ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Bachelor Thesis Economics and Business Economics

Title thesis: Ukrainian labour migration and its impact on the Polish Economy

Name student: Kinga Magdalena Ścierska

Student ID number: 480561

Supervisor: Dr. Anna Baiardi

Second assessor: Dr. Aksel Erbahar

Date final version: 3/07/2020

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Abstract

Recession and conflict in Ukraine induced a mass migration of its citizens to Poland in 2014. This level of immigration influx is unprecedented in Polish post-communist history. Simultaneously, such inflow might positively contribute to economic growth but also introduce a new competition for natives. I attempt to address the question of the economic impact of Ukrainian labour immigration to Poland during the years 2009-2018. To assess it, data from The Office for Foreigners and Statistics Poland is utilized across 16 regions of Poland. Fixed effects regressions serve as the main analytical tool, along with instrumental variable for checks. I conclude that migrants have a favourable but insignificant effect on the Polish economy, without causing major disadvantages for unemployment and wages.

1. Introduction

As reported by the Eurostat (2019), Poland has issued the highest number of first residence permits among all EU member states in 2018. The prominent migration destination states such as Germany and the United Kingdom were respectively in the next places. Out of all permits, 527 000 were issued to Ukrainian citizens, which is 2.6 higher than to the Chinese, who came as the second (Eurostat, 2019). These phenomenal figures can be linked to the year 2014, which will be marked as a turbulent period in Ukrainian's history. In 2014, civil demonstrations in Ukraine's capital Kyiv have triggered a military conflict in the region of Donbas. Besides more than ten thousand casualties, it is estimated that the war contributed to the economic recession within the country lowering overall GDP by 15.1% on average over the period 2013-2017 (Bluszcz & Valente, 2019). This, together with the favourable immigration legislation, geographical and cultural proximity, has led to the mass labour migration to neighbouring Poland (Jaroszewic & Malynowska, 2018; Chmielewska, Dobroczek & Panuciak, 2018).

According to the unofficial estimations, there have been almost 1 million of Ukrainians working in Poland throughout 2019 (PAP, 2019). They can be characterized as low-skilled and short-term labour (Jaroszewic & Malynowska, 2018). Meaning they tend to occupy lower-paid job position than an average Polish worker and are not

planning to permanently reside in the host country. In 1989, Poland has transformed its economy from centrally planned to free-market. Such an enormous influx of foreign workers has never been observed in Polish post-communist history. Notably, after the year 2014 the Ukrainian immigration increase immensely, as demonstrated in figure 1. This was accompanied by considerable and stable economic growth during following years in all regions of Poland as depicted by figure 2. For example, in the Masovian region the regional GDP per capita was approximately 70 000 PLN in the year 2014 but almost 90 000 PLN as of 2018. Motivated by these premises, I was prompted to investigate what economic and labour market effects Ukrainian migrants may have with the construction of a following central research question *"What is the economic impact of Ukrainian labour immigration to Poland during years 2009-2018?".*

There is an abundance of academic research focused on migration effects on host countries' economies and labour markets. However, it is predominantly concentrated on

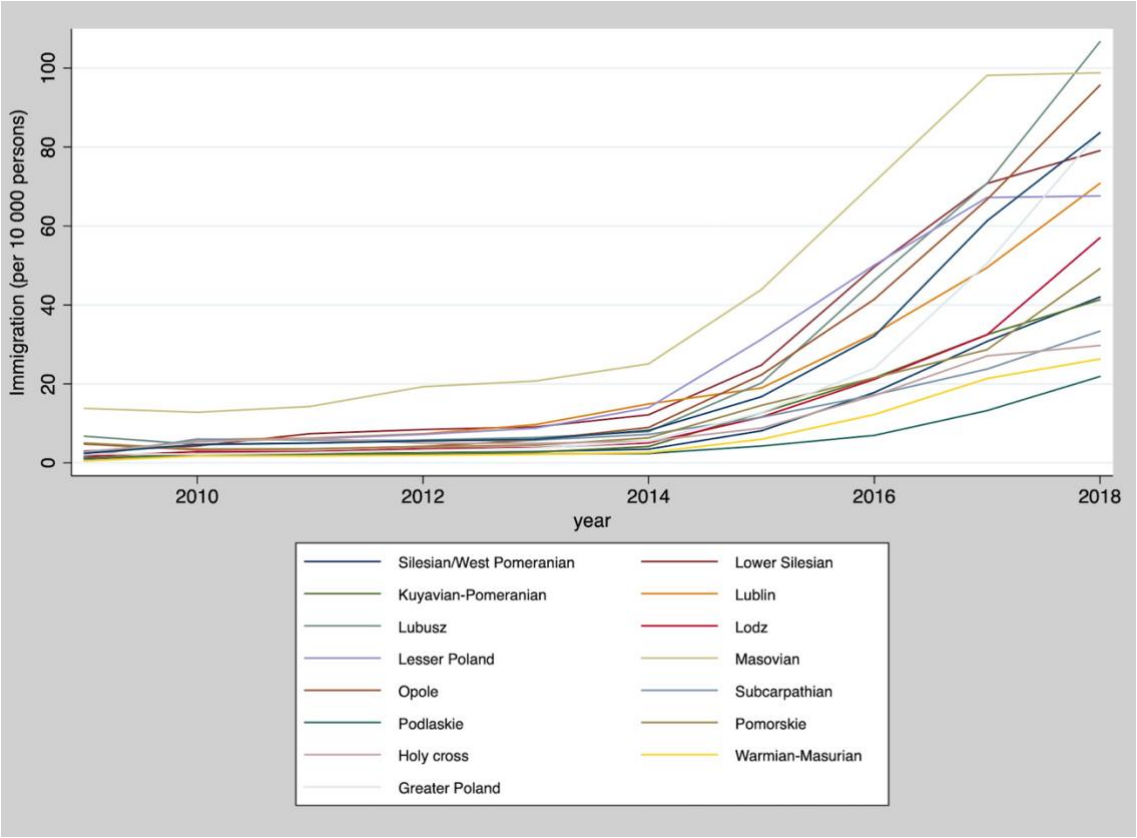

Figure 1. Level of Ukrainian Migration across regions in Poland, 2009-2018

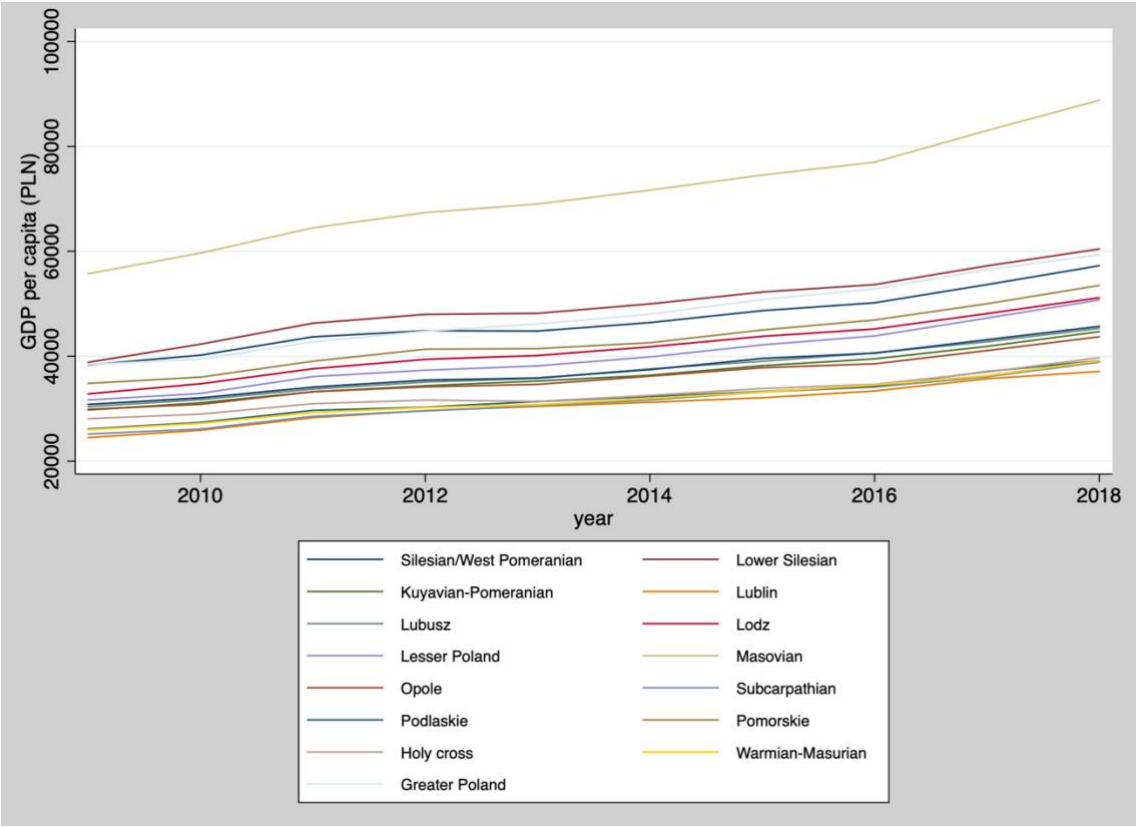

Figure 2. Level of GDP per capita across regions in Poland, 2009–2018

industrialized countries with a significantly larger proportion of migrants within the society such as the United States of America (Borjas et al., 2003; Card, 1990; Card, 2001), the United Kingdom (Blanchflower and Shadforth, 2009;) or Western Europe (Mitaritonna et al., 2017; D'Amuri and Peri, 2014). The literature based on Eastern European cases is absent. If any economic implications are analysed, they concern returning native migrants rather foreign migrants, e.g. Co, Gang & Yun (2000) and Hungarian analysis. Poland, in contrast to above mentioned Western societies, is generally considered to be one of the most homogenous countries in the EU in terms of its population. Its proportion of migrants among all citizens is one of the lowest in Europe with only 5.6 immigrants per 10 000 persons as of 2018 (Eurostat, 2020). The non-existence of preestablished nets of migrants may alter the behaviour of market participants. Furthermore, Poland until recently has been regarded as the main source of labour migration outflow rather than the opposite. Therefore, it constitutes a striking case to test whether standard theories and models of labour economics hold in this setting.

In recent years, a few xenophobic attacks on Ukrainians have been reported and there is a general debate within society discussing the pros and cons of this migration. Some of the public concerns actually include the substitution of Polish low-skilled workers with "cheaper" Ukrainian ones and lower growth of wages in sectors employing them. Notably, Confederation Liberty and Independence party advocates for restrictions on labour immigration claiming it limits the welfare of Polish nationals. As of May 2020, it holds around 10% of popular support (Super Express, 2020). From a social perspective, it is crucial to test whether these grievances and extreme attitudes can be justified with any economic findings.

Moreover, answering this research question can help to construct adequate policy and legislation concerning migration. Currently, Poland is facing demographic problems with a low birth rate that is below the natural replacement rate. This may introduce financial pressure on a pension system in the future. If this migration has a positive and significant impact on the Polish economy, it would be beneficial to implement a policy that would further encourage this labour inflow or incentivize Ukrainians to prolong their employment in Poland rather than settle for a short-term period. Whereas, if effects are proven to be negative, Ukrainian immigration could be limited. Furthermore, if findings are statistically convincing, they could perhaps be generalized to other Eastern European economies that closely resemble the Polish one.

In my empirical research, I test variation of fixed effects models with migration size as the independent variable and average general wage, sector-specific wage, unemployment rate and share of the lowest educated among unemployed as a dependent. Later, I proceed to the robustness checks with the instrumental variable that quantify the historic pattern of distribution of migrants multiplied by lagged aggregated migration level. I have reached a conclusion that migrants have a rather positive effect on the Polish economy, with no harm for unemployment, average general wage and sector-specific wages. Using individual and time fixed effects, these influences are insignificant, which does not allow me to reject any of my stated hypotheses. Whereas while implementing an instrumental variable, the results appear to be significant and more intense. The policy implication of my findings is that Ukrainian labour force should not be limited or should be even encouraged, as there is no vivid negative impact on the labour market variables.

I commence this paper with a literature review. It is primarily focused on the impacts of immigration on wages and unemployment followed by GDP per capita. Variety of perspectives and academic papers are taken into account. Later, the utilized data is described along with the explanation and justification of applied mathematical models. The main data is obtained from the Statistics Poland and The Office for Foreigners from 2009 to 2018 and concerns migration level and economic measures. Techniques applied include fixed-effect models and instrumental variable estimation. Finally, the results of the analysis are presented and discussed. Conclusion and recommendation for further study constitute the last section of the research. There, I also state the potential limitations of my study.

2. Literature Review

2.1 Impact of immigration on wage

As mentioned, there exists an extensive literature on economic impacts of labour migration and I will summarize the main findings in this section. Standard market mechanisms of labour demand and supply predict that the influx of foreign workers ceteris paribus will decrease the wages of workers already employed in the market through increased supply of workforce. The empirical study by Borjas, Freeman and Katz (1997) and Borjas and Katz (2003) indeed demonstrates that substantial increase of low skilled immigrants in the USA in late decades of 20th century led to the fall in incomes for natives with similar educational attainment. Increase in the supply of 10% reduces the wages of competing workers by 3% to 4% (Borjas & Katz, 2003). Card (2001), who based its research on 1990s census data, discovered that the 1980s labour immigration to the United States reduced the wages of low-skilled natives by 1 to 3 percentage points in “traditional gateway” cities such as Los Angeles and Miami.

Dustmann, Fabbri and Preston (2005) provide contradictory conclusion based on British labour market analysis. Their research suggests that there does not exist clear evidence that immigrant inflows would depress native wages. Potentially, that is a result of labour migration being a response to disequilibrium setting such as an excessive labour demand. A natural experiment of the Mariel Boatlift examined the effects of 7% labour force increase in the Miami metropolitan area caused by sudden influx of Cuba refugees.

The analysis showed that it had no effect on the wages of less-skilled workers (Card, 1990). The specifics of local labour such as negligible language barriers made the absorption of the new workers feasible. Card (2012) identifies that the differences between conclusion reached by Borjas et al. (1997; 2003) and other scholars are merely a result of divergent assumptions. Borjas et al. (1997; 2003) hold capital fixed and treat workers with equal education levels as perfect substitutes. Furthermore, they distinguish four education groups in the labour market. Card (2012) postulates for opposed assumptions; allowing for a long-run change in capital, imperfect substitution among natives and foreigners and two-group division in terms of educational attainment. Peri and Sparber (2009) emphasized the different specialization patterns between native workers and immigrants. According to their research, natives naturally have a comparative advantage in language- and communication-intensive tasks. On the contrary, immigrants have a competitive advantage in manual tasks. Based on these facts, they arrived at the conclusion that wage losses are significantly smaller than expected for a model with perfect substitutability. Lastly, Foged and Peri (2016) found positive effects of labour migration for native wages with analysis of the Danish data. Such a surprising outcome could have been caused by increased mobility of native workers toward more complex occupations and away from manual tasks. D'Amuri and Peri (2014) adhere to this justification. Using the sample of 15 Western European countries from the 1996-2010 period, they concluded that there is a 0.7% increase in native wages as a direct effect of doubling of the immigrants' share. It is again attributed to the shift of natives away from manual and routine jobs to more complex ones.

Ukrainian workers in Poland can be characterized as low-skilled, being mainly employed in sectors like manufacturing or construction. Moreover, with the closeness of Polish and Ukrainian languages, I expect that they can be as easily absorbed in the labour market as in the case of Mariel Boatlift refugees. Following Card (2012) and Peri et al. (2016) argumentation, I regard Ukrainian workforce as imperfect substitutes with regards to Polish natives, implying that their effect on the supply of labour on the market is limited. Along with negligible changes in supply, I predict that there could have occurred shifts in the labour demand curve due to constant economic growth over the past decade. This could have contributed to the greater labour demand similar to this indicated in the study of Dustmann et al. (2005), which potentially prevented a considerable decline in

the wages. Thus, I should expect that immigrants coming from Ukraine do not have a significant impact on average wages allows us to formulate the following hypothesis:

Hypothesis 1: Ukrainian immigrants do not have an impact on the average wage.

Findings of Borjas et al. (1997), Borjas and Katz (2003) and Card (2001) emphasized that it is likely that the wages of workers with similar education attainment will decrease, thus of these who directly compete with migrants. Applying this empirical outcome and standard economic theory, one can expect that the average wage will decrease in sectors where Ukrainians are being mostly employed, even if the general average wage remains on a stable level.

Hypothesis 2: Ukrainian immigrants have a negative impact on average wages in sectors employing them.

2.2 Impact of immigration on unemployment

I firstly ought to acknowledge any theory that models predict. In a perfectly competitive market model with two substitutable labour types, migrants and native, immigrational supply shock will result in wage decline without any unemployment expansion for natives. But if there are any wage rigidities that induce market frictions, the influx of immigrants may negatively affect the employment of natives. Thus, correspondingly to above-mentioned literature review on wages, the empirical articles analysing migration impact on employment provide mixed evidence of consequences. Research by Angrist and Kugler (2003) indicate that a 10% increase of foreign workforce will lead to 0.2 – 0.7 of a percentage point reduction in native unemployment. On account of restricted market flexibility such as rigid wages and employment protection legislation (EPL), this effect may actually be amplified in particular countries. Immigrants are in general less likely to be protected by the EPL, making their labour costs lower and encouraging their employment. Longhi, Nijkamp and Poot (2005) using meta-analytic assessment of a few OECD countries quantity the effect of a 1% increase in the immigration number to decrease native employment by merely 0.02%.

Contrary to previously mentioned literature, Dustmann et al. (2005) and Friedberg et al. (1995) argue that there is no evident proof that foreign workers reduce native

employment, even among native workers who could be classified as the closest substation to the migrant labour force. That result, equivalently with the wage effect, finds its justification in expanding labour demand. Blanchflower and Shadforth (2009) approached this question focusing on the analysis of the British market after 2004 and 2007 EU accessions of ten new Eastern European countries and inflow of migrants from these territories. Their paper gathers proof that the employees most suspectable to competition from foreign workers have seen weaker wage inflation, allowing for a reduction in the natural rate of unemployment. There exists a shred of evidence that immigrants are on average less successful in their job search in comparison to natives (Frijtes, Shields & Price, 2005). It would carry a critical motion to our investigation, implying that migrants do not constitute direct competition to native workers. Lack of evident rivalry would result in a little impact of increased labour migration on native employment.

In 2013, the strictness of EPL in terms of dismissals in Poland remained slightly above OECD average, yet behind some other European countries such as Italy, Portugal, Germany or the Netherlands (OECD, 2013). With this information, I might assume that inflexible labour market to some extend is present in Poland. The research findings suggest that the effect of immigrants on unemployment would still be small even with these circumstances (Angrist et al., 2003; Longhi et al., 2005). I will once more adhere to the assumption that Ukrainian and Polish workers are not perfectly substitutable in line with literature conclusions by Fritjes et al. (2005), Dustmann et al. (2005) and Friedberg et al. (1995). If that holds true, I suppose that Ukrainian immigrants do not have a considerable impact on the unemployment rate.

Hypothesis 3: Ukrainian immigrants do not have an impact on the regional unemployment rate.

Furthermore, the share of the skill-set equal to labour migrants among unemployed should not rise due to the imperfect substantiality of Ukrainian and Polish, in accordance with Dustmann et al. (2005) and Friedberg et al. (1995).

Hypothesis 4: Ukrainian immigrants do not cause an increase in the share of unemployed with the lowest education attainment.

2.3 Impact of immigration on GDP per capita

There prevails a general consensus among economists that expansion of workforce via labour migration channel increases the total output of the host country. The key dispute is whether GDP per capita growths along with the population rise. In simplified theory, if labour productivity or share of employed population increases ceteris paribus I should expect that income per capita will increase (OECD/ILO, 2018). Majority of the evidence concerning real-world data shows that immigration has a positive impact on GDP per capita of the host state (Alesina, Harnoss & Rapoport, 2016). Jaumotte, Koloskova and Saxena (2016) attempted to quantify that outcome and analysed dataset from developed OECD countries between the years 1980 and 2010. They discovered that 1 percentage point rise in the share of migrants in populations leads up to 2% increase in per capita income. This is perhaps possible because migrants positively affect industry productivity through enhanced rate of innovation as proven by Akcigit, Grigsby and Nicholas (2017) and Ortega and Peri (2013). Mitaritonna, Orefice and Peri (2017) provide further evidence that total factor productivity indeed increased in France on a firm-level together with an increased share of foreign-born workers employed. When taking into account the data across the USA before the year 1960, Peri (2012) reaches the same conclusion which reports that total factor productivity has a strong, positive association with immigration. Conversely, the standard neoclassical model of growth developed by Mankiw, Romer and Weil (1992) predicts that permanent increase in the flow of migration will induce a decline in GDP per capita due to capital dilution. Nevertheless, this effect might be offset by a positive contribution to human capital accumulation (Dolado, Goria & Ichino, 1994). This inference conveys a pivotal point that the effects of immigration can be determined by demographic characteristics and skill levels of foreign workers. In the context of Ukrainian immigrants, studies confirm that significant majority of them (around 80%) tend to be in a working-age group (between 26-64 years old) (Brunarska et al., 2012). Therefore, they ought to positively influence the share of the employed population and average labour productivity, and increase income per capita. Following this logical justification and conclusion reached by the majority of scholars, I expect that increased Ukrainian immigration has a positive impact on GDP per capita.

Hypothesis 5: Ukrainian immigrants have a positive impact on GDP per capita.

3. Data and Methodology

3.1 Data description

In order to examine the economic impact of migrants, I use Statistics Poland (GUS) database. It is a chef government agency that collects and publishes data and statistics concerning the Polish economy and society. Local Data Bank is a particular subsidiary of Statics Poland that reports data on local economies and demographics of its 16 administrative regions named voivodeships since 2002. For the research, I extracted panel data between the period 2009 and 2018 from all 16 regions regarding its general unemployment rate, percentage share of the lowest educated among unemployed, amount of new jobs created and liquidated, average general wage, averages wages of the industrial processing and construction workers, net native migration rate, gross domestic product per capita and share of the population in the working age. That allowed me to collect 160 observations in total.

None of the regions was excluded from the sample because I intend to measure the impact of immigrants across the whole of Poland. Furthermore, they all ought to remain comparable as Poland is classified as a unitary state with identical legislature across voivodeships. To account for pre- and post-migration conditions of the regions, time range close to 2014 is chosen. Data points from 2008 are excluded as I suspect that the economic recession might have greatly influenced some variables, chiefly unemployment and GDP per capita. Part of the paramount data for 2019 is still not published prior to this analysis, hence this year is not considered as a part of the sample.

Information regarding the size of Ukrainian migration was acquired from The Office for Foreigners database. The Office for Foreigners is a government body that assists all foreigners in legalizing their stay in the Polish state, which includes obtaining valid working permits and visa issuance. Their database consists of data that records the number of immigrants currently holding valid documents that allow for the legal residence in Poland. The variation is presented across years, starting 1992 until 2020. Additionally, it covers the origin of the migrant, their sex, age and region of residence. From the data collection described above, I extracted information focused exclusively on the Ukrainian nationals as other foreign citizens are irrelevant to my research. The general effect of all

migrants is to be analyzed so I did not select any distinct age or sex criteria. All regions and years 2009–2018 were of my interest, due to reasons already explained earlier.

In addition, I extracted data concerning Ukrainian aggregated migration size on a national level for years 2008–2017. It was acquired from The Office for Foreigners database as well. These statistics are essential for the instrumental variable estimator in order to predict migration variable for years 2009–2018. Due to the same reasons, I collected data on Ukrainian population size and its distribution across regions in Poland for year 2002. It was obtained from Polish census of 2002, of which results are available for viewing on Statistics Poland website.

3.2 Unemployment and wage effect analysis

Firstly, I implement variations of the standard fixed-effects model. Throughout the whole analysis, 5% significance level will be applied.

(1) $$Unemployment_{it} = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

$Unemployment_{it}$ is a continuous dependent variable, which represents the unemployment rate in the region i at the end of the year t. The unemployment rate is defined as the percentage share of the registered unemployed population to the economically active population. In accordance with Statistics Poland (2020), to classify a person as unemployed, they have to strictly fulfil all criteria 1) be between 18 years old and legal retirement age 2) not perform any kind of paid work 2) be available for full-time work 3) registered in the labour office 4) seek for employment or any other paid work. Economically active population refers to employed persons in public and private units as well as unemployed persons (Statics Poland, 2020).

$Migration_{it}$ is a continuous independent variable of interest that describes the number of Ukrainian immigrants per 10 000 people of working age. Working age is defined to be between 15 to 64 years old (OECD, 2020). Variable is calculated by taking the total number of legally residing Ukrainian immigrants in the region i in year t and dividing it by the total number of the economically active population. Consecutively, this result is multiplied by 10 000. Because some regions experience immigration of negligible size, in it essential to use the immigration per 10 000 persons approximation to capture

any changes within the societal composition of foreigners. Otherwise, with more general and smaller estimates, such as per 1 000 persons, some variation within immigration size across regions and years would be lost. Coefficient of interest ρ indicates the causal effect of 1 immigrant per 10 000 persons increase on the unemployment rate. This rate changes by ρ percentage points with the following change.

For this model, I introduce three continuous control variables $Jobs_{it}$, $Internal\ Migration_{it,}$ and $Population\ Growth_{it}$, empirically verified and implemented in research by Borjas (2006). All of them strive to control for supply and demand shift in the labour market, which are prone to influence the employment rates and migration variable. Inclusion of those omitted variables enables to separate the effect of any changes to labour demand or supply that will inevitably cause disturbances in employment and migration rates. $Jobs_{it}$ is the first control variable that accounts for the net number of jobs offered, expressed in thousands, in the region i during year t. Its aim is to represent any changes exclusive to the demand size of labour market. In order to calculate it, I subtracted the number of jobs liquidated from the new jobs created. Where the jobs liquidated refer to the loss of vacancies, due to e.g. bankruptcy of a company. Conversely, jobs created represent a boost in the number of vacancies offered on the market, that can result from economic growth and an increase in economic activity. If the provision of vacancies is limited, the unemployment rate is bound to increase. Owing to the introduced control variable, this effect will be not be captured by the coefficient of the interest variable. In a contrary example, if the job market is booming in a specific region and induces foreign migration, the inclusion of this control variable allows accounting for that effect of self-selection of the workforce. $Internal\ Migration_{it}$ depicts the migration of working age natives within Poland between the regions. By definition, it considers the net balance of native migration by deducting the number of native's outflow from particular voivodeship from native inflow, during the year t. Significant internal migration of native citizens introduces more competition into the regional labour market and cause a decline in the rates of foreign migration. Therefore, the lack of this control variable potentially leads to an overestimation of the causal effect of foreign migration on unemployment. $Population\ Growth_{it}$ measures the percentage change in the economically active population in in the region i in year t. Analogously to the previous control variable, increased share of the population in the working age will induce higher

competition in the labour market, simultaneously lowering employment opportunities. Furthermore, by controlling for this outcome, I ensure that any change in $Migration_{it}$ variable and the causal effect is attributed to the adjustment in its numerator relating to the number of immigrants rather than to denominator which stands for the magnitude of the economically active population. Interpretation of coefficients β, λ and τ is dispensable within this empirical setting. Lastly, I shall briefly mention other model specifications. Individual fixed effects for each region are defined by α_i, whereas time fixed effects are expressed by f_t. Time and area specifications are denoted with t and i, where year is represented by $t = 2009, \dots, 2018$ and region with $i = 1, \dots, 16$. The error term is depicted as ε_{it}.

$$(2)\ Unemployment\ low\ education_{it} = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

The second model almost fully reproduces the first one, with the exception of the dependent variable. $Unemployment\ lowest\ education_{it}$ is a continuous variable that indicates the percentage share of people with the lowest schooling level out of the unemployment in the region i at the end of the year t. Lower secondary, primary and incomplete primary education attainment is classified as the lowest schooling level (Statistics Poland, 2020).

$$(3)\ \log(Wage_{it}) = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

$$(4)\ \log(Wage\ construction_{it}) = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

$$(5)\ \log(Wage\ industrial\ processing_{it}) = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

Following models, 3, 4 and 5, aim to quantify the wage effect of Ukrainian immigration. Once more, I repeated the preceding regressions and substituted the dependent variable. The newly introduced continuous variable $Wage_{it}$ reflects the general

average hourly wage levels expressed in the currency of Polish Zloty (PLN). For the reason that Statistics Poland database does not offer explicit information on that aspect, a special adjustment was inevitable. To derive the wage in the region i in year t, average earnings per month had to be divided by 160, which accounts for the standardized 40 working hours multiplied by 4 weeks per month. This assumption is in accordance with article 129 of the Polish Labour Code, which states that averaged working hours cannot exceed 8 hours per day in a week with 5 days of work. In order to quantify the wage effect as the percentage change rather than as an absolute causal effect, logarithmic transformation is applied to the variable $Wage_{it}$. Furthermore, as displayed in figure 4. (Appendix) non-linear relationship between the dependent variable of wage and the independent variable of migration can constitute a valid concern for my analysis. Log transformation effectively solves this issue as well. Such alteration established a final dependent variable of the third model named $\log(Wage_{it})$.

$Wage\ construction_{it}$ and $Wage\ industrial\ processing_{it}$ are other continuous variables of average hourly wages in the construction sector and industrial processing sector in the region i in year t declared in PLN. Wages of these particular industries are chosen to serve as the dependent variables because they constitute the most prominent sectors for Ukrainian employment as reported by data from Ministry of Family, Labour and Social Policy (2018). The same transformations are performed as for $Wage_{it}$ variable. These include wage transformation, using average earnings in corresponding industries, and logarithmic transformation. Similarly to the average wage model, this alteration is essential for a percentage change interpretation and to address the non-linear relationship problem (figures 5. and 6.). Thus, $\log(Wage\ construction_{it})$ and $\log(Wage\ industrial\ processing_{it})$ constitute the definite dependent variables. The third, fourth and fifth model can incorporate identical control variables as in the previous models because in theory wage should be determined by labour market condition, similarly to unemployment.

3.3 GDP per capita analysis

While evaluating the impact of migration of GDP per capita, fixed effects model is further applied (6).

$$(6)\ \log(GDP_{it}) = \alpha_i + f_t + \rho Migration_{it} + \beta Jobs_{it} + \lambda Internal\ Migration_{it} + \tau Population\ Growth_{it} + \varepsilon_{it}$$

GDP_{it} is a continuous variable that accounts for gross domestic product per capita measure expressed in PLN which was produced within the region i at throughout the year t. Again, logarithmic transformation is applied to GDP measurement, resulting in $\log(GDP_{it})$ dependent variable that allows for a percentage change interpretation. The causal effect of a one-unit change in migration variable on GDP is depicted by a coefficient ρ. Time and region variables remain the same as indicated earlier. Identical control variables as in models 1–5 are preserved since I suspect that they might affect the GDP per capita variable. For example, an increased amount of vacancies represented by $Jobs_{it}$ control should be reflected in the increase in income per capita. In the way that if new employment opportunities emerge for the local population, i.e. as an effect of the past economic growth, incomes should increase. Similarly, $Internal\ Migration_{it}$ and $Population\ Growth_{it}$ may impact productivity and a total number of the local population, e.g. through decrease or increase in working-age citizens, thus affecting GDP per capita. The threat of reverse causality is excluded for all variables since GDP per capita is measured at the end of the specific year in December, whereas independent and control variables are measured throughout that year, so prior to the dependent variable.

3.4 Instrumental variable estimation

In order to test the plausibility and robustness of the results derived from models 1 to 6 instrumental variable (IV) estimation is applied with the use of the following models.

$$Y_{it} = \alpha + \rho \widehat{Migration}_{it} + \varepsilon_{it}$$

$$\widehat{Migration}_{it} = \delta + \gamma Migration\ pattern_{it-1}$$

$$Y_{it} = \theta + \tau Migration\ pattern_{it-1} + \eta_{it}$$

$\widehat{Migration}_{it}$ is a predicted independent variable analogous to the previous variable of migration. Because this model's main aim is to perform robustness check for models

1–6, Y_{it} is a dependent variable referring to either $Unemployment_{it}$, $Unemployment\ low\ education_{it}$, $\log(Wage_{it})$, $\log(Wage\ construction_{it})$, $\log(Wage\ industrial\ processing_{it})$ or $\log(GDP_{it})$. $Migration\ pattern_{it-1}$ serves as my IV. I constructed it with the use of historic pattern of Ukrainian minority distribution across regions, which was interacted (multiplied) with one-year lagged value of migration size for each year aggregated on a national level expressed per 10 000 working-age persons. Essentially, the national migration size is collected for years 2008 up to 2017, in order to predict 2009–2018 $\widehat{Migration}_{it}$ variable. The historic distribution is measured in the year 2002 across all 16 regions and is defined as the number of ethnic Ukrainians per 10 000 working-age persons. I define ethnic Ukrainian minority member as every person who identified themselves as such in the 2002 census, regardless of their actual legal status. Time and region variables remain the same as indicated earlier, again denoted by i and t. θ, δ and α are the constant terms and ε_{it} and η_{it} are time and period-specific error terms. The causal effect of a one-unit change in migration variable on dependent variable is depicted by a coefficient ρ, which constitutes the outcome of coefficient τ being divided by γ.

3.5 Justification of analytical techniques

Causality estimation establishes a great challenge when applying macroeconomic indicators such as immigration flow, unemployment or GDP per capita. It is due to the abundance of possible omitted variables. The advantage of the fixed effects model is that it helps me to eliminate all the time-invariant selection bias. For every voivodeship, estimated fixed effect captures all the time-invariant characteristics and eradicates the influence of all the permanent interregional differences and year effects. Those could be permanent wage differences, the concentration of industries or resource endowments. Other sources of selection bias are accounted for with the use of control variables. Furthermore, a similar approach was already adopted in other empirical research evaluating the influence of migration on host-economies (Dustmann et al., 2005, Borjas, 1997). In order to recognize the fixed effect estimation as valid, I have to assume that there are no unobservable characteristics which change over time that are correlated with the dependent and independent variable. By definition, it is not verifiable by any test. Another condition of the model requires that the migration causes any changes in wage, unemployment and GDP variable, not conversely. All the dependent variables are

quantified at the end of the year in December, whereas the migration occurs throughout that exact specific year, naturally preceding the measurement. Given that timeline, there is no reason to expect that reverse causality would occur.

Assuming wage and unemployment are mostly determined by labour market conditions, it is feasible to find adequate control variables that will allow eliminating some coefficient estimation bias. In the case of GDP per capita, I will implement the same control variables to test the effects, as justified in the model description. However, it is not possible to answer how realistic that assumption is, and endogenous bias cannot be excluded with full certainty. There might exist numerous time-invariant, time-varying observable and unobservable characteristics that will have an impact on wages, unemployment, GDP per capita and immigration. Therefore, this emphasizes a necessity to conduct a robustness check of the fixed effects results with instrumental variable methodology. The IV method allows me to eliminate all the potential selection bias and to directly disclose if migration has any effect on selected dependent variable. I have decided to utilize shift-share migration variable as my IV. It describes the past settlement patterns interacted with one-year lagged migration size per 10 000 persons on a national aggregated level. There exists some observed and documented evidence that Ukrainians prefer to migrate into voivodeships with pre-established immigration base (Brunarska, Grotte & Lesinska, 2012). Additionally, the same methodology was already implemented in other researches on migration topics, e.g. Dustmann et al. (2005), D'Amuri and Peri (2014), Mayda, Peri and Steingress (2018), Card (2001), proving the validity of the IV. Although to classify this technique as suitable in terms of my research setting, all the IV assumptions ought to be fulfilled. First of all, the instrument must have a strong causal effect on the variable of interest. Indeed, this assumption holds with $F(1,158) = 82.29 > 10$. Second one states that the IV cannot be correlated with an error term, which is also known as an independence assumption. The verification of this condition is not viable. Nonetheless, I believe that the 2002 assumed historic migration distribution patterns of Ukrainians was to some extend random because of a mixture of historic, geographical and economic factors. According to Jerczynski (1999), the Ukrainian minority was primarily prone to settle in regions that were incorporated to Poland after II World War and where the Soviet garrisons where quartered. There is no solid reason at this stage to suspect that this might be correlated with any current economic measures that will further

impact the GDP per capita. Lastly, the instrument should not have a direct effect on the outcome, meaning that the exclusion restriction needs to hold. It is not a testable assumption.

War and critical economic conditions were among the main factors that incentivized Ukrainians to migrate more after 2014. Poland was chosen as their prime destination because of the appealing immigration law, geographic, cultural and linguistic proximity rather than any endogenous economic changes. This setting makes the Ukrainian supply shock comparable with Mariel Boatlift experiment examined by Card (1990) and 2004 accession supply shock of Eastern European workers to British labour market studied by Dustmann et al. (2005). Because of that, the 2014 shock migration is can to some extend be classified as a natural experiment characterized by exogenous labour supply. Even though all of the regions experienced a rise in foreign immigration, some, notably Masovian, Lubusz and Lower Silesian, experienced relatively more intensive migration than others. Furthermore, for all the regions the volume of migration before 2014 was negligible. These premises enable me to effectively apply fixed effects and instrumental variable models, as the independent and dependent variables exhibit differences for regions across each year.

3.6 Descriptive statics

Table 1. presents an overview of the specific characteristics of variables implemented in the models. There exists the largest discrepancy in the data on migration, with the minimal value of 0.48 and a maximum of almost 107 migrants per 10 000 persons. It proves that migrations indeed varied substantially between regions and across years, which allows for application of proposed methodology. GDP per capita also varies significantly across regions and time with minimum 24 489 PLN being the lowest value and 88 795 PLN being the highest, more than two times the mean. On average, the unemployment rate is set at 11.58 %, whereas the share of unemployed with the lowest education is 27.91%. Average general wage, the wage of construction workers and wage in industrial processing is almost identical across years with a mean of 23–24 PLN per hour. There were more jobs created than liquated between 2009 and 2018 in Poland, hinting at growing labour demand, as the mean difference is positive. Internal migration average of 0 displays the positive evidence for the data reliability. The outflow from one voivodship ought to be pronounced in the inflow to another voivodship, otherwise, the

input is dubious. There has been a general decline in the population of working age across years as reflected by negative population growth mean, which demonstrates the potential demographic challenge for Polish society. This trend is also depicted with a graphical representation available in the appendix.

All the correlations between variables are available in table 2. Majority of them is significant with 5% level. Unemployment rate and migration size have a strong negative correlation with -0.69, whereas the share of unemployed with the lowest education appears to have almost no correlation at all with Migration size. This is visually proven with scatter plots presented in the appendix. Severe correlation might indicate that there are some omitted variables which lead to this large estimation bias. All wage variables and migration are positively correlated. Equivalently, GDP per capita and migration display positive relation. All the proposed control variables have a significant and robust correlation with the variable of interest and dependent variables, with the exception of the share of unemployed with the lowest education. This evidence suggests that it is essential to preserve them in the models.

Table 1. Descriptive statics for regions across 2009-2018

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Migration	160	18.76	23.67	0.48	106.69
Unemployment	160	11.58	3.93	3.2	21.6
Unemployment low education	160	27.91	4.46	19.5	35.7
Wage	160	23.09	3.63	17.13	36.81
Wage industrial processing	160	23.27	3.88	16.21	34.46
Wage construction	160	24.19	4.63	17.25	40.98
Jobs	160	14.50	17.14	-9.4	95.8
Internal migration	160	0	3404.68	-4794	12306
Population growth	160	-0.37	0.27	-0.8	0.3
GDP	160	40 394	11252.55	24489	88795

Table 2. Correlation table for regions across 2009–2018

Variable	1	2	3	4	5	6	7	8	9	10
1 Migration	1									
2 Unemployment	−0.69*	1								
3 Unemployment low education	−0.01	0.22*	1							
4 Wage	0.75*	−0.75*	−0.05	1						
5 Wage industrial processing	0.8*	−0.79*	−0.05	0.94*	1					
6 Wage construction	0.66*	−0.69*	0.03	0.88*	0.84*	1				
7 Jobs	0.57*	−0.62*	−0.12	0.77*	0.69*	0.73*	1			
8 Internal migration	0.28*	−0.35*	−0.05	0.55*	0.42*	0.64*	0.6*	1		
9 Population growth	−0.56*	0.55*	−0.19*	−0.72*	−0.78*	−0.54*	−0.43*	−0.12	1	
10 GDP	0.6*	−0.67*	0.04	0.88*	0.79*	0.88*	0.84*	0.76*	−0.58*	1

Note. * $p < 0.05$

4. Results

4.1 Fixed effects results

Hypotheses 1 and 2 are concentrated on the causal effect of migration on wages. First one states that Ukrainian immigrants do not have an impact on the average wage in general. Conversely, the second statement asserts that they have a negative impact on average wages in sectors employing them, namely industrial processing and constructions. Individual and time fixed effects regressions are implemented in order to analyse both of them. The variable of interest – migration – appears to have a slightly positive coefficient of 0.0003, as shown in table 3. The result is significant at 10% significance level ($p < 0.10$). Thus, with every addition of one Ukrainian immigrant per 10 000 persons in the voivodeship, the averaged general wage is boosted by around 0.03% on average, other things equal. Clearly, this wage effect is neutral, close to 0, with immigration of a small scale. The coefficient of the variable of interest slightly decreases to 0.0002 if control variables are not considered as a part of the model, and changes to being insignificant even at 10% level ($p > 0.10$). Hence, the negligible and insignificant (5 % level) effect of migration on averaged wage does not allow me to reject

the hypothesis 1 conveying the notion Ukrainian nationals do not have an impact general average wage.

Table 3. Log-linear regression with fixed effects results for relationship between average wage and migration across regions, 2009-2018

Variable	(1) log(Wage)	(2) log(Wage)
Migration	0.0003*	0.0002
	(0.0001)	(0.0002)
Jobs	-0.0003**	
	(0.00)	
Internal migration	0.000	
	(0.000)	
Population growth	-0.0143	
	(0.0121)	
2010.year	0.043***	0.041***
	(0.0035)	(0.0035)
2011.year	0.0912***	0.0926***
	(0.0062)	(0.0034)
2012.year	0.124***	0.128***
	(0.0075)	(0.0039)
2013.year	0.160***	0.164***
	(0.0083)	(0.004)
2014.year	0.195***	0.197***
	(0.0095)	(0.004)
2015.year	0.228***	0.231***
	(0.0110)	(0.0045)
2016.year	0.259***	0.263***
	(0.0132)	(0.0064)
2017.year	0.309***	0.314***
	(0.0158)	(0.0090)
2018.year	0.369***	0.375***
	(0.0176)	(0.0111)
Constant	2.944***	2.943***
	(0.0036)	(0.0039)
Observations	160	160
R-squared	0.994	0.993
Number of regions	16	16

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. contains the results of fixed effects regressions with an average wage of industrial processing and construction as dependent variables, after log transformation. The coefficient of migration is positive for models of both sectors and with the inclusion of control variables. For regression of average wage in industrial processing, it equals

0.0003, whereas for regression of average wage in construction it is 0.0002. Both results are insignificant, $p > 0.05$. In practical terms, an increase in 1 migrant per 10 000 persons will cause an increase of 0.03% or 0.02% in wage on average depending on the industry, other things equal. Hence, a positive change of 1% in the Ukrainian foreign population in Poland will lead to a 2–3% rise in the sectorial average wage. This effect is strikingly comparable to the effect on the general average wage, implying that there are no disruptions caused in individual sectors that could be offset on a national level. The wage level seems to grow with the same rate no matter the sector. With this evidence of an insignificant positive effect on the average wage in industrial processing in construction, second hypothesis stating that migrants have a negative effect on the average wage in sectors employing them fails to be rejected.

Table 4. Log-linear regression with fixed effects results for relationship between sector-specific wage and migration across regions, 2009–2018

Variable	(1) log(Wage industrial processing)	(2) log(Wage industrial Processing)	(3) log(Wage construction)	(4) log(Wage construction)
Migration	0.0003	0.0000	0.0002	0.0002
	(0.0003)	(0.0004)	(0.0003)	(0.0004)
Jobs	−0.0007**		0.0000	
	(0.0003)		(0.0004)	
Internal migration	0.0000		0.0000	
	(0.0000)		(0.0000)	
Population growth	−0.0223		0.0246	
	(0.0299)		(0.0315)	
2010.year	0.0717***	0.0674***	0.0293	0.0274
	(0.0073)	(0.0068)	(0.0220)	(0.0205)
2011.year	0.121***	0.122***	0.0715***	0.0641***
	(0.0101)	(0.0093)	(0.0217)	(0.0192)
2012.year	0.129***	0.135***	0.0285	0.0190
	(0.0115)	(0.0069)	(0.0195)	(0.0183)
2013.year	0.185***	0.189***	0.0709***	0.0596**
	(0.0135)	(0.0102)	(0.0238)	(0.0208)
2014.year	0.237***	0.237***	0.128***	0.115***
	(0.0142)	(0.0094)	(0.0257)	(0.0198)
2015.year	0.270***	0.274***	0.173***	0.158***
	(0.0184)	(0.0092)	(0.0289)	(0.0195)
2016.year	0.320***	0.325***	0.214***	0.197***
	(0.0204)	(0.0090)	(0.0285)	(0.0199)
2017.year	0.385***	0.390***	0.272***	0.253***

	(0.0296)	(0.0203)	(0.0297)	(0.0219)
2018.year	0.449***	0.457***	0.354***	0.335***
	(0.0320)	(0.0241)	(0.0286)	(0.0235)
Constant	2.914***	2.912***	3.042***	3.043***
	(0.0072)	(0.0086)	(0.0161)	(0.0160)
Observations	160	160	160	160
R-squared	0.979	0.977	0.910	0.907
Number of regions	16	16	16	16

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Hypothesis 3 states that Ukrainian immigrants do not have an impact on the unemployment rate. Its plausibility is again to be assessed with the regression that includes a fixed effect. Table 5. states the results, where the unemployment rate is a dependent variable and migration is an independent variable of interest. Two regressions are estimated with and without proposed control variables to check for their impact. The regression with fixed effects demonstrates that the variable Migration has a negative effect on variable Unemployment with a coefficient equal to approximately -0.006. According to this output, an increase in one migrant per 10 000 inhabitants of the region will lead to a negligible decrease in the unemployment rate of 0.006 percentage points on average. Without any controls applied this effect adjusts to become positive with coefficient 0.002, implying that expanded migration causes a surge in unemployment. With the decreasing share of working-age population growth and increasing workers demand over the past years, the negative result of the model with controls and positive otherwise may suggest that Ukrainians fill out the gap in the labour market. However, none of the effects is significant as $p > 0.05$. Therefore, there is not enough evidence the reject the third hypothesis which considers immigrant from Ukraine not to have any impact on unemployment.

Table 5. Linear regression with fixed effects results for relationship between unemployment rate and migration across regions, 2009-2018

Variable	(1) Unemployment	(2) Unemployment
Migration	-0.0059	0.0023
	(0.0148)	(0.0174)
Jobs	0.0306***	

	(0.0100)	
Internal migration	−0.0002	
	(0.0001)	
Population growth	1.024	
	(0.791)	
2010.year	0.0974	0.285*
	(0.192)	(0.139)
2011.year	0.371	0.321*
	(0.286)	(0.159)
2012.year	1.479***	1.207***
	(0.313)	(0.165)
2013.year	1.314***	1.099***
	(0.290)	(0.211)
2014.year	−0.962**	−0.993***
	(0.445)	(0.265)
2015.year	−2.501***	−2.706***
	(0.492)	(0.373)
2016.year	−4.053***	−4.325***
	(0.615)	(0.508)
2017.year	−5.752***	−6.019***
	(0.813)	(0.765)
2018.year	−6.558***	−6.947***
	(0.977)	(0.993)
Constant	13.29***	13.35***
	(0.227)	(0.275)
Observations	160	160
R-squared	0.947	0.938
Number of regions	16	16

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In order to analyse hypothesis 4, again fixed effect model with regression will be exploited. The hypothesis states that Ukrainian immigrants do not cause an increase in the share of unemployed with the lowest education attainment. The results of the investigation are exhibited in table 6. with the share of the lowest educated among unemployed as a dependent variable and migration as an independent variable of interest. Both regressions with and without proposed control variables are estimated to account for their strength. The coefficient of interest for regression with control variables is determined to be − 0.01, indicating that one more migrant per 10 000 will lead to decrease in the share of unemployed with the lowest education by 0.01. The estimation is not significant, $p > 0.05$. Without the control variable, the coefficient equals 0 and is not significant, proving that they are adequate to eliminate the potential bias. As the model shows, with insignificant negative causal effect, there is not enough evidence to

reject the fourth hypothesis which declares that immigrants from Ukraine do not contribute to an increase in the share of unemployed with the lowest education.

Table 6. Linear regression with fixed effects results for relationship between the share of the lowest educated unemployed and migration across regions, 2009–2018

Variable	(1) Unemployment low education	(2) Unemployment low education
Migration	−0.0059	0.0000
	(0.0069)	(0.0065)
Jobs	0.0058	
	(0.0117)	
Internal migration	0.0000	
	(0.0001)	
Population growth	3.076*	
	(1.615)	
2010.year	−0.513**	−0.644***
	(0.181)	(0.0882)
2011.year	−0.0047	−0.831*
	(0.836)	(0.463)
2012.year	−0.889	−2.031***
	(0.541)	(0.547)
2013.year	−0.486	−1.800***
	(0.864)	(0.248)
2014.year	−0.0125	−1.482***
	(0.978)	(0.253)
2015.year	0.761	−0.995***
	(1.057)	(0.309)
2016.year	1.137	−0.871**
	(1.209)	(0.392)
2017.year	1.120	−1.085**
	(1.322)	(0.489)
2018.year	0.628	−1.595***
	(1.326)	(0.537)
Constant	28.90***	29.04***
	(0.217)	(0.183)
Observations	160	160
R-squared	0.308	0.274
Number of regions	16	16

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Lastly, hypothesis 5 will be evaluated with a fixed effects approach, analogous to previous ones. It states that Ukrainian immigrants have a positive impact on GDP per

capita. Table 7. shows that variable Migration has indeed positive coefficient of 0.0001 with controls applied and 0.0002 without. Consequently, the addition of 1 more immigrant per 10 000 persons in the region on average causes a positive change of 0.01% in GDP per capita, other things equal. However, the results remain insignificant, $p > 0.05$. Hence, the analysis did not provide any evidence that would allow me to reject the fifth hypothesis, as the positive insignificant causal effect of Ukrainian migration on income per capita persists.

Table 7. Log-linear regression with fixed effects results for relationship between GDP per capita and migration across regions, 2009–2018

Variable	(1) log(GDP)	(2) log(GDP)
Migration	0.0001	0.0002
	(0.0002)	(0.0002)
Jobs	0.0004*	
	(0.0002)	
Internal migration	0.0000	
	(0.0000)	
Population growth	0.0195	
	(0.0151)	
2010.year	0.0436***	0.0454***
	(0.0051)	(0.0039)
2011.year	0.126***	0.123***
	(0.0078)	(0.0052)
2012.year	0.166***	0.160***
	(0.0096)	(0.0062)
2013.year	0.183***	0.177***
	(0.0126)	(0.0074)
2014.year	0.217***	0.213***
	(0.0141)	(0.0072)
2015.year	0.263***	0.256***
	(0.0160)	(0.008)
2016.year	0.293***	0.285***
	(0.0192)	(0.0101)
2017.year	0.354***	0.345***
	(0.0218)	(0.0119)
2018.year	0.414***	0.403***
	(0.0225)	(0.0131)
Constant	10.37***	10.37***
	(0.0054)	(0.0055)
Observations	160	160
R-squared	0.308	0.274
Number of regions	16	16

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2 Robustness checks

Tables 3–7. present various models with and without control variables considered. For all models, except the two models estimating the impact on a log of wage construction in table 4., coefficients differ for the regressions with and without controls. This evidence suggests that the proposed controls used the fixed effects estimation are to a certain extend adequate. Nonetheless, the plausibility and robustness of the results still should be checked with the introduced IV method. All the estimations are presented in tables 8–13. in the Appendix.

Firstly, the impact of migration on averaged general wage using IV appears to be more substantial than with the fixed effects regression; its coefficient is 0.0059 and significant ($p < 0.05$) in comparison to 0.0003. The effect might be underestimated with the fixed effects model. However, most importantly the direction of the relationships between migration and average national wage is positive with both techniques.

Likewise, the effect of migration sector–specific average wage in industrial processing and construction is stronger and significant with IV estimate in comparison to regression analysis. The coefficient of migration for the sector–specific average wage in industrial processing and construction is 0.0063 ($p < 0.05$). Therefore, the practical interpretation is the same as with the general wage above. Additional immigrant per 10 000 persons increases sector–specific average wage by 0.6% compared to 0.02–0.03% with the regression estimate. The important conclusion is that again the effect of migration on general and sector–specific wage is of equal magnitude, just as proven in the regression analysis. This notion conveys a practical implication that Ukrainian migration effect does not differ between sectors and on an aggregated national level. Furthermore, the relationship between migration and chosen industry wages is again positive in both cases, fixed effects and IV estimation.

Considering the foreign workforce influence on the unemployment rate, instrumental variable established the coefficients to be equal to −0.1005 and significant ($p < 0.05$) whereas for fixed effects regression it was −0.0059. As with the previous observations, the effect appears to be underestimated, but the same (negative) tendency is sustained. Hence, IV results support the claim that larger migration lowers the unemployment rate rather than reinforcing it. The most ambiguous robustness check derived from instrumental variable relative to regression concerns the unemployment

of workers with the lowest education attainment. Fixed effects model demonstrated an impact of migration on the share of the lowest educated among unemployed of approximately -0.01 percentage points. Conversely, IV method results state that migration has an adverse effect of the same magnitude (0.01) on the share of the lowest educated among unemployed. However, that matter of noncompliance is limited in its nature because both results are statistically insignificant, as $p > 0.05$.

The final robustness check on GDP per capita follows the established pattern. The IV methodology implies that one additional migrant per 10 000 citizens increases GDP per capita by approximately 0.6%, with the exact coefficient being 0.0059 and significant ($p < 0.05$). Fixed effect regression underestimates this effect with an insignificant coefficient of 0.0001.

5. Discussion

Now since the main results have been presented, I wish to elaborate on their practical meaning and relation to the theoretical background. The empirical study with the use of fixed effects regressions demonstrated that the Ukrainian immigrants generally have positive but insignificant influence on Polish labour market conditions and economy. Especially in the case of small-scale immigration, the effect is either neutral or at most slightly positive. With both fixed effects model and IV estimation, I found that the general average wage and sector-specific wages grow with an increasing number of immigrants. This conclusion disproves the findings of Borjas et al. (1997), Borjas and Katz (2003). Perhaps this divergence can be explained by the degree of labour market intuitions and policies. Borjas et al. (1997), Borjas and Katz (2003), Card (2001) concentrated their research on the data from the United States of America. In European countries, the policies tend to be far more protective than in America. Particularly, the institution of minimum wage could have offset the negative effects of an increased labour market competition from migrants on the workers in the lowest-paid sectors. The legal price floor could have potentially protected the wages of workers from decreasing and eventually lead to the stable or higher average wage. Foged and Peri (2016) and Dustmann et al. (2005), who analysed other European labour markets – Danish and British – enclosed findings that closely resemble mine.

Another possible explanation of this positive effect of foreign workers on wages can derive from previously mentioned imperfect substitutivity assumption between migrants and natives, who might not compete for the same job positions. Yet, even if foreigners and Polish citizens were to constitute a direct competition, my conclusion can still align with the neoclassical model of the labour market. During the year 2009–2018, Poland has experienced constant economic growth, along with simulations decline in the economically active population. Given that, the labour supply was gradually shrinking, and labour demand could have exhibited an increasing trend. Thus, Ukraine workers may have been easily absorbed by the Polish labour market, without any negative consequences for the wages.

The investigation with fixed effects did not produce any statistically significant results which would allow me to reject the claim that migrants do not affect unemployment of the host economy. Whereas, the IV estimate indicated that increasing immigration lowers the unemployment rate. Furthermore, with both of the techniques, I did not find any significant evidence against the case of Ukrainian workers not influencing unemployment among the lowest educated, which aimed to represent their direct competitors. The share of the people with the lowest education attainment among unemployed in general did not increase nor decreased significantly during the investigated years, implying the stability of this proportion. The general lack of any unfavourable employability consequences for natives is in consensus with academic research of Friedberg et al. (1995). It, as in the case of wage effects, can be attributed to the expanding labour demand. On the other hand, why the data did not indicate any adverse influence of Ukrainians nationals on unemployment can be due to the limited size of the migration. Angrist and Kugler (2003) emphasize that at least 10% increase in foreign workers is required to see a reduction of unemployment equal to 0.2 – 0.7 percentage points. In comparison to Western Europe, Poland's share of immigrants among the total population remains particularly small. Nonetheless, the plausibility of the results concerning the share of unemployed with the lowest education attainment can be questioned, as the IV estimated the coefficient of migration to be reversely related, opposed to fixed effects method. As both coefficients remain insignificant, the analysis is inconclusive.

Finally, the fixed effects regression displayed the positive but still insignificant contribution of foreigners towards a GDP per capita growth. The positive relationship is supported with IV methodology. It matches the conclusion of the majority of empirical studies on this issue (e.g. Alesina et al., 2016; Jaumotte et al., 2016). Ukrainians, being mostly in economically active age, may have a positive effect on the productivity of the population.

I will devote the last paper of the result section to discuss the divergence between fixed effects and IV model. Generally, both methods displayed the same tendencies for almost all the results regarding the sign of the coefficients, thus the direction of relationships. This, to some extent, enables me to interpret the findings and comment on them with some degree of confidence, since they appear to be credible. In spite of that, the coefficients differed in terms of significance and magnitude. Without doubt, it constitutes a major shortcoming of my analysis and due to that, the exact effect cannot be quantified. Perhaps that derives from violation of certain assumptions for both models. Regarding fixed effects models, underestimation of the impact of migration can be possibly derived from endogeneity bias, indicating the lack of adequate controls. Unfortunately, this cannot be empirically verified. Similarly to the main method, IV estimation is based on several assumptions. The year 2002 was selected as a historic pattern of distribution of the Ukrainian minority, yet it still might be too recent. Particularly, the independence assumption can be violated with a case of long-term investments which could begin in the early 2000s, attracting a higher number of immigrants and have an impact on GDP per capita and labour market conditions even a decade later.

6. Conclusion

To conclude, this paper has been trying to address the question of *"What is the economic impact of Ukrainian labour immigration to Poland during years 2009-2018?"*. In order to quantify this effect, I have constructed five hypotheses focused on unemployment, wages and GDP per capita. The empirical analysis of the fixed effects model and IV estimation showed that the economic impact of Ukrainian foreign workers during the years 2009-1018 is mainly positive or non-existent. However, the insignificance of results in the fixed effects model did not allow me to reject any

hypotheses. Robustness checks with instrumental variable estimations confirmed the positive tendency, even hinting at underestimation of the beneficial effects on the economy. The data evaluation demonstrated symmetrical positive contribution towards both general and sector-specific wage growth. I did not observe any significant disadvantageous effects of increased Ukrainian migration on regional general unemployment rates or unemployment of the lowest educated workers. Thus, foreign influx does not harm the workers which could be classified as their closest substitutes. Lastly, the foreign workforce seems to have a favourable contribution to regional GDP per capita. The precise effect is hard to assess due to inconsistencies between applied methodologies and insignificance of the results.

The standard neoclassical theory predicts that migration is indeed able to generate benefits and increase the welfare of the whole nations with the more efficient allocation of labour force across borders. This occurs perhaps at the cost of certain groups within society e.g. competing native workers. However, in the case of Poland, this expected trade-off between increased GDP and adversity to native workers strikes as being absent. The event of mass migration of Ukrainians to Poland appears to have rather favourable or neutral consequences than any negative ones. As stated in the discussion section, it might be possible due to the internal adjustments of the Polish labour market and reasonably smooth absorption of foreign workers. That being a result of gradually declining native labour force and growing labour demand. Furthermore, the institutions of minimum wage and EPL may as well broaden the protection of the lowest educated and lowest-paid workers, who mainly compete with the eastern immigrants.

Beneficial or neutral consequences of migration pose as a piece of evidence that radical approaches of political parties and some citizens who perceive Ukrainians as a threat do not find justification in currently available economic data. The dilemma between negative consequence for the labour market and positive GDP per capita does not occur. Hence, the policy implication of this study is that the Polish government should not hinder the current inflow of foreign workers, but can actually start to actively encourage it. Ukrainians might constitute a sufficient solution to the demographic crisis that Poland, likewise the majority of Europe, is facing. Countries with an akin historical and social background as well as economic conditions to Poland, especially from Central and Eastern Europe, might find my conclusions applicable to their cases.

Finally, I am aware that my research does not perfectly accommodate all the issues of this specific post-2014 mass migration analysis. What I merely considered throughout my empirical investigation were the Ukrainians which legally reside in Poland with a rather long-term employment perspective in mind. Migrants which come to Poland for seasonal employment and work quasi-legally are not examined. New investigation with this sample remains as my suggestion for further research. Additionally, the results are not completely robust, they appear to be underestimated. As mentioned, in the fixed effects model this perhaps arises from omitted variables bias (endogeneity). Thus, my suggestion for further research is to experiment with different variations of individual and time fixed effects models. These could include new control variables that should not be exclusively restricted to labour market demand and supply side as I did in this analysis. Particularly, for the fixed effect model measuring migration's impact on GDP, lagged values of GDP could be added. I worked with the assumption that people are not directly incentivized to migrate because of GDP per capita indicator, but rather through its effect on employment opportunities. Consequently, the jobs variable should absorb any influences of economic growth or recession. Nonetheless, this assumption could be challenged in future research. Concerning the IV method, the 2002 census data on Ukrainian distribution across regions can be replaced by data obtained from the 1988 census. This change would strongly diminish the explained potential threat of the independence assumption violation. Moreover, the data on unemployment, wages and GDP per capita is available on even lower administrative level than 16 regions, namely 2477 gminas. Yet, the information on labour migration is only given for regional databases. Therefore, if the immigrational data is updated and accessible in the future for gmina-level, then this study can be replicated with the enlarged sample size to improve the reliability of the findings and likely to alter the significance of the results. At last, I assumed that labour market outcomes are mainly determined by internal supply and demand forces. Nevertheless, the Heckscher-Ohlin model also predicts that the change in incomes of workers can be affected by trade patterns. It could be stimulating to test whether any changes in trade occurred in the Polish economy between the years 2009-2018. Additionally, I recommend analysing any links between patterns in trade and wages in Poland. There is a chance that the increase in the trade of labour-intensive

goods may have limited the negative effects of growing market competition for natives from immigrants via this described channel.

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8. Appendix

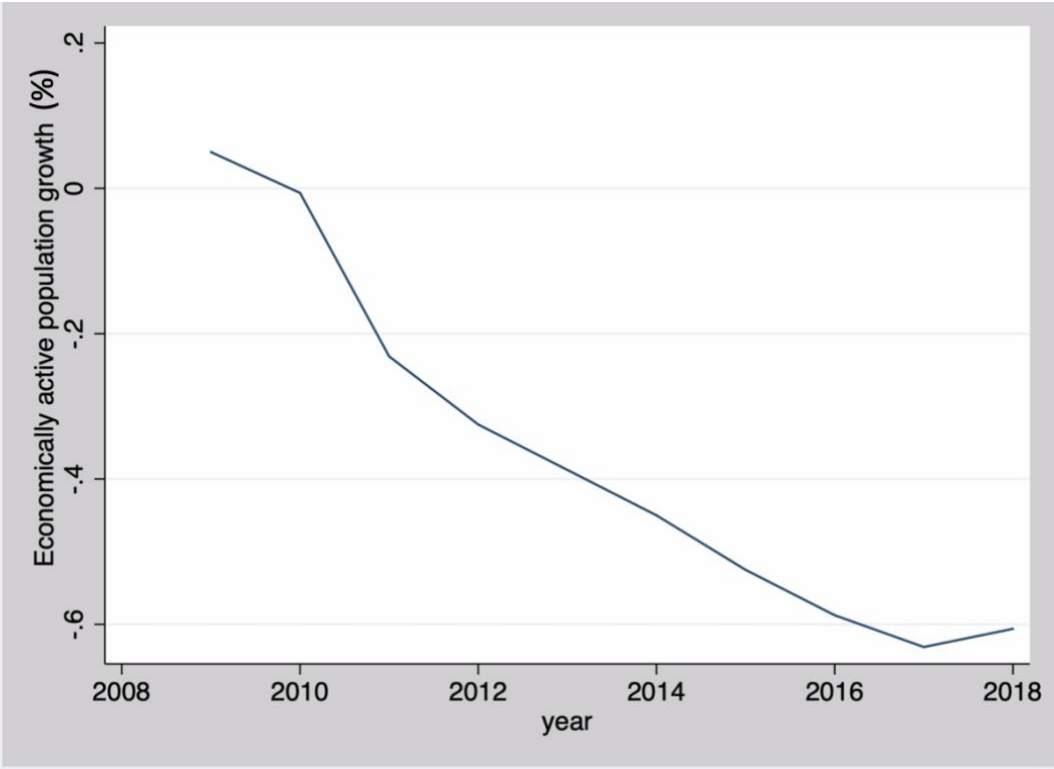

Figure 3. Growth of economically active population in Poland, 2009–2018

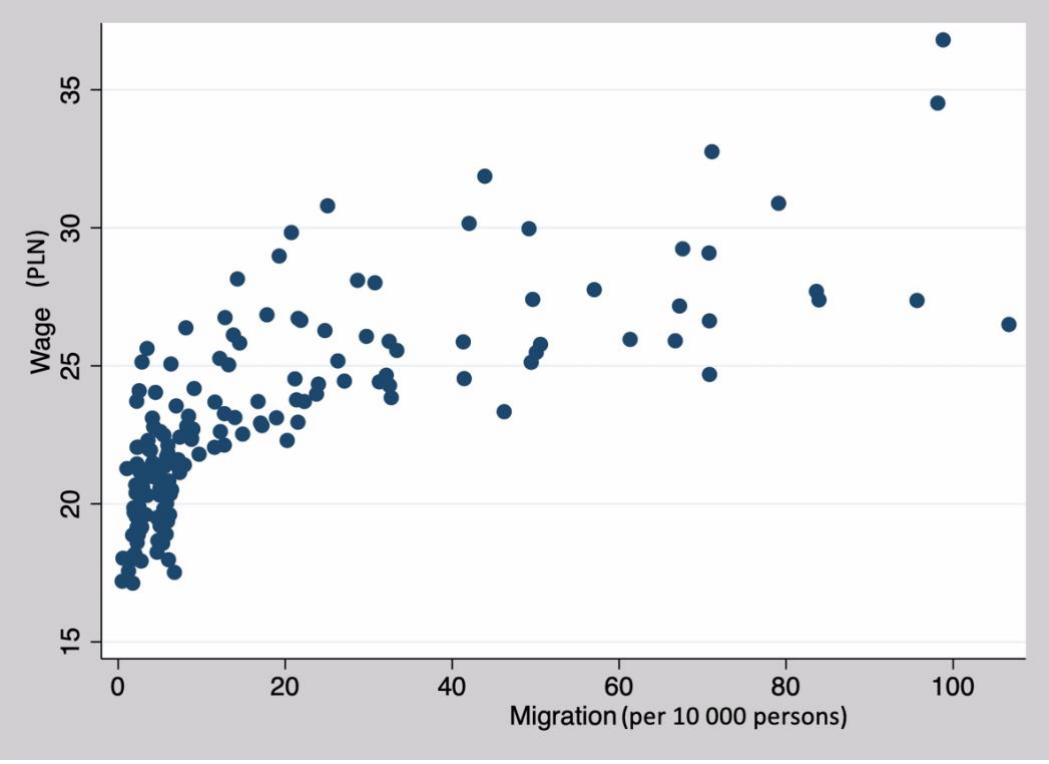

Figure 4. Scatter plot of average wages and migration at a regional level in Poland, 2009–2018

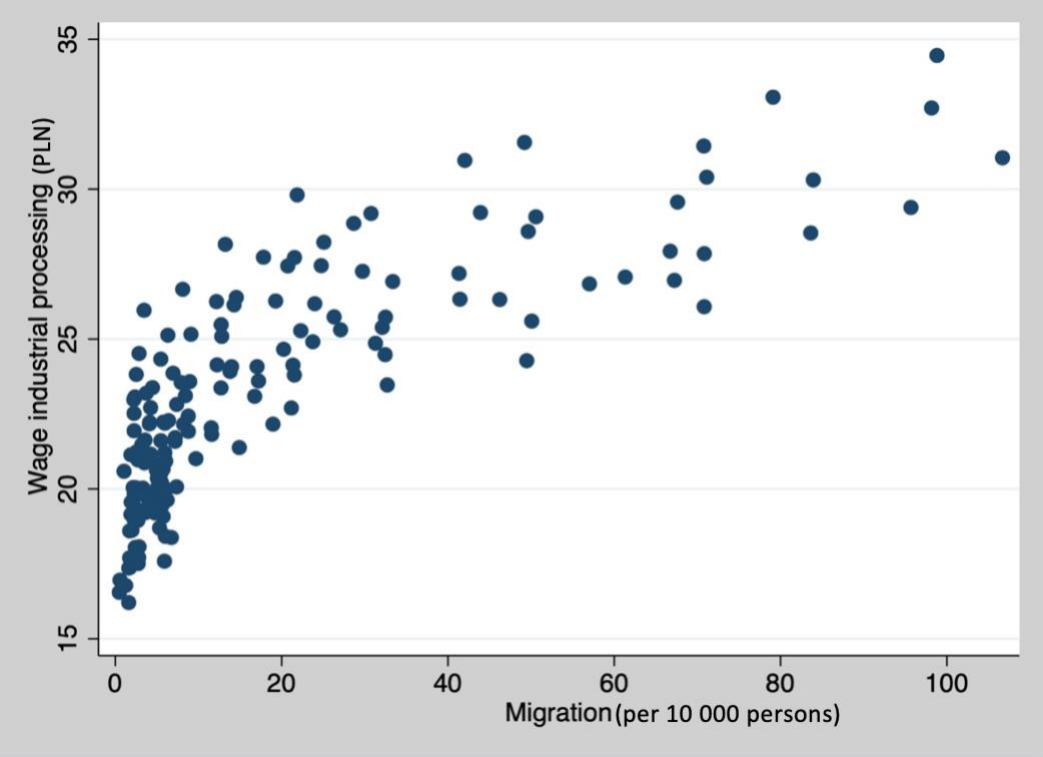

Figure 5. Scatter plot of wages in industrial processing and migration at a regional level in Poland, 2009–2018

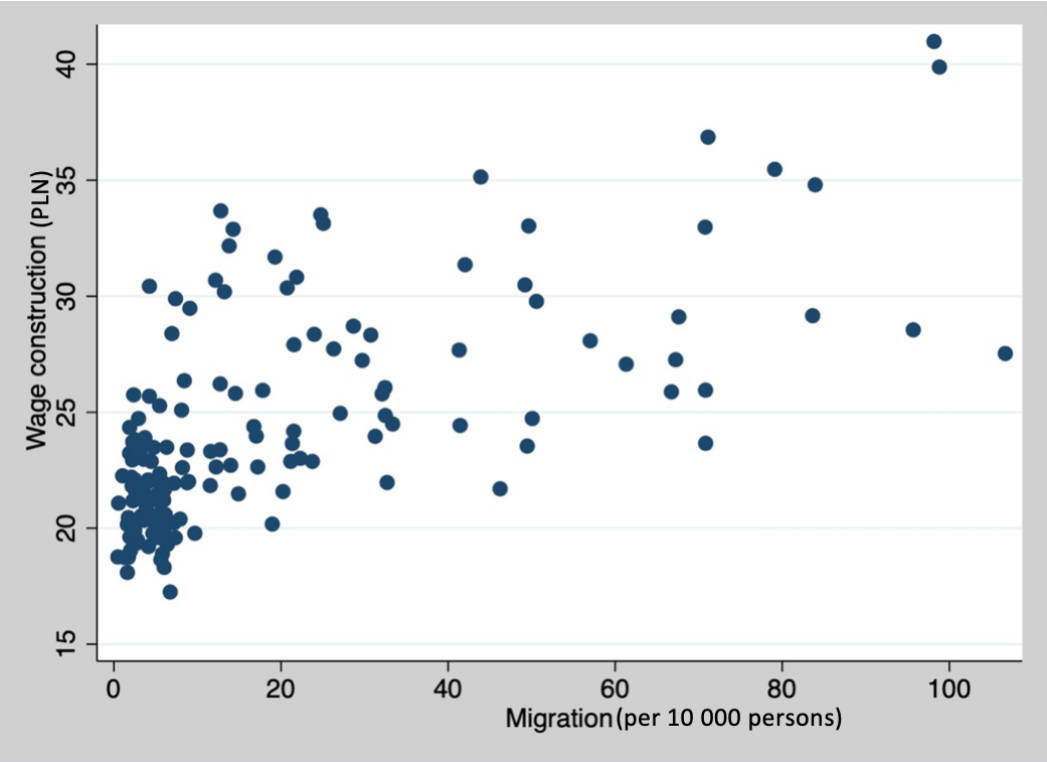

Figure 6. Scatter plot of wages in construction and migration at a regional level in Poland, 2009–2018

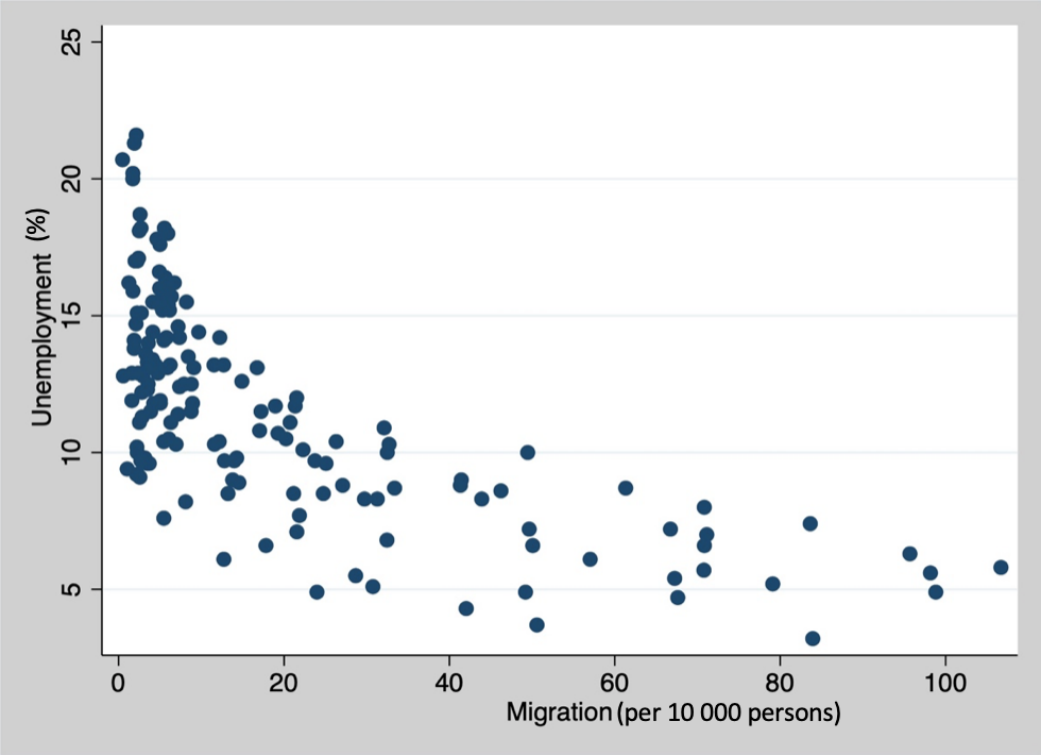

Figure 7. Scatter plot of the unemployment rate and migration at a regional level in Poland, 2009–2018

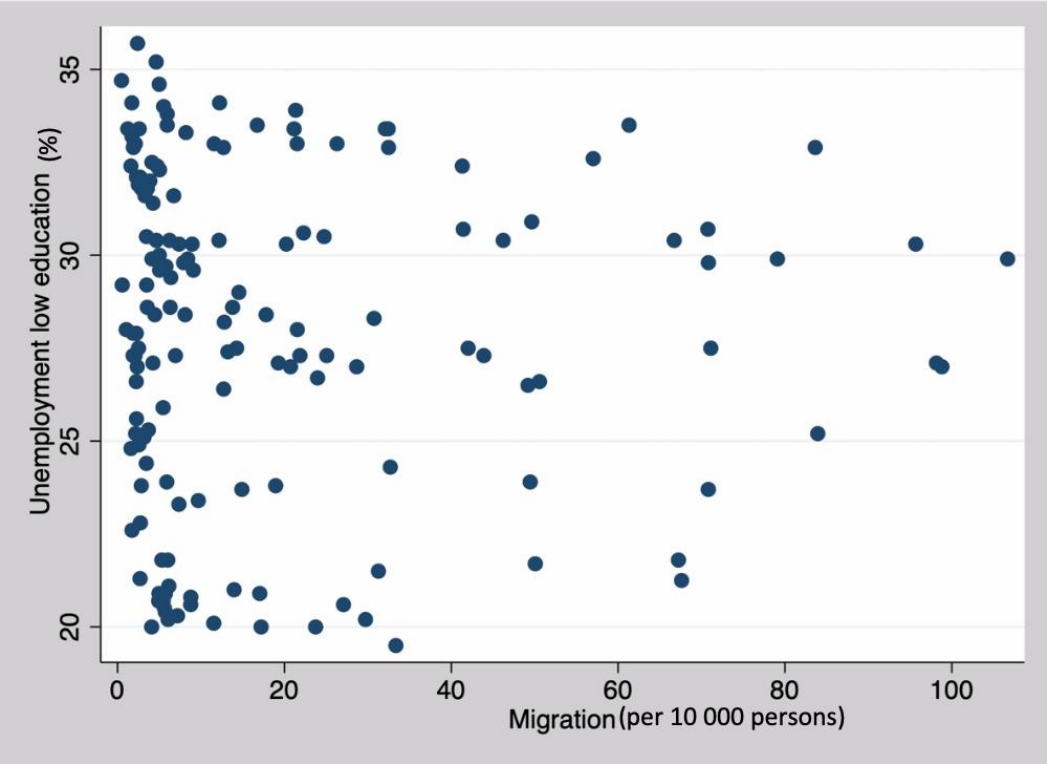

Figure 8. Scatter plot of the unemployment share of the lowest educated and migration at a regional level in Poland, 2009–2018

Table 8. Instrumental variable estimation for relationship between average wage and migration across regions, 2009–2018

VARIABLES	log(Wage)
Migration	0.0059***
	(0.0006)
Constant	3.0178***
	(0.0135)
Observations	160
R-squared	0.511

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9. Instrumental variable estimation for relationship between industrial processing sector wage and migration across regions, 2009–2018

VARIABLES	log(Wage industrial processing)
Migration	0.0063***
	(0.007)
Constant	3.0148***
	(0.0157)
Observations	160
R-squared	0.57

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10. Instrumental variable estimation for relationship between construction sector wage and migration across regions, 2009–2018

VARIABLES	log(Wage construction)
Migration	0.0063***
	(0.0008)
Constant	3.0513***
	(0.0166)
Observations	160
R-squared	0.393

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11. Instrumental variable estimation for relationship between unemployment rate and migration across regions, 2009–2018

VARIABLES	Unemployment
Migration	−0.1005***
	(0.0133)
Constant	13.469***
	(0.3634)
Observations	160
R-squared	0.465

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12. Instrumental variable estimation for relationship between the share of the lowest educated unemployed and migration across regions, 2009–2018

VARIABLES	Unemployment low education
Migration	0.0065
	(0.0248)
Constant	27.7829***
	(0.5882)
Observations	160
R-squared	0.792

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13. Instrumental variable estimation for relationship between log GDP per capita and migration across regions, 2009–2018

VARIABLES	log(GDP)
Migration	0.0067***
	(0.0012)
Constant	10.4473***
	(0.0268)
Observations	160
R-squared	0.344

Note. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1