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Effects of Regional Labour Markets on Migration Flows, by Education Level

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EFFECTS OF REGIONAL LABOUR MARKETS ON MIGRATION FLOWS, BY EDUCATION LEVEL

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Abstract. European economies display large variations in unemployment rates across regions as well as between education groups. Insufficient labour mobility is widely believed to contribute to higher regional disparities and overall unemployment, but few studies have compared mobility responses of different education groups to regional shocks. This paper employs administrative registers covering the entire Norwegian population to compute annual time series from 1994 to 2004 of migration flows and regional labour market conditions by educational level for 90 travel-to-work areas. We find that regional disparities in unemployment rates are decreasing in education level, whereas the response of migration flows to regional unemployment shocks is increasing in education level. The results suggest that low regional mobility of low-educated workers may contribute to higher regional disparities and higher overall unemployment among the low educated.

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1. Introduction

The paper compares mobility responses of different education groups to regional labour market shocks using administrative registers covering the whole Norwegian population. Our analysis is motivated by four facts about European labour markets:

- i) Compared to the US, most European countries have large and persistent disparities in regional unemployment and employment rates (OECD, 2005). Regional inequalities are especially pronounced in Germany, Belgium, Southern Europe and Eastern Europe. In some countries, differences between high and low unemployment regions amount to 15-20 % of the labour force. High regional disparities tend to go hand in hand with high overall unemployment.
- ii) Gross and net migration flows between regions are generally smaller in Europe than in the US (OECD, 2005; European Commission, 2008). Southern and Eastern Europe has the lowest mobility rates. Whereas migration is an important adjustment mechanism to regional shocks in the US, Australia and New Zealand, interregional migration flows respond slowly to regional shocks in Europe (Decressin and Fatas, 1995; Bentivogli and Pagano, 1999; OECD, 2005; Ederveen, Nahuis and Parikh, 2007).
- iii) Unemployment rates are decreasing in educational attainment. In the EU19 area¹, the average unemployment rate of persons without upper secondary education is more than three times higher than that of persons with tertiary education (OECD, 2009).
- iv) Mobility between European regions depends on educational attainment. Persons with higher education relocate more often than less-educated individuals (Gobillon and Blanc, 2003; Gregg, Machin and Manning, 2004; Hunt, 2004; European Commission, 2008; Machin, Pelkonen and Salvanes, 2008).

Many scholars believe that the first two facts are linked; arguing that low mobility, together with real wage rigidity, contributes to European regional labour market disparities (Jimeno and Bentolila, 1998; Braunerhjelm et al., 2000; Brunello, Lupi and Ordine, 2001). Relocation of economic activity is not matched by relocation of workers or wage adjustment, leaving

¹ EU15 plus the four eastern European members of the OECD, Poland, Czech Republic, Slovakia and Hungary.

persistent differences in unemployment rates between successful and backwards regions. Spatial mismatch between jobs and workers in turn contributes to higher overall unemployment.

If weak mobility responses to regional shocks cause regional disparities and high overall unemployment, we would expect the last two facts to be linked as well. However, despite widespread concern about insufficient mobility and poor employment prospects of less skilled workers in the increasingly integrated European economies, few scholars have compared migration responses to regional shocks by education level or other skill measures. Hughes and McCormick (1994) examined migration between British regions by occupation. The authors found a small and insignificant impact of regional unemployment on out-migration of professional and managerial workers and a ‘perverse’ negative effect of regional unemployment on out-migration for other workers.² Antolin and Bover (1997) found small effects of regional unemployment on regional out-migration by Spanish workers; the difference between workers with higher education and other workers was not significant.³

Both studies relied on cross-sectional variation between regions to identify migration responses to regional unemployment differentials.⁴ As pointed out by Murphy, Muellbauer and Cameron (2006), a methodological challenge of this approach is that omitted site-specific amenities may bias the estimated effects of local labour market conditions. Both location choices and local labour market conditions will in general depend on a wide variety of local amenities, including local public services, safety, private and public transportation, cultural and environmental amenities and neighbourhood quality.^{5 6} Collection of data about all relevant site-specific amenities is a very demanding task, and for some amenities, good measures of amenity levels are hard to find (Carlsen et al., 2009). Based on their review of

² The authors did not examine in-migration by occupation.

³ The authors found a significant and negative impact of regional unemployment on out-migration for workers registered as unemployed, but did not check whether this effect varied by education level.

⁴ Antolin and Bover (1997, p. 227) state that regional dummies were added in additional analyses but no results for specifications with regional fixed effects are reported.

⁵ Movers and stayers differ along a number of dimensions that are not easily observed, such as personality traits, including social skills, and cognitive abilities (Jokela, 2008; Bacolod, Blum and Strange, 2010). Population movements therefore influence the geographical mix of population attributes that potentially affect both local labour markets and how attractive places are to migrants.

⁶ Local amenities also affect house prices, which in turn affect location decisions.

European migration studies, Murphy, Muellbauer and Cameron (2006) conclude that analyses which control for regional fixed effects generally produce more plausible estimates of effects of regional labour market conditions on mobility than studies which utilize cross-sectional variation.

Sasser (2010) examines population flows between US states and presents evidence suggesting that cross-sectional studies of mobility suffer from omitted variable bias. She finds that the estimated effect of state unemployment on net out-migration changes from negative and significant to positive and significant when state fixed effects are included.

This paper contributes to the literature by presenting evidence on mobility responses to regional shocks by education level. Administrative registers covering the entire Norwegian population are used to compute regional time series of migration flows, unemployment rates and average earnings for each of three education groups (tertiary education, upper secondary education and compulsory schooling). A large database of house transactions is used to compute regional house price indices. We control for time-invariant amenities by first-differencing regional time series and include proxies for several potentially time varying amenities.

We find substantial differences in the mobility response to regional unemployment shocks by education level. For persons with tertiary education, there is a strong and statistically significant negative response of net in-migration to regional unemployment shocks. By contrast, no effect of shocks on migration flows of persons with compulsory schooling or less can be detected.

The remainder of the paper is organized as follows. Section 2 presents our data set. Section 3 presents results from panel data analyses of interregional migration. Section 4 concludes.

2. Data set

Statistics Norway has divided Norway into 90 travel-to-work areas, denoted regions, based on information about commuting flows between municipalities. We use the population-, tax-, education-, employment and unemployment registers⁷ of Statistics Norway to compute annual time series of migration, unemployment and earnings for each region from 1994 to 2004.⁸ Separate time series are computed for three education categories: tertiary education (persons that have completed at least one year at college), upper secondary education (persons that have completed upper secondary education) and primary education (persons that have not completed upper secondary education).

The population register contains historical information about all changes in resident municipality. During the period we consider, merging and splitting of municipalities only involved municipalities within the same region. We are therefore able to compute consistent time series of in- and out-migration for each region. As the standard retirement age in Norway is 67, and we are not interested in retirement location decisions, we study population movements by persons aged 20-66. Our dependent variables are the number of net immigrants to a region in the respective education groups scaled by the size of the education group in the region.

The unemployment register contains all unemployment spells registered by the Norwegian Labour Administration, and the employment register provides information about employment and self-employment during a particular week in November. We consider a person to be a member of the labour force in a given year if he/she was employed or self-employed in this week and/or registered as unemployed at least once during the year. The unemployment rate of an education group is the number of persons in the group who were unemployed for at least one month during the year, or more than six months if they also have been in education or in employment during the year⁹, scaled by the size of the group's labour force.

⁷ The registers cover the whole Norwegian population.

⁸ Comparable data of earnings for earlier years are not available due to the tax reform that came into force in 1994.

⁹ A person does not have to be unemployed for more than six *consecutive* months to be counted as unemployed.

The tax register gives information about income from employment and self-employment, capital income and government transfers. Since we want to describe regional variation in income opportunities, and capital income is independent of residence, we consider the sum of income from employment/self-employment and transfers, denoted earnings.¹⁰ Fluctuations over time in a region's average earnings will both reflect genuine variation in income opportunities and changes in workforce composition.¹¹ To remove effects of exits from and entrances to the labour force, we compute average earnings in a given region and year in three steps. We first estimate education specific cross-sectional regressions for the first year, 1994, explaining individual earnings as a function of age dummies, gender and regional fixed effects; this gives us regression adjusted average regional earnings in 1994. We then use the set of individuals who worked in the same region in two consecutive years, $t-1$ and t , to compute changes in average regional earnings from $t-1$ to t , $t = 1995, 2004$.¹² Finally, estimates of average regional earnings for year t , $t=1995, 2004$, are obtained by adding changes in average regional earnings from 1994 to year t .

Data about vacancies at the regional level are not available, but the National Labour Market Agency has published time series of registered vacancies at the county level.^{13 14} We have computed two vacancy variables: annual inflow of vacant jobs and average stock of unfilled jobs; both are scaled by the labour force in the county. The two measures are strongly correlated and produce very similar results; we present results for the flow measure only.

¹⁰ Government transfers depend on place of residence, both because the level of social security benefits is set by the municipalities and because state transfers depend on labour and capital income and therefore on local income opportunities.

¹¹ Average earnings will also be affected by changes in work hours per worker. None of the administrative registers have information about work hours, but the employment register lists whether employed workers worked part time, defined as less than 30 hours per week. We use only full time, employed workers to estimate regional earnings. We also exclude persons above 60, as some workers may choose to reduce work hours in the years before retirement, and persons below 25 since some young workers are part-time students.

¹² We compute regression adjusted changes, using the same controls for personal characteristics as in the cross-section regression for 1994.

¹³ Norway has 19 counties.

¹⁴ It is mandatory for employers to notify vacancies to the Labour Market Agency. Registered vacancies are therefore likely to be a good proxy for actual vacancies.

Since regional price indices for Norway are not available, we use the price of housing as proxy for cost-of-living. The variable is computed from Statistics Norway's data base of house transactions. Annual hedonic regressions are estimated explaining house price as a function of housing attributes (square meters, year of construction, the number and type of rooms, travel distance to municipality centre) and a full set of regional dummy variables. The regional fixed effects are taken to represent the price levels of the respective regions in that year.

Table 1 presents descriptive statistics for the net migration rates and the regional unemployment rates. Using the mean of absolute values as a measure of migration flows, we first note much higher values for tertiary education compared with the two other groups. The Table also shows that the migration rate is most dispersed for tertiary education, both measured with the overall standard deviations, and after controlling for regional fixed effects. On the other hand, both average unemployment rates and the dispersion in regional unemployment are decreasing in educational level. The unemployment rates are positively correlated, in particular for primary and upper secondary education. The correlations between the migration rates are all positive, but less strong. Using the within-groups correlation, we also note that all migration rates are negatively correlated with the unemployment rates for all education groups.¹⁵

Table 1 (See appendix)

Table 2 (See appendix)

Finally, Table 2 reports results from first order autoregressive regressions for the three regional unemployment rates. Using the estimated autoregressive parameter as a measure of unemployment persistence, the results clearly indicate that shocks to the regional unemployment rates are less persistent for tertiary education than for the two other education levels.

¹⁵ Descriptive statistics for the other variables used in the panel data analysis are reported in Appendix A. All results reported in this paper are obtained using OxMetrics, see in particular Doornik and Hendry (2007), chapter 9.

3. Panel data analysis of migration

Turning to the panel data analysis, the main issue will be to identify the mobility responses to regional unemployment and in particular to investigate whether or not these responses differ by educational level. Our basic empirical specification follows Pissarides and McMaster (1990) and Carlsen, Johansen and Røed (2006) and is given by

$$MJ_{it} = \beta_1 UJ_{it} + \beta_2 DWJ_{it} + \beta_3 VAC_{ct} + \beta_4 \log HP_{it} + \alpha_t + \eta_i + \varepsilon_{it}, \quad (1)$$

where MJ , UJ and DWJ ¹⁶ are, respectively, the net in-migration rate, the unemployment rate and the rate of wage growth for education group J, and VAC is the county level vacancy rate (all in percent). HP is the housing price index, α_t and η_i represent time and regional specific effects, respectively, and ε_{it} is an error term assumed to be identically and independently distributed.

The labour market variables should be considered potentially endogenous because migration flows may affect labour supply. Housing prices are also potentially endogenous since housing demand depends on the size and composition of the population. To obtain consistent estimators, we apply the generalized method of moments (GMM) estimator suggested by Arellano and Bond (1991). The model is first-differenced to remove the regional specific effects. In the absence of second-order correlation in the transformed residuals, endogenous variables lagged two years or more are valid instruments. In our analysis, we restrict the set of instruments to include the second and third lags of all explanatory variables. The effective sample period utilised in all regressions reported below is 1996 – 2004.

Using wage growth instead of the log of wage level is motivated by preliminary results based on more general dynamic specifications which always produced statistically insignificant long run level effects of wages on migration rates.¹⁷ For the remaining explanatory variables, the preliminary analyses suggest that contemporary variables generally perform better than lags. This result may seem surprising as it takes time to make and implement a decision to move.

¹⁶ $DWJ = 100 \cdot \Delta \ln WJ$ where WJ is the wage rate for education group J.

¹⁷ Regional wage growth is used in several panel data studies of interregional mobility, including Eichengreen (1993), Fredrikson (1999) and Pissarides and McMaster (1990).

However, since the explanatory variables are instrumented by their lags, contemporaneous variables can be interpreted as expected magnitudes, conditional on past values.

Table 3 reports two-step robust GMM results for the basic migration equation as well as some parsimonious versions for tertiary and upper secondary education.¹⁸ In all equations, the diagnostic test statistics indicate that the instruments are valid. The Arellano and Bond (1991) test for second order correlation in the transformed residuals, AR(2), is below critical values, and the orthogonality restrictions are always accepted by the Sargan (1958) test for instrumental validity.

For primary education, all estimated effects are small and statistically insignificant, and the joint test cannot reject the null hypothesis that all parameters are equal to zero. We estimated several alternative specifications, but could not detect any significant effect of regional shocks on migration flows for this education group. In the rest of the section, we therefore concentrate on the results for the two other education groups.

Table 3 (See appendix)

The estimated mobility responses to regional unemployment are statistically significant in all equations for tertiary and upper secondary education, and the estimated effects seem robust with respect to specification. The estimated effects on migration flows are substantial, the estimated effects reported in equations II and V imply that increasing the unemployment rate by one percentage point will reduce net in-migration by, respectively, 0.25 percent (upper secondary education) and 0.64 percent (tertiary education) of the population. Since migration rates of persons with tertiary education are considerably higher, the magnitudes in terms of standard errors of migration rates are comparable. For both upper secondary education and tertiary education, increasing the unemployment rate by 2.5 percentage points will reduce net in-migration by approximately one standard error. Interestingly, the estimated effect for upper secondary education is close to the response to open unemployment reported in Carlsen,

¹⁸ The reported t-statistics are based on standard errors which are corrected for small-sample bias as suggested by Windmeijer (2000) and implemented in OxMetrics.

Johansen and Røed (2006) using aggregate migration rates for the time period 1992-98.¹⁹ Our results provide evidence of substantial differences in the mobility responses to regional unemployment shocks by education level.

The estimated effects of the vacancy rate are always negatively signed, but statistically insignificant from zero. The results provide some evidence that higher regional wage growth increase net in-migration for tertiary and upper secondary education. For tertiary education, the estimates are marginally significant (p-value = 0.085) and of some economic importance, whereas the estimates are statistically insignificant for upper secondary education. Finally, higher regional housing prices significantly reduce net in-migration, and again the mobility responses are highest for tertiary education.

So far we have investigated the mobility responses to education specific regional unemployment. However, one may argue that regional labour markets are not completely segmented by education level. In good times, workers with low education may be offered a job which normally requires higher education. In bad times, workers may consider jobs which require less education as an alternative to relocation or unemployment. An individual's migration decision may therefore be affected also by the state of the regional labour market at other education levels. To take this argument into account, we constructed two new unemployment variables. The first one, *UTS*, is given by the weighted average of the unemployment rate for workers with tertiary education and the unemployment rate for workers with upper secondary education. The second one, *USP*, is given by the weighted average of the unemployment rate for workers with upper secondary education and the unemployment rate for workers with primary education.

Table 4 reports results using the new unemployment variables along with results for the baseline migration equations, II and V. For tertiary education, the estimated effect of the *UTS* is almost exactly equal to the estimated effect of the education specific unemployment rate, but we notice that the estimate of *UTS* is most precisely determined. The estimated migration responses to the alternative unemployment variables are also rather similar for upper

¹⁹ The results in Carlsen, Johansen and Røed (2006), equation (4.1) in Table 4, imply that increasing the unemployment rate by one percentage point around sample mean will reduce net in-migration by approximately 0.29 percentage points.

secondary education although the combination of unemployment for workers with tertiary and upper secondary education seems to perform best, cf. equation IV.

Table 4 (See appendix)

As a final robustness check we expand the basic migration equations with more control variables. First, we include the log of municipal revenues per capita, MR. This variable may have a positive impact on net in-migration because higher municipality revenues can be expected to improve municipality services. Second, we control for some aspects of climatic conditions by including average temperature in July, Summertemp, and average temperature in January, denoted Wintertemp. Finally, we control for regional variation in criminal activity by including the variable Crime, defined as number of murders per 1000 inhabitants. All four variables are aggregated by us to region/year from municipal level time series provided by, respectively, Statistics Norway, the Norwegian Meteorological Institute, and the Police Directorate.

Table 5 reports results for the expanded migration equations. Higher municipality revenues and higher summer temperature significantly increase net in-migration of persons with tertiary education, whereas higher winter temperature (less cold winters) significantly increase net in-migration of persons with upper secondary education. The remaining estimated effects of the new control variables are small and statistically insignificant.

Table 5 (See appendix)

The most important result reported in Table 5 is that the estimated mobility responses to unemployment are almost completely unaffected by re-specification of the migration equations. We also note that the point estimates of wage growth and housing prices are rather robust.

4. Conclusion

Insufficient labour mobility is widely believed to contribute to higher regional disparities and overall unemployment, but few studies have compared mobility responses of different education groups to regional shocks.

This paper contributes to the literature by presenting evidence on mobility responses to regional shocks by education level. Administrative registers covering the entire Norwegian population are used to compute regional time series from 1994 to 2004 of migration flows, unemployment rates and average earnings for each of three education groups (tertiary education, upper secondary education and compulsory schooling) for 90 travel-to-work areas. A large database of house transactions is used to compute regional house price indices. We also control for time-invariant amenities by first-differencing regional time series and include proxies for several potentially time varying amenities.

We find that regional disparities in unemployment rates are decreasing in education level, whereas the response of migration flows to regional unemployment shocks is increasing in education level. For persons with tertiary education, there is a strong and statistically significant negative response of net in-migration to regional unemployment shocks. By contrast, no effect of shocks on migration flows of persons with compulsory schooling or less can be detected. The results suggest that low regional mobility of low-educated workers may contribute to higher regional disparities and higher overall unemployment among the low educated.

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Appendix A Descriptive statistics

Variable	Mean	Standard deviation	WG standard deviation
Vacancy rate (VAC)	15.794	6.425	5.953
Wage growth			
Primary education (DWP)	5.593	1.286	1.336
Upper secondary schooling (DWS)	5.704	1.205	1.256
Tertiary schooling (DWT)	6.630	1.238	1.281
log housing prices (HP)	-0.230	0.341	0.221
log municipal revenues (MR)	0.376	0.149	0.050
Summertemp	14.524	2.160	1.510
Wintertemp	-2.095	3.837	1.800
Crime	0.010	0.027	0.027

Table 1: Descriptive statistics

		Mean	Mean of absolute values	Standard deviation	WG Standard deviation
Migration rates:					
Primary education	(MP)	0.141	0.410	0.584	0.476
Upper secondary education	(MS)	-0.207	0.553	0.692	0.454
Tertiary education	(MT)	-1.344	1.679	1.701	1.040
Unemployment rates:					
Primary education	(UP)	5.828		2.255	1.512
Upper secondary education	(US)	4.931		1.940	1.202
Tertiary education	(UH)	1.990		0.733	0.525

Correlations

	UP	US	UT	MC	MS
US	0.86				
UT	0.59	0.67			
MP	-0.15	-0.16	-0.11		
MS	-0.16	-0.21	-0.02	0.42	
MT	-0.02	-0.15	0.08	0.12	0.54

Correlations after WG transformations

	UP	US	UT	MC	MS
US	0.83				
UT	0.46	0.57			
MP	-0.10	-0.13	-0.09		
MS	-0.20	-0.20	-0.16	0.37	
MT	-0.19	-0.22	-0.11	0.12	0.30

Table 2: Unemployment persistence

Education group	Estimated equation: $UJ_{it} = \rho UJ_{it-1} + \alpha_i + \varepsilon_{it}$	
	Estimate of ρ without time dummies	Estimate of ρ with time dummies
Primary education	0.60	0.56
Upper secondary education	0.61	0.54
Tertiary education	0.46	0.34

Notes: All equations are estimated using the Within-Groups transformation. Sample period is 1995 – 2004.

Table 3: Basic migration equations

Explanatory variables	Tertiary education		Upper secondary education			Primary education
	I	II	III	IV	V	VI
UJ	-0.626 (2.27)	-0.637 (2.34)	-0.226 (3.88)	-0.225 (3.68)	-0.250 (3.08)	-0.031 (0.57)
VAC	-0.018 (0.85)		-0.018 (1.68)			-0.005 (0.35)
DWJ	0.359 (1.72)	0.325 (1.72)	0.089 (1.40)	0.076 (1.13)		-0.007 (0.07)
logHP	-1.863 (2.05)	-1.982 (2.22)	-0.831 (1.85)	-0.908 (1.92)	-1.544 (2.28)	-0.385 (0.97)
Joint significance (p-values)	0.000	0.000	0.000	0.000	0.002	0.485
Sigma	1.310	1.309	0.589	0.589	0.601	0.735
AR(1)	-4.80	-4.79	-4.48	-4.49	-4.72	-6.12
AR(2)	-1.84	-1.80	0.50	0.59	0.33	0.335
Sargan (p-values)	0.244	0.264	0.544	0.529	0.221	0.269

Notes: Estimates with two-step robust t-statistics in parentheses. Estimation method is GMM, see Arellano and Bond (1991). The effective sample period is 1994 – 2004. All equations include time dummies. Joint significance is a chi-square test for joint significance of the included explanatory variables. Sigma is the equation standard error, AR(i) is the Arellano and Bond (1991) test for serial correlation of order i in the transformed residuals, and Sargan is the Sargan (1958) test for instrumental validity.

Table 4: Results using alternative definitions of unemployment

Explanatory variables	Tertiary education		Upper secondary education		
	II	VII	V	VIII	IX
UJ	-0.637 (2.34)		-0.250 (3.08)		
Weighted average of UT and US (UTS)		-0.638 (4.66)		-0.301 (3.40)	
Weighted average of US and UP (USP)					-0.228 (2.78)
DWJ	0.325 (1.72)	0.259 (1.62)			
logHP	-1.982 (2.22)	-1.713 (1.88)	-1.544 (2.28)	-1.460 (2.06)	-1.339 (2.15)
Joint significance (p-values)	0.000	0.000	0.002	0.001	0.011
Sigma	1.309	1.325	0.601	0.600	0.593
AR(1)	-4.79	-4.87	-4.72	-4.65	-4.71
AR(2)	-1.80	-1.89	0.22	0.40	0.38
Sargan (p-value)	0.264	0.336	0.221	0.276	0.202

Notes: See notes to Table 3.

Table 5: Sensitivity analysis

Explanatory variables	Tertiary education		Upper secondary education	
	II	X	V	XI
UJ	-0.637 (2.34)	-0.613 (1.96)	-0.225 (3.68)	-0.218 (3.93)
DWJ	0.325 (1.72)	0.333 (1.51)	0.076 (1.13)	0.108 (1.51)
logHP	-1.982 (2.22)	-2.141 (2.10)	-0.908 (1.92)	-1.174 (2.62)
logMR		5.189 (3.44)		0.774 (0.93)
Summertemp		0.073 (1.69)		0.009 (0.52)
Wintertemp		0.023 (0.65)		0.049 (4.01)
Crime		-0.311 (0.11)		0.113 (0.12)
Joint significance	45.55	49.89	34.16	49.68
Sigma	1.309	1.312	0.589	0.589
AR(1)	-4.79	-4.81	-4.49	-4.37
AR(2)	-1.80	-1.45	0.59	0.70
Sargan (p-value)	0.264	0.327	0.529	0.616

Notes: See notes to Table 3