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Does post-enlargement emigration from Poland impact on the wages of Poles?

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The purpose of this study is to empirically examine the impact emigration has had on real wages in Poland after its accession to the EU. The elasticity of wages with respect to emigration is examined using the Polish LFS, conducted from 2004 to 2009. The results show that a 10% decrease in the labour force caused by emigration brings about a 2-4% increase in wages. Some divisions of the dataset and the investigation show significant differences in the results for different socio-demographic groups, defined with regard to sex, age or employment sector. Two separate periods of prosperity and recession were also taken into account in the analyses.

Key words: emigration, real wages, elasticity of wages

Introduction

The debate among scientists from varying disciplines regarding the social and economic consequences of international migration remains lively. The enlargement of the European Union, for example, has given millions of Europeans the opportunity to migrate, which has subsequently provided the motivation for European researchers to investigate this phenomenon.

Many recent studies have investigated the impact of immigration on the economic situation in the receiving country. However, the literature regarding the impact of emigration on sending countries remains sparse. Apart from some research conducted in the American context (i.e. Aydemir, Borjas, Hanson, Mishra) which shows a significant relationship between emigration rates and wage growth rates in sending countries, little research has been undertaken on this issue.

The aim of this study is to examine the relationship between emigration and real wage growth in the European context, based on emigration from Poland after its accession to the European Union.

Background and motivation

1 May 2004 was probably one of the most important dates in contemporary history for the 10 Central-East European countries which joined the European Union on that day, of which Poland was one. The accession was highly anticipated by Poles and it heralded the beginning of many forthcoming changes in the country's economic and social situation.

However, the Polish citizens who wanted to move to the old EU countries just after the accession were faced with the regulations of the transitional period, which restricted the openness of the European labour markets for Poles. In 2004, Polish workers enjoyed freedom of movement only to the UK, Ireland and Sweden. The rest of the markets were opened for Poles successively until 1 May 2011.

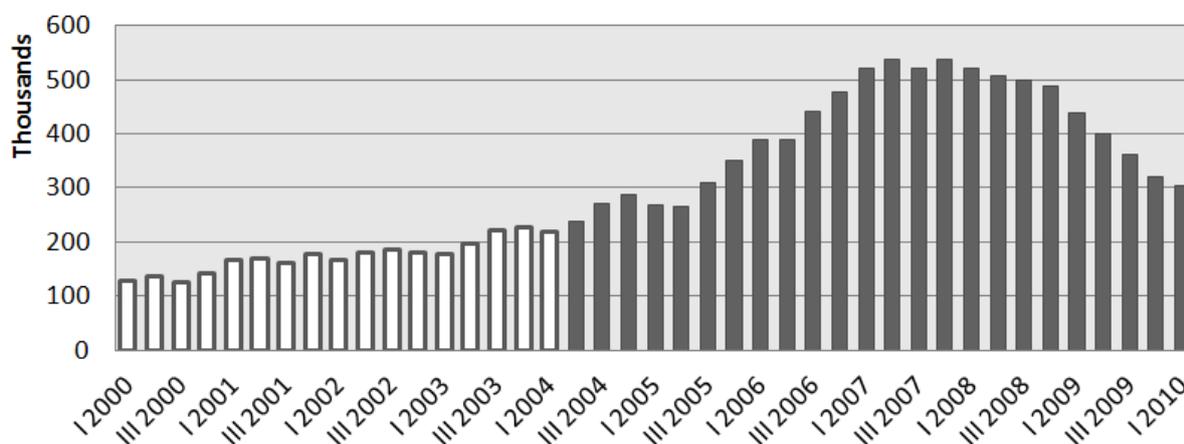
Poland's economic situation just after accession was much worse than that of the EU15. The unemployment rate in April 2004 reached 19.5%, while the average unemployment rate in the EU15 during that period was around 9%, and 4.7% and 4.6% in the UK and Ireland, respectively. For comparison, in the 3rd quarter of 2008, Poland's unemployment had fallen to under 9%, thereby reaching the European average.

In terms of earnings, the situation in Poland was also much worse than in the EU15, and especially worse than in the countries which had opened their borders to Polish workers. In terms of Purchasing Power Standard (PPS), net earnings in Poland in 2004 were about 2.4 times lower than in Ireland and 3.3 times lower than in the UK. In absolute values, these differences were even bigger, being 5.7 times lower than in Ireland and 6.7 times lower than in the UK. However, from 2004 on we observed real growth in the average wages in Poland of between 1% and 6% yearly. In PPS, the earnings of Poles were 2.2 times lower than in Ireland and 2.8 times lower than in the UK. In absolute terms, they were 4.7 times lower than in Ireland and 4.4 times lower than in the UK. The reduction of these differences may be understood as the first signs of an equalisation of wages on the markets, due to the free movement of workers. This paper intends to examine this topic.

If we consider the world economy since 2004, this period can be divided into two phases: a phase of prosperity from 2004 to 2007 and phase marked by recession from 2007 onwards. Europe's strong economic condition shortly after accession was the main reason for the high labour demand which could not be satisfied by local workforces in some countries, i.e. the UK and Ireland. These conditions motivated the increase in labour migration between new and old member states.

These trends are exemplified in Figure 1, which shows the number of Polish migrants temporarily¹ abroad in the first decade of the 21st century. Up until 2004, the number of Polish temporary emigrants was between 100,000 and 200,000. Starting in the 2nd quarter of 2004 we can observe an increase in the number of emigrants, and this trend continued until the end of 2007, when the maximum number of Polish migrants temporarily abroad reached almost 550,000. After 2007, we can observe a decline in the number of temporary emigrants from Poland. Temporary migrants constituted a significant share of the total number of Polish migrants abroad. According to the Polish Labour Force Survey (LFS), the total stock of Polish migrants abroad, including emigrants from earlier waves, rose from about 1 million in 2004 to 2.27 million in 2007, but then started to decline.

Figure 1: Stock of Polish migrants abroad (before 2007: between 2 and 12 months, later: between 3 and 12 months)



Source: Polish LFS, 2000-2010, quarterly.

The Polish LFS shows that the average post-enlargement Polish emigrant is a young man from a small city with vocational education. About 65% of post-enlargement Polish emigrants are men, about 55% are between 20 and 29 years of age, circa 32% / 38% are from small cities or villages (in terms of selectivity indexes², citizens of small cities are of higher importance) and roughly 26% have a vocational education. However, it should be noted that after accession, the importance of emigrants with tertiary education (11%) rose and the selectivity index for emigrants with tertiary education increased about 20 times, if we compare emigration before and after accession. Hence, it can be claimed that after accession, the best educated social strata in Poland began to show a substantial interest in emigration opportunities. In addition, we can observe a relatively high share of short-term migration in post-enlargement immigration. The Polish LFS indicates that about 60% of new emigrants from 2004 to 2007 were abroad for less than 1 year. In accordance with various studies (i.e. Żołędowski 2007; Kaczmarczyk/Mioduszevska/Żylicz 2009), financial incentives provided the main reason for migration and influenced the emigrants' choice of destinations, with the UK and Ireland being the most common.

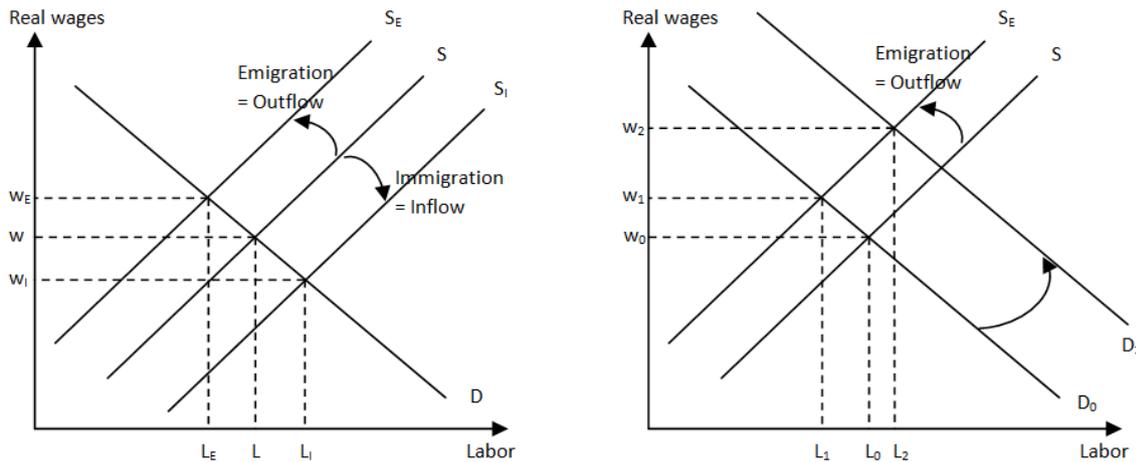
Outline of the theoretical framework

According to many theories in mainstream neoclassical economics (Ravenstein 1889; Hicks 1932; Fei/Ranis 1961; Todaro 1976), differences in wages in competitive markets, which are caused by differing levels of labour supply, can be an essential incentive for mobility. Population movements, in particular the movement of economically active populations, can result in changes in the labour supply of both the sending and the receiving markets. These changes in the labour supply are generally reflected in the process of wage equalisation between markets. However, both the size and strength of the changes in the labour supply are dependent on several factors, which in the general consist of: characteristics specific to the labour market, forms of mobility, and the migrant's individual characteristics. According to the theory, as a result, the different sizes and strengths of the changes to the labour supply caused by worker migration will have ambiguous effects on the various markets experiencing an inflow or outflow of workers.

According to the neoclassical postulate of an equalisation of wages in markets which exchange employees, we can expect wage growth in the sending country and wage decline in the host country. This simple relationship is presented in Figure 2.

As the theory points out, free labour mobility between high- and low-wage regions will decrease income inequalities over time and as a result, people will become less prone to migrate. The effects of wage growth may be intensified by a growing demand in the source country. This outcome can be expected if the source country has a growing economy, which induces the creation of new job places. Other factors that may increase labour shortages are changes in the education system, low levels of internal mobility, low levels of inter-occupational mobility, as well as long-term demographical and technological changes.

Figure 2: Impact of immigration on wages in source and host country (left) and impact on wages in the source country with growing demand (right)



The first research based on the method of econometric analysis, which aims to estimate the impact of emigration on individual wages in the sending country, has been proposed by Mishra (2006). The methodological framework for this study, however, is based on the approach originally proposed by Borjas (2003) who attempts to estimate the impact of labour supply growth caused by immigration on wages in the host country for migrants. However, both Borjas and Mishra, as well as other researchers (Aydemir, Gangon) using this methodology, have concentrated their efforts on studies of migration from Central America (mainly from Mexico, but also from Puerto Rico (Borjas 2007) and Honduras (Gangon 2010)) to North America, mainly to the United States and to Canada in later studies (Aydemir/ Borjas 2006). Among recently published studies, only a few attempts have applied Borjas' methodology outside the American context and these focus on emigration from Moldova (Bouton et al. 2009) and Lithuania (Elsner 2011). All of these studies show that a 10% decrease in the labour supply caused by emigration results in an average wage increase of 3% to 4%³. This paper's aim is to implement this methodological framework in the case of Poland and to check if the results are comparable to those obtained by other researchers.⁴

Empirical Framework

The main goal of this paper's empirical approach is to model the elasticity of wages with respect to emigration. Following the Borjas methodology, we assume that the investigated markets are perfectly competitive and we are dealing with a 3-level production function with constant elasticity of substitution (CES) in the source country.

To present the empirical application of the methodology used in this research, it is necessary to define the concept of cluster⁵, which will be understood here as a group of persons having education i and experience j at the time t . The number of clusters that the whole sample is divided into depends on the criteria of how we define levels of education and experience, as well as on the frequency of observations. The main motivation to use the cluster concept is an unequal distribution of the characteristics in the population and over time. In particular, we may expect a different tendency to migrate and different migration frequency depending on both education and age. Consequently, the estimated wage effect probably will not be identical in all clusters.

In addition, the migration size is measured by the simple coefficient m_{ijt} , which represents the supply shock on the sending labour market that is caused by emigration of workers in the ijt cluster. The coefficient is expressed by $m_{iit} = M_{iit}/N_{iit}$, where M_{iit} is the number of persons with education i and experience j who were emigrants at the time t , and

N_{ijt} represents domestic labour that has education i , experience j and is observed at the time t .⁶

The baseline regression model consists of a set of equations that bind the average individual wage of non-migrants to each cluster with a decrease in labour supply caused by emigration. This relationship can be expressed by the following panel model for the aggregate data:

$$w_{ijt} = \delta m_{ijt} + s_i + d_j + \pi_t + (s_i * \pi_t) + (d_j * \pi_t) + (s_i * d_j) + \varepsilon_{ijt} \quad (1)$$

In equation 1, w_{ijt} is the natural logarithm of the average monthly wage of workers from cluster ijt . Parameter δ estimated at variable m_{ijt} is the measure of wage elasticity with respect to emigration, and it is a percentage change of wages induced by percentage change in the labour supply caused by emigration. The main advantage of this approach is the good interpretational properties of the elasticity concept. If m_{ijt} denotes a percentage drop in the labour supply caused by emigration in cluster ijt ,⁷ the elasticity of wages with respect to emigration is defined by $\partial w_{ijt} / \partial m_{ijt} = w_{ijt} / m_{ijt} * \delta$.⁸

Equation 1 also includes a number of control variables. The first three of them s_i , d_j , π_t represent fixed effects for education, experience and time, respectively. Then we have a set of interactions: $(s_i * \pi_t)$ and $(d_j * \pi_t)$ are added to the model to control the possibility of variation of results over time for each group of education and experience, respectively, while $(s_i * d_j)$ controls the possibility that wage differences occur in the experience profile depending on the level of education. Such defined control variables enable us to capture the shocks that affect the whole sample in the same way and the shocks that impact variously on different groups of workers depending on the level of education and experience. ε_{ijt} is an error term.

Due to the uneven distribution of the characteristics in the sample, the number of individuals belonging to each cluster may vary significantly. In order to obtain representative outcomes, the regression results are weighted. Ratios of non-migrants are used as weights belonging to each cluster.

It is also possible to estimate the impact on wages caused by emigration on the individual data. In this approach, the supply shock induced by emigration is treated merely as one of many explanatory variables. If we treat the analysed database as a cross-sectional dataset, the model will be represented by the following equation:

$$w_I^{ijt} = \delta m_I^{ijt} + \beta X_I^{ijt} + \pi_t + \varepsilon_I^{ijt} \quad (2)$$

The dependent variable w_I^{ijt} represents the natural logarithm of the wage of person I which has been observed at the time t . In addition, we know about person I that he/she belongs to the group of education i and to the group of experience j . In other words, w_I^{ijt} is the wage of person I that belongs to the cluster ijt .⁹ Variable m_I^{ijt} , similar to equation 1, represents the supply shock on the labour market caused by the emigration of workers from the cluster to which the person I belongs. Thus, the parameter δ is again the measure of the elasticity of wages with respect to emigration. Expression $\beta X_I^{ijt} = \beta_1 x_{1I}^{ijt} + \beta_2 x_{2I}^{ijt} + \dots + \beta_k x_{kI}^{ijt}$ represents a number of socio-demographic explanatory variables that describe individual characteristics of person I who belongs to cluster ijt . Since the observations were conducted at different points of time, the model also includes variable π_t , which is a time control variable.¹⁰ ε_I^{ijt} is an error term.

Estimates on individual data are more complex if we observe what happens with wages of certain persons at different moments of time. It is possible to make a slight alteration of equation 2 so that it uses a panel analysis for individual data:

$$w_{It}^{ij} = \delta m_{It}^{ij} + \beta X_{It}^{ij} + s_i^I + d_j^I + \pi_t^I + (s_i^I * \pi_t^I) + (d_j^I * \pi_t^I) + (s_i^I * d_j^I) + \varepsilon_{It}^{ij} \quad (3)$$

Where one finds w_{It}^{ij} , m_{It}^{ij} and X_{It}^{ij} are defined as in equation 2. The only difference is that in equation 3 it is possible for observations of person I to take place at different moments of time. If we have a balanced panel sample, then $I = 1, \dots, n/t$ where n is the sum of all

observations from all moments of time and t is the number of waves. Variables s_i^l , d_i^l and π_t^l represent fixed effects that control education, experience and time, respectively. Interactions ($s_i^l * \pi_t^l$) and ($d_i^l * \pi_t^l$) control the possibility that the level of education or experience of person I changes over time and interaction ($s_i^l * d_i^l$) controls the impact of the experience variable at different levels of the education variable. Finally, ε_{it}^{ij} represents an error term.

Data and summary statistics

The empirical analysis is based on the Polish Labour Force Survey, which is conducted on a quarterly basis. The data used for the measurements are from the Q1 2004 to Q4 2009. A sample of about 10 thousand observations is drawn from each wave of the survey sample. The following restricted sample was used for some parts of the regressions: Q1 2004 to Q2 2007. The restricted sample is used to eliminate possible disturbances caused by the recent economy slump from the model.

To define the clusters 6 levels of education (tertiary, more than secondary but tertiary not finished, secondary, secondary-technical, vocational, primary or lower), 9 levels of experience¹¹ (no more than 2, 5, 10, 15, 20, 25, 30, 35, 40 years on the labour market), 6 / 24 moments of time for aggregate and individual data are used, respectively.

A preliminary analysis of the key variables shows that coefficient m_{ijt} increases from 2004 to 2007 and then rapidly drops for all education and experience groups. In addition, the real wage¹² increases, but not-linearly, throughout the whole sample. There is a strong correlation between coefficient m_{ijt} and real wages in the period of prosperity. If we consider all respondents, the correlation is about 0.87; for respondents with more than tertiary education it is 0.98, with vocational education it is 0.97 and with secondary education it is 0.88.

Results and interpretation

Aggregate Data

The individual data was aggregated into 324 clusters¹³. The average real wages and emigration ratio m_{it} have been calculated for each cluster. The estimation results for both the whole sample and the period of prosperity only are presented in Table 1.

Table 1: Results for aggregate data

Period	2004-2009						2004-2007 (prosperity period)					
	Not weighted			Weighted			Not weighted			Weighted		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
delta (p-Value)	-0.2859 (0.002)	-0.3309 (0.000)	-0.1755 (0.171)	-0.2971 (0.000)	-0.2971 (0.000)	-0.1612 (0.119)	0.2411 (0.077)	0.1126 (0.359)	-0.0724 (0.647)	0.1794 (0.038)	0.1794 (0.038)	-0.0638 (0.605)
fixed effects	yes	yes	yes	yes	yes	yes						
edu*exp	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
year*edu year*exp	no	no	yes	no	no	yes	no	no	yes	no	no	yes

Notes: values in brackets indicate p-Values for the given coefficients.

Without any further investigation, the results are inconclusive. However, the regularity in terms of the sign of the estimated coefficient δ at m_{it} takes place in the results. The negative and significant coefficients appear in the regressions for the whole sample, whereas in the regressions for the restricted sample the estimated significant coefficients are positive. However, the analysis on the data from 2004 to 2009 is done at the risk of estimating on a sample that includes two heterogeneous periods: prosperity and recession. This fact not only underlines the need to control the occurrence of two heterogeneous periods in the estimated models but even legitimates the decision to focus only on the restricted sample in the period of prosperity.

Another exercise that was done for the aggregate data refers to the different ways for controlling time. The results shown in table 1 were obtained with the assumption of controlling time using the yearly dummy. Now the time variable will be represented by the binary variable that equals 1 when the observation is from the period of prosperity and equals 0 if the observation belongs to the recession period. We assume that controlling time by distinguishing prosperity and recession periods and not by controlling each year separately better describes the problem of the studied phenomenon.

Table 2: Results for aggregate data – time controlled by prosperity-recession variable

Period	2004-2009					
	Not weighted			Weighted		
Regression	(I)	(II)	(III)	(I)	(II)	(III)
Version						
delta	-0.1205	-0.1866	0.2330 *	-0.1078	-0.1078	0.3777 ***
fixed effects	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes
up*edu up*exp	no	no	yes	no	no	yes

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

For both regression types, weighted and unweighted, we received similar results. The estimated significant coefficients are positive. These results are coherent with the results from Table 1 for the restricted sample. These findings may be treated as another conformation that it is crucial to distinguish between prosperity and recession periods in the cases being analysed.

The received coefficients δ from the analysis of the aggregate data are between 0.18 and 0.38, which may be interpreted in the following way: a 10% decrease in the labour supply due to emigration causes a 1.8-3.8% increase in wages.

Individual data

The analysis of the individual data is divided into two parts and each part employs a different theoretical model and data type. The first results of the cross-sectional analysis will be presented, followed by the findings from the panel analysis.

The conclusions drawn from the analysis of the aggregate data show the heterogeneity of the analysed period. In this case it is much safer to focus on the shorter and homogenous sample. Otherwise, it is possible that the received results are either insignificant or significant but biased. The period of prosperity from 2004 to 2007 will be used to assess the individual data below.¹⁴

Table 3 presents the results for the cross-sectional data.

Table 3: Results for individual data – cross-sectional analysis

Period	2004-2007					
	4 levels of education			9 levels of education		
Regression	(I)	(II)	(III)	(I)	(II)	(III)
Version	(I)	(II)	(III)	(I)	(II)	(III)
delta	0.4942 ***	0.1632	0.0717	0.2321 **	0.2911 **	0.1591
fixed effects	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes
year*edu	no	no	yes	no	no	yes
year*exp	no	no	yes	no	no	yes

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

The proper selection of control variables in such models is of crucial importance. Two sets of regression results that control education levels differently are presented in Table 3. In one case, only 4 levels of education are distinguished, whereas 9 levels are distinguished in other cases. However, similar results were received in terms of the sign of the estimated coefficient for both regression sets. If only significant, it varies from 0.23 (for a 9-level education controlled regression) to 0.49 (for a 4-level education controlled regression). In other words, we conclude from the analysis of the cross-sectional data that a 10% decrease in labour supply due to emigration causes a 2.3-4.9% increase in wages, depending on the assumptions.

Finally, Table 4 contains the results of the panel analysis conducted on the individual data. Similar to the cross-sectional analysis, the results are presented for different levels of the education control variable.

For both regression types, two out of four sets of control variables gave significant results. The coefficient δ varies from 0.19 to 0.27 for the 4-level education control variable and from 0.23 to 0.45 for the 9-level education control variable.

Table 4: Results for individual data – panel analysis

Period	2004-2007							
	4 levels of education				9 levels of education			
Regression	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
Version	(I)	(II)	(III)	(IV)	(I)	(II)	(III)	(IV)
delta	0.1931 **	0.2694 ***	0.0516	0.0766	0.1542	0.4514 ***	0.2274 **	0.1397
fixed effects	yes	no	yes	yes	yes	no	yes	yes
edu*exp	no	yes	yes	yes	no	yes	yes	yes
year*edu	no	no	no	yes	no	no	no	yes
year*exp	no	no	no	yes	no	no	no	yes

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

Thus, the results received from the panel analysis oscillate around the same values as the results received from the cross-sectional analysis. The mean of all significant coefficients received from regressions on the individual data is around 0.34. This leads to the conclusion that on average, and depending on assumptions, a 10% decrease in the labour supply due to emigration causes about a 3.4% increase in wages. This result seems to coincide with the results of the aggregate data where the coefficient varied from 0.18 to 0.38.

Models of the individual data also offer additional information regarding the impact of many other characteristics on wages. Table 5 presents the sign, minimum and maximum coefficients that were received at variables from vector X (see equations 2 and 3) in all regressions conducted on individual data.

Table 5: Results for individual data – individual characteristics

Variable		Sign	min	max
sex (0 – man, 1 – woman)		negative	-0.2557	-0.2456
age		positive	0.0004	0.0616
age ²		negative ¹	-0.0006	0.0001
place of residence (0 – village, 1 – small city < 100k, 2 – big city > 100k)	1	positive	0.0201	0.0273
	2	positive	0.1185	0.1311
marital status (0 – single, 1 – married, 2 – widow/er, 3 – divorced)	1	positive	0.0611	0.0747
	2	positive	0.0364	0.0520
	3 ²	positive	0.0034	0.0212
Employment sector (0 – public, 1 – private)		negative	-0.0410	-0.0202
0 – full-time job, 1 – part-time job		negative	-0.7122	-0.5722

¹ Positive exception for one cross-sectional regression. ² Insignificant in all regressions.

It may be concluded from the values presented in Table 5 that women earn significantly less than men (about 25%) and that earnings increase with age. Place of residence is the other factor which differentiates the earnings of respondents; the more populated the respondent's place of residence is, the bigger his earnings. In terms of marital status, married respondents whose earnings are about 7% higher than the earnings of single respondents are in the best position. Respondents employed in the private sector declared earnings that were about 3% smaller than those employed in the public sector. This result was the only one that contradicted general preconceptions. A possible explanation of this result is the fact that, in this case, the private sector also includes those who have only part-time jobs, i.e. students, and are still dependent on their parents. Additionally, this is in accordance with the last finding: respondents employed on a part-time basis earn about 60% less than those employed full-time. However, it is necessary to remember that the dependent variable in these regressions was defined as monthly wage and was not recalculated to a 1-hour rate of pay.

Estimates for sub-populations

The last exercise that was done in this research was aimed at calculating the elasticity of wages with respect to emigration for different socio-demographic groups. There are two possible approaches to conducting this research. The elasticity of wages for each socio-demographic group may be measured by taking into account only emigrants who belong to this particular socio-demographic group; or, it may be assumed that employees from different socio-demographic groups are substitutes on the labour market and the elasticity may be measured by taking into account emigrants from all groups. In the analysis done in this paper, it was assumed that, on the labour market, men are substitutes for women, people from different age groups are substitutes across groups and those who work in the private sector are substitutes for those who work in the public sector¹⁵.

The analysis of panel individual data for the period of prosperity was used for the measurements. Similarly to the previous subsection, the results are presented for two versions of the education control variable: 4-level and 9-level. At first it was checked to see if there were any differences in the estimated elasticity depending on the sex of respondents. The results for this characteristic are presented in Table 6.

The results obtained for men differ significantly from those obtained for women. The estimated elasticity for men is positive and oscillates around the same values as the elasticity estimated for the whole sample. Elasticity for men only, however, has a smaller variance and a slightly bigger mean than elasticity for the whole sample; it varies from 0.32 to 0.42, depending on assumptions. The same coefficient for women is insignificant in all regressions, but it is worth noting that it is negative. This fact may be interpreted in the following way: emigration is not a significant factor in the process of wage adaptation for women, who

emigrate relatively less often than men. However, a decrease in the labour supply caused by emigration is more likely to result in a decrease in women's wages than an increase.

Table 6: Results for individual data – sub-populations, sex

Reg.	Sex = man						Sex = woman					
	4 levels of education			9 levels of education			4 levels of education			9 levels of education		
Version	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
delta	0.348**	0.191	0.192	0.322**	0.423**	0.248	-0.041	-0.101	-0.052	-0.066	-0.014	0.008
fixed eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
year*edu	no	no	yes	no	no	yes	no	no	yes	no	no	yes
year*exp												

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

Another characteristic that was used to check the stability of the estimated elasticity in the sample was age. 3 age groups were defined: under 30, between 30 and 44 and over 44. For each of these age groups we estimated the elasticity of wages with respect to emigration, which is presented in Table 7 (4-level education control variable) and in Table 8 (9-level education control variable).

Table 7: Results for individual data – sub-populations, age (4 levels of education)

Reg.	4 levels of education								
	<30			30-44			>44		
Version	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
delta	0.341 ***	0.236 *	0.265 *	-0.430 ***	-0.484 ***	-0.482 ***	0.122	0.101	0.01
fixed eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes	no	yes	yes
year*edu	no	no	yes	no	no	yes	no	no	yes
year*exp									

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

Table 8: Results for individual data – sub-populations, age (9 levels of education)

Reg.	9 levels of education								
	<30			30-44			>44		
Version	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
delta	0.153	0.339 **	0.368 **	-0.243 *	-0.282 **	-0.268 *	0.137	0.165	0.029
fixed eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes	no	yes	yes
year*edu	no	no	yes	no	no	yes	no	no	yes
year*exp									

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

In terms of the significance, the results from tables 7 and 8 are coherent. Emigration seems to be the significant factor in the process of wage adaptation for respondents under 30 and between 30 and 44. The insignificance of the estimated coefficients for the oldest age group can be easily explained by the fact that the emigration phenomenon is very rare among the oldest respondents.

If we look closer at the results in Tables 7 and 8, we will realise immediately that the coefficients for the youngest and the middle age groups differ significantly. The estimated elasticity for respondents under 30 is positive and varies from 0.23 to 0.37, (depending on assumptions). The elasticity for respondents between 30 and 44 is negative and varies from 0.48 to -0.24, depending on assumptions. In other words, a 10% decrease in the labour supply

due to emigration among respondents under 30 causes about a 2.3-3.7% increase of real wages. Among respondents between 30 and 44, it causes roughly a 2.4-4.8% decrease of real wages.

A possible interpretation of these results is the fact that respondents between 30 and 44 are usually employed in better-paid positions than the youngest respondents. When companies suffer from the emigration of their middle-age employees, they can easily find new candidates from the youngest age group without increasing the wage rate that was assigned to a vacant position. For the youngest employees being promoted to a position previously occupied by middle-age employees, it is still satisfactory.

In the case of emigration from positions usually occupied by the youngest employees, the companies' policy has to be different. It can be assumed that they attract new employees with vacancies that appeared due to emigration by increasing wage rates.

The last characteristic that was used to divide the sample to smaller sub-populations was the sector of employment. Results are presented in Table 9.

Table 9: Results for individual data: sub-populations, employment sector

Reg.	Public						Private					
	4 levels of education			9 levels of education			4 levels of education			9 levels of education		
Version	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
delta	-0.203	-0.368***	-0.340**	-0.103	-0.133	-0.052	0.277***	0.124	0.172	0.213**	0.280**	0.180
fixed eff.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
edu*exp	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
year*edu												
year*exp	no	no	yes	no	no	yes	no	no	yes	no	no	yes

Notes: ***, **, * indicate significance of 1%, 5% and 10%, respectively.

When this sector of employment was treated as the one of explanatory variables, see Table 5, the relationship that was detected between the sector of employment and wages contradicted common perceptions. However, if we estimate elasticity for the smaller sub-populations that characterise being employed in one of these sectors, we get interesting results. The elasticity is negative for the public sector and it oscillates around -0.35, and for the private sector it is positive and oscillates around 0.25. In other words, a 10% decrease in labour supply due to emigration in the public sector causes about a 3.5% decrease in real wages, and in the private sector it causes roughly a 2.5% increase in real wages. These results may be explained by the fact that only in private sector do we have to contend with the process of wage adaptation which is powered by differences in supply and demand on the labour market. In the public sector, wage rates are very often an effect of trade unions' negotiations with the government. Nominal wages in the public sector being "frozen" for a long time result in a decrease of real wages¹⁶.

Conclusion

This paper set out to answer the question if emigration has an impact on the economy, and in particular, on the wages of the sending country. Neoclassical economic theories suggest that, at least in the short run, we should expect the phenomenon of the equalisation of wages on markets that exchange employees. Consequently, wages in the sending country should increase.

This paper used micro data from the Polish Labour Force Survey (2004-2009). The analysis conducted on this dataset showed a significant relationship between emigration and real wage growth. However, it has to be noted that the results may differ if we consider a sample that include periods that are not homogenous in terms of general economic conditions. The researched phenomenon is sensitive to the general condition of the economy, and different results might be obtained for prosperity and recession periods, separately. In this

paper, we focused on the homogenous, period of prosperity in which a 10% decrease in the labour force caused by emigration brought about a 2-4% increase of wages, depending on assumptions.

The dataset was divided into different socio-demographic groups defined with regard to sex, age and employment sector. By way of this procedure, significant differences in the estimated elasticity of wages with respect to emigration were detected. In particular, the wage effect is much stronger for men than women and for women it is even doubtful if emigration takes part in the wage adaptation process. Age is the other factor that differentiates elasticity. The highest elasticity characterises employees under 30, and the lowest, even strongly negative elasticity, characterises employees between 30 and 44. Finally, the sector of employment influences the elasticity as well. In the private sector the elasticity is positive and in public sector it is negative.

This study focused only on the Polish case and some differences in elasticity were detected, depending on the socio-demographic conditions of the analysed sample. However, this paper leaves a field open for further investigations which could focus on different countries, regions or economy sectors, on the one hand, and take more variables into account, so as to minimise the results' bias, on the other hand.

Notes

- ¹ Temporary migrants from Poland are defined (according to Polish LFS) as Polish citizens who reside abroad for longer than 2 months (from 2007 for longer than 3 months) but shorter than 1 year.
- ² Selectivity index counted from the statistical formula used in demographic researches (Mioduszevska 2008; Kaczmarczyk/Okólski 2008). Selectivity index is a measure that shows in a syntactical way a scale of selectivity phenomenon in the chosen population with respect to the chosen feature.
- ³ The only exception is the Honduran case, where 10% decrease in labour supply caused by emigration resulted in increase of wages by about 11%.
- ⁴ See also Boeri/Brücker 2004; Budnik 2007/2008; Kahane/Zimmerman 2009; Kicing/Weinar 2007
- ⁵ Skill group (see Borjas 2003).
- ⁶ The usage of the percentage of emigrants as a measure of supply shock caused by emigration on the domestic labour market has been used by Mishra (2006) and is analogous to the use of the percentage of immigrants to measure supply shock caused by immigration on the labor market of the host country (Borjas 2003 and 2007; Aydemir/Borjas 2006; Friedberg 2001; Altonji/Card 1991, among others).
- ⁷ The alternative method to estimate equation 1 (Borjas 2003) is to denote m_{ijt} as a ratio of emigrants from cluster ijt to the total number of migrants and non-migrants (taken together) from cluster ijt :

$$m_{ijt} = M_{ijt} / (M_{ijt} + N_{ijt})$$
Then the elasticity of wages with respect to emigration is equal to:

$$\partial w_{ijt} / \partial m_{ijt} = \delta / (1 - x_{ijt})^2$$
where $x_{ijt} = M_{ijt} / N_{ijt}$.
- ⁸ If the elasticity of wages with respect to emigration is for example $\delta = 0,2$ it means that a 10-percent drop in labor supply in cluster ijt caused by emigration of workers belonging to this cluster resulted in a 2-percent wage increase in this cluster.
- ⁹ As In equation 2, the data are treated as cross-sectional dataset, superscripts are informational only. In addition, $ijt = 1, \dots, i^j * t$ and $I = 1, \dots, n$ where n is the total number of observations in all periods.
- ¹⁰ The variable is decomposed to t binary variables that are equal to 1 if the observation comes from a moment of time t and that is equal to 0 in other cases.
- ¹¹ Experience is calculated from respondents' age and education. I assume that respondents with more than secondary education enter the labor market at 23, with secondary education at 19, with vocational education at 16 and with primary or lower education at 15.
- ¹² Real wage is approximate by income from the main workplace corrected by the inflation rate.
- ¹³ 324 clusters = 6 education levels * 9 experience levels * 6 years.
- ¹⁴ In all regressions for individual data, time is controlled by yearly dummy.
- ¹⁵ Across sectors (sub-populations) we might observe spillover effects (error terms for them might be correlated). One needs to bear in mind that the results for some sub-populations may be biased and consequently they should not be discussed in isolations from the results for other sub-populations and for the

whole sample.

¹⁶ See i.e. Ustawa Budżetowa na rok 2011 (*eng. Budget Act 2011*) that freezes wages in the public sector.

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