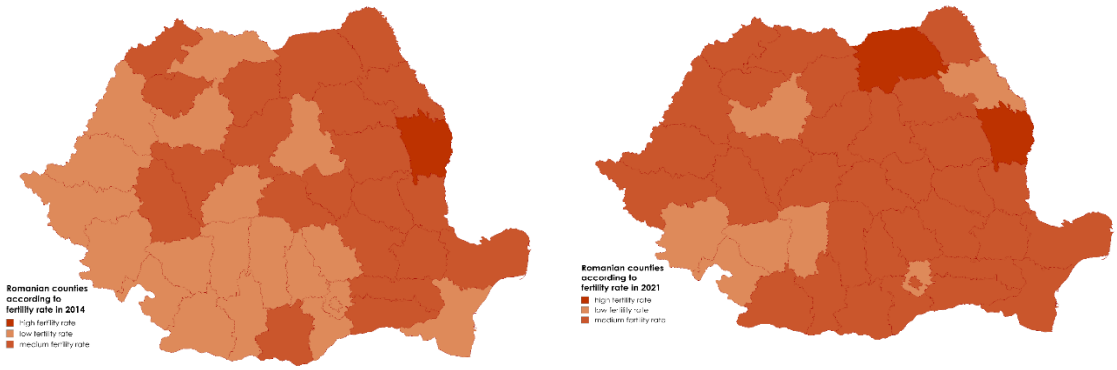

FIGURE 1 – ROMANIAN COUNTIES ACCORDING TO FERTILITY RATE IN 2014 AND 2021
Source: maps based on MapChart

Table 3 suggests a growth of the number of counties with low proportion of population aged 65 years and more, but the demographic ageing still remains an issue for Romania that if facing problems with the pension system that is supported by a low number of employees.

TABLE 3 - CLUSTERS BASED ON PROPORTION OF POPULATION AGED 65 YEARS AND MORE IN ROMANIAN COUNTIES (2014 AND 2021)

Proportion of population aged 65 years and more	Number of counties in the cluster		Final Cluster Centers	
	2014	2021	2014	2021
Low	16	22	16.26	18.05
Medium	24	18	19.3	21.21
High	2	2	24.18	26.35

Note: own calculations in SPSS

Teleorman and Vâlcea are the counties with the highest proportion of population aged 65 years and more in both years (2014 and 2021). Overall, the proportion has registered low decrease in time; the highest values belong to counties in the South and Southeast (see Figure 2).

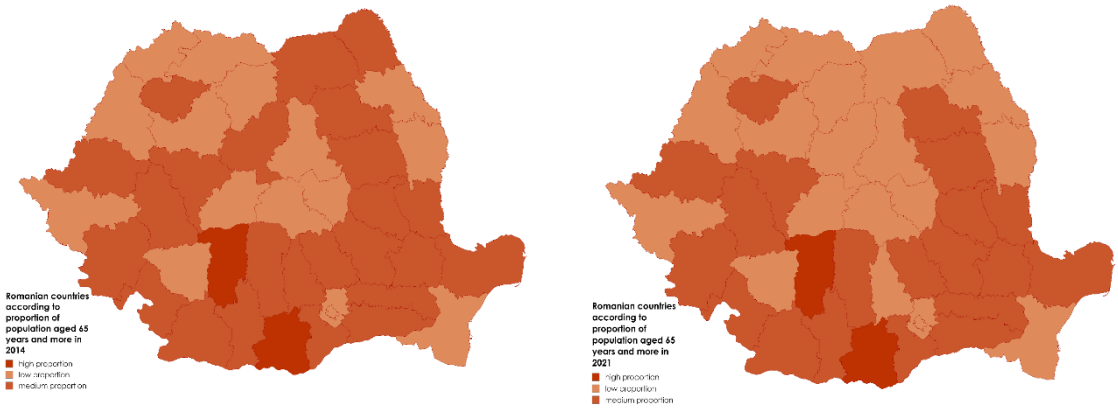

FIGURE 2 – ROMANIAN COUNTIES ACCORDING TO PROPORTION OF POPULATION AGED 65 YEARS AND MORE IN 2014 AND 2021
Source: maps based on MapChart

The nature of panel data necessitates employing specialized methods. Determining the most suitable model requires preliminary tests, including cross-sectional dependence and panel unit root tests. The heterogeneity hypothesis is assumed to hold, considering the observed significant differences between counties in terms of wage share, fertility rate, employment, and population aged 65+. These disparities can be attributed to regional variations in economic and social development, alongside demographic characteristics.

To assess the cross-sectional dependence hypothesis, the Pesaran's CD test (Pesaran, 2015) is implemented.

$H_0: \rho_{ij} = \rho_{ji} = cor(e_{it}, e_{jt}) = 0, \ \ i \neq j$ (cross-sectional independence)

$H_1: \rho_{ij} = \rho_{ji} \neq 0, \ for\ some\ i \neq j$

ρ_{ij}- pair-wise correlation coefficient for errors

$$\rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^{T} e_{it} \cdot e_{jt}}{\sqrt{\sum_{t=1}^{T} e_{it}^2} \cdot \sqrt{\sum_{t=1}^{T} e_{jt}^2}} \quad (1)$$

The CD statistic in the case of unbalanced panels is computed as:

$$CD = \sqrt{\frac{2}{N(N-1)}} \cdot \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \sqrt{T_{ij}} \cdot \hat{\rho}_{ij} \quad (2)$$

T_{ij}- number of common observations between two cross-sections (*i* and *j*)

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t \in T_i \cap T_j} (\hat{e}_{it} - \bar{e}_i)(\hat{e}_{jt} - \bar{e}_j)}{\sqrt{\sum_{t \in T_i \cap T_j} (\hat{e}_{it} - \bar{e}_i)^2} \cdot \sqrt{\sum_{t \in T_i \cap T_j} (\hat{e}_{jt} - \bar{e}_j)^2}} \quad (3)$$

$$\bar{e}_i = \frac{\sum_{t \in T_i \cap T_j} (\hat{e}_{it})}{\#(T_i \cap T_j)} \quad (4)$$

In the presence of cross-sectional dependence, as indicated by tests like Pesaran's CD, second-generation panel unit root tests, such as Pesaran's CADF test, become necessary. If these tests confirm stationarity of the data series, the analysis can proceed with the construction of dynamic panel data models.

$wage\ share_{ij} = a_i + b_1 wage\ share_{it-1} + b_2\ fertility_{it} + b_3\ pop65_{it} + b_4\ employment_{it} + e_{it}$ (5)

i represents the index for county, while *t* is the time index;

e_{it}-error;

a_i, b_1, b_2, b_3, b_4-coefficients (parameters).

The matrix of correlation does not show significant correlations between the explanatory variables (coefficients of correlations below 0.32). The dynamic panel GMM estimator is suitable for our scenarios, where we have a short time series, but many cross-sections. This strength lies in its ability to address endogeneity, a crucial issue in such settings. To counteract potential heteroskedasticity and autocorrelation in the errors, we employ the Windmeijer (2005) finite-sample correction within the two-step system GMM estimator. This approach creatively utilizes both dependent and independent variables as instruments. The validity of these instruments is then rigorously assessed using the Sargan over-identification test. Additionally, the Arellano & Bond (1991) test ensures the absence of serial autocorrelation.

However, the suitability of the dynamic panel data model hinges on the stationarity of the data series. Alternative models like fixed effects or random effects might be considered. However, it is important to note that these models are not equipped to handle endogeneity, making them less appropriate for our specific context.

We also constructed linear regressions with bootstrap standard errors to assess the impact of population aged 65 years and more on other measures of income inequality: variance based on logarithm of wage share and coefficient of variation for wage share. The data series for these measures of income inequality were computed using the data for the period 2014-2021. The population aged 65 years and more is computed as an average in the analysed period. This approach allows us to consider other measures of income inequality and an overall image of the phenomenon in the analysed period. The next section presents the results based on the described methods.

4. RESULTS

As evidenced by Table 4, significant cross-sectional dependence (p<0.01) is observed across all data series. This finding justifies employing second-generation panel unit root tests to evaluate stationarity, a crucial step before proceeding with further analysis.

TABLE 4 - THE RESULTS OF PESARAN (2004) CD TEST

Variable	CD stat.	p-value
Fertility	54.41	<0.01
pop65	82.51	<0.01
Employment	5.83	<0.01
wage share	65.17	<0.01

Note: own calculations in Stata 15

Analysis of Table 5 reveals stationarity in level for all data series at the 1% significance level. To ensure robustness, the Pesaran CADF test was employed in two variants, acknowledging its sensitivity to lag selection. This confirmed stationarity of the data series, which recommends the application of dynamic panel data models.

According to Table 6, fertility rate and employment had a indirect influence on wage share in the period 2014-2021 in the NUTS 3 Romanian regions. On the other hand, population aged 65 years and more had a direct effect on wage share. The wage share in the previous year directly impacted the wage share in the actual year, which suggests the tendency of increase in wage share. In other words, higher fertility rate and more employment determine a decrease in wage share of GDP, while more population aged at least 65 years increase the wage share of GDP. Further analysis using the second-order autocorrelation test confirms the absence of correlation at the second lag, suggesting no model misspecification. To verify the validity of our

chosen instruments, we conducted the Sargan over-identification test. In this case, the p-value is 0.034, lower than 0.05, which confirms the lack of over-identifying restrictions.

TABLE 5 - THE RESULTS OF CADF TEST

Variable	Data series in level				Data series in the first difference			
	Constant+ Trend and one lag		Constant+ Trend and two lags		Constant and one lag		Constant and two lags	
Fertility	-6.053***	(<0.01)	-3.176***	(0.001)	-12.922***	(<0.01)	-8.907***	(<0.01)
pop65	-7.019***	(<0.01)	-5.818***	(<0.01)	-13.090***	(<0.01)	-12.158***	(<0.01)
employment	-6.772***	(<0.01)	-3.193***	(0.001)	-12.413***	(<0.01)	-9.620***	(<0.01)
wage share Note: own calculations in Stata 15; ***p-value<0.01, **p-value<0.05, *p-value<0.1	-8.211***	(<0.01)	-5.613***	(<0.01)	-12.413***	(<0.01)	-11.638***	(<0.01)

TABLE 6 - ARELLANO-BOND DYNAMIC PANEL-DATA ESTIMATION TO EXPLAIN WAGE SHARE BASED ON DEMOGRAPHIC DYNAMICS

Variable	Coefficient	z calculated	p-value
Wage share in the previous year	0.740***	4.34	<0.01
Fertility	-0.170*	-1.73	0.083
Pop65	0.866**	2.59	0.01
Employment	-0.171*	-1.66	0.097
Constant	-1.764	-1.57	0.117
Arellano-Bond test for zero autocorrelation in first-differenced errors Note: own calculations in Stata 15; ***p-value<0.01, **p-value<0.05, *p-value<0.1	Order 1	-1.7658	0.0774
	Order 2	1.0662	0.2863

When a population has a higher fertility rate, it means more people are entering the workforce over time. This can lead to an increased labour supply. With more workers available, competition for jobs can rise. This can put downward pressure on wages, potentially leading to a decrease in the wage share of GDP. As there are more workers competing for the same amount of income, the overall share going to labour wages might decrease relative to other factors like profits or capital income. On the other hand, in Romania, the child-raising allowance is ensured as a financial support provided to mothers or parents who choose to take care of their young children instead of working. In Romania, this allowance is available to all parents who meet certain criteria, regardless of their previous income and it usually lower than their previous wage, which might explain the decrease in wage share of GDP if GDP does not reduce more than employee compensation. Married or common-law mothers receive 85% of the average net monthly income from the last 2 years before the child's birth, but not less than 85% of the minimum gross guaranteed wage in the country. Unmarried mothers receive 85% of the average net monthly income from the last 2 years before the child's birth, but not less than 50% of the minimum gross guaranteed wage in the country.

A higher employment rate can have a similar effect. If more people are employed, it again increases the labour supply. This can lead to a decrease in the bargaining power of workers as competition for jobs intensifies. As a result, wages might not rise as quickly as productivity, leading to a smaller share of GDP going to labour.

As the population ages and more people retire, the labour supply shrinks. This can lead to a decrease in the number of workers relative to the total population. With fewer workers available, there might be less competition for jobs and potentially higher wages. This could lead to an increase in the wage share of GDP as the remaining workers have more leverage to negotiate higher wages. Additionally, as retirees often rely on pensions and social security, these payments could contribute to the overall income going to labour even if they are not actively employed.

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These effects of demographic factors on wage share have implications in terms of income inequality. A higher employment rate is a double-edged sword for inequality. On the one hand, it can lead to more people earning wages, potentially lifting some out of poverty and reducing inequality. On the other hand, if these new jobs are primarily low-paying, it could concentrate wealth at the top and exacerbate income inequality. In the particular case of Romania, when the salaries are in general low, higher employment might generate more income inequality.

Lower wage share of GDP because of high fertility might have different implications on income inequality. First, income inequality might increase because of labour supply and dependency ratio. A larger labour force with high fertility can lead to an oversupply of labour, particularly if skill levels are not keeping pace with job demands. This can drive down wages for everyone, but especially for low-skilled workers (Sarkar, 2008). With more children and fewer working adults, the dependency ratio (dependents vs. working population) increases. This puts a strain on social safety nets and public services, potentially widening the gap between rich and poor (Adserà, 2017). Second, lower wage share of GDP because of higher fertility might mitigate income inequality due to demographic dividend and human capital investment. In some cases, a population boom can lead to a temporary "demographic dividend" where the working-age population is large relative to dependents. This can spur economic growth and potentially benefit everyone if managed well (Alderson and Nielsen, 1999). If governments invest in education and training for the growing population, it can enhance their skills and future earning potential. This could lead to a more equal distribution of income in the long run (Kleven and Landais, 2017). However, these potential effect of growing fertility on the income inequality need interpretation in the specific context of the Romanian regions. This country has a fertility rate below replacement level and the labour force has decreased dramatically because of the labour migration. The minimum wage has grown in the last years, but it is still under the minimum of the other EU countries. Many higher-skilled workers have emigrated and lower-skilled remained in Romania. Fewer and lower-skilled working adults remaining in the country and more children made dependency ratio to increase, putting pressure on social safety nets and public services and making income inequality to increase. So, in the particular case of Romania we consider that higher fertility rate widened the gap between rich and poor. Moreover, in Romania the child-raising allowance is usually lower than mothers' previous salary which made the wage share of GDP to decrease and the income inequality to increase.

Higher employment reduced the wage share to GDP, because higher overall supply of labour put downward pressure on wages, especially for low-skilled jobs (Kochan and Riordan, 2016). In the particular case of Romania, this can enhance income inequality.

As the population ages and more people retire, the wage share of GDP increased with implication on income inequality. In the last years, the salaries have grown and the pensions have risen in Romania. However, most of the pensioners have low pensions because many Romanian pensioners had shorter contribution periods due to factors such as unemployment or working off the books. Moreover, the general standard of living was lower in previous years, leading to lower pensions calculated based on salaries from that period. From this point of view, in the particular case of Romania, we argued that income inequality increased because of more population aged 65 years and more.

All in all, the results are in line with the expectations. Higher fertility will reduce the wages for females. More employees will determine an increase in wages, but if this increase has coverage in GDP that will grow more, the wage share decreases. However, in Romania the salaries are low and many people are underpaid for their job. Moreover, informal market is well developed in Romania and this reduces wages. Therefore, more employment supports economic growth even if the wages are not high enough. An increase in the population aged 65 years and more determines more public expenditure. On the other hand, the low levels of pensions force many elder people to continue to have a job, which increases the wage and, consequently, the wage share of GDP.

The results are also in line with previous studies. For example, the capacity of population ageing to increase income inequality measured by the Gini index was confirmed by Hwang et al. (2021) for South Korea using a RIF regression. The same direct impact of higher elder population on income inequality was supported by Kim

et al. (2014) for South Korea, by Zhong (2011) for rural zones in China in the last three decades and by Dong et al. (2018) in Chinese provinces in the period 1996-2011.

The results in Table 7 confirm the direct effect of elder people on income inequality, but when it is measured using the coefficient of variation for wage share. On the other hand, there is a very small and direct influence of elder people on income inequality, when it is measured using the variance of the logarithm from wage share.

TABLE 7 - LINEAR REGRESSIONS WITH BOOTSTRAP STANDARD ERRORS

Dependent variable: variance of ln(wage share)	Observed coefficient	Bootstrap standard error	z calculated	p-value
pop65	0.251	0.144	1.73	0.084
Constant	$-4.22\cdot 10^{-3}$	0.169	0.0001	0.999
Dependent variable: coefficient of variation for wage share	Observed coefficient	Bootstrap standard error	Z	p-value
pop65	0.243	0.144	1.68	0.093
Constant	$-3.29\cdot 10^{-9}$	0.149	0.0001	0.999

Note: own calculations in Stata 15

The models with bootstrap standard errors confirm the direct influence of the proportion of population aged 65 years and more on income inequality, which has been previously suggested in this study by the estimations based on dynamic panel data model. The test for second-order autocorrelation indicates non-correlation for the second order, which suggests that the model is not mis specified.

The study's findings may not be directly applicable to other countries due to substantial variations in demographic characteristics across national contexts. Further discussion and interpretation of these results, particularly regarding policy implications, will be presented in the subsequent section. Van Der Hoeven (2013) also suggested that more employment enhances income inequality and suitable policies should be implemented to tackle this issue.

5. CONCLUSIONS. POLICY IMPLICATIONS

Following Romania's transition to a market economy in 1990, a marked increase in income inequality has become progressively evident (Precupetu, 2013). This shift, although accompanied by significant economic reforms, was not without its drawbacks, including widening disparities in income distribution. The main findings reveal that more population of 65 years and more enhanced the wage share of GDP. On the other hand, fertility and employment reduced wage share of GDP.

While this study offers valuable insights into income inequality across Romanian regions, it acknowledges certain limitations. Data availability constraints necessitated including only certain variables in the models, potentially restricting a more comprehensive understanding of the dynamics. This study uses a dynamic panel data model to manage endogeneity and linear regressions with bootstrap standard errors. Future research could benefit from incorporating spatial effects by employing spatial panel data models. This would allow for a more nuanced understanding of how regional characteristics and interactions influence income inequality. Additionally, conducting a robustness check by analyzing the data at the national level could provide valuable insights into broader trends and potential variations compared to the regional findings.

Some policy proposals are described starting from these results. While Romania's fertility rate remains below replacement level, a potential future increase could have complex consequences for income inequality. First, it is necessary to support families by implementing generous and equal parental leave for both mothers and fathers, allowing for a better work-life balance and encouraging shared childcare responsibilities (Cui et al., 2024). It is necessary to offer financial assistance to families for childcare costs, especially for low-income families. This can help ensure continued workforce participation by parents. The demographic policies should also consider the investment in high-quality and affordable early childhood education programmes. This can improve future earning potential for children from all backgrounds. Targeted family benefits based on income

can help alleviate financial pressures for larger families. Other measures could include government subsidies for childcare centres or tax breaks for employers who provide childcare.

The labour market policies should allocate resources towards vocational training programmes and educational opportunities tailored to the evolving needs of the labour market. This can ensure a skilled workforce that can command higher wages. It is recommended to review and adjust minimum wage levels regularly to reflect the cost of living and ensure a decent standard of living for low-income workers with larger families (Colleran et al., 2015). Flexible work arrangements like remote work or part-time options are welcome to support work-life balance, particularly for parents. Strong anti-discrimination laws should be implemented and they should be enforced effectively to ensure equal opportunities for employment and promotion regardless of parental status (Wang and Wong, 2021).

In terms of fiscal policies, it is necessary to improve the progressive tax system where higher earners contribute a larger share of their income in taxes (Kudła, 2014). This can generate revenue for social programmes that address inequality. By implementing these types of policies, Romania can work towards mitigating potential negative effects of higher fertility on income inequality and promote a more just and equitable society for all.

To reduce the income inequality generated by the higher employment, Romania needs stronger labour market institutions, investment in skills and the acceleration of technological change. Minimum wage regulations, collective bargaining rights, and effective social safety nets can help ensure that wages do not fall too low, even with higher employment (Stewart, 2012). If governments and businesses invest in education and training programmes, they can equip the workforce with the skills needed for higher-paying jobs. This can lead to rising wages and potentially reduce inequality. Technological progress can displace low-skilled workers, but it can also create new high-paying jobs (Osório & Pinto, 2020). The outcome depends on how well workers are prepared for the changing job market.

It is important to note that the problem of low pensions is complex and requires a multidimensional approach, with the involvement of the authorities, civil society and the business community. An increase in minimum pensions could ensure a decent standard of living for the most vulnerable pensioners. A reform of the pension system could contribute to increasing future pensions, through measures such as increasing the contribution rate or linking pensions to inflation (Van Vliet et al., 2012). General economic growth could lead to higher wages and therefore higher pensions in the long term. Romania should seriously address the ageing population phenomenon. This could involve increasing the retirement age, providing more support for the elderly, or other measures to ensure that the elderly population can remain active and productive in the society.

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