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FACTOR MOBILITY AND REGIONAL DISPARITIES

EAST, WEST, HOME'S BEST?

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Richard Nahuis and Ashok Parikh*

Abstract

Unemployment rates as well as income per capita differ vastly across the regions of Europe. Labour mobility can play a role in resolving regional disparities. This paper focuses on the questions why labour mobility is low in the EU and how it is possible that it remains low. We explore whether changes in labour participation act as an important alternative adjustment mechanism. We answer this question in the affirmative. Furthermore, we argue that labour participation of young females is very important in adjusting to regional disparities. Finally, we examine whether part-time work is an adjustment mechanism that is comparable to labour force participation. It turns out not to be.

JEL Codes: F22, J61

Keywords: Labour mobility, labour participation, European Union

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1. Introduction

The desire to establish the four freedoms belonging to the formation of a common market – free movement of goods, services, persons and capital – was already written down in the Rome Treaty. The integration project formed, relatively successfully, a single goods and capital market. Currently, the European Commission is undertaking serious efforts to tackle the problems preventing an effective single services market. The free movement of persons is de facto the black sheep in the integration process as (cross-border) migration is still very low.

The 15 members of the European Union constitute a large set of diverse regions. They differ in labour market outcomes such as unemployment rates and wages but also in industry structure (Midelfart-Knarvik et al., 2000). This makes Europe relatively vulnerable to asymmetric shocks (Bayoumi & Eichengreen, 1993), which might be amplified by a better functioning of the single market (Krugman, 1993).[1]

Labour mobility can play a role in adjusting to shocks. In a single currency area, the adjustment to asymmetric shocks can take place via price or quantity adjustment or via fiscal transfers. In particular, real wages ought to be flexible, fiscal redistribution should be of sufficient size, or capital, labour and income flows should be sufficiently responsive to disturbances.[2] In the EU fiscal redistribution is relatively unimportant compared to the US, while wage flexibility is known to be notoriously low. It is not clear, however, that the role for labour mobility is or can be important in absorbing short-term shocks. Hence, for the largest part of the analysis we focus on long-term or permanent shocks.

Labour mobility can play a role in resolving regional disparities. Unemployment rates as well as income per capita differ vastly across regions. Midelfart-Knarvik et al. (2000) show that the industry structure is also very diverse across the EU and is becoming even more so. Barro and Sala-i-Martin (1991) show that per capita incomes tend to converge but that complete convergence is still out of sight. Putting these pieces together, it is easy to make the point that there is a potential role for labour mobility in resolving regional disparities. Indeed, it is low mobility in the presence of large regional disparities that is worrying. Hence what is crucial is the responsiveness of labour to regional disparities and, thus, it is important to try to explain the responsiveness. This is what this paper sets out to do.

Closely related to our approach are Decressin and Fatás (1995) and Puhani (2001).

Decressin and Fatás (1995) use the methodology of the seminal study of Blanchard and Katz (1992) to show that the responsiveness of European regional labour mobility is slow and low relative to the US. They find that in the short run almost nothing of an idiosyncratic shock is absorbed by migration. Also in the long run the role for labour mobility is low compared to the US. The major adjustment mechanism is the change in labour participation rates. Changes

[1] This is disputed, however, by Fatás (1998) and Frankel & Rose (1997).

[2] It is not a priori clear that the disappearance of the exchange rate instrument is an unambiguous loss. A lot of countries have abstained from using the exchange rate as an instrument for shock adjustment for a long time.

in unemployment rates account only for a small portion of the change in regional employment. Puhani (2001), using a different methodology, explains net migration rates by regional disparities (instead of region-specific shocks). He finds that only unemployment rates significantly explain migration. His methodology is closely related to ours.

This paper focuses on the questions why labour mobility is low in the EU and how it is (apparently) possible that it remains low. We explore the issue of labour participation, thrown up by Decressin and Fatás (1995), as the most important alternative adjustment mechanism. In particular, our analysis contains five contributions to the literature. First, using a framework different from Decressin and Fatás we address the question on labour participation as an alternative adjustment mechanism for labour mobility in the EU. Second, we examine whether labour participation of the young is important or labour participation is important in general.[3] Third, we use a more finely disaggregated data-set than Decressin and Fatás and Puhani and include more regions. Fourth, we treat the EU regions as a single panel whereas Decressin and Fatás and Puhani treat different countries separately. Finally, we introduce several new variables in the migration model. That is, we distinguish between long-term unemployment and unemployment in general; and we examine whether part-time work is an adjustment mechanism that is comparable to labour force participation.

The paper is organised in six sections. Section 2 presents a theory of net migration. Section 3 describes the data and discusses data limitations. Section 4 presents the econometric estimation based on balanced and unbalanced panel structures of the data. Furthermore it draws inferences from the static econometric model applied to 191 regions of EU. Section 5 formulates a partial adjustment model for the net migration rate. The dynamic model is estimated using OLS, Generalised Least Squares and Generalised Method of Moments. The estimated adjustment coefficients permit us to study both short-run and long-run responses of net migration rates to unemployment, income and other labour market variables. Section 6, finally, concludes.

2. A theory of net migration

The role that labour mobility plays in resolving aggregate regional disparities is captured by net migration flows.[4] The section sets up a model that is sufficiently flexible to discuss a number of different labour market variables. We derive net migration flows by explaining the gross flows based on individual (or household) migration decisions. The net migration rate is the difference between a region's immigration and emigration (expressed as the proportion of the region's population).

2.1 The model

To derive migration flows we consider first the decision to emigrate. An individual in region i calculates the expected value of supplying labour on the home market, indexed with the second i, (Vii) and compares that to the expected value of participating in the alternative labour markets (Vij). Thereby, the individual (q) takes into account the cost of leaving the region of residence, for example the number of children. We assume that these unobservable characteristics are randomly distributed among all potential migrants within each region.

[3] In the empirical specification we use female labour participation. This has more variation, since men more often work full time.

[4] Gross flows of workers that are not identical with respect to skill, might be resolving disequilibria on specific labour markets. Due to a lack of suitable data, this issue could not be analysed.

Among the observables we focus on economic state variables. Having a partner that is currently employed might for example raise the cost of emigration. Female labour participation rates can serve as a proxy for this. Denote these costs of leaving for individual q as Ci,q. Thus an individual migrates if for any region *j*:

$$V_{ii} \leq V_{ij} - C_{i,q} \tag{1}$$

The average of Ci,q over individuals in a region is denoted Ci and is interpreted as a function of labour market variables. Ci equals the willingness of the average individual to leave region i.[5] The expected value of supplying labour on the (home or any other) labour market depends on the wage and the probability of being matched successfully.[6] Thus, we propose:

$$V_{ij} = M(U_j, S_j)W_j \quad M_u < 0, \quad M_s = ? \tag{2}$$

where M is the function that indicates the chance of having or obtaining a job in market j and W is the wage rate in market *j*. The subscripts to M denote partial derivatives.[7] Uj is the unemployment rate in labour market j and Sj is a vector of factors determining flexibility of the labour market. Proxies of the latter are the share of part-time work, wage flexibility and the participation rate. The sign of the flexibility factors, *S*, is unclear. More flexibility, on the one hand, increases the matching probability. On the other hand, a region with a flexible labour market might not 'need' migrants to resolve disequilibria.[8] An individual thus emigrates from region i if:

$$M(U_i, S_i)W_i + C_i < \underset{j \in N}{Min}\left[M(U_j, S_j)W_j\right] \tag{3}$$

where N is the set of alternative regions. This suggests that a region is more likely to face emigration if the cost of leaving is low and if the wage is low. Unemployment encourages emigration at two levels: the unemployed are more likely to go as their cost of leaving (C) is lower and higher unemployment lowers the probability of obtaining a job in the home region.

Analogously, an individual that decided to emigrate from region j chooses to go to region i if:

$$M(U_i, S_i)W_i < \underset{h \in N}{Max}\left[M(U_h, S_h)W_h\right] \tag{4}$$

Immigration thus increases in the probability of obtaining a job (for example low unemployment or higher wages). In deciding which region to go, Cj, proxied by the labour market status of the potential immigrant, does not play a role as it is identical for all destination regions.

Using equation (3) and (4) it follows that net migration (NMi) is explained by:[9]

$$NM_i = b + M(U_i, S_i)W_i + C_i \tag{5}$$

For some labour market variables the push factors (for unemployed it is less costly to leave) and pull factors (a high level of unemployment discourages immigration) work in the same

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[5] We ignore, for tractability, the fact that the cost of leaving might depend on the region of destination too.

[6] For simplicity we assume matching rates that are equal for employed and unemployed persons.

[7] Note that by omitting a subscript i to the wage we do not consider discrimination of migrants in the labour market. See Ortega (2000) for a discussion on discrimination.

[8] This second interpretation of flexibility goes beyond the narrow analytical set-up presented here.

[9] Note that we use the fact that the terms between brackets are identical for all regions and that these can be treated as a constant (*b*).

direction. For other variables it is not a priori clear. Take, for example, labour participation of females. On the one hand it increases the cost of leaving a region (Ci increases). On the other hand, high female participation in the labour market might proxy labour market flexibility which might make a region 'need' less migrants.[10] Here time-series testing is needed to shed light on the dominating effect.[11]

2.2 Other theoretical considerations

The discussion above deals with individuals although the relevant decision unit is the household. We capture this in the model by taking the cost of leaving into consideration, which approximates for having a partner that has a job, etc. Of course, whether or not a family has school age children does matter for the household decision. We assume that these factors are randomly distributed and hence do not bias our estimates. Bauer and Zimmermann (1995) suggest that migration may become a self-perpetuating process, because the costs and risks of migration are lowered by social and information networks. The network approach indicates that the cost of moving may be substantially reduced for the relatives and friends of migrants and this could increase the probability of migration. The network effect of migration hence implies that migration induces more migration. We will touch upon this issue by considering a dynamic specification of our econometric model.

Countrywide unemployment levels tend to discourage migration as it makes migration riskier. Moreover, credit-market conditions might worsen in recessions making it difficult to finance the mobility cost (see Gordon, 1985). That aggregate unemployment affects gross flows negatively does not, however, deliver a clear prediction for net flows; hence we do not pursue this line here (Pissarides & McMaster, 1990, elaborate on this).

3. Data: description and limitations

We use regional data from Eurostat (2000). From the available regions we select those providing the necessary data to construct net migration rates. This provides us with an unbalanced panel of 191 regions with time-series of up to 13 years (1983-95).

Constructing a balanced panel with the time-series dimension unaltered reduces the number of regions reduced to 83 (for details on the regions included in both panels, see Appendix A).

The fact that we use population migration where labour migration is relevant for the labour market impact requires some discussion. First, the data do not allow us to distinguish between labour migration and population migration. Second, there is evidence that qualitatively comparable results are obtained using either labour or population-migration data (see Parikh & Van Leuvensteijn, 2002). Finally, systematic biases in the difference between population and labour migration (think of a region with a large university) will end up in fixed effects. The unsystematic bias is white noise.

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[10] An alternative view is that labour market flexibility makes a region more attractive. Then the effect on net migration would be positive.

[11] We expect that younger people are, on average, much more flexible than older individuals. In the empirical analysis we use the age group 25-35. For this group the cost of leaving is low as they commonly do not have school-age children (for the highly educated, Mauro and Spilimbergo, 1999, find that the higher educated are more mobile). This effect of age does not necessarily dominate the negative matching effect because changes in young age female participation in the labour market act as an alternative adjustment mechanism that smooths unfavourable regional conditions.

Table 1. Summary statistics (balanced panel)[a]

	Mean	Std Dev	Minimum	Maximum
GDP[b]	14311.3	4533.9	5053.1	33734.7
U	8.4	3.9	1.5	25.4
ACTfy	67.6	10.0	32.2	88.7
ACTf	40.8	6.7	22.0	62.4
POP[c]	2260.3	1798.6	222.8	11004.3
NM[d]	3.0	6.5	□ 44	27.0

[a] The summary statistics are taken from the untransformed variables.
[b] GDP per inhabitant at PPPs.
[c] In thousands.
[d] Multiplied by a thousand.

The explanatory variables for which the information is available are summarised in Table 1 (Appendix A provides detailed definition for the different variables). As a proxy for the wage rate, we use GDP per inhabitant at purchasing power parity (GDP). The spread in GDP per inhabitant is large; Thessalia in Greece in 1983 has the lowest income in the panel; Schleswig-Holstein in Germany in 1995 has the highest. We use two figures for unemployment: those recorded as unemployed, U, and those who are in unemployment for more than twelve months, long-term unemployment (Ult). In the balanced panel, however, we restrict ourselves to 'general' unemployment with the highest being in Campania in Italy where a quarter of the labour force is unemployed. Other explanatory variables are: the activity rate of females (ACTf) and the activity rate of young females (ACTfy). The population data are provided to illustrate the size of the regions. The mean size of a region is 2.2 million people. The mean rate of migration is 0.003, hence the regions in the sample are, as an unweighted average, immigration regions. Hence a region with 2,200,000 inhabitants received 6,600 net migrants a year.[12] The mean rate of migration, 0.003, might be low, but it is not the same as saying that migration is unimportant, as it is an important factor in explaining population changes.

Figure 1 depicts the average of the absolute value of the net migration rate in the sample. The spike around 1989, 1990 is to a considerable extent caused by the German unification.[13] What deserves attention is that, despite further steps in the European integration process, the migration rate is back to its low rate of the early 1980s. Two issues are important to judge the time-series behaviour of the net migration rate: first, what is the magnitude of migration compared to population change and second, how big is the incentive to migrate.

First, saying that the migration rate is low is different to saying that migration is unimportant. Figure 2 makes this point. It shows the share that migration contributes to population change. Figure 2 depicts the median observation.[14] This median share is roughly 50% to 80% and has not returned to the share level observed in the early 1980s.

[12] That is: 2,200,000 * 3 / 1000.
[13] The general findings that we present in the next section stand upright when we exclude Germany.
[14] We show the median of migration/population instead of the mean, as the mean is not informative since the denominator tends to zero for several observations.

Figure 1. Net migration rate over time

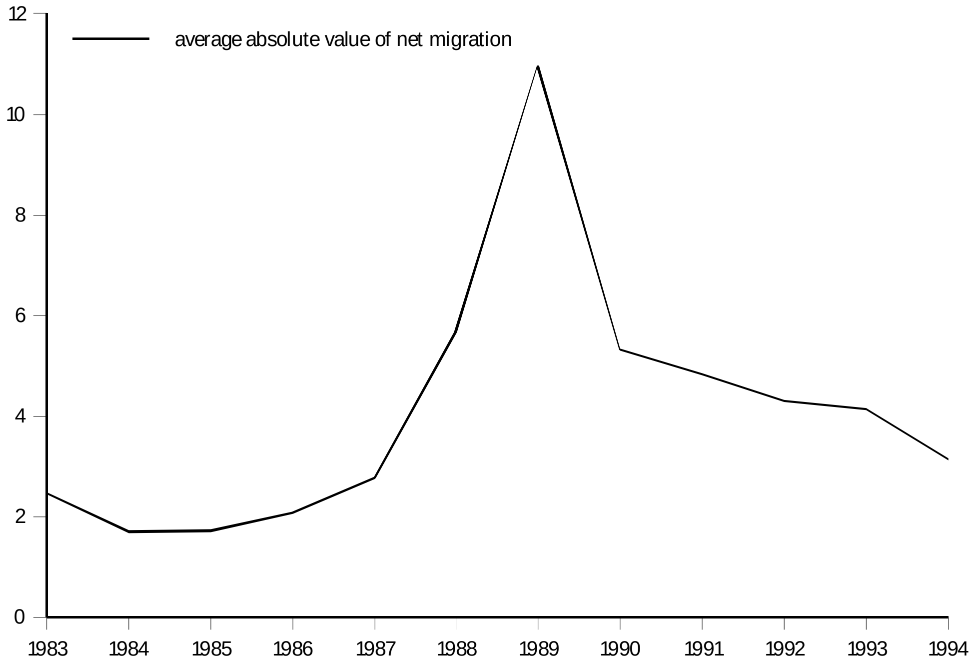
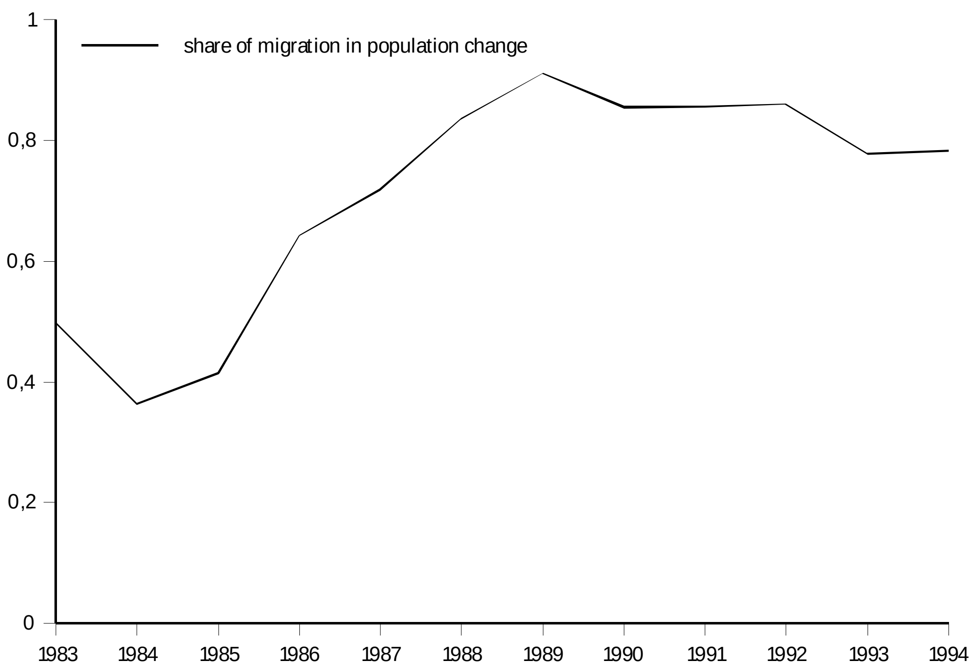
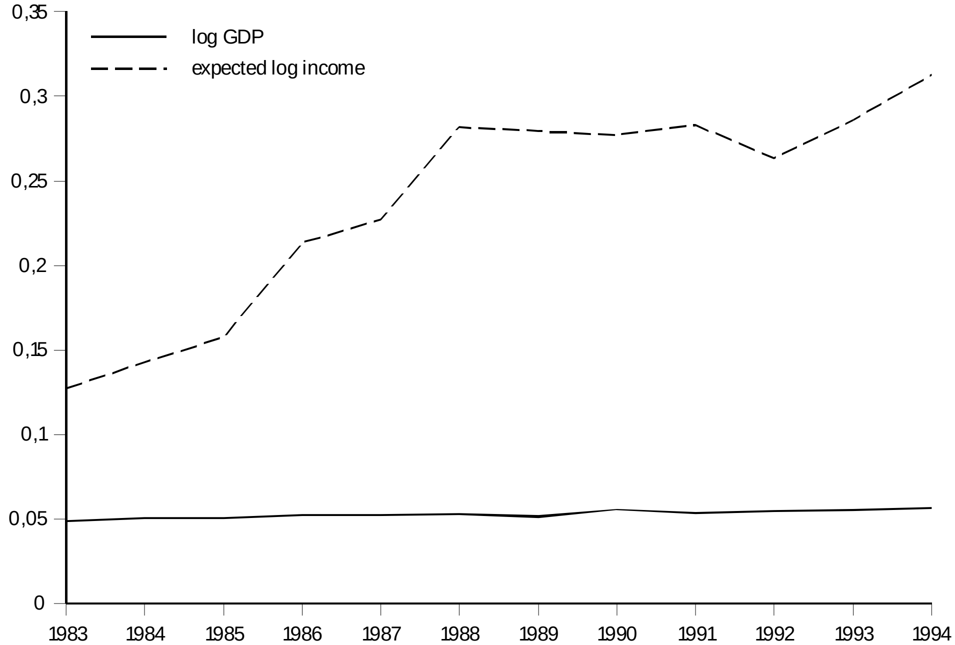


Figure 2. Contribution of migration to population change



Second, the return to the relatively low rates of migration of the 1980s is not worrying as such; what matters is whether the rate of migration is low despite high incentives to migrate. Figure 3 presents some indicators of the incentives to migrate. The lower line in the figure depicts the variance of the log of per capita GDP. The constancy (or, slight increase) indicates that the regions in our sample have not converged considerably in the period under consideration (see, for a similar finding, Barro & Sala-i-Martin, 1991).

Figure 3. Variance of expected income and income



In Section 2 we argued that the relevant decision variable for migration is the chance of obtaining a job multiplied by the wage, ie M(.))W. To proxy this, the upper line shows whether (1-U)* logGDP showed convergence; the opposite is true.[15] The low rate of migration remains puzzling as the incentives for migration have gone up.[16] Putting some pieces of this puzzle together is the issue to which we turn now.

4. Econometric estimation and results

The estimating equation, related to equation (5), is specified as

$$MN_i = b_0 + b_1 \ln W_i + b_2 \ln U_i + \varepsilon_i$$

The interpretation of the estimated coefficients is as follows: a one percent increase in the wage rate increases the net migration rate by b1 migrants per 1000 inhabitants, ceteris paribus. For the unemployment rate it is slightly more complicated: a one percentage-point increase in the unemployment rate increases the net migration rate with b2/U (where U is the relevant average unemployment rate) migrants per 1000 inhabitants, ceteris paribus.

Panel data are a special type of pooled cross-section/time-series data in which the same individual units are sampled over time. In our analysis both cross-sectional variation and inter-temporal variation can provide useful information. Hence, it may be useful to classify variables into one of three types: time-invariant, region-invariant and region-time varying variables. The time-invariant variables are constant over time but specific for the cross-sectional units: think of a pleasant climate in a certain region. The region-invariant variables are the same for the cross-sectional units at a given point of time but they vary through time.

[15] The latter finding is robust to the method of computing the variation in expected income. The coefficient of variation also produces an upward trend as does this statistic with the level of income (without taking logs).

[16] Appendix B is more elaborate on the convergence issue in our sample. There is evidence for so called β-convergence.

Examples of these would be year-effects including the changes in attitudes towards migration from one year to another. The region-time varying variables vary across cross-sectional units at a point in time and also exhibit variations through time. Most of the variables in our study are region-time-varying variables.[17]

Given this type of data we use four different estimation techniques. The first is the total, which is plain OLS on the pooled cross-section data. The second is the within estimation that takes into account the regional fixed effects. The focus is then on the time-series dimension in the data. The third, between estimation, explores the cross-sectional dimension by using only the regional means over time. In most cases we will restrict ourselves to the within estimations only. In all cases we restrict the estimated coefficients to be identical across regions. The fourth approach is the random effects estimation. All the approaches are used for the following model specification:

$$y_{it} = X_{it}\beta + \varepsilon_{it} \text{ where } \varepsilon_{it} = \alpha_i + \eta_t$$

The random effects estimator is preferred over the within (or fixed-effect) estimation if the time-invariant region specific variables, i, are uncorrelated with Xit. When the true model is the random effects model, OLS will yield consistent estimates of but the standard errors will be underestimated. Hence, we will use the Generalized Least Squares procedure.[18]

The Hausman test tests the null hypothesis of a true Random Effects model. In the presented results in the next section, the Hausman test rejects in many cases the random effects model given the diversity of regions. Hence the empirical evidence strongly favours fixed effects models in a majority of regression specifications.

4.1 Unbalanced panel estimation

Table 2 reports the results for the basic equations, where we introduce only the unemployment rate and the wage proxy. Both variables have the expected signs and are significant. The wage proxy is insignificant in the between estimation. Thus, the time-average level of GDP does not explain time-averaged migration rates. Only in a time series perspective GDP does explain net migration; thus a higher GDP relative to the (common) European benchmark, increases the net migration rate. An elaborate interpretation of size of the estimated coefficients is postponed to the discussion of the balanced panel estimations.

On annual data one might suggest that GDP and unemployment of the previous period will influence the net migration rate. Migrants might wait one period and thus react to the observed GDP and unemployment rates of last period before taking a decision to move to a more prosperous region. This is tested using the lagged unemployment rate and GDP variables. Columns (III) to (IV) show that the results are very similar to the results in column (I).

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[17] The advantage of panel data comes in a variety of ways: a) it increases the number of observations; b) it adds more variability and more information; c) it permits the data to be treated in two dimensions separately provided there are enough time periods for which data are available; and d) it enriches econometric specification such that we can use a fixed effect and a random effects model.

[18] When there is no uncorrelated region-specific component of variance, the random effects estimator reduces to the pooled OLS estimator. The pooled estimate weights all observations equally. The OLS estimator on the pooled data does not use the information about heteroscedasticity that can result from repeated observations. The random effects estimator is a combination of the between and within estimator with GLS weights.

Table 2. Unbalanced panel. Basic estimations. Dependent variable is net migration rate (NM)[a]

Variable	(I) Within	(II) Between	(III) Within	(IV) Between
GDP	4.22^{***}	0.14	–	–
	[6.73]	[0.11]	–	–
UN	-3.55^{***}	-3.32^{***}		
	[6.07]	[4.65]	–	–
GDP(-1)	–	–	3.19^{***}	– 0.92
	–	–	[4.55]	[0.64]
UN(-1)	–	–	-3.14^{***}	-3.76^{***}
	–	–	[5.01]	[4.90]
R^2	0.44	0.12	0.46	0.13
N	1966	1966	1775	1775
Hausman test $\square^2$ (2,2)	9.85	–	6	–

[a] Sample period is 1983-95, 191 regions. Absolute t-statistics are given in brackets under the estimates. *, **, and *** denote statistical significance at the 10% level, the 5% level, and the 1% level, respectively. $\square^2$ (2,2) refers to two degress of freedom for each of the two models.

As a next step we introduce the following alternative push and pull factors sequentially in the model:

$$MN_i = b_0 + b_1 \ln W_i + b_2 \ln U_i + b_3 \ln Ult_i + b_4 \ln PARTf_i + b_5 \ln ACTf_i + \varepsilon_i$$

To reiterate, based on the discussion in Section 2, we expect both short-term (or 'regular') as well as long-term unemployment to have a negative sign. The expected sign for the other labour-market indicators, i.e. part-time work, is not a priori clear. The time-series or within-region results should shed light on the issue whether changing labour-participation rates act more as an impediment for emigration than as a discouragement for immigration. There is no clear prediction for the cross-section (between) estimation.

Table 3 shows the results for the random effects estimation.[19] First, we introduce the long-term unemployment rate instead of the 'regular' unemployment rate. Long-term unemployment turns up highly significant. The significance of the GDP factor is drastically reduced (compare with column (I) in Table 2). This suggests that changes in the rate of long-term unemployment provide a more powerful explanatory factor for net migration than the regular unemployment rate. To test for this, we include the share of long-term unemployment in total unemployment along with the total unemployment rate; this term is, however, insignificant (column (II)).

When we turn our attention to column (I) in Table 4.2 and compare that to column (I) in the previous table we can infer something about the different reactions to a percentage point increase in the long-term unemployment rate and the 'regular' unemployment rate. The estimated coefficients differ considerably but the responsiveness of net migration to both

[19] The choice to present the random effects model depends on the fact that the null-hypothesis of a random-effects model is not rejected. In the remainder, both when we report the random effects model as well as when we report the fixed effects model, we will show the Hauseman test for the random effects model.

types of unemployment turns out not to differ. A one percentage-point increase in the 'regular' unemployment rate causes a change in the net migration rate of 0.00044 (that is -4.22/1000 divided by the sample mean of 9.49), ceteris paribus. For long-term unemployment we find 0.00041 (that is -1.91/1000 divided by the sample mean of 4.56), ceteris paribus.

The final column in Table 3 reports a regression including the share of females that work part-time. Part-time work is not significant and hence does not seem to act as a cost to emigration or a substitute for adjustment. It might be the case that both play a role and that the effects therefore cancel out.

Table 3. Unbalanced panel. Dependent variable is net migration rate (NM)[a]

Variable	(I) Random	(II) Random	(III) Random
GDP	1.59*	2.16***	3.65***
	[1.79]	[2.44]	[4.91]
UN		– 3.48***	– 4.29***
		[6.73]	[8.22]
UNlt	– 1.91***		
	[5.32]		
UNltshare		0.65	
		[0.90]	
PARTf			0.2
			[0.38]
R^2	0.11	0.13	0.13
N	1435	1435	1504
Hausman test $\chi^2(2,3,3)$	2.78	7.58	8.64

[a] Sample period is 1983-1995, 191 regions. Absolute t-statistics are given in parentheses under the estimates. *, **, and *** denote statistical significance at the 10% level, the 5% level, and the 1% level, respectively. $\chi^2(2,3,3)$ refers to 2, 3 and 3 degrees of freedom respectively for each of the three models.

The next section will refine the inferences with the balanced panel.

4.2 The balanced panel and female labour participation

Table 4 reports the within results for the balanced panel. These basic results are analogous to those obtained with the unbalanced panel. Again GDP and unemployment explain net migration rates in the expected way. Almost 45% of the time series variation is explained by these two variables. How sensitive is migration to unemployment and GDP? A one percent increase in GDP increases the migration rate by 0.005 percentage points ceteris paribus. A one percentage point increase in the unemployment rate decreases the migration rate (increases out-migration) by -0.00095 percentage-points (-8.02/1000 divided by the sample mean of 8.4), ceteris paribus. Hence in a region with 2.2 million inhabitants, 2100 people leave when the unemployment rate increases with one percentage point (the latter is an increase in unemployment by 22,000 people), other things remaining the same. An alternative interpretation of these numbers is that a permanent adverse shock is absorbed for over 90% by unemployment changes and 10% by net migration. In the US these numbers are 30% and 65% respectively, in the short run. In the long run, the shock is entirely absorbed by migration (Blanchard and Katz, 1992). Our methodology differs however from Blanchard and Katz; Decressin and Fatás (1995), employing the Blanchard-Katz methodology, confirm our finding. They argue that changes in labour participation absorb shocks.

In columns (II) and (III) labour-participation rates are added to the specification (the alternative adjustment factors introduced by Decressin and Fatás).[20]

Table 4. Balanced panel. Dependent variable is net migration rate (NM)[a]

Variable	(I) Within	(II) Within	(III) Within	(IV) Within with differeces () in ACTfy	(V) Within with differeces () in ACTy
GDP	5.08***	7.15***	6.38***	4.53***	4.45***
	[6.86]	[7.89]	[7.00]	[5.21]	[5.10]
UN	– 8.02***	– 8.03***	– 8.13***	– 7.68***	– 7.67***
	[10.08]	[10.17]	[10.22]	[8.92]	[9.02]
ACTfy (Δ ACTfy)		– 11.91***		6.56	
		[3.90]		[1.57]	
ACTf (Δ ACTf)			– 8.27 **		0.005
			[2.43]		[0.002]
R^2	0.45	0.45	0.45	0.52	0.46
N	1066	1066	1066	984	984
Hausman test □^{2}(2,3,3)	17.98	23.24	22.04	15.14	11.81

[a] Sample period is 1983-95, 82 regions. Absolute t-statistics are given in parentheses under the estimates. *, **, and *** denote statistical significance at the 10% level, the 5% level, and the 1% level, respectively. □^{2}(2,3,3) refers to 2, 3 and 3 degrees of freedom for each of the three models, respectively.

The estimation shows that young female labour participation affects net migration significantly negative (see column (II)). Overall female labour participation is also significant (column (III)). Both effects are of similar magnitude and hence there is no evidence for the ‘cost of leaving’-effect of female labour participation we discern; discouragement of

[20] Recall that we are unable to use long-term unemployment and part-time participation data as that would considerably reduce the sample size.

emigration. A one percentage-point increase in female labour participation decreases net migration by approximately 400 (in a 2.2 milj. inhabitants region).[21] When we introduce both female labour participation variables (ACTf and ACTfy) in the regression we find that the ACTfy is significant only. With the static estimation this is the only evidence present for the discouragement of emigration by the level of female labour participation.[22] Summarising the results with the level of female labour participation as explanatory variable: we find that (young) female labour participation affects net migration negatively. The explanation for this result is not entirely clear; female labour participation might act as an alternative labour-market adjustment mechanism that makes immigration to a region with high female participation unattractive.

To assess the role of labour participation in the adjustment process to idiosyncratic shocks the specifications in columns (II) and (III) tell a puzzling story: a high level of female labour participation lowers a region's net migration rate. A more direct test for the hypothesis that female labour participation acts as an alternative adjustment process is to introduce the participation variables in first differences. Columns (IV) and (V) show that the differenced variables enter insignificantly. In the next section we argue that these findings are not robust. We show that the results drastically change when estimating a dynamic migration model.

5. A dynamic panel approach: Allowing for 'network effects'

Network effects can be important, as we suggested in Section 2. To account for these mechanisms we employ a dynamic panel approach in this section. The advantage of the dynamic panel approach is that it allows for lags in the behaviour of agents and as we estimate a reduced form it can be consistent with various hypotheses based on adjustment costs. One of the interpretations is that a fixed proportional adjustment is achieved in one or two periods and that the remainder is spread over time. The smaller the adjustment coefficient, the longer it takes to reach equilibrium or the desired level of net migration. We propose a model where the dynamics are introduced through lagged dependent and exogenous variables.

The model we estimate is first-differenced and dynamic version of the model in the previous section:

$$MN_{it} = b_1 \ln GDP_{it} + b_2 \ln GDP_{it-1} + b_3 \ln U_{it} + b_4 \ln U_{it-1} + b_5 \Delta \ln ACTf_{it} + \lambda_1 MN_{it-1} + \lambda_2 MN_{it-2} + \alpha_i + \eta_{it}$$

Hence, all variables are defined as before but now we use first differences. We assume that a random sample of N regions' time series (*NMi1..........NMiT*) is available. T is small and N is large. The $\tilde{}$it is assumed to have finite moments in particular $\tilde{E}$(it)=$\tilde{E}$(it$\tilde{}$ is) =0 for t□s.We assume lack of serial correlation but not necessarily independence over time. With these assumptions *NM* lagged two period or more could be valid instruments in the equations estimated in first differenced form.

We report all one step estimates based on Arellano-Bond procedure (1991). Two-step and other estimates can be obtained from the authors. Different specifications are tried and the important results are shown in Table 5.

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[21] A one percent increase in the 'young' female participation rate causes a fall in the net migration rate of 0.00018 (that is -11.91/1000 divided by the sample mean of 67.57), ceteris paribus. For the participation rate of all females we find 0.00020 (that is -8.27/1000 divided by the sample mean of 40.77), ceteris paribus.

[22] We do not report this estimate to save space. It is available on request.

Table 5. Net migration equations GMM estimates. Dependent variable is net migration rate (NM). All variables are in first diffences

Name of variable	(I) Model with 2 lags	(II) Model with one lag and without lact	(III) Model with one lag and without lacty	(IV) Model without lags and without lact	(V) Model without lags and without lacty
NMR(-1)	0.2186***	0.2116***	0.2248***	0.2302***	0.2292***
	(5.19)	(5.11)	(5.34)	(5.65)	(5.47)
NMR(-2)	0.0475	0.0405	0.0463	0.0246	0.0252
	(1.21)	(1.04)	(1.18)	(0.63)	(0.65)
UNEM	− 7.6912***	− 7.7563***	− 7.7578***	− 5.7012***	− 5.7206***
	(4.02)	(4.06)	(4.07)	(3.07)	(3.09)
UNEM(-1)	− 1.010	− 1.0913*	− 1.2508		
	(0.59)	(1.7113)	(0.73)		
GDP	24.031***	22.8960***	23.4987***	4.3943	4.2771
	(2.81)	(2.69)	(2.75)	(0.55)	(0.59)
GDP(-1)	− 37.9870***	− 38.8472***	–37.243***		
	(4.49)	(4.61)	(4.40)		
ΔLACTY	− 7.1217	− 9.1844**		− 0.0780	
	(1.26)	(2.05)		(0.02)	
ΔLACTY(-1)	− 7.3621	− 12.4298***			
	(1.34)	(2.87)			
ΔLACT	− 5.0559		− 10.9780*		1.0015
	(0.69)		(1.88)		(0.19)
ΔLACT(-1)	− 11.2918		− 17.0655***		
	(1.58)		(3.02)		
Constant	0.8104	0.9376**	0.7896	− 0.2624	− 0.2545
	(1.04)	(1.90)	(1.60)	(0.60)	(0.58)
Sargan Test □ 2 (52 DF)	69.83	67.48	71.60‡	74.41‡	74.15‡
TEST Second Order AC	1.13	1.15	1.38	1.59	1.63
Wald □ 2	135.38	133.63	132.47	91.22	91.54

‡Test of overidentifying restrictions violated.

Figures in parentheses are the asymptotic z-ratios where z-statistic follows a normal distribution. *, **, and *** denote statistical significance at the 10% level, the 5% level, and the 1% level, respectively.

Time dummies were included in each equation to begin with but because of collinearity, they were eliminated in subsequent run.

The GMM estimates reported are all one-step excepting the Sargan test which refers to two-step estimates. Two-step estimates can be obtained from the authors. The second-order autocorrelation test does not indicate serial correlation on all first-differenced variables. The Wald statistic is a test of the joint significance of the independent variables asymptotically distributed as $\chi 2$ (K) under the null of no relationship, where *K* is the number of coefficients estimated. We present the results of five estimated models as there is a problem of multicollinearity among the changes in young female participation rate and overall female participation rate. The general model uses two lags in the dependent variable and one lag in all explanatory variables. Results with two lags in all explanatory variables can be obtained from the authors. The long-run impact of unemployment on the net migration rate is negative and similarly with the changes in female labour participation rate and young female labour participation rate. Hence increases in the female labour participation rate indeed lower the net migration rate in the dynamic model. These signs confirm that female labour participation changes can act as a shock absorber against demand shocks.

Columns (II) and (III) present the results for the variables on changes in female labour participation rates. These also support the negative impact of female labour participation rates on migration rate. Other regression parameters do not change in relation to the general model.[23]

To summarise, a dynamic specification of the migration model confirms the hypothesis that changes in (female) labour participation act as an alternative adjustment mechanism.

6. Conclusions

In this study, two simple models are used to study European population migration. Changes in economic activity or in unemployment affect the regional population due to migration. This aspect is captured both in the panel study of 82 regions and in the unbalanced panel study of 191 regions. For an average region (with 2.2 million inhabitants, take Noord Brabant in the Netherlands or Hannover in Germany), a one percentage-point increase in unemployment induces 2,100 persons extra to leave. A one percent increase in the per capita income induces an inflow of 11,000 persons. It is clear that mobility is low, especially when it comes to unemployment differences.

The important aspect of this study is the sustenance of low labour mobility for a long period of time despite regional disparities. We show that this can partly be explained through the adjustment in labour market variables, other than unemployment rates. In this respect, female participation and participation of young females mitigates the adverse effects of low labour mobility. Hence, using a different approach we have a finding related to the Decressin and Fatás (1995) finding. Part-time employment does not play an analogous role.

[23] All these results are free of second order serial correlation on first differenced data. Also, if the data have a unit root problem this has been taken care of by using the first differences. The results presented in columns (IV) and (V) do not use any lags of the explanatory variables and Wald test yields a low value of the fit and both changes in labour participation rates and GDP have very low asymptotic z-values due to lack of adequate dynamics. The adjustment coefficient in all these models is near 0.7339 (in the most general model) and varying between (0.7389 to 0.7479 in columns (II) and (III)). This suggests that the despite low labour mobility when the female labour participation is taken into account the adjustment to the desired level of net migration is achieved within 1.36 years.

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Appendix A. Data

Regions in the panel

We use regional data at the Nuts 2 level from Eurostat (2000). Nuts 2 (nomenclature of territorial units for statistics) subdivides the territory of the European Community into 211 regions. Two regions at the Nuts 2 level are identical to countries: Luxembourg and Denmark. We use data on population changes and economic variables, like GDP, and labour market data, as unemployment and participation rates.

From the available regions we selected the regions which provided the necessary data to construct net migration rates.[24] This provides us with an unbalanced panel of 191 regions with time series up to 13 years (1983-95).

From the unbalanced panel we constructed a balanced panel with the time-series dimension unaltered and the number of regions reduced to 82. The following regions are in the unbalanced panel. The balanced panel contains the regions with a (B).

Région Bruxelles-capitale/Brussels hoofdstad gewest (B), Antwerpen (B), Limburg (B) , Oost-Vlaanderen (B), Vlaams Brabant, West-Vlaanderen (B), Brabant Wallon, Hainaut (B), Liège (B), Luxembourg (B), Namur (B), Denmark (B), Stuttgart (B), Karlsruhe (B), Freiburg (B), Tübingen (B), Oberbayern (B), Niederbayern (B), Oberpfalz (B), Oberfranken (B), Mittelfranken (B), Unterfranken (B), Schwaben (B), Berlin, Brandenburg, Bremen (B), Hamburg (B), Darmstadt (B), Gießen (B), Kassel (B), Mecklenburg-Vorpommern, Braunschweig (B), Hannover (B), Lüneburg (B), Weser-Ems (B), Düsseldorf (B), Köln (B), Münster (B), Detmold (B), Arnsberg (B), Koblenz (B), Trier (B), Rheinhessen-Pfalz (B), Saarland (B), Schleswig-Holstein (B), Thüringen, Anatoliki Makedonia, Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia (B), Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Attiki, Voreio Aigaio, Notio Aigaio, Kriti (B), Galicia, Principado de Asturias, Cantabria, Pais Vasco, Comunidad Foral de Navarra, La Rioja, Aragón, Comunidad de Madrid, Castilla y León, Castilla-la Mancha, Extremadura, Cataluña, Comunidad Valenciana, Baleares, Andalucia, Murcia, Ceuta y Melilla (ES), Canarias (ES), Île de France (B), Champagne-Ardenne (B), Picardie (B), Haute-Normandie (B), Centre (B), Basse-Normandie (B), Bourgogne (B), Nord - Pas-de-Calais (B), Lorraine (B), Alsace (B), Franche-Comté (B), Pays de la Loire (B), Bretagne (B), Poitou-Charentes (B), Aquitaine (B), Midi-Pyrénées (B), Limousin (B), Rhône-Alpes (B), Auvergne (B), Languedoc-Roussillon (B), Provence-Alpes-Côte d'Azur, Corse, Piemonte (B), Valle d'Aosta (B), Liguria, Lombardia (B), Trentino-Alto Adige (B), Veneto (B), Friuli-Venezia Giulia (B), Emilia-Romagna (B), Toscana (B), Umbria (B), Marche (B), Lazio (B), Abruzzo (B), Molise (B), Campania (B), Puglia (B), Basilicata (B), Calabria (B), Sicilia (B), Sardegna (B), Luxembourg (B), Groningen, Friesland, Drenthe, Overijssel, Gelderland, Flevoland, Utrecht, Noord-Holland, Zuid-Holland, Zeeland, Noord-Brabant, Limburg (NL), Burgenland, Niederösterreich, Wien, Kärnten, Steiermark, Oberösterreich, Salzburg, Tirol, Vorarlberg, Norte, Centro (P), Lisboa e Vale do Tejo, Alentejo, Algarve, Açores (PT), Madeira (PT), Stockholm, Östra Mellansverige, Sydsverige, Norra Mellansverige, Mellersta Norrland, Övre Norrland, Tees Valley and Durham, Northumberland, Tyne and Wear, Cumbria, Cheshire, Greater Manchester, Lancashire, Merseyside, East Riding and North Lincolnshire, North Yorkshire, South Yorkshire, West Yorkshire, Derbyshire and Nottinghamshire, Leicestershire, Rutland and Northants, Lincolnshire, Herefordshire, Worcestershire and Warks, Shropshire and Staffordshire, West Midlands, East Anglia, Bedfordshire, Hertfordshire, Essex, Inner London,

[24] We left out the four French overseas departments a priori.

Outer London, Berkshire, Bucks and Oxfordshire, Surrey, East and West Sussex, Hampshire and Isle of Wight, Kent, Gloucestershire, Wiltshire and North Somerset, Dorset and Somerset, Cornwall and Isles of Scilly, Devon, West Wales and The Valleys, East Wales, North Eastern Scotland, Eastern Scotland, South Western Scotland, Highlands and Islands, Northern Ireland

Definitions of the variables

GDP Log of gross domestic product per inhabitant at Purchasing Power Parities at NUTS level 2.

The following data are the results of a survey. The survey refers exclusively to private households. The labour force (or active population or working population) was defined as comprising persons in employment and the unemployed. All those persons who are not classified as employed or unemployed are defined as inactive. Activity rates represent the labour force as a percentage of the population of working age (15 years or more for the post-1991 series, 14 years or more for the series between 1983 and 1991).

ACTf Log of activity rates of females (19/11/1998)

ACTfy Log of activity rates of females aged between 25 and 35 years related to the corresponding total population

PARTf Log of the share of working females that has a part-time job

Unemployed persons are those who, during the reference period of the interview, were aged 15 years or over, without work, available for work within the next two weeks and had used an active method of seeking work at some time during the previous four weeks.

U Log of unemployment rates at NUTS level 3 (11/10/1999)25

Ult Log of long-term unemployment; those who are in unemployment for more than 12 consecutive months. (26/07/1999).

The following data are not used directly in the estimation but to construct net migration rates.

Pop Population at 1st January

Births Live births

Deaths Deaths

The data on migration rates are derived from population changes that are not explained by births and deaths. The figures thus constructed report the difference between immigration and emigration. The immigrant either resided in a different region within the same country, a region in some other EU country or some non-EU country. The net change in population due to migration to offset region-specific shocks is relevant. The source of the migrants is (economically) not relevant. The information on gross flows between regions would facilitate the analysis of different push and pull factors within an economy. Such information is, however, not available between regions of the EU economies.

[25] Latest update by Eurostat.

Appendix B. Convergence

We elaborate in this appendix on the convergence issue thrown up in the main text.

Note that a necessary condition for the existence of sigma convergence is beta convergence. Poor regions can grow faster than rich ones without cross-sectional dispersion falling over time. We find that -convergence indeed occurs. This, however, leaves the results in the main text unaffected. Barro (1996) quoting the iron law of Summers indicates that if each year the poor region adjusts to the rich regions by 2% per annum then the beta convergence can be regarded to be strong and significant. We used the data of 82 regions over 1983-95 period and found that overall the regression coefficient of growth on per capita income was -0.029, negative and highly significant in our sample. Our tests on sigma convergence indicated that the observed variance in per capita income did not show a decline from year to year for a sample of 82 regions. Our reservation on sigma convergence is that it should be conditional sigma convergence rather than unconditional sigma convergence.

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