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RURAL SOCIOLOGY

Political events upon the Romania rural population using VAR model

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ABSTRACT: Maintaining a rural-urban balance is absolutely necessary in the context of the challenges related to food security and environmental protection as well as the perspectives of urban agglomeration. This paper highlighted the impact of the main events from the last 30 years on the rural population. This study used the vector autoregressive model (VAR) to investigate the estimates and analyse the dynamic impact of innovations on the system of variables. Key issues that influenced certain periods in the analyzed interval were highlighted, which clearly show the impact on the analyzed variables using variance decomposition. The cost of living in rural areas is increasing, so more and more inhabitants give up growing certain crops or raising certain animals, thus having to search for food to survive, leading to additional wage income to cover these costs.
Key words: demography, agriculture, rural areas, VAR model.

A influência de eventos políticos sobre a população rural usando o modelo VAR: Eventos da Romênia

RESUMO: A manutenção do equilíbrio rural-urbano é absolutamente necessária no contexto dos desafios relacionados com a segurança alimentar e proteção ambiental, bem como as perspetivas de aglomeração urbana. O objetivo do trabalho é destacar o impacto dos principais acontecimentos dos últimos 30 anos sobre a população rural. Este estudo utilizou o modelo autoregressivo vetorial (VAR) para investigar as estimativas e analisar o impacto dinâmico das inovações no sistema de variáveis. Foram destacadas as principais questões que influenciaram determinados períodos no intervalo analisado, o que mostra claramente o impacto nas variáveis analisadas usando a decomposição de variância. O custo de vida nas zonas rurais está a aumentar, tanto mais que cada vez mais habitantes desistem de cultivar determinadas culturas ou de criar determinados animais, tendo assim de obter os alimentos necessários à sua sobrevivência, o que obriga a um rendimento salarial adicional para cobrir estas despesas custos.
Palavras-chave: demografia, agricultura, áreas rurais, modelo VAR.

INTRODUCTION

Rural areas are considered to be predominantly agricultural areas, where agriculture is the main activity of the inhabitants of these areas. The rural population is of particular importance in terms of maintaining a rural-urban balance as urban centres are growing, taking more and more of the rural area which is the main way to limit the effects of climate change (HALL et al., 2006). At the same time, the rural population is the main source of labour for agricultural activities, in the context of an increasingly unlikely period in which unforeseen events are occurring more frequently, putting pressure on food security (POLINESI et al., 2020; MITRICĂ et al., 2020). At the same time, the agglomeration of urban regions is putting increasing pressure on the inhabitants of these areas, who, in addition to the psychological aspects, face price increases driven by rising demand (COMANESC et al., 2019; BOGDANOV et al., 2008).

The low standard of living in these rural areas, with fewer and lower paid jobs than those found in industrialized urban centers, with the lack of essential utilities (water, sewage, electricity, road infrastructure), encourages rural people to migrate to urban areas (DUMITRU et. al., 2021; DINU et al., 2020). This phenomenon can also be associated with the economic development of countries, where in the case of China, the enlargement of cities, even building new cities from scratch, has led to the highest decrease in rural population, in the context of demographic growth (BONGLI & YU, 2022).

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A major factor in the depopulation of rural areas, which is a widespread phenomenon, is migration, which is predominantly considered to be unidirectional. Therefore, the European Union's concern is considerable, in the context of granting funds for the development/establishment of agricultural and non-agricultural activities in rural areas, which have somewhat tempered this phenomenon in some cases (IANCU et al., 2022). However, the rural population of the European Union decreased by about 24.5% in 2021 compared to 1960, while only Austria, the Czech Republic, Slovakia, Ireland and Cyprus show increasing trends in rural population in recent years (TUDOR et al., 2022).

Agriculture is of particular socio-economic importance, providing the necessary food for the population, and on the other hand generating employment; although, the wages in this area do not reach the level of other industrialized sectors (TUDOR et al., 2022). However, the digitization process in this sector seems to be replacing human labour, initially in branches where there are labour shortages. Even at a relatively early stage, this threats can be serious (STERIE & DUMITRU, 2021).

The measures adopted by each country to counter the effects of the urban-rural imbalance vary, depending on its specificity. Developing rural areas, and encouraging the retention of the rural population in Austria, has focused on exploiting the country's tourism potential; although, population ageing is the main demographic problem. They have also encouraged generational exchange between farmers by providing financial incentives. Several communist countries in Europe have experienced declines in rural population due to the process of urbanization, whereby people were given jobs in various industries near cities (EGIDI et al., 2021; ŠIMKOVÁ, 2007; JANETTA et al., 2019).

The rural context in Romania

With the establishment of the communist regime in 1945, which immediately implemented the Law for the implementation of agrarian reform, which consisted in taking over agricultural land under private ownership and transferring it to the state property, this led to the creation of imbalances (STANCIU, 2019).

Thus, after 1989, when the communist regime in Romania fell, and through the new agricultural reform of 1991, the owners whose property had been confiscated by the communist regime were returned. Unfortunately, this process led to a sharp fragmentation of agricultural areas, resulting in low yields, which still persists today, as the number of farms stands at around 2.4 million (MACK et al., 2018) (Figure 1).

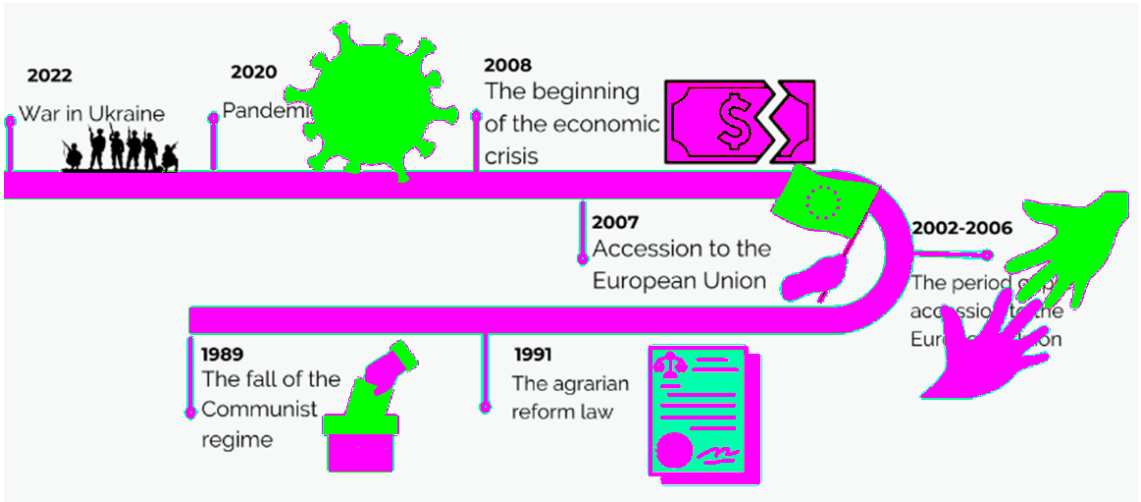

Figure 1 - Chronology of the main events influencing the rural population. Source: Own processing after: STANCIU, 2019; MACK et al. 2018; MIHAI & MINEA, 2021; RAZVANTA, 2020; DINU et al. 2020; TOPLIŠEK et al. 2022; POPOVICI et al. 2018; STERIE et al. 2022; CONSTANTIN et al. 2015; IBĂNESCU et al. 2018.

The process of urbanization, which began during the communist period, continued after the regime fall but it was also accompanied by the freedom to leave the country, and the decline of the countryside became more marked. The post-revolutionary process was relatively short-term, stabilizing until the 2000s, when Romania's new orientation towards the European Union was confirmed. However, the migration of young people, due to the lack of development prospects, has been continuous, while the ageing population remained in rural areas (MIHAI & MINEA, 2021; RAZVANTA, 2020) (Figure 1).

The year 2002 was marked by Romania's intention to join the European Union, a process that was successfully completed in 2007, which facilitated the migration of the population to Western European countries in search of a higher standard of living. Essentially, the agricultural labour force suffered the most, and that is still the case today, even though wage incomes in agriculture have reached at least the same level as in other industries, thus farmers have to import labour from non-EU countries (VLADU et al. 2022; GIANLUCA, et al., 2021) (Figure 1).

With Romania's accession to the European Union, significant funds have been allocated for investment in agricultural and non-agricultural activities over the two programming periods in which it has participated so far, namely 2007-2013 and 2014-2020. One of the most accessed funding measures has been the support to young farmers, with the aim of rejuvenating the generation of farmers. The funding program have also encouraged the consolidation of agricultural holdings in order to repair the effects of the 1991 agrarian reform, which affected farm productivity (DINU et al., 2020) (Figure 1).

The economic crisis that appeared worldwide at the end of 2007, but was felt in Europe and Romania a little later, consisted of austerity measures through wage cuts that affected the population. As time went by, the economy recovered, receiving a major shock in 2020 with the advent of the COVID-19 pandemic. Measures imposed by the authorities on the movement of people, especially in urban centres, led to the migration of the urban population to peri-urban areas, constrained by these measures (TOPLIŠEK et al., 2022; POPOVICI et al., 2018) (Figure 1).

The war in Ukraine in the context of being a major player in the grain market, bordering Romania, may endanger food security in Europe, but also in Africa. This disruption may leave Romania uncovered, in the context of dependence on imports of agri-food products, and labour shortages, necessary for agricultural production (STERIE et al. 2022) (Figure 1).

The aim of the paper is to highlight the role that government decisions have played in certain periods over the last 30 years, and the impact this has had on the rural population, average income from agriculture, rural out-migration and the agricultural labour force.

Theoretical ackground

Given that with the rise of populism in the developed world, urban-rural disparities have become increasingly acute. Studying citizen satisfaction in the European Union, Lake Ignatius demonstrated that there is a 'geography of dissatisfaction' when it comes to the benefits of democracy, in that rural residents have lower levels of satisfaction than urban residents, and it seems to be correlated with the level of urbanization of the country. Basically the more urbanized a given country becomes, the less the authorities look into the needs of rural residents (LAGO, 2022).

The lower interest of authorities in rural areas is also reflected in lower school enrolment, leading to local losses in per-school funding. This makes it impossible for schools to reduce some expenditure. Lorna Jimerson has identified 20 policy identifications to help redress this situation. Among the most important are giving communities and economies time to recover, adjusting to population and income loss, and focusing on excellent education in communities where enrollments are declining (JIMERSON, 2006).

Other authors have started from the premise of economic and demographic decline in rural areas caused by the trend of industrialization and urbanization, where they have looked at the influence of tourism on the revitalization of these areas. Tourism appears to be a way to generate income and increase employment opportunities, thus helping to save disadvantaged rural areas. In addition, Janecka Nicola examined the processes that have contributed to the creation and development of rural tourism. The findings of the study indicated that rural residents put tourism development and future support for tourism development in a favourable light (JANECKA, 2009).

Qingfeng Wang and Xu Sun examined fertility transitions in selected countries, considering four different income categories. They observed that social, economic, and political factors contribute to lower fertility rates in these countries. The authors believed that political freedom plays an important role in shaping people's perceptions of fertility. Thus, in upper middle income countries with worsening political freedom exerts pressure on declining fertility rates, while positive effects are found in lower and lower middle income countries (WANG & SUN, 2016).

The development of collective farms, particularly in the Balkan countryside and which had a positive effect on the development of these areas is at risk from the decline and marginalization of rural areas and small towns. They see as solutions, focusing on strengthening the community and finding a new function to protect the preservation of collective farming centres and enhance their value (INGERPUU, 2022).

After more than three decades of rural transformation in Eastern and Central Europe, rural areas are in a process of restructuring as a result of the post-communist period. In the case of Romania, severe ageing, declining birth rates and increasing external migration, overall rural population dynamics have been negative. However, rural-urban inflow has increased in recent years, due to the expansion of residential neighbourhood around urban centres. These investments have contributed to economic and social prosperity, leading to improvements in people's living standards (MITRICĂ et al., 2019).

MATERIALS AND METHODS

The study examines the links between variables influencing the rural population. These data were collected from the platform of the National Institute of Statistics of Romania at the end of 2022. The aspects that were the basis for the selection of the variables can be found in the table 1.

In order to achieve a consistent and credible approach to the selected data, taking

Table 1 - Description of the variables analysed.

Variable	Abbreviation	----------Definition----------	----------Rationale----------
Average monthly wage in agriculture ($)	AMWA	Net nominal earnings are obtained by subtracting from gross nominal earnings the employees' compulsory social contributions (social insurance and health insurance contributions payable by employees) and the corresponding tax.	Although, agriculture is the main activity in rural areas, the majority of jobs are seasonal, impacting on the income stability of the population. Incomes are also considerably lower than in other sectors of employment (TUDOR et al. 2022).
Number of departures from rural areas	NDRA	Persons who have changed their place of residence within a certain period of time by moving to another locality.	It is considered to be a major factor in the depopulation of rural areas, caused by political decisions (fall of the communist regime, EU accession) and low living standards (DUMITRU et al. 2021).
Number of employees in agriculture	NEA	Represents the average number of employees comprising persons employed under a fixed-term or indefinite contract of employment/employment relationship (including seasonal workers, manager or administrator) whose contract of employment/employment relationship has not been suspended during the reference period and who work in agriculture, forestry and fishing.	In rural areas of Romania, the main occupation of the inhabitants is focused on agricultural activities (TUDOR et al. 2022).
Rural population	RP	Represents all people with Romanian citizenship, foreigners and non-citizens, who have their usual residence in Romania and who live in rural areas.	The rural population is the main component of the countryside. Maintaining the rural-urban balance is necessary in order not to disrupt food security, the environment and urban agglomeration (TUDOR et al. 2022; DUMITRU et al. 2021).

into account some of the issues that occurred in the past, VAR Models were used, using Eviews 12 Student Version Lite, IHS Global Inc., Irvine, CA, USA. These models generalize univariate autoregressive models by generalizing multivariate time series. This type of approach presents the need for structural modeling by treating each endogenous variable in the system as a function of lags, past values, and all endogenous variables, with the following mathematical representation (SOYOUNG & JONG-WHA, 2022):

Displayed equation
(y_t=A_1 y_(t-1)+A_2 y_(t-2)+⋯+A_P y_(t-p)+B_ (x_t)+ε_t)

where: yt = K-dimensional vector of endogenous variables, xt = D-dimensional vector of exogenous variables, A1, Ap; and B = matrix of coefficients to be estimated, ε_t = vector of innovation.

The first step was to determine the length of the lags, taking into account the values expressed by the Akaike, Schwartz and Hannan-Quinn coefficients. The stability of the VAR model implies stationarity. Thus, the polynomial AR characteristics of the inverse roots were determined. Also the diagnosis of residuals was determined, consulting the autocorrelation correlogram with 2 std. err. approximation. Bounds.

In addition, the LM Correlation Test of the serial residual VAR was performed, taking into account the length of the lags established. Next, the Granger Causality Test was performed which examines whether the values of the lags of the variables help us predict the other variables taking into account:

H0: X does not Granger Cause Y;
H1: X Granger cause Y.

In order to be able to track the time path of the variables in the model at a one unit increase in the present value of one of the VAR errors, the Impulse-Response function (IRF) was used, based on the Cholesky Decomposition. Finally, the Variance Decomposition was used which displays the percentage of the forecast error of the variables over time due to the shock.

This paper starts from the hypothesis used by TUDOR et al. (2022) that the average wage in agriculture influences the number of rural inhabitants, determined by the fact that it is the main occupation of rural inhabitants.

RESULTS AND DISCUSSION

Departures from the rural areas have fluctuated over time due to socio-economic measures adopted by the authorities. However, in 2021 compared to the reference year (1991), the number of departures decreased by 15.3%. Also, the population working in the agricultural sector decreased by 85.6% in 2021 compared to 1991; although, income increased by about 6 times (Figure 2).

Unlike the other variables, the rural population shows a continuous downward trend, with no fluctuations, so that if in 1991 the rural population totaled 10.6 million inhabitants, the most recent data indicate a rural population of 8.7 million inhabitants, representing a decrease of 17.6% (Figure 2).

The skewness index shows values close to 0 in the case of NDRA, indicating an almost normal distribution, while RP shows negative values, quite close to 0, indicating a slightly negative asymmetry. In the case of AMWA and NEA positive values indicate a positive skewness of the data distribution (Table 2).

The Kurtosis index shows a leptokurtic distribution of the data in the case of NDRA and NEA, while AMWA and RP indicate a platykurtic distribution. The additional Jauque-Barbera index taking into account the Skewnes and Kurtosis indices indicates an anomalous distribution of the variables, showing values greater than 0 (Table 3).

Stationary Conditions and Residue Diagnosis

The inverse Roots R polynomial characteristic (inverse Roots R Polynominal) has mode less than 1, and the points must be inside the circle, so the estimation bar is stable (Figure 3).

As can be seen in the figure, the roots extend inside the circle. This is also evidenced by the values obtained, where the highest value is 0.93, fulfilling the condition of being below 1 (Figure 3).

In addition, the tabular representation of the values depicted in Figure 1 reinforces the statement that the points are inside the circle, with the recorded values being below 1 (Table 4).

Checking autocorrelation with 2 std. err. Bounds we can see that the vast majority of the lines are within the error standard, so by the two checks, it can be stated that the data used is stationary (Figure 4).

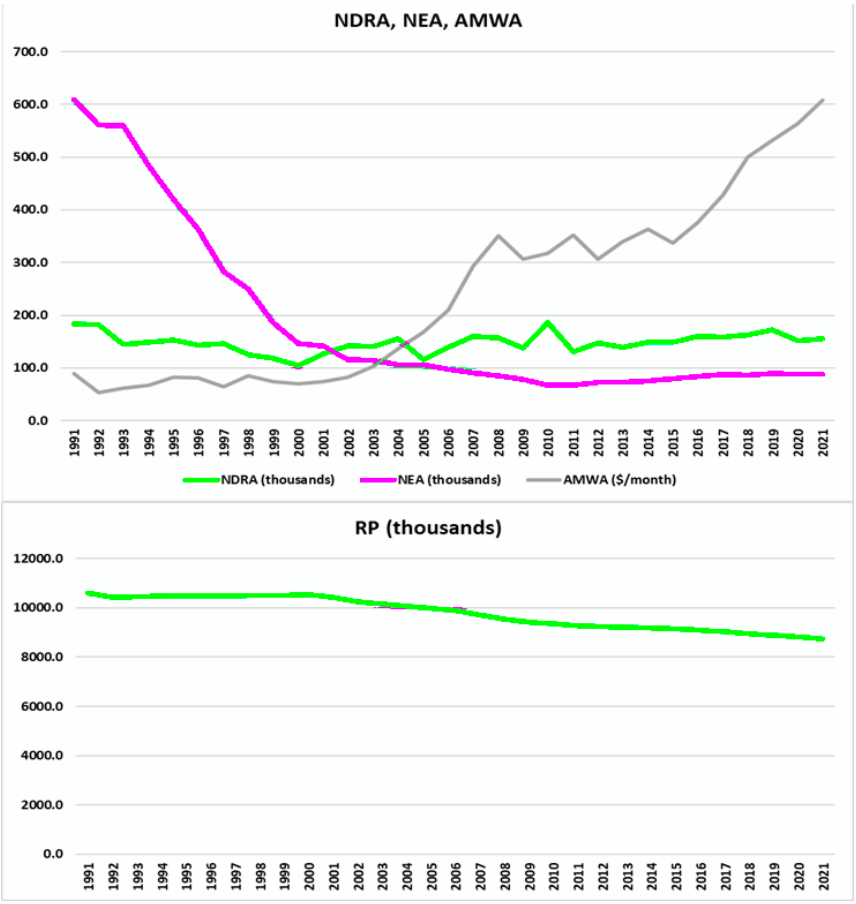

Figure 2 - Evolution of the variables analyzed between 1991 and 2021. Source: In-house processing.

According to the LM correlation test in which 4 LAGs are used, it is observed that the use of two or more LAGs in our model indicates that there is no autocorrelation between the residual values, recording a P-value greater than 0.05. Taking into account all the steps taken to check the stationarity of the analyzed data, we can state that there is no autocorrelation between the selected Lags (Table 5).

Granger causality test

Next, it was used the Granger causality test to see if the lags of one variable help to predict other variables in the model. Using this causality test, the vast majority of the results indicate that they can help to predict the set variables, as they have a p-value less than 0.05, except for the RP variable on the dependent variables NDRA, NDRA on the dependent variables NEA, and NEA on the dependent variables RP, which have values higher than 0.05 (Table 6).

Next it was used the Impulse-Reponse function which allows to track certain time patterns of our model.

Applying this function, we derived the main findings from the figure above, where 10 periods have been highlighted (Figure 5):

•A shock (innovation) of 1 SD to AMWA has a noticeable initial impact on the NDRA in periods 1 and 2. From the second period onwards it gradually increases until period 5, when it reaches the equilibrium period, remaining in the positive period. Low wages in agriculture led to massive departures of the rural population in search of better paid jobs, so this process stabilized as agricultural wages reached values at least similar to other industries.

Table 2 - Descriptive statistics of variables. Source: In-house processing.

	----------AMWA----------	----------NDRA----------	----------NEA----------	----------RP----------
Mean	241.346438	147.9274	185.7114	9787.111
Median	210.395158	149.144	97.637	9896.426
Maximum	608.134634	185.642	608.753	10596.63
Minimum	53.8211297	103.955	66.634	8730.078
Std. Dev.	172.586977	18.99028	168.1501	651.6334
Skewness	0.52906702	-0.07769	1.474147	-0.14138
Kurtosis	2.06521312	3.06976	3.683689	1.41039
Jarque-Bera	2.57490415	0.037467	11.83149	3.367137
Probability	0.27597304	0.981441	0.002697	0.18571
Sum	7481.73957	4585.748	5757.054	303400.4
Sum Sq. Dev.	893587.943	10818.92	848233.4	12738782
Observations	31	31	31	31

Source: Own calculations based on INS.

•In the case of a shock (innovation) of 1 SD for AMWA has a notable initial impact on NEA in periods 1 and 2, followed by a gradual increase until period 8, when it stabilises, showing positive values throughout the periods. Due to the low wages in the first period, the number of jobs decreased, so that with the increase in wages, the number of jobs also started to increase, correlated with the continuous development of the agricultural sector and the emergence of more and more firms in this sector.

•A shock (innovation) of 1 SD for AMWA has a noticeable impact on the RP from the beginning of the period to period 7, after which it remains constant, remaining in the negative period. Even if wage increases are considerable in the agricultural sector, which is the main concern of rural dwellers, this factor fails to positively influence the rural population, due to the accentuated ageing process of the rural population. Clearly, the rural exodus, which has led to a fall in the workforce employed in agriculture, has forced firms in this sector to bring wages into line with those in other sectors.

•A shock (innovation) of 1 SD to the NDRA has a noticeable impact on the AMWA, so in periods 1

Table 3 - VAR Lag Order Selection Criteria. Source: In-house processing.

Lag	--------LogL--------	---------LR--------	--------FPE-------	--------AIC-------	---------SC--------	--------HQ--------
0	-609.874	NA	6.58e+14	45.47218	45.66416	45.52927
1	-461.399	241.9600	3.67e+10	35.65919	36.61907*	35.94461
2	-437.264	32.17982	2.19e+10	35.05661	36.78439	35.57037
3	-424.644	13.08750	3.59e+10	35.30697	37.80266	36.04907
4	-387.612	27.43064*	1.30e+10*	33.74909*	37.01268	34.71953*

Endogenous variables: AMWA, NDRA, NEA, RP.
Exogenous variables: C.
Sample: 1991 2021.
Included observations: 27.

LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error.
AIC: Akaike information criterion.
SC: Schwarz information criterion.
HQ: Hannan-Quinn information criterion.

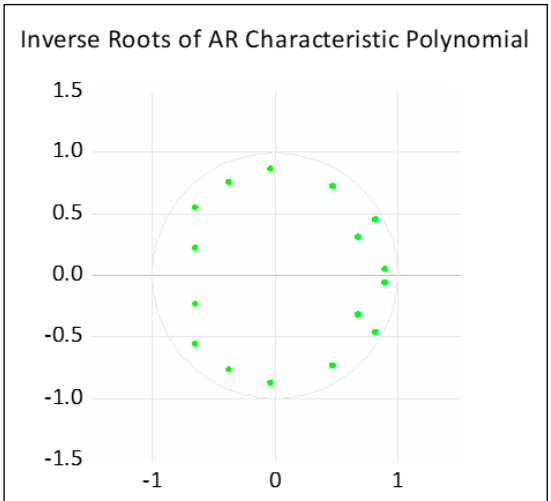

Figure 3 - Inverse Roots of AR Charasteristic Polynomial. Source: In-house processing.

and 2 it increases, followed by a decrease, and then stabilizes in period 5 to the end.

•A shock (innovation) of 1 SD for NDRA has a notable impact on NEA, thus in periods 1 and 2 it increases, followed by a decrease until period 4, then in the remaining periods there is a steady increase, remaining in the negative period.

•In the case of a shock (innovation) of 1 SD for NDRA

Table 4 - Roots of Charasteristic Polynominal. Source: In-house processing.

Root	----------Modulus----------
0.812809 - 0.458801i	0.9333571796887468
0.812809 + 0.458801i	0.9333571796887468
0.893202 - 0.053606i	0.8948094032942269
0.893202 + 0.053606i	0.8948094032942269
-0.039333 - 0.875438i	0.876320928074878
-0.039333 + 0.875438i	0.876320928074878
0.462538 - 0.729168i	0.8634968044121081
0.462538 + 0.729168i	0.8634968044121081
-0.653721 - 0.559212i	0.860272275877136
-0.653721 + 0.559212i	0.860272275877136
-0.381090 - 0.768489i	0.8577904348624961
-0.381090 + 0.768489i	0.8577904348624961
0.669784 - 0.311058i	0.7384902766628394
0.669784 + 0.311058i	0.7384902766628394
-0.648210 - 0.223742i	0.6857383170227114
-0.648210 + 0.223742i	0.6857383170227114

Endogenous variables: AMWA, NDRA, NEA, RP.
Exogenous variables: C.
Lag specification: 1-4.

No root lies outside the unit circle.
VAR satisfies the stability condition.

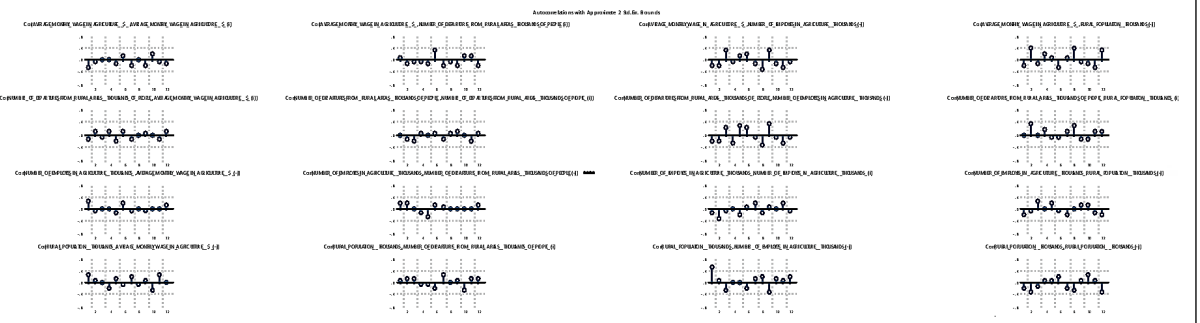

Figure 4 - Autocorrelation with Approximate 2 Std. Err. Bounds. Source: In-house processing.

has a notable impact on RP, registering a continuous increase from the beginning of the first period until period 6, then it is followed by a slight decrease until the end of the period.

•A shock (innovation) of 1 SD for RP has a noticeable impact on NEA until the 4th period, followed by a continuous increase, but remaining in the negative period.

Variance Decomposition using Cholesky Factors

Using variance decomposition with Chelesky factors, the results indicated that in the 10 intervals established, the variables relating to Rural population, Number of departures from rural areas, Number of employees in agriculture explain in relatively low but continuously increasing weights from one period to another the changes on the variable relating to Average monthly wage in agriculture (Table 7).

However, perhaps the most enlightening example is the case of the RP variable, where as time goes by the explanation of the change in the variable analyzed by the NDRA and NEA tends to decrease, while the AMWA steadily increases, reaching that in period 10 it explains 79.6% of the change in RP (Table 7).

With the fall of the communist regime in 1989, followed by the agrarian reform of 1991, which saw the repossession of agricultural land by its rightful owners, which had been wrongfully taken by the communist regime, led to a sharp decline in the number of agricultural workers, due to massive migration to urban centres. However, through this reform, slowly but surely large commercial farms emerged and developed, but this process led to a fragmentation of agricultural areas, which significantly affected agricultural productivity (IANCU et al., 2022).

The shocks of the legislative decisions were felt significantly each time, impacting on rural departures, agricultural workers, the average agricultural wage and finally the rural population.

The signing of the documents on preparations for accession to the European Union was an important first step for the country, which led to an

Table 5 - VAR Residual Correlation LM Tests. Source: In-house processing.

----------Null hypothes is: No serial correlation at lag h----------						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	37.99737	16	0.001	5.266709	(16, 9.8)	0.005
2	20.02304	16	0.219	1.404561	(16, 9.8)	0.299
3	12.85995	16	0.682	0.704415	(16, 9.8)	0.742
4	15.33573	16	0.500	0.913505	(16, 9.8)	0.579

Sample: 1991 2021.
Included observations: 27.

Table 6 - VAR Granger Causality/Block Exogeneity Wald Tests. Source: In-house processing.

Dependent variable: AMWA			
Excluded	Chi-s q	df	Prob.
NDRA	13.81108	4	0.0322
NEA	13.51380	4	0.0458
RP	14.00944	4	0.0047
All	42.33431	12	0.0247
Dependent variable: NDRA			
Excluded	Chi-s q	df	Prob.
AMWA	11.68644	4	0.0432
NEA	13.76754	4	0.0081
RP	15.37304	4	0.0511
All	24.87188	12	0.0154
Dependent variable: NEA			
Excluded	Chi-s q	df	Prob.
AMWA	14.464198	4	0.0468
NDRA	14.335599	4	0.0625
RP	15.997485	4	0.0199
All	45.797282	12	0.0430
Dependent variable: RP			
Excluded	Chi-s q	df	Prob.
AMWA	16.852243	4	0.0439
NDRA	13.788274	4	0.0354
NEA	14.206503	4	0.0788
All	45.87702	12	0.0036

Sample: 1991 2021.
Included observations: 27.

accelerated increase in agricultural wages until 2008, which was followed by a decline due to the effects of the economic crisis, represented by the measures adopted by the government. This period, during which agriculture benefited from funds dedicated to adapting to the European requirements, contributed to the development of large farms (COMANESCU et al. 2019). At the same time, departures from rural areas increased until 2004, followed by a significant decrease in the following year due to the postponement of Romania and Bulgaria's accession to the European Community, for 2007. After this period, departures from rural areas continued, managing to stabilize after 2019, also determined by fears arising from the Covid-19 pandemic (DINU et al., 2020).

As for the agricultural labour force, it only returned to an upward trend in 2010, due to the lack of labour in agriculture, which led to an increase in wages in this sector, in line with the values recorded by other sectors of activity.

According to the results, it seems that wage increases have succeeded in moderating rural out-migration, which can also be seen in the gradual increase in the last 5 periods of the Variance Decomposition of NDRA, where the AMWA weight has been increasing. The same has been recorded for the Variance Decomposition of RP, where the AMWA share has started to increase significantly. However, in order to mitigate the decline of the rural population, increasing the average wage in agriculture is not enough, either in terms of value, infrastructure or jobs, to encourage young people to move to these areas.

Applying the Variance Decomposition of RP we observe that the weights of periods 2-10

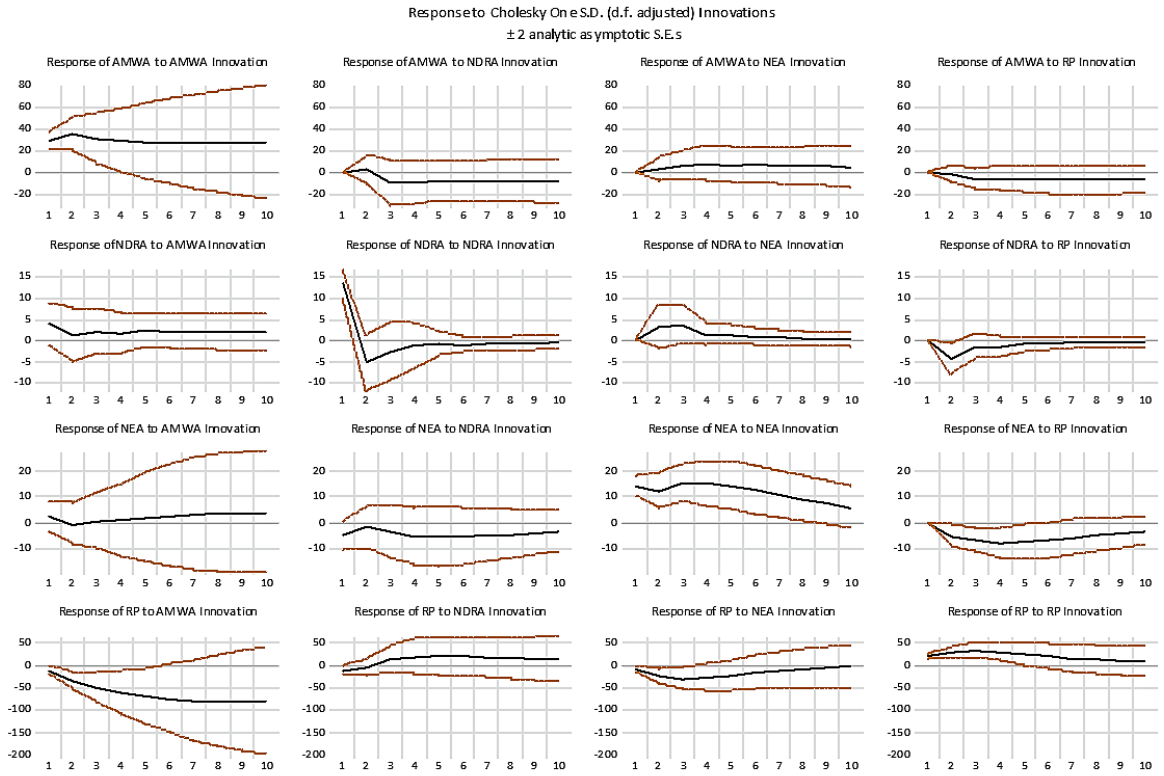

Figure 5 - Response to Cholesky One S.D. (d.f. Adjusted) Innovations. Source: In-house processing.

of the AMWA tend to increase steadily, while the shocks given by the NDRA remain relatively constant within the 10 intervals. However, of note is the decrease in the weight of NEA, which has fallen from around 18.6% (period 2) to 5.9% (period 10).

CONCLUSION

The turning point from communist to democratic ideologies, with inclinations towards relations with Western European countries, left its mark on the rural population, which led to a decrease in the number of workers in agriculture, as well as to constant departures from the rural areas, even though wage incomes in this sector have steadily increased.

We have highlighted the key issues that influenced certain periods in the interval analyzed, which clearly reflect the repercussions on the variables analyzed, using variance decomposition. This allowed us to identify the shocks perceived by the rural population as a result of the events from the last 30 years. However, maintaining a balance between rural and urban areas is absolutely necessary in order to slow down the process of climate change effects (environmental protection), but also to ensure food security in the context of increasing frequency of unforeseen events (ZHANG et al., 2023), such as the COVID-19 pandemic, which occurred in 2020, or the war in Ukraine, which started in 2022 (TUDOR et al., 2022).

As time goes by the earnings environment in agriculture increasingly influences the rural population; although, the income from agriculture is similar to other industries. The cost of living in rural areas is increasing, all the more so as more and more inhabitants give up growing certain crops or raising certain animals (for self-consumption), thus having to procure the food needed to survive, leading to the need for additional wage income to cover these costs (STERIE et al., 2022).

Table 7 - Variance Decomposition using Cholesky Factors. Source: In-house processing.

Variance Decomposition of AMWA					
Period	S.E.	AMWA	NDRA	NEA	RP
1	30.3397	100.0000	0.0000	0.0000	0.0000
2	47.2142	98.7340	0.4481	0.7279	0.0899
3	58.4620	94.0746	2.8846	2.0972	0.9436
4	67.1888	91.7171	3.7781	3.2678	1.2369
5	74.1349	90.6074	4.0764	3.7139	1.6023
6	80.4417	89.8589	4.2007	4.0572	1.8831
7	86.2082	89.2791	4.3381	4.2435	2.1393
8	91.5907	88.9155	4.4326	4.3298	2.3221
9	96.6293	88.7314	4.4968	4.3196	2.4521
10	101.3903	88.6901	4.5299	4.2481	2.5319
Variance Decomposition of NDRA					
Period	S.E.	AMWA	NDRA	NEA	RP
1	14.0053	7.8193	92.1807	0.0000	0.0000
2	15.9233	6.6896	82.0914	4.2271	6.9919
3	16.7819	7.7757	76.2170	9.1006	6.9066
4	17.0270	8.4678	74.5860	9.4890	7.4572
5	17.2733	10.0520	72.6462	9.8644	7.4375
6	17.4675	11.3588	71.3117	9.8746	7.4549
7	17.6448	12.7394	70.0481	9.8403	7.3722
8	17.7936	13.9577	69.0013	9.7419	7.2991
9	17.9315	15.1201	68.0253	9.6376	7.2170
10	18.0579	16.1827	67.1431	9.5309	7.1432
Variance Decomposition of NEA					
Period	S.E.	AMWA	NDRA	NEA	RP
1	15.1151	2.6938	10.6022	86.7040	0.0000
2	20.2396	1.5943	6.5266	85.7474	6.1317
3	26.4219	1.0059	5.2901	83.9254	9.7785
4	31.8185	0.7777	6.1921	80.3099	12.7204
5	36.0737	0.9045	6.9446	78.1187	14.0323
6	39.1951	1.2348	7.6448	76.3011	14.8192
7	41.4550	1.7700	8.1866	74.8978	15.1456
8	43.0562	2.4086	8.6158	73.7124	15.2632
9	44.1907	3.1079	8.9218	72.7208	15.2496
10	45.0001	3.8119	9.1341	71.8725	15.1816
Variance Decomposition of RP					
Period	S.E.	AMWA	NDRA	NEA	RP
1	27.8151	15.2148	17.0083	8.4421	59.3348
2	58.8941	37.6582	4.6312	18.5998	39.1108
3	89.9299	45.4742	4.1773	18.6417	31.7068
4	118.1691	53.1448	5.1121	16.6270	25.1162
5	142.6453	60.0412	5.6140	13.8152	20.5295
6	164.5351	66.0019	5.6803	11.3533	16.9646
7	184.1924	70.7444	5.5628	9.4002	14.2927
8	202.0079	74.4577	5.3429	7.9284	12.2710
9	218.2264	77.3342	5.0967	6.8284	10.7406
10	233.1122	79.5812	4.8587	5.9962	9.5640

Cholesky One S.D. (d.f. adjusted).
Cholesky ordering: AMWA NDRA NEA RP.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

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