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MT–**DP.** 2002/16

THE GEOGRAPHIC MOBILITY OF LABOR AND THE RIGIDITY OF EUROPEAN LABOR MARKETS

GÁBOR KÉZDI

Institute of Economics
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The Geographic Mobility of Labor and the Rigidity of European Labor Markets

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THE GEOGRAPHIC MOBILITY OF LABOR AND THE RIGIDITY OF EUROPEAN LABOR MARKETS

GÁBOR KÉZDI

Abstract

Regional unemployment and non-participation rates are higher, more disperse, and more stable in Europe than in the U.S. This paper helps understand what may cause this phenomenon. Specifically, it looks at the role of migration in regional differences. I analyze the adjustment mechanisms of regional labor markets in seven countries of continental Europe (Belgium, Germany, Spain, France, Italy, The Netherlands, and Portugal), and the United States. I develop a simple model to understand the role of migration in the adjustment mechanism and estimate comparative static parameters. Under demand shocks, migration elasticities are identified relative to other supply elasticities. I argue that comparative statics give more reliable results than the usual Vector Autoregression approach. I exclude part of the possible supply-induced variation in my analysis. According to the results, aggregate migration elasticities relative to other supply responses are significantly weaker in Europe than in the U.S. The differences are small for the economically most active cohorts, and the aggregate differences are driven primarily by the less active cohorts, both young and old. This suggests that the Europe-US differences in regional inequality are driven at least as much by stronger unemployment and non-participation responses than weaker migration.

Key words: regional labor markets, migration, labor supply adjustment.

MUNKAERŐ-MOBILITÁS ÉS
AZ EURÓPAI MUNKAERŐ-PIACOK RUGALMATLANSÁGA

KÉZDI GÁBOR

Összefoglaló

Az európai régiók munkanélküli és inaktivitási rátái átlagosan magasabbak, jobban szóródnak, és időben stabilabbak mint az Amerikai Egyesült Államok régióié. Az alábbi tanulmány ennek a különbségnek a megértéséhez járul hozzá. Konkrétan arra a kérdésre keresi a választ, hogy mi a szerepe annak, hogy Európában alacsonyabb a munkaerő migrációs hajlandósága. Hét európai ország (Belgium, Németország, Spanyolország, Franciaország, Olaszország, Hollandia és Portugália) és az USA régióinak igazodási mechanizmusait vizsgálom. Egy egyszerű modellen keresztül bemutatom a migrációs hajlandóság és a foglalkoztatási ráták szóródásának kapcsolatát, és tárgyalom a modell paramétereinek becslését. Amennyiben a rendszert keresleti sokkok mozgatják, a migrációs hajlandóság identifkálható, de csak a teljes kínálati rugalmassághoz képest. Bemutatom, hogy a komparatív statikus megközelítés könnyebben értelmezhető paramétereket identifikál és megbízhatóbb, mint az irodalomban elterjedt vektor autoregressziós (strukturális VAR) mérési stratégia. Az eredmények alapján elmondhatjuk, hogy az aggregált kínálati igazodásban valóban jelentősen kisebb a szerepe a migrációnak Európában mint Amerikában. Ez igaz az országokon belüli migrációra is, de különösen nagy az eltérés ha az országok közötti igazodást is figyelembe vesszük. A különbségek azonban viszonylag kicsik a gazdaságilag aktív csoportokban, ami azt sugallja, hogy a migráció kisebb szerepe legalább annyira köszönhető annak, hogy a többi kínálati alkalmazkodás jóval erősebb, mint annak, hogy a migráció gyengébb Európában.

Kulcsszavak: regionális munkaerőpiacok, migráció, munkakínálati alkalmazkodás

The Geographic Mobility of Labor and the Rigidity of European Labor Markets

Preminilary. Do not quote.

Gábor Kézdi
University of Michigan

May 31, 2002

Abstract

The rigidity of regional labor markets in Europe is manifested in more disperse and pertsistent unemlpoyment and non-participation rates. I try to assess the role of inter-regional migration in this phenomenon. Adjustment mechanisms of regional labor markets are analyzed in seven countries of continental Europe (Belgium, Germany, Spain, France, Italy, The Netherlands, and Portugal) and the United States. A simple theoretical model is developed to understand the role of migration in the adjustment mechanism. Migration elasticities are identified relative to other supply elasticities, under demand shocks. OLS estimates are possibly biased by supply shocks, in either direction. The IV used in the US literature turns out to be very weak in our context. Using other methods, part of the possible supply-induced variation is excluded and the migration elasticities are re-estimated. According to the results, aggregate migration elasticities are significantly weaker in Europe than in the U.S.. The economically most active cohorts are only slightly less mobile, and the aggregate differences are driven primarily by the less acitve cohorts. This suggests that the Europe-US differences are probably driven more by stronger unemployment and non-participation responses than weaker migration.

Regional unemployment rates are not only higher in continental Europe than in the U.S., but they are also more disperse, and the differences are more stable over time. Maurice Obstfeld and Giovanni Peri (1998) found that the coefficient of variation of regional unemployment rates was around 0.38 in the late 1980's and early 1990's in the European Union, while the corresponding U.S. figures were about 0.23. They also show that differences were a lot more persistent in Europe. The correlation of regional unemployment rates of 1985 and 1995 are moderate in the U.S. (with a correlation coefficient of 0.38) but strong in the U.K. (0.89), Germany (0.76), and Italy (0.83). They argue that more persistence is due to less adequate adjustment to exogenous changes and not a result of differences in the natural rate of unemployment.

That European labor markets are less flexible than those in the United States is a commonplace among economists. Olivier Blanchard and Pedro Portugal (2001) find that flows of workers into and out of unemployment are about three times lower in Portugal than in the U.S. They find that job creation and job destruction ("job flows") are lower in Portugal at high frequencies but they are actually very similar at the annual level. They also find evidence that worker mobility across firms in addition to job creation are significantly lower in Portugal. This latter fact suggests that an important part of the inflexibility of the Portuguese labor market is due to lower worker mobility. Together with the first findings, workers' mobility actually looks more important than demand inflexibilities for annual and longer horizons.

Another commonplace is that people in Europe are less mobile than people in the U. S. Blanchflower and Oswald (1999) report that the fraction of people moving between American states is almost three times larger than the fraction of people moving between German regions (3 per cent versus 1.1 per cent in 1986). Although realized mobility may reflect less incentives to move as well as less propensity to move given the incentives (a point made my Obstfeld and Peri), casual empiricism and most of the previous literature also support the low propensity to migrate among Europeans (see, for example, Krueger, 2000).

The question I try to answer in this paper is whether there is a causal connection between these phenomena. That is, I try to assess the extent to which the more disperse unemployment rates in Europe (an indicator of less flexible labor markets) is due to lower geographic mobility of people. A significant part of the lower mobility of workers documented by Blanchard and Portugal (2001) might be a result of lower propensity to migrate. This is an important factor if different industries are clustered at different places in order to enjoy the benefits of agglomeration, and at the same time changes in industry-specific labor demand are different. Although European countries are known to be less diverse in industrial composition than the U.S., that difference is not very large (see section 3.2 below).

Andrew Oswald (1999) presents evidence that correlation between home-ownership and unemployment rate is positive and surprisingly large. The relationship holds across countries and across regions within countries, both in cross-section and in long-term changes. Moreover, Oswald presents results that suggest that unemployment benefits, taxes on labor income, or unionism have a lot weaker (if any) impact on the spatial distribution of unemployment rates. He notes that "conventional wisdom [on the source of labor market rigidities] is more of a result of theoretical preconception than a weighing of hard evidence." The causal mechanism between home-ownership and unemployment rates is through the geographic mobility of people. He argues that wide-spread home-ownership makes markets for housing less liquid and therefore increases migration costs, which makes regional adjustments less complete. Oswald lists a few indirect mechanisms for candidate explanations, but all rest on the primary role of migration responses.

In order to answer my question I examine aggregate adjustment mechanisms of European and U.S. regional labor markets. The topic has been extensively researched: Bartik (1991), Blanchard and Katz (1992), and Bound and Holzer (2000) analyze U.S. regional labor markets, while Decressin and Fatás (1994), Obsfeld and Peri (1998), and Mauro and Spilimergo (1999) look at European regions (the first one from all Europe, the second one from Germany, Italy, and the U.K., and the third one from Spain).

The European literature follows the structural VAR methodology developed by Blanchard and Katz (1992). It offers quite conflicting conclusions for the role of inter-regional migration in adjustment to exogenous changes in Europe. Decressin and Fatás' (1994) results suggest that there is a relatively weak migration response in the first year after an exogenous shock in labor demand in Europe. In five years, they find no remaining unemployment or participation, which indicates that all changes in employment translate to migration. On the other hand, Mauro and Spilimbergo's results for Spain suggest a migration response less than 50 per cent. Obstfeld and Peri (1998) also conclude that people's propensity to migrate is a lot smaller than Decressin and Fatás' results would suggest. For all three European countries they examine (Germany, Italy, and the U.K.), the migration response after five years is about 30 per cent (compared to 80% in the U.S. and 70% in Canada).

In a separate paper I show that the VAR approach requires assumptions that are implausible, not testable, or rejected by the data. Although the effect of some of these may not be crucial for the main results (especially if dynamics at yearly frequencies may not be that important, which I will provide evidence for), their main identifying assumptions can lead to quite misleading results. Here I follow a comparative static approach. Instead of making use of the year-to-year dynamics, I look at simple differences covering one to ten year spans. At the same time, however, I try to think harder about what drives variation in the data and what identifies the coefficients I estimate. This approach is close to Bartik's (1991) and Bound and Holzer's (2000) analysis.

I examine seven countries in continental Europe: Belgium, Germany, Spain, France, Italy, The Netherlands, and Portugal. The simple supply and demand model I develop helps understanding the identification problems. The migration elasticity is identified only relative to other supply elasticities, and even that is true if regions experienced demand shifts only. OLS estimates might be biased by supply shocks, in either direction. The IV used for the US in the 1980's does not work in our context. I exclude parts of the supply shifts by looking at within birth-cohort changes but the results are rather mixed.

I find evidence that migration aggregate responses are indeed smaller in Europe (except in France and Holland). However, these are a result of relatively small differences in the most active cohorts and large differences in older and very young cohorts. Since the migration elasticity is identified only relative to other supply responses, the results suggest that it is probably those other mechanisms (adjustment on the unemployment and non-participation margin) that are responsible for most of the rigidity.

The rest of the paper is organized the following way. The first section develops a simple theoretical model. The model is useful to interpret the empirical results and sheds light on the main problem of identification. The second section introduces the data, and the third section discusses the results. The last part concludes.

1 Adjustment mechanisms of regional labor markets

1.1 A simple model

The goal of the paper is to understand how a regional labor markets adjust to exogenous changes in labor demand or supply, and what is the role of migration in the adjustment. This section introduces a simple model of aggregate adjustment of regional labor markets. The model very simple, but I believe that it incorporates the basic elements of most economists' intuition. There is no emphasis on dynamics; the analysis focuses on long-run issues. As the data will confirm, the long run may be quite short in our case: one-year differences are not that different from longer ones.

All important parameters (demand and supply elasticities) are assumed to be the same for all regions in a given country, but different regions are assumed to experience different exogenous shocks. This is a "small economy" (small regions) partial equilibrium model: whatever happens in one region does not directly affect the others. Quantities and wages should be understood as differentials from the national average. This makes sense if countries are closed for factor mobility, and it is probably a good approximation if mobility within countries is a lot larger than mobility between countries.

Let l denote log employment in a region, and let dl denote changes in log employment (approximate percentage changes). Similarly, let w denote the log (real) wage and dw the change in log wage. Labor demand is described by the following log-linear relationship:

$$dl^D = -\eta \; dw + d\xi. \tag{1}$$

η is the elasticity of demand and $d\xi$ is an exogenous shock. Labor supply is assumed to follow a similar log-linear relationship. However, here I distinguish two elements of shocks and adjustments. In the "short run", people don't migrate and all adjustment takes place on the employment - non-employment margin (unemployment and participation).[1] In the "long run", however, people can move and therefore leave or enter the region. The short-run versus long-run distinction should be thought of more as theoretical concepts than real timing differences. The short-run elasticity is meant to be counterfactual: it describes what would happen if there were no migration at all.

$$dl^{SS} = \psi \; dw + d\zeta \tag{2}$$
$$dl^{SL} = (\psi + \lambda) \; dw + (d\zeta + d\kappa)\,. \tag{3}$$

Short-run supply is denoted by superscript SS, and SL means long-run supply. ψ is the short-run elasticity of labor supply. It is the counterfactual elasticity of adjustment on the employment - non-employment margin without migration. λ is the migration elasticity in response to changes in real wages. $d\zeta$ is non-migration shocks to labor supply while $d\kappa$ is migration shocks.

Figure 1 illustrates the setup. D is demand for labor. $\mathrm{S_S}$ is labor supply "in the short run", and $\mathrm{S_L}$ is labor supply "in the long run". $\mathrm{S_L}$ is more elastic than $\mathrm{S_S}$ because the latter incorporates responses through migration (λ). At each wage level, the difference between

[1] This broad interpretation of labor supply is very similar to Olivier Blanchard's use of the term (see, for example, Blanchard, 1997). A more elastic short-run labor supply means a stronger relationship between real wages and participation or unemployment. A more generous welfare system with wide disability pensions coverage, early retirement possibilities, or longer unemployment assistance may result in a more elastic supply. Countries in continental Europe may therefore be characterized by more elastic supply curves than the U.S.

the short-run and the long-run supply curve corresponds to migration. In the absence of labor mobility, the short-run and the long-run curves coincide. Under perfect mobility, the long-run curve is horizontal.

Figure 1 shows a situation where there is some labor supply response without migration (S_S is not vertical). There is migration response in addition, but is not infinitely elastic (S_L is different from S_S but it's not horizontal). Initially, the labor market is in equilibrium at point E_0, where demand equals supply and employment is at l_0. Figure 1 illustrates the case where all curves intersect at E_0 in the initial equilibrium. That is, there is no migration at the going real wage. This corresponds to a world where there are no changing region-specific "consumption amenities" that would result in inter-regional migration at equilibrium wages.

In the long run, equilibrium changes are the following:

$$dw^* = \frac{d\xi - d\zeta - d\kappa}{\eta + \psi + \lambda} \tag{4}$$

$$dl^* = \frac{\psi + \lambda}{\eta + \psi + \lambda} d\xi + \frac{\eta}{\eta + \psi + \lambda} \left(d\zeta + d\kappa \right). \tag{5}$$

Long-run wage effects are larger the smaller the elasticities (η, ψ, λ). The long-run change in employment is a function of the relative size of the demand and supply elasticities, and it depends on the source of the shock. It is always less than or equal to the size of the shock for it is dampened by wage effects. For a given demand shock, the long-run employment response is larger the larger the supply elasticities relative to the elasticity of demand. For a given supply shock, the opposite is true.

By definition, equilibrium migration is exogenous migration plus the migration response to the equilibrium changes in the real wage:

$$dp^* = \lambda \, dw^* + d\kappa = \frac{\lambda}{\eta + \psi + \lambda} \left(d\xi - d\zeta \right) + \frac{\eta + \psi}{\eta + \psi + \lambda} d\kappa. \tag{6}$$

Similarly to the employment effects, the long-run migration response depends on where the shock comes from. Following a non-migration shock, the larger the migration elasticity relative to the other elasticities the larger the long-run effect. For an exogenous migration shock the opposite is true.

If there are only demand shocks, long-run equilibrium changes simplify to $dw^* = \frac{1}{\eta+\psi+\lambda} d\xi$, $dl^* = \frac{\psi+\lambda}{\eta+\psi+\lambda} d\xi$, and $dp^* = \frac{\lambda}{\eta+\psi+\lambda} d\xi$. Figure 1 illustrates a negative demand shock. The demand curve shifts by $d\xi$, from D to D′ (the shift is represented by the dashed arrow). In the absence of labor mobility, the new equilibrium would be at point E_S. The full effect is represented by point E_L with employment l_L and wage w_L. The long-run change in employment is $dl \equiv l_L - l_0$, illustrated by the bottom thick arrow on Figure 1. With mobility, the decrease in employment is larger and the decrease in wages is smaller in equilibrium. Equilibrium migration is equal to the distance between the long-run and the short-run supply curve at the equilibrium wage w_L. After the negative demand shift, there is net outmigration of dp from the region, illustrated by the upper thick arrow on Figure 1.

1.2 The role of migration

One can assess the role of migration in accommodating exogenous changes by measuring the share of migration in total adjustments,

$$\beta \equiv \frac{dp^*}{dl^*} = \frac{\lambda \ (d\xi - d\zeta) + (\eta + \psi) \ d\kappa}{(\psi + \lambda) \ d\xi + \eta \ (d\zeta + d\kappa)}. \tag{7}$$

β describes the role of migration in total adjustment of employment. It is a function of the demand and supply elasticities, and those parameters interact with the source of the exogenous changes. In what follows I focus on demand shocks.

In response to a demand shift only, we have that

$$\beta^D \equiv \beta_{d\zeta=0,d\kappa=0} = \frac{\lambda}{\psi + \lambda}. \tag{8}$$

β^D depends on two parameters: migration elasticity and the elasticity of short-run labor supply (unemployment and participation responses). In this isoelastic setup, the size of the demand shift does not matter for β^D. The elasticity of demand has no effect either.

β^D is always between 0 and 1. A stronger migration response relative to other supply adjustments results in a larger β^D (unless $\psi = 0$, that is unless all adjustment falls on migration). If there is no migration response at all (S_S and S_L coincide), $\beta^D = 0$. For the same migration elasticity, a larger non-migration response (a flatter S_S) results in a smaller β^D. Naturally, in the absence of any kind of supply adjustment (S_S is vertical and is the same as S_L), there is no change in employment at all, $dp^* = dl^* = 0$, and β^D is not defined.

The parameters of the model are not identified from a single source of shock. In the case of demand shifts, it is the relative importance of migration and non-migration elasticities in the supply schedule that are identified. In principle, one could identify all three parameters from β if the three shocks were observable separately. As we will see, however, even demand shocks are not easy to identify in the data. Therefore I do not try to isolate other sources of exogenous variation.

1.3 Migration and cross-regional variation of employment rates

The phenomenon I'd like to explain is the rigidity of European regional labor markets, illustrated by the larger and more persistent dispersion of unemployment rates. In the spirit of the simple theoretical model outlined above, I do not distinguish between unemployment and non-participation. As a result I focus on the employment rate defined as the fraction of the active age population that is employed.

Under demand shocks only, $\beta = \beta^D$ is closely related to inter-regional variation of employment rates (employment over population). In order to have a scale-independent measure of its variation, let us look at log employment rates:

$$e \equiv \log\left(\frac{L}{P}\right) = l - p, \tag{9}$$

where L is employment and P is population. Let's imagine a thought experiment, in which all regions start with the same employment rate. They experience a demand shock, each region a different one. After the shock, their (equilibrium) employment rate changes to

$$de^* = dl^* - dp^*.$$

Before the shock, inter-regional variation in log employment rates were zero. After the shock, they change to

$$\begin{aligned} Var\left(de^*\right) &= Var\left(dl^*\right) + Var\left(dp^*\right) - 2Cov\left(dl^*, dp^*\right) \\ &= \left(\frac{\psi}{\eta+\psi+\lambda}\right)^2 Var\left(d\xi\right) \\ Sd\left(de^*\right) &\equiv \sqrt{Var\left(de^*\right)} = \frac{\psi+\lambda}{\eta+\psi+\lambda}\frac{\psi}{\psi+\lambda} Sd\left(d\xi\right) \\ &= \left(1 - \frac{\eta}{\eta+\psi+\lambda}\right) \times \left(1-\beta^D\right) \times Sd\left(d\xi\right). \end{aligned}$$

If we assume that all regions experienced demand shocks only, the standard deviation of log employment rates is a function of the elasticity of demand relative to the long-run elasticity of supply; the role of migration; and the standard deviation of the demand shocks (measured in log employment). Stronger demand elasticity (relative to supply adjustment) and larger migration response lead to smaller dispersion.

Larger European dispersion of log employment rates are therefore a result of weaker demand adjustment, weaker migration responses, stronger unemployment and non-participation responses (these form β^D), or larger shocks. As we will see (in tables 3 and 4), the last explanation is very unlikely. If demand shocks are dominant, the relative rigidity of European labor markets is a result of weaker demand or migration responses, or stronger adjustment on the non-employment margin.

1.4 Measurement strategy

We can identify β^D from cross-regional variation by estimating a simple two-variate regression with changes in population on the left-hand side and changes in employment on the right-hand side:

$$dp = \beta\ dl + \varepsilon. \tag{10}$$

If we assume that changes we look at correspond to two equilibria, and all regions experienced demand shocks only, the probability limit of β in the above population regression estimated by OLS is equal to β^D:

$$\text{p}\lim \hat{\beta}_{OLS} = \frac{Cov\left(dp, dl\right)}{Var\left(dl\right)} = \frac{\lambda\left(\psi+\lambda\right)Var\left(d\xi\right)}{\left(\psi+\lambda\right)^{2}Var\left(d\xi\right)} = \frac{\lambda}{\psi+\lambda} = \beta^{D}. \tag{11}$$

On the other hand, when measuring the thought experiment β by comparing different regions, we may compare regions that experienced different kinds of exogenous changes from both supply and demand factors. In that case, the probability limit of the OLS estimate of β is not β^D. For example, if regional labor markets experience demand shocks and non-migration labor supply shocks, and the two shocks are uncorrelated, the probability limit of the OLS estimate is smaller than β^D:

$$\text{p}\lim \hat{\beta}_{OLS} = \frac{\lambda}{\psi+\lambda} \times \frac{\left(\psi+\lambda\right)Var\left(d\xi\right) - \eta Var\left(d\zeta\right)}{\left(\psi+\lambda\right)Var\left(d\xi\right) + \frac{\eta^{2}}{\psi+\lambda}Var\left(d\zeta\right)} < \beta^{D}.$$

Estimation of β^D is therefore subject to an identification problem. We have to restrict variation to exogenous changes in demand for consistent estimation.

2 Data

2.1 Regions

I try to estimate β^D for seven countries of continental Europe and the U.S., using yearly balanced panel data from 1987 to 1998. The seven European countries analyzed here are Belgium (BE), Germany (DE for Deutschland), Spain (ES for Espana), Italy (IT), France (FR), the Netherlands (NL) and Portugal (PT).[2] In the U.S. regions are the Sates. In the European countries, the regions are NUTS-1 and NUTS-2 level units (NUTS stands for Nomenclature of Territorial Units). Table 1 provides summary statistics for the regions, for the 16-74 years old population. For more details, see Eurostat (1999).

There are 43 NUTS1 regions in the seven countries altogether (not counting East Germany, Berlin, and the overseas territories)[3]. These regions are in size comparable to states in the U.S., but they are a lot more similar to each other. Inter-regional variation in the U.S. is therefore probably overstated relative to Europe, and so will be migration responses. At any rate, using the NUTS1 regions when comparing European and U.S. regions is better than using the NUTS2 regions.[4]

[2] Regional classification changed during the period in the U.K. Other countries were either extremely small or had no data for most years.

[3] Overseas territories of the European countries, regions in former Eastern Germany (and all Berlin), Corse (FR), Sardegna (IT) the Baleares Islands (ES) and Ceuta y Melilla (ES, the tiny part of Africa opposite to Gibraltar) were excluded from the analysis. Alaska and Hawaii were excluded from the U.S. dataset but D.C. was retained.

[4] In an ideal world, we would have somewhat finer level of disaggregation in the U.S. than states themselves. In princliple, one could try looking at MSA-s. Unfortunately, they do not cover all of the area in a state. As we will see, the American survey sample (CPS) is also a lot smaller than its European counterparts so that finer than states analysis may not be feasible. One could also try aggregating some of the smalles U.S states in order to get a more homogenous sample in terms of population. Leaving D.C. out from the analysis might also help. For the current version of the paper, I have not done anything along these lines.

The U.S. data come from the annual March CPS files. Sample size is around 50,000 households altogether. The sample is based on a stratified design with the strata are based on States since 1985. The European data are from national labor force surveys harmonized and aggregated by Eurostat, the statistical agency of the European Community.[5] The samples are very large: in terms of households, they are 35,000 in Belgium; 350,000 in Germany; 65,000 in Spain; 75,000 in France; 75,000 in Italy; 60,000 in the Netherlands; and 20,000 in Portugal. All samples are stratified with strata at or below the level of NUTS2 regions. Table 2 shows the most important sample statistics.[6]

In principle, our population and employment variables are subject to sampling error, especially when looking at changes over time. At this sample size this turns out to be a non-issue, even for subpopulations defined by 10-year age groups. Although the American samples are smaller within a region, that is less of a problem because there is more substantive variation there.

Another, probably more important source of measurement error is that the variables I consider are totals. They are created using population estimates, which are based on decennial census data and life statistics between census years. Intuitively, errors in between-census estimates bias estimates of β^D towards one. This problem is relevant for all studies that deal with totals (total employment, for example), not only my analysis. Assessing the extent of this bias is one of the most important tasks I have to deal with in the future.

In addition to the data based on labor force surveys, establishment-based series by 17 industries are going to be used for IV estimation. The data is based on Eurostat series and were cleaned by Cambridge Econometrics.

2.2 Regional employment rate differentials

Before turning to estimation, it is worth once again looking at the phenomenon I want to explain. As I indicated before, it is employment over population (in active cohorts) that I focus at rather than unemployment rates. The reason is the same as in the broad definition of labor supply: I do not want to distinguish between the participation and unemployment decisions.

Between 1987 and 1998, the standard deviation of the log employment rates for age 16 to 64 was 0.14 in the seven European countries, on average (nuts1 regions). The corresponding figure for the U.S. was 0.06. This is a significant difference, both in statistical and economic terms.

Figure 2 shows the joint distribution of the 1988 and 1998 log employment rates for the EU7 and the US. It is evident just by looking at them that the European rates are not

[5] The data I use in this analysis are yearly NUTS2 aggregates of population, employment, and unemployment, by sex and single years of age. Following my specifications, the data were provided by Eurostat.

[6] There are two reasons why samples of the European labor force surveys are so much larger compared to the population, and therefore, within comparable regional units. The first one is to help detalied national analyses. The second one is an explicit policy of Eurostat to facilitate NUTS2-level regional analyis. In particular, one major goal when determining the optimal size of the survey samples is to get unemplpoyment rates with less than 10 percent of standard error (in terms of the coefficient of variation) at the NUTS2 regional level (Eurostat, 1998).

only smaller and more disperse but also more persistent over time. Indeed, the correlation coefficient is 0.87 for Europe and 0.75 for the U.S.

Figure 3 shows the same log rates for each European country, for the smaller nuts2 regions. Germany, the Netherlands, and Portugal show relatively high, less disperse, and less persistent rates; Belgium and France show more persistence; and regional employment in Spain and Italy is the lowest, most disperse, and most persistent (especially for the last one).

Not surprisingly, the data at hand show the same phenomenon the literature has established: non-employment in continental Europe is not only higher than in the U.S. but it shows larger and more stable regional differences, both within and across individual countries.

3 Estimation

3.1 Summary statistics

Just as in the theoretical section, let l denote log employment and p log population. Index c corresponds to countries and i to regions. Let changes from t to $t+s$ be denoted by Δ_s (so that, for example, $\Delta_s l_{cit} \equiv l_{ci(t+s)} - l_{cit}$). Changes in variables can be decomposed into two factors: changes shared by all regions in the economy and other factors that are specific to the region. Let $\Delta\tilde{l}$ and $\Delta\tilde{p}$ denote changes that are cleaned of changes shared by all regions. Then, for a country c, we have that

$$\Delta_s l_{cit} = \gamma_{(l)cst} + \Delta_s \tilde{l}_{cit} \text{ and} \quad (12)$$

$$\Delta_s p_{cit} = \gamma_{(p)cst} + \Delta_s \tilde{p}_{cit}, \quad (13)$$

where i is region in country c, and t is year of observation. Standard deviation of the two variables ($\Delta_s \tilde{l}_{cit}$ and $\Delta_s \tilde{p}_{cit}$) are presented in Table 3. The standard deviations inform us about the typical size of (equilibrium) employment changes, measured as deviations from the national trends.

The structure of most tables is going to be the same from now. The rows represent different countries or all Europe. The country-specific results are based on NUTS2 regions. European results are presented both for NUTS2 and NUTS1 regions. The columns correspond to different time-spans: one, five, and ten-year differences (Δ_1, Δ_5, Δ_{10}).

All samples cover the years from 1987 to 1998, and therefore for each time horizon Δ_s, the number of observations is equal to $s+1$ times the number of the regions. For example, the U.S. sample for the one-year time horizon consists of 11×49 regions, while for the ten-year horizon there are 2×49 observations. Region-level observations are not weighted throughout the entire analysis.

Comparing the NUTS2 and NUTS1 European averages confirms that spatial aggregation reduces regional differences, though this effect is modest except for the oldest age groups. A typical difference of year-to-year total employment changes from the national average is about 4 per cent in the U.S., about 2 per cent in the comparable regions of the seven

European countries, and varies between 2% and 4% (France) among the more disaggregated European regions. Although realized employment changes correspond to equilibria, these figures suggest that it is unlikely for European regions to experience significantly larger shocks than US states. Therefore, the larger variation in European non-employment rates suggest rigidity and not simply larger shocks.

The size of the typical change increases by a factor of two to three as we look at ten-year differences instead of year-to-year changes. Typically, the increase in the standard deviations are slightly smaller than what a random walk would produce (which, from 1 to 10 is a factor of $\sqrt{10} \approx 3.2$). This might indicate small negative serial correlation in the exogenous changes.

The second panel of Table 3 presents the standard deviation of changes in population relative to national changes ($\Delta\tilde{p}_{cit}$). In the U.S. these show a very similar pattern to the employment change differentials. In the European regions they are further away from employment standard deviations. This reflects lower mobility in equilibrium. To address this question more directly, the next section presents estimates of β^D, the measure of the role of migration in employment changes.

3.2 OLS results

Region-specific deviations of population change from the national average changes are regressed on similar measures of changes in employment, in each country and together in Europe, without a constant term (results are very robust to inclusion of constants). The following equation is estimated for different age-groups by OLS:

$$\Delta_s\tilde{l}_{cit} = \beta_{cs}\Delta_s\tilde{p}_{cit} + \varepsilon_{cit} \tag{14}$$

where s is time horizon, i is region in country c, and t is year of observation. Point estimates of β_{cs} for $s = 1, 5$, and 10 are presented together with later, in tables 6 and 7. Results for all $s = 1$ to 10 and standard error are in the appendix, Table A1. Standard errors allow for arbitrary heteroskedasticity and within-region clustering.

The estimated parameters are surprisingly tight. Standard errors don't grow very large even for long differences in small countries, which have very small samples (the 10-year horizon sample for Portugal consists of 8 observations). Spatial aggregation tends to decrease the point estimates in the long horizon but not in the short horizon.

Longer horizons give larger point estimates in the U.S. but not in all European countries. Results for Portugal and Italy typically decrease with the length of the time span, Belgium and The Netherlands usually show a steep increase, while the other countries are constant or increase slightly. The NUTS1-aggregated European average β also shows a decreasing pattern in most cases. Together with the almost random-walk-like increase in the employment change standard deviations, increasing values of β are consistent with delayed migration responses. Decreasing values of β, however, are hard to reconcile, if not by the possibility of negatively serially correlated shocks. Constant coefficients suggest that for those countries, the long run arrives within a year.

The fact that the one-year coefficients are not dramatically different from the ten-year ones (except for Belgium and the Netherlands) indicate that most of the migration response takes place within a year. That would not necessarily be an implication if the exogenous shocks were positively correlated, but this is not supported by the pattern of the standard deviations documented before. This finding is not new in the U.S. context (see, for example, Blanchard and Katz, 1992) and is also consistent with Obstfeld and Peri's (1998) findings for Italy. It is at odds, however, with most other results for Europe.[7]

The OLS estimates of β^D are subject to the main identification problem. In the remaining sections I try to restrict variation to demand shifts only. I will return to the interpretation of the OLS results together with other estimates.

3.3 Instrumenting for exogenous changes in demand

The instrument I planned to use is regional employment growth predicted from national (or all-European) employment growth by industry and the industrial composition of the regions' employment. This "mixing variable" was introduced by Bartik (1991) and used subsequently by Blanchard and Katz (1992) and Bound and Holzer (2000). Let $j = 1..J$ denote different industries. Then the instrument is defined as

$$\Delta\hat{l}_{it} \equiv \sum_{j=1}^{J} s_{ijt} \Delta \log\left(L_{.jt}\right) = \sum_{j=1}^{J} \frac{L_{ijt}}{L_{.jt}} \Delta \log\left(L_{.jt}\right),$$

where $L_{.jt} = \sum_{i=1}^{I} L_{ijt}$ is total employment in industry j in Europe or the U.S. For the analysis, $J = 17$ industry categories were used, following the available European data.

$\Delta\hat{l}_{it}$ can be interpreted as the hypothetical change in employment in region i if it simply followed the overall industrial changes. If regional labor demand shocks originate from industry-specific changes in technology or product demand, this variable is probably a good predictor of that. The instrument is valid for $\Delta\tilde{l}_{it}$ if no supply factors in region i can affect overall employment growth in any industry. The smaller regions are in overall employment the more likely that this condition holds. In what follows, I use two different instruments for Europe. One is constructed from all-European trends (including countries left out from the main analysis: the data come from another source). The other one is constructed from national trends. The latter captures country-specific changes in industrial labor demand (resulting for example from the large exchange-rate movements in the late 1980s), but its validity is more questionable in small countries.

We expect the instrument to explain more of the variation in employment changes in the U.S. than in Europe because regional differences in industrial structure are smaller in the EU than in the US. Table 4 presents the country-wide means of the Herfindahl-Hirschman index of industrial concentration of employment within regions. Here it is defined

[7] The results by Decressin and Fatás (1994) suggest that changes in employment between two consecutive years correspond to a smaller share of the migration response than in the long run, for pooled European NUTS1 regions. The other studies on specific European countries show similar results, including Obstfeld and Peri's (1998) analysis on Germany. All of these results are based on structural VAR's with long-run effects identidied from two lags. Their long-run implications are therefore indirect as opposed to the direct long-diferences comparisons here.

as $\sum_{j=1}^{J}\left(\frac{L_{ijt}}{L_{.it}}\right)^2$, for each region i.[8] The results indicate that U.S. states are more specialized than comparable European regions. This difference is significant although not enormously large. To understand magnitudes, compare this 300 points difference to the changes within the U.S. From 1977 to 1998 this amounted roughly to 100 points.

Table 5 shows the results of the first-stage regressions

$$\Delta_s \tilde{l}_{cit} = \delta_{0cs} + \delta_{cs}\Delta_s \hat{l}_{cit} + \nu_{cit}.$$

To be more precise, Table 5 shows the t-values $\hat{\delta}_{cs}/SE\left(\hat{\delta}_{cs}\right)$ for the 16-74 and the 25-54 years old. Nothing is significant: this IV is very weak in our context. Note that the IV works somewhat better for the U.S. if additional years from1977 are added. That indicates that demand shifts were more important in late 1970s and early 1980s in the U.S.

3.4 Identification from within-cohort changes

In this section I presented another method to exclude at least part of the possible variation from exogenous supply changes. Although it cannot accomplish what the IV could have (excluding all supply variation and controlling for the size of the demand shifts at the same time), this method can help understanding what drives the OLS results.

Exogenous changes in labor supply in a region can have many different sources. One of them is cohort-size differences: larger than usual entering cohorts, for example, shift labor supply outwards. Since throughout all estimations we restrict all variables to differences from the country average, it is region-specific cohort size differences that would matter. Unfortunately, it is not possible to tell directly how much of the population differences we dealt with so far is due to region-specific net migration and how much is from region-specific cohort size differences.

On the other hand, we can exclude the variation that comes from cohort size differences by focusing only on within birth-cohort changes. As we will see, this way we magnify the role of region-specific mortality, which is also determined by exogenous supply factors and is also impossible to identify. On the other hand, we can safely assume that mortality differences don't play a significant role for the younger cohorts. It is a clear advantage over simple population differences, because there unidentifiable cohort size differences may introduce exogenous supply variation for any age-group.

Let $\Delta_s P_{tg}$ denote change in the number of people who were born in year g, between years t and $t+s$, in the region. $\Delta_s P_{tg}$ is a result of inter-regional migration ($\Delta_s P_{tg}^{(m)}$) and mortality ($\Delta_s P_{tg}^{(d)}$):

$$\Delta_s P_{tg} \equiv P_{(t+s)g} - P_{tg} \equiv \Delta_s P_{tg}^{(m)} + \Delta_s P_{tg}^{(d)}$$

Total population is the sum of people born in different years g. Therefore we have that

[8] It is defined for each region and not for a whole country so that we always have 17 shares to sum. The index is different if summed over different number of points, by construction. This way, however the index always varies between 588 (equal employment shares) and 10,000 (only one industry).

$$\begin{aligned}
\Delta_s P_t &= P_{t+s} - P_t = \sum_{g=g0}^{G} \left(P_{(t+s)(g+s)} - P_{tg} \right) \\
&= \sum_{g=g0+s}^{G-s} \left(P_{(t+s)g} - P_{tg} \right) + \sum_{g=G-s-1}^{G} P_{(t+s)g} - \sum_{g=g0}^{g0+s-1} P_{tg} \\
&= \sum_{g=g0+s}^{G-s} \left(\Delta P_{tg}^{(m)} + \Delta P_{tg}^{(d)} \right) + \left(\sum_{g=G-s-1}^{G} P_{(t+s)g} - \sum_{g=g0}^{g0+s-1} P_{tg} \right)
\end{aligned}$$

The first term is within-cohort population change, while the second term is the difference between the entering and the exiting cohorts. Cohort size differences enter to changes in total population through the second term. For year-to-year differences in total (16 to 74 years old) population, $\Delta_1 P$ will be dominated by the first term, that is by migration and mortality differences. However, same is not true for long differences in subpopulations defined by age. If we compare ten-year age groups (e.g. the 45 to 54 years old) over a ten-year period ($s = 10$), the first term disappears and cohort size differences can have a significant role.

The proposed modification is to leave out the second term and keep the first one that is not affected by cohort size differences. For year-to-year changes, that will preserve most of the changes in population. In fact, the new measure will be very close to the simple population change. For long differences in small age groups this procedure would leave us with very little or no changes at all. It seems therefore as if the new measure would be either very similar to the old one or meaningless altogether. On the other hand, long differences are a sum of sort differences. For any variable X, the long difference (in levels) is

$$\begin{aligned}
\Delta_s X_t &= X_{t+s} - X_t = X_{t+s} - X_{t+s-1} + X_{t+s-1} - ...X_{t+1} + X_{t+1} - X_t \\
&= \sum_{h=1}^{s} \left(X_{t+h} - X_{t+h-1} \right) = \sum_{h=1}^{s} \Delta_1 X_{t+h}
\end{aligned}$$

Therefore, we can approximate the within-cohort term by the sum of yearly within-cohort changes. Define

$$\Delta_s P_t^{(g)} \equiv \sum_{h=1}^{s} \Delta_1 P_{t+h}^{(g)}$$

So far relative changes were defined as log differences. They are approximations to relative differences defined in a more natural way: $\Delta_s p_t \approx \frac{\Delta_s P_t}{\left(P_{(t+s)} + P_t\right)/2}$. By analogy, define

$$\Delta_s p_t^{(g)} \equiv \frac{\Delta_s P_t^{(g)}}{\left(P_{(t+s)} + P_t\right)/2} = \frac{\sum_{h=1}^{s} \Delta_1 P_{t+h}^{(g)}}{\left(P_{(t+s)} + P_t\right)/2}$$

By transforming the changes in employment variable the same way we as before, we can restrict our analysis to deviations from country trends:

$$\Delta_s l_{cit}^{(g)} = \gamma_{(l)sct}^{(g)} + \Delta_s \tilde{l}_{cit}^{(g)} \text{ and} \tag{15}$$

$$\Delta_s p_{cit}^{(g)} = \gamma_{(p)sct}^{(g)} + \Delta_s \tilde{p}_{cit}^{(g)}, \tag{16}$$

Using these variables we can estimate the fraction of migration to total changes in employment in the same way:

$$\Delta_s \tilde{l}_{cit}^{(g)} = \beta_{sc}^{(g)} \Delta_s \tilde{p}_{cit}^{(g)} + \varepsilon_{cit}^{(g)}. \tag{17}$$

$\beta^{(g)}$ is identified from within-cohort changes.

Table 6 and 7 present the point estimates together with the OLS results. Table 6 shows more aggregated results, for the 16-74 and the 25-54 years old. Table 7 presents the estimates for all ten-year age groups. Table A2 in the appendix shows more detailed estimates together with standard errors, in the same format as the OLS estimates.

OLS and within-cohort estimates are virtually the same for the U.S. This indicates two things: first, that demand shifts dominated changes in the US states; and secondly, that the log approximation to relative changes is accurate.

For the 25-44 age groups, the new results show less of the odd decreasing pattern for the European countries. On the other hand, it shows up quite strongly for the 45-54 years old. One possible interpretation for the whole phenomenon is the presence of negatively correlated supply shocks. In the simple OLS results, this was possibly relevant for all cohorts. Here it affects the older more than the younger, which may be a result of regional differences in mortality.

When comparing the OLS and within-cohort results, one has to remember that for older cohorts, the latter may be biased by mortality differentials. For the 25-44 and 65-74 years old, the OLS and within-cohort estimates are quite similar in most European countries. Typically, OLS estimates are somewhat smaller in the economically most active age range.

3.5 Substantive results

The aggregate results seem to support the view that migration in the U.S. plays significantly larger role in accommodating demand shocks that in Europe. In the aggregate figures, Belgium and the Southern countries are further away, while Germany, France, and the Netherlands are quite close to the US.[9] Among the economically most active (the 25-54 years old), migration accounts for 90 percent of the adjustment in the US in 10 years. But one-year adjustments are very close: migration there accounts for almost 80 percent. In Europe, both figures are about 60 percent. These are significant but not striking differences.

When looking at the young but economically active cohorts, however, the Europe-US differences are not very large. In Europe, the 25-44 year old show over 70 percent of the adjustment from migration. Differences among the older cohorts are, however, striking. It is especially true for ages at which most people still work or are at the retirement margin.

[9] Lower migration elasticities in the Mediterranean countries are not surprising. In Belgium, it may be a result of more widespread commuting between smaller regions (like nuts2).

Since for older cohorts the within-cohort estimates may be more biased than OLS, it is worth looking at both estimates. The OLS estimates suggest that 45-54 years old Europeans may behave similarly to the younger ones (and to the Americans), while the within-cohort estimates show a significantly smaller migration response. For the 55-64 years old, however, even the OLS estimates are far behind the US. The same is true for the youngest, most of whom attend (or consider attending) school.

It is crucial to understand that β^D identifies the migration elasticity only relative to total supply adjustment. The larger Europe-US differences for those who are on the participation margin suggest that strong non-employment responses in Europe may be primarily responsible for the results. The strong European welfare state may explain these phenomena. Schooling as a buffer for the young unemployed may be an important factor behind the significant differences we see among the 16-24 years old. For those above 55, it is the generous pension system that may result in large non-participation responses.

4 Conclusion and further research

Adjustment mechanisms of regional labor markets were analyzed in seven countries of continental Europe (Belgium, Germany, Spain, France, Italy, The Netherlands, and Portugal) and the United States, for years 1987 to 1998. The results indicate that the role of migration in total adjustment is significantly weaker in Europe than in the U.S. Indirect evidence suggests, however, that this may be more the result of strong non-employment (primarily non-participation) responses than a weak migration elasticity.

Based on this very indirect evidence, one can conclude that strong non-employment (primarily non-participation) responses and not weak migration that are the most important factors behind the large dispersion of regional non-employment rates in Europe. This weakens Oswald's (1999) arguments about the importance of home ownership through restricting migration. The results point to institutions that are not directly part of the labor market. Firing constraints, workplace regulations, and unions may play an important role, but other institutions of the welfare state may be just as important for the rigidity of European labor markets.

All results are, however, subject to a still unresolved identification and a possible measurement problem. Although they are probably dominant, we cannot be sure that exogenous changes in demand are the only cause of variation in the data. Moreover, the use of totals in the analysis may bias the results in different ways for different countries. Therefore, further research is needed to draw stronger conclusions.[10]

[10] Some notes on further research, in a very informal way. The indirect evidence may be strengthened by looking at smaller groups with different attachment to the labor market. For example, it may be intersting to see how the results vary for men and women. I also acquired new (albeit shorter) data for groups with different education levels, harmonized accross different countries. I may also try to identify supply shocks. And lastly, I should deal with the measurement problem by having a better understanding how total population is estimated in the different countries.

References

[1] Bartik, Timothy (1991), *Who Benefits from State and Local Development Policies?* Kalamazoo, MI: Upjohn Institute.

[2] Blanchard, Olivier J. (1997), "The Medium Run," *Brookings Papers on Economic Activity* (2): 89-141.

[3] Blanchard, O. and L. Katz (1992), "Regional Evolutions," *Brookings Papers on Economic Activity* (1): 1-61.

[4] Blanchard, O. and P. Portugal (2001), "What Hides Behind and Unemployment Rate: Comparing Portuguese and U.S. Labor Markets." *American Economic Review* 91(1): 187-207.

[5] Blanchflower, D. G. and A. J. Oswald (1999), "What Can Be Done to Reduce the High Levels of Youth Joblessness in the World?" *Working Paper* 99:8, Dartmouth College.

[6] Bound, J. and H. Holzer (2000), "Demand Shifts, Population Adjustments, and Labor Market Outcomes during the 1980s." *Journal of Labor Economics* 18(1): 20-54.

[7] Decressin, J. and A. Fatás (1994), "Regional Labour Market Dynamics in Europe." *CEPR Working Paper* 1085.

[8] Eurostat (1998), *Labour force survey - Methods and definitions.* Eurostat, Brussels.

[9] Eurostat (1999), *Regions: Nomenclature of territorial units for statistics (NUTS).* Eurostat, Brussels.

[10] Krueger, Alan B. (2000), "From Bismarck to Maastricht: The March to European Union and the Labor Compact." *NBER Working Paper* 7456.

[11] Mauro, P. and A. Spilimergo (1999), "How Do the Skilled and the Unskilled Respond to Regional Shocks? The Case of Spain." *IMF Staff Papers* 46(1).

[12] Obstfeld, M. and G. Peri (1998), "Regional Nonadjustment and Fiscal Policy: Lessons for EMU." *NBER Working Paper* 6431.

[13] Oswald, Andrew J. (1999), "The Housing Market and Europe's Unemployment: A Non-Tecnhnical Paper," *Working Paper* University of Warwick.

Table 1. Regions in the analysis

Country	# regions		Mean population (millions)		CV of population	
	nuts2	nuts1	nuts2	nuts1	nuts2	nuts1
BE	11	3	0.7	2.5	0.5	0.7
DE	30	10	1.6	4.7	0.6	0.9
ES	15	6	1.8	4.5	0.8	0.4
FR	21	8	1.9	5	0.8	0.3
IT	19	10	2.2	4.2	0.8	0.3
NL	12	4	0.9	2.8	0.8	0.6
PT	4	2	1.8	3.5	0.5	1.1
EU-7	112	43	1.6	4.2	0.8	0.6
USA		49		3.5		1.1

Table 2. Sample sizes

	Mean	CV	min	1st dec.	median
EU-7, N2	7,647	0.74	307	2,242	5,872
EU-7, N1	19,903	0.63	2,232	4,425	23,489
USA	2,078	0.88	764	960	1,287

Table 3. Standard deviation of log changes. 16-74 years old.

16-74	std dl			std dp		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.02	0.03	0.06	0.01	0.02	0.04
DE	0.02	0.03	0.04	0.01	0.02	0.03
ES	0.02	0.05	0.1	0.01	0.03	0.05
FR	0.04	0.07	0.07	0.03	0.06	0.06
IT	0.02	0.05	0.08	0.01	0.02	0.04
NL	0.03	0.06	0.09	0.02	0.05	0.08
PT	0.03	0.06	0.09	0.02	0.03	0.03
EU7-N2	0.03	0.05	0.07	0.02	0.04	0.05
EU7-N1	0.02	0.03	0.05	0.01	0.02	0.03
USA	0.04	0.08	0.11	0.03	0.06	0.1

Table 4: Industrial concentration of employment. Average of the Herfindahl-Hirschman index of employment in 17 industrues, by country, 1987 to 1998.

	mean	std	cv
BE	1,552	250	0.16
DE	1,232	140	0.11
ES	1,303	205	0.16
FR	1,298	122	0.09
IT	1,420	197	0.14
NL	1,542	149	0.1
PT	1,633	327	0.2
EU-7 nuts2	1,367	217	0.16
EU-7 nuts1	1,361	176	0.13
USA	1,654	223	0.13

Table 5. Results of the first-stage regression of the IV model: t-statistics.

t-statistics	16-74			25-54		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	-0.71	-0.74	-0.59	-1.15	-0.88	-0.99
DE	0.09	0.91	0.53	-0.20	1.03	0.53
ES	3.66	0.43	0.72	1.27	0.44	0.72
FR	0.05	-0.47	-0.09	0.05	-0.35	-0.46
IT	-0.06	-0.35	-0.01	-0.83	-0.40	0.12
NL	0.35	1.27	0.73	-0.02	1.00	0.61
PT	-0.54	2.61	3.11	-1.28	-0.60	1.44
EU7-N2	0.59	0.25	0.94	-0.42	-0.08	0.69
EU7-N1	-0.06	-0.29	0.39	-0.48	-0.48	0.08
USA	0.81	-0.18	-0.99	1.64	1.18	-0.35
USA 1977-98	0.55	1.79	0.87	1.89	2.37	0.97

Table 6. OLS and Within-Cohort results: point estimates of β. 16-74 and 25-54 years old.

16-74	OLS			Within Cohort		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.06	0.42	0.56	0.07	-0.05	-0.03
DE	0.38	0.37	0.48	0.33	0.38	0.41
ES	0.13	0.40	0.36	0.14	0.27	0.14
FR	0.73	0.78	0.76	0.69	0.84	1.17
IT	0.18	0.20	0.18	0.28	0.43	0.42
NL	0.43	0.78	0.87	0.35	0.32	0.29
PT	0.42	0.25	0.12	0.42	0.45	0.34
EU7-N2	0.46	0.55	0.49	0.52	0.55	0.48
EU7-N1	0.46	0.44	0.35	0.38	0.38	0.35
USA	0.55	0.71	0.77	0.57	0.71	0.76

25-54	OLS			Within Cohort		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.06	0.30	0.41	0.15	0.40	0.43
DE	0.63	0.64	0.65	0.60	0.61	0.66
ES	0.46	0.59	0.56	0.42	0.44	0.32
FR	0.89	0.98	1.04	0.87	0.93	0.88
IT	0.45	0.28	0.25	0.49	0.49	0.49
NL	0.46	0.87	0.96	0.44	0.64	0.84
PT	0.69	0.61	0.29	0.68	0.61	0.52
EU7-N2	0.67	0.71	0.61	0.63	0.67	0.62
EU7-N1	0.66	0.58	0.43	0.63	0.61	0.56
USA	0.77	0.83	0.87	0.77	0.84	0.89

Table 7. OLS and Within-Cohort results: point estimates of β. By ten-year cohorts.

16-24	OLS			Within Cohort		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.06	0.06	0.08	0.02	-0.04	-0.04
DE	0.44	0.51	0.55	0.22	-0.09	-0.16
ES	0.22	0.23	0.40	0.15	0.20	0.23
FR	0.28	0.61	0.63	0.17	0.11	0.12
IT	0.25	0.08	0.12	0.32	0.20	0.17
NL	0.14	0.58	0.70	0.16	0.30	0.27
PT	0.47	0.71	0.56	0.36	0.34	0.34
EU7-N2	0.27	0.37	0.46	0.19	0.06	0.04
EU7-N1	0.27	0.28	0.47	0.20	0.09	0.08
USA	0.48	0.59	0.63	0.50	0.53	0.41

25-34	OLS			Within Cohort		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.10	0.25	0.28	0.30	0.60	0.70
DE	0.76	0.80	0.83	0.74	0.75	0.76
ES	0.63	0.73	0.77	0.62	0.67	0.70
FR	0.90	0.95	1.02	0.86	0.88	0.72
IT	0.59	0.47	0.42	0.60	0.64	0.45
NL	0.38	0.68	0.83	0.51	0.79	0.94
PT	0.94	0.89	0.89	0.96	0.91	0.85
EU7-N2	0.72	0.73	0.71	0.72	0.78	0.72
EU7-N1	0.70	0.64	0.65	0.74	0.72	0.70
USA	0.84	0.91	0.92	0.84	0.89	0.92

35-44	OLS			Within Cohort		
	1 y	5 y	10 y	1 y	5 y	10 y
BE	0.13	0.43	0.52	0.24	0.45	0.49
DE	0.76	0.82	0.82	0.76	0.74	0.73
ES	0.67	0.68	0.64	0.65	0.53	0.57
FR	0.89	0.91	0.84	0.86	0.89	0.90
IT	0.70	0.49	0.26	0.73	0.71	0.68
NL	0.30	0.74	0.91	0.52	0.81	0.99
PT	0.74	0.71	0.61	0.73	0.78	0.70
EU7-N2	0.73	0.75	0.70	0.73	0.74	0.74
EU7-N1	0.73	0.70	0.54	0.74	0.72	0.70
USA	0.79	0.82	0.84	0.80	0.82	0.86

45-54	OLS			Within Cohort		
	1 y	**5 y**	**10 y**	**1 y**	**5 y**	**10 y**
BE	0.13	0.59	0.64	0.27	0.39	0.35
DE	0.80	0.75	0.68	0.73	0.62	0.58
ES	0.59	0.64	0.60	0.57	0.56	0.52
FR	0.77	0.88	0.92	0.77	0.86	0.93
IT	0.55	0.64	0.70	0.50	0.30	0.18
NL	0.25	0.77	0.92	0.29	0.33	0.33
PT	0.66	0.56	-0.01	0.75	0.59	0.52
EU7-N2	0.62	0.74	0.71	0.59	0.53	0.42
EU7-N1	0.68	0.78	0.66	0.63	0.48	0.38
USA	0.78	0.81	0.82	0.77	0.79	0.79

55-64	OLS			Within Cohort		
	1 y	**5 y**	**10 y**	**1 y**	**5 y**	**10 y**
BE	0.02	0.24	0.44	0.04	0.06	-0.05
DE	0.39	0.40	0.36	0.35	0.29	0.21
ES	0.29	0.32	0.27	0.19	0.09	0.08
FR	0.34	0.37	0.35	0.22	0.07	0.01
IT	0.19	0.23	0.38	0.17	0.23	0.18
NL	0.06	0.16	0.22	0.08	0.14	0.12
PT	0.55	0.21	-0.02	0.23	-0.03	-0.06
EU7-N2	0.23	0.30	0.31	0.18	0.10	0.04
EU7-N1	0.28	0.33	0.36	0.19	0.07	0.04
USA	0.56	0.58	0.64	0.56	0.57	0.61

65-74	OLS			Within Cohort		
	1 y	**5 y**	**10 y**	**1 y**	**5 y**	**10 y**
BE	0.00	0.03	0.08	0.00	0.00	0.00
DE	0.02	0.00	0.08	0.00	0.02	0.02
ES	0.04	0.00	0.03	0.03	0.01	0.01
FR	0.01	0.01	0.05	0.02	0.01	-0.01
IT	0.05	0.10	0.12	0.06	0.10	0.02
NL	0.01	0.02	0.06	0.01	-0.01	-0.02
PT	0.24	0.04	-0.05	0.17	-0.03	-0.07
EU7-N2	0.02	0.02	0.07	0.01	0.01	0.00
EU7-N1	0.03	0.03	0.10	0.02	0.02	0.01
USA	0.14	0.17	0.26	0.18	0.18	0.18

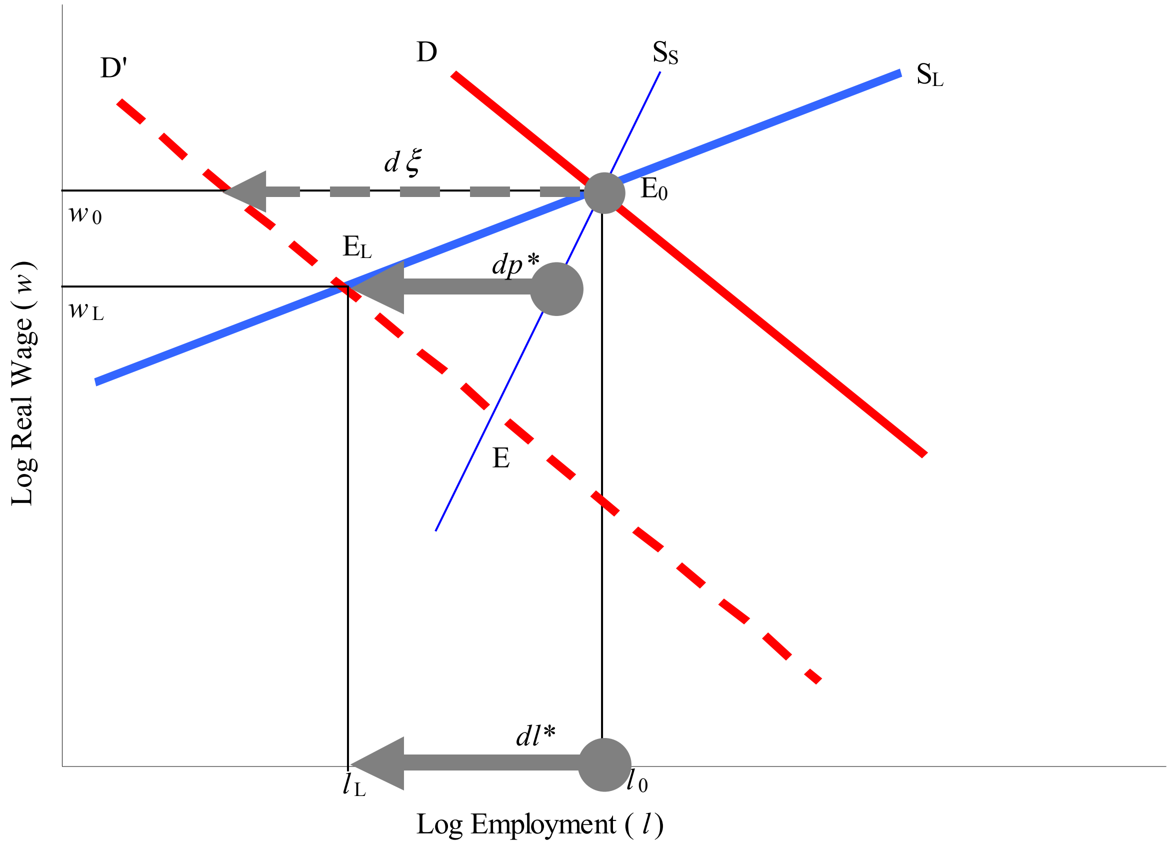
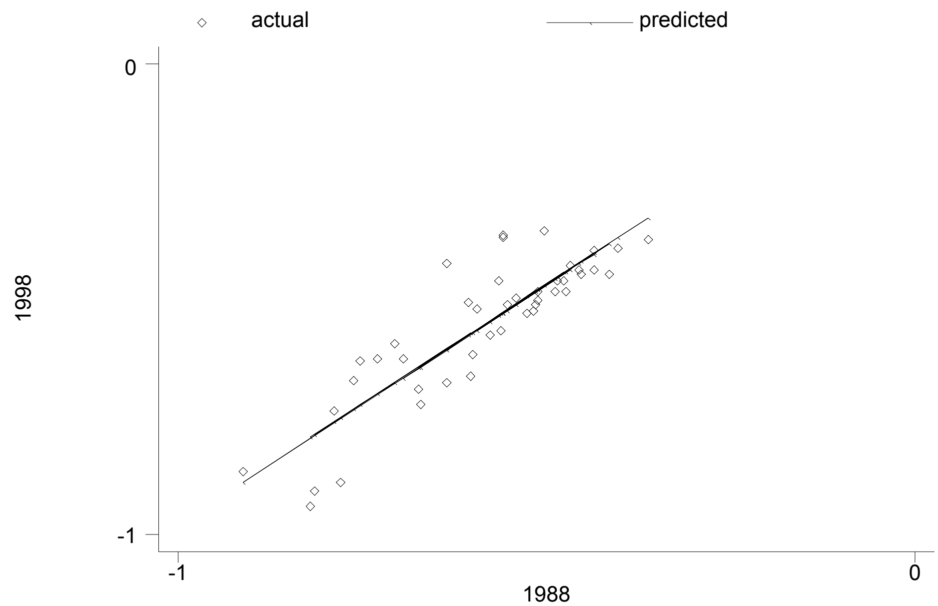
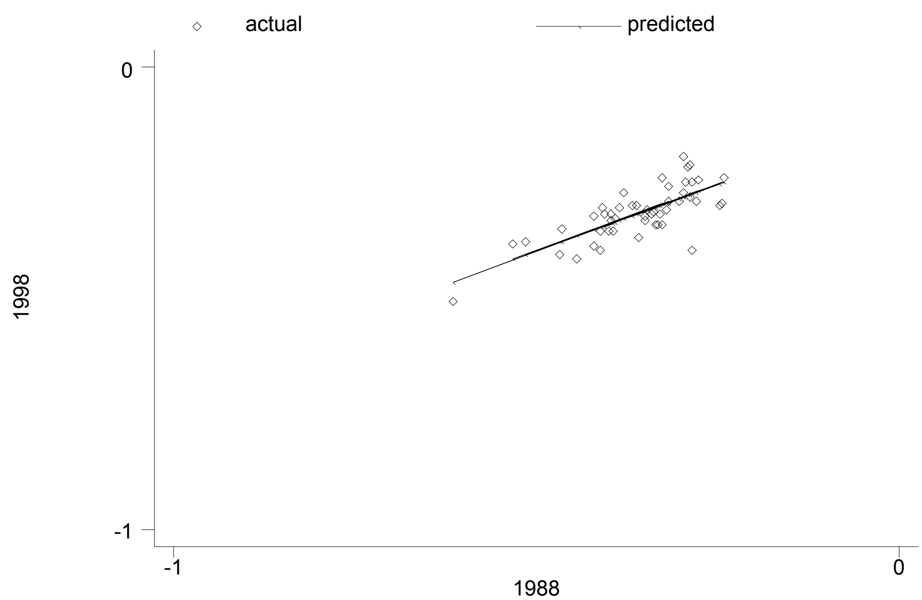


Figure 1. Simple model, negative demand shift.



log(Employment/Population), 16-64 years old. EU7 nuts1

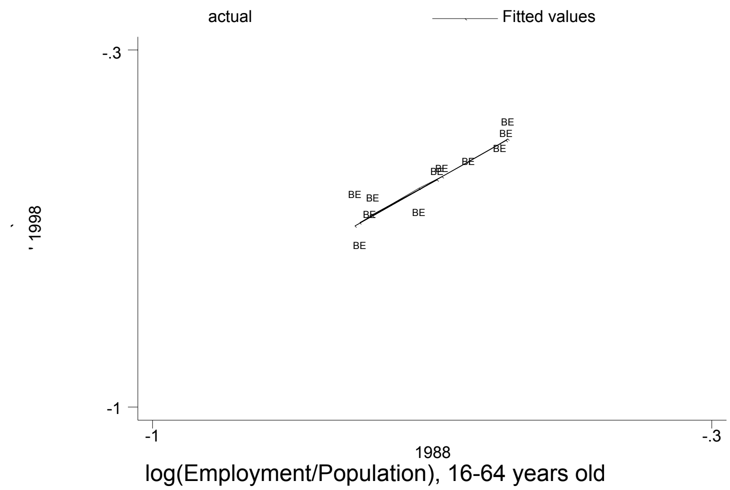
Continental Europe



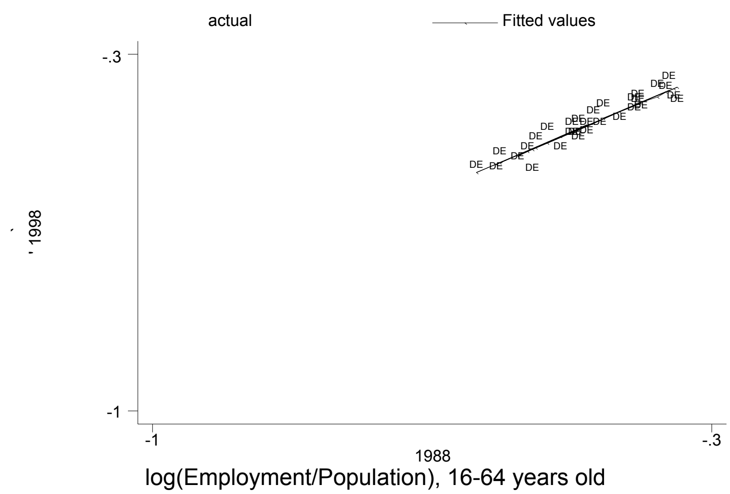
log(Employment/Population), 16-64 years old. US states

United States

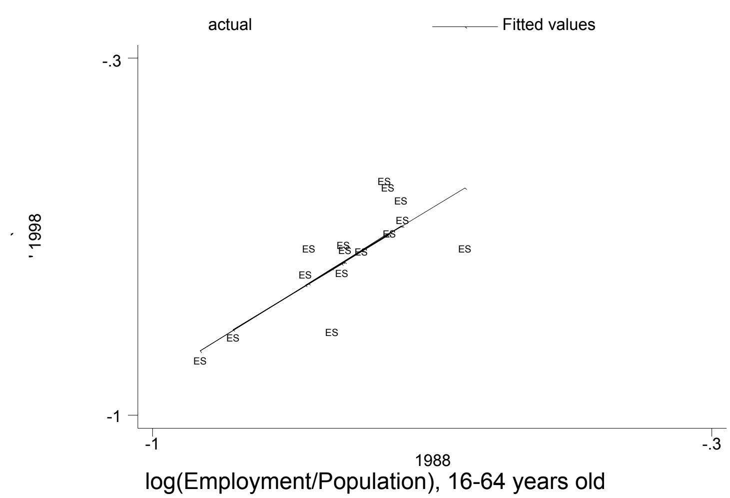
Figure 2. Log employment rates (employment over population), 1988 and 1998. EU7 and US.



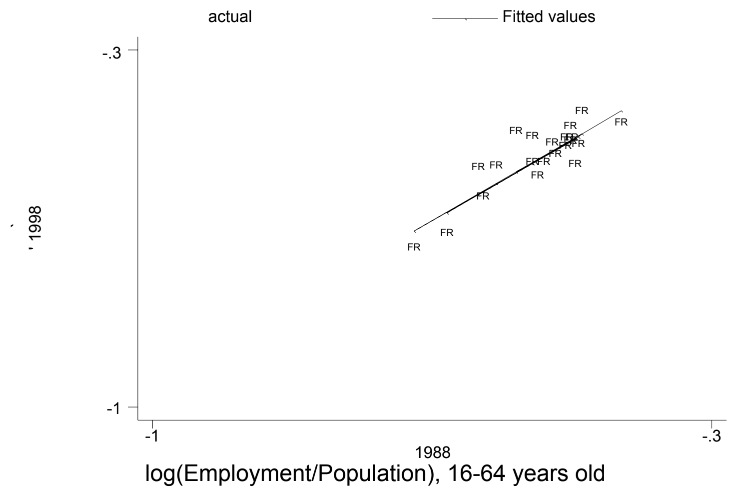
Belgium



Germany



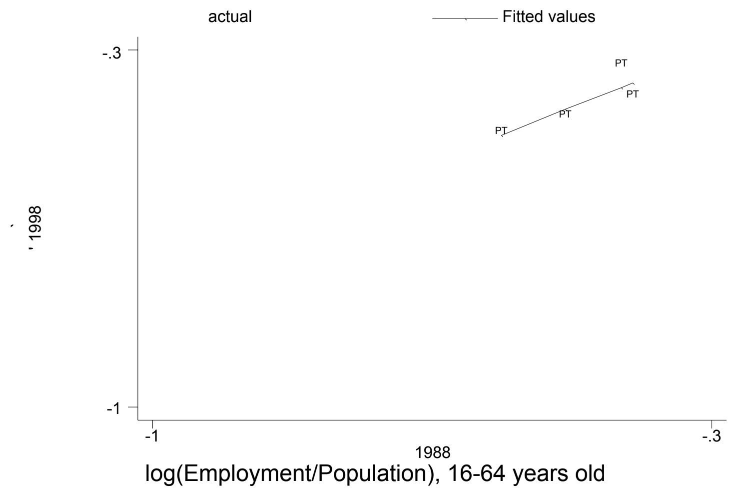
Spain



France

Italy

Holland


actual
Fitted values
-.3
-1
-1
-.3
PT
PT
PT
PT
1998
1988
log(Employment/Population), 16-64 years old

Portugal

Table A1. OLS estimates of beta_cs. Standard Errors next to each coefficient, in small size.

16-74	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.06	0.02	0.38	0.06	0.13	0.03	0.73	0.03	0.18	0.04	0.43	0.09	0.42	0.08	0.46	0.04	0.46	0.05	0.55	0.04
2	0.13	0.04	0.29	0.03	0.23	0.04	0.80	0.04	0.16	0.04	0.53	0.13	0.33	0.12	0.52	0.05	0.47	0.06	0.57	0.04
3	0.23	0.06	0.31	0.04	0.32	0.05	0.80	0.03	0.17	0.05	0.63	0.16	0.27	0.13	0.54	0.05	0.47	0.07	0.63	0.04
4	0.33	0.08	0.33	0.05	0.38	0.07	0.79	0.03	0.19	0.05	0.74	0.15	0.24	0.13	0.54	0.05	0.45	0.07	0.70	0.05
5	0.42	0.11	0.37	0.06	0.40	0.08	0.78	0.03	0.20	0.06	0.78	0.12	0.25	0.11	0.55	0.05	0.44	0.07	0.71	0.06
6	0.47	0.12	0.42	0.07	0.41	0.08	0.80	0.03	0.21	0.06	0.82	0.10	0.21	0.12	0.57	0.06	0.45	0.07	0.72	0.06
7	0.51	0.13	0.45	0.08	0.39	0.08	0.81	0.03	0.20	0.06	0.87	0.10	0.16	0.12	0.57	0.06	0.42	0.07	0.74	0.07
8	0.54	0.12	0.48	0.09	0.39	0.08	0.80	0.04	0.18	0.06	0.86	0.08	0.09	0.14	0.54	0.07	0.39	0.07	0.73	0.07
9	0.53	0.12	0.44	0.09	0.38	0.08	0.77	0.05	0.18	0.06	0.85	0.08	0.08	0.13	0.51	0.07	0.37	0.07	0.74	0.07
10	0.56	0.12	0.48	0.09	0.36	0.08	0.76	0.07	0.18	0.07	0.87	0.06	0.12	0.12	0.49	0.07	0.35	0.07	0.77	0.08

25-54	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.06	0.02	0.63	0.04	0.46	0.03	0.89	0.03	0.45	0.04	0.46	0.08	0.69	0.04	0.67	0.04	0.66	0.04	0.77	0.03
2	0.09	0.03	0.62	0.05	0.51	0.05	0.94	0.04	0.42	0.04	0.56	0.13	0.68	0.05	0.72	0.04	0.68	0.06	0.78	0.03
3	0.16	0.04	0.60	0.06	0.51	0.06	0.95	0.04	0.34	0.04	0.67	0.17	0.69	0.07	0.72	0.04	0.65	0.07	0.81	0.03
4	0.23	0.06	0.61	0.07	0.56	0.05	0.96	0.05	0.30	0.05	0.80	0.17	0.63	0.08	0.71	0.05	0.61	0.07	0.83	0.03
5	0.30	0.07	0.64	0.06	0.59	0.06	0.98	0.06	0.28	0.05	0.87	0.15	0.61	0.08	0.71	0.06	0.58	0.07	0.83	0.04
6	0.34	0.09	0.66	0.07	0.65	0.07	1.00	0.07	0.27	0.05	0.91	0.14	0.68	0.06	0.72	0.06	0.58	0.08	0.83	0.05
7	0.36	0.09	0.67	0.08	0.64	0.07	1.01	0.07	0.28	0.05	0.96	0.17	0.72	0.08	0.71	0.07	0.55	0.08	0.84	0.06
8	0.38	0.10	0.66	0.09	0.63	0.08	1.03	0.08	0.27	0.04	0.94	0.14	0.64	0.10	0.68	0.07	0.52	0.07	0.85	0.06
9	0.39	0.11	0.65	0.09	0.59	0.08	1.02	0.09	0.25	0.05	0.93	0.15	0.48	0.12	0.65	0.07	0.49	0.07	0.84	0.07
10	0.41	0.11	0.65	0.11	0.56	0.07	1.04	0.10	0.25	0.06	0.96	0.13	0.29	0.14	0.61	0.07	0.43	0.07	0.87	0.07

16-24	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.06	0.02	0.44	0.03	0.22	0.04	0.28	0.05	0.25	0.04	0.14	0.06	0.47	0.07	0.27	0.02	0.27	0.03	0.48	0.03
2	0.02	0.02	0.48	0.04	0.24	0.04	0.42	0.07	0.20	0.03	0.21	0.09	0.53	0.03	0.30	0.03	0.26	0.04	0.52	0.03
3	0.06	0.03	0.52	0.04	0.30	0.04	0.48	0.08	0.15	0.03	0.32	0.14	0.66	0.03	0.34	0.03	0.27	0.05	0.54	0.04
4	0.06	0.03	0.53	0.04	0.27	0.05	0.56	0.10	0.11	0.04	0.47	0.17	0.72	0.02	0.36	0.04	0.27	0.06	0.59	0.04
5	0.06	0.04	0.51	0.03	0.23	0.07	0.61	0.09	0.08	0.06	0.58	0.19	0.71	0.03	0.37	0.05	0.28	0.07	0.59	0.04
6	0.07	0.05	0.49	0.03	0.25	0.08	0.60	0.11	0.07	0.07	0.63	0.15	0.68	0.03	0.38	0.05	0.29	0.07	0.55	0.03
7	0.04	0.06	0.51	0.04	0.27	0.11	0.57	0.12	0.03	0.07	0.63	0.14	0.71	0.05	0.38	0.06	0.30	0.08	0.58	0.03
8	0.05	0.06	0.53	0.04	0.34	0.12	0.72	0.13	0.10	0.07	0.69	0.17	0.62	0.02	0.43	0.06	0.36	0.09	0.58	0.04
9	0.05	0.06	0.55	0.05	0.42	0.12	0.80	0.14	0.09	0.07	0.71	0.15	0.53	0.04	0.45	0.06	0.39	0.09	0.61	0.04
10	0.08	0.09	0.55	0.07	0.40	0.12	0.63	0.11	0.12	0.07	0.70	0.18	0.56	0.04	0.46	0.05	0.47	0.07	0.63	0.04

25-34	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.10	0.03	0.76	0.02	0.63	0.04	0.90	0.02	0.59	0.03	0.38	0.09	0.94	0.08	0.72	0.02	0.70	0.03	0.84	0.02
2	0.08	0.04	0.76	0.03	0.71	0.03	0.93	0.03	0.59	0.04	0.44	0.12	0.91	0.07	0.76	0.02	0.71	0.04	0.88	0.02
3	0.15	0.05	0.79	0.04	0.75	0.04	0.96	0.04	0.52	0.05	0.50	0.13	0.87	0.05	0.76	0.03	0.69	0.05	0.88	0.02
4	0.24	0.06	0.78	0.03	0.71	0.04	0.95	0.04	0.49	0.05	0.59	0.15	0.89	0.04	0.75	0.04	0.68	0.06	0.88	0.02
5	0.25	0.07	0.80	0.04	0.73	0.05	0.95	0.05	0.47	0.05	0.68	0.13	0.89	0.03	0.73	0.04	0.64	0.06	0.91	0.03
6	0.24	0.08	0.81	0.04	0.77	0.05	0.97	0.05	0.43	0.04	0.70	0.13	0.92	0.04	0.73	0.05	0.64	0.07	0.92	0.03
7	0.25	0.09	0.82	0.04	0.79	0.05	0.98	0.06	0.44	0.04	0.84	0.18	0.93	0.04	0.73	0.05	0.64	0.07	0.92	0.04
8	0.26	0.10	0.82	0.05	0.80	0.04	0.98	0.07	0.42	0.03	0.84	0.13	0.87	0.11	0.72	0.05	0.65	0.08	0.93	0.04
9	0.29	0.11	0.82	0.06	0.78	0.05	0.98	0.07	0.39	0.04	0.83	0.16	0.85	0.06	0.71	0.05	0.66	0.08	0.92	0.05
10	0.28	0.13	0.83	0.06	0.77	0.05	1.02	0.06	0.42	0.04	0.83	0.13	0.89	0.12	0.71	0.05	0.65	0.08	0.92	0.05

35-44	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.13	0.03	0.76	0.03	0.67	0.03	0.89	0.02	0.70	0.03	0.30	0.07	0.74	0.04	0.73	0.02	0.73	0.02	0.79	0.02
2	0.25	0.02	0.78	0.03	0.68	0.05	0.91	0.03	0.70	0.06	0.42	0.11	0.77	0.04	0.77	0.02	0.76	0.03	0.82	0.02
3	0.33	0.05	0.77	0.03	0.68	0.05	0.92	0.02	0.64	0.07	0.55	0.12	0.84	0.06	0.77	0.02	0.74	0.03	0.83	0.02
4	0.39	0.07	0.79	0.04	0.70	0.05	0.92	0.03	0.53	0.09	0.64	0.13	0.77	0.06	0.76	0.03	0.71	0.04	0.83	0.03
5	0.43	0.06	0.82	0.04	0.68	0.05	0.91	0.04	0.49	0.10	0.74	0.15	0.71	0.02	0.75	0.03	0.70	0.05	0.82	0.04
6	0.45	0.07	0.83	0.04	0.73	0.07	0.92	0.05	0.45	0.12	0.84	0.15	0.73	0.04	0.76	0.03	0.68	0.05	0.82	0.04
7	0.49	0.07	0.85	0.04	0.71	0.07	0.92	0.07	0.40	0.09	0.87	0.16	0.74	0.05	0.76	0.04	0.64	0.05	0.85	0.05
8	0.52	0.09	0.82	0.04	0.71	0.07	0.89	0.10	0.34	0.08	0.83	0.15	0.75	0.06	0.73	0.04	0.61	0.06	0.87	0.06
9	0.50	0.10	0.81	0.05	0.66	0.06	0.88	0.10	0.27	0.13	0.88	0.14	0.72	0.08	0.71	0.04	0.58	0.06	0.87	0.06
10	0.52	0.10	0.82	0.05	0.64	0.09	0.84	0.11	0.26	0.18	0.91	0.13	0.61	0.07	0.70	0.04	0.54	0.06	0.84	0.06

45-54	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.13	0.02	0.80	0.04	0.59	0.05	0.77	0.03	0.55	0.06	0.25	0.05	0.66	0.04	0.62	0.03	0.68	0.03	0.78	0.02
2	0.22	0.04	0.77	0.04	0.60	0.04	0.80	0.04	0.55	0.05	0.35	0.10	0.65	0.08	0.64	0.03	0.69	0.03	0.81	0.02
3	0.36	0.07	0.75	0.05	0.60	0.07	0.82	0.04	0.56	0.06	0.49	0.18	0.60	0.06	0.67	0.03	0.69	0.04	0.80	0.02
4	0.47	0.08	0.75	0.05	0.62	0.07	0.84	0.04	0.63	0.05	0.68	0.17	0.54	0.08	0.71	0.03	0.75	0.05	0.81	0.02
5	0.59	0.08	0.75	0.04	0.64	0.08	0.88	0.05	0.64	0.07	0.77	0.17	0.56	0.06	0.74	0.03	0.78	0.05	0.81	0.03
6	0.69	0.09	0.75	0.05	0.69	0.06	0.90	0.05	0.67	0.09	0.83	0.18	0.59	0.07	0.78	0.04	0.80	0.05	0.81	0.03
7	0.67	0.09	0.74	0.06	0.68	0.07	0.89	0.05	0.62	0.10	0.92	0.20	0.70	0.10	0.78	0.04	0.79	0.06	0.80	0.03
8	0.65	0.09	0.72	0.07	0.68	0.07	0.89	0.06	0.56	0.10	0.91	0.21	0.66	0.15	0.76	0.05	0.75	0.06	0.82	0.03
9	0.63	0.11	0.65	0.08	0.63	0.07	0.90	0.07	0.64	0.06	0.89	0.25	0.32	0.10	0.72	0.05	0.69	0.07	0.81	0.04
10	0.64	0.12	0.68	0.10	0.60	0.07	0.92	0.09	0.70	0.06	0.92	0.36	-0.01	0.32	0.71	0.05	0.66	0.07	0.82	0.04

55-64	BE	DE	ES	FR	IT	NL	PT	EU7 (nuts2)	EU7 (nuts1)	US
1	0.02 0.01	0.39 0.05	0.29 0.03	0.34 0.04	0.19 0.05	0.06 0.02	0.55 0.07	0.23 0.02	0.28 0.03	0.56 0.02
2	0.07 0.02	0.35 0.06	0.31 0.04	0.38 0.04	0.18 0.03	0.07 0.02	0.52 0.10	0.25 0.03	0.28 0.04	0.58 0.03
3	0.13 0.04	0.37 0.07	0.32 0.04	0.38 0.03	0.19 0.03	0.10 0.04	0.58 0.10	0.28 0.02	0.32 0.04	0.56 0.03
4	0.17 0.06	0.40 0.07	0.33 0.03	0.36 0.04	0.23 0.03	0.13 0.06	0.41 0.23	0.29 0.02	0.34 0.05	0.56 0.03
5	0.24 0.07	0.40 0.07	0.32 0.04	0.37 0.04	0.23 0.05	0.16 0.05	0.21 0.21	0.30 0.02	0.33 0.05	0.58 0.04
6	0.27 0.09	0.39 0.07	0.31 0.04	0.39 0.04	0.25 0.05	0.19 0.05	0.05 0.25	0.30 0.03	0.33 0.07	0.62 0.03
7	0.33 0.09	0.42 0.07	0.31 0.04	0.45 0.06	0.28 0.04	0.20 0.05	0.11 0.17	0.33 0.03	0.41 0.06	0.63 0.03
8	0.39 0.11	0.47 0.06	0.30 0.04	0.48 0.07	0.34 0.06	0.23 0.03	-0.01 0.13	0.36 0.03	0.43 0.06	0.60 0.04
9	0.36 0.09	0.41 0.07	0.26 0.05	0.42 0.09	0.34 0.05	0.24 0.02	-0.10 0.21	0.32 0.03	0.39 0.07	0.64 0.05
10	0.44 0.09	0.36 0.14	0.27 0.06	0.35 0.08	0.38 0.08	0.22 0.02	-0.02 0.25	0.31 0.04	0.36 0.08	0.64 0.06

65-74	BE	DE	ES	FR	IT	NL	PT	EU7 (nuts2)	EU7 (nuts1)	US
1	0.00 0.00	0.02 0.01	0.04 0.02	0.01 0.01	0.05 0.03	0.01 0.00	0.24 0.08	0.02 0.01	0.03 0.01	0.14 0.02
2	0.01 0.00	0.01 0.02	0.05 0.02	0.01 0.02	0.06 0.02	0.01 0.00	0.23 0.11	0.02 0.01	0.03 0.01	0.19 0.02
3	0.01 0.01	0.02 0.02	0.05 0.02	0.02 0.02	0.07 0.02	0.02 0.00	0.10 0.10	0.03 0.01	0.03 0.01	0.23 0.02
4	0.02 0.01	0.02 0.02	0.01 0.03	0.02 0.02	0.07 0.03	0.02 0.01	0.08 0.09	0.02 0.01	0.03 0.01	0.20 0.02
5	0.03 0.02	0.00 0.02	0.00 0.03	0.01 0.02	0.10 0.03	0.02 0.01	0.04 0.11	0.02 0.01	0.03 0.02	0.17 0.02
6	0.04 0.02	0.01 0.02	0.00 0.03	0.01 0.03	0.11 0.05	0.03 0.02	0.04 0.10	0.03 0.01	0.04 0.02	0.16 0.02
7	0.05 0.02	0.03 0.02	-0.02 0.04	0.04 0.03	0.10 0.05	0.07 0.03	-0.02 0.07	0.04 0.01	0.04 0.02	0.16 0.03
8	0.05 0.02	0.03 0.02	0.00 0.04	0.04 0.03	0.14 0.04	0.07 0.03	-0.02 0.05	0.05 0.01	0.08 0.02	0.15 0.04
9	0.06 0.03	0.04 0.03	0.00 0.05	0.05 0.03	0.10 0.05	0.06 0.02	-0.02 0.05	0.05 0.01	0.09 0.02	0.19 0.05
10	0.08 0.03	0.08 0.04	0.03 0.04	0.05 0.03	0.12 0.06	0.06 0.01	-0.05 0.03	0.07 0.01	0.10 0.02	0.26 0.06

Table A2. OLS estimates of beta(g)_cs. Standard Errors next to each coefficient, in small size.
beta(g)_ols and standard error
1987 to 1998

16-74	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.07	0.03	0.33	0.05	0.14	0.04	0.69	0.01	0.28	0.05	0.35	0.08	0.42	0.03	0.52	0.07	0.38	0.04	0.57	0.04
2	-0.01	0.04	0.30	0.04	0.19	0.04	0.74	0.02	0.34	0.04	0.33	0.11	0.41	0.06	0.51	0.07	0.36	0.04	0.58	0.04
3	-0.03	0.05	0.31	0.04	0.22	0.04	0.76	0.02	0.39	0.04	0.32	0.16	0.42	0.11	0.53	0.08	0.35	0.04	0.63	0.05
4	-0.04	0.06	0.35	0.05	0.24	0.03	0.77	0.03	0.43	0.04	0.33	0.18	0.43	0.12	0.53	0.09	0.36	0.04	0.69	0.05
5	-0.05	0.06	0.38	0.06	0.27	0.04	0.84	0.04	0.43	0.05	0.32	0.18	0.45	0.12	0.55	0.10	0.38	0.04	0.71	0.07
6	-0.05	0.06	0.42	0.08	0.28	0.06	0.90	0.05	0.44	0.05	0.32	0.18	0.47	0.10	0.57	0.10	0.41	0.05	0.72	0.07
7	-0.05	0.06	0.45	0.10	0.27	0.09	1.01	0.07	0.43	0.05	0.32	0.20	0.52	0.12	0.58	0.12	0.41	0.05	0.74	0.08
8	-0.05	0.07	0.45	0.13	0.26	0.11	1.12	0.13	0.44	0.05	0.33	0.19	0.42	0.19	0.56	0.13	0.40	0.05	0.71	0.08
9	-0.04	0.07	0.47	0.15	0.22	0.12	1.15	0.15	0.43	0.05	0.33	0.19	0.40	0.25	0.56	0.14	0.39	0.06	0.73	0.08
10	-0.03	0.07	0.41	0.20	0.14	0.12	1.17	0.19	0.42	0.05	0.29	0.20	0.34	0.32	0.48	0.12	0.35	0.06	0.76	0.08

25-54	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.15	0.02	0.60	0.04	0.42	0.04	0.87	0.03	0.49	0.05	0.44	0.08	0.68	0.02	0.63	0.03	0.63	0.03	0.77	0.03
2	0.20	0.04	0.60	0.04	0.41	0.05	0.91	0.04	0.51	0.06	0.47	0.08	0.70	0.03	0.67	0.03	0.63	0.05	0.78	0.03
3	0.29	0.06	0.59	0.04	0.38	0.06	0.90	0.05	0.50	0.08	0.51	0.10	0.70	0.05	0.66	0.03	0.61	0.05	0.81	0.03
4	0.35	0.09	0.60	0.03	0.39	0.07	0.91	0.06	0.51	0.09	0.58	0.11	0.64	0.05	0.66	0.04	0.61	0.05	0.84	0.03
5	0.40	0.10	0.61	0.03	0.44	0.07	0.93	0.07	0.49	0.09	0.64	0.12	0.61	0.04	0.67	0.04	0.61	0.04	0.84	0.04
6	0.43	0.12	0.64	0.03	0.57	0.09	0.97	0.07	0.50	0.09	0.66	0.13	0.62	0.05	0.70	0.04	0.64	0.04	0.84	0.05
7	0.45	0.12	0.64	0.03	0.59	0.09	0.96	0.07	0.51	0.09	0.67	0.17	0.63	0.02	0.70	0.04	0.63	0.04	0.86	0.06
8	0.44	0.12	0.65	0.04	0.62	0.12	0.95	0.08	0.52	0.09	0.68	0.15	0.54	0.03	0.68	0.04	0.61	0.05	0.87	0.06
9	0.41	0.13	0.65	0.04	0.47	0.11	0.92	0.09	0.51	0.10	0.73	0.15	0.52	0.03	0.65	0.05	0.59	0.06	0.87	0.05
10	0.43	0.14	0.66	0.05	0.32	0.12	0.88	0.10	0.49	0.12	0.84	0.16	0.52	0.04	0.62	0.05	0.56	0.06	0.89	0.06

16-24	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.02	0.02	0.22	0.03	0.15	0.05	0.17	0.05	0.32	0.03	0.16	0.04	0.36	0.03	0.19	0.02	0.20	0.03	0.50	0.02
2	-0.02	0.03	0.09	0.03	0.16	0.06	0.19	0.05	0.28	0.03	0.18	0.05	0.34	0.04	0.14	0.02	0.15	0.03	0.52	0.03
3	-0.04	0.03	0.01	0.04	0.18	0.07	0.15	0.05	0.25	0.03	0.21	0.07	0.35	0.05	0.10	0.02	0.12	0.03	0.52	0.05
4	-0.04	0.03	-0.04	0.04	0.19	0.08	0.11	0.06	0.24	0.02	0.26	0.10	0.35	0.05	0.08	0.03	0.10	0.04	0.54	0.05
5	-0.04	0.03	-0.09	0.05	0.20	0.09	0.11	0.06	0.20	0.02	0.30	0.12	0.34	0.05	0.06	0.03	0.09	0.04	0.53	0.06
6	-0.04	0.03	-0.12	0.06	0.23	0.09	0.11	0.07	0.21	0.03	0.36	0.14	0.34	0.05	0.06	0.03	0.08	0.04	0.52	0.06
7	-0.04	0.03	-0.14	0.06	0.23	0.11	0.10	0.07	0.21	0.04	0.39	0.17	0.33	0.05	0.05	0.03	0.08	0.04	0.51	0.07
8	-0.05	0.03	-0.14	0.05	0.23	0.12	0.14	0.07	0.16	0.04	0.36	0.17	0.34	0.06	0.04	0.03	0.07	0.04	0.49	0.08
9	-0.05	0.04	-0.14	0.05	0.23	0.12	0.12	0.07	0.17	0.05	0.31	0.16	0.33	0.06	0.04	0.03	0.07	0.05	0.46	0.08
10	-0.04	0.04	-0.16	0.05	0.23	0.12	0.12	0.07	0.17	0.05	0.27	0.15	0.34	0.05	0.04	0.03	0.08	0.05	0.41	0.08

25-34	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.30	0.05	0.74	0.03	0.62	0.06	0.86	0.02	0.60	0.03	0.51	0.05	0.96	0.06	0.72	0.02	0.74	0.02	0.84	0.02
2	0.39	0.09	0.75	0.04	0.61	0.07	0.88	0.03	0.62	0.05	0.57	0.06	0.94	0.04	0.75	0.02	0.75	0.02	0.89	0.02
3	0.47	0.10	0.76	0.04	0.60	0.10	0.89	0.03	0.58	0.07	0.68	0.07	0.92	0.04	0.75	0.03	0.74	0.02	0.88	0.02
4	0.55	0.10	0.73	0.04	0.58	0.12	0.88	0.04	0.62	0.07	0.73	0.11	0.92	0.04	0.76	0.03	0.72	0.02	0.87	0.02
5	0.60	0.10	0.75	0.04	0.67	0.14	0.88	0.04	0.64	0.07	0.79	0.14	0.91	0.03	0.78	0.03	0.72	0.02	0.89	0.03
6	0.67	0.10	0.76	0.04	0.86	0.14	0.88	0.04	0.65	0.07	0.84	0.17	0.90	0.06	0.80	0.03	0.72	0.02	0.89	0.03
7	0.70	0.10	0.75	0.05	0.95	0.14	0.86	0.05	0.68	0.07	0.89	0.22	0.84	0.06	0.81	0.04	0.72	0.03	0.91	0.04
8	0.69	0.11	0.76	0.05	0.98	0.15	0.83	0.07	0.63	0.08	0.91	0.18	0.82	0.08	0.80	0.04	0.71	0.03	0.92	0.04
9	0.67	0.14	0.77	0.07	1.06	0.18	0.77	0.07	0.52	0.12	0.97	0.16	0.82	0.04	0.76	0.04	0.70	0.03	0.91	0.04
10	0.70	0.15	0.76	0.08	0.70	0.29	0.72	0.07	0.45	0.14	0.94	0.17	0.85	0.03	0.72	0.05	0.70	0.03	0.92	0.04

35-44	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.24	0.05	0.76	0.02	0.65	0.03	0.86	0.02	0.73	0.02	0.52	0.05	0.73	0.02	0.73	0.02	0.74	0.02	0.80	0.02
2	0.33	0.05	0.77	0.03	0.66	0.06	0.89	0.03	0.75	0.04	0.62	0.04	0.79	0.04	0.76	0.02	0.75	0.02	0.82	0.02
3	0.39	0.07	0.75	0.03	0.61	0.06	0.89	0.03	0.75	0.03	0.67	0.05	0.87	0.06	0.76	0.02	0.74	0.02	0.84	0.02
4	0.42	0.08	0.74	0.03	0.58	0.07	0.89	0.05	0.73	0.04	0.75	0.04	0.80	0.09	0.74	0.02	0.72	0.02	0.84	0.02
5	0.45	0.08	0.74	0.03	0.53	0.06	0.89	0.07	0.71	0.04	0.81	0.06	0.78	0.09	0.74	0.02	0.72	0.02	0.82	0.02
6	0.46	0.09	0.75	0.03	0.55	0.09	0.91	0.08	0.71	0.03	0.84	0.08	0.83	0.08	0.76	0.03	0.72	0.02	0.83	0.03
7	0.48	0.09	0.75	0.03	0.60	0.11	0.92	0.10	0.70	0.03	0.85	0.10	0.82	0.09	0.76	0.03	0.72	0.03	0.87	0.03
8	0.49	0.10	0.74	0.03	0.62	0.10	0.90	0.12	0.70	0.04	0.85	0.11	0.82	0.09	0.74	0.03	0.71	0.03	0.88	0.03
9	0.48	0.10	0.74	0.03	0.58	0.09	0.90	0.10	0.70	0.03	0.91	0.11	0.81	0.19	0.74	0.03	0.70	0.03	0.88	0.03
10	0.49	0.10	0.73	0.03	0.57	0.12	0.90	0.10	0.68	0.04	0.99	0.13	0.70	0.17	0.74	0.03	0.70	0.03	0.86	0.03

45-54	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.27	0.04	0.73	0.03	0.57	0.04	0.77	0.02	0.50	0.06	0.29	0.03	0.75	0.02	0.59	0.03	0.63	0.04	0.77	0.02
2	0.29	0.05	0.69	0.04	0.51	0.05	0.80	0.03	0.43	0.06	0.30	0.05	0.73	0.04	0.57	0.03	0.58	0.04	0.79	0.02
3	0.35	0.05	0.65	0.04	0.50	0.07	0.81	0.03	0.37	0.06	0.30	0.04	0.66	0.04	0.55	0.03	0.53	0.05	0.79	0.02
4	0.37	0.06	0.65	0.04	0.52	0.08	0.83	0.04	0.33	0.06	0.36	0.04	0.59	0.06	0.55	0.03	0.50	0.07	0.79	0.02
5	0.39	0.07	0.62	0.04	0.56	0.10	0.86	0.05	0.30	0.06	0.33	0.05	0.59	0.07	0.53	0.04	0.48	0.07	0.79	0.02
6	0.41	0.09	0.62	0.04	0.60	0.09	0.87	0.06	0.29	0.07	0.34	0.07	0.50	0.08	0.53	0.04	0.46	0.08	0.79	0.03
7	0.42	0.09	0.62	0.04	0.60	0.10	0.88	0.06	0.27	0.07	0.32	0.11	0.51	0.11	0.51	0.04	0.44	0.08	0.78	0.04
8	0.39	0.10	0.61	0.04	0.59	0.08	0.88	0.08	0.24	0.07	0.37	0.10	0.50	0.12	0.48	0.04	0.42	0.08	0.78	0.04
9	0.35	0.12	0.56	0.04	0.55	0.08	0.89	0.09	0.21	0.06	0.34	0.12	0.51	0.11	0.44	0.04	0.39	0.07	0.79	0.04
10	0.35	0.12	0.58	0.05	0.52	0.08	0.93	0.14	0.18	0.06	0.33	0.12	0.52	0.12	0.42	0.04	0.38	0.08	0.79	0.05

55-64	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.04	0.01	0.35	0.05	0.19	0.03	0.22	0.02	0.17	0.04	0.08	0.02	0.23	0.11	0.18	0.02	0.19	0.03	0.56	0.02
2	0.06	0.02	0.33	0.05	0.15	0.03	0.18	0.03	0.22	0.03	0.10	0.03	0.07	0.08	0.17	0.02	0.14	0.02	0.60	0.03
3	0.05	0.03	0.34	0.05	0.12	0.04	0.13	0.02	0.24	0.03	0.14	0.02	0.05	0.08	0.15	0.02	0.12	0.03	0.58	0.03
4	0.05	0.03	0.31	0.05	0.11	0.04	0.08	0.03	0.23	0.04	0.16	0.03	0.00	0.07	0.12	0.02	0.09	0.03	0.57	0.03
5	0.06	0.03	0.29	0.06	0.09	0.03	0.07	0.03	0.23	0.04	0.14	0.02	-0.03	0.05	0.10	0.02	0.07	0.03	0.57	0.04
6	0.01	0.04	0.25	0.06	0.08	0.03	0.05	0.04	0.21	0.05	0.13	0.03	-0.04	0.05	0.08	0.02	0.06	0.03	0.60	0.04
7	0.01	0.04	0.23	0.06	0.08	0.03	0.04	0.04	0.23	0.05	0.16	0.03	-0.06	0.04	0.07	0.02	0.05	0.03	0.59	0.04
8	0.00	0.04	0.22	0.06	0.08	0.03	0.02	0.04	0.22	0.05	0.14	0.04	-0.06	0.04	0.05	0.02	0.04	0.03	0.55	0.04
9	-0.03	0.06	0.21	0.06	0.07	0.03	0.01	0.04	0.18	0.04	0.15	0.06	-0.05	0.04	0.04	0.02	0.04	0.03	0.55	0.05
10	-0.05	0.08	0.21	0.07	0.08	0.03	0.01	0.03	0.18	0.06	0.12	0.06	-0.06	0.04	0.04	0.02	0.04	0.03	0.61	0.07

65-74	BE		DE		ES		FR		IT		NL		PT		EU7 (nuts2)		EU7 (nuts1)		US	
1	0.00	0.00	0.00	0.01	0.03	0.02	0.02	0.01	0.06	0.03	0.01	0.00	0.17	0.10	0.01	0.01	0.02	0.01	0.18	0.02
2	0.00	0.01	-0.01	0.01	0.02	0.02	0.01	0.01	0.08	0.02	0.00	0.01	0.08	0.10	0.01	0.01	0.02	0.01	0.20	0.02
3	-0.01	0.01	0.00	0.02	0.02	0.01	0.01	0.01	0.09	0.02	0.00	0.01	0.03	0.08	0.01	0.01	0.02	0.01	0.20	0.02
4	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.09	0.03	0.00	0.01	0.00	0.07	0.01	0.01	0.02	0.01	0.19	0.02
5	0.00	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.10	0.03	-0.01	0.01	-0.03	0.05	0.01	0.01	0.02	0.01	0.18	0.02
6	0.00	0.00	0.02	0.02	0.01	0.01	0.01	0.02	0.11	0.03	-0.02	0.01	-0.06	0.01	0.01	0.01	0.02	0.02	0.19	0.02
7	0.00	0.00	0.03	0.02	0.01	0.01	0.01	0.02	0.11	0.03	-0.02	0.01	-0.09	0.02	0.01	0.01	0.02	0.02	0.19	0.02
8	0.01	0.00	0.03	0.01	0.00	0.02	0.01	0.02	0.10	0.03	-0.02	0.02	-0.08	0.02	0.01	0.01	0.02	0.02	0.18	0.02
9	0.01	0.01	0.02	0.02	0.01	0.02	0.00	0.03	0.07	0.04	-0.01	0.02	-0.07	0.02	0.01	0.01	0.02	0.02	0.17	0.02
10	0.00	0.01	0.02	0.02	0.01	0.01	-0.01	0.03	0.02	0.05	-0.02	0.03	-0.07	0.02	0.00	0.01	0.01	0.02	0.18	0.03