The Effect of Romania's EU Accession on Regional Emigration and Development

Hannah Moreno[1]
Senior Essay, Yale Department of Economics

Fabrizio Zilibotti
Advisor, Tuntex Professor of International and Development Economics

April 21, 2021

[1] First and foremost, thank you to Professor Fabrizio Zilibotti for his extraordinary support and mentorship throughout such a time-intensive project. I would also like to thank Professor Mushfiq Mobarak, Teresa Delgado, and the rest of the team at the MacMillan Center for introducing me to economics research and continuing to guide me throughout my years as an undergraduate student. Much appreciation to my professors for helping me build my skillset and instilling in me a passion for the field of development – thanks in particular to Rakesh Mohan and Nicholas Alipui. I am incredibly grateful to those who have inspired me to pursue a project about Romania: Professor Mona Momescu and the team at the U.S. Embassy in Bucharest. Thank you to Shengqi Ni and Dragos Radu for their help at various steps in my thesis-writing process. Lastly, thank you to my friends and family for their continued encouragement, which I relied on hugely throughout this project. Their support has meant the world to me.

All data and code used in this paper are available upon request.

Abstract

Emigration has varying effects on the development of sending countries: while outflows of skilled labor or heightened inequality can be harmful, these phenomena can be offset by increased remittances, investment, and productivity from return migration. Romania is the source of the fifth largest diaspora worldwide. As a country with a long history of emigration, Romania has experienced heterogenous effects of migration outflows at the regional level. These effects have only intensified since Romania joined the European Union in 2007. This paper uses an event study methodology with a heterogenous migration treatment effect to measure how the event of Romania joining the EU affected certain outcome variables at the county level. I find that Romanian regions with pre-EU accession emigration rates above the national median saw a 12% higher increase in educational enrollment rate after joining the EU than other regions. Additional regressions show that high-migration regions in Romania experienced a 34% stronger increase in real GDP per capita and an 8% stronger increase in monthly real net earnings than low-migration regions after Romania's 2007 EU accession. This suggests that emigration can indeed be a positive mechanism for economic development at the regional level, and that Romania's EU accession has stimulated positive economic and educational outcomes via migration. This study contributes to the theoretical debate on the effects of emigration on development, adds to the literature on the economic effects of EU enlargement on Eastern Europe, and examines migration and its impacts at the regional level which has not been done in previous related studies.

Keywords: emigration, international migration, European Union, education, economic development, regional development

JEL classification: F22; F55; I25; O15; R11

Table of Contents

1. Introduction

Emigration can hinder the economic development of emigrants' country of origin due to phenomena such as the risk of brain drain and increased inequality. While there has certainly been evidence for such negative impacts of emigration, there is growing support for an alternative hypothesis: emigration may lead to growth in countries of origin due to the increased productivity and skills brought back by return migrants, along with increased wages and remittances that boost consumption and investment.

In this paper, I investigate how Romania's accession to the EU in 2007 impacted its regional development via migration patterns[2]. My goal is to ultimately provide insight into whether Romania's accession to the EU has had an overall positive or negative effect on the country's economic development, and to what extent emigration flows have contributed to its development. Romania is an excellent test case. As of 2016, 17% of Romania's population was living abroad, making it the country with the highest emigration rate among neighboring countries and among countries of origin for migrants to the OECD area (OECD, 2019). Additionally, Romania has seen a remarkable increase of over 200% in its emigrant population from 2000 to 2016, coinciding with Romania's accession to the EU in 2007 (OECD, 2019). As a result, Romania has seen a sharply decreasing population since 2000.

The debate on whether emigration leads to net gains or losses is ongoing in many new EU member countries. The Romanian case is especially compelling not only because of the large incidence of emigration, but also because Romania is a relatively large country with a remarkable internal heterogeneity in terms of ethnic diversity and historical propensity of individuals from different regions to emigrate. I exploit this variation as a source of

[2] Treaty concerning the accession of the Republic of Bulgaria and Romania to the European Union

heterogeneity in the intensity of the exposure of different Romanian regions to the EU accession shock. This approach circumvents – or at least limits – a number of standard criticisms to aggregate event studies. For instance, Romania's EU accession in 2007 was followed by the onset of the Great Recession, which has likely affected migration independently in a variety of ways. It would therefore be difficult to make any inference from comparing aggregate emigration before and after the accession. As long as the effects of the Great Recession are not too different across Romanian regions, my analysis is not subject to the same criticism, since I can filter out the common effect of the global recession and focus on the heterogenous effects across regions with different emigration propensities.

1.1 Data and Methodology

In particular, I examine whether Romanian counties with higher emigration propensities saw larger increases in key economic and educational outcome variables after 2007 when compared against other counties. I exploit the variation in propensity to migrate across Romanian counties to estimate the differential impact of the EU accession on the economic development of high-migration regions relative to low-migration regions. I use a panel dataset of all 42 Romanian counties over the time period 2002-2013. I construct averages of all variables in the 5-year pre-EU accession period (2002-2007) and the 5-year post-EU accession period (2008-2013). Since data is available at the NUTS3 regional level from Romania's National Institute for Statistics (INSSE), I am able to construct a panel dataset with observations for all counties before and after the EU accession.

More specifically, I use an event study methodology with a heterogenous migration treatment effect to measure how the event of Romania joining the EU in 2007 affected each outcome variable at the county level. I construct a dummy variable switching on for Romanian

regions with pre-EU accession emigration rates above the median and a time dummy switching on for the post-2007 period. I run regressions where a variety of outcome variables are each regressed on the post-accession time dummy and the interaction between the post-accession time dummy and the high-emigration dummy. Time-invariant regional heterogeneity is controlled for using regional fixed effects[3].

1.2 Summary of Main Findings

My main hypothesis is that the opportunity to emigrate increases the incentive for people to obtain more education. Motivated by this hypothesis, my preferred outcome variable is the gross educational enrollment rate. I find that Romanian regions with pre-EU accession emigration rates above the national median saw a 12% higher increase in educational enrollment rate after joining the EU than other Romanian regions. I also run the same type of regression using alternative dependent variables such the logarithm of real GDP per capita and the logarithm of monthly real net earnings. Here, the hypothesis is that emigration opportunities may improve, or possibly deteriorate, the economic situation of those who stay in the country. On one hand, emigrants can provide remittances or new international connections with local businesses. On the other hand, selective brain drain may reduce the productivity of those left behind. Overall, I find a net positive effect: high-migration regions in Romania experienced a 34% stronger increase in real GDP per capita and an 8% stronger increase in monthly real net earnings than low-migration regions after Romania's 2007 EU accession (though the latter is not statistically significant).

In separate regressions, I use a continuous measure of the pre-EU accession propensity to emigrate instead of the high-emigration dummy. The results are similar to the previous

[3] Note that, because of the regional fixed effects, I cannot include the main effect of the high-emigration dummy.

specification. Since I predict that real GDP per capita is positively correlated with regional propensity to migrate, additional regressions were run controlling for the possible confounding effect of GDP per capita on educational enrollment and earnings outcomes. Educational enrollment results were maintained but lost their statistical significance; monthly real net earnings results were mixed but not statistically significant.

Overall, my results reveal that Romanian regions with higher emigration rates saw stronger growth in educational and economic outcomes than other regions as a result of joining the EU. This suggests that Romania's accession to the EU had a positive effect on the indicators examined in this paper, and high emigration further stimulated economic development outcomes.

1.3 Contribution

My paper's contribution is threefold. First, it adds novel evidence to the theoretical debate on the effects of emigration on development based on a rigorous econometric modeling of educational and economic outcomes for the sending country. Second, it contributes to the existing literature on the economic effects of post-EU enlargement migration for Eastern Europe. In particular, it focuses on Romania, a country that is understudied with regards to gains and losses from joining the EU despite migration being a first-order issue. Third, it exploits a novel source of heterogeneity at the regional level which to the best of my knowledge has not been considered in recent studies on the effect of migration.

1.4 Related Literature

There is a wide literature on the effects of migration on wages and employment in receiving countries; see Kerr and Kerr (2011) for a detailed review of literature on the economic impacts of immigration on host countries. However, there is still very little research on the economic effects of migration on sending countries, which is especially relevant for a country

such as Romania that has seen a sharply decreasing population since 2000 and whose outward migration has been responsible for over 75% of that decline (OECD, 2019).

Descriptive papers currently pose a theoretical debate: does emigration improve or worsen the development outcomes of countries of origin? (De Haas, 2010). Historically, the brain drain of highly skilled people or intellectuals who decide to leave their home country has been a major concern for the economic wellbeing of poorer countries, and this phenomenon has been especially pronounced in Eastern Europe via migration flows westward (Vizi, 1993) (Andrén and Roman, 2016). Atoyan, *et al*. (2016) highlight the lack of clarity in this debate in their review of emigration's economic impact on Eastern Europe; some evidence has argued that migration increases remittances, investment, and productivity from return migration, while other evidence has pointed to output losses or skilled labor outflows as ultimately harmful. Kahanec and Zimmermann (2010) also discuss this issue, yet authors conclude that the often temporary nature of brain drain migration combined with the possibility for influxes of remittances should ultimately lead to positive effects on the source country, particularly in the case of countries that recently joined the EU in 2004 and 2007. Most existing literature on this topic is only descriptive. Elsner (2013) produced the first econometric analysis of the effect of post-EU enlargement migration waves on sending countries, and he found that Lithuanian stayers experienced significant increases in real wages after the rise in migration from Lithuania's 2004 EU accession. Also focused on the 2004 phase of EU enlargement, Barrell, *et al*. (2010) estimated the potential macroeconomic impacts of migration flows from New Member States by simulating what migration flows would have been in the absence of EU enlargement; they predicted that GDP per capita growth made Central and Eastern European countries that joined the EU better off than they would have been had they not joined the EU (Barrell, *et al.*, 2010).

In an empirical study on Romania by Ambrosini, *et al*. (2015), simulations predicted that an increase in freedom of migration – such as that set on by Romania's EU accession – would lead to higher educational attainment and higher average wages. However, their paper did not empirically consider Romania's EU accession and rather focused on quantifying the average migration and return premia experienced by Romanian migrants to Spain, the US, and Austria in the early 2000s. The OECD provides a descriptive overview of the Romanian diaspora and its evolution from 2000-2016, which is useful in understanding the composition and patterns of Romanian migration (OECD, 2019). Authors point to the brain drain as a cause of reduced education levels in Romania after labor market openings from EU enlargement. Neither of these studies on Romania is broken down at the regional level, likely because it is very difficult to link destinations of Romanian migrants with their counties of origin.

Relative to the literature reviewed above, my paper examines the effect of Romania's post-EU accession migration on its regional educational and economic outcomes through a rigorous econometric analysis. I focus on educational enrollment, real GDP per capita, and real earnings – three indicators that previous papers have pointed to as significant factors likely to change due to EU enlargement and migration flows. Lastly, I conduct a county-level analysis in order to understand the regional as well as the aggregate gains and losses experienced by Romania after joining the EU.

1.5 Road Map

The remainder of this paper is organized as follows. The next section provides some descriptive analysis of Romania before and after the EU accession. Section 3 describes the data sources, provides descriptive statistics, and relates how I construct the variables used in my econometric analysis. Section 4 discusses the econometric method adopted. Section 5 presents

the main empirical analysis. Section 6 discusses the interpretation of the main results. Section 7 offers some extensions, and Section 8 concludes.

2. Background

Romania has a long history of emigration, especially since the end of the Communist regime in 1989 which lifted the tight controls on citizens' mobility. In fact, Romania's population has declined every year since 1991, with an annual rate of decline of 0.75% since 2000[4]. Over 75% of the population decline from 22.4 million in 2000 to 19.5 million in 2018 is attributable to outward migration (OECD, 2019). As a result, it is estimated that more than 3.5 million Romanians lived abroad in OECD countries in 2016, and OECD countries are home to over 97% of Romanian emigrants (OECD, 2019). These trends have made the Romanian diaspora the fifth largest worldwide. In 2000, the top destination countries were Germany, Hungary, the US, and Israel (OECD, 2019). However, since Romania joined the EU in 2007, emigration patterns shifted so that EU countries made up a significantly higher proportion of emigrants' destinations. In 2016, 30% of Romanian emigrants lived in Italy, 20% in Germany, 17% in Spain, and the next 24% in the UK, the US, Hungary, France, Austria, and Canada (OECD, 2019). Most Romanian emigrants cite economic and social opportunities abroad as their reason for migrating, including employment and studies. Emigration tendencies have become deeply ingrained in Romania to the point where over one fourth of Romanians surveyed between 2009 and 2018 reported that they intended to emigrate (OECD, 2019).

As part of the European Union's most recent enlargement in Central and Eastern Europe, several countries have joined the EU in three separate waves: the Czech Republic, Estonia,

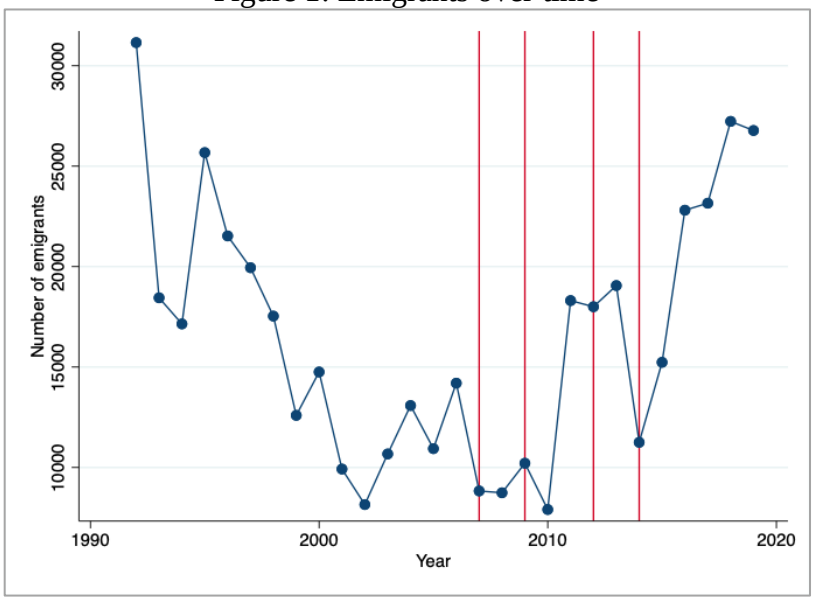
[4] The World Bank Group

Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia, and Slovenia in 2004; Romania and Bulgaria in 2007; and Croatia in 2013[5]. Most of these countries underwent phased accession processes to ease the adaptation for New and Old Member States alike. For Romania, this occurred in the form of a phased lifting of mobility restrictions. Romania had a seven-year transitional period during which EU countries could delay Romanians' access to their labor markets in the case of sufficient labor market disturbances (OECD, 2019). At the time of accession in 2007, Romanians had access to ten EU countries' labor markets: the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Poland, Slovenia, Slovakia, Finland, and Sweden. Two years later, in 2009, Romanian workers could freely immigrate to Denmark, Greece, Spain, Hungary, and Portugal. Spain re-imposed labor market restrictions in 2011, and Italy and Ireland lifted their restrictions in 2012. Finally, all other EU countries opened their labor markets to Romania in 2014, including Spain. This phased approach, combined with the economic strains of the Great Recession in 2008, likely eased the pace of Romanian emigration growth after 2007. Despite these labor market restrictions, Romanians were still free to move and live in all EU countries immediately upon joining the EU.

Figure 1 shows the flow of all Romanian emigrants from 1992 to 2019, with vertical lines marking each phase of labor market opening associated with Romania's EU accession (2007, 2009, 2012, and 2014). In the years leading up to Romania's accession to the EU, the number of emigrants remained steady, but there was a spike beginning in 2010 that continued in the following years. The slight delay in the emigration response to Romania's EU accession is likely due to the staggered labor market opening of EU countries to Romania, in addition to the Great Recession of 2008 and the resulting economic challenges (Kahanec and Zimmermann, 2016).

[5] European Commission

Figure 1: Emigrants over time



This graph shows the number of emigrants from Romania on the vertical axis versus year on the horizontal axis, with vertical lines at 2007, 2009, 2012, and 2014. These years correspond to the initial accession to the EU; the additional labor market access to Denmark, Greece, Spain, Hungary, and Portugal; then to Italy and Ireland; and finally to the remainder of the EU. Data comes from Romania's National Institute for Statistics (INSSE).

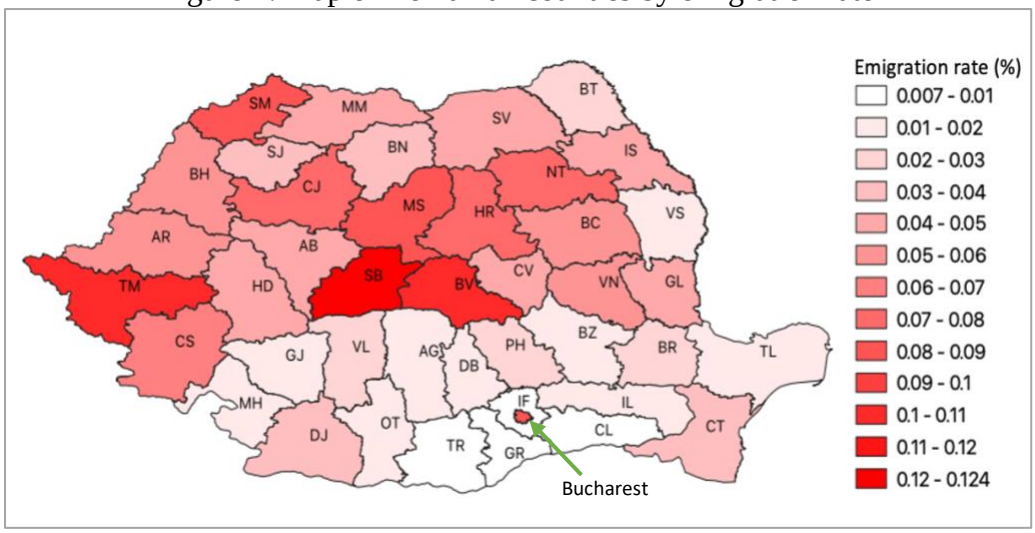
Still, the overall trend of increasing emigration since 2010 is striking; the number of emigrants in recent years has almost reached the extreme levels of 1992 that stemmed from the collapse of a restrictive Communist dictatorship. In order to capture the full effect of Romania's accession to the EU on its regional economic development – rather than simply the immediate effect – my analysis relies on data averaged over the five years prior and the five years following the accession.

There is large variation in the characteristics of Romanian emigrants in terms of education, age, and ethnicity. This variation is directly related to emigrants' county of origin as well as to their destination countries. For instance, several regions in Romania are known to contain large populations of ethnic Hungarians, who are also more likely to migrate to Hungary (Andrén and Roman, 2016). Harghita (HR) and Mureș (MS) are two of the regions with the highest Hungarian minority populations, and they have very high emigration rates as depicted in Figure 2. The same trend applies to ethnic Germans who have migrated to Germany and

Romanian Jews who have migrated to Israel (Andrén and Roman, 2016). Moreover, 92% of Romanian emigrants were of working age (15-64) in 2016, and younger age groups (25-44) made up a disproportionately large fraction (OECD, 2019). In particular, those of working age made up over 80% of all Romanian emigrants in Italy, Austria, Spain, and the UK in 2016 (OECD, 2019). Indeed, the majority of migrants to Italy, the UK, and Spain cited employment as their reason for moving, while family reasons dominated migrants' reasons for moving to Austria (OECD, 2019). There is also considerable heterogeneity in migrants' education levels across destination countries. Italy and Spain have overwhelmingly high proportions of migrants with low education, whereas Canada and Denmark have the largest proportions of highly-educated migrants (OECD, 2019). This suggests that migration patterns to certain countries form on the basis of economic opportunities or potential wage premia for specific skill levels. The age and skill composition across regions in Romania likely plays a role in determining those regions' emigration trends, whether they drive emigration towards certain destinations or slow emigration altogether. Also, regions close to Romania's northwestern border are likely to see more emigration compared to regions farther away with higher costs of migration.

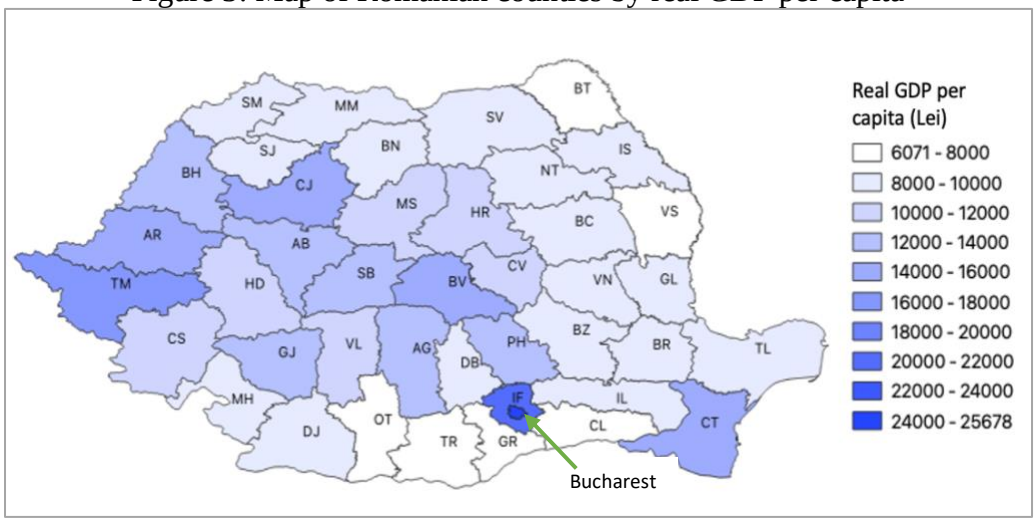
Another hypothesis is that counties with high real GDP per capita see more emigration due to individuals' ability to afford migration. On the other hand, those from regions with lower GDP values may see more incentives to migrate due to higher potential gains. See Figures 2 and 3 to observe the heterogeneity in emigration rate and real GDP per capita for Romanian counties before the EU accession. Figure 2 reveals that Bucharest, Sibiu (SB), Brașov (BV), and Timis (TM) are regions with particularly high pre-EU accession propensities to migrate, while many regions along the southern border have very low propensities to migrate. While some regions with high GDP per capita also have high emigration rates – such as Bucharest, Timis (TM), and

Figure 2: Map of Romanian counties by emigration rate



This map shows the emigration rate of all 42 Romanian counties on a gradient scale. The emigration rate is the 5-year pre-EU accession average (2002-2007); data comes from Romania's National Institute for Statistics (INSSE).

Figure 3: Map of Romanian counties by real GDP per capita



This map shows the real GDP per capita of all 42 Romanian counties on a gradient scale. The real GDP per capita is the 5-year pre-EU accession average (2002-2007); data comes from Romania's National Institute for Statistics (INSSE).

Cluj (CJ) – other high-GDP regions do not necessarily share this trend – such as Ilfov (IF) and Constanța (CT). Most regions with low real GDP per capita also have low emigration rates, but this is not a strict rule; Satu Mare (SM) serves as a counterexample, yet its high emigration rate may be related to the county's high proportion of ethnic Hungarians and its proximity to the

Hungarian border. Evidently, there is variation in emigration rates among regions with similar levels of real GDP per capita.

It is unclear which regional characteristics play the largest roles in steering emigration patterns from various counties. However, the significant variation in ethnic diversity, geographic proximity to the northwestern border, real GDP per capita, and age and skill composition definitely lead to heterogeneity in Romanians' propensity to move abroad. In turn, this heterogeneity can lead to differences in the strength of emigration's effect on development. I leverage this in my paper in order to study how high-migration regions have seen different educational and economic outcomes when compared to other regions. In Section 7, I further analyze regional characteristics that may act as determinants of propensity to migrate.

3. Data

The primary data source for this analysis is Romania's National Institute for Statistics (INSSE)[6]. Official statistics are obtained from a combination of surveys and administrative data. All data is available at the NUTS 3 regional level; the NUTS classification (Nomenclature of territorial units for statistics) is a "hierarchical system for dividing up the economic territory of the EU and the UK," where NUTS 3 is the smallest regional breakdown level[7]. Romania has 42 counties at the NUTS 3 level, which provides enough observations to draw conclusions about economic development indicators regionally. Romania's National Institute of Statistics also has data across a large time span, including annually in our focus period of 2002-2013. A major drawback is that annual regional emigration data does not contain information on the country of

[6] National Institute for Statistics - ROMANIA
[7] Eurostat

destination, educational attainment, political affiliation, ethnicity, or real earnings. Therefore, my analyses use values of these variables for each region and investigate how they correspond to the emigration rates of those regions in pre- and post-EU accession periods. More specifically, the variables extracted from Romania's National Institute for Statistics and their variable names on the INSSE website are as follows:

(1) Permanent emigrants by county of departure and year [POP309B]

(2) Permanent resident population by age, county, and year at January 1st [POP107A]

(3) Enrolled population by level of education (primary, lower-secondary, upper-secondary, post-secondary, tertiary, bachelor), county, and year [SCL103F]

(4) GDP by county and year [CON103C; CON103I]

(5) Average monthly nominal net earnings by county and year [FOM106A; FOM106E]

I then compute the *emigration rate* by dividing permanent emigrants (1) by the population (2); the *gross educational enrollment rate* by dividing enrollment (3) by population of school age (2); the *real GDP per capita* by dividing nominal GDP (4) by the population (2) and by the GDP deflator; and the *real net earnings* by dividing net earnings (5) by the consumer price index. In the analysis, I consider the logarithms of real GDP per capita and real earnings. I adjust net earnings values for the years 2003 and 2004 by dividing by 10,000 to account for the monetary reform of Romanian Lei in 2005[8]. Data for the national GDP deflator and consumer price index are obtained from the World Bank[9]. One limitation is that real earnings and real GDP per capita at the regional level are calculated based on national price indexes. Ideally, one would use local price deflators, but these are not available to the best of my knowledge. In my gross educational

[8] Banca Națională a României

[9] The World Bank Group (GDP Deflator); The World Bank Group (Consumer Price Index)

enrollment rate computation, I use the average school age ranges according to the OECD Reviews of Evaluation and Assessment in Education in Romania in 2017 (Kitchen, *et al*., 2017). Finally, all variables are averaged over the 5-year pre- and post-EU accession periods, respectively.

Regional data on ethnic diversity are obtained from the 2002 and 2011 Romanian census, with non-Romanian ethnic minorities including Hungarians, Romas, Germans, and religious minorities such as Jews[10]. The variable for *ethnic diversity* is constructed by combining all non-Romanian ethnic minority individuals as a percentage of the total population in each region. Since data is only available in 2002 and 2011, the ethnic diversity in 2002 is used to represent baseline pre-EU accession ethnic diversity. Geographic data are obtained from the Romanian Ministry of Public Works, Development, and Administration and the European Environment Agency[11]. In particular, geographic data on Romanian regional centroids and the Hungarian border are used to compute the natural logarithm of the *average distance to the Hungarian border* for each region. I selected the distance to the Hungarian border as a relevant variable impacting ease of migration since Romania is at the easternmost edge of the EU and the vast majority of Romanian emigration occurs westwards past Hungary; over 80% of all Romanian emigrants in 2015/16 went to western EU countries (OECD, 2019).

In Section 7, I extend my analysis to consider how joining the EU may have affected political outcome variables in high-migration regions versus low-migration regions. This extension is based on the hypothesis that emigration opportunities may lead to heightened pro-EU sentiment and changes in political preferences on the right-left scale. Political data are

[10] Population and Housing Census 2002; Population and Housing Census 2011
[11] Romanian Ministry of Public Works, Development, and Administration; European Environment Agency

obtained from Romania's Permanent Electoral Authority[12]. I consider the first round of presidential elections in 2004 and 2009 and split the top five parties with the most votes into pro- or anti-EU and right- or left-wing; constructed variables represent the *percentage of votes for pro-EU or left-wing parties* among the top five parties. The top five parties received over 93% of votes in presidential elections in both 2004 and 2009. All computations of variables are completed using STATA and QGIS.

Table 1 shows descriptive statistics for key variables from INSSE, given at the county level and averaged over the pre-EU accession period 2002-2007 and the post-EU accession period 2008-2013.

Table 1: Romanian county-level descriptive statistics

Variable	Pre-EU accession (2002-2007)				Post-EU accession (2008-2013)			
	Mean	**Std. dev.**	**Min.**	**Max.**	**Mean**	**Std. dev.**	**Min.**	**Max.**
Emigrants (per annum)	262	308	20.2	1830	326	562	55.7	3720
Emigration rate (%)	0.0429	0.0300	0.00694	0.124	0.0493	0.0290	0.0176	0.173
Educational enrollment rate (%)	76.8	12.1	62.8	119	78.8	14.3	63.3	133
Real GDP per capita (Lei)	11200	3880	6070	25700	13100	5580	6850	37000
Monthly real net earnings (Lei)	895	101	750	1242	1250	190	1050	2000

This table shows the descriptive statistics of key variables across the sample of 42 Romanian counties from 2002-2013. All data comes from Romania's National Institute for Statistics (INSSE), and all summary statistics are based on the 5-year averages for each region from 2002-2007 and 2008-2013.

The emigration rate and educational enrollment rate have remained nearly constant, while all other variables in Table 1 have increased between the two periods of interest. While some of these increases seem more significant than others, it is important to recall that other factors such as the Great Recession impacted aggregate emigration and economic trends at the same time as Romania's EU accession. Inspecting these variables before and after 2007 is not enough to draw a robust conclusion. Rather, my study considers the regional heterogeneity in how these variables changed between the two periods.

[12] Autoritatea Electorală Permanentă

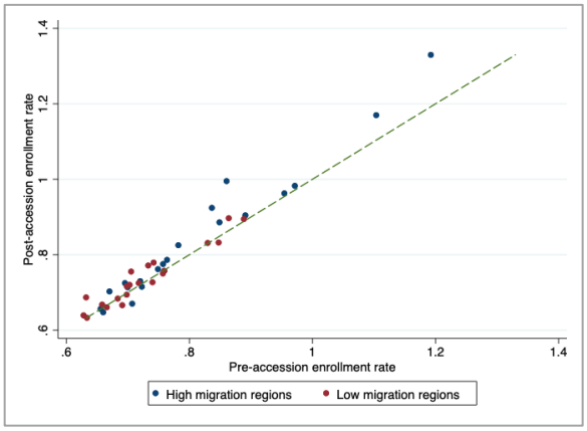
I also construct several descriptive graphs using data at the county level to observe how pre-EU accession outcome variables compare to post-EU accession outcome variables. In Figures 4-6, regions with pre-EU accession emigration rates above the national median (high-migration regions) are represented by blue dots, and other regions (low-migration regions) are identified by red dots. Figure 4 shows a higher increase in educational enrollment rate for regions with high emigration propensity; this is demonstrated by the higher ratio between the post-EU accession and pre-EU accession enrollment rates, or the large concentration of high-migration region points above the 45-degree line. A similar but weaker trend can be observed in Figures 5 and 6, as well: there is a slightly higher increase in real GDP per capita and real net earnings for high-migration regions when compared to low-migration regions.

Figures 7 and 8 demonstrate how the pre-EU accession emigration rate correlates with ethnic diversity and distance to the Hungarian border for all 42 Romanian counties. Figure 7 reveals a positive correlation between a region's proportion of non-Romanian ethnic minorities and its baseline pre-EU accession emigration rate, while Figure 8 displays a negative correlation between a region's average distance to the Hungarian border and its emigration rate. Notably, some regions with low ethnic diversity still have quite high emigration rates, and the regions with the highest emigration rates actually have low ethnic diversity. In these cases, other variables may be more important, such as distance to the Hungarian border as an indicator of ease of migration.

Finally, Figures 9 and 10 show Romania's pre-EU accession emigration rate plotted against the percentage of pro-EU votes and left-wing votes in the 2004 presidential elections at the regional level. Figure 9 depicts a positive trend between emigration rate and support for pro-EU political parties in the presidential election. Meanwhile, Figure 10 shows a negative

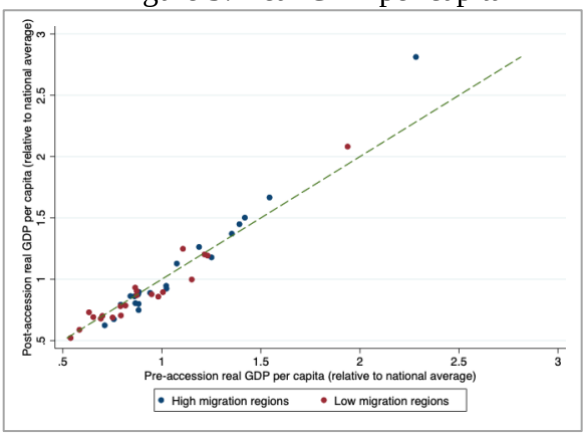
relationship between emigration and left-wing vote percentages. Based on these results, high-migration regions likely experienced higher increases in pro-EU and right-wing vote percentages than other regions after Romania joined the EU.

Figure 4: Educational enrollment rate



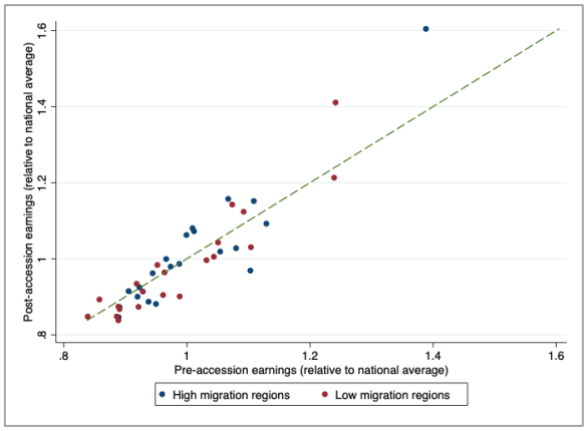
This graph shows the post-EU accession (2008-2013 average) educational enrollment rate on the vertical axis versus the pre-EU accession (2002-2007 average) educational enrollment rate on the horizontal axis for all 42 Romanian counties, comparing high- and low-migration regions by color-code. There is a 45-degree line for reference. Data comes from Romania's National Institute for Statistics (INSSE).

Figure 5: Real GDP per capita



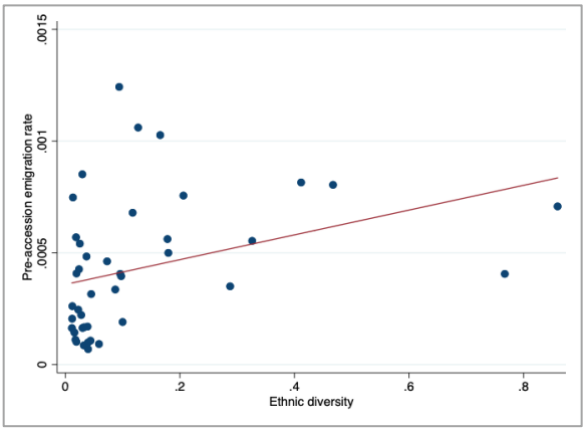
This graph shows the post-EU accession (2008-2013 average) real GDP per capita on the vertical axis versus the pre-EU accession (2002-2007 average) real GDP per capita on the horizontal axis for all 42 Romanian counties, comparing high- and low-migration regions by color-code. There is a 45-degree line for reference. Real GDP per capita values are given relative to the pre- and post-EU accession national averages; original units are in Romanian Lei. Data comes from Romania's National Institute for Statistics (INSSE).

Figure 6: Average monthly real net earnings



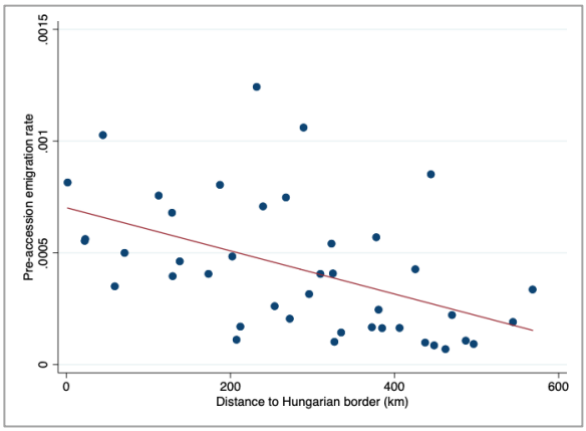
This graph shows the post-EU accession (2008-2013 average) average monthly net real earnings on the vertical axis versus the pre-EU accession (2002-2007 average) average monthly net real earnings on the horizontal axis for all 42 Romanian counties, comparing high- and low-migration regions by color-code. There is a 45-degree line for reference. Earnings values are given relative to the pre- and post-EU accession national averages; original units are in Romanian Lei. Data comes from Romania's National Institute for Statistics (INSSE).

Figure 7: Emigration rate vs. ethnic diversity



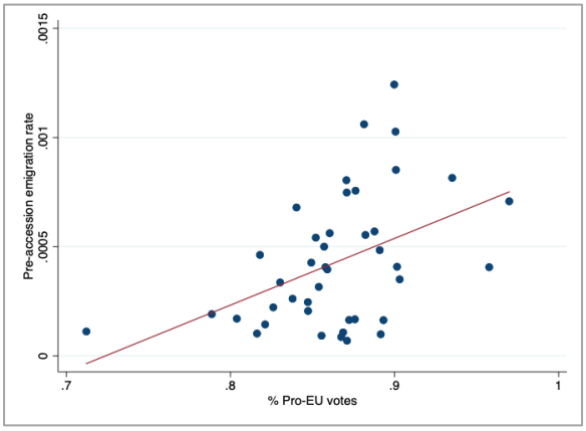
This graph shows the pre-EU accession (2002-2007 average) emigration rate on the vertical axis versus the proportion non-Romanian ethnic diversity on the horizontal axis for all 42 Romanian counties. There is a trend line for reference. Emigration rate data comes from Romania's National Institute for Statistics (INSSE), and ethnic diversity data comes from Romania's 2002 national census.

Figure 8: Emigration rate vs. distance to Hungarian border



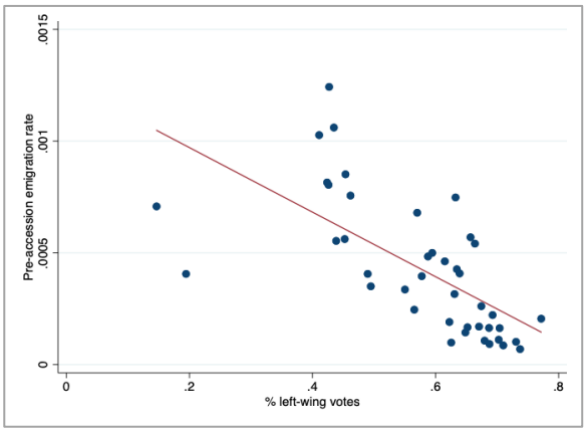
This graph shows the pre-EU accession (2002-2007 average) emigration rate on the vertical axis versus the average distance to the Hungarian border in kilometers on the horizontal axis for all 42 Romanian counties. There is a trend line for reference. Emigration rate data comes from Romania's National Institute for Statistics (INSSE), and geographic data comes from the Romanian Ministry of Public Works, Development, and Administration and the European Environment Agency.

Figure 9: Emigration rate vs. percentage pro-EU votes



This graph shows the pre-EU accession (2002-2007 average) emigration rate on the vertical axis versus the percentage pro-EU votes out of the top five parties in the first round of the 2004 presidential election for all 42 Romanian counties. There is a trend line for reference. Emigration rate data comes from Romania's National Institute for Statistics (INSSE), and political data comes from Romania's Permanent Electoral Authority.

Figure 10: Emigration rate vs. percentage left-wing votes



This graph shows the pre-EU accession (2002-2007 average) emigration rate on the vertical axis versus the percentage left-wing votes out of the top five parties in the first round of the 2004 presidential election for all 42 Romanian counties. There is a trend line for reference. Emigration rate data comes from Romania's National Institute for Statistics (INSSE), and political data comes from Romania's Permanent Electoral Authority.

4. Methodology

In order to draw inference on how increased emigration resulting from Romania's accession to the EU affected educational and economic outcome variables, I run regressions allowing the EU accession shock to have heterogenous effects across counties with different historical propensities to emigrate. More formally, I perform an event study with a heterogenous treatment effect. The hypothesis is that the accession shock has a more intense effect in regions where people have a higher inclination to emigrate. This hypothesis is inspired by the evidence from earlier studies suggesting that migrants are attracted to regions where they can find a network of earlier generations of migrants coming from the same region. This was documented by the influential contribution of Card (2001); this study triggered a large literature which focused mostly on the spatial variation of immigrant inflows in the destination country, whereas my paper focuses on the spatial variation in the source country[13].

My methodology bears some resemblance to the difference-in-difference approach used by Alder, *et al.* (2016) who study the effect of special economic zones in China. The main difference is that in their study, there is heterogeneity in both space and time: different regions received the status of special economic zones at different times, and some were never granted such status. In contrast, in my study, there is a single treatment (the EU accession in 2007) and I exploit the heterogenous intensity of the treatment at the regional level.

[13] Card (2001) exploits the fact that immigrants to certain regions often originate from the same source country due to the existing immigrant community in those regions. In particular, Card constructs a supply-push component of inflows of immigration that acts as an exogenous determinant of recent migration flows in the destination country. In my paper, I exploit the exogeneity of propensity to emigrate based on the idea that there are existing outflows of migrants from certain regions of origin.

5. Empirical Analysis

This section presents some descriptive statistics, main hypotheses, and empirical specifications of the analysis. Table 2 shows the averages of key outcome variables (educational enrollment rate, real GDP per capita, and monthly real net earnings) for Romania's 42 counties during the pre-EU accession time period (2002-2007) and the post-EU accession time period (2008-2013). Results are given for all regions, for high-migration regions, and for low-migration regions. High-migration regions are defined as regions with pre-EU accession emigration rates above the national median, and low-migration regions are all other regions. I emphasize this distinction because it reflects the way I measure propensity to emigrate in the econometric analysis that follows.

Table 2: Key Romanian county-level outcome variables pre- and post-EU accession

	Educational enrollment rate			**Real GDP per capita (Lei)**			**Monthly real net earnings (Lei)**		
	Pre*	**Post****	**Percent increase**	**Pre**	**Post**	**Percent increase**	**Pre**	**Post**	**Percent increase**
High-migration regions	0.812 (0.245)	0.839 (0.176)	3.33%	12200 (4000)	14400 (6410)	18.0%	886 (108)	1270 (202)	43.3%
Low-migration regions	0.725 (0.0724)	0.737 (0.0763)	1.66%	10300 (3610)	11800 (4380)	14.6%	903 (96.5)	1230 (179)	36.2%
All regions	0.768 (0.121)	0.788 (0.143)	2.60%	11200 (3880)	13100 (5580)	17.0%	895 (101)	1250 (190)	39.7%

*Pre: average value over 5-year pre-EU accession time period (2002-2007)
**Post: average value over 5-year post-EU accession time period (2008-2013)
This table shows the averages of key outcome variables before and after Romania's accession to the EU, comparing all high-migration regions, all low-migration regions, and the national aggregate. Regions are the 42 NUTS 3 regions in Romania, or counties. All data comes from Romania's National Institute for Statistics (INSSE).

Table 2 supports the evidence observed in Figures 4-6; there was a higher percent increase in educational enrollment rate, real GDP per capita, and monthly real net earnings after Romania's EU accession in regions with high propensity to migrate when compared with other regions. Based on these summary statistics, it seems that Romania's accession to the EU had a positive effect on regional educational and economic indicators via emigration.

5.1 Hypothesis

My main hypothesis is that high-migration regions experienced stronger increases in all three outcome variables in the post-EU accession time period when compared to low-migration regions. This stems from the idea that in high-migration regions, people see a stronger incentive to receive an education due to strong returns to skilled migration abroad. Ambrosini, *et al.* (2015) argue that skilled labor migration may increase educational incentives in friends and family in the sending country; my hypothesis is in line with their argument. Larger increases in real GDP per capita and earnings in high-migration regions could arise from return migrants who often become entrepreneurs or bring highly productive skills back to their home county in Romania. Even when the emigrants do not return home, they can create opportunities for their families, friends, and social network in the source country. In Barrell, *et al.* (2010)'s study of Eastern European countries that joined the EU in 2004, GDP per capita increases were attributed to the heightened productivity of return migrants and the reduced unemployment following emigration flows that shrink labor supply. I expect similar phenomena in Romania to stimulate larger increases in GDP per capita in regions that experienced stronger migration flows. Ambrosini, *et al.* (2015) discuss the positive return premium that return migrants receive on their wages upon return to Romania, which is another facet through which high-migration regions could experience economic gains. Also, shrinking labor supply directly increases real wages in the short run (Solow, 1956). Ultimately, I hypothesize that Romania's accession to the EU had a net positive impact on Romania's regional economic and educational outcomes via migration flows.

5.2 Econometric Specifications

I propose the following baseline econometric specification to test my hypotheses:

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(HighMigration_i \times Time_t) + \epsilon_{i,t}, \quad (1)$$

where $Y_{i,t}$ is the dependent variable, ϕ_i is a regional fixed effect, $Time_t$ is a dummy variable equal to 1 for the post-EU accession time period (2008-2013), $HighMigration_i$ is a dummy variable equal to 1 for regions with pre-EU accession emigration rates above the national median, and $\epsilon_{i,t}$ is a standard error term. I apply the specification above to different dependent variables, including the gross educational enrollment rate, the logarithm of real GDP per capita, and the logarithm of average monthly real net earnings. In all cases, I cluster standard errors at the regional level.

Across all regressions, I control for county fixed effects to filter out heterogeneity in time-invariant regional characteristics. The key explanatory variable is the interaction between the post-accession dummy ($Time_t$) and the high-migration dummy ($HighMigration_i$); thus, β is the main coefficient of interest. In particular, the coefficient α on $Time_t$ measures the effect of the EU accession, represented by the post-EU accession time period dummy, on the outcome variable for low-migration regions. The coefficient β on the interaction term ($HighMigration_i \times Time_t$) measures the difference in effect of the EU accession on the outcome variable for high-migration regions relative to other regions.

Although I use a dummy for high-emigration counties in the specification above, emigration is a continuous variable, so it is also possible to run an interaction model with the continuous variable. Therefore, a second specification uses a continuous variable based on the

pre-EU accession emigration rate to distinguish high-migration regions[14]. More specifically, the estimation equation is:

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(MigDeviation_i \times Time_t) + \epsilon_{i,t}, \quad (2)$$

where $Y_{i,t}$ is the dependent variable, ϕ_i is a regional fixed effect, $Time_t$ is a dummy variable equal to 1 for the post-EU accession time period (2008-2013), $MigDeviation_i$ is the difference between the average emigration rate across the pre-EU accession years (2002-2007) for region i and the national average, and $\epsilon_{i,t}$ is a standard error term. In this equation, the coefficient α measures the effect of the EU accession on the outcome variable for a region with an emigration rate exactly at the sample mean. The coefficient of interest, β, measures how much more the outcome variable changes after the EU accession for each percentage deviation from the sample average emigration rate[15].

For the estimations involving educational enrollment and earnings, I include additional control variables for the possible confounding effect of real GDP per capita on the educational enrollment and earnings outcome variables. Since I predict that the logarithm of real GDP per capita is positively correlated with propensity to migrate (as later confirmed by Table 4 in Section 6), it is worth examining whether the effect of propensity to migrate on post-EU accession educational enrollment and earnings persists even when specifically controlling for an interaction variable capturing heterogenous pre-EU accession regional real GDP per capita. The following estimation equations are used:

[14] Even though emigration rate is a continuous variable, the baseline specification uses a dummy for high-migration regions for ease of interpretation.

[15] Note that an interaction specification requires the inclusion of two main effects in the regression, which in this case are $Time_t$ and $MigDeviation_i$. However, the variable $MigDeviation_i$ has no time variation and rather only has cross-sectional variation. Thus, it cannot be added directly to the specification because of its perfect multicollinearity with the set of county fixed effects. The interaction effect is not problematic because it varies both across counties and over time. This applies to all specifications in my paper, which utilize interaction terms.

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(HighMigration_i \times Time_t) + \gamma(GDPDeviation_i \times Time_t) + \epsilon_{i,t} \quad (3)$$

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(MigDeviation_i \times Time_t) + \gamma(GDPDeviation_i \times Time_t) + \epsilon_{i,t}, \quad (4)$$

where $GDPDeviation_i$ is the difference between the average logarithm of real GDP per capita across the pre-EU accession years (2002-2007) for region *i* and the national average. In both equations, the coefficient γ measures how much more the outcome variable changes after the EU accession for each percentage deviation from the sample average real GDP per capita. The coefficient of interest is still β, as before.

5.3 Estimation Challenges

There are several estimation challenges associated with running this analysis. Firstly, there is a risk of variable correlation within regions. For instance, educational enrollment before and after Romania's EU accession may be correlated within the region of Cluj. The clustering of standard errors at the regional level allows for correlation in the structure of the error terms that, when ignored, could bias the statistical significance of the regression results. It is worth acknowledging that there might be spatial correlation between adjacent regions, which could be accounted for using methods such as those developed by Conley (1999). Employing such spatial clustering methods would be difficult since the sample used in this analysis only includes 42 regions, and any further clustering could lead to the point where little can be extrapolated from the results.

Furthermore, real GDP per capita may have a confounding effect on emigration rate as well as educational enrollment and earnings outcome variables. If this is true, Romania's EU accession may affect regions with different GDP per capita levels differently; for example, a high-GDP region may already be correlated with higher emigration and educational enrollment, distorting the effect the accession actually had on educational enrollment in regions with

different propensities to migrate. Specifications (3) and (4) include an interaction term that captures heterogenous pre-EU accession regional real GDP per capita. These regressions aim to confirm that results were not simply spurious effects of heterogeneity in real GDP per capita, but rather represent legitimate relationships between the EU accession and outcome variables for high- and low-migration regions. Note that real GDP per capita could not be controlled for directly since it is correlated with regional fixed effects in the model, so an interaction variable was controlled for instead. The variable is an interaction between the deviation of a region's average logarithm of real GDP per capita in 2002-2007 from the national average and a post-EU accession time dummy.

Lastly, the quality of data from the National Institute for Statistics may not be very high. National data originated from a combination of surveys and administrative sources and may include a considerable amount of measurement error, especially due to the granular level at which it was reported. The existence of measurement error explains the level of noise in the data that may have caused some regression results to not reach statistical significance at the 5% level.

6. Results

The following two sections contain the main results of the paper. In this section, I show the results of a number of regressions using the model described earlier in which I use different dependent variables and various strategies to control for confounding factors. In particular, Table 3 includes empirical specifications (1)-(4) for gross educational enrollment rate; Table 4 presents results for specifications (1) and (2) on real GDP per capita; and Table 5 includes econometric specifications (1)-(4) on monthly real net earnings. These regressions suggest that pre-accession propensity to migrate affects the intensity of Romania's EU accession shocks across counties.

Among other extensions, in Section 7, I try to identify time-invariant characteristic of counties that are correlated with propensity to emigrate.

The regression results for all outcome variables and specifications are on page 30. In Table 3, column (1) reveals that Romanian regions with baseline emigration rates above the national median saw a 12% higher increase in educational enrollment rate after 2007 compared to other regions. To understand the coefficient in column (2), it is useful to note that in my sample, $MigDeviation_i$ ranges between -0.000360 and 0.000814. Thus, a coefficient of 261 means that moving from the least migration-prone to the most migration-prone county entails an increase in the educational enrollment rate after EU accession by 31%[16]. To report another commonly-used quantification, the standard deviation of $MigDeviation_i$ is 0.000298. So, an increase by one standard deviation in $MigDeviation_i$ is associated with an increase in the educational enrollment rate of 7.8%[17]. In both columns (1) and (2), the estimated coefficients of interest are statistically significant – if only at the 10% level – and suggest that regions with high propensities to migrate responded more positively to Romania's EU accession in terms of educational outcomes. This confirms my hypothesis and is likely attributable to the education incentives associated with strong returns to skilled labor migration, which are especially strong in regions with large outflows of migration. As discussed earlier, in columns (3) and (4) I control for the interaction between the post-accession time dummy and GDP per capita. I should stress that this specification with two interactions is demanding because the data may find it difficult to separate the interacted effect of GDP per capita from that of the propensity to migrate. In fact, the estimate of the coefficient of interest becomes smaller and loses statistical

[16] $[Max(MigDeviation_i) - Min(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000814 - (-0.000360)] \times [261] = 0.306$

[17] $[SD(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000298] \times [261] = 0.0778$

Table 3: Educational enrollment baseline regression

	(1)	(2)	(3)	(4)
HighMigration x Time	0.118*		0.063	
	(0.058)		(0.056)	
MigDeviation x Time		261.361*		139.911
		(101.987)		(99.811)
GDPDeviation x Time			0.307*	0.279*
			(0.135)	(0.138)
Regional FE	Yes	Yes	Yes	Yes
N	84	84	84	84
R^2	0.103	0.170	0.306	0.319

Standard errors in parentheses.
The dependent variable is the educational enrollment rate. HighMigration x Time is an interaction dummy switching on for high-migration regions after Romania's EU accession in 2007. MigDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession emigration rate; the variable switches on after 2007. GDPDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession logarithm of real GDP per capita; the variable switches on after 2007. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Logarithm of real GDP per capita baseline regression

	(1)	(2)
HighMigration x Time	0.344*	
	(0.146)	
MigDeviation x Time		617.518*
		(229.517)
Regional FE	Yes	Yes
N	84	84
R^2	0.187	0.202

Standard errors in parentheses.
The dependent variable is the natural logarithm of real GDP per capita. HighMigration x Time is an interaction dummy switching on for high-migration regions after Romania's EU accession in 2007. MigDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession emigration rate; the variable switches on after 2007. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Logarithm of monthly real net earnings baseline regression

	(1)	(2)	(3)	(4)
HighMigration x Time	0.078		-0.000	
	(0.058)		(0.045)	
MigDeviation x Time		102.716		-107.203
		(99.268)		(61.153)
GDPDeviation x Time			0.436***	0.482***
			(0.073)	(0.074)
Regional FE	Yes	Yes	Yes	Yes
N	84	84	84	84
R^2	0.768	0.764	0.875	0.880

Standard errors in parentheses.
The dependent variable is the natural logarithm of monthly real net earnings. HighMigration x Time is an interaction dummy switching on for high-migration regions after Romania's EU accession in 2007. MigDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession emigration rate; the variable switches on after 2007. GDPDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession logarithm of real GDP per capita; the variable switches on after 2007. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

significance when I control for an interaction variable that captures heterogenous pre-EU accession real GDP per capita. However, the estimated coefficients remain positive, meaning that the effect of propensity to migrate on post-EU accession educational enrollment persists but weakens when controlling for the confounding effect of pre-EU accession real GDP per capita. Regardless of the fragility of the result, the point estimate suggests that, even controlling for heterogenous effects by GDP per capita, high-migration regions still experience stronger increases in educational enrollment after 2007. Interestingly, column (3) shows that moving from the lowest-GDP region to the highest-GDP region sparks an increase in educational enrollment after the EU accession of 44%[18], and an increase by one standard deviation in $GDPDeviation_i$ sparks an increase of 9.2%[19]; this result is statistically significant. Counties with higher GDP per capita may have responded better to the EU accession in terms of education due to more capacity to increase educational enrollment.

In Table 4, I test the hypothesis that heterogeneity in the pre-accession propensity to migrate directly affects GDP growth across counties[20]. The fundamental idea behind this hypothesis is that counties that witness more emigration could see boosts in their GDP per capita either because of a reduction in labor supply (the traditional effect in the Solow model rising from diminishing returns to labor) or because linkages with friends or family members living abroad could increase the opportunity to start new entrepreneurial activities related to import or export. Results reveal that Romanian regions with pre-EU accession emigration rates above the

[18] $[Max(GDPDeviation_i) - Min(GDPDeviation_i)] \times [GDPDeviation\ x\ Time\ Coefficient] = [0.873 - (-0.569)] \times [0.307] = 0.443$

[19] $[SD(GDPDeviation_i)] \times [GDPDeviation\ x\ Time\ Coefficient] = [0.300] \times [0.307] = 0.0921$

[20] Note that I use GDP as a control variable in regressions (3)-(4) in Table 3. This might suggest some inconsistency. However, recall that in these previous regressions, I use pre-accession GDP exclusively as a source of variation. Instead, the regressions in Table 4 study whether heterogeneity in the propensity to migrate affects GDP growth. Therefore, the two specifications are not mutually incompatible.

national median experienced a 34% greater increase in real GDP per capita from joining the EU than other regions, as observed in column (1). According to column (2), a change in one standard deviation of $MigDeviation_i$ would lead to an 18%[21] stronger increase. Both of these results are statistically significant, and they indicate that high-migration regions benefitted significantly more from joining the EU than other regions in terms of real GDP per capita, confirming my prediction. Apart from the hypotheses stated earlier, these trends could stem from increased investment or remittances in regions that have seen more emigration since joining the EU. In any case, regions with high emigration saw more economic growth than other regions, signaling that the EU accession has had positive regional economic effects on Romania via migration.

Whereas in Table 4, I tested the hypothesis that GDP growth could be affected asymmetrically by Romania's EU accession depending on whether a regional economy has a high or low propensity to emigrate, in Table 5, I also check the results for robustness using net earnings[22]. Column (1) shows that high-migration regions had 7.8% stronger increases in monthly real net earnings than low-migration regions after 2007, and column (2) shows that a one standard deviation increase in $MigDeviation_i$ would lead to a 3.1%[23] greater increase in earnings after 2007. Even though results lack statistical significance, high-migration regions did see greater earnings benefits from joining the EU than other regions, probably from high return premia for return migrants on their wages, or simply from the effect of reduced labor supply on the wages of stayers. Column (3) shows a very small but negative effect of higher propensity to

[21] $[SD(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000298] \times [618] = 0.184$

[22] I should note that wages and earnings are typically measured less precisely than GDP. Under the assumption of classical measurement error, I must expect some attenuation bias. Consistent with this expectation, the regression results yield statistically insignificant estimates.

[23] $[SD(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000298] \times [103] = 0.0307$

migrate on post-EU accession earnings when controlling for the potential confounding effects of GDP per capita, whereas column (4) shows a large negative effect. We can conclude that the effect of propensity to migrate on the earnings response to Romania's EU accession weakens when heterogenous pre-accession GDP per capita is accounted for. On a separate note, columns (3) and (4) reveal that a one standard deviation change in $GDPDeviation_i$ causes over a 13%[24] stronger increase in earnings after 2007; these results are highly statistically significant. The greater earnings benefit that regions with higher GDP per capita experienced after Romania joined the EU might be due to a greater capacity for offering high return premia in those regions.

In sum, although the estimated coefficients are not always significant, my results paint a consistent picture: the EU accession positively affected Romania's regional educational and economic outcomes via migration in the regions that were more exposed to the shock of the accession. This agrees with Ambrosini, *et al.* (2015)'s findings that educational outcomes and wages would increase in Romania in the case of increased freedom of migration. In other countries, Elsner (2013) has provided evidence for wage increases in Lithuania after joining the EU, and Barrell, *et al.* (2010) found that GDP per capita increased in Eastern European countries that joined the EU. While in agreement with some related studies, these results suggest that the commonly-cited effect of brain drain has not hindered high-migration regions from growth following Romania's EU accession. These outflows of skilled workers and output were outweighed by the positive effects of migration in Romania. The existence of competing effects of migration on development has certainly been acknowledged, so it is particularly interesting to clarify empirically which effect has been stronger in the case of Romania.

[24] $[SD(GDPDeviation_i)] \times [GDPDeviation\ x\ Time\ Coefficient] = [0.300] \times [0.436] = 0.131$
$[SD(GDPDeviation_i)] \times [GDPDeviation\ x\ Time\ Coefficient] = [0.300] \times [0.482] = 0.145$

7. Extensions

In this section, I explore several subsidiary questions that arose during my analysis. First, I investigate potential explanatory variables for a Romanian region's propensity to migrate. Next, I examine the relative importance of low-skilled versus high-skilled migration in response to Romania's EU accession. Lastly, I explore how regional propensity to migrate affected the impact of Romania's EU accession on regional political outcome variables.

7.1 Determinants of propensity to migrate

It is clear that propensity to migrate plays a significant role in determining the impact of the EU accession on key indicators. However, it is possible that certain regional characteristics such as ethnic diversity or distance to the Hungarian border could be underlying determinants of propensity to migrate. While my regression results are robust against time-invariant regional heterogeneity (see Section 6), it is still worth investigating which of these heterogenous characteristics, if any, may determine propensity to migrate. This could be helpful in understanding which kinds of features make some regions experience positive returns to emigration in the overarching debate on whether emigration leads to development gains or losses for the sending country. I hypothesize that ethnic diversity is a positive predictor of propensity to migrate, largely due to Romania's significant Hungarian and German minority population emigrating west. Also, I expect distance to the Hungarian border to be a negative predictor of propensity to migrate since costs of migration are presumably higher for larger distances.

The following regressions are run only using data from the pre-EU accession time period (2002-2007). Standard errors are clustered at the regional level.

$$MigDeviation_i = \alpha(EthnicDiversity_i) + \epsilon_i \quad (5)$$

$$MigDeviation_i = \alpha(LogDistance_i) + \epsilon_i, \quad (6)$$

where $MigDeviation_i$ is the difference between the average emigration rate across the pre-EU accession years (2002-2007) for region *i* and the national average, $EthnicDiversity_i$ is the percentage non-Romanian ethnic minority in the population of region i, $LogDistance_i$ is the logarithm of the distance to the Hungarian border from the centroid of region i, and ϵ_i is a standard error term. The coefficient α measures the percentage deviation from the sample average emigration rate a region experiences for each percentage increase in ethnic diversity or distance to the Hungarian border.

Table 6: Determinants of propensity to migrate

	(5)	(6)
EthnicDiversity	0.00055*	
	(0.00021)	
LogDistance		-0.00011***
		(0.00003)
N	42	42
R^2	0.122	0.178

Standard errors in parentheses.
The dependent variable is the deviation from Romania's average pre-EU accession emigration rate. EthnicDiversity is the percentage non-Romanian ethnic minority. LogDistance is the logarithm of the distance to the Hungarian border from the regional centroid. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results are presented in Table 6. The coefficient on $EthnicDiversity_i$ is positive, while the coefficient on $LogDistance_i$ is negative; both results are statistically significant. As hypothesized, regions that are more ethnically diverse and/or closer to the Hungarian border tend to experience higher emigration rates compared to the national average. In influencing propensity to migrate, these characteristics likely determine how regions respond to Romania's EU accession and labor market opening.

7.2 Relative importance of high-skilled migration

An additional exploration is made into the relative importance of high-skilled migration versus low-skilled migration in response to Romania's EU accession. More precisely, I measure how much more the emigration rate increased in regions with high baseline educational

enrollment rates versus regions with low educational enrollment rates after the EU accession. These results can inform an answer to the question of whether the EU accession led to more high-skilled emigration – proxied by regions with high education – or low-skilled emigration – proxied by regions with low education. I predict that Romania's EU accession led to more high-skilled emigration due to high premia for skilled migration abroad that have contributed to the widely-cited brain drain effect. Note that in this extension, I no longer consider propensity to migrate an exogenous regional characteristic as I do in my main analysis, and instead I examine how emigration might have changed in response to exogenous educational outcomes. In order to fully analyze the joint relationship between these variables, a dynamic model would be required.

The following equations are estimated. Standard errors are clustered at the regional level.

$$Emigration_{i,t} = \phi_i + \alpha Time_t + \beta(HighEdu_i \times Time_t) + \epsilon_{i,t} \quad (7)$$

$$Emigration_{i,t} = \phi_i + \alpha Time_t + \beta(EduDeviation_i \times Time_t) + \epsilon_{i,t}, \quad (8)$$

where $Emigration_{i,t}$ is the emigration rate of region *i* in time period *t* (either 2002-2007 or 2008-2013), ϕ_i is a regional fixed effect, $Time_t$ is a dummy variable equal to 1 for the post-EU accession time period (2008-2013), $HighEdu_i$ is a dummy variable equal to 1 for regions with pre-EU accession educational enrollment rates above the national median, $EduDeviation_i$ is the difference between the average educational enrollment rate across the pre-EU accession years (2002-2007) for region *i* and the national average, and $\epsilon_{i,t}$ is a standard error term. In equation (7), the coefficient α measures the effect of the EU accession on emigration rate for low education regions, and the coefficient β measures the difference in effect of the EU accession on emigration rate for high education regions relative to other regions. In equation (8), α measures the effect of the EU accession on emigration rate for a region with an educational enrollment rate exactly at the sample mean, and β measures how much more the emigration rate changes after

the EU accession for each percentage deviation from the sample average educational enrollment rate. β is the coefficient of interest.

Table 7: Relative importance of high-skilled migration

	(7)	(8)
HighEdu x Time	0.00013	
	(0.00014)	
EduDeviation x Time		0.00178**
		(0.00063)
Regional FE	Yes	Yes
N	84	84
R^2	0.042	0.247

Standard errors in parentheses.
The dependent variable is the emigration rate. HighEdu x Time is an interaction dummy switching on for high-education regions after Romania's EU accession in 2007. EduDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession educational enrollment rate; the variable switches on after 2007. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

See results in Table 7. I find positive coefficients on both $HighEdu_i \times Time_t$ and $EduDeviation_i \times Time_t$. Only the latter result is statistically significant. Still, regions with higher educational enrollment saw larger increases in emigration rate after Romania joined the EU compared to other regions. These regression results confirm my hypothesis that Romania's EU accession encouraged more emigration from regions with higher educational enrollment; however, the effect is quite small. In reality, Romania experienced spikes in both high- and low-skilled emigration after it joined the EU, despite experiencing slightly larger growth in high-skilled emigration.

7.3 Political outcomes

In addition to educational and economic indicators, the effects of migration also extend to political outcomes such as voting trends, voter turnout, and political polarization. Anelli and Peri (2017) found that Italian municipalities with high emigration rates during an emigration wave in 2010-2014 tended to present different voting habits than other municipalities; their political institutions were more likely to be corrupt, they had less voter turnout, and they voted more for the 'status quo' party. High-migration regions also tended to elect fewer young,

educated candidates, stifling political change. On one hand, people from politically unstable or stagnant municipalities may be more attracted to the idea of moving abroad, thus perpetuating the lack of political change in those regions; on the other hand, the movement of individuals towards countries with stronger political and economic systems can create a network that encourages political change back home (Anelli and Peri, 2017). In Romania's case, I hypothesize that the post-EU accession migration wave led to mixed political outcomes in high-migration regions. Firstly, I expect these regions to have more votes for pro-EU parties, seeing as these regions contain the highest proportions of people who took advantage of Romania's freedom of movement within the EU. I also expect high-migration regions to vote more strongly for right-wing parties, which tend to be more dynamic in terms of driving political change in Romania. While this hypothesis is contrary to the results found in Italy by Anelli and Peri (2017), the positive correlation between Romanian regions' emigration rates and educational and economic outcomes suggests that high-migration regions are home to large populations of highly-educated, economically productive individuals who likely also favor political dynamism. Effects like these would have significant implications for the consequences of emigration on politics at the local level.

I consider votes in the first round of Romanian presidential elections in 2004 and 2009, and I focus on the percentages of votes for pro-EU and left-wing parties as dependent variables. The second round of presidential elections is a run-off election with only the top two candidates. The top two parties were both pro-EU in 2004 and 2009, and the top two parties were both left-wing in 2009, so I could not use run-off election data given my chosen dependent variables. I choose presidential election data over parliamentary, local, or European parliamentary election data because the presidential election consistently receives the highest voter turnout in Romania.

Lastly, I decide to construct my own political outcome variables representing pro-EU and left-wing vote percentages because most political variables for Romania are only available at a national level, and I opt to categorize county-level election results into easily interpretable binary variables. The top five political parties in the first round of the 2004 and 2009 presidential elections are listed in Table 8. Note that it is difficult to categorize Romanian political parties into binary variables due to the fluid multi-party system in Romania that lends itself to more centrist-leaning parties and alliances between parties that may shift their political leanings.

Table 8: Romanian first-round presidential election outcomes

2004				2009			
Party	**Pro-EU?**	**Left-wing?**	**% vote**	**Party**	**Pro-EU?**	**Left-wing?**	**% vote**
PSD + PUR	Y	Y	40.9%	PDL	Y	Y	32.4%
D.A. PNL-PD	Y	N	33.9%	PSD + PC	Y	Y	31.2%
PRM	N	Y	12.6%	PNL	Y	N	20.0%
UDMR	Y	N	5.1%	PRM	N	Y	5.6%
PNȚCD	Y	N	1.9%	UDMR	Y	N	3.8%
Total			94.4%				93%

This table shows the Romanian first-round presidential outcomes in 2004 and 2009, by political party. All data comes from Romania's Permanent Electoral Authority.
PSD + PUR: Alliance between the Social Democratic Party (PSD) and the Romanian Humanist Party (PUR) [later known as the Conservative Party (PC)]
D.A. PNL-PD: Justice and Truth Alliance (DA) between the National Liberal Party (PNL) and the Democratic Party (PD)
PRM: Greater Romania Party
UDMR: Democratic Alliance of Hungarians in Romania
PNȚCD: Christian Democratic National Peasants' Party
PDL: Democratic Liberal Party
PSD + PC: Alliance between the Social Democratic Party (PSD) and the Conservative Party (PC) [formerly known as the Humanist Party of Romania (PUR)]
PNL: National Liberal Party

Baseline specifications (1) and (2) are run on the following dependent variables: the percentage of votes for pro-EU parties and the percentage of votes for left-wing parties among the top five parties in Romania's first-round presidential elections. Recall the estimating equations below, with standard errors clustered at the regional level:

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(HighMigration_i \times Time_t) + \epsilon_{i,t} \quad (1)$$

$$Y_{i,t} = \phi_i + \alpha Time_t + \beta(MigDeviation_i \times Time_t) + \epsilon_{i,t}, \quad (2)$$

The coefficient of interest is once again β.

Table 9: Political outcomes

	(1) Pro-EU	(2) Pro-EU	(1) Left-wing	(2) Left-wing
HighMigration x Time	-0.001		-0.023	
	(0.014)		(0.060)	
MigDeviation x Time		7.718		-134.906
		(26.850)		(99.488)
Regional FE	Yes	Yes	Yes	Yes
N	84	84	84	84
R^2	0.747	0.748	0.454	0.476

Standard errors in parentheses.
The dependent variable is the percentage of first-round presidential election votes for pro-EU or left-wing political parties among the top five parties with the most votes. HighMigration x Time is an interaction dummy switching on for high-migration regions after Romania's E.U. accession in 2007. MigDeviation x Time is an interaction variable representing a region's deviation from Romania's average pre-EU accession emigration rate; the variable switches on after 2007. Standard errors are clustered at the regional level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results are presented in Table 9. High-migration regions saw a 0.1% decrease in pro-EU vote percentages after Romania's EU accession, while a one standard deviation change in $MigDeviation_i$ would lead to a 0.23%[25] increase in a region's pro-EU vote percentage. The relationship between emigration rate and pro-EU voting trends is weak at best, and neither of these results is statistically significant. This could be due to the multiple opposing effects of emigration. High migration in a region might signal that the only supporters of EU integration in that region have left, thus decreasing the pro-EU vote patterns of stayers. In contrast, high migration might encourage friends and family members of emigrants to support EU integration and increase their support for pro-EU parties. The lack of significant results may also be due to the structuring of the pro-EU variable. The vast majority of political parties in Romania are pro-EU, and all of the top five parties in Romania's 2004 and 2009 presidential elections are pro-EU apart from the nationalist party PRM. Instead of measuring pro-EU sentiment, a binary variable may simply represent voters' lack of support for PRM in particular.

[25] $[SD(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000298] \times [7.72] = 0.00230$

Slightly stronger results are found when analyzing political leanings. Counties with emigration rates above the national median experienced a 2.3% decrease in left-wing vote percentages after 2007, and a one standard deviation change in $MigDeviation_i$ would spur a 4.0%[26] decrease in left-wing vote percentages. This confirms my hypothesis that regions with higher emigration rates likely saw increases in right-wing party support; however, these results are not statistically significant. Still, the latter result is significant at the 18% level, representing an improvement over the previous political regression results. The effect of post-EU accession emigration on political leanings can nonetheless not be confirmed at a robust level. The political effects of Romania's accession to the EU via emigration are certainly not as strong as the educational and economic effects observed in the primary regressions.

8. Conclusion

There is a debate concerning whether emigration ultimately leads to positive or negative development outcomes for the sending country. Furthermore, there are knowledge gaps regarding how emigration waves following EU enlargement have affected New Member States. This paper empirically investigates whether emigration resulting from Romania's EU accession had a net positive or negative effect on Romania's regional development, with a focus on economic and educational outcomes. I find that counties with higher emigration rates did indeed experience greater growth in educational enrollment rates, real GDP per capita, and monthly net real earnings in response to Romania's accession to the EU in 2007. This confirms my hypothesis and reveals that emigration can be a positive mechanism for economic development at the regional level, with its positive impacts prevailing over brain drain effects in the case of

[26] $[SD(MigDeviation_i)] \times [MigDeviation\ x\ Time\ Coefficient] = [0.000298] \times [-135] = -0.0402$

Romania. Additional findings show that counties that are more ethnically diverse and that are closer to the Hungarian border tend to have higher emigration rates, thus influencing how strongly those regions might respond to labor market openings linked to the EU accession. It can also be noted that both high-skilled and low-skilled emigration increased since Romania joined the EU, and no clear trend is found between regions with higher emigration rates and selected political outcomes since 2007.

On one hand, these results provide crucial insight into potential policy responses for Romania. In order to drive economic growth, regional officials could focus on encouraging pathways to emigration, as well as supporting a strong flow of return migration thereafter. These forces could increase educational incentives for stayers who see opportunities for skilled labor premia abroad, boost the flow of remittances entering the country, and prompt more migrants with newly acquired skills to return. Careja (2013) suggests that government intervention is the most effective way to exploit and increase the potential development gains from emigration in Romania. Additional government priorities could include continuing to support migrants abroad and their families back home, creating a favorable regulatory environment for entrepreneurship and investment, and disseminating information about resources such as EU funding schemes that could support entrepreneurs (Careja, 2013).

On the other hand, this evidence brings to light the regional inequalities that emigration flows may contribute to. Different regions respond inherently differently to major forces such as joining the EU. In some cases, regions with more ethnic diversity or of closer proximity to the border simply may have benefited more from the EU accession via their higher propensity to migrate. I also find that Romania's EU accession encouraged marginally more emigration from counties with stronger educational outcomes, and that the accession caused counties with higher

GDP per capita to see significantly higher increases in earnings and educational enrollment. In some ways, Romania joining the EU created more opportunities for regions that were already ahead or otherwise predisposed to benefit from the new labor market flexibility and freedom of movement within the EU.

There are several key areas of future research to be done. Firstly, I conduct my analysis using five-year averages before and after 2007, which may not have captured the full dynamic effects of Romania's EU accession and the ensuing phases of member states' labor market opening. A subsequent study replicating my model but using continuous time variation could reveal interesting trends and delays in regions' responses to the EU accession. Secondly, my study is limited in that it only considers emigrants' county of origin and not their destinations; a future study that explores the variation in regional development based on emigrants' country of destination could strengthen the current understanding of how strongly destinations determine economic benefits or losses for the sending country. Thirdly, a more in-depth political study could provide intuition into the effects of EU enlargement-related emigration on political outcomes at the national level, including voter turnout and political leanings besides simply pro-EU versus anti-EU or left-wing versus right-wing status. Lastly, future studies could more deeply investigate the effects of emigration on regional inequalities, including the impacts on local innovation, entrepreneurship levels, and firm creation. It is important that more empirical work be done on the impacts of emigration for sending countries at large and for New Member States in the EU in particular, hence providing more empirical evidence for countries in addition to Romania.

References

Alder, S., Shao, L., & Zilibotti, F. (2016). Economic reforms and industrial policy in a panel of Chinese cities. *Journal of Economic Growth*, *21*(4), 305–349. https://doi.org/10.1007/s10887-016-9131-x

Ambrosini, J. W., Mayr, K., Peri, G., & Radu, D. (2015). The selection of migrants and returnees in Romania: Evidence and long-run implications. *Economics of Transition*, *23*(4), 753–793. https://doi.org/10.1111/ecot.12077

Andrén, D., & Roman, M. (2016). Should I Stay or Should I Go? Romanian Migrants During Transition and Enlargements. In *Labor Migration, EU Enlargement, and the Great Recession.* https://doi.org/10.1007/978-3-662-45320-9

Anelli, M. & Peri, G. (2017). Political change: Does emigration delay political change? Evidence from Italy during the great recession. *Economic Policy*, *32*(91), 551-596. https://doi.org/10.1093/epolic/eix006

Atoyan, R., Christiansen, L. E., Dizioli, A., Ebeke, C., Ilahi, N., Ilyina, A., Mehrez, G., Qu, H., Raei, F., Rhee, A., & Zakharova, D. (2016). Emigration and Its Economic Impact on Eastern Europe. *IMF Staff Discussion Notes*, *16*(7), 1. https://doi.org/10.5089/9781475576368.006

Barrell, R., Fitzgerald, J., & Riley, R. (2010). EU Enlargement and Migration: Assessing the macroeconomic impacts. *Journal of Common Market Studies*, *48*(2), 373–395. https://doi.org/10.1111/j.1468-5965.2009.02056.x

Card, D. (2001). Immigrant inflows, native outflows, and the local labor market impacts of higher immigration. *Journal of Labor Economics, 19*(1), 22–64. https://doi.org/10.1086/209979

Careja, R. (2013). Emigration for Development? An Exploration of the State's Role in the Development-Migration Nexus: The Case of Romania. *International Migration*, *51*(5), 76–90. https://doi.org/10.1111/imig.12115

Conley, T.G. (1999). GMM estimation with cross sectional dependence. *Journal of Econometrics*, *92*(1), 1-45. https://doi.org/10.1016/S0304-4076(98)00084-0

De Haas, H. (2010). Migration and development: A theoretical perspective. *International Migration Review*, *44*(1), 227–264. https://doi.org/10.1111/j.1747-7379.2009.00804.x

Elsner, B. (2013). Does emigration benefit the stayers? Evidence from EU enlargement. *Journal of Population Economics*, *26*(2), 531–553. https://doi.org/10.1007/s00148-012-0452-6

Kahanec, M., & Zimmermann, K. F. (2010). EU labor markets after post-enlargement migration. In *EU Labor Markets After Post-Enlargement Migration*. https://doi.org/10.1007/978-3-642-02242-5

Kahanec, M., & Zimmermann, K. F. (2016). EU Post-enlargement Migration and the Great Recession: Lessons and Policy Implications. In *Labor Migration, EU Enlargement, and the Great Recession*. https://doi.org/10.1007/978-3-662-45320-9

Kerr, S. & Kerr, W. (2011). Economic Impacts of Immigration: A Survey. *NBER Working Paper Series.* http://www.nber.org/papers/w16736

Kitchen, H., Fordham, E., Henderson, K., Looney, A., & Maghnouj, S. (2017). Romania 2017. *OECD Reviews of Evaluation and Assessment in Education*. Paris: OECD Publishing. https://doi.org/10.1787/9789264274051-en

OECD. (2019). Talent Abroad: A Review of Romanian Emigrants. *Talent Abroad: A Review of Romanian Emigrants*. https://doi.org/10.1787/bac53150-en

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, *70*, 65–94. https://doi.org/10.2307/1884513

Vizi, E. S. (1993). Reversing the brain drain from Eastern European countries: The "push" and "pull" factors. *Technology in Society*, *15*(1), 101–109. https://doi.org/10.1016/0160-791X(93)90029-N