

The Effects of Interregional Wage Differentials on Linguistic Heterogeneity

Daniel Pop
Associate Lecturer
Faculty of Political Science
“Babes-Bolyai” University
Romania

Abstract

Explanations dealing with the ethnic composition of local labour markets focus on the role community and the political choices have in minority policy rather than that of economic factors. The article proposes to contribute to the literature by inquiring about the effects of income differentials driven voluntary labour migration has on minority groups. The cases are Hungary, Romania and Transylvania (the north-western province of Romania). The study finds that large enough wage differentials produce unidirectional migration to the region with higher wages. To evaluate the effects of such type of migration, a three-level hierarchical CGE model is applied. The findings indicate that, under conditions of sufficiently large interregional wage differentials, linguistic match between the receiving region and a segment of labour in the source region might lead to the selection of migrant labour speaking the local language. The general conclusion is that labour liberalisation under conditions of significantly large wage differentials and language preferences on the host market produces language homogenization in formerly mixed regions.

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1. Introduction

Uneven economic growth and social development persist both at national and supranational levels. The cumulative effects of these disparities on capital mobility, price flexibility and voluntary interregional migration have been studied extensively. Yet, the issue of how international income disparities influence the evolution of language heterogeneity in sub-national labour markets remains understudied.

Voluntary labour migration among local markets in Central and Eastern Europe becomes an increasingly important issue for analysis, as in this region language borders cross over state borders. Over the last fifteen years these countries have undergone significantly different transitional paths leading to increasing differentials in economic growth and social development. The result is that migration pressures among these countries have strengthened. What is specific to this new pattern of migration is the language dimension, due to the fact that language borders cross over state borders.

The analysis focuses on evaluating the extent to which voluntary labour migration has a language dimension for the case of Hungary as well as the implications of this migration on the language heterogeneity of the main source region. The article seeks to find out to what extent the knowledge of the language spoken in the local labour market is relevant for migrant labour selection in Hungary. Then some of the possible implications of this phenomenon on the source regions' language mixture are discussed.

The article has three parts. First, we inquire about the extent to which voluntary labour migration is language defined and whether it leads to ethnic homogenisation in the source regions or not. In this case the emphasis is on the origin of labour migrants and the type of migration we are dealing with for the case of

Hungary. Second, we look at the target region's policy problem by focusing on the need to maintain the competitiveness of the economy relying on the quasi-reserve labour from the neighbouring countries. In this case we study the labour demand and supply equilibrium for the general economy and for specific sectors in Hungary. Finally, we discuss the implications of this new pattern of migration for the labour market of the source region. Namely, we look at the issue of labour loss and the dwarfing of the minority in different stages of the economic development.

2. Background and hypotheses

A supranational regional economic space characterized by local labour markets with significantly large interregional income differentials creates labourers incentives to migrate to those labour markets where they have the possibility of earning higher wages. The labour migration literature distinguishes two possible effects of such migration on the local economy of the supranational economic space.

First, migration reduces labour stock in the lower-income or source labour market. The nature of the economic impact on the source region depends on the occupation sector and the activity level of the labour stock that migrates. In the case in which it is surplus labour that migrates, the impact is positive, as the economic and social burden associated with the costs of sustaining inactive labour is reduced. However, if it is active labour that migrates, this leads to labour scarcity. As a consequence, firms face higher labour costs, which then reduce their competitiveness.

Second, in the higher-income or recipient region with high growth rate, immigration could lead to either oversupply of labour or to the reduction of sector specific labour shortages. In the first scenario, the presence of migrant labour results in a reduction of wages. Labour costs decrease and native labourers' level of

satisfaction decreases as they lose their jobs to the immigrant labour. In the second scenario, migrant labour fills open positions that the local economy is unable to supply. The role of migrant labour in this case is to reduce the growth bottleneck attributable to labour shortage. In both scenarios firms become more competitive within the supranational economic space.

We evaluate the effects of labour migration in a setting of three regions: Hungary, Romania, and Romania's north-western province, Transylvania. Out of the three regions it is Transylvania which is linguistically mixed, the two main languages spoken being Hungarian and Romanian. Hungary presents a substantively larger wage rate than the other two regions. To evaluate labour migration patterns and the way these affect the language composition in Transylvania, we propose to test the following two hypotheses:

- H 1.** *The level of interregional wage differentials is large enough to produce unidirectional interregional labour migration.*
- H 2.** *If interregional differentials are large enough, then there is a market driven selection of labour based on the language differentials of migrants.*

If the above hypotheses are verified, it will explain – complementary to the provisions of the literature linking nationalism and labour market segregation – some of the selection process of migrant labour based on their language knowledge. Also, it could help rephrase the instruments used in designing and implementing current minority, immigration and labour policy in Central and Eastern European countries with large national minorities.

3. Case study

The case study regions, as already mentioned, include Hungary, Romania and the north-western region of the latter, Transylvania. The period under study covers the period from 1995 to 1999. The year 1999 is considered to be the benchmark year for the analysis. Given the fact that the data on international labour migration is recorded in the target country, we will use mainly Hungarian data to proxy the migrating behaviour of Hungarian speakers from Transylvania. In the period considered, Hungary had a positive balance of migration. Each year the number of immigrants ranged from 13,000 to 20,000 individuals. In contrast, the number of emigrants was situated below 2,000 each year.

We distinguish among migrant labourers in Hungary based on their legal status following Hungarian legislation on migrant labourers¹. Thus, on the one hand, we have migrant citizens holding valid work permits, and on the other hand, permanent residents. According to the Hungarian legislation, work permits are not time but workplace specific. Foreign citizens can apply for a work permit if a job is offered to them in accordance with the provisions of the law, which offers primacy to native labour. Work permits need to be renewed on a yearly basis.

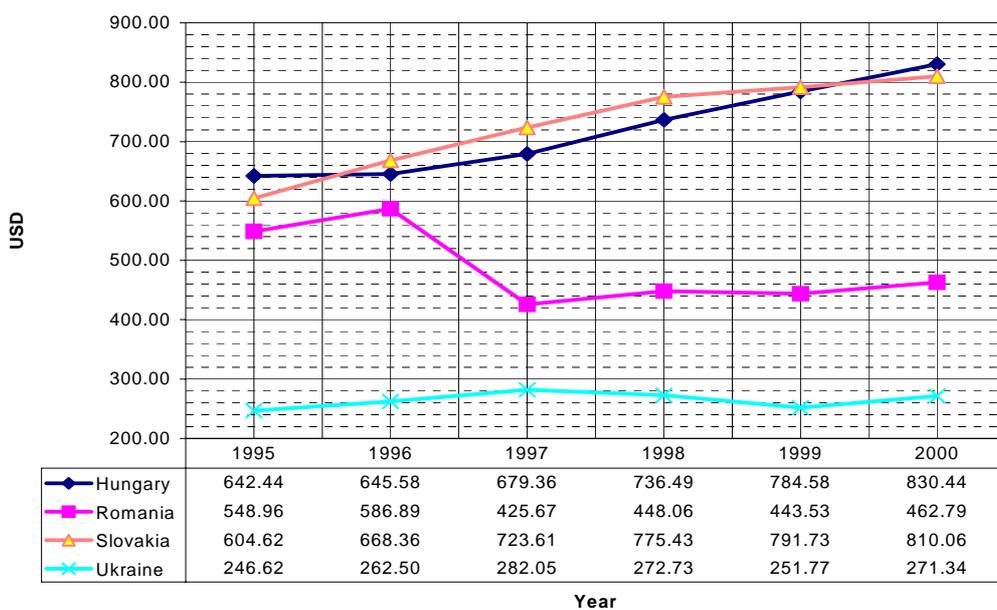
Once the labour contract at a given workplace is dissolved, the work permit loses its validity, and thus the foreign citizen in question loses his/her status in Hungary. To accept a new job and regain legal status, foreign citizens need to apply for a new work permit. In what regards permanent residence permits for migrant labour, they are issued after at least one year of legal employment, based on the provision of the law. Country quotas in Hungary were introduced only in 2001. Since then the yearly quota has never been reached.

4. The migration rationale

We now wish to see if there are only unidirectional migration trends between Romania (including Transylvania) and Hungary. If this is shown, we can qualify the supposed market driven migration of labour without distinguishing among multidirectional effects. This condition is relevant only for complexity reasons. The unidirectional scenario is a particular case of a possibly more complicated pattern of cross-hauling in international labour movement.

We conceptualise migration decision as the utility maximisation problem of migrant labourers. According to this, people choose to migrate to a foreign labour market in the prospect of a higher income. Given our competition concept, once a job is secured by a migrant labourer, the prospect of better remuneration is already realized. Below we present the average monthly income for every year of the 1995 to 2000 period, in terms of purchasing power parities to USD (Figure 1).

Figure 1 Average monthly gross rate, PPP/USD



The figure shows that in terms of purchasing power parities to USD, national gross wages (including pensions) in Hungary experienced a significant ascending tendency. Thus, if at the start of the period PPP gross wages in Hungary were 642.44 USD; by 1999 they were 784.58 USD. This represents a more than 20 per cent increase in the real value of gross wages. In contrast, in Romania, 1997 represents the year of a sudden devaluation of gross wages in terms of PPP/USD, which led to an almost 40 per cent depreciation of all wages. This dramatic loss was not recovered by the end of the period. In 1999 wages were 443.53 PPP/USD, over 20 per cent less than in the start year 1995. Thus, the wage gap between the Hungarian and Romanian labour market almost quadrupled, from 93.48 to 341.05 PPP/USD. These data sustain the fact that the level of wage differentials between Hungary and Romania is large enough to produce the rationale for migration to Hungary.

5. The policy environment

As of now, we cannot speak about unrestricted labour migration between Romania and Hungary. Hungarian policy-makers need to choose the immigration policy that achieves stated policy goals. Therefore, they need to set the proportion among native labour (L_i^n), Hungarian speaking migrant labour ($L_i^{m.H}$) and non-Hungarian speaking migrant labour ($L_i^{m.NH}$).

At one extreme, there is the choice to completely prohibit foreign citizens' access to the national labour market. In this case, the proposed 'nests' in our model collapse into a two-level nest as $L_i^{m.H}$ and $L_i^{m.NH}$ become equal to zero and consequently $L_i = L_i^n$, where L_i represents Hungarian labour force. In this policy

context the labour stock would exclusively be formed by native labour, and migrant labour would have no access to the Hungarian labour market. The direct effect of this choice would be an increase in labour costs (due to scarcity of skilled labour and extensive training costs of unskilled labour) and increased inflexibility of the Hungarian labour market.

At the other extreme, the access to the Hungarian labour market could be fully liberalised, with no restrictions on foreign labour's access to the local market. Under these conditions, the proposed functional form would still hold, only that the nature of competition changes. Competition on the labour market would no longer be based on skills, but would become a price competition (certainly not below the minimum wage level, at least on the official labour market) for the least expensive labour force.

Currently, the Hungarian immigration policy allows foreign labour to be offered employment only if equally qualified native labour is not available. As a consequence, at least theoretically, it is not labour price but the skills possessed that are most important. Hungarian labour possessing the required skills should be employed even if more expensive than migrant labour. We conceptualise this policy context as based on competition among migrant labourers for the vacant job opportunities, while protecting local labour force. From a legal perspective, migrant labourers are not discriminated based on their nationality and ability to speak the local language. The only selection mechanism is defined by the skills required for the positions left vacant by native labour.

Based on the above, we need to describe the competition of migrant labour for jobs on the Hungarian labour market, as well as the effects this might have on the source migrant communities in Transylvania. Also, there is the issue of evaluating the possible impact of policy change for the evolution of the Hungarian labour market. If

at present migrant labourers from main source regions may only compete for the positions left vacant, what will happen after their accession to the European Union, when they will qualify for any position available in the whole labour market?

We say that the Hungarian labour force L_i is composed of native labour L_i^n , and migrant labour L_i^m . Formally:

$$L_i = L_i^n + L_i^m \quad (1)$$

Native labour is composed of skilled and unskilled, that is:

$$L_i^n = L_i^{n,S} + L_i^{n,NS} \quad (2)$$

Migrant labour with legal status in Hungary is composed of Hungarian speaking and non-Hungarian speaking labour, that is:

$$L_i^m = L_i^{m,H} + L_i^{m,NH} \quad (3)$$

If there is a job opening, the possibilities are that native labour either qualifies and fills the job or does not qualify and leaves it vacant. Certainly, non-skilled native labourers might be trained, but this creates extra costs and also requires time. If the job is left vacant, we have Hungarian speaking and non-Hungarian speaking migrant labour competing for the job. The result of this conceptualisation is that the price of labour as the co-ordination mechanism of the labour market is substituted by policy choices regarding labour migration regulation. This is why native and migrant labourers do not compete with each other on the Hungarian labour market. Instead, migrant labour complements the available labour stock.

At certain times and locations, when the recipient labour market is unable to cope with the skills shortage relying exclusively on the native labour force, properly skilled migrant labour is invited or allowed to participate in the Hungarian labour market. In this conception, opening up the labour market for skilled migrant labour is

a form of productivity enhancement. We might say that skilled migrant labour is the supplement of unskilled or internally immobile skilled native labour.

On the supply side, the lack of sufficient labour with the skills required by the market constitutes into labour market rigidity. This is due to a series of factors related to the speed of changes in skills requirements. From the perspective of firms, we consider unskilled and skilled but internally immobile native labour as being more costly than migrant labour having the skills required by the given job opportunity “here and now”. If the price mechanism were sufficient to clear all labour markets instantaneously, we would not have labour migration until all native labour would be employed. But if this is not the case, we have the situation of both labour migration and unemployment. Also, low levels of internal mobility may further add to the shortage of skilled labour in the Hungarian labour market characterized by fast development.

Labour migration implies the seeking of higher income for a similar job. For instance, a high school teacher’s salary in Romania ranges from 80 to 120 USD, while in Hungary it varies between 300 and 350 USD. Thus, if a high school teacher migrates from Romania to Hungary, he/she should earn 220 to 230 USD more than before. Even after adjusting for the purchasing power parity differences between the two countries, there remains a considerable net benefit.

6. The source countries of labour migrants

The total number of foreign citizens holding valid work permits in Hungary increased from 116,638 in 1995 to 124,975 in 1999. The pool of source countries includes countries from all continents. For the purposes of this analysis we split source countries into two groups. First, there is the group of neighbouring countries with a

significant Hungarian ethnic population. These countries include Romania, Slovakia, Ukraine and former Yugoslavia. The latter is not considered due to lack of consistent data, mainly explainable by the recent redrawing of political boundaries. During the period under study, Romania, Slovakia and Ukraine were the source countries of between 57 per cent and 65 per cent of migrant labour with valid work permits (Table 1) issued annually. The second group includes the countries without significant Hungarian ethnic groups (i.e. all the countries that are not part of the first group).

Table 1
The number and share of foreign citizens with valid work permits
based on the two groups of countries

	1995	1996	1997	1998	1999
Group 1 – Romania, Slovakia, Ukraine	12,691 60.41%	10,866 57.91%	12,374 60.71%	13,523 60.19%	18,628 65.43%
Group 2 – Rest of the World (RoW)	8,318 39.59%	7,897 42.09%	8,008 39.29%	8,943 39.81%	9,841 34.57%
Total	21,009 100.00	18,763 100.00	20,382 100.00	22,466 100.00	28,469 100.00

Source: Sándor Illés and Éva Lukács - Migration and Statistics, Research Report no. 71. Hungarian Central Statistical Office, 2002/1, p. 73

The data show that the relative share of the two groups did not change significantly by the end of the period under study. In 1995 it was a balanced 60.41 per cent to 39.59 per cent. In the following year it narrowed. In 1997 (60.71 per cent and 39.29 per cent) and 1998 (60.19 per cent and 39.81 per cent) the ratio almost repeated the one registered in the base year, while in 1999 the gap increased (65.43 per cent to 34.57 per cent). In terms of absolute numbers, migrant labour with a valid work permit from Group 2 diminished in the first years, but by the end of the period it registered an increase with almost 1,500 permits. Compared to this, migrant labour with a valid work permit from countries belonging to Group 1 expanded by more than 50 per cent by the end of the period (from 12,691 to 18,628).

Now if we turn to the tendencies of each individual country within Group 1 we observe quite different evolutions (Table 2).

Table 2
The number and share of foreign citizens with valid work permits in Hungary within Group 1

	1995	1996	1997	1998	1999
Romania	9,808 77.28%	8,526 78.46%	9,478 76.60%	10,610 78.46%	14,132 75.86%
Slovakia	662 5.22%	428 3.94%	425 3.43%	469 3.47%	972 5.22%
Ukraine	2,221 17.50%	1,912 17.60%	2,471 19.97%	2,444 18.07%	3,524 18.92%
Total	12,691 100.00	10,866 100.00	12,374 100.00	13,523 100.00	18,628 100.00

Source: Sándor Illés and Éva Lukács - Migration and Statistics, Research Report no. 71. Hungarian Central Statistical Office, 2002/1, p. 73

Romania is the largest country with citizens holding valid work permits on the Hungarian labour market. The share of Romanian workers in Hungary compared to the other two Group 1 countries was above 75 per cent each year. This is also illustrated in Table 3, which presents the share of Romanian citizens with work permits in Hungary to Group 1 and to the number of total labour migrants. In 1996 the number of Romanian labour migrants decreased. Nevertheless, by 1999 the number of Romanian citizens with valid work permits increased by almost 50 per cent compared to the base year 1995.

In 1995 the number of Slovakian citizens with valid work permits registered a modest number of 662, representing 5.22 per cent of migrants from Group 1 countries and 3.15 per cent of overall migrants. By year 1999 the number of Slovakian citizens with work permits increased with almost 50 per cent, becoming 972. This increase implied that Slovakia maintained its relative weight (5.22 per cent) among Group 1 countries.

Table 3
The number and share of Romanian citizens immigrating to Hungary compared to Group 1 and total migrants

	1995	1996	1997	1998	1999
Romanian migrants	9,808	9,526	9,478	10,610	14,132
Share to Group 1	77.28%	78.46%	76.60%	78.46%	75.86%
Share to total migrants	46.68%	45.44%	46.50%	47.23%	49.64%

Source: Demographic Yearbook 2001, Hungarian Statistical Office, pp. 94-95

The case of Ukraine shows a similar trend. The only difference is that the number of workers with valid work permits increased with over 65 per cent compared to the base year. The number of Ukrainian workers with valid work permits grew from 2,221 in 1995 to 3,524 in 1999.

From these we can see that – after a short setback in 1996 – Hungary registered a significant increase in the number of migrant workers with valid work permits. The increase was of 35 per cent over the five-year period under study, reaching 28,469 in 1999, compared to 21,009 in 1995. Interestingly, the number of migrant workers increased in both Group 1 and Group 2, but the pace turned out to favour migrants from Group 1.

The data presented in the tables above are stock data referring to the number of work permits issued in the given year. There are two important factors which contribute to the change in the real stock of migrant labour in Hungary. First, there are a certain number of labour migrants who decide, due to various reasons, to discontinue their work in Hungary. Official statistics show that only a small fraction of migrant workers that managed to secure a valid work permit choose to return to their country of origin. Second, there is a certain percentage of migrant labour that received residence permit. Once a resident permit has been obtained, it entails a work permit, so individuals with a resident permit do not need to renew their work permits.

The question emerges: to what extent is migration to Hungary defined by the language skills of migrant workers? By assessing the share of Hungarian speaking migrant labourers, we seek to identify the degree to which the Hungarian labour market favours Hungarian speaking migrant citizens as reserve labour force. We also wish to evaluate the possible impact such labour market strategy could have on the community life of the Hungarian minority in Transylvania.

8. The model

To test our second hypothesis, we apply a CGE model using constant elasticity of substitution. In the model we allow for language heterogeneity of the labour force and unemployment. The labour markets in the three regions under study differ in the labour force's language structure and income levels. The language composition varies from exclusively Hungarian to exclusively Romanian with all mixture possibilities in any labour market. The goal is to evaluate the degree of elasticity of substitution between Hungarian and non-Hungarian speaking migrant labour, and its effect on the elasticity of substitution among labour and capital used in the production of goods.

In the model we differentiate among four types of agents:

- *Regions*, which are linguistically:
 - mixed Romanian region, which is Transylvania (R_M);
 - compact Romanian region (R_R);
 - compact Hungarian region (R_H); and,
 - the outside world (R_W).
- *Workers* (L_i), which include:
 - native workers (L_i^n), who are either skilled ($L_i^{n,S}$) or non-skilled ($L_i^{n,NS}$);
 - migrant workers (L_i^m), who are either Hungarian speaking ($L_i^{m,H}$) or non-Hungarian speaking ($L_i^{m,NH}$);
- *Firms* (F_{ij}),
- *Governments*:
 - the Romanian government (G_R), and
 - the Hungarian government (G_H).

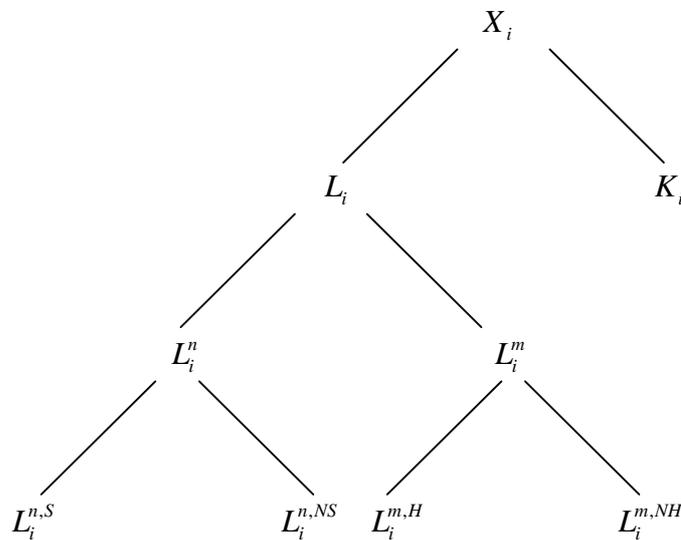
All agents (migrants and firms) are assumed to be utility maximising. Therefore, in the following we model the production function assuming migrant utility maximising and firm cost-minimizing behaviour. The optimisation problem of workers involves relocation costs and supposes the ability to secure a job at the new location. Based on this, foreign labour is expected to migrate only if the net income gain in the host labour market is larger than the one in their home labour market plus the costs incurred.

To specify the production functions, we propose to use the functional form of constant elasticity of substitution (CES) for the relation between capital and labour. This functional form has been chosen because it allows us to follow the relevant parameters for our analysis, i.e. it allows us to express the substitutability among primary factors in the production functions. Furthermore, we apply a hierarchical (nested) production function to be able to expand the elasticity parameters used to calibrate the estimates.

The figure below graphically presents the simple two-level nesting structure of production function that we describe in this article. At the first level we represent the elasticity of substitution between capital (K_i) and labour (L_i) used to produce output X_i . Level two presents the substitution among three types of labour. The elasticity of substitution among factors at each level is influenced by the elasticity at other levels; the principal effect is given by the elasticity specified at the given level. Consequently, the elasticity at the first level calibrates the estimates of the elasticity of labour with respect to returns to capital. Similarly, the second level calibrates the elasticity of different types of labour.

The model applies a three-layered nested CES production function. According to this, two types of native labour of the i^{th} region (L_i^n) and two types of migrant labour of the i^{th} region (L_i^m) are combined to produce the aggregate labour input of the i^{th} region (L_i), which then is used with investing capital to produce good X_i . This is represented in Figure 2.

Figure 2
Nesting



9. Findings

In section four we have seen that there is a large and widening wage gap (expressed in PPP) among the Hungarian labour market and that of the main source countries of migration, which are Romania and Ukraine. The share of labour migrants from Romania is by far the largest, compared to any other country of origin. Romanian labour migrants represent over 45 per cent of all migrants for each year under study. Over 90 per cent of all legally registered Romanian labour migrants seek to obtain residence permits, which allow them to settle in Hungary and gain Hungarian citizenship. Many of the migrants, regardless of their origin, tend to bring their

families along with themselves, which by 1999 led to the migration of around 100,000 migrants to Hungary. This represents 1 per cent of the total population of the country, which is not large according to the Western European standards.

Under the Hungarian Privacy Act, the Office of Immigration and Nationality from within the Hungarian Ministry of Interior does not publish data on the ethnic affiliation of migrant labour active on the Hungarian labour market. As a consequence, we need to proxy the share of Hungarian to non-Hungarian speaking migrant labour from Romania. We have done this in three steps.

As a first step, we grouped source countries of migrant labour to the Hungarian labour market into two groups based on the presence or absence of a Hungarian ethnic minority. From this we learned that around 60 per cent of all immigration to Hungary originates from Group 1 countries, which include Romania, Slovakia and Ukraine.

This leads us to the second step, where we looked at the share of Romanian citizens to the total number of migrant citizens with valid work permits to Hungary in a given year. According to Tables 1, 2 and 3, the number of labour migrants from Romania holding valid work permits in 1999 was 14,132, i.e. 49.64 per cent out of the total of 28,469 migrants. If we look at Group 1 countries only, over 75 per cent of migrants come from Romania. This indicates that Romania is by far the largest source of labour migrants to Hungary.

In the third step, in order to verify our hypothesis we tried to estimate the share of Hungarian and non-Hungarian speaking migrant labour from Romania for year 1999. The estimation was executed with modelling different levels of elasticity of substitution between Hungarian and non-Hungarian speaking migrant labour from Romania.

In the Hungarian policy context in 1999 we cannot talk about market regulated elasticity among native and immigrant labour. In fact, the number and the skill composition of migrant labour accepted to the Hungarian labour market was decided based on policy directives. This implies that there was no price competition between native and migrant labour. For the purposes of this article we have evaluated the language composition of the migrant labour accepted to the Hungarian labour market.

In the Hungarian legislation there is no specific stipulation regarding the language skills of migrant labour. It is the employers who decide what language skills they require from their potential migrant employees.

To show the effect of the unidirectional labour migration from Romania to Hungary on the ethnic composition of Transylvania, we have modelled the labour migration schedules for different elasticity of substitution between Hungarian and non-Hungarian speaking migrant labour from Transylvania. According to the model, if all migrant labour from the Transylvanian region of Romania were Hungarian speaking, and if we took into account the current negative natural demographic trend in Transylvania, the Hungarian speaking labour force would reduce from about 650,000 in 1999 to below 50,000 by 2045. With different levels of elasticity of substitution among Hungarian and Non-Hungarian speaking labour from Transylvania, this process slows down. Nevertheless, even if only 10 per cent of all migrants from Transylvania were Hungarian speaking, by 2090 it would lead to the absorption of the whole community into the Hungarian labour market. Obviously, this can happen only if the wage differentials remain significantly high and the Hungarian speaking labour from Transylvania possesses the required skills to enter the Hungarian labour market.

If we consider that Hungarian migration as a policy field has not been independent by other policy issues, we are faced with the complexity of contradictory policy considerations. The public debate on issues related to migration to Hungary relates to a large extent to the status of ethnic Hungarians living in Hungary's neighbouring countries. The main impact of this interrelationship is that migration is viewed as an instrument to influence negative population trends in Hungary. The idea of migration as an instrument to reduce negative population trends has been strongly debated in the Hungarian society since the early 1990s. It has also become a strongly politicized issue, as it is linked to the national policy, according to which Hungarians living abroad should be supported to remain in their communities.

An alternative framing of the migration policy is that it could be used as an instrument to cover missing or undersupplied skilled labour. In this view, labour migration is conceptualized as being determined by the demand side. This framing leads to complex regulations with the goal to reduce the migration pressure and to select the skill composition of migrants needed by the Hungarian labour market.

By relaxing the assumption that the Hungarian immigration policy context will not change, we return to the classical framework of price competition. This is the scenario in which the wage gap between our three regions becomes significant again. In this case, our benchmark is the Hungarian minimum wage. The wage differences presented in Figure 1 show that in year 2000 the wage gap was 367 in terms of PPP/USD, almost the double of the wage rate in Romania. The expectation is that if this wage gap remains so large, we can expect to have a wave of labour entering the Hungarian labour market. Again, this is expected to improve the competitiveness of Hungarian firms. However, this would occur under different circumstances than in the current context. This might drive labour cost down by a significant level.

The mechanism by which this would occur is embedded in our model, according to which firms have a factor input cost minimising behaviour and labourers have a revenue maximising behaviour. The key question is at what level of migration we reach a market equilibrium point. How large will labour heterogeneity be in Transylvania at this point?

10. Conclusions

In this analysis we assume away a series of factors that certainly have important effects on the evolution of migration to Hungary from Romania and more specifically, Transylvania. This simple model allowed us to capture the flow of labour migration and the influence this has on the language heterogeneity of the Transylvanian region. We have shown that there is a significantly high level of wage differential among our regions and that around 50 per cent of migration to Hungary occurs from the other two regions. Even if only a small share of labour from the source region is Hungarian speaking, this has a significantly high impact on the language heterogeneity of the source region. Furthermore, if all inelasticity produced by migration control is eliminated, the large levels of wage differences among our regions will produce a market adjustment of labour, which leads to homogenisation of labour in terms of the language spoken.

The current policy context is expected to change fundamentally in the near future with the Romania's possible accession to the European Union. We expect to have all labour movement restrictions lifted among our regions by the years 2010–2015. This is the scenario in which competition among labour of different types will occur on a market based determination of labour costs. We can add to these that the liberalisation of labour movement will occur with an even larger wage gap than the

current one, and Hungary's native labour stock will further shrink, due to reasons of demographic patterns and migration towards better paying European job markets.

As a sum-up, we can say that labour movement liberalisation under conditions of large wage differentials produce a series of migration pressures that potentially lead to language homogenisation of supranational regional labour markets. For the case of Central and Eastern European countries, this means that national minority groups living in neighbouring countries face the pressure of being absorbed by the labour market of the "mother" country.

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Appendix: The Model

The model put forward is a three-layered nested CES production function, which formally stated, can be defined as the problem of factor composition under conditions of firm cost minimisation. This, for our three level nested functions can be represented as follows:

- at the top level we have:

$$X_i = E(\delta L_i^{\mu_4} + (1 - \delta)K_i^{\mu_4})^{1/\mu_4},$$

- at the middle level we have,

$$L_i = D[\chi(L_i^n)^{\mu_3} + (1 - \chi)(L_i^m)^{\mu_3}]^{1/\mu_3},$$

and at the bottom level we have to solve for both branches:

$$L_i^n = A[\alpha(L_i^{n,S})^{\mu_1} + (1 - \alpha)(L_i^{n,NS})^{\mu_1}]^{1/\mu_1} \text{ and}$$

$$L_i^m = B[\beta(L_i^{m,H})^{\mu_2} + (1 - \beta)(L_i^{m,NH})^{\mu_2}]^{1/\mu_2}.$$

In the equations, A, B, D, and E are constants defining units of measurement, α , β , χ and δ are share parameters, while μ_1 , μ_2 , μ_3 and μ_4 are the curvatures of the isoquants.

As the algebraic problem of calibrating the elasticity of substitution between factors at all levels require the same algebraic procedure, we present in details only the calculations at the middle level. At this level we seek to identify the quantity of composite labour with given skills needed to produce a unit quantity of L_i with given elasticity of substitution between native and migrant labour. The production function can be written as:

$$L_i = D[\chi(L_i^n)^{\mu_3} + (1 - \chi)(L_i^m)^{\mu_3}]^{1/\mu_3} \quad (2.1.)$$

After calculating the marginal products of L_i^n and L_i^m , we can turn to the cost-minimisation problem. For this we need to define the price of L_i in the Hungarian labour market, to respect the condition that if l_i^n units of native labour, l_i^m units of migrant labour are used to produce one unit of L_i , then the price of L_i equals the costs of different forms of labour employed. Formally, using official statistics for evaluating the price of labour, we evaluate the cost based on the following formula:

$$C_{L_i} = P_{L_i} = l_i^n P_{L_i^n} + l_i^m P_{L_i^m}, \text{ which is subject to } D[\chi(l_i^n)^{\mu_3} + (1-\chi)(l_i^m)^{\mu_3}]^{1/\mu_3} = 1.$$

After doing the calculations, substitutions and rearrangements we have:

$$l_i^n = \frac{\chi^{1/(1-\mu_3)} P_{L_i^m}^{1/(\mu_3-1)}}{D[\chi^{1/(1-\mu_3)} P_{L_i^n}^{\mu_3/(\mu_3-1)} + (1-\chi)^{1/(1-\mu_3)} P_{L_i^m}^{\mu_3/(\mu_3-1)}]^{1/\mu_3}} \quad (2.2.)$$

$$l_i^m = \frac{(1-\chi)^{1/(1-\mu_3)} P_{L_i^n}^{1/(\mu_3-1)}}{D[\chi^{1/(1-\mu_3)} P_{L_i^n}^{\mu_3/(\mu_3-1)} + (1-\chi)^{1/(1-\mu_3)} P_{L_i^m}^{\mu_3/(\mu_3-1)}]^{1/\mu_3}} \quad (2.3.)$$

in any of our regions we can express the cost of one unit of composite L_i as:

$$C_{L_i} = \frac{1}{D} \cdot [\chi^{1/(1-\mu_3)} P_{L_i^n}^{\mu_3/(\mu_3-1)} + (1-\chi)^{1/(1-\mu_3)} P_{L_i^m}^{\mu_3/(\mu_3-1)}]^{(\mu_3-1)/\mu_3} \quad (2.4.)$$

Now we need to specify the elasticity of substitution in order to be able to calibrate our CES production function. For this, we use the fact that $\sigma_3 = 1/(1-\mu_3)$.

We calculate each of the two pairs $l_i^n P_{L_i^n}$, respectively $l_i^m P_{L_i^m}$ and then divide them,

which is:

$$\omega_{L_i^n L_i^m} = \frac{l_i^n P_{L_i^n}}{l_i^m P_{L_i^m}} = \frac{\chi^{\sigma_3} P_{L_i^n}^{1-\sigma_3}}{(1-\chi)^{\sigma_3} P_{L_i^m}^{1-\sigma_3}} \quad (2.5.)$$

By introducing our assumption regarding the price of native and migrant labour, namely, that they are the same and equal to 1, then we can rearrange equation (2.5.) in the following way:

$$\chi = \frac{(\omega_{L_i^n L_i^m})^{1/\sigma_3}}{1 + (\omega_{L_i^n L_i^m})^{1/\sigma_3}} \quad (2.6.)$$

By assuming that there is perfect competition in the different labour markets and long-run equilibrium, using (2.4.) we can express the unit cost of L_i , which is:

$$C_{L_i} = \frac{1}{D} \cdot [\chi^{\sigma_3} + (1 - \chi)^{\sigma_3}]^{1/(1-\sigma_3)} = 1 \quad (2.7.)$$

executing the required rearrangements, we have:

$$D = [\chi^{\sigma_3} + (1 - \chi)^{\sigma_3}]^{1/(1-\sigma_3)} \quad (2.8.)$$

Similarly, using the same procedure, one might define the rest of the share and scale parameters as well as the one of isoquants. These are represented in the table below:

Table 4.

Share parameters	Scale parameters
$\delta = \frac{(\omega_{L_i K_i})^{1/\sigma_4}}{1 + (\omega_{L_i K_i})^{1/\sigma_4}}$	$E = [\delta^{\sigma_4} + (1 - \delta)^{\sigma_4}]^{1/(1-\sigma_4)}$
$\chi = \frac{(\omega_{L_i^n L_i^m})^{1/\sigma_3}}{1 + (\omega_{L_i^n L_i^m})^{1/\sigma_3}}$	$D = [\chi^{\sigma_3} + (1 - \chi)^{\sigma_3}]^{1/(1-\sigma_3)}$
$\beta = \frac{(\omega_{L_i^m H L_i^m NH})^{1/\sigma_2}}{1 + (\omega_{L_i^m H L_i^m NH})^{1/\sigma_2}}$	$B = [\beta^{\sigma_2} + (1 - \beta)^{\sigma_2}]^{1/(1-\sigma_2)}$
$\alpha = \frac{(\omega_{L_i^n S L_i^n NS})^{1/\sigma_1}}{1 + (\omega_{L_i^n S L_i^n NS})^{1/\sigma_1}}$	$A = [\alpha^{\sigma_1} + (1 - \alpha)^{\sigma_1}]^{1/(1-\sigma_1)}$

Variables

K_i - capital input in the i -th region;

L_i - labour input in the i -th region;

L_i^n - native labour input in the i -th region;

- $L_i^{n,S}$ - native skilled labour input in the i -th region;
- $L_i^{n,NS}$ - native non-skilled labour input in the i -th region;
- L_i^m - migrant labour input in the i -th region;
- $L_i^{m,H}$ - Hungarian speaking migrant labour input in the i -th region;
- $L_i^{m,NH}$ - non-Hungarian speaking migrant labour input in the i -th region;
- X_i - output in the i -th region;
- C_{L_i} - cost of labour;
- $l_i^{n,S}$ - unit of native skilled labour input in the i -th region;
- $l_i^{n,NS}$ - unit of native non-skilled labour input in the i -th region;
- l_i^m - unit of migrant labour input in the i -th region;
- $l_i^{m,H}$ - unit of Hungarian speaking migrant labour input in the i -th region;
- $l_i^{m,NH}$ - unit of non-Hungarian speaking migrant labour input in the i -th region;
- P_{L_i} - price labour input in the i -th region;
- $P_{L_i^n}$ - price native labour input in the i -th region;
- $P_{L_i^{n,S}}$ - price native skilled labour input in the i -th region;
- $P_{L_i^{n,NS}}$ - price native non-skilled labour input in the i -th region;
- $P_{L_i^{m,H}}$ - price Hungarian speaking migrant labour input in the i -th region;
- $P_{L_i^{m,NH}}$ - price non-Hungarian speaking migrant labour input in the i -th region;

Parameters

A, B, D, E - are scale parameters;

$\alpha, \beta, \chi, \delta$ - are share parameters;

σ_4 - is the elasticity of substitution at the third level of the nest for native labour;

σ_3 - is the elasticity of substitution at the third level of the nest for migrant labour;

σ_2 - is the elasticity of substitution at the second level of the nest for labour;

σ_1 - is the elasticity of substitution at the first level of the nest for labour and capital.

¹ The Hungarian legislation on the employment of foreigners includes: Act V of 1990 on Individual Entrepreneurship, and the Act IV 1991 on the Support of Employment and Benefits for Unemployed Persons. This is amended by Ministerial Decree No. 8 of 1999 on its implementation and Act LIII in 2002. The policy regime of foreigners changes substantively when Act XXXIX of 2001 on Entry and Residence of Foreigners in Hungary and Government Decree No. 170 of 2001 and Minister of Interior Decree No. 25 of 2001 on its implementation are adopted. In the current format of this paper these modifications in legislation are not considered as we stop our analysis with 1999.