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The implications of emigration on the mining sector and overall economy of Romania

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Abstract
In the context of Romania's demographic decline and large-scale migration to wealthier states, the evaluation of the effects of emigration on the economy is necessary in order to implement suitable policies for this country. A panel data and Bayesian approach are used to assess the impact of emigration on the average number of employees in the mining sector, real wage, unemployment rate, and real GDP, but also the impact of remittances on the Romanian economy. The increase in the number of emigrants and remittances reduces the average number of employees in the mining sector. The loss of skilled labour force has a negative effect on output. The tensions in the labour market are to some extent reduced because of lower unemployment, but the real wages are still low. The negative consequences of emigration on the economy are somehow compensated by the benefits of remittances that stimulate output through private consumption in the period 1994-2019, but healthy economic growth is not ensured in this way. Future migration policies should focus on the emigration limitation and the use of remittances for investment.

Keywords
emigration, remittances, labour market, real GDP, mining sector

Introduction

The effects of emigration on the economic activity in the origin country of migrants depend on the size of the economy and the sector of activity of these emigrants (traded sectors or non-traded service sectors). There are no significant effects of emigration on the source country's economy in the case of small countries that do not influence global markets where the international context gives prices and wages and if all the goods made in these countries are tradable (Asch and Reichmann, 1994). Prices and wages do not change in case of massive emigration if these are determined by the international conditions and not by the internal changes in the country. However, the production in the origin country of emigrants decreases because of emigration, which determines a decline in labour supply. The decrease in the output equals the contribution of the emigrants. Output per worker does not change after emigration because the size of the population and the output decrease by the same amount.

The situation changes in the case of the non-traded goods sector like the servicer sector, which is labour intensive. In this case, human capital emigration determines changes in wages and prices (Quibria, 1989; Rivera-Batiz, 1989). Even if the labour force is skilled or unskilled, the emigration negatively influences the producer sector. In this case, the domestic output and the inputs used to create the output are affected. When human capital emigrates, the labour supply decreases, the fall being higher in the labour-intensive sector. The prices of non-tradable goods provided by this sector are not determined by the global market, being influenced by the shocks in the domestic economy like drops in labour supply because of emigration. In this context, nominal salaries increase, and the level of human capital decreases. This increase in wages determines cost growth for producers. In this case, these producers might try to reduce the increase in costs by using cheaper inputs, or they might reduce the output and grow the prices.

Besides the producers' market, the consumers' market is also affected by emigration since emigrants were before consumers in their origin country (Quibria, 1989). In this context, emigration determines a fall in the aggregate demand for products in all sectors, which will slow down somehow the increase in salaries and prices. To sum up, the expected effects of emigration on the source country's economy consist of output fall, reduction in employment, and increases in prices and wages.

A particular case is the emigration process in Romania. The emigration intensified in Romania after 1989, when the revolution took place. The communist regime's fall brought free mobility of human capital. In the new political context, before 2007, emigration was mainly based on migration networks. The destination countries were initially Turkey, Hungary, Germany, Israel, and Italy, while from 2002 to 2006, Romanians mostly chose Italy and Spain as destination countries (Goga, 2020). After Romania's integration into the EU in 2007, the opportunities of the European labour market made the emigration of Romanian people to be, in many cases, a permanent and highly skilled labour force has left more and more their country. Three and a half million Romanian citizens are registered outside the country, placing Romania among the first 20 countries in the world with the largest Diaspora. These new patterns have serious consequences on the economic activity in Romania that have not been assessed yet on an empirical basis. The new challenge determined by COVID-19 might change the patterns in emigration in the next year, but the ex-post evaluation until 2019 is relevant.

Particular attention should be assigned to the mining sector. Despite the huge potential of Romania in mineral resources, especially oil, gold, salt, natural gas, silver and non-ferrous metals, the lack of investment in the mining sector and the dismissal of miners had negative consequences on the Romanian economy. Some of the employees in this field were forced to emigrate, but the remittances helped their families. Projects like "Closure of Mines and Mitigation of Social Impact" and "Closure of Mines, Environmental Restoration and Socio-Economic Regeneration (Mining II) were part of the EU plan to close the non-competitive mines.

Therefore, the main aim of this paper is to evaluate the impact of emigration on the Romanian economy using panel data and a Bayesian framework. After this introduction, the paper makes a presentation of scientific achievements in the field. The methodological framework and empirical results are described in the next section. The last part concludes.

Literature review

The emigration affects other inputs of production (capital, various categories of labour), but the magnitude of effects is conditioned by the existence of substitutes or complements for inputs. In case of an input that is a substitute for the category of labour that migrates, knowing the wages increase, the demand for the substitute will grow and consequently, the quantity and the price of the substitute will increase. If the skilled labour force emigrates being substituted by unskilled human capital, then the employment and the salaries of the unskilled labour force will increase in the emigrants' origin country. However, these positive effects on substitutes are mitigated by the reduction in production, and the analysis of empirical data might conclude if there are significant positive effects of emigration on the salaries and employment of substitutes.

In the case of an input that complements the category of labour that leaves the country, the demand for that input will decrease, which usually determines a decrease in wage. Therefore, one may conclude that emigration

generates a decrease in salaries and employment for the complement. However, the magnitude of changes is conditioned by the fall in production.

According to economic theory, the labour market decisions and consumption of the emigrants' households change. If a member of the household emigrates and he was employed before departure, the income of the household will decrease. In the case of a household where leisure time is strongly and positively correlated to income when emigration occurs for one or more members of a household, the leisure will fall. This leisure fall will determine the increase in labour participation if emigrants do not send remittances to their households in the origin country. Therefore, the labour supply will increase, contributing to the reduction of the deficit of the labour force brought by emigration.

Emigration can worsen competitiveness through multiple channels. Reducing the workforce could generate increased pressure on domestic wages (Misra and Mertz, 2015), and skilled labour outflows could reduce productivity in the presence of externalities of human capital and a lower degree of substitution between skilled and unskilled labour. Secondly, remittances may increase the level of insured income and reduce the supply of labour. In addition, large inflows of remittances may generate an appreciation of the exchange rate in the beneficiary country of remittances (Chami et al., 2008; Barajas and Barten, 2011), which negatively affects trade (Acosta et al., 2009, Amuedo -Dorantes and Pozo, 2005). When these effects are large, emigration can reduce output growth and stimulate emigration.

Labour migration issues have also been on the agenda of EU enlargement negotiations with Eastern European countries amid political pressures over a maximum of 7 years in the case of free migration of citizens from newly-admitted countries in the EU. Similar discussions have taken place since the accession of the countries of southern Europe to the EU (Greece in 1981, Spain and Portugal in 1986). Despite the large income gaps between the old members of the EU and these southern countries (Greece's GDP per capita was close to 60% of the EU average and in Portugal and Spain almost 55%), the flow of immigrants from these countries was quite small.

The economic benefits of free movement of workers within the Single Market are counterbalanced by politicians' fears about the high flow of immigrants from CEE countries that can damage the welfare of Western European countries.

Emigration has had positive effects on migrants in Eastern, Central and Southern Europe (ECSE) but also across the EU. Economic migration driven by individual choices is an important part of economic development. Migrating abroad seeks a better standard of living for both them and their families in the country. Migration is an indicator of the performance of the EU project that has provided freedom of movement for better economic integration and higher income. By externalities, large-scale migration has slowed economic growth and convergence to GDP per capita, as shown by Atoyan et al. (2016). The massive departure of highly qualified workers has reduced the size of the labour market and labour productivity in the migrant's home country. Moreover, this tendency also has consequences on the competitiveness of the economy and on the structure of the budget that is less conducive to economic growth. These effects are more visible in the Baltic countries and southern European countries. Moreover, the income and institutional quality differences between the South-East and Western European countries tend to persist for a longer period of time. In the absence of coordinated policies, income convergence will further decrease.

A meta-study on the literature on empirical analysis of migration effects on economic growth and convergence was made by Ozgen, Nijkamp and Poot (2009), who indicated that net migration tends to have a positive effect in the long run on GDP growth real per capita. The magnitude of the impact depends on the persistence of emigration but also on the structure of migrants by age and qualifications.

Neoclassical models of economic growth consider that emigration can reduce total output but can increase per capita income in countries sending migrants, accelerating economic convergence. This result is similar to predictions based on trade models with factor (Heckscher and Ohlin, 1991). However, empirical evidence is more in line with theories of endogenous growth and new models of economic geography that emphasize the advantages of agglomeration (Ozgen, Nijkamp and Poot 2009). The authors consider the externalities of human capital and the low degree of substitution between skilled and unskilled workers. In addressing endogenous growth, the productivity and well-being of the underprivileged can fall if there are externalities related to emigration. Especially the emigration of highly qualified workers may diminish capital stock and the rate of return on capital and labour (Haque and Kim, 1995). Under the circumstances of human capital externalities, highly qualified migrants can reduce the productivity of poorly trained workers, with negative effects on total labour productivity (Docquier, Ozden and Peri, 2014). The emigration of highly qualified young people can also generate non-economic externalities by eliminating those who might have been agents of change to improve institutional quality in their country of origin.

More details are provided on the relationship between emigration and aspects related to remittances and the labour market. A fall in the unemployment rate is expected if emigrants were employed before departure, the salaries remaining unchanged since demand and supply for labour do not change. On the other hand, if some emigrants were employed and some were unemployed, the salaries would increase, and unemployment would decrease. If emigrants were employed before departure, if the unemployed people are complements of emigrants,

there are chances for unemployment to increase since the employment of complements decreases. The impact of emigration on unemployment is ambiguous if the unemployed people are substitutes for the labour force that emigrates. Employers will substitute unemployed people for the people who emigrated. However, employers might also reduce employment because of the output fall and prices increase.

The reduction of unemployment and tensions in the labour market due to emigration implies a reduction in social protection expenditure. However, Silasi and Simina (2008) showed that this advantage might conduct to a serious labour force deficit that could be covered by importing human capital in the long run.

In the context of Romania's integration into the EU, the problem of labour migration became deeper. An attempt to assess the effects of human capital exodus in other European countries on the labour market in Romania was made, but also on the labour market in the destination countries of Romanian migrants. The EU has proposed for Romania a transitional period after accession in order to avoid the imbalance of the labour markets. In the context of massive emigration from Romania, there is a risk that this country will become a destination country for many citizens in the eastern states, including the Asians, who will seek higher wages and better working conditions.

The brain drain phenomenon has negative effects on the source country of emigrants: loss of return in investment made in human capital that left the country (schooling costs and costs occurred by raising of human capital, costs covered by the public sector), the private and social gain brought by skilled human capital is lost (higher productivity, higher skills, salaries, tax revenues, lower fertility and infant mortality).

However, some authors like Lucas (1988) consider that in some cases, the public investment in human capital might be small due to investments made by individuals and their families, and the remittances might cover these costs. In the case of temporary migration, the public investment in human resources might return through physical capital. Families that have poor access to capital markets could decide to invest in children's education in order to emigrate and remit (Lucas and Stark, 1985).

Remittances might reduce the loss in the income generated by the emigration of family members. The remittances might be spent for consumption or for investment/savings. Remittances might finance the government expenditure. If these remittances are used for private consumption, the contribution to economic growth in the origin country of emigrants is low the capital development is not ensured. However, higher consumption due to remittances may increase living standards, reduce poverty, and improve health and education levels. If remittances are more used for consumption rather than investment, this might cause issues with monetary transactions.

Remittances can also influence labour market decisions. If leisure increases with income, the labour force participation of household members might decrease when remittances are received. The variation in income distribution in households receiving remittances might reduce, but this should be checked on empirical data. The remittances might improve the balance of payment in the country.

In case emigrants return back to their origin countries, the salaries might increase, but to a lower extent. The returned migrants might come with better knowledge that increases their productivity, but some of them might come back with diseases and lower capabilities that reduce their productivity.

There is a direct and strong relationship between remittances and sustainable development at the theoretical level, but this relationship must be empirically validated for each country. In some countries, such as Mexico, remittance benefits were significant (Ratha, 2003), while in Eastern Europe and Asia, the remittance multiplier effect was reduced (Orozco, 2003). From economic theory, it is known that remittances lead to an increase in state revenues from external sources, which contributes to improving living standards, national economic development, investment and consumption, reducing pressure on the government to implement social and economic reforms. All these effects of remittances are related to economic and social development, which are two of the pillars of sustainable development. The effects of remittances are seen in the short term, but long-term research has not revealed any significant direct impact on economic development.

Microeconomic beneficiaries of remittances are families and friends who have remained in the country, but OECD showed a relatively stable structure in terms of how to use remittances but a very low share of productive investment. At the macroeconomic level, remittances support the balance of payments and increase internal consumption but also affect exchange rates, inflation, imports and exports.

The biggest challenge for decision-makers of economic and social policy is to propose policies that promote remittances and, at the same time, diminish their adverse effects. In the context of globalization and the ageing population in developed countries where emigrants are settled, demand for foreign labour will continue to increase, but some policy prescriptions need to be considered by migrants' countries of origin:

- Measuring remittances: workers' remittances are in the balance of payments, but the properties of this time series differ from employee compensation and migrant transfers. A frequent practice in the literature is to sum up the three components to render total remittances, but this aggregation can lead to incorrect conclusions about the remittance properties and, implicitly, suboptimal political decisions.
- Tax policy: remittances should not be directly taxed. Consumer taxes provide an optimal incentive structure to maximize the benefits of remittances. On the other hand, labour income taxes exacerbate the stimulation of leisure time through work and encourage inflation as an indirect tax. States receiving remittances

should be consulted so as to change the system of consumer taxes to mitigate potential adverse effects on economic growth, minimize the tensions induced by monetary and fiscal policy, and benefit from any tax-based growth as a result of investments made on the basis of remittances.

- Sustainability of public debt: remittances may reduce the economy's risk and may even improve public debt sustainability. In addition to economic development, another positive remittance effect may be linked to an increase in the government income base, which lowers the marginal cost of rising income.
- Tax discipline: remittances can help the government in maintaining tax discipline. Empirical analyzes show that states benefit from the fiscal advantages of remittances by expanding consumption and savings.
- Economic growth: remittances are not necessarily associated with an increase in domestic investment or a more efficient allocation of it. If they are reasonably managed, remittances can substitute for labour market income. Since capital and labour are complementary factors of production, the capital accumulation rate is negatively influenced. Empirical evidence shows the nonsignificant effect of remittances on economic growth.
- The role of international financial institutions: external agreements may require the government to implement the necessary reforms quickly, even under substantial remittances. Therefore, international institutions play an important role in encouraging remittance beneficiary countries to undertake or accelerate the necessary reforms. A usual reform strategy may be counterproductive. Therefore, reforms must be adapted for each state to the characteristics of remittances entering the country.
- Effects of Dutch Disease: Although remittances are a source of funding in the balance of payments, empirical studies show that remittances are positively correlated with the appreciation of the real exchange rate. In this context, there is evidence of the effects of Dutch disease in countries receiving remittances. Economic policymakers must mitigate this effect on the real exchange rate or resolve any loss of competitiveness generated by exchange rate appreciation.
- Governance and incentives: remittances pose a moral hazard problem by reducing the political will to undertake reform. Compensatory remittances that protect the population from adverse economic shocks and isolate it from state policy reduce household pressure on the government to implement growth-enhancing policies. Therefore, remittances may delay the improvement of public infrastructure by reducing the demand for improved public goods and by reducing the incidence of the crisis needed to implement governmental measures.

As mentioned above, remittance flows have an impact on migrants' home countries at both macroeconomic and microeconomic levels. In many underdeveloped countries, remittances exceed foreign direct investment; portfolio flows in financial markets and official development aid as a flow. The total volume of remittances in some countries represents a large proportion of imports and a fairly large fraction of GDP. Taking into account the high value of aggregate remittance flows, they are also expected to have important macroeconomic effects at the level of migrants' home country. On the other hand, remittances may even constitute a significant potential source of financing a country's economic development. Against this background, remittance policies have to take into account two aspects: managing macroeconomic effects and exploiting the potential of remittances to support economic and social development.

At the microeconomic level, remittances help families overcome poverty and be protected from income shocks. Loss of skilled labour can reduce labour productivity (Bhagwati, 1976; Burns and Mohapatra, 2008), and remittances may reduce labour supply by increasing reserved earnings (Amuedo-Dorantes and Pozo, 2006). On the other hand, remittances can stimulate private investment in human and physical capital by reducing credit restrictions (Léon-Ledesma and Piracha, 2004; Giuliano and Ruiz-Arranz, 2009). They can also generate financial and intermediary growth (Demirgüç-Kunt et al., 2011; Aggarwal et al., 2011).

The main effects of high emigration on the origin countries of migrants are synthesized in Table 1, which allows for establishing some potential relationships between emigration and economic activities in Romania.

Tab. 1. The potential effects of net emigration on the origin country of migrants

Potential positive effects	Potential negative effects	Ambiguous consequences
Higher wages won by the substitutes of emigrants	Lower wages won by complements of emigrants	Labour force participation of emigrants' families
Lower unemployment for the emigrants' categories of labour	Higher unemployment for the complements of emigrants	Effects on income distribution
Remittances that might ensure higher savings and higher aggregate demand	Lower employment	Employment/unemployment of emigrants' substitutes
Brain gain in case of returnees	Higher consumer prices in labour-intensive sectors	Sustainable development
Decrease in income variability for emigrants' households	Brain drain with return loss for human capital investment	
	Loss of physical capital	
	Decrease in aggregate demand	
	Diseconomies of scale in production	
	More government expenditure	
	Less social protection expenditure	

Source: adaptation after Asch and Reichmann (1994)

These connections between the number of emigrants and various macroeconomic variables are checked on empirical data. However, the selection of the variables is conditioned by the data available for Romania at the regional level and at the national level. Therefore, the impact of the number of Romanian emigrants on the unemployment rate, real wage, and real GDP will be assessed by considering data for Romanian counties (42 counties, including Bucharest). Moreover, data at the national level are used to evaluate the impact of remittances on private consumption, government expenditure, real GDP, occupation rate and unemployment rate.

Data and methodology

For assessing the impact of emigration on the ILO unemployment rate, real wage, and real GDP, data for Romanian counties were considered in the period 2008-2019. The selection of the period was conditioned by the data availability. The number of emigrants from each county was determined by summing up the permanent and temporary emigrants provided by the Tempo-online database of the National Institute of Statistics from Romania. The real wage is determined by dividing the average net monthly wage by the index of consumer prices, while real GDP is computed by dividing nominal GDP by the GDP deflator. The data for the average number of employees in the mining sector and all the other indicators were provided by the National Institute of Statistics from Romania.

Some dynamic panel data models were estimated using Arrelano-Bover-Blundell-Bond estimators, the results being presented in Tables 2, 3, 4 and 5. The panel data unit root tests were applied, and the estimations were conducted on stationary data.

A short description of the methodology is made to understand the dynamic panel data models.

We start from a regression model based on spatial and temporal data (pooled ordinary least squares- POLS) without using fixed or random effects from panel techniques:

$$\boldsymbol{y_{it} = \beta_0 + \sum_j \beta_j \cdot X_{jit} + \varepsilon_{it}} \qquad (1)$$

y_{it}- dependent variable for individual unit i and at time t
$\boldsymbol{X_{jit}}$- the regressor *j* for individual unit i and at time t
β_0- constant (common for all individual units)
$\boldsymbol{\varepsilon_{it}}$- errors
i=1,2,…, N; t=1,2,…,T

This general model will be transformed for estimating the parameters using the fixed-effects panel techniques that test the existence of individual effects. Considering a specific particularity of each individual unit that is constant in time, the unobserved characteristics are modelled as fixed effects included in different values of β_{0i} for each individual unit. These individual effects show the characteristics of the individual units that are supposed to be constant in the mentioned period that impact the dependent variable. Therefore, the unobserved heterogeneity

is controlled under the assumption that it is constant in time and, eventually, correlated with regressors. The form of the one-way fixed effects model is:

$$\boldsymbol{y_{it}} = \boldsymbol{\beta_{0i}} + \sum_j \boldsymbol{\beta_j} \cdot \boldsymbol{X_{jit}} + \boldsymbol{\varepsilon_{it}} \quad (2)$$

y_{it}- dependent variable for individual unit *i* and at time *t*
$\boldsymbol{X_{jit}}$- the regressor *j* for individual unit *i* and at time *t*
β_0- constant (common for all individual units)
$\boldsymbol{\varepsilon_{it}}$- errors
i=1,2,…, N; t=1,2,…,T

The model could be extended to include the fixed effects in time (two-way fixed effects model):

$$\boldsymbol{y_{it}} = \boldsymbol{\beta_{0i}} + \boldsymbol{\gamma_i} + \sum_j \boldsymbol{\beta_j} \cdot \boldsymbol{X_{jit}} + \boldsymbol{\varepsilon_{it}} \quad (3)$$

$\boldsymbol{\gamma_i}$- fixed effects in time

The impact of time passage is put into evidence by changes in economic policies, the economic crisis influence or the economic replacement in each individual unit.

The random-effects model considers the model constant as a random variable of average β_0, but the differences between individual units are random deviations from the constant mean β_0:

$$\boldsymbol{\beta_{0i}} = \boldsymbol{\beta_0} + \varepsilon_i \quad (4)$$

In the case of the random-effects model, the errors are determined as:

$$u_{it} = \varepsilon_i + e_{it} \quad (5)$$

ε_i= error that is specific to individual unit *i*
$\boldsymbol{e_{it}}$- random error

The demeaning transformation in panel data generates the problem of unobserved heterogeneity. The dynamic panel models make the first differencing to remove the unobserved heterogeneity. A partial adjustment mechanism is ensured by the lagged variable or lagged variables in the model. The demeaning procedure generates a regressor which is not distributed independently of the error. If the explanatory variables are correlated with the lagged dependent variable, the coefficients are biased. The fixed-effect model has the problem of Nickell bias. This bias appears even if the errors are independent and identically distributed. In order to solve this problem, the first differences of the initial model are considered. If a single explanatory variable and a lagged dependent variable Y are taken, we consider the following model:

$$\boldsymbol{y_{it}} = \boldsymbol{\beta_0} + \boldsymbol{\rho} \cdot \boldsymbol{y_{i,t-1}} + \boldsymbol{\beta_1} \cdot \boldsymbol{X_{it}} + \boldsymbol{u_i} + \boldsymbol{\varepsilon_{it}} \quad (6)$$

$\boldsymbol{X_{it}}$-exogenous regressors
$\boldsymbol{y_{it}}$ - dependent variable
$\boldsymbol{u_i}$ −unobserved individual effect
$\boldsymbol{\varepsilon_{it}}$- error

The construction of the model in the first difference will eliminate the constant and the individual effect:

$$\Delta\boldsymbol{y_{it}} = \boldsymbol{\rho} \cdot \Delta\boldsymbol{y_{i,t-1}} + \boldsymbol{\beta_1} \cdot \Delta\boldsymbol{X_{it}} + \Delta\boldsymbol{\varepsilon_{it}} \quad (7)$$

In this case, we still have a correlation between disturbances and the lagged dependent variable.

We may build instruments for the lagged dependent variable from the 2nd and the 3rd lag. If the error is i.i.d., then the lags are correlated with the lagged dependent characteristic, but it will not be correlated with the composite error term.

Let's consider the equations:

$$y_{it} = \beta_0 \cdot X_{it} + \beta_1 \cdot W_{it} + v_{it} \quad (8)$$

$$\boldsymbol{v_{it}} = \boldsymbol{u_i} + \boldsymbol{\varepsilon_{it}} \quad (9)$$

$\boldsymbol{X_{it}}$-exogenous regressors
$\boldsymbol{W_{it}}$-predeterminated and endogenous regressors correlated with $\boldsymbol{u_i}$

The first-differencing equation eliminates the unobserved individual effect, but omitted -variable bias appears.

The Arrelano-Bond (AB) approach and its extension to System GMM (generalized method of moments) is an estimator for the following cases:

- many individual units and few time periods;
- a linear and functional relationship between variables;
- one left-hand dynamic variable;
- not strictly exogenous right-hand variables;
- fixed individual effects that suppose unobserved heterogeneity;
- autocorrelation and homoskedasticity within individual units.

The AB estimator supposes a generalized method of moments problem. It consists of a model built as a system of equations where the instruments corresponding to each equation are different. The possible weakness of the AB estimator is solved by Arrelano-Bond-Blundell-Bond (ABBB) estimator. The lagged levels are, in practice, poor instruments for the variables in the first difference. The new estimator (ABBB one) includes lagged differences and lagged levels. The initial estimator is called difference GMM, but the expanded one is named System GMM, and it supposes supplementary restrictions regarding the initial conditions for generating the dependent variable.

The estimations of dynamic panel data models on empirical data are presented in the next tables.

Tab. 2. Dynamic panel data model to assess the impact of emigrants on real wage in Romania

Variable	Coefficient	Z	P>|z|
Real wage in the previous year	1.4764	64.17	0.000
Number of emigrants	-0.0354	-6.51	0.000
Constant	-399.2828	-26.75	0.000

Source: own calculations in STATA 15

According to Table 2, there is a low but significant and negative impact of emigration on real wages in Romanian counties. On the other hand, there is an average trend of increase in the real wage from one year to another. This result might be explained by the fact that the reduction of the labour force because of emigration determined the production reduction, and the increase in real wage was attributed to other factors than migration. An increase in the number of emigrants by 1000 people generated, on average, a decrease in the real wage by 35.4 units. Our result is contrary to that of Ciupureanu (2014), who showed that emigration has a positive impact on the income of the remaining population, arguing on the basis of a linear regression model for the period 1998-2012 in Romania. However, the model proposed by Ciupureanu (2014) is based on a small set of data for which the linear regression model is not relevant.

Tab. 3. Dynamic panel data model to assess the impact of emigrants on the unemployment rate in Romania

Variable	Coefficient	Z	P>|z|
The unemployment rate in the previous year	0.2328	7.09	0.000
Number of emigrants	-0.0007	-11.29	0.000
Constant	8.5201	17.81	0.000

Source: own calculations in STATA 15

According to Table 3, there is a very low but significant and negative impact of emigration on the unemployment rate in Romanian counties. On the other hand, there is an average trend of increase in the unemployment rate from one year to another. This result might be explained by the fact that the reduction of the labour force because of emigration reduced a little the pressure on the Romanian labour market, reflected in a lower unemployment rate. An increase in the number of emigrants by 1000 people generated, on average, a decrease in the unemployment rate by 0.7 percentage points.

Tab. 4. Dynamic panel data model to assess the impact of emigrants on real GDP in Romania

Variable	Coefficient	Z	P>|z|
Real GDP in the previous year	1.1316	46.90	0.000
Number of emigrants	-0.5714	-2.94	0.003
Constant	1289.348	2.35	0.019

Source: own calculations in STATA 15

According to Table 4, there is a low but significant and negative impact of emigration on real GDP in Romanian counties. On the other hand, there is an average trend of increase in the real GDP from one year to another. This result might be explained by the fact that the reduction of the labour force because of emigration determined the production reduction. An increase in the number of emigrants by 1000 people generated, on average, a decrease in the real GDP by 571.4 units. The theoretical model of learning built by Dustmann, Fadlon and Weiss (2011) also highlighted output losses in migrant-sending countries and considerable gains for host countries that attracted those migrants. Barrell et al. (2010) measured output losses from the emigration of citizens from countries that have recently joined the EU since 2004.

On the whole, emigration has led to a decline in economic growth but also in output convergence in the case of EEAS countries. The empirical analysis of Atoyan et al. (2016) showed that in 2012 the real GDP rate would have been 7 percentage points higher in the absence of the 1995-2012 emigration. As a consequence, convergence in GDP per capita has slowed down, especially in Romania, Bulgaria, Croatia and Albania, which have a large number of young and highly qualified migrants.

According to Table 5, emigration reduced the average number of employees in the mining sector. Some of the employers in this sector decided to emigrate because of the lack of state support. This result might also be explained by the closure of the mines since the European Commission imposed on member states the complete closure of non-competitive mines. Part of the dismissed workers was forced to emigrate.

Tab. 5. Dynamic panel data model to assess the impact of emigrants on the average number of employees in the mining sector in Romania

Variable	Coefficient	Z	P>|z|
Real GDP in the previous year	1.2312	54.33	0.000
Number of emigrants	-0.1127	-3.04	0.000
Constant	956.660	4.13	0.000

Source: own calculations in STATA 15

All in all, considering this analysis at the county level, we may conclude that emigration in the period 2008-2019 reduced the unemployment rate in Romania, the number of employees in the mining sector but also production. Increases in real wage due to emigration were not observed because of the production drop.

The impact of remittances on various economic indicators is also important to have a better image of emigration effects on the Romanian economy. The short sets of data for remittances imposed the use of Bayesian linear regressions.

The Bayesian approach is based on three steps:

1. The researcher intuits the values of parameters' estimators, using previous information on coefficients and the errors' variance, but the information is not related to the data series' values for the model's variables.
2. The second phase is also met in the classic econometrics, and it supposes collecting the data for X (explanatory variable) and Y (dependent variable) and the estimation of the likelihood function.
3. The researcher updates the expectations regarding the model parameters using the data for X and Y and the estimated likelihood function. Practically, the prior probability distribution is combined with the likelihood function in order to get the posterior repartition. In other words, the prior distribution is gotten by dividing the product between the likelihood function and the prior probability by the marginal likelihood (the marginal density of data, which is a scalar). So, the prior distribution is proportional to the likelihood function by a prior number of times.

We consider normal distribution for priors, and the variance follows an inverse Gamma distribution. The estimation method is Random-walk Metropolis-Hasting.

Data at the national level for remittances, private consumption, government expenditure, real GDP, occupation rate and unemployment rate have been available since 1994. The remittances were provided by World Bank, while the data for the rest of the indicators are taken from the database of the National Institute of Statistics

in Romania. Therefore, the effect of remittances sent to Romania on various macroeconomic indicators is evaluated for the period 1994-2019.

As expected, the remittances had a significant impact on the private consumption of households in the period 1994-2019 in Romania. On average, an increase in the remittances by 10 dollars generated an increase in private consumption by 1.6 percentage points (see Table 6).

In Romania, the impact of remittances on the employment rate and unemployment rate is very low and negative. The increase in remittances motivated members of emigrants' families to participate less in the labour market. However, a significant impact of remittances on the unemployment rate was not observed.

Remittances had a positive and significant impact on real GDP in Romania in the period 1994-2019. An increase in remittances by 10 dollars generated, on average, an increase in the real GDP by 1.2 percentage points. The government expenditure was less influenced by remittances. There is a positive but very low impact of remittances on government expenditure.

Tab. 6. Bayesian linear regression to assess the impact of remittances on private consumption in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	0.0164	0.0024
Unemployment rate	-0.0104	0.0033
Constant	65.1773	4.5449

Source: own calculations in STATA 15

According to Table 6, the remittances had, on average, a positive effect on private consumption in the period 1994-2019. As expected, most of the remittances were used by Romanians for household consumption rather than for investments or savings. The result is consistent with that of Încalţărău and Maha (2009), who discovered for Romania the same positive effect of remittances households' consumption in the period 1990-2009.

Tab. 7. Bayesian linear regression to assess the impact of remittances on occupation rate in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	-0.0012	0.0005
Real GDP	0.1288	0.0538
Constant	55.3996	1.0273

Source: own calculations in STATA 15

According to Table 7, the remittances had, on average, a negative effect on the occupation rate in the period 1994-2019. As expected, the remittances used for consumption demotivated people from engaging in economic activities; a similar observation is made by Goschin and Roman (2012).

Tab. 8. Bayesian linear regression to assess the impact of remittances on the unemployment rate in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	-0.0002	0.0001
Real GDP	-0.078	0.0067
Constant	6.9481	0.2030

Source: own calculations in STATA 15

According to Table 8, the remittances had, on average, a negative effect on the unemployment rate in the period 1994-2019. Correlating this result with the previous one, one may say that people who did not receive remittances found jobs, and the unemployment rate decreased.

Tab. 9. Bayesian linear regression to assess the impact of remittances on government expenditure in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	0.0019	0.0002
Real GDP	0.077	0.005
Constant	98.5663	0.0369

Source: own calculations in STATA 15

According to Table 9, the remittances had, on average, a positive effect on government expenditure in the period 1994-2019. As expected, a part of the remittances was used for public expenses being collected from taxes.

Chami et al. (2008) showed that the reduction in the cost of funds associated with remittances could support higher public consumption and debt levels.

Tab. 10. Bayesian linear regression to assess the impact of remittances on private consumption in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	0.0121	0.0016
Unemployment rate	-0.0032	0.0073
Constant	76.5457	3.1309

Source: own calculations in STATA 15

According to Table 10, the remittances had, on average, a positive effect on real GDP in the period 1994-2019. As expected, most of the remittances were used by Romanians for household consumption which contributed to real GDP growth, but this growth was not a healthy increase. As previous authors mentioned before, Romanians should use remittances mostly for opening a business and creating jobs (Blouchoutzi and Nikas, 2010; Roman and Voicu, 2010). Orozco (2003) has shown that some studies indicate that up to 80% of remittances are directed towards the private consumption of migrant families and only 5% to 10% for investment in human capital (health, education, nutrition).

Tab. 11. Bayesian linear regression to assess the impact of remittances on the average number of employees in the mining sector in Romania (1994-2019)

Variable	Mean	Standard deviation
Remittances	-0.0233	0.0029
Real GDP	-0.0034	0.0048
Constant	38.1128	4.5567

Source: own calculations in STATA 15

According to Table 11, remittances had a low negative impact on the average number of employees in the mining sector. The remittances might have encouraged people working in this field to give up their job and use the money received from abroad. The number of employees in the mining sector continued to decrease even in times of economic growth.

Conclusions

Emigration had a low and negative impact on real wages, the unemployment rate, and real GDP. This means that unemployment tensions have reduced, but in a short measure, the real wage is also low. Moreover, the lack of skilled labour force that emigrated had negative consequences on output and the average number of employees in the mining sector. The positive effects of remittances somehow compensated for these negative effects of emigration, but the recent tendency is to limit the flow of remittances to Romania as the emigration becomes permanent, while the money coming from other countries are not efficiently used for investment, being mostly used for private consumption that generates an unhealthy long-run economic growth.

All in all, we can conclude that remittances had a positive impact on real GDP, private consumption, and government expenditure in Romania, but a negative impact on occupation, the average number of employees in the mining sector and the unemployment rate in the period 1994-2019.

Combining the empirical results based on the analysis at the regional and national levels, we can conclude that migrants' home countries should implement more than one type of policy, as Atoyan et al. (2016) previously explained:

- strengthening economic policies and institutions to promote the return of migrants, reduce emigration and attract highly skilled workers from other countries;
- better use of existing workforce by increasing productivity and labour market participation;
- better use of remittances through investment and less for the consumer;
- mitigating the adverse tax effects of emigration.

This research should be extended in the future to include the effect of Covid-19 on the emigration process in Romania. In this country, the impact of emigration on the economy might change in the next few years.

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