8 REMITTANCES-ECONOMIC GROWTH NEXUS: EVIDENCE FROM THE EU MEMBER STATES

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Abstract

In the current context of globalization, with migration trends intensifying annually, it becomes essential to study the influence of remittances on growth. Accordingly, this research assesses the long-term effect of remittances on economic performance [proxied by GDP per inhabitant] in the EU-27 from 2007 to 2023. In this respect, we apply the Granger causality test as well as two-step system generalized method of moments. The econometric outcomes reveal that (1) there is a bidirectional relationship between remittances and GDP per inhabitant, (2) remittances, R&D expenditure, and trade openness exert a positive lasting impact on economic performance, while (3) unemployment and a country membership in the 'new' EU states category (compared to 'old' EU states category) hinder growth. Additionally, these results remain consistent even when the econometric model is changed.

Key words: *Remittances, Growth, the EU-27, Granger Causality, GMM*

JEL Classification: *F24, O47, F15, C32, C36*

1. Introduction

Over the years, fostering economic growth has received much attention as it is a component of sustainable economic development (alongside social and environmental pillars). Hence, since we live in a constantly changing globalized world, with nations that have their specificities, it is paramount that each state finds the best path to obtain growth and further economic welfare while overcoming the difficulties and seizing the opportunities that might emerge. Within this context, remittance inflows, comprising money and goods sent by citizens working abroad to their relatives in the homeland, represent a salient financing source for achieving economic development, especially in emerging and frontier economies.

As Ratha et al. (2023) point out, there are plenty of cases when international remittances serve as a lifeline for the economic development of recipient states (particularly in developing countries). This claim is because these external financial resources accelerate consumption, savings, and investments in the beneficiary nations (Meyer & Shera, 2017). For instance, remittances are used to meet basic needs or are saved and invested in human capital development (i.e., nutrition,

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education, and healthcare), physical capital accumulation, local business development, and properties acquisition, all contributing directly to the population's poverty alleviation and welfare spurring and, consequently, to the long-term economic growth (Acosta et al., 2007).

Additionally, a significant characteristic of remittance flows is that they remain overall stable, even in times of economic hardship/financial crises in the source country, unlike other private capital flows (like FDI - foreign direct investment), which are more volatile (Ratha et al., 2023). For example, in 2020 (when the COVID-19 pandemic began), global remittances declined by only 1.4% from 2019, while global FDI decreased by 43.7% from 2019 (Ratha et al., 2023). Moreover, as time goes by, the reliance of low- and middle-income states [LMISs] on remittances is presumed to amplify compared to FDI. Thus, in 2023, the volume of remittances to LMISs exceeded FDI flows by more than $250 billion, and in 2024, this discrepancy is expected to rise further (Ratha et al., 2023). Hence, remittances are becoming an increasingly essential element of the global economy (Kuziboev et al., 2024).

Although the existing literature comprises various studies on the remittances-economic growth nexus, there has yet to be unanimous agreement about the influence of remittance inflows on growth (Bucevska & Naumoski, 2023). While some researchers conclude that a strong positive causality exists between the two (Dutta & Saikia, 2024), others have found no statistically significant effect (as partially concluded by Cismaş et al., 2019) or even found a negative link (Habib, 2024). Consequently, further empirical investigation on this topic is necessary to better comprehend how remittances and growth actually influence each other for different geographical regions and periods.

Accordingly, our research aims to contribute to current scientific literature by assessing the long-term effect of remittances (along with some control variables, i.e., research and development [R&D] expenditure, trade openness, unemployment, and a dummy variable that underlines countries' membership in the 'new' EU states category [EU-13] or 'old' EU states category [EU-14]) on economic performance (measured by gross domestic product [GDP] per inhabitant) for all European Union countries [EU-27] spanning the years from 2007 to 2023.

We opted to assess the EU countries for the following two reasons. First, most academic works about the remittances-growth nexus are conducted on low- or lower-middle-income economies and less focus on high-income ones, or if they do, mainly target states that are part of Central and Eastern Europe [CEE]. Therefore, fewer research papers are carried out for the entire EU and more for the EU states that are found in CEE. Second, it would be interesting to evaluate the situation in the EU as a whole because, although these states are part of the same economic union (whose objective is to create deeper integration and cooperation among its member states), there are still notable differences that persist between them. That is, the EU's members have a certain degree of heterogeneity in terms of growth and development, standard of living, quality of the institutional and political frameworks, human capital development, innovation performances, and many other aspects (European Commission, 2023). Furthermore, the reason we chose to start the analysis from 2007 was to ensure comparability across EU member states, considering that in 2007, apart from Croatia (which joined the EU in 2013), all the other countries were already members of the EU. In other words, including the years prior to 2007 would result in substantial structural discrepancies between countries. For instance, before the accession to the EU, some countries had communist regimes, migration flows were significantly limited, and socio-economic conditions were more difficult. Conversely, after joining the EU, states gained access to more financial aid and development prospects, including the four fundamental freedoms within the EU: free movement of persons, commodities, services, and capital.

Regarding the study's novelty, it stems from the following considerations. First, we apply the Granger causality test to identify whether remittances forecast GDP per inhabitant and vice versa at the EU-27 level. Second, to measure the long-run effect of remittances (interest variable) as well as the control variables on growth, we employ a comprehensive estimation technique that

deals with the endogeneity challenge, namely two-step system generalized method of moments [GMM]. Accordingly, our research provides valuable insights regarding the implications of different factors in achieving economic prosperity across the entire EU.

Therefore, through our study, we intend to find answers to two research questions: *(1)* Do remittances from past periods determine current economic expansion, and, respectively, does previous economic expansion shape current remittance trends at the EU level? If so, what is the optimal lag number (for both cases)? and *(2)* What is the influence of remittances along with four control variables (i.e., R&D expenditure, trade openness, unemployment, and EU membership dummy) on GDP per capita in the long run for all EU states?

The document's structure is the following: *Section 2* delves into the review of the literature; *Section 3* exposes the research methodology; *Section 4* comprises the main results of the econometric estimates; *Section 5* checks the results' robustness; and *Section 6* synthesizes the conclusions and offers potential policy recommendations.

2. Literature review

Given the importance of external financial sources in achieving higher economic performance, especially in emerging and frontier markets, many researchers have empirically tested the implications of remittance flows to growth in various recipient nations and periods. In this respect, plenty of scholarly works validate the favorable effect of remittances on long-term economic expansion due to a rise in households' income, which might be used to support consumption smoothing, debt repayments, human capital fostering (knowledge, skills, and health improvement), profitable investments in tangible and intangible assets, entrepreneurial activities, etc.

For example, Cismaş et al. (2019) studied how remittances affect GDP/inhabitant growth rate in 11 CEE states, over the years 1996 to 2017. In this sense, the authors applied various econometric estimations and concluded that while in some countries, remittances were proven to exert significant positive effects on growth, in others, this effect was found to be insignificant. Likewise, in a case study conducted for the Indian economy between 1976 and 2021, Khan (2024) revealed that remittance inflow exerts positive lasting influences on sustained economic growth, while the possible negative influence is not strong enough to hamper growth.

Moreover, Dutta and Saikia (2024) confirm the positive long-term role of remittance inflows in promoting growth for 17 Asian economies between 1993 and 2017. Additionally, the authors point out that, given the upward trend of remittances in the Asian continent, governments should design and enforce policies that sustain the beneficial impacts of remittances on growth.

Similarly, Bajra (2021) emphasized the positive sway of remittances over both growth spurring (proxied by GDP growth) and inequality reduction (proxied by Gini index) in Western Balkan countries (spanning 2010-2019). Likewise, evaluating a sample comprising Western Balkan states between 2000 and 2017, Jushi et al. (2021) spotlighted the meaningful role of remittances for development. Nonetheless, the researchers argue that for these beneficial effects to be sustained and amplified, governments need to ensure sound policies that facilitate remittance inflows as well as promote productive investment among the population.

Considering the importance of effective investment, Dash (2023) demonstrates that external capital inflow, represented by remittances, substantially contributes to intensifying domestic investments. Nevertheless, the effect is greater for nations with better-developed financial systems and human capital. These conclusions are drawn from a case study conducted on 24 low-income recipient economies from 2004 to 2018. Analogical, Magwedere and Marozva (2024) researched the impact of remittances on domestic investment for 2000-2021 in 30 African states. Employing the Granger causality test, the econometric estimation disclosed the significant

positive bidirectional causality between the two concepts. Moreover, the authors draw attention to the fact that through its mechanisms, the government performs a vital role in attracting and capitalizing on remittance inflows in the recipient country to ensure that money is well-thought-invested, not only used for current consumption.

Additionally, remittances are relevant for stimulating growth and welfare through the channel of human development. Therefore, Acosta et al. (2007) addressed this issue within a study conducted in 11 Latin American states. In this sense, the authors' outcomes suggest that, overall, remittance inflows diminish poverty (although the strength of this influence is relatively moderate) and incentivize the population to invest in the youth's education and health. Likewise, performing research on 11 member countries of the Commonwealth of Independent States between 1990 and 2019, Kuziboev et al. (2024) indicate that remittances positively Granger-cause life expectancy. Hence, since the money sent by migrants is used for healthcare (implying both physical and mental health), it directly leads to better health outcomes and increases the standard of living in the origin country.

Furthermore, Aregbeshola (2022) unveils that remittances have both short- and long-term positive effects on school enrolment, poverty eradication, improved health status, and access to technology (analysis of 18 African countries from 1970 to 2019). In a similar fashion, Oda (2023) underscores that the inflow of money from overseas matters for attaining education in Pakistan (timespan 2014-2015). Nevertheless, while this influence is statistically significant for male children, it is not the case for female children (hence, gender disparities are highlighted).

Addressing the same topic for a set of 141 emerging economies (1961-2014), Benhamou and Cassin (2021) found a U-shaped relation among remittances and growth. The explanation is that the beneficiary population uses remittances for investments in education at the expense of domestic savings. Hence, remittances positively correlate with human capital spurring but negatively with domestic savings. This situation could be unfavorable to growth in the short run but advantageous eventually. Consequently, the authors observed that for some countries, long-term per capita growth is stimulated due to lasting positive influences of building human capital (which surpasses the shortcomings of a reduction in savings). Yet, this was not the case for other countries, where this compensation did not occur, and hence, growth declined. Therefore, what is an effective practice for one country could be insignificant/detrimental for another due to high heterogeneity between states (i.e., the existence of asymmetric effects in the remittance-growth nexus between world regions).

Concerning the creation of new businesses in receiving countries, Vaaler (2011) provides evidence that remittances are crucial financial support for entrepreneurs on their way to launching start-ups or expanding enterprises (study conducted on 61 developing economies between 2002 and 2007). Moreover, these types of investments have positive effects not only on the recipient families but also on the entire community since they stimulate economic activity, the creation of new jobs, and general prosperity. Thus, policymakers should focus on cultivating stable investment policies along with strong property rights (Vaaler, 2011) that incentivize the population to channel their money to sound investments from which the whole society might benefit.

In addition to the positive links between remittances and growth, there could be cases in which migrants' remittances thwart growth in recipient countries. For instance, this could be the case when the money received from abroad is ineffectively utilized, i.e., it is destined for current consumption rather than saving or productive investment. In this respect, for a sample of 12 Middle Eastern and North African states from 2002 to 2020, Habib (2024) concluded that remittances negatively influence growth because they are mainly spent on financing the basic necessities of impoverished families and not on value-creating investments. Besides, this approach makes the beneficiary population highly dependent on remittances, which is a harmful situation in cases where the migrants will no longer be able to send money to their relatives.

In the same vein, studying the case of India, which is among the largest remittance recipients from developing nations, Mallick (2012) supports the idea that if remittances received by the home country mainly target private consumption, they induce users' dependence on external financial resources. Moreover, the author asserts that for his analysis during 1966-1967 and 2004-2005, remittances were not allocated to efficient investment but used for individual consumption, a situation which might be detrimental to price stability and, ultimately, to long-term economic growth.

Also, another type of issue that might occur in the case of remittance inflow is the so-called 'Dutch disease' effect, which implies an appreciation of the real exchange rate in the recipient state - a situation that is further susceptible to affecting international trade competitiveness and economic growth. For instance, for a study undertaken in Latin America between 1980 and 2018, López-Marmolejo et al. (2021) demonstrate how the inflow of remittances led to a strong appreciation of local currency and, hence, indirectly affected growth. In these circumstances, the government should carefully assess the benefits and drawbacks that might arise from remittance inflows (i.e., identify the issue) and implement such policies that mitigate the adverse effects (i.e., solve the issue).

Furthermore, apart from studies that reveal a causal relationship (positive or negative) running from remittances to growth, scientific literature also includes various academic papers that disclose that, in reality, there is bidirectional causality between these two concepts. For example, in the case of 24 Sub-Saharan African states between 2005 and 2019, Delessa et al. (2024) underscore that not only do remittances exert a favorable long-term direct influence on growth, but also vice versa. Moreover, the authors purport that the interplay between remittances and growth cannot be perceived as context-free; instead, it hinges on several factors, such as a country's macroeconomic environment and governance quality. Additionally, Bucevska and Naumoski (2023) consent that remittances per capita positively Granger-cause GDP per capita as well as the other way around (for six Southeast European countries, 2008q1-2021q2). Nevertheless, researching the case of the top ten world remittance-recipient states from 1998 to 2014, Ali et al. (2018) argue that bidirectionality cannot be automatically assumed for all regions; instead, it is mainly a country-specific matter. This implies that while for some countries, the hypothesis of bidirectionality is valid, for others, there might be only a one-way linkage or even no association/causality.

In a nutshell, although prior literature comprises miscellaneous studies regarding the linkage between remittances and growth, there is still no empirical consensus on whether these two aspects evolve directly or indirectly proportionally and whether the causality runs only from one to the other or in both directions (Bucevska & Naumoski, 2023). Accordingly, it is essential to undertake additional research on this topic for better clarification about the potential remittances-economic growth nexus so that more recipient countries can make informed decisions to promote their economic prosperity.

3. Research methodology

For assessing the long-term influence of remittances as well as other factors on economic performance over a 17-year time span (2007-2023) in the EU-27, the following proxy variables were utilized. The response variable is the real per inhabitant GDP (constant 2021 international $ employing purchasing power parity rates). The variable of interest is remittances, comprising personal transfers and employee compensation (% of GDP). Additionally, the four control variables likely to impact economic prosperity were selected in accordance with the literature (Romer, 1990; Cismaş et al., 2019; Dash, 2023), namely: R&D expenditure in tertiary-level education, government, business, and private non-profit sectors (% of GDP), trade openness (% of GDP), unemployment (% of total workforce), and a binary variable which describes a country's

status of being an 'old' or 'new' EU member state (taking zero value for 'old' EU member states and one otherwise). Data is retrieved from the World Bank (https://data.worldbank.org/).

Table 1 highlights the descriptive statistics of the data. To smooth the outliers of the GDP per capita variable, we applied the natural logarithm. Also, for the remaining variables (except for the dummy variable), we calculated the standardized values using z-scores. For data distribution checking, we evaluate the two well-known parameters: skewness (an asymmetry measure) and kurtosis (sharpness of the peak measure). Concerning asymmetry, all variables reveal a right-tailed distribution (being positively skewed), while regarding the sharpness of the peak, besides R&D expenditure and the EU membership dummy variable, which have a platykurtic distribution, the remaining variables are leptokurtic distributed. Thus, all data are non-normally distributed.

Table 1. Descriptive statistics, 2007-2023

Variable	Min	Max	Average	Std. Dev.	Kurtosis	Skewness	Obs.
GDP per capita	9.92	11.83	10.72	0.37	3.88	0.70	459
Remittances	-1.05	4.13	0	1	5.37	1.46	459
R&D expenditure	-1.78	2.28	0	1	2.22	0.62	459
Trade	-1.32	4.34	0	1	7.04	1.69	459
Unemployment	-1.44	4.53	0	1	6.76	1.75	459
EU dummy	0	1	0.48	0.50	1.01	0.07	459

Regarding the econometric estimation of our function ($Y = f(X) + \varepsilon$), we first need to assess whether remittances (X) are a good predictor of GDP per inhabitant (Y) in the long run. In this respect, a widely applied test for identifying whether a variable might be used to forecast another is the Granger causality test for panel data. This test checks for the absence of causality between two or more variables (the null hypothesis [H_0] posits that X does not Granger-cause Y, while the alternative hypothesis [H_a] posits that X does Granger-cause Y). Its linear dynamic model has the following specification:

$$Y_{i,t} = \theta_{0,i} + \sum_{l=1}^{L} \theta_{il}\, Y_{i,t-l} + \sum_{l=1}^{L} \phi_{il}\, X_{i,t-l} + \varepsilon_{i,t}, \qquad i = 1, \dots, N;\ t = 1, \dots, T \tag{1}$$

Where: $Y_{i,t}$ is the response variable from period *t*; $Y_{i,t-l}$ is the lagged response variable and $X_{i,t-l}$ is the lagged explanatory variable, with *l* = the number of lags (running from 1 to L); $\theta_{0,i}$ are the individual-specific effects parameters, θ_{il} are the autoregressive parameters; ϕ_{il} are the Granger-causality parameters; $\varepsilon_{i,t}$ denotes the error terms; *i* stands for cross-sectional units, *t* stands for time. H_0: $\phi_{il} = 0$ for all $i = 1, \dots N$ (no causality between the specified variables), while H_a: $\phi_{il} \neq 0$ for some $i \in \{1, \dots N\}$ (the presence of causality between the specified variables at least for some *i*, if not all).

For our research, we utilize Juodis et al.'s (2021) Granger noncausality test by applying the *xtgrangert* STATA command introduced by Xiao et al. (2023). This test provides various valuable advantages, since it is effective for homogeneous or heterogeneous alternatives and remains reliable in cases of heteroskedasticity and cross-section dependence (Xiao et al., 2023). Rewriting the above equation based on the variables involved in our study, we obtain the following form:

$$GDP\ pc_{i,t} = \theta_{0,i} + \sum_{l=1}^{L} \theta_{il}\, GDP\ pc_{i,t-l} + \sum_{l=1}^{L} \phi_{il}\, Remittances_{i,t-l} + \varepsilon_{i,t}$$

$$i = 1, \dots, 27;\ t = 1, \dots, 17 \tag{2}$$

Nevertheless, since we suspect that not only remittances exert a significant influence on growth but also vice versa, we are also interested in testing whether past values of GDP per capita are

a reliable predictor of the current volume of remittances. We, therefore, also consider the following relationship in the context of Granger causality:

$$Remittances_{i,t} = \theta_{0,i} + \sum_{l=1}^{L} \theta_{il}\, Remittances_{i,t-l} + \sum_{l=1}^{L} \phi_{il}\, GDP\ pc_{i,t-l} + \varepsilon_{i,t}$$

$$i = 1, \dots, 27;\ t = 1, \dots, 17 \qquad (3)$$

Furthermore, to properly determine the impact of remittances (as well as the other four factors considered) on economic growth, we should envisage two aspects. First, we must be aware that it is possible to encounter some problems related to the data. Second, we must ensure that we implement a correct econometric estimation approach, which can solve the issues in the data and, hence, deliver unbiased outcomes.

In this regard, one of the greatest issues that could occur in a linear/nonlinear function is endogeneity, which, according to Bond et al. (2001), is frequently expected in empirical growth models, determining unrealistic results when the researcher uses an inappropriate estimation method. Endogeneity intervenes when there is a bidirectional causality between the predicted variable and the predictor variables - not only does X influence Y but also the other way around. In this vein, plenty of empirical analyses confirm the simultaneous causality between growth and remittances. Hence, on the one hand, remittance inflows represent an essential source of income for the receiving population, being a noteworthy contributor to poverty reduction and growth, especially in developing nations (Meyer & Shera, 2017). Nevertheless, on the other hand, growth is one predictor for remittances volume, bearing in mind that in emerging and frontier economies, where the economic opportunities are low, a larger % of inhabitants is incentivized to migrate and thus, send more financial resources to their relatives remaining in the homeland (see Ratha et al., 2023).

Additionally, apart from bidirectional causality, another problem that might arise is that the right-hand-side [RHS] variables might be correlated with the error term (that is, RHS variables are not strictly exogenous) - a situation in which various estimation methods produce biased results. Therefore, if the orthogonality criteria between the variables and the residual term are not accomplished, methods such as Ordinary Least Squares, Generalised Least Squares, or Fixed Effects regressions generate inconsistent estimates (Nickell, 1981). Furthermore, given that economic growth is influenced by a variety of factors, not including all relevant determinants in the model (that is, the case of omitted variables) leads to overestimation/underestimation of the included variables' impact. Besides, it must be sensed that the current realization of economic growth might be a consequence of its past (lagged) levels (that is, autoregressive dependent variable); therefore, dynamic panel estimation methods are preferred to static ones. Moreover, the RHS variables might be highly correlated with each other (i.e., multicollinearity), a situation that raises concerns when interpreting the econometric results. Also, autocorrelation in the error terms across cross-sections or periods is another potential issue that could appear in a regression model.

Therefore, considering the abovementioned, in an endeavor to counteract the possible difficulties that might appear and select the most appropriate estimation method for our data, we evaluate the feasibility of the generalized method of moments [GMM] to deliver accurate, impartial results. GMM is one of the most notorious dynamic panel estimators, which is adequate for *(i)* "small *T* - large *N*" panels (that is, samples spanning fewer years and more cross-sections); *(ii)* linear regressions; *(iii)* cases when the current values of the response variable depend on its past values; *(iv)* cases when the explanatory variables are not strictly exogenous; *(v)* cases with fixed cross-sections effects; *(vi)* cases of heteroskedasticity and autocorrelation within cross-sections (Roodman, 2009a, p. 86).

The GMM framework has two possible types of estimates to choose from, called *(1)* Difference GMM and *(2)* System GMM. While the first type has the property of transforming the explanatory variables by using the first difference (with the aim of removing fixed effects), the latter estimator augments the first estimator by introducing additional instruments - a characteristic which significantly increases the efficiency in the estimation (Roodman, 2009a). This advantage is because System GMM encompasses a system of two equations: the original one and the transformed one (one equation in differences and another in levels) (Roodman, 2009a). Furthermore, an additional significant advantage of GMM (a dynamic panel data model) is that, although panel heterogeneity can bias results, the unobserved heterogeneity is removed by taking first differences (refer to Baum, 2013, who highlights that first differencing possesses the ability to remove unobserved heterogeneity).

Therefore, considering the properties of the GMM estimation as well as the fact that in the present research, we deal with strongly balanced panel data, with 17 years (*T*) and 27 countries (*N*), we opt to use the System GMM model. In this respect, for the GMM framework implementation, we apply the command *xtabond2* from STATA, developed by Roodman (2009a), which provides substantial flexibility in the model specification compared to other GMM estimation commands. For instance, it allows the use of the *collapse* option to restrict the instruments' proliferation and automatically lists some diagnostic tests to verify *(i)* the existence of residuals' autocorrelation (through Arellano-Bond [AB] tests for the first [AR (1)] and second-order [AR (2)] in first differences) and *(ii)* the overall validity of the instruments (through Sargan and Hansen tests).

Nevertheless, it is essential to consider the following issues when interpreting these post-estimation tests. First, regarding the serial correlation in error terms, there is no problem if the model has first-order autocorrelation in the differenced residuals, but accepting the autocorrelation in the second differences implies a concern (Piper, 2013). Hence, we will focus only on the AB test for AR (2) in the first differences. Second, concerning the instruments' validity tests, Roodman (2009a, p. 98) affirms that "the Sargan/Hansen test should not be relied upon too faithfully because it is prone to weakness". This is because both tests have some shortcomings, i.e., while the Sargan test is "not robust, but not weakened by many instruments", the Hansen test is "robust, but weakened by many instruments" (in accordance with the output after estimating the GMM model). However, although not perfect, these two tests remain the most commonly used tests in the GMM framework. Yet, we will focus only on the Hansen test because, according to Roodman (2009b), the Sargan test is inefficient when error terms do not have constant variance, which is usually the case in empirical models.

The standard representation of the GMM equation is as follows:

$$Y_{i,t} = \alpha + \beta * Y_{i,t-1} + \gamma * X_{i,t} + \delta * Z_{i,t} + \varepsilon_{i,t}, \quad i = 1, \dots, N;\ t = 1, \dots, T \qquad (4)$$

Where: $Y_{i,t}$ is the response variable; $X_{i,t}$ is the vector of endogenous explanatory variables; $Z_{i,t}$ is the vector of strictly exogenous explanatory variables; α is the estimated intercept; β, γ, and δ are variables' estimated slope coefficients; $\varepsilon_{i,t}$ is the random error term; *i* stands for cross-sectional units, *t* stands for time.

Consequently, based on GMM estimator, the stochastic equation of the dynamic regression implied in this research has the following form:

$$GDP\ pc_{i,t} = \alpha + \beta * GDP\ pc_{i,t-1} + \gamma_1 * Remittances_{i,t} + \gamma_2 * R\&D\ expenditure_{i,t} + \gamma_3 * Trade\ openness_{i,t} + \gamma_4 * Unemployment_{\ i,t} + \delta * EU\ membership\ dummy_{i,t} + \varepsilon_{i,t}$$
$$i = 1, \dots, 27;\ t = 1, \dots, 17 \qquad (5)$$

Where: the variable *Remittances* is of interest, while the variables *R&D expenditure*, *Trade openness*, *Unemployment*, and *EU membership dummy* are of control. Except for the dummy variable, which is strictly exogenous, the others are endogenous; hence, for them, we take their

lags of 2 and longer as instruments (according to Roodman (2009a), this is the standard treatment of the endogenous variables).

4. Results and discussions

First, we test whether the explanatory variables are correlated by applying the variance inflation factor [VIF] test. Accordingly, we obtained that VIF for the *EU dummy* is 2.21, for *R&D expenditure* is 2.13, for *remittances* is 1.63, for *unemployment* is 1.43, and for *trade openness* is 1.28. As noticed, these values are under the threshold value of five, suggesting a weak correlation between variables. Hence, no corrective measures are required, as we do not deal with multicollinearity. Next, we perform a series of preliminary tests, which are essential to ensure the accuracy of econometric estimates, including *(i)* Levin-Lin-Chu [LLC] and Im-Pesaran-Shin [IPS] unit-root tests, *(ii)* cross-sectional dependence test with bias correction [CD*], i.e., an improved version of the standard CD test, *(iii)* heterogeneity test, and *(iv)* heteroskedasticity test (Table 2). By evaluating the results, we can draw the following conclusions: *(i)* both LLC and IPS tests reveal that overall, the employed variables are stationary, *(ii)* CD* agrees upon the existence of a weak cross-sectional dependence for all variables, *(iii)* slope coefficients are heterogeneous across countries, and *(iv)* heteroskedasticity in the errors is present.

Table 2. Preliminary tests, 2007-2023

Unit-root tests	Levin-Lin-Chu (2002)			Im-Pesaran-Shin (2003)		
Variable	Statistic [p-value]	Reject H_0	H_0 and H_a	Statistic [p-value]	Reject H_0	H_0 and H_a
GDP per capita	-11.23 [0.00]	YES	H_0: Panels contain unit roots. H_a: Panels are stationary.	-4.71 [0.00]	YES	H_0: All panels contain unit roots. H_a: Some panels are stationary.
Remittances	-5.32 [0.00]	YES		-2.96 [0.00]	YES	
R&D	-4.45 [0.00]	YES		-1.33 [0.09]	NO	
Trade	-11.68 [0.00]	YES		-6.94 [0.00]	YES	
Unemployment	-13.42 [0.00]	YES		-1.97 [0.02]	YES	
Bias-corrected cross-sectional dependence test			Pesaran and Xie (2024)			
Variable			Statistic [p-value]	Reject H_0	H_0 and H_a	
GDP per capita			0.31 [0.76]	NO	H_0: Weak cross-section dependence. H_a: Strong cross-section dependence.	
Remittances			1.86 [0.06]	NO		
R&D			-1.79 [0.07]	NO		
Trade openness			0.92 [0.36]	NO		
Unemployment			-1.05 [0.29]	NO		

Other tests		Statistic [p-value]	Reject H_0	H_0 and H_a
Heterogeneity	Pesaran and Yamagata (2008)	12.49 [0.00]	YES	H_0: Slope coefficients are homogeneous. H_a: Slope coefficients are heterogeneous.
Heteroskedasticity	Breusch-Pagan (1979)	7.66 [0.01]	YES	H_0: Residuals have constant variance. H_a: Residuals do not have constant variance.

Further on, to answer the first research question, we use Granger causality test for panel data, which tests for the absence of causality between two or more variables. Hence, in Table 3, we check for the effects of lagged remittances on current GDP per inhabitant, while in Table 4, we assess the impact of lagged GDP per inhabitant on current remittances. The decision regarding the optimal lag length, which provides the most suitable model fit, is predicated upon BIC - Bayesian Information Criterion.

Table 3. Granger causality test: remittances → GDP per capita, 2007-2023

Optimal lag length according to BIC selection				
One lag: BIC = -2473.65*			Four lags: BIC = -1634.72	
Two lags: BIC = -2189.87			Five lags: BIC = -1376.08	
Three lags: BIC = -1933.12			Six lags: BIC = -654.85	
Lagged Remittances	Coefficient	Std. err.	p-value	Reject/not reject H_0
Lag 1	0.048	0.011	0.000	Reject H_0

*Notes: H0: Remittances do not Granger-cause per inhabitant GDP. Ha: Remittances do Granger-cause per inhabitant GDP for at least one-panel vector autoregression. * shows the optimal number of lags.*

Table 4. Granger **causality** test: GDP per capita → remittances, 2007-2023

Optimal lag length according to BIC selection				
One lag: BIC = -1313.44*			Four lags: BIC = -1039.50	
Two lags: BIC = -1233.62			Five lags: BIC = -1031.99	
Three lags: BIC = -1129.42			Six lags: BIC = -378.98	
Lagged GDP per capita	Coefficient	Std. err.	p-value	Reject/not reject H_0
Lag 1	-1.801	0.401	0.000	Reject H_0

*Notes: H0: Per inhabitant GDP does not Granger-cause remittances. Ha: Per inhabitant GDP does Granger-cause remittances for at least one-panel vector autoregression. * shows the optimal number of lags.*

As per BIC value, the optimal lag order for remittances and GDP per inhabitant is one. Overall, we reject H_0 at a 1% significance level for both cases evaluated. Thus, from these estimates, we might draw the following two conclusions: *(1)* an intensification in the remittances volume exerts positive long-term effects on GDP per inhabitant, and *(2)* an increase in per capita GDP exerts negative long-term influences on remittances.

The results are according to our prior expectations and current literature on the topic of remittances-growth. Consequently, concerning our first statement, various studies also confirm that remittances represent a salient income source for a country's citizens, potentially contributing to long-term economic growth when used appropriately (see Vaaler, 2011; Meyer & Shera, 2017; Oda, 2023; Kuziboev et al., 2024). Furthermore, regarding our second claim, as a country develops, fewer citizens leave their homeland temporarily/forever; hence, the remittances are expected to diminish gradually. This remark aligns with the reality, which shows that low- and middle-income states are indeed top recipients of remittances globally (Ratha et al., 2023), while higher-income states rely little on this type of external financial resources.

Considering the above findings, we support the presence of a two-way causality relation among remittances and GDP per inhabitant (the case of endogeneity). Thus, employing the two-step system GMM estimation is appropriate to test the impact of remittances along with the control variables on GDP per inhabitant at the EU-27 level between 2007 and 2023 (Table 5). Thus, we respond to the second research question.

Table 5. Two-step system GMM estimation of factors influencing GDP per capita, 2007-2023

Variable	Coefficients
Lagged GDP per capita	0.772*** (0.017)
Remittances	0.013*** (0.004)
R&D expenditure	0.021** (0.010)
Trade	0.096*** (0.003)
Unemployment	-0.024*** (0.002)
EU membership dummy	-0.145*** (0.016)
Constant	3.057*** (0.189)
AB test for AR (2) in first differences (*H_0: No autocorrelation of order 2*)	z = 0.01 [p = 0.992]
Hansen's test of overidentifying restrictions (*H_0: Overidentifying restrictions are valid*)	$\chi^2(75) = 26.68$ [p = 1.000]
No. of instruments	82
No. of groups	27
No. of observations	432

*Notes: *** p < 0.01. ** p < 0.05. Standard errors in ().*

By assessing the above results, as a first general remark, one may notice that all independent variables are statistically significant. Regarding the influence, in line with our expectations, lagged GDP per inhabitant, remittances, R&D expenditure, and trade have a positive effect on current GDP per inhabitant. In contrast, the countries' membership in the 'new' EU category and unemployment induce adverse effects on growth. As a second general remark, the GMM estimation confirms that the outcomes obtained through Granger causality test are robust (lagged values of remittance inflows matter in predicting current GDP per capita evolution).

Furthermore, in addition to the significance thresholds (i.e., p-values), to ensure that the obtained results are consistent, it is paramount *(1)* not to have second-order autocorrelation in the differenced disturbance term and *(2) to* obtain a joint validity of the instruments utilized in the regression. As noticed, the probability value of the AB test for AR (2) in first differences implies that we do not reject H_0 of no autocorrelation of order 2 (correctly specified model). Besides, the probability value for Hansen's test of overidentifying restrictions highlights that we do not reject H_0, which indicates that the instruments employed are valid (moment conditions are accurately specified). Therefore, our results are reliable and free of bias.

Accordingly, this research provides clear evidence that, within the EU member states, the variable of interest (*remittance*) enhances GDP per capita, although the effect's magnitude is not extremely large. The explanations are the following. First, due to the fact that mainly all the EU states are classified as high-income states, with a 2023 per capita GNI higher than $14,006 overall, the households' incomes are sufficient to lead a decent life (World Bank database). Consequently, people can afford to save the money received from abroad in order to invest it subsequently appropriately (that is, overall, they do not use remittances primarily for basic needs, like food, clothing, or shelter). Therefore, the aggregate effect of remittance inflows on growth is anticipated to be positive. Second, concerning the magnitude of the remittance effect on growth trajectory, it is not very large because the EU's economic growth is not mainly built on the remittance inflows. Instead, it relies on a combination of different endogenous and exogenous factors at the country level, such as investments in infrastructure, physical and human capital, R&D activities, technological advancement, international trade, good institutional and political frameworks. This contrasts with the case of low-income countries, which rely heavily on remittances and where a fluctuation in them strongly influences GDP per capita. Besides, considering that in the EU, fewer citizens emigrate compared to some other world regions, it is natural that the quantum of remittances should be smaller, and thus, its impact on growth should be smaller.

Nevertheless, our econometric estimation must be cautiously interpreted, as the outcomes are computed for the entire sample, comprising all EU member states, and not separately. Hence, the results highlight the general situation at the EU level but do not imply that all EU members are similar in terms of migration, remittance inflows, or growth. That is, a couple of countries like Bulgaria or Romania have a higher emigration rate (Cristea et al., 2021) and depend more on remittances, unlike the conditions in other EU countries such as Luxembourg, Ireland, or the Nordic countries. Consequently, in some EU countries, remittances are susceptible to contributing to growth to a greater extent than in others.

All in all, the favorable effects of remittances on EU economic prosperity could be explained as follows. Remittances can be allocated towards a wide range of purposes that contribute to long-term growth. For example, among the foremost practices for building a prosperous society is investing money in the development of human capital, which involves adequate nutrition, education, and healthcare (see Cismaș et al., 2020). Therefore, when people are not burdened by poverty, they can afford to devote money received from abroad to education, lifelong learning, and healthcare (including payments for school fees, educational materials, skills development courses, medical expenses, etc.). All these financial efforts have lasting favorable influences on educational outcomes (knowledge and skills acquisition), productivity, and health outcomes (physical and mental health). Thus, in this scenario, people will have higher chances to reach their full potential, have enhanced opportunities to find better-paying jobs, and experience lower unemployment rates, all of which will magnify people's quality of life and overall economic welfare.

Additionally, besides investing in people, remittances might be used to finance the commencement of new business ventures or the growth of existing ones (Vaaler, 2011). As a result of this type of investment, new jobs will be generated, and thus, not only the business owner

but also the people who will be employed in that enterprise will benefit, resulting in a rise in welfare for the whole community.

Furthermore, unlike channeling remittances into productive investments, which reduces poverty, there are cases, especially for poorer households, when received money is spent on non-durable goods and services complying with that household's needs (Pant, 2008). Nevertheless, even so, the remittance recipient state might still take advantage because a demand increase (due to a higher household income) generates a production increase, which spurs real GDP (also consistent with Pant, 2008).

In addition to the abovementioned advantages, there are also others at the macro level; that is, because remittance flows are a stable income source even in times of crises (Ratha et al., 2023), they are an essential buffer against economic uncertainty and financial shocks. Thus, remittances augment overall economic and financial stability (Miao & Qamruzzaman, 2021) when other types of financial resources fail to do so (Ratha et al., 2023). Furthermore, considering that remittance inflows result in foreign currency inflows into recipient nations, they potentially increase foreign exchange reserves and produce real exchange rate appreciation (also per Kersan-Škabić & Tijanić, 2022). However, the beneficial effects of currency inflows extend until the point at which the local currency overly appreciates and weakens the export sector's competitiveness, that is, the so-called 'Dutch disease' phenomenon (López-Marmolejo et al., 2021). Thus, to properly gauge the consequences of remittances on growth, these money transfers should not be perceived in isolation but rather integrated into a country's economic context.

Last but not least, our findings are validated by various studies from the scientific literature. For instance, Soava et al. (2020) also discovered that remittances positively affect GDP growth at the EU level (between 1996 and 2019), albeit at a lower intensity compared to other employed indicators. Likewise, Cismaş et al. (2019) confirmed the occurrence of a positive relationship among remittance inflows and growth for seven out of eleven 'new' EU states assessed (between 1996 and 2017). Also, for a sample of eleven 'new' EU countries (2004-2020), Kersan-Škabić and Tijanić (2022) agreed that remittances stimulate economic development. Furthermore, in a case study conducted on four EU countries, Giannetti et al. (2009) econometrically demonstrate that remittances exert statistically significant positive influences on poverty alleviation, which is an essential contributor to growth. Additionally, the authors underscore that the magnitude of the remittance effect on poverty mitigation is smaller than that of welfare transfers. Moreover, this effect differs across countries, depending on a state's institutional framework and socioeconomic conditions. Similarly, for a sample of seven EU countries (2006-2015), Butkus et al. (2020) state that remittances have a great potential to mitigate poverty in recipient households; nevertheless, efficient management of these external financial flows at the country level is required to generate an increase in the population's economic welfare.

To sum up, according to our econometric estimates, remittance inflows have a statistically significant potential to boost economic growth at the entire level of EU member states (spanning 2007-2023), provided that they are used appropriately. Nevertheless, since growth is a multifaceted phenomenon that depends on miscellaneous internal and external factors within a country (Dima et al., 2017; Dima et al., 2019), it is expected that the magnitude of the influence of remittances on growth will be relatively small.

Concerning the control variables, the *EU dummy* exerts the largest (negative) impact on growth, which denotes that being part of the 'new' EU member states category negatively affects economic growth, compared to being part of the 'old' EU group. The estimation is not surprising, accounting for the significant differences concerning economic, political, and social conditions in the EU-13 compared to the EU-14. Although at the EU level, there are continuous attempts to achieve convergence between member states regarding the level of development, the disparities within the EU still remain large (European Commission, 2023). Overall, the EU-14 are highly developed countries with high living standards, unquestionable governance structures, and a

significant focus on educational and innovation performance - a situation that has persisted over the years (under the working document of the European Commission, 2023). Unfortunately, this is not the case for many EU-13 countries, which, although undergoing significant transformation after the communist period and EU accession, still have not managed to catch up with the more developed EU states. Hence, in EU-14, the economic environment is much more favorable to growth and development than in EU-13. These asymmetries within the EU yet persist (Alexa et al., 2019).

The subsequent control variable, which reveals a positive influence on growth, is *R&D expenditure*. In compliance with *Endogenous growth theory*, human capital and technological advancement are the main contributors to growth (Romer, 1990). Hence, financial resources dedicated to R&D sectors are likely to enhance a country's innovation capacity, which is a key propellant for growth and development (Saman, 2022). According to various empirical pieces of research, R&D investments pave the way to a wide range of innovations (some even revolutionary). These innovations have the remarkable potential to foster long-term productivity and competitiveness within domestic industries, leading to lasting better economic results (Gumus & Celikay, 2015). Nevertheless, although R&D expenditure is regarded as an essential factor of territorial development, the extent to which it increases growth is contingent upon the territory's absorption capacity of these types of investments (Celli et al., 2021).

The third utilized control variable, *unemployment*, reflects a socio-economic issue, which, as expected, negatively affects GDP per capita. This is because a long-run rise in unemployment is detrimental to economic growth from several perspectives. For example, since unemployment involves people without jobs and stable incomes, it reduces households' consumption/ savings/spending, increases poverty, and thus, adversely affects the overall welfare of individuals and the country's economic health. Hence, persistent unemployment significantly affects the evolution of GDP, at least in the long term, if not in the short term as well (Uddin & Rahman, 2023).

Finally, the last control variable, *trade openness*, positively impacts economic growth. Consequently, a country's engagement in international trade is highlighted as a means to achieve growth and development. As supported by plenty of researchers, international trade ranks among the foremost engines of long-term growth (Raghutla, 2020). Due to the fact that trade openness implies wider access to global markets, countries have the opportunity to specialize in producing those products or services for which they possess a revealed competitive advantage (i.e., are highly effective in the production process) and import those for which they have a revealed competitive disadvantage (i.e., it is not worth producing them domestically but buying from abroad). This, therefore, leads to a more optimal allocation of resources and higher overall productivity, which are key predictors of prosperity and growth.

As for lagged per-inhabitant GDP, it has a large positive influence on current per-inhabitant GDP, implying that a country's past economic performance matters in predicting present economic conditions. Hence, as witnessed over the years, prosperous countries managed to grow further while most poor economies stagnated or only grew slightly, lagging behind developed nations.

5. Robustness Check

A salient question in any empirical research is whether the obtained results are robust if another methodology is employed. Thus, we apply the Bayesian Model Averaging [BMA] model (a Bayesian approach) to validate the robustness of the outcomes obtained by the GMM model (a Frequentist approach). The rationale for selecting BMA for robustness verification lies in its great advantage of addressing model uncertainty in linear regression by computing models for all feasible combinations of the explanatory variables, subsequently constructing a weighted average across these models (StataCorp, 2025). Therefore, BMA not only highlights the effect

(+, -, or ±) of each explanatory variable on the explained variable but also reveals which predictors are most relevant in predicting the dependent variable – this is done through the posterior inclusion probability [PIP], i.e., the higher the PIP value of a variable, the more likely it is that the variable in question belongs to the true model, and hence, the more important is that variable (StataCorp, 2025). Accordingly, BMA is a widely used model in empirical research due to its remarkable properties (Dima & Canepa, 2024).

Table 6 shows the BMA results based on 32 models visited. The remittances variable was set to be included in all models because it is our variable of interest. Moreover, based on the results depicted by the Granger causality test, in the BMA model, we incorporated remittances lagged by one period (refer to Table 3, where it is shown that the optimal lag order for remittances in relation to per capita GDP is one). As observed, the BMA estimations are as expected, i.e., while unemployment and the EU dummy negatively impact economic prosperity, the others exert a positive influence. Moreover, the coefficient rankings are mainly maintained between the BMA and GMM models. Also, almost all variables exhibit high PIP values, implying that they are significant predictors of per capita GDP. All in all, comparing the outcomes from BMA with those of GMM, we conclude that the variables preserve their influence on the dependent variable (i.e., the coefficients' sign is conserved); thus, our results remain consistent even when the econometric model is changed.

Table 6. BMA model of factors influencing GDP per capita, 2007-2023

Variable	Effect	Mean	Std. dev.	Posterior inclusion probability [PIP]
Constant	+	0.790	0.182	1
Lagged GDP per capita	+	0.929	0.016	1
Lagged remittances	+	0.001	0.002	1
Trade	+	0.016	0.004	0.998
Unemployment	-	-0.012	0.003	0.994
EU membership dummy	-	-0.028	0.012	0.916
R&D expenditure	+	0.00003	0.001	0.055

Notes: BMA model with beta-binomial model prior, Zellner's prior with Empirical Bayes local g parameter for coefficients, and non-informative priors for error variance and constant.

6. Conclusion and policy recommendations

In the current context of globalization, with migration trends intensifying annually (Tomoiagă et al., 2025), it becomes essential to analyze how remittances might sway economic growth in the origin countries, acknowledging the pivotal role of economic prosperity in explaining societal sustainable development (Dima et al., 2024).

Considering the abovementioned, our paper aimed to appraise the lasting effects of remittances on growth for the EU-27 between 2007 and 2023. Therefore, we commenced by implementing the Granger causality test to evaluate if remittance inflows significantly forecast GDP per capita, as well as vice versa. Further on, to gauge the influences exerted by remittances and four control variables (namely, R&D expenditure, trade openness, unemployment, and EU membership dummy) upon economic growth, we applied the two-step system GMM procedure (a complex estimation technique, well-known for solving endogeneity concerns). Accordingly, the empirical econometric results might be summarized as follows: *(1)* there is a robust bidirectional relationship between remittances and per inhabitant GDP (one lagged period remittances Granger-cause current per inhabitant GDP as well as vice versa), *(2)* remittances, R&D expenditure, and trade

exert a statistically significant long-term positive effect on per inhabitant GDP, and *(3)* unemployment and the countries' membership in the 'new' EU states category (compared to the 'old' EU states category) are detrimental to growth. These outcomes align with previous studies on the topic of economic prosperity (see Delessa et al., 2024; Bucevska & Naumoski, 2023). Finally, by applying the BMA model, we were able to confirm the robustness of the results obtained in the GMM model.

Given the results of our research, we have formulated some policy recommendations:

(1) First, governments should develop programs that incentivize people to use their money (received from abroad or earned) more effectively. This aspect is paramount because, in the context of optimal utilization of remittances, not only do the recipient individuals benefit from an enhancement in life quality, but the entire society could also prosper. Consequently, people must comprehend the importance of investments that bring value over time, such as those in human capital development (i.e., education and healthcare), business set-up, or property acquisition/construction, and, hence, mainly focus on them rather than just on current consumption. In this manner, remittances are highly susceptible to boosting economic growth.

(2) Second, policymakers should develop and implement remittance-related policies that promote the use of formal channels in transferring money from abroad to the home country. At present, the global flows of remittances are much higher than those officially declared because many individuals send money through informal routes (Ratha et al., 2023). Hence, considering that this practice indeed hampers the eventual economic and social benefits of remittances, governments need to struggle to find the best policies that discourage the use of irregular channels.

(3) Third, governments ought to implement strategies that facilitate the enhancement of remittance volumes. This could be achieved, for example, by reducing transfer costs so that remittance transfers are affordable and cost-effective for everyone. Also, providing greater access to financial services for the whole population is of utmost importance so that the number of unbanked adults is as low as possible. In this context, financial transactions can be efficiently conducted through formal channels, which positively affects financial system development.

To sum up, remittance inflows represent an essential potential engine for economic growth, serving as a lifeline for developing economies. However, depending on their usage (i.e., if it is an optimal use or not), remittances can influence growth differently. Accordingly, countries should devote their efforts to first creating frameworks that favour the attraction of this type of external finance and, second, stimulating the beneficiary inhabitants to allocate the remittances to fruitful investments and not just spending the money on nondurable consumer goods. In other words, effective management of remittance inflows is paramount to ensure that their positive effects on population welfare are maximized (Butkus et al., 2020). This approach is expected to enhance the general quality of life and combat poverty. Nevertheless, there needs to be more than just remittance inflows to guarantee a drastic reduction in inequality and substantial growth. Hence, each country should also consider securing other types of external funding sources, such as attracting FDI, grants, or others (per Bajra, 2021).

Regarding the limitations of this paper, we could mention the unavailability of quarterly data for remittance inflows, which could have provided a better consistency of our results (an idea also pointed out by Cismaş et al., 2019; Bucevska & Naumoski, 2023). In addition, since a large volume of remittances are not transferred through formal channels, the actual effects of remittances on growth cannot be fully estimated, as Bucevska and Naumoski (2023) also noticed.

Finally, some possible directions for future research on the present topic could include *(1)* adding more predictor variables, *(2)* employing other econometric estimation procedures, *(3)* expanding the sample to encompass other European countries, or *(4)* conducting a comparative study at a

global scale on how remittances impact growth for the three types of economies (developed, emerging, and frontier).

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