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Emigration, Business Dynamics, and Firm Heterogeneity in North Macedonia

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Emigration, Business Dynamics, and Firm Heterogeneity in North Macedonia

Prepared by Ninghui Li* and Thomas Pihl Gade**

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ABSTRACT: High emigration rates are a challenge in the Western Balkans. High emigration rates might lead to inadequate skilled labor and affect firm creation, capital formation, and economic convergence. The 2021 North Macedonia census reveals that more than 12.4% of North Macedonians live abroad. To assess the consequences, we estimate the impact of emigration on the number of firms and capital formation. Business dynamics can affect emigration reversely. To alleviate the endogeneity bias, we use a shift-share instrument with the historical diaspora networks and destination countries' GDP growth rate as a source of exogenous variations. Our results show that (1) In the short run, a 1 percentage point increase in the emigration rate leads to a 2.91% decrease in the number of firms in the area of origin; (2) The long-run effects of emigration on the number of firms are less negative than the short-run impacts; (3) Emigration mainly reduces the number of micro and small firms; (4) Emigration affects the number of firms and capital formation more in the industrial sector than the other sectors, through the skilled labor shortage channel. This paper contributes to the literature on emigration and provides implications and policy considerations for developing countries, where high emigration rates are prevalent.

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WORKING PAPERS

Emigration, Business Dynamics, and Firm Heterogeneity in North Macedonia

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EU	European Union
IMF	International Monetary Fund
IOM	International Organization for Migration (United Nations Systems)
MKD	North Macedonia
OECD	Organisation for Economic Co-operation and Development
SSO	State Statistical Office
WBG	World Bank Group

1. Introduction

Like other Western Balkan countries, North Macedonia has seen high emigration rates over the last two decades. Data from Eurostat suggest that at least 200,000 people, or close to 10 percent of the total population, have emigrated to other countries in Europe over the last two decades. The recent 2021 Population Census of North Macedonia allowed North Macedonians living abroad for more than a year to register for the Census. The Census showed a non-resident population of 260,606, out of a total population (resident and non-resident) of 2.1 million. However, due to self-registration, the Census may have underestimated the actual number of non-residents but provides some evidence that at least 10 percent of the population lives abroad.

Emigration has economic costs for North Macedonia. Whether emigration is a 'youth drain' or a 'brain drain' or both, it leads to a loss of labor, knowledge, and entrepreneurial spirit. The loss of labor, knowledge and entrepreneurial spirit leads to a loss of potential output in the economy, both through regular labor channels, human capital, and innovation, but potentially also through the ability to attract foreign direct investment and physical capital. As North Macedonia has suffered from large emigration, the economic loss from this would help explain the lack of economic convergence to the rest of the European Union over the last two decades.

In this paper, we study the impact of emigration on the number of firms and capital formation in North Macedonia, using a panel of data for municipalities in North Macedonia and business surveys. This is a study which has not been performed on data for North Macedonia before. The paper thus contributes to the growing literature on the effects of emigration in the source country. In section 2, we qualitatively outline the emigration challenges in North Macedonia, the potential causes of emigration and stylize the economic costs of emigration. Section 3 outline the business characteristic of North Macedonia and provides estimates of the effect of emigration on the number of firms, across their business sector, as well as firm size, both in the short-run and long-run. The section also provides estimates of the effect on firms' capital formation. Section 4 explores policy implications related to the educational system, labor market and business environment.

2. The Emigration Challenge in North Macedonia

2.1. Characteristics of Emigration from North Macedonia

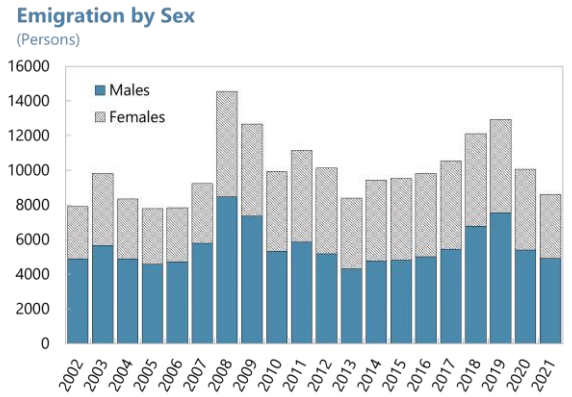
While emigration rates have been relatively high and constant, emigration numbers rose towards 2010, likely as a result of changes to European Union (EU) visa facilitation and readmission agreements as well as the process of EU enlargement with Eastern European states, and again saw a steady increase from around 2015 through 2019, with emigration primarily rising to new EU member states. In recent years, emigration has been lower likely because of the Covid-19 pandemic and lack of mobility across countries. The destination countries have primarily been Germany, Italy, Slovenia, Switzerland, and Austria. While the emigration to Western Europe has been relatively constant, EU-member countries closer to North Macedonia such as Slovenia, Croatia, and Bulgaria have seen an increase in immigration from North Macedonia in recent years.

The demographics of the emigrating population indicate that emigration is especially pronounced among the youngest of the working age population, i.e., people in the age range 20–30 years of age accounting for almost 50 percent of those emigrating. The share of men and women emigrating are roughly equal and relatively constant during the years. The most frequent employment sectors of male immigrants from the Western

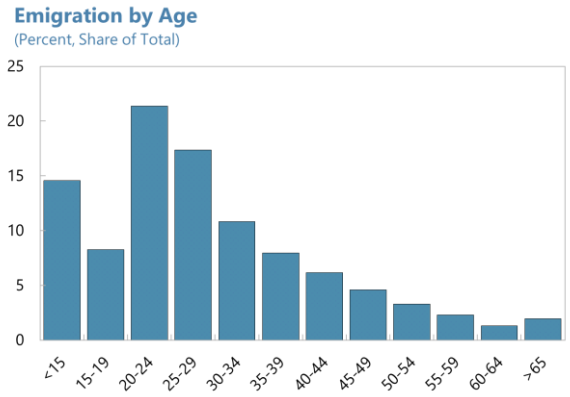
Balkans in OECD countries are construction and related trades as well as manufacturing jobs, while for female immigrants are most frequently employed as cleaners and helpers, sales workers, personal service and care workers, and health associate professionals (OECD, 2022).

This would match that it is among the English speaking young of the working population where, according to data from the national statistical office, we may underestimate emigration; 52 percent of those emigrating from North Macedonia have a secondary education, suggesting a 'youth drain'. However, worth noticing is that 20 percent have a tertiary education, such that more than 70 percent of emigrants out of North Macedonia have at least a secondary education, indicating both a 'youth drain' as well as a potential 'brain drain'.

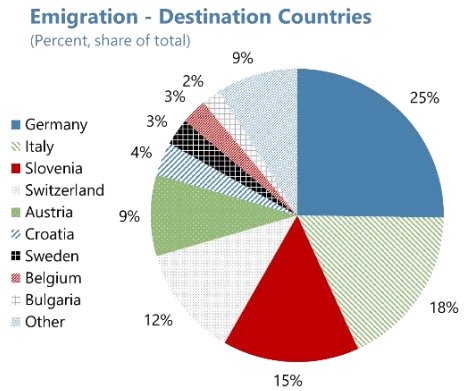
Figure 1. Emigration from North Macedonia



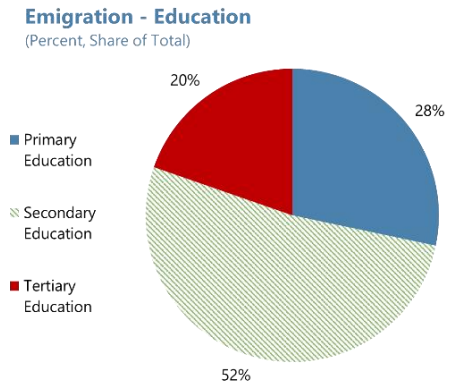
Sources: Eurostat, IMF staff calculations.



Sources: Eurostat, IMF staff calculations.



Sources: Eurostat, IMF staff calculations.
Note: Incomplete data, e.g. United Kingdom missing.



Sources: SSO, IMF staff calculations.

2.2. The potential causes of emigration

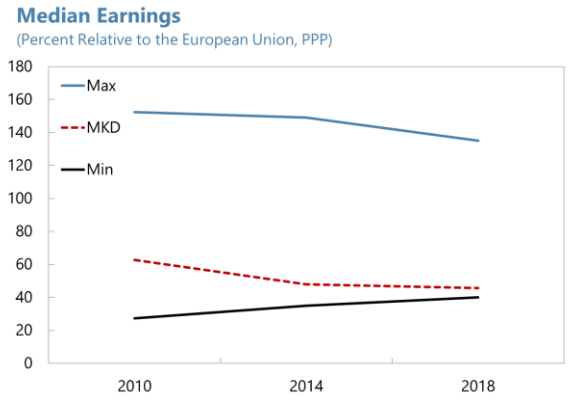
Emigration is typically driven by relative differences in income, job opportunities in the local labor market, as well as differences in the institutional quality, health systems, and generally, future prospects.

The level of earnings in North Macedonia, which is a general characteristic of the Western Balkans, is significantly lower than that of European peers. Adjusted for the purchasing power of earnings, the median earnings of employment in North Macedonia have developed from being around 60 percent of the EU average in 2010 to around 46 percent of the EU average in 2018, meaning that the gap to the EU average has increased over the last decade. While there is a significant step-up in purchasing-power adjusted earnings from emigrating, income differences adjusted for purchasing power may not be the sole driver of emigration.

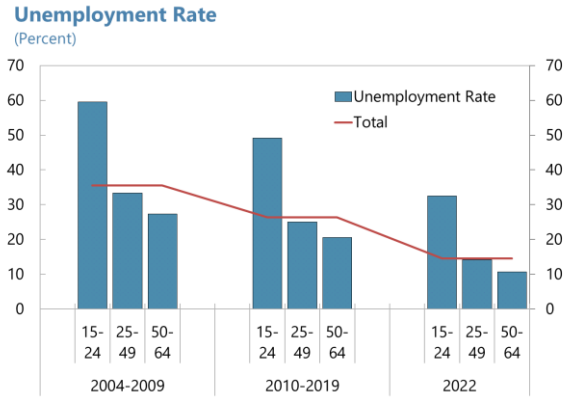
High unemployment rates have been a challenge over the last two decades in North Macedonia, although there is a high degree of informal employment, meaning that the unemployment rate likely overestimates actual (formal and informal) unemployment in the economy. However, the magnitude of especially youth unemployment, close to 60 percent in the 2000s and 50 percent in the 2010s, is an indication of a lack of employment opportunities for the young part of the population. While the youth unemployment rate, and the unemployment rate in general, has decreased over the last two decades, youth unemployment was still a staggering 32.5 percent according to the labor force surveys in 2022. Irrespective of high informal employment, this is likely the result of poor matching between education outcomes and the needs of the labor market (IMF, 2020).

Other causes of emigration can be related to the institutional quality of the country such as rule of law, control of corruption, and political stability. Governance indicators that try to capture such developments are typically perception based indicators, and therefore should be interpreted carefully. Looking at those indicators for North Macedonia in a longer time perspective, North Macedonia compared less favorable than many destination countries during the 2000s on indicators such as political stability, control of corruption, and rule of law. Over the last decade most indicators have improved in absolute terms as well as in relative terms.

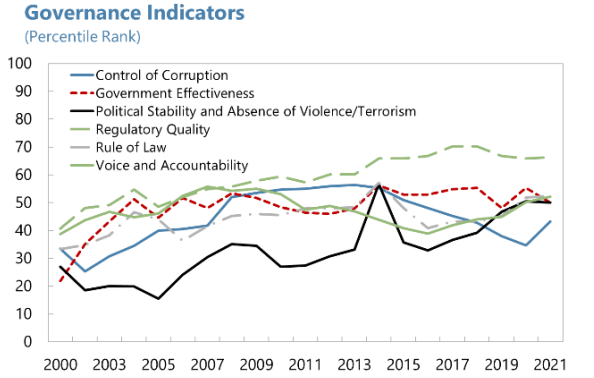
Figure 2. Selected Socio-economic Indicators



Sources: Eurostat, IMF staff calculations.



Sources: Haver Analytics, SSO, IMF staff calculations.



Sources: Worldwide Governance Indicators, D. Kaufmann (Natural Resource Governance Institute and Brookings Institution) and A. Kraay (World Bank), and IMF staff calculations. Note: The Worldwide Governance Indicators are perception-based indicators, and a cautious interpretation of the indicators is warranted.

2.3. The Economic Costs and Benefits of Emigration

Whether emigration is a 'youth drain' or a 'brain drain' or both, it leads to a loss of labor, knowledge, and entrepreneurial spirit. The loss of labor, knowledge and entrepreneurial spirit leads to a loss of potential output in the economy, both through regular labor channels, human capital, and innovation, but potentially also through the ability to attract foreign direct investment and physical capital.

A standard growth model with labor and capital inputs would suggest that a loss in the labor force leads to a loss of real output. The loss may be significantly larger, if it also has a negative impact on the level of knowledge (human capital), the productivity level (innovation), and the ability to attract foreign capital (capital and technology). As North Macedonia has suffered from large emigration, the economic loss from this would help explain the lack of economic convergence over the last two decades, c.f. figure 3. In turn, the large diaspora outside of North Macedonia also meant that remittances are relatively large, adding to income levels.

Migration is not new, and the economic costs and benefits of emigration have been examined over the years. In an early paper, Lucas (1987) examined the consequences of temporary migration from five countries to South Africa's mines. He finds that emigration decreases crop production in the sending countries in the short term. However, in the long term, emigration enhances crop productivity and cattle accumulation through invested remittances. Additionally, he shows that emigration increases domestic wages for plantation workers. Similarly, Mishra (2007) provides evidence that Mexican emigration to the United States has a strong and positive effect on Mexican wages. However, it also leads to increasing wage inequality.

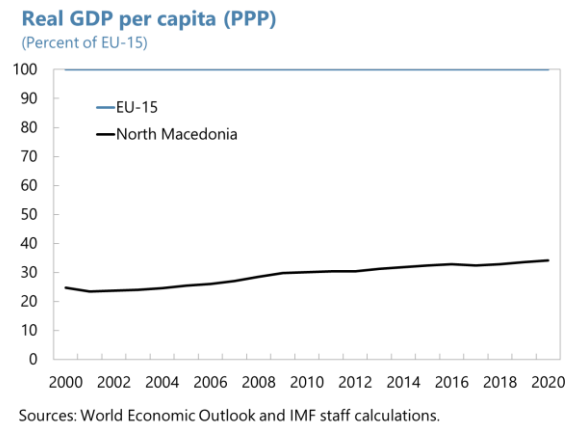
Recently, with the increasing availability of data, researchers have conducted more empirical work on the educational composition of emigrants when examining the costs of emigration. Docquier, Ozden, and Peri (2014) provide a comprehensive view, depicting that emigrants from OECD countries in the 1990s were more "tertiary-education-intensive" than the corresponding non-migrant native labor force. They demonstrate that emigration had a negative effect on the wages of less educated native workers. Mattoo, Neagu, and Özden (2008) investigate the occupational placement of the educated migrants in host countries. They find that educated migrants might end up in unskilled jobs. This phenomenon, known as migration-induced brain waste, occurs when skills developed in home countries are poorly transferable to the host countries.

While most of the existing literature studies the impact of emigration on workers' occupations and wages, there is an emerging strand of pioneering work that explores the effect of emigration on firm creation. Anelli et al. (2022) find that emigration leads to a reduction in the number of firms in the local labor market of origin, primarily due to a decline in firm creation. They propose a novel mechanism to explain this finding: the emigration of young, educated individuals may deprive origin countries of entrepreneurs. As a result of the loss of human capital and entrepreneurial talent, the economic costs of emigration may include negative impacts on firm birth and even firm growth. This study serves as baseline for the empirical work in this paper.

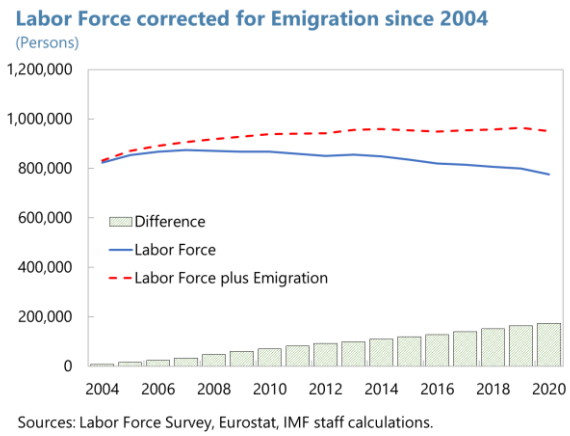
Over time, emigrants may return to their home country with greater skills and knowledge, again adding to the labor force and enabling a knowledge transfer between advanced and emerging economies. However, the magnitude of the economic benefit to the home country would in part depend on whether the knowledge and skill set has been maintained in the destination country. [The indications from the data are that a large wave of returnees should not be expected, and that emigration likely leads to a permanent economic loss for the source country.] In addition, indications are that emigrants typically are overqualified for their work in the destination country (OECD, 2022), suggesting that the knowledge transfer may be limited.

Several papers have explored the topic of migration in North Macedonia. From an economic perspective, IOM (2022) includes a descriptive assessment of the impact on the workforce and the labor market. OECD (2022) takes a broader perspective on emigration from the Wester Balkan countries and qualitatively find that high emigration rates can lead to skill shortages, impact human capital levels and education systems, while financial remittances have a positive impact. Merita Alili et. Al. (2021) examines the academic brain drain in North Macedonia. World Bank (2018, 2023) finds that emigration and skills-mismatch continued to be a constraint for growth. This Working Paper is the first paper that assess the impact on firms and capital investments.

Figure 3. Convergence and Labor Force



Sources: World Economic Outlook and IMF staff calculations.



Sources: Labor Force Survey, Eurostat, IMF staff calculations.

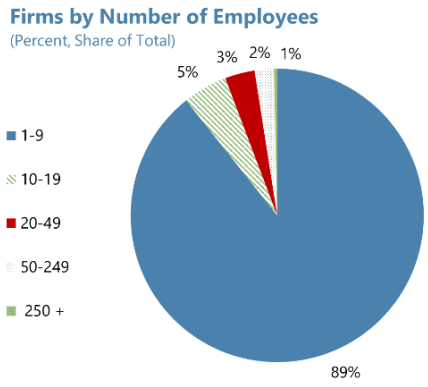
3. Emigration and Firm Heterogeneity in North Macedonia

3.1. Business and Economic Characteristics in North Macedonia

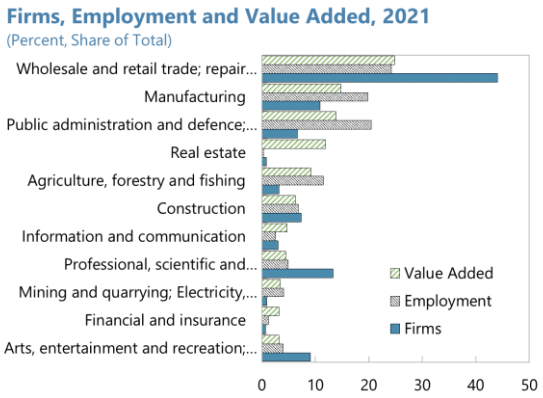
North Macedonia is characterized by an economy with many small and medium-sized firms and fewer large firms. There are a total of almost 70,000 firms with 1–9 employees in North Macedonia, making up almost 90 percent of the total number of firms, while the number of firms with more than 250 employees was 234 in 2021. Meanwhile, large firms with more than 250 employees account for a disproportionally larger share of economic output and value added with close to 30 percent of total value added.

The economy is relatively diverse with a large share of firms, employment and economic value added represented in the wholesale and retail sale sectors, manufacturing, and the public sector. As an example, the share of firms in the wholesale and retail sale sector is close to 45 percent, and they account for around 25 percent of total economic value added and employment. Meanwhile, the manufacturing sector, where many of the larger firms are located, accounts for about 11 percent of firms, 20 percent of employment, and 15 percent of value added.

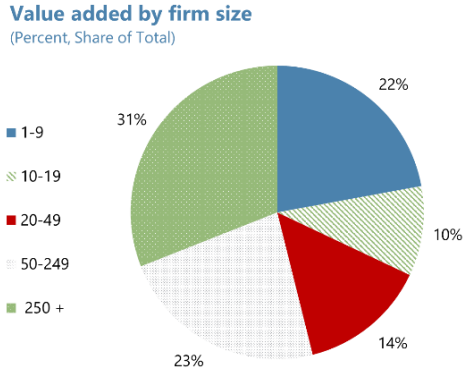
Figure 4. Business and Economic Characteristics



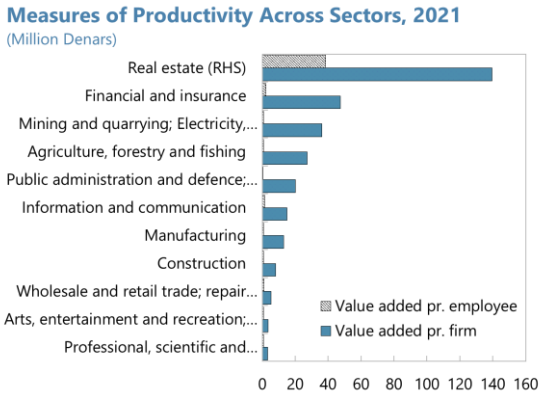
Sources: SSo, IMF staff calculations.



Sources: SSO, IMF staff calculations.



Sources: SSO, IMF staff calculations.



Sources: SSO, IMF staff calculations.

3.2. Short-run Analysis of Emigration Effects on Firm Dynamics

3.2.1 Baseline Specification

We aim to estimate the short-run and long-run effects of emigration on the number of firms, following the empirical framework and instrumental variable (IV) strategy of Anelli et al. (2022). For the short-run analysis, we develop the panel regressions with annual changes based on the approach proposed by Wozniak and Murray (2012). Their study is the first to extend the long-run analysis of immigration to examine shorter-period impacts in U.S. cities. For the long run analysis, we leverage the cumulative 5-year change and employ a regression model similar to the one utilized by Anelli et al. (2022). Applying these approaches using data for North Macedonia is a first and it contributes to the empirical literature on the effects of emigration.

To conduct our analysis, we primarily utilize two datasets from the State Statistical Office of North Macedonia (SSO). First, we use the population database to calculate the emigration rate. This database provides the number of emigrants and population estimates for 73 municipalities based on the territorial division in 2014. However, the number of emigrants may be undercounted. Based on the 2021 Census, the number of diasporas is 260,606, while the total number of emigrated citizens during 2005–2020 is 12,210 according to the SSO. Although the diasporas include emigrated Macedonians and their children (first-generation and second-generation emigrants), it is evident that the number of emigrants should be corrected.

Underreporting the number of emigrants is a global issue. Anelli et al. (2022) found that the actual emigration flows of Italians documented by destination countries are about 2.6 times larger than those registered in the Italian National Institute of Statistics records. They construct a weighted-average correction factor (weighted across top 5 destination countries) equal to 3.48. We use this correction factor from the literature to adjust the emigration data from North Macedonia SSO.

To validate the correction factor, Table A1 in the appendix presents the summary statistics of emigration rate before and after correction. In addition, we standardize the uncorrected emigration rate and use it as the explanatory variable in our robustness check. The advantage of this method is that the estimated results are not influenced by whether or how we adjust the emigration rate. These results are presented in section 3.2.3.

Moreover, we leverage the business entities database from the SSO, which provides the number of active business entities at the municipal level across 21 industries according to NKD Rev.2 classification. This public dataset has been used by researchers in North Macedonia to study regional disparities of socio-economic development (Dejan 2019). Given the use of data at the municipal level, we limit the analysis to North Macedonia, to have enough data observations at the disaggregate level, and to avoid data comparability issues. To focus on the local labor markets in North Macedonia, we exclude two industry categories: households as employers and extraterritorial organizations and bodies. Our analysis utilizes data for the number of active firms across 19 industries in 73 municipalities, covering the period of 2013–2018.

The business entities database does not exhibit any extreme values, and thus, there is no need to eliminate outliers. Municipalities are the first-order administrative divisions of North Macedonia. According to the database, the average number of active firms across municipalities in 2018 is 753, with a maximum of 4,110 in Karposh, one of the ten municipalities that make up the city of Skopje, and a minimum of 43 in Staro Nagorichane, a small municipality in the northern part of the country.

We choose the 2013–2018 period allowing us to examine the period after the Global Financial Crisis (GFC), providing possible insights for the post-pandemic period in the coming years. According to Eurostat, emigration started to increase again from 2013 onwards as the European labor market gradually recovered after the 2008–2009 GFC. Emigration continued to rise until 2019, prior to the outbreak of the pandemic, c.f. Figure 1.

Our objective is to examine whether the emigration of North Macedonians affects the number of firms at the municipal level. The estimation relates the change in the total number of firms Δy to the number of emigrants m. Following Peri and Sparber (2011) and Anelli et al. (2022), we normalize the number of emigrants with population size pop to generate the main explanatory variable, which is the emigration rate in the area-of-origin. Similarly, we also normalize the change in firm stocks. This normalization method helps to address concerns related to scale effects that the size of municipality might drive large changes in both the number of firms and emigrants.

Specifically, we estimate the following:

$$\frac{\Delta y_{c,t}}{pop_{c,t}} = \alpha_t + \beta \frac{m_{c,t}}{pop_{c,t}} + \varphi_r + \gamma X_{r,t} + \varepsilon_{c,t} \quad (1)$$

The dependent variable is the change in the total number of firms per capita in municipality c, at year t. The explanatory variable is the emigration rate in municipality c at year t. β represents the coefficient of interests, which captures the impact of emigration on the number of firms.

We include controls for the business cycle such as the regional unemployment rate and GDP per capita which are denoted as $X_{r,t}$, where regions are indexed by r. To account for time-specific effects, we introduce a year-dummy variable α_t and to capture regional-specific effects, we introduce a region-dummy variable φ_r. The inclusion of time fixed effects helps control for macroeconomic shocks, while the region-specific effects absorb regional characteristics such as the initial industrial structure or age distribution in 2013. Standard errors are clustered at the municipal level.

If the emigration rates were randomly distributed across places in North Macedonia, the estimates of panel regression model (1) would reflect the causal impacts of emigration on the number of firms. However, this scenario is unlikely and there is a concern regarding endogeneity bias, i.e., reversed causality.

On one hand, individuals may be more inclined to leave areas where economic activity slows down and labor demand decreases. In such cases, the emigration rate would be negatively correlated with the number of firms, leading to underestimated estimates and a potential downward bias in the coefficient estimates. On the other hand, regions with a higher presence of entrepreneurial and innovative activities, as well as foreign-owned manufacturing such as the industrialized zones, tend to have stronger connections with foreign economies. As a result, it is possible that more young people emigrate from these areas to pursue education overseas. The positive or zero correlation between emigration and economic activities could lead to an upward bias in the panel regression estimates.

3.2.2 Identification: the IV Approach

To mitigate the endogeneity concern, we employ a shift-share instrumental variable (IV) approach in our regression analysis. Drawing on the methodology described by Anelli et al. (2022), we construct an IV using the established networks of historical emigrants, weighted by GDP growth rate in destination countries. The previous emigrants can provide information or even job referrals about the destination countries to North Macedonians in the area-of-origin. A network exerts a stronger pull force when the connected countries experience economic growth and provide more economic opportunities.

The SSO provides historical emigration data from 47 municipalities in North Macedonia to 10 destination countries, only available for the years after 2007. We use the number of North Macedonians who emigrated from municipality c to destination country d during the period of 2007–2011 to construct the network factors. These networks exert strong pull force, particularly when the destination countries are experiencing economic booms. Therefore, we weight the network factors with GDP growth rate in destination country d. By summing the pull force across destination countries, we obtain the instrumental variable as follows:

$$Pull_{c,t} = \sum_d NTWK_{c,d} * \frac{GDP_{d,t}}{GDP_{d,t-1}} \quad (2)$$

$Pull_{c,t}$ is the pull force of migration in municipality c at year t. $NTWK_{c,d}$ represents the network factor between municipality c and destination country d. $GDP_{d,t}$ indicates the GDP level of destination country d at year t. The network factor interacts with the GDP growth rate of destination country d at year t. It is less likely that North

Macedonia has a substantial impact on the GDP growth rate of destination countries. The 2007–2011 municipality-destination outflow data includes destination countries: Germany, Russia, Turkey, Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Slovenia, Serbia, and Montenegro. As a result, the concern of reverse causality is mitigated, which validates our instrumental variable strategy.

As previously mentioned, the total number of emigrants is often underreported. To construct the IV, we also need to adjust the number of emigrants by destination countries. The 2021 Census provides information about the number of diasporas in each destination country, which we can use to calculate destination-specific correction factors. For example, the total number of citizens who emigrated to Slovenia during 2005–2020 is reported as 461 based on SSO data. In contrast, the 2021 Census indicates that there are 3,555 diasporas in Slovenia. The correction factor is calculated as 7.71 (3,555/461), and we then apply this factor 7.71 to the number of emigrants to Slovenia. Using this approach, the strength of network is consistent with the magnitude of diasporas.

3.2.3 Baseline Results

We begin by estimating random effects regressions without controlling for fixed effects, unemployment rate, and GDP per capita. The estimated coefficient is displayed in Table 1 column (1), indicating a negative but not significant association between emigration and the number of firms. Then we introduce time fixed effects in column (2) and conduct time-demeaned regressions in column (3). Controlling for time fixed effects and conducting time-demeaning are equivalent methods for estimating the coefficient of interest. These approaches help mitigate bias in the estimates caused by unobserved time trends. The results are the same as the demeaned regression is equivalent to the time fixed effects panel regression. To consider the influence of region-specific characteristics, such as age distribution, and industry-specific characteristics, such as the level of market competition, we include time, region, and industry sector fixed effects in column (4) of our analysis. It is noteworthy that the estimated emigration effects in columns (2)-(4) remain consistently negative, although not significant.

Table 1. Panel Regressions Using Annual Changes

	(1) Random effects	(2) Time fixed effects	(3) Time-Demeaned	(4) Multiple Fixed Effects
Emigration Rate	-0.179	-0.106	-0.106	-0.252
	(0.261)	(0.255)	(0.254)	(0.200)
Time FE		X	X	X
Region FE				X
Observations	438	438	438	438

Note: The dependent variable is the change in firm stock per capita times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In Table 2 column (1), we add control variables including the unemployment rate and GDP per capita. The estimated coefficient of the emigration rate remains consistent with the results presented in Table 1 column (4). Furthermore, the signs of the coefficients for the controls align with prior expectations that an increase in the number of firms is associated with a lower unemployment rate and higher GDP per capita.

Columns (4)-(5) present the results for fixed effect regression with IV, which exhibits statistically significant and more pronounced negative effects of emigration on the number of firms. This finding aligns with the study conducted by Anelli et al. (2022), which suggests that the use of the Bartik instrument helps address the potential upward bias in panel regression estimation. To test for weak instruments, we compute the first-stage F-statistics, which are displayed at the bottom of columns (4)-(5) and surpass the rule of thumb threshold of 10. This indicates that weak instrumental problem is not a concern.

The IV estimates in column (5) can be interpreted as 1 percentage point increase in the emigration rate generates a reduction of 0.763 firms per 1,000 people. Given an average of 26.2 firms per 1,000 people per municipality in 2018, this result suggests that a 1 percentage point increase in the emigration rate corresponds to a decrease of approximately 2.91% in the total number of firms. We explore heterogeneity across business sectors and across firm size in later sections.

Table 2. Fixed Effects Panel Regressions with IV Using Annual Changes

	(1)	(2)	(3)	(4)	(5)
	FE regression	FE regression	FE regression	FE regression with IV	FE regression with IV
Emigration Rate	-0.283	-0.230	-0.274	-0.771***	-0.763***
	(0.183)	(0.205)	(0.183)	(0.0408)	(0.0469)
Unemployment Rate	-3.541		-12.20*		-14.39**
	(3.297)		(5.968)		(5.902)
GDP PC	1.754***		1.358		1.361
	(0.472)		(0.785)		(0.784)
Year FE	X	X	X	X	X
Region FE	X	X	X	X	X
First-stage F-stat				13.56	13.61
Observations	438	282	282	282	282

Note: The dependent variable is the change in firm stock per capita times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

For robustness checks, we perform a subsample analysis using FE panel regressions in columns (2)-(3). As previously mentioned, the dataset provided by the SSO includes historical emigration flows from 47 municipalities to destination countries, which represents a subset of the total 73 municipalities in the full sample. Within this subsample of 47 municipalities, we are able to construct an instrumental variable and conduct IV estimation. In order to validate the IV estimation based on this subsample, we re-estimate the FE panel regressions, and the results are presented in columns (2)-(3). The FE panel regression results obtained from the subsample analysis corroborates the results obtained from the full sample analysis in column (1).

We conduct several additional robustness checks. First, we examine the stability of our results by excluding data for the year 2013 or the year 2018. We aim to ascertain that our conclusions were not solely driven by specific points in time. In Table 3 columns (1)-(2), we present the results of these checks, which confirm the consistency of our findings within these subsets of time.

Furthermore, in Table 3 column (3), we conduct a robustness check by excluding the largest 5 municipalities during the period of 2013–2018: Kumanovo, Tetovo, Gostivar, Gazi Baba, and Prilep. Gazi Baba is one of the 10 municipalities that constitute the City of Skopje. By removing these municipalities from the analysis, we can address concerns related to outliers or influential observations from the large population that could disproportionately impact the results. In column (4), we exclude the smallest 5 municipalities: Rankovce, Debarca, Staro Nagorichane, Zelenikovo, and Plasnica. This exclusion is motivated by the limited variation and potential measurement errors associated with smaller areas.

As previously mentioned in section 3.2.1, we standardize the uncorrected emigration rate and use it as the explanatory variable for robustness checks. Specifically, we demean the emigration rate and divide it by its standard deviation. This method guarantees that the estimated results are not influenced regardless of whether we adjust the emigration rate. We simply prove it in the Appendix B.

The results using this approach are consistent with the existing literature. Column (5) indicates that a one standard deviation increases in emigration rate results in a reduction of 0.514 firms per 1,000 people. Given an average of 26.2 firms per 1,000 people across municipalities in 2018, this corresponds to an approximately 1.96% decrease of total number of firms. Anelli et al. (2022) find that in Italy during 2008–2015, a one standard deviation increases in the emigration rate generated a 4.8% decline in firm creation for the long run.

The results of these robustness checks, as presented in Table 3, support the stability and robustness of our findings across different subsets of time and municipality sizes. These checks enhance the validity of our conclusions, affirming that emigration has a negative impact on the number of firms.

Table 3. Fixed Effects Panel Regressions with IV for Robustness Checks

	(1)	(2)	(3)	(4)	(5)
	2014–2018	2013–2017	Omit the largest 5 municipalities	Omit the smallest 5 municipalities	Standardized emigration rate
Emigration Rate	-0.655***	-0.703***	-0.760***	-0.753***	-0.514***
	(0.0587)	(0.0413)	(0.0448)	(0.0377)	(0.0316)
Year FE	X	X	X	X	X
Region FE	X	X	X	X	X
First-stage F-stat	9.69	11.61	226.60	15.43	13.61
Observations	235	235	252	252	282

Note: The dependent variable is the change in firm stock per capita times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Emigration reduces the number of firms. Is the reduction of firm count driven by lower firm birth rates or lower firm survival rates? To answer this question, we leverage the data for firm births and deaths. Unfortunately, the data provided by SSO only includes the total number of firm births and deaths at the regional level for the

period of 2013–2018. This data is less granular compared to the municipal level data used for our baseline results. As a result, we adjust regression model (1) and present the revised specification below:

$$\frac{y_{r,t}}{Num_{r,t-1}} = \alpha_t + \beta \frac{m_{r,t}}{pop_{r,t}} + \varphi_r + \gamma X_{r,t} + \varepsilon_{r,t} \quad (3)$$

The dependent variable is the firm birth rate or firm death rate in region r, at year t, where $y_{r,t}$ represents the number of firm births or firm deaths and $Num_{r,t-1}$ denotes the number of active firms in the last period. The explanatory variable is the emigration rate in region r at year t. β represents the coefficient of interests, which captures the impact of emigration on firm birth rates or firm death rates. We control for time and region fixed effects. Additionally, we control for regional GDP per capita and unemployment rate in $X_{r,t}$. Standard errors are clustered at the regional level.

The regression results are presented in Table 4. As illustrated in Table 4, an increase in the emigration rate is associated with a decrease in the firm birth rate and a decrease in the firm death rate. Comparing columns (1) and (2), we observe that firm birth rate declines more than firm death rate, leading to a reduction in the number of firms. The estimate for the impacts of emigration on firm birth is almost tripled the estimate for firm death. Table 4 indicates that this negative effect of emigration on the number of firms is driven by lower firm birth rates (that is, fewer firm got created). Given the low number of observations and non-significance of the results, the results should be interpreted as an indication only. However, the results are consistent with the main findings reported in Anelli et al. (2022).

Table 4. Fixed Effects Panel Regressions Using Annual Changes: Firm Births and Firm Deaths

	(1)	(2)
	Firm Birth	Firm Death
Emigration Rate	-0.487	-0.186
	(0.435)	(0.322)
Observations	48	48

Note: The dependent variable is the firm birth rate (in percentage point) (1) and firm death rate (in percentage point). Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

3.2.4 Instrument Validity

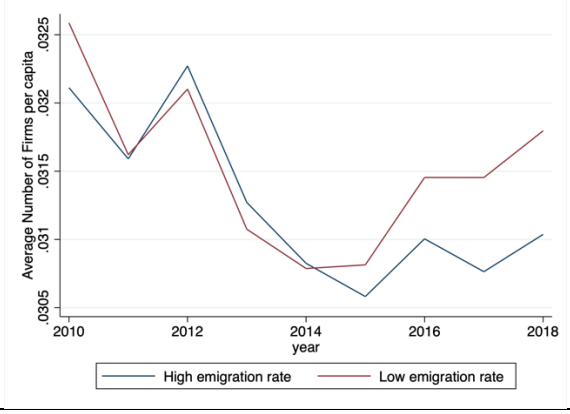
Our key identifying assumption is that the pre-existing emigrant networks weighted by pull force of destination countries are uncorrelated with unobserved factors specific to municipalities that affect the number of firms after 2013. However, unobserved households' characteristics in a municipality can pose a potential threat. Households more sensitive to economic opportunities domestically and abroad may sort into some areas, such as Skopje. To increase confidence in our instrument, we perform several robustness checks.

First, we note that we control the regional unemployment rate, GDP per capita, and time fixed effects in our baseline specification. We account for domestic economic conditions (unemployment rate and GDP per capita) and economic opportunities abroad (time fixed effects for macro trends) that might influence the households' decisions on migration and the number of firms in a municipality simultaneously.

Second, to rule out the concern about sensitive households sorting into Skopje, we conduct subsample analysis excluding municipalities in Skopje. The results, presented in Appendix Table A2, align with the main findings in Table 2. This confirms that households sorting across municipalities does not pose a substantial threat to our causal estimates.

Third, we examine the pre-trend of high-emigration area and low-emigration areas. We graph the time series of the average number of firms per capita among these two areas. A municipality is classified as a high-emigration area if its cumulative emigration rate during 2007–2012 is above the median over 73 municipalities. The graph shows that before 2013, historically high-emigration and low-emigration areas have a similar number of firms per capita. This alleviates concerns that individuals more sensitive to economic opportunities domestically and abroad may sort into some specific areas.

Figure 5. Firm Stock per Capita in High and Low Emigration Municipalities, 2010–2018



3.3. Long-Run Analysis of Emigration Effects on Firm Dynamics

We conduct long-run analysis using the 5-year change during the period of 2013–2018. The empirical strategy equation (4) presented below has a similar specification as the short-run analysis. We calculate the cumulative change in the number of firms Δy_c and the cumulative number of emigrants $\sum_{t=2013}^{2018} m_{c,t}$ during 2013–2018. As in equation (1), we divide both variables by population level at municipality c in 2012, prior to the observed trend of increasing emigration from 2013 to 2018. φ_r indicates the region dummies. Standard errors are clustered at the regional level.

$$\frac{\Delta y_c}{pop_{c,2012}} = \alpha + \beta \frac{\sum_{t=2013}^{2018} m_{c,t}}{pop_{c,2012}} + \varphi_r + \varepsilon_c \quad (4)$$

To mitigate the endogeneity concern in the long run, we construct a shift-share IV using the 5-year change, like the approach in equation (2). The pull force is calculated as the weighted sum of the GDP growth rate, with the network factor $NTWK_{c,d}$ as the weight. $NTWK_{c,d}$ is constructed in the same way as the short-run analysis, whereas the GDP growth rate is calculated as the accumulative change instead of the annual changes during 2018-2013. This IV approach allows us to correct the potential bias in the OLS estimation.

$$Pull_c = \sum_d NTWK_{c,d} * \frac{GDP_{d,2018}}{GDP_{d,2013}} \quad (5)$$

According to the SSO, the data for the unemployment rate and GDP per capita is available only at the regional level. To account for regional-specific effects, we included regional dummies in our long-run analysis. However, including both the regional unemployment rate and GDP per capita along with the regional dummies would result in multicollinearity issues, as the dummies would absorb the impacts of these variables. Hence, it is not feasible to include them simultaneously in our model.

In Table 5, column (1), we estimated the OLS regression controlling for industry fixed effects, unemployment rate and GDP per capita in 2012. In column (2), we controlled for region fixed effects. The sign of the coefficient in column (2) aligns with the short-run analysis. Controlling for regional dummies instead of the unemployment rate and GDP per capita is our preferred specification as regional dummies can absorb all the observed and unobserved time-invariant regional characteristics, including the 2012 unemployment rate and GDP per capita. The estimated coefficients in columns (1)-(2) are all close to 0 and insignificant, consistent with the OLS results for the long-run analysis reported in Anelli et al. (2022).

We conduct IV regressions controlling for the unemployment rate and GDP per capita in column (3) and controlling for region fixed effects in column (4). The estimated coefficients are both negative and significant, indicating that emigration leads to a decrease in the number of firms in the long run. In addition, the IV estimates are more negative than the OLS estimates, suggesting that the IV corrects the upward bias in the OLS estimates. This correction is consistent with the IV in the short-run analysis.

Table 5. OLS and IV Regressions Using 5-year Change

	(1)	(2)	(3)	(4)
	OLS	OLS	IV	IV
Emigration Rate	0.0620	-0.0743	-0.298**	-0.363***
	(0.237)	(0.203)	(0.138)	(0.0386)
Controls	X		X	
Region FE		X		X
First-stage F-stat			21.26	11.75
Observations	73	73	47	47

Note: The dependent variable is the change in firm stock per capita times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The IV estimates in Table 5 column (4) can be interpreted as 1 percentage point increase in the emigration rate generates a reduction of 0.363 firms per 1000 people. Given an average of 26.2 firms per 1000 people per municipality in 2018, this result suggests that a 1 percentage point increase in the emigration rate corresponds to a decrease of approximately 1.39% in the total number of firms. Combined with the results in Table 2, we may find that a 1 percentage point increase in the emigration rate leads to a 2.91% decrease in the number of firms in the short run, and 1.39% in the long run. These results are comparable to the literature. Anelli et al. (2022) find that a one percentage point increase in the emigration rate generates a 2.8% decrease in the number of firms created in Italy during 2008–2015 in the long run.

The results suggest that the long-run effects of emigration are less negative than the short-run effects, which is expected. In the short run, emigration may lead to a reduction in the number of created firms. This occurs when a lack of skilled workers causes delays in the establishment of new businesses or when individuals with entrepreneurial talents leave. However, longer intervals provide more time for adaption to labor market conditions through training and skill development programs, particularly for large companies. Even if there is a shortage of managers or experienced workers in the local markets who are crucial for starting up a branch, companies can still assign their trainees to initiate new firms. Also, it is possible that in the long-run, there is other adjustment in the labor market due to wage/labor supply dynamics, such that some people outside of the labor market, may decide to enter the labor market due to labor shortages and higher wages. This difference between short-run and long-run effects is more pronounced in certain firm sizes and sectors than others.

3.4. Heterogeneity by Firm Size

We have discovered the fact that emigration reduces the number of firms in North Macedonia. However, understanding this loss solely in terms of count may be incomplete. The value added per firm may vary across different firm sizes. We observe that in 2021, 1675 large and medium firms accounted for 54% of the total value added by firms, while 68749 micro and small firms contributed the remaining 46%. If emigration mainly affects the number of small firms, the actual reduction in value added would be lower than the consequences of a 2.8% decrease of average-sized firms. This raises an important question: Does emigration primarily affect the number of small firms or large firms?"

Motivated by this question, we estimate the impacts of emigration by firm size in the next step. The SSO dataset provides information on the number of active firms by firm size for each municipality during 2013–2018. Firm size is determined by the number of employees, where micro firms have 0-9 employees, small firms have 10-49 employees, medium firms have 50–249 employees, and large firms have more than 250 employees. In the manufacturing industry, for instance, there were 6,570 micro firms, 1063 small firms, 331 medium firms and 69 large firms in 2018.

The estimation strategy is similar to the baseline model (1) and (4). As the model below demonstrates, the main difference is that the dependent variable is $\Delta y^{s}_{c,t}$, the change in the number of firms per capita of size s, instead of $\Delta y_{c,t}$, the change in the total number of firms in baseline model (1).

$$\frac{\Delta y^{s}_{c,t}}{pop_{c,t}} = \alpha_t + \beta \frac{m_{c,t}}{pop_{c,t}} + \varphi_r + \mu_s + \gamma X_{r,t} + \varepsilon_{c,t} \qquad (6)$$

In addition, we control for firm size fixed effect μ_s besides the time fixed effect α_t and regional fixed effect φ_r. For the control variables, besides regional unemployment rate and GDP per capita, we also control for the average firm size in city c. Standard errors are clustered at regional level.

For robustness checks, we cluster standard errors at the municipal-year level and the results are presented in the appendix Table A3. One concern arises from the fact that independent variables are measured at the municipal-year level, while dependent variables are measured at the municipal-year-size level. To address this issue and correct for any potential correlation in the error term, we adopt the approach used by Olney (2013) by clustering the standard errors at the municipal-year level. We can observe that the estimated coefficients are

the same between Table 6 columns (1)-(2) and Table A3. The estimated standard errors are different, but the effects of emigration on the number of firms by size are still significant.

Table 6 presents the findings from both short-run and long-run analysis. Consistent with the baseline results in Tables 2 and 4, the estimates indicate that overall, emigration leads to a decrease in the number of firms. To further explore the heterogeneous effects of emigration, we conduct additional analyses focusing on small firms and large firms. Specifically, we re-estimate the IV regressions using two subsamples: micro and small firms (Table 7 columns (1)-(2)), and medium and large firms (Table 7 columns (3)-(4)). Not every municipality have large firms. We exclude the observations when the municipalities never have large firms.

Table 6. The Impacts of Emigration by Firm Size

	(1) FE regression with short run	(2) FE regression with IV short run	(3) OLS long run	(4) IV long run
Emigration Rate	-0.0759	-0.161***	-0.0196	-0.0883***
	(0.0583)	(0.00998)	(0.0309)	(0.0230)
Year FE	X	X		
Region FE	X	X	X	X
Size FE	X	X	X	X
First-stage F-stat		18.49		13.46
Observations	1524	972	254	162

Note: The dependent variable is the change in per capita firm stock by size times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7. IV Regressions on Small and Large Firms

	(1) Micro and small short run	(2) Micro and small long run	(3) Medium and large short run	(4) Medium and large long run
Emigration Rate	-0.340***	-0.187***	0.000182	0.00636
	(0.0216)	(0.0511)	(0.00205)	(0.00490)
Year FE	X		X	
Region FE	X	X	X	X
Size FE	X	X	X	X
First-stage F-stat	19.64	10.62	16.96	15.77
Observations	516	86	456	76

Standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Note: The dependent variable is the change in firm stock by size per thousand persons. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The results reveal a significant reduction in the number of micro and small firms due to emigration, both in the short run and the long run. In contrast, for the number of medium and large firms, emigration has no significant adverse impacts. The potential explanation can be large firms' ability to adjust to labor shortage. In addition, firms might respond to shortages of high-skilled workers through mergers and acquisitions (Chen, Hshieh and

Zhang 2022). This may decrease the number of micro and small firms and increase the number of medium and large firms in the long term. Table 6 and 7 corroborate that emigration mainly reduces the number of micro and small firms.

Table 7 illustrates that a 1 percentage point increase in emigration rate leads to a significant reduction of 0.187 micro and small firms in the long term. This corresponds to a decrease of 1.51% in the total number of micro and small firms, given an average of 12.36 such firms per 1,000 persons in 2018. The value added by micro and small firms was 65.37 million denars per 1000 persons in 2018. A rough calculation indicates that, in the long term, a 1 percentage point increase in the emigration rate is associated with a loss of 0.987 (1.51%*65.37) million denars in value added per thousand persons, equivalent to 0.31% of the GDP, considering the GDP per thousand persons was 318 million denars in 2018.

For the purpose of loss analysis, we focus only on the significant estimate, and do not consider the insignificant increase of 0.00636 medium and large firms associated with emigration, as the insignificant estimates tend to be noisy. In addition, we use the long-run estimates in Table 7 column (2), rather than the short-run estimates in column (1). This is because a 1 percentage point increase in the emigration rate should be understood as a cumulative rate over more than 5 years. According to United Nations (Table A1), the annual net migration rate in North Macedonia was 0.0624% on average during 2013–2018.

It is worth noting that the estimated loss in value added may be subject to overestimation for two reasons. First, the insignificant increase of medium and large firms might contribute to gains in value added. Second, due to data limitation, our analysis mainly focuses on the number of firms in terms of the effects of emigration on business performance. Other performance indicators, such as productivity, have not been considered. Average productivity per firm could potentially increase if low-productivity micro and small firms exit the market, which implies a lower loss in value added. To provide a more comprehensive assessment of this loss, a thorough analysis using a general equilibrium model would be necessary, which is left for future research.

3.5. Heterogeneity by Sector

Besides the firm size, the response of firms to emigration may also vary depending on the sector in which they operate. For instance, the impact of labor shortage caused by emigration tends to be more negative in the industrial sector, compared to the agricultural sector. Manufacturing industries often require specialized skills, technical knowledge, and hands-on experience for operating machinery and managing production processes. Training and developing a skilled workforce can be time-consuming. Therefore, when a labor shortage occurs due to emigration, difficulties in finding qualified manufacturing workers to fill the vacant positions may lead to disruptions in the operations.

In this section, our aim is to analyze the heterogeneous effects of emigration across sectors of the economy, specifically focusing on the agricultural, industrial, and services sectors. We have grouped the 19 industries in our full sample into these three main categories. The agricultural sector includes the agriculture, forestry, and fishing industries. The industrial sector comprises industries such as manufacturing, mining, and quarrying, construction, and others. The services sector encompasses industries such as wholesale and retail trade, accommodation and food service activities, financial and insurance activities, information, and communication, etc. These three sectors significantly contribute to the overall economy. In 2021, the agricultural sector

accounted for 8.4% of the GDP. The industrial sector accounted for a larger portion with 25.8% of the GDP, while the services, including the public sector, dominated with 65.8% of the gross value added.

We conduct short-run and long-run analyses using subsamples from each of the three categories, and the results are presented in Table 8. Columns (1)-(2) show that emigration does not significantly decrease the number of firms in the agricultural sector, as the estimate is insignificantly positive. By comparing columns (3)-(4) and columns (5)-(6), we can observe that emigration has more negative impacts on the industrial sector compared to the service sector, both in the short run and in the long run.

Another loss analysis can be conducted considering heterogeneity across sectors. As Table 8 illustrates, a 1 percentage point increase in the emigration rate is associated with a significant reduction of 0.0382 firms in the industrial sector and 0.0147 in the service sector for the long run.

Table 8. Regressions on Agricultural, Industrial, and Services Sector

	(1) Agricultural short run	(2) Agricultural long run	(3) Industrial short run	(4) Industrial long run	(5) Service short run	(6) Service long run
Emigration Rate	0.0294	0.0248	-0.0581***	-0.0382***	-0.0386***	-0.0147***
	(0.0303)	(0.0240)	(0.00319)	(0.00275)	(0.00193)	(0.00205)
Year FE	X		X		X	
Region FE	X	X	X	X	X	X
Industry FE	X	X	X	X	X	X
First-stage F-stat	13.61	13.77	13.89	13.78	13.93	13.78
Observations	282	47	1410	235	3666	611

Note: The dependent variable is the change in firm stock by industry per thousand persons. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Within the industrial sector, the number of firms vary across industries. For example, the number of firms per 1000 persons is 3.27 in the manufacturing industry, whereas 0.12 in the mining and quarry industry. The average number of firms per industry is 1.11 per 1000 persons. Therefore, a 1 percentage point increase in the emigration rate corresponds to a decrease of 3.4% in the number of firms within the industrial sector. Within the service sector, the average number of firms per industry is 1.50 per 1000 persons. Therefore, a 1 percentage point increase in the emigration rate corresponds to a decrease of 1% in the number of firms within the service sector.

In 2018, the value added per 1000 persons was 76.52 million denars by industrial sector, and 172.83 million denars by service sector. A rough calculation indicates that, in the long term, a 1 percentage point increase in the emigration rate is associated with a loss of 4.33 (3.4%*76.52 + 1%*172.83) million denars in value added per thousand persons, equivalent to 1.36% of the GDP, considering the GDP per thousand persons was 318 million denars in 2018. Similar to the loss analysis in section 3.4, we do not consider insignificant estimates.

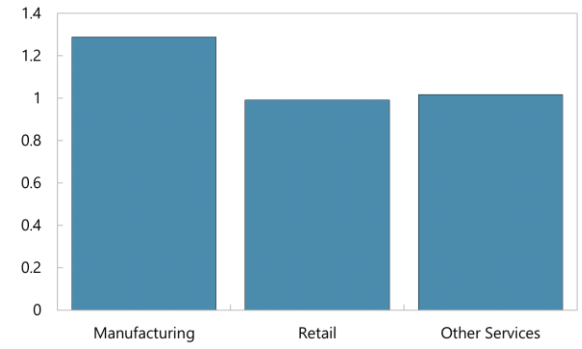
When considering sector heterogeneity, the estimated loss in value added exceeds the estimate when accounting for firm size heterogeneity, aligning with our expectations. Upon closer look at the heterogeneous

impacts of emigration across sectors, we observe that emigration effects are more negative in the industrial sector than the service sector, which also has higher value added per firm compared to the service sector. In contrast, when focusing on firm size heterogeneity, emigration primarily reduces the number of micro and small firms, having lower value added per firm than medium and large firms. As a result, the estimated loss considering sector should surpass that of firm size considerations.

We further examine whether labor shortage contributes to the heterogeneity in sectors. We exploit data from the World Bank Enterprise Survey, which provides insights for firm characteristics such as industry sector, firms' age, and firms' business situations. In the Enterprise Survey North Macedonia 2019, managers of establishments participate in a questionnaire that interviews the challenges hindering their current operations.

One specific question is: "To what degree is an Inadequately Educated Workforce an obstacle to the current operations of this establishment?" This question assesses whether firms are affected by a shortage of skilled labor. Brain drain can lead to shortage of skilled labor, as demonstrated in Figure 5, where 70 percent of emigrants out of North Macedonia have at least a secondary education.

Figure 6. Firm Operating Obstacles



Sources: World Bank Enterprise Survey.

We compute the average levels of obstacles from an inadequately educated workforce across different sectors. The World Bank Enterprise Survey categorizes all the establishments into 3 sectors: manufacturing, retail, and other services. In the survey, managers can choose an integer from 0 to 4, with 0 indicating "No obstacle" and 4 indicating "Very severe obstacle". The histogram below shows that the shortage of skilled labor is a more substantial obstacle for the manufacturing sector, compared to the retail and other services sectors. This histogram provides empirical evidence for our conjecture that heterogeneous effects of emigration arise from the labor shortage channel. Emigration may cause the shortage of skilled labor, which can disrupt the operation and lead to business closure or mergers more in the manufacturing sector than the services sector.

3.6. Emigration and Capital Formation

The effects of emigration may be felt both in firms that close and those that survive. The industrial sector may experience a more severe shortage of skilled labor due to emigration than the other sectors. This shortage not only leads to a decline in the number of created firms but may also hinder capital investment in the surviving firms. The lack of skilled workers can cause project delays, leading managers to hesitate in building construction or purchasing new machinery and equipment. This uncertainty in business operations also acts as a discouragement for investors, including foreign investors.

Our next investigation focuses on whether emigration leads to a reduction in capital investment. World Bank Enterprise Survey data does not provide the municipal location of the interviewed firms. As a result, it does not allow us to estimate the impact of emigration on firms' capital investment in local labor markets. To overcome

this data limitation, we utilize data from the SSO on gross fixed capital formation (referred to as GFCF) at the municipal level, categorized by industry.

GFCF by industry at the municipal level is available only for the period of 2007–2012, and the industry classification system for this dataset changed between 2009 and 2010. To avoid inconsistency in data due to the system evolution, we estimate the impacts of emigration on GFCF for the period 2007–2009 and the period 2010–2012 separately.

Around the Global Financial Crisis in 2008–2009, some municipalities experienced no capital investment inflows and no emigrant outflows, as the economy inside or outside North Macedonia performed poorly. This situation might lead to some GFCF and emigration rate values being 0 across the whole panel. Having all 0 values for observations in panel regression can be problematic and may lead to collinearity and limited variation in estimation. To address this issue, we exclude the municipalities with 0 GFCF and 0 emigrants for the entire 2007–2009 period or 2010–2012 period.

Similar to the baseline model (1), we normalize GFCF with the local population size. The dependent variable is GFCF per capita in unit of million denars. There might be a time lag between the capital formation and the investment decision. Koeva (2000) collects time-to-build data from newspaper and trade journal articles, and she shows that average construction lead time for new plants is around two years in most industries. Therefore, the impacts of emigration on capital formation might be observable at least after 1 year. For this reason, we use the lagged emigration rate as the explanatory variable. Specifically, we estimate the following:

$$\frac{y^i_{c,t}}{pop_{c,t}} = \alpha + \beta \frac{m_{c,t-1}}{pop_{c,t-1}} + \varphi_{r,t} + \mu_i + \varepsilon^i_{c,t} \quad (7)$$

The dependent variable is the GFCF per capita in municipality c, industry i, at year t. The explanatory variable is the emigration rate in municipality c at year $t-1$. β captures the impact of emigration on the capital formation.

Data for the regional unemployment rate and the regional GDP per capita is unavailable before 2011. To control for time-variant economic conditions at the regional level, we introduce region-year dummies, which is denoted by $\varphi_{r,t}$. The region-year dummy $\varphi_{r,t}$ is the interaction of the time dummy for year t and the space dummy for region r. Additionally, we include an industry-dummy variable μ_i to control for industry-specific magnitude of capital formation. Standard errors are clustered at the regional level.

We first estimate the impacts of emigration for the period 2010–2012. As shown in Table 9 columns (1)-(2), higher emigration rates are associated with lower GFCF per capita. Consistent with the existing literature, the negative impacts of emigration on GFCF are more pronounced and significant after one year compared to the concurrent impacts. Furthermore, we perform an analysis with the subsample of industrial sector, as shown in column (3). It is evident that emigration reduces GFCF more within the industrial sector than overall. These results align with our previous findings, as demonstrated in Table 8, which indicate that emigration has more negative impacts on the number of firms within the industrial sector.

Table 9. Emigration and GFCF: Panel Regressions with Annual Changes

	(1)	(2)	(3)	(4)	(5)	(6)
		2010-2012			2007-2009	
	All industries	All industries	Industrial sector	All industries	All industries	Industrial sector
Lagged Emig Rate	-2.044***		-6.681***	-0.500**		-2.475***
	(0.460)		(2.297)	(0.202)		(0.569)
Emig Rate		-0.858			-0.346	
		(1.451)			(0.231)	
Observations	1824	1824	384	959	1449	140

Note: The dependent variable is the gross fixed capital formation by industry per thousand persons (in unit of million denars). Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In addition, we conduct regression analysis for the period 2007–2009, and the results are presented in columns (4)-(6). The patterns are similar to the results for the period 2010–2012, which corroborates the heterogeneity of emigration effects across sectors.

4. Policy Considerations

Emigration is a ‘brain drain’ and ‘youth drain’ for the North Macedonian economy. While the diaspora is responsible for a large part of remittances channeled back to the North Macedonian economy, on balance the loss of labor has negative implications for the North Macedonian economy. Unless the emigrating population at some point return to North Macedonia, the loss of an educated labor force is a permanent loss to the economy.

This requires policies that ensures employment opportunities, that skills match the needs of the labor market, and that the general institutional framework, as well as economic and political stability, are supportive of attracting foreign capital investments and retaining a talented labor force. Alternative policies could focus on incentivizing a return of the diaspora or integrating foreign immigration into the labor force.

The skills mismatch between the skills provided in the educational system and those needed by the labor market has been a recurring issue in North Macedonia (IMF, 2020/2022). To address skill shortages and mismatches, reform of the education system should focus on increasing completion rates and the quality of secondary education, and modernizing the vocational education system, as well as making more use of skill-enhancing active labor market policies.

The literature highlights the importance of training and skill development. Such programs can help firms build a more skilled and adaptable workforce, enhance their competitiveness, retaining labor and thus foster long-term resilience in the face of emigration-induced labor disruptions. The majority of emigrants report that skills learned abroad are improving technical skills or language skills (OECD, 2022).

Policy reform should focus on strengthening governance, reducing corruption, and continue to align regulation with best international practices (IMF, 2020/2022 & OECD, 2022). The accession process towards EU

membership is a very important part of these reform efforts. Following-up on the de-jure alignment of regulation etc. with de-facto effective implementation, will strengthen governance, alleviate corruption concerns, and attract foreign investments, creating continued employment opportunities and enhance future prospects.

While institutional and governance policy reform in the long run will improve the business environment, attract more foreign capital, and in general provide better prospects, it is likely that a pull factor remains, as income levels in advanced Europe, even adjusted for purchasing power, will remain higher than in North Macedonia for a long time. Over time, economic convergence through continuous reform efforts should mitigate this factor. Policies that incentivize a return of the diaspora could be considered (OECD, 2022). These policies could include lowering obstacles to starting new companies for entrepreneurs, aligned regulation with the European Union or business support schemes to understand existing regulation, as well as strengthening skills and education recognition systems.

Finally, immigration of foreigners to North Macedonia is on a much smaller scale than emigration of North Macedonian citizens. The majority of immigration is from the European continent with only 10 percent of immigration being from elsewhere. However, policies could be guided towards integrating immigrating foreigners into the North Macedonia labor market through education and training (OECD, 2022).

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Appendix

Appendix A: Tables

Table A1. Summary Statistics of Emigration Rate

	2013–2018 municipal level according to SSO		2013–2018 national level according to United Nations
	Emig. Rate before Correction	Emig. Rate after Correction	Net Migration Rate
Mean	0.031%	0.107%	0.0624%

According to the United Nations Population Division database, North Macedonia had an annual net migration rate of 0.0624% during 2013–2018. The net migration rate is calculated as "(number of emigrants - number of immigrants) / population", implying that the annual emigration rate for North Macedonia should exceed 0.0624%. Table A1 demonstrates that after adjusting the number of emigrants using the correction factor of 3.48, the summary statistics for the emigration rate are more consistent with the figures reported by the United Nations.

Table A2. Fixed Effects Panel Regressions with IV Excluding Municipalities in Skopje

	(1) FE regression	(2) FE regression	(3) FE regression	(4) FE regression with IV	(5) FE regression with IV
Emigration Rate	-0.291	-0.251	-0.287	-0.764***	-0.757***
	(0.186)	(0.206)	(0.188)	(0.0425)	(0.0491)
Unemployment Rate	-3.388		-12.08*		-14.20*
	(3.428)		(6.312)		(6.254)
GDP PC	1.348***		0.856		0.826
	(0.487)		(0.873)		(0.880)
Year FE	X	X	X	X	X
Region FE	X	X	X	X	X
First-stage F-stat				13.55	13.59
Observations	414	258	258	258	258

Note: The dependent variable is the change in firm stock per capita times 1000. Robust standard errors, clustered at the regional level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table A3 The Short-run Analysis by Firm Size with Standard Errors Clustered at MSA*Year Level

	(1) FE regression with short run	(2) FE regression with IV short run
Emigration Rate	-0.0759*	-0.161**
	(0.0437)	(0.0793)
Year FE	X	X
Region FE	X	X
Size FE	X	X
First-stage F-stat		3.66
Observations	1524	972

Note: The dependent variable is the change in per capita firm stock by size times 1000. Robust standard errors, clustered at the MSA*year level, are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix B: Proof

We denote emigration rate with x.

When we don't adjust the emigration rate, the standardized emigration rate is given by:

$$z(x) = \frac{x - mean(x)}{std(x)}$$

Suppose we adjust the emigration rate using the correction factor k, thus the emigration rate after correction is kx. The standardized emigration rate is

$$z(kx) = \frac{kx - mean(kx)}{std(kx)} = \frac{kx - k \times mean(x)}{k \times std(x)} = \frac{x - mean(x)}{std(x)} = z(x)$$

Therefore, using standardized emigration rate as the explanatory variables makes the estimated results not influenced by whether we adjust the emigration rate or not.

PUBLICATIONS

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