THE EFFECTS OF INTERREGIONAL WAGE DIFFERENTIALS ON LINGUISTIC HETEROGENEITY

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Abstract:**

Explanations of the ethnic composition of local labor markets usually focus on the role of community and political choices in minority policy rather than on that of economic factors. We propose to contribute to this literature by inquiring about the effect that voluntary labor migration driven by income differentials has on minority groups. We focus on the cases of Hungary, Romania, and Transylvania (the north-western province of Romania). We show that sufficiently large wage differentials produce unidirectional migration to the region with higher wages. To evaluate the effects of this type of migration, we use a three-level hierarchical CGE model. The findings indicate that, under conditions of sufficiently large interregional wage differentials, linguistic match between the receiving region and a segment of labor in the source region might lead to language skill based migration. The general conclusion is that labor liberalization under conditions of significantly large wage differentials and language preferences in the host market leads to language homogenization in formerly mixed regions.

Key words: labor migration, CGE

1. Introduction

Uneven economic growth and social development persist, both at the 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 labor markets remains understudied.

Voluntary labor migration among local markets in Central and Eastern Europe is an increasingly important issue for analysis, since language-community borders cut cross state borders in this region. 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 intensified. What is specific to this new pattern of migration is the language dimension, due to the fact that language borders and state borders are not isomorphic.

Our analysis focuses on evaluating the extent to which voluntary labor migration has a language dimension in the case of Hungary, as well as the implications of this migration on the language heterogeneity of the main source region. We seek to find out to what extent the knowledge of the language spoken in the local labor market is relevant for migrant labor selection in Hungary. Then we discuss the various implications this could have on the language mixture of the source regions.

The paper has three parts. First, we inquire about the extent to which voluntary labor migration is language-defined and whether it leads to ethnic homogenization in the source regions or not. Here, the emphasis is on the origin of labor migrants and the type of migration we are dealing with, in the case of Hungary. Second, we look at the target region's policy problems by focusing on the need to maintain the competitiveness of the economy by relying on the quasi-reserve labor from neighboring countries. In this case we study the labor 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 labor market of the source region. Namely, we look at the issue of labor loss and the dwindling of the minority poulation at different stages of the economic development.

2. Background and hypotheses

A supranational regional economic space, characterized by local labor markets with significantly large interregional income differentials, creates

laborer incentives to migrate to those labor markets where they have the possibility of earning higher wages. The labor migration literature distinguishes two possible effects of such migration on the local economy.

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

Second, in the higher-income, or recipient, region with a high growth rate, immigration could lead to either oversupply of labor or to the reduction of sector specific labor shortages. In the first scenario, the presence of migrant labor results in a reduction of wages. Labor costs decrease and native laborers' level of satisfaction decreases as they loose their jobs to the immigrant labor. In the second scenario, migrant labor fills open positions that the local economy is unable to fill with its indigenous labor force. In this case, the role of migrant labor is to reduce the growth bottleneck attributable to a labor shortage. In both scenarios firms become more competitive within the supranational economic space.

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

> ➢ *The level of interregional wage differentials is large enough to produce unidirectional interregional labor migration.*

> ➢ *If interregional differentials are large enough, then there is a market driven selection of labor based on the language differentials of migrants.*

If our hypotheses are verified, we would be able to explain some of the selection process of migrant labor based on language knowledge, complementing the literature linking nationalism and labour market segregation. Also, we could begin to redesign the instruments used in current minority, immigration, and labour policy in Central and Eastern European countries with large national minorities.

3. Case study

The case study examines Hungary, Romania, and Transylvania during 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 labor migration is recorded in the target country, we will use mainly Hungarian data to proxy the migration 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 well below 2,000 each year.

We distinguish among migrant laborers in Hungary based on their legal status, according to Hungarian legislation on migrant labourers[1]. Thus, on the one hand, there are migrants holding valid work permits and, on the other, permanent residents. According to 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 labor. Work permits need to be renewed on a yearly basis. Once the labor contract at a given workplace is dissolved, the work permit loses its validity, and thus the foreigner in question loses his/her status in Hungary. To take a new job, and regain legal status, foreign workers need to apply for a new work permit. As for permanent residence permits for migrant workers, they are issued after at least one year of legal employment, based on the provisions in the law. Country quotas were introduced only in 2001, though the yearly quota has never been filled.

4. The migration rationale

We first must establish if there the migration trends between Romania (including Transylvania) and Hungary are only unidirectional. If this is, indeed, the case, we can qualify the supposed market driven labor migration 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 labor movement.

We conceptualize migration decision as the utility maximization problem of migrant laborers. According to this, people choose to migrate to a foreign labor market in the prospect of a higher income. Given our competition concept,

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1 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. The policy regime of foreigners changes substantively when Act XXXIX of 2001 on Entry and Residence of Foreigners in Hungary, 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 in 1999.

once a job is secured by a migrant laborer, the prospect of better remuneration is already realized. Below we present the average monthly income for every year from 1995 to 2000, in terms of purchasing power parities in USD (Figure 1).

Fig 1. Average monthly gross rate, PPP/USD
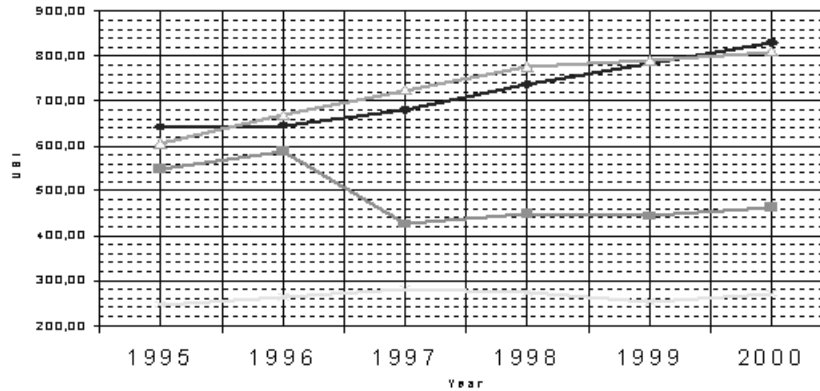
The figure shows that in terms of purchasing power parities in USD, national gross wages (including pensions) in Hungary experienced a significant ascending tendency. Thus, if at the start of the period PPP gross wages in Hungary were 642.44 USD; by 1999 they were 784.58 USD. This represents a more than 20 per cent increase in the real value of gross wages. By 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 labor market almost quadrupled, from 93.48 to 341.05 PPP/USD. These data are sufficient to establish the fact that the wage differential level between Hungary and Romania is sufficiently large to produce a rationale for migration to Hungary.

5. The policy environment

At the present moment, we cannot speak of unrestricted labor migration between Romania and Hungary. Hungarian policy-makers need to choose the immigration policy that achieves their stated policy goals. Therefore, they need to set the proportion among native labor (L_n)Hungarian speaking migrant labor (L_h^m) and non-Hungarian speaking migrant labor (L_{nh}^m).

At one extreme, there is the choice to completely prohibit foreign worker access to the national labor market. In this case, the proposed 'nests' in our model collapse into a two-level nest as $L_{\overline{2}}^{\blacksquare,M}$ and $L_{\overline{1}}^{\blacksquare,m}$ become equal to zero and consequently $L_i = L_i^\bullet$ where L_i represents the Hungarian labor force. In this policy context the labor stock would be exclusively comprised of native labor, and migrant labor would have no access to the Hungarian labor market. The direct effect of this choice would be an increase in labor costs (due to a scarcity of skilled labor and the extensive training costs of unskilled labor) and an increased inflexibility in the Hungarian labor market.

At the other extreme, the access to the Hungarian labor market could be fully liberalized, with no restrictions on foreign access to the local market. Under these conditions, the proposed functional form would still hold, only the nature of competition changes. Competition on the labor 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 labor market) for the least expensive labor force.

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

Based on the above, we need to describe the competition of migrant labor for jobs on the Hungarian labor market, as well as the effects this might have on the source communities in Transylvania. In addition, there is the issue of evaluating the possible impact of policy change on the evolution of the Hungarian labor market. If, at present, migrant laborers only compete for positions left vacant by the native labor force, what will happen after European Union accession, when they will qualify for any position available in the labor market as a whole?

We say that the Hungarian labor force L_i is composed of native labor $L_i^\bullet$ and migrant labor $L_i^\blacksquare$. Formally:

$$L_i = L_i^\bullet + L_i^\blacksquare \tag{1}$$

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

$$L_i^z = L_i^{z,S} + L_i^{z,NS} \tag{2}$$

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

$$L_i^z = L_i^{z,H} + L_i^{z,NH} \tag{3}$$

If there is a job opening, the possibilities are that native labor either qualifies and fills the job or does not qualify and leaves it vacant. Certainly, non-skilled native laborers 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 labor competing for the job. The result of this conceptualization is that the price of labor as the co-ordination mechanism of the labor market is substituted by policy choices regarding labor migration regulation. As a result, native and migrant laborers do not compete with each other on the Hungarian labor market. Instead, migrant labor complements the available labor stock.

At certain times and locations, when the recipient labor market is unable to cope with the skills shortage, relying exclusively on the native labor force, properly skilled migrant labor is invited or allowed to participate in the Hungarian labor market. In this conception, opening up the labor market for skilled migrant labor is a form of productivity enhancement. We might say that skilled migrant labor supplements unskilled or internally immobile skilled native labor.

On the supply side, the lack of sufficient labor with the requisite skills constitutes labor 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 labor as being more costly than migrant labor with the skills required by the given job opportunity 'here and now'. If the price mechanism were sufficient to clear all labor markets instantaneously, we would not have labor migration until all native labor was employed. But if this is not the case, we have a situation characterized by both labor migration and unemployment. Also, low levels of internal mobility may further add to the shortage of skilled labor in the rapidly developing Hungarian labor market.

Labor 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 from between 300 to 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 labor migrants

The total number of foreign workers 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 neighboring countries with significant Hungarian ethnic populations. These countries include Romania, Slovakia, Ukraine, and former Yugoslavia. The last 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 supplied between 57% and 65% of the migrant labor with valid, annually-issued work permits (Figure 2). The second group includes the countries without significant ethnic Hungarian populations (i.e. all the countries that are not part of the first group).

Fig 2. 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% to 39.59%. In the following year it narrowed. In 1997 (60.71% and 39.29%) and 1998 (60.19% and 39.81%) the ratio almost repeated the one registered in the base year, while in 1999 the gap increased (65.43% to 34.57%). In terms of absolute numbers, migrant labor 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 labor with a

valid work permit from countries belonging to Group 1 expanded by more than 50% 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 (Figure 3).

Fig 3. The number and share of foreign citizens with valid work permits in Hungary within Group 1

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

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

Of the countries in this group, Romania contributed by far the largest share of workers holding valid work permits to the Hungarian labor market, at 75% in each year under study. This is also illustrated in Figure 4, which presents the share of Romanian citizens with work permits in Hungary of Group 1 and of the number of total labor migrants. In 1996 the number of Romanian labor migrants decreased. Nevertheless, by 1999 the number of Romanian citizens with valid work permits increased by almost 50% compared to the base year 1995.

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

Fig 4. The number and share of Romanian citizens migrating 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

Ukraine demonstrates a similar trend. The only difference is that the number of workers with valid work permits increased by over 65% 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 data 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-35% over the five-year period under study, reaching 28,469 in 1999 as compared to 21,009 in 1995. Interestingly, the number of migrant workers increased from both Group 1 and Group 2 countries, but the pace favored 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 labor in Hungary. First, there are a certain number of labor migrants who decide, for various reasons, to discontinue their work in Hungary. However, official statistics show that only a small fraction of migrant workers that manage to secure valid work permits choose to return to their country of origin. Second, there is a certain percentage of migrant labor that receive residence permits. 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.

We can now turn to the question: to what extent is migration to Hungary defined by language skills? By assessing the share of Hungarian speaking migrant laborers, we seek to identify the degree to which the Hungarian labor market favors Hungarian speaking migrant citizens as its reserve labor force. We also wish to evaluate the possible impact such labor market strategies 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 labor force and unemployment. The labor markets in the three regions under study differ in the labor force's language structure and income levels. The language composition varies from exclusively Hungarian to exclusively Romanian with all possibilities in any labor market. The goal is to evaluate the degree of elasticity of substitution between Hungarian and non-Hungarian speaking migrant labor, and its effect on the elasticity of substitution among labor and capital used in the production of goods.

In the model we differentiate among four types of agents:
- *Regions,* which are:
- the linguistically mixed Romanian region, which is Transylvania (R_M)
- the linguistically compact Romanian region (R_R)
- the linguistically compact Hungarian region (R_H); and,
- the outside world (R_O).

- *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 maximizing. Therefore, in the following we model the production function assuming migrant utility maximizing and firm cost-minimizing behavior. The optimization problem for workers involves relocation costs and presupposes the ability to secure a job at the new location. Based on this, foreign labor is expected to migrate only if the net income gain in the host labor market is larger than the one in their home labor 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 labor. 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 paper. At the first level we represent the elasticity of substitution between capital (K_i) and labor (L_i) used to produce output X_i. Level two presents the substitution among three types of labor. 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 labor with respect to returns to capital. Similarly, the second level calibrates the elasticity of different types of labor.

The model applies a three-layered, nested CES production function. According to this, two types of native labor of the ith region $\left(L_i^n\right)$ and two types of migrant labor of the ith region $\left(L_i^m\right)$ are combined to produce the aggregate labor input of the ith region (L_i), which is then used with investing capital to produce good $\times_i$. This is represented in Figure 5.

Fig 5.Nesting
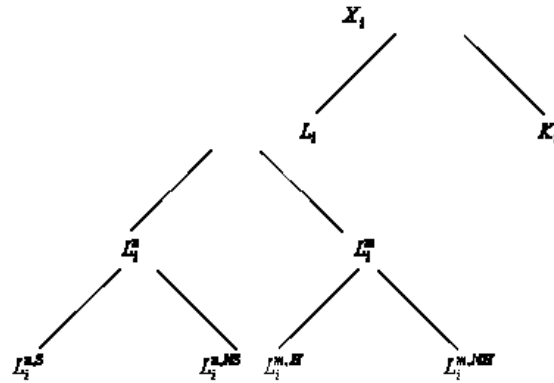
9. Findings

In section four we have seen that there is a large and widening wage gap (expressed in PPP) between the Hungarian labor market and that of the main migration source countries, Romania and Ukraine. The share of labor migrants from Romania is by far the largest, compared to any other country of origin. Romanian labor migrants represent over 45% of all migrants for each year under study. Over 90% of all legally registered Romanian labor migrants seek to obtain residence permits, which allows 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 people to Hungary. This represents 1% of the total population of the country, which is not large according to Western European standards.

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

First, we grouped source countries of migrant labor to the Hungarian labor market into two groups based on the presence or absence of a Hungarian ethnic minority. From this we learned that around 60% of all immigration to Hungary originates from Group 1 countries, including Romania, Slovakia, and Ukraine.

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

Third, in order to verify our hypothesis, we tried to estimate the share of Hungarian and non-Hungarian speaking migrant labor from Romania for year 1999. The estimation was executed by modeling different levels of elasticity of substitution between Hungarian and non-Hungarian speaking migrant labor from Romania.

In the Hungarian policy context in 1999 we cannot talk about market regulated elasticity among native and immigrant labor. In fact, the number and the skill composition of migrant labor accepted into the Hungarian labor market was determined based on policy directives. This implies that there was no price competition between native and migrant labor. For the purposes of this paper we have evaluated the language composition of the migrant labor accepted to the Hungarian labor market. In the Hungarian legislation there is no specific stipulation regarding the language skills of migrant labor. The employers themselves decide what language skills they require from their potential migrant employees.

To show the effect of the unidirectional labor migration from Romania to Hungary on the ethnic composition of Transylvania, we have modelled the labor migration schedules for different elasticity of substitution between Hungarian and non-Hungarian speaking migrant labor from Transylvania. According to the model, if all migrant labor 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 labor 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 labor from Transylvania, this process slows down. Nevertheless, even if only 10% of all migrants from Transylvania were Hungarian speaking, by 2090 it would lead to the absorption of the whole community into the Hungarian labor market. Obviously, this can happen only if the wage differentials remain sufficiently high and the Hungarian speaking labor from Transylvania possesses the requisite skills.

If we consider that Hungarian migration, as a policy field, has not been independent from other policy issues, we are faced with the complexity of contradictory policy considerations. The public debate on issues related to migration to Hungary deals to a large extent with the status of ethnic Hungarians living in Hungary's neighboring 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 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 so as to remain in their communities.

An alternative framing for migration policy is that it could be used as an instrument to cover lacking or undersupplied skilled labor. In this view, labor migration is conceptualized as determined by the demand side. This framing leads to complex regulations with the goal to reduce migration pressure and to select the skill composition of migrants needed by the Hungarian labor 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 double the wage rate in Romania. The expectation is that if this wage gap remains this large, we can expect to have a wave of labor entering the Hungarian labor market. Again, this would be expected to improve the competitiveness of Hungarian firms. However, this would occur under different circumstances than in the current context. This might drive labor cost down by a significant margin.

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

10. Conclusions

In this analysis we assume away a series of factors that certainly have significant effects on the evolution of migration to Hungary from Romania and, more specifically, Transylvania. This simple model allows us to capture the flow of labor migration and the influence this has on the language heterogeneity of the Transylvanian region. We have shown that there is a significant wage differential among our regions and that around 50% of migration to Hungary

occurs from the other two regions. Even if only a small share of labor 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 wage differentials among our regions will produce a market adjustment of labor, which leads to homogenization of labor in terms of the language spoken.

The current policy context is expected to change dramatically in the near future, with the Romania's possible accession to the European Union. We expect to have all labor movement restrictions lifted among these regions by the years 2010-2015. In this scenario, competition among labor of different types will occur on a market based determination of labor costs. We can add to this that the liberalization of labor movement will occur with an even larger wage gap than the current one, and Hungary's native labor stock will further shrink, due to reasons of demographic patterns and migration towards better paying European job markets.

In sum, we can say that labor movement liberalization under conditions of large wage differentials produces a series of migration pressures that potentially lead to language homogenization in supranational regional labor markets. In the case of Central and Eastern European countries, this means that national minority groups living in neighboring countries face the possibility of being absorbed by the labor 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 minimization. This, for our three level nested functions can be represented as follows:

- at the top level we have:

$$X_i = E(\delta L_i^{\mu_1} + (1-\delta)K_i^{\mu_1})^{1/\mu_1} \quad ,$$

- at the middle level we have,

$$L_i = D[\chi(L_i^Z)^{\mu_2} + (1-\chi)(L_i^Z)^{\mu_2}] \quad ,$$

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

$$L_i^Z = A[\alpha(L_i^{Z,S})^{\mu_3} + (1-\alpha)(L_i^{Z,NS})] \quad \text{and}$$

$$L_i^Z = B[\beta(L_i^{Z,H})^{\mu_4} + (1-\beta)(L_i^{Z,NH})^{\mu_4}]^{1/\mu_4} \quad .$$

In the equations, A, B, D, and E are constants defining units of measurement $\alpha, \beta, \chi,$ 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 requires the same algebraic procedure, we present in detail only the calculations at the middle level. At this level we seek to identify the quantity of composite labor with given skills needed to produce a unit quantity of   with given elasticity of substitution between native and migrant labor. The production function can be written as:

$$L_i = D[\chi(L_i^Z)^{\mu_2} + (1-\chi)(L_i^Z)^{\mu_2}]^{1/\mu_2} \quad \text{(2.1.)}$$

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

$$C_{L_i} = P_{L_i} = l_i^z P_{L_i^z} + l_i^m P_{L_i^m}$$

, which is subject to .

$$D[\chi(l_i^z)^{\mu_3} + (1-\chi)(l_i^m)^{\mu_3}]^{1/\mu_3} =$$

After doing the calculations, substitutions, and rearrangements we have:

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

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

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

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

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 and $l_i^z P_{L_i^z}$ and $l_i^m P_{L_i^m}$ and then divide them:

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

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

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

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

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

executing the required rearrangements, we have:

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

(2.8.)

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

Share parameters	Scale parameters
$\delta = \dfrac{(\varpi_{L_i K_i})^{1/\sigma_4}}{1+(\varpi_{L_i K_i})^{1/\sigma_4}}$	$E = [\delta^{\sigma_4} + (1-\delta)^{\sigma_4}]^{1/(1-\sigma_4)}$
$\chi = \dfrac{(\varpi_{L_i^a L_i^m})^{1/\sigma_3}}{1+(\varpi_{L_i^a L_i^m})^{1/\sigma_3}}$	$D = [\chi^{\sigma_3} + (1-\chi)^{\sigma_3}]^{1/(1-\sigma_3)}$
$\beta = \dfrac{(\varpi_{L_i^{a,S} L_i^{a,NS}})^{1/\sigma_2}}{1+(\varpi_{L_i^{a,S} L_i^{a,NS}})^{1/\sigma_2}}$	$B = [\beta^{\sigma_2} + (1-\beta)^{\sigma_2}]^{1/(1-\sigma_2)}$
$\alpha = \dfrac{(\varpi_{L_i^{a,S} L_i^{a,NS}})^{1/\sigma_1}}{1+(\varpi_{L_i^{a,S} L_i^{a,NS}})^{1/\sigma_1}}$	$A = [\alpha^{\sigma_1} + (1-\alpha)^{\sigma_1}]^{1/(1-\sigma_1)}$

Variables

K_i - capital input in the i-th region;

L_i - labor input in the i-th region;

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

$L_i^{a,S}$ - native skilled labour input in the i-th region;

$L_i^{a,NS}$ - 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 labor;

$l_i^{n,S}$ - 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 labor input in the i-th region;

P_{E_i} - price native labour input in the i-th region;

$P_{E_i^s}$ - price native skilled labour input in the i-th region;

$P_{E_i^{ns}}$ - price native non-skilled labour input in the i-th region;

$P_{L_i^m}$ - price Hungarian speaking migrant labour input in the i-th region;

$P_{E_i^{ms}}$ - 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 labor;
σ_3 - is the elasticity of substitution at the third level of the nest for migrant labor;
σ_2 - is the elasticity of substitution at the second level of the nest for labor;
σ_1 - is the elasticity of substitution at the first level of the nest for labor and capital.