

Have the old edged out the young in the new millennium?

Empirical evidence on cross-age crowding out from EU aggregate data

Zsombor Cseres-Gergely*

15th September 2008

Abstract

WORK IN PROGRESS - PLEASE DO NOT QUOTE!

Employment of older and young workers has always been of importance for government policy in Europe – pension reforms and other actions aiming at increasing employment of older workers are the most recent signs of this commitment. The direct impact of activation policies is studied in a number of papers, but we still know little about indirect effects of increased employment of the older, in particular about its potential employment effects on other groups. This paper is a first empirical work that takes a closer look at the crowding out effect between younger and older workers in the 2000s. Using microdata aggregated to the country and region level, results from panel regressions confirm the presence of cross-age crowding in Europe in recent years. Results broken down by different regional units, outcome variables (employment and unemployment), education and gender groups and industries show that the crowding out effect is not universal. Most prone to the effect are lesser educated individuals, and those working in manufacturing and the service sector. Using regional units instead of countries show smaller effects, highlighting the potential importance of migration. Flexible estimates allowing for cross-gender effects confirm the q-substitutability of young men and older women.

JEL codes: J13, J14, J21, Keywords: youth, older workers, employment, unemployment, crowding out

1 Introduction

Employment of older workers is a main concern of many European countries. Employment rates vary a lot across Europe and countries having the lowest

*Institute of Economics, HAS and CEU; e-mail: zgergely@econ.core.hu

rates have usually the lowest rates among the 55-64 age group as well. If current employment rates prevail, ageing of the society will strengthen these tendencies. Over the coming 25 years, we can expect a further 4-5 percent decrease in employment rates in this case. Both ageing and the fiscal pressure on pension systems suggests attacking the problems through active ageing policies, where pension reforms are key “sticks” along with “carrots” of unemployment assistance and perhaps legislative support. For such policies to be effective, they have to rise exit age, and ultimately, employment of older workers. (Burniaux et al., 2004) reports an estimated expected increase in older workers’ participation around 8 percentage points within the EU.

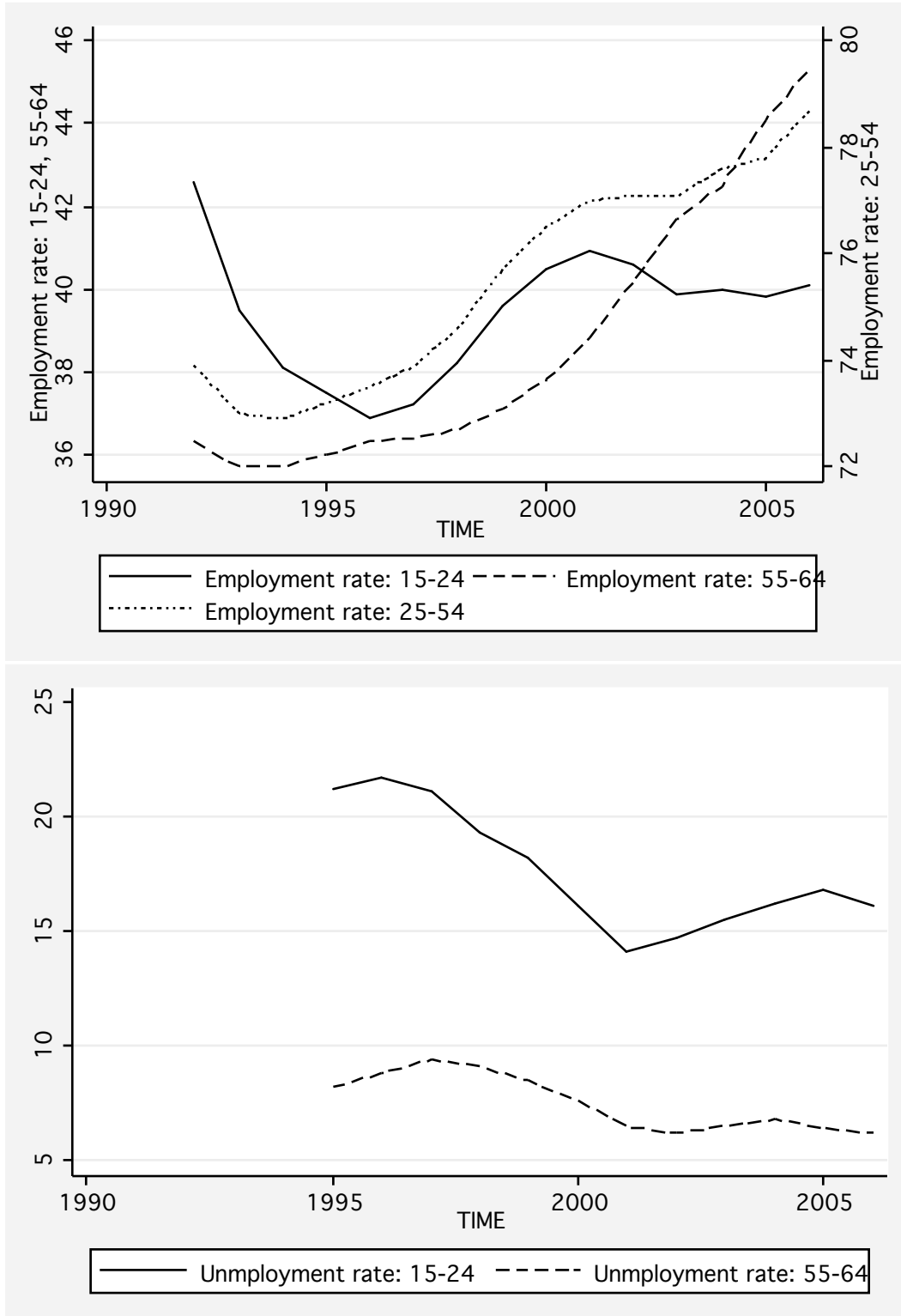
The importance of the employment of older workers is also recognised as a main goal of the common European Employment Strategy (EES). The 2003 communication of the EES by the EC considers not only the benefits, but also the potential costs of activation, primarily an unintended adverse effect of increased employment of the older on the younger workers. Clearly, if such an effect exists, there are labour market as well as fiscal consequences and expected net benefits have to be re-evaluated. The report argues as follows:

... Thirdly, there is no empirical evidence that younger workers and older workers are substitutes. The fact that exits of older workers (55-64) and inflows of younger workers (15-24) do not occur in the same sectors suggests that this is not the case. Both changes in their specific sectoral employment structure as well as absolute growth rates over the past few years show that, although to a different degree, the positive or negative sign of employment change is generally the same for young and older workers – except for “Manufacturing” (Annex 2, chart 3). In addition, experience from several Member States demonstrates that growth in the employment rate of older workers goes hand-in-hand with growth in that of younger workers (Annex 2, chart 4). In several of the new Member States the picture is more complex with sizeable reductions in the employment rates of younger workers over the past five years in several of them, due to the depressed state of the labour markets.

The communication suggests that the relevant connection between older and the younger workers is direct substitution and a condition for negative impact is the difference in growth rates in old and young employment rate. An opposing change in employment share in certain industries is considered too. The data used in the analysis spans the 1998-2002 period - both claims are well supported by graphs of raw data (not reproduced here).

Figure 1 re-creates one of the figures in the EC communication for a longer time span, including the recent years up to 2006. It shows employment rates of three age groups, that of the younger (15-24), the prime age (25-54) and the older (55-64) workers from the beginning of the 1990s on. Using prime age employment as an indicator of overall labour demand (strongly correlated with output), it is easy to spot four distinct periods over the years 1) the end of the economic downturn until 1994, 2) the recovery and steady growth until around 2000, 3) short stagnation through 2001-2003 and 4) a recovery thereafter. Young and older employment seem to behave very differently. While employment of the older follows the dynamics of overall employment figures quite closely (but with much greater changes in magnitude), youth employment reacts with some

Figure 1: Employment and unemployment rates of the young (15-24), prime age (25-54) and older (55-64) workers within the EU15



lag and gets “off-track” at around 2000-2001, not being able to recover from the post-2000 crisis.¹ In the case of the younger, increasing unemployment shows that employment must have decreased and stagnated subsequently without the building up of pressure. Position of the younger is thus weaker than that of the old in every respect: in terms of employment, unemployment and in turn, most certainly also in terms of wages.

“Much of the recent discussion of crowding out has been confusing simply because the term has not been carefully defined.” As we shall see, there has not been much discussion recently on what I shall refer to in the followings as cross-age crowding out. Indeed, this quote refers to the classic case of public-private investment crowding out (Carlson and Spencer, 1975) – the point is however applicable to our case too, and thus before we move forward, we have to clarify what we shall mean by cross-age crowding out. In what follows, I shall use the following definition:

$$\Delta = E[Pr(\ell_y)|emp_o = L, \Omega] - E[Pr(\ell_y)|emp_o = H, \Omega] \quad H > L,$$

where ℓ_y is a measure of employment of the young, emp_o is employment rate of the old and Ω is everything predetermined in the economy. In words: cross-age crowding out is defined here as the change in employment chances of the young as a result of an increase in older workers’ employment. Note that although this definition is loose (no specification on what labour market indicator we have to use for the young, for example), it does exclude some non-trivial possibilities. First of all, it requires that we measure only the effect of older workers’ increased employment. It is important therefore to control for and separate effects that might drive both events or a potential reverse-causality. Secondly, the definition does not say that crowding out should cause a drop in raw labour market chances, such as employment rates (as the EES communication suggests). The change has to occur compared to an unobservable counterfactual. Thirdly, the evaluation should not fix conditions in the economy in a way that would artificially constrain adjustment. This would happen if we, say, required that employment rate in the economy was fixed. Under such circumstances, it would be much easier to observe crowding out, if we use employment rate as a measure of both groups’ employment chances. However, it would also be incorrect, as an increased overall employment rate, the adjustment of demand to a supply shock is perhaps the most important channel of all.

In what follows, I will be looking at the effect of older workers increased employment on labour market chances of the young. My analysis will be mostly empirical, based on aggregate data calculated from European LFS microdata for the sake of flexibility. The second section discusses the related and relevant literature, while the third section introduces data used in the empirical work. The fourth section estimates the strength of the crowding out effect, breaking down the estimates by various subgroups of the population, different outcome variables and using different regional units. The fifth short section concludes and points out avenues for further research.

¹This effect is even more dramatic if we include the new member states. However, because they are very different in ways that are important regarding the problem at hand, they are omitted from the analysis. An important example is the very rapid expansion of the higher education system, beyond the pace of the EU average.

2 An overview of the related literature

The problem of crowding out between younger and older workers is almost completely absent from recent discussions. During the early 1980s, European governments were busy setting up early retirement schemes - a correlation between old and young employment was interesting then to see if this effort was worth the cost. Such beliefs were shown to be invalid theoretically (by Layard et al. (1991), for example), illustrated by some empirical evidence. It is instructive to briefly discuss their argument on why exogenous decrease in the size of part of the workforce will not cause other parts to have better chances on the labour market.

Layard et al. (1991) put forward their argument against the effectiveness of early retirement in chapter 10 of their book. A natural starting point of the authors' is to analyse the case when output does not change *as a result* of the change - if it does, it can quickly accommodate the decrease in the workforce. If it does not change however, unemployment shrinks as there are less older workers, which in turn causes inflation to rise or accelerate (wages adjust slowly). The authors argue that because there is no reason for the government to choose a different unemployment-inflation mix than it did before, it might well be tempted to let unemployment go back to its previous level to fight inflation. But this of course will result in a situation with reduced output. This idea can in principle be adopted to retirement and youth employment. In that case, the change is the opposite: the influx of extra workforce will increase unemployment, which in turn will decrease the inflationary pressure. Here the government has an incentive to go back to a previous inflation-unemployment mix by inflating real wages, thus lowering production costs of firms and also unemployment through that.

The above argument is not only roughly sketched, but assumes a lot that is uncertain. The action of the government is not known and so is not the relative constancy of output. It is not clear how long the process of adjustment lasts and what costs individuals incur who are involved in it - Boeri (2005) for example raises the point that the increased employment of women delay labour-market integration of the young, which can in turn have permanent effect on their future labour-market performance. But most importantly: there is very little empirical evidence on the employment interaction between the age groups (the book uses primary data sources to create a change in unemployment versus change in early retirement scatter plot).

Empirical evidence referring directly to cross-age crowding out is scarce, but does exist, mostly in the context of labour demand. Hamermesh (1987) describes firms' demand for heterogeneous factors, and workers of different age can be regarded just that. Surveying different articles that estimate factor-substitution elasticities, the author points out a remarkably stable result. "One intriguing result occurs in all four studies (Borjas (1983a), Grant-Hamermesh (1981), Berger (1983) and Freeman (1979)) that examine the issue. Adult women are q-substitutes for young workers. Borjas (1983a) also disaggregates the black male work force by age and finds that most of the q-substitutability is between women and young black men." The youth and women are close competitors, because of their relative shortage of experience and often of education too. The situation is similar but not identical to what is unfolding nowadays with regard to employment of older workers in general. Grant and Hamermesh (1981) argues that "competition from adult women has very likely had a negative impact on

the labor market for youth.” One might justly ask the question, why would the results be different in response to the recent increased labour supply of older workers in Europe?

Empirical evidence that does exist on the correlation between younger and older workers’ employment is focusing on the effect of the *decreasing* employment of the older. Herbertsson (2001) is one study that look at cross-age crowding out, presenting a fixed-effect panel regression based on data of OECD countries between 1979 and 1998 (Table 7 in the paper). Herbertsson uses employment rate of 55-64 year old people as an outcome and the unemployment rate of 16-24 year olds as the only right-hand side variable. Estimating a significant and negative parameter, he concludes that there is no crowding out to speak of, an observation quite in line with theoretical predictions and the observation we can draw from the pre-1999 part of Figure 1.

Even though the regression of Herbertsson (2001) serves well as a quick check of cross-age crowding out, we have to note that there are important issues not addressed there. One such issue is that an increase in employment of the old might have very different effect than its decrease. Decreasing work requirements and availability of financial support at the same time (as it is the case of early retirements) should increase wages in the affected market to which there is no theoretical limit, while an increased supply can hit the wage floor set by minimum wage legislation or collective bargaining and union activity. Secondly, using unemployment of the young as the labour market indicator is a nontrivial choice, as pressure on the youth labour market is easily channelled into participation in education. This does not mean that unemployment is a wrong choice - it merely means the analysis does not tell everything it could. Finally there are possibly influential factors omitted from the analysis (even though country fixed effects are present). One such factor is the trend in employment - if both unemployment and employment follows a similar trend, it is this trend that will capture most of their correlation. Another important factor is demographics, namely the change in the sizes of the cohorts in focus.

2.1 Generational crowding

Information is lacking on cross-age crowding out, but this is not so in other areas of age-related crowding. As opposed to cross-age crowding out, generational crowding refers to the effect the large size of a cohort has on its members’ labour market chances. Here we can not discuss the complete body of the related literature, but refer to comprehensive studies such as the one by Korenman and Neumark (1997). The effect the generational crowding literature is looking at is a cohort-specific shock implying stronger competition among people being born (actually: entering the labour market) in a specific year. The argument is a standard one, referring to stronger competition with increasing number of participants. The simple version of the model is tested and developed further by a number of authors. As discussed in Fertig and Schmidt (2003) among others, the importance of rigidities and institutions within the literature is central. A good example of the approach is the paper of Jimeno and Palenzuela (2003), who look at the effect of generation size and institutions together on youth unemployment.

The demographic crowding idea faces empirical challenges. Indeed, the evidence is mixed whether the effect of a larger cohort size depresses or enhances youth labour market possibilities. Refining measurement seems to be a major

concern for the literature – a good example is the study of Skans (2005). The author uses data on the level of local labour markets and includes fine measure of population structure in the form of population shares of 5-year age groups. He also employs an IV estimation procedure, using cohort sizes lagged by one and a half decade, in order to circumvent the possibility of reverse causality. His results are among the ones opposing standard demographic crowding and cross-age crowding wisdom, indicating that members of large cohorts enjoy better than average labour market conditions and there is a negative correlation between labour market chances of the old and the young.

Pure demographic changes are however not the only aggregate factors that can affect labour market outcomes of the young. A desaggregation by education groups is proposed by Biagi and Lucifora (2005), yielding a twofold benefit. On the one hand, differentiating between individuals of heterogeneous education allows for separating the pure demographic (ie. the baby bust) and educational (increase of more educated people) component of shocks. On the other hand, the authors can examine the effect of these shocks on different type of individuals, broken down by schooling. It turns out that both type of shocks have differential effect by education. An important finding is that the share of post-compulsory educated individuals tend to reduce unemployment of all. Such a cross-effect is noteworthy as a similar mechanism might be at work also in the case of cross-age crowding.

2.2 Causes of age-biased adjustment

Looking at both q-substitution and generational crowding, most papers discussed above have relied at least partially on the idea of substitution within the production process. Although substitution plays an important role in the cross-age crowding story, it does not tell it completely. It is not hard to see that without some asymmetry between different types of workers, cross-age crowding has limited effect. One way such asymmetry can arise is differences in the ability of wages to adjust. Reasons why wages of the youth can not adjust downward include unions, minimum wage policies or other elements of the legislative framework that introduce a formal or effective wage floor. Nevertheless, asymmetries can arise independently of wage floors, as a result of firm behaviour and a priori neutral policy intervention. Pagés and Montenegro (2007) discusses as a result of job security policies in the spirit of Hopenhayn and Rogerson (1993). The authors build on costs and barriers to entry and firing costs that are ex post asymmetric between workers with different tenures. Based on a theoretical model, the conclusion is drawn that higher severance payments put the younger at more risk in bad times than the old. An increase in protection is also shown to lead to a so-called Last In First Out personnel policy for the young. Under such a regime, it is the young who are fired first and hired last.² Time series estimates from Chile support the theoretical findings: a synthetic index of job security is indeed positively correlated with youth unemployment.

Note that the mechanism described by Pagés and Montenegro (2007) can exert its effect even if the only shock is coming from older workers' increased employment. Related to the dynamics of labour demand, the mechanism of

²Under heavy fluctuations of the business cycle, such a policy would be enough to increase youth unemployment and decrease employment. This is however not the case in the period we are looking at empirically.

internal promotions and the resulting “vacancy chains” is explored by sociologists to a great depth (see for example Stewman (1988)).

3 Data

The introductory empirical analysis is based on aggregate data, available from the Eurostat website for most European countries starting from the beginning of the 1990s. Such data is useful for the analysis on the population as a whole, but does not allow for the separation of potentially competing labour markets and the identification of labour market entrants. To this end, I use the European Labour Force Survey (EU LFS) to produce aggregates by education, sex and sub-country regions as well as to use retrospective data on economic activity to identify labour-market entrants. The EU LFS is an individual-level data set based on the member states’ own labour force surveys. It is a harmonised survey, but is richer for some countries and time periods than for others. Belgium, Denmark, France, Greece, Ireland, Italy, Luxemburg, the Netherlands, Portugal, Estonia and the UK are the countries that give most of the time-series observations, going back to the beginning of the 1980s. Out of the EU15, Austria, Finland, Germany and SE provide only few observations, dating back only to the 1990s.

Because quarterly data is available only after 2000 for many countries, the data set is standardised on the second, most commonly available quarter. Using data a year instead of a quarter apart rids of a considerable number of data points, but avoids problems (such as dealing with seasonality) on the one hand and makes instantaneous adjustment and hence the omission of dynamics more palatable.³ Clearly, even if we decide against modelling dynamics, the standard errors have to be calculated in a way to accommodate it, similarly to heteroskedasticity coming from the data being aggregate.

The working data consists a standard set of variables for different populations: a complete aggregate, men and women separately, and three education groups. The variables are various employment-measures and are calculated at the country and NUTS II regional level for the “younger” (age 15-24), the “prime age” (age 25-54) and the “older” (age 55-64) workers:

- Employment rate of the young
- Entry employment rate of the young
- Unemployment rate of the young
- Entry unemployment rate of the young
- Employment rate of the prime age
- Employment rate of the older

Employment and unemployment rates follows the ILO definition and refers to the whole population when not noted otherwise. Entry employment rate is calculated for those whose status one year earlier was “pupil, student, further training, unpaid work experience”, “In compulsory military service” or “child less than 15 years” and is not any of these at the time of the survey. Descriptive

³Country-specific fixed effects are very important in approaching the problem. Including dynamics, we would have to difference the data, which, according to our investigations, introduces an unacceptable level of noise.

statistics for the cross-country data file is given in Appendix A on page 16, including abbreviations used in variable names.

As we have already seen in Figure 1, employment rate data past 2000 show a trend that can be interpreted as crowding out: employment rate of older people increase, while that of the young decrease at the same time, especially at the end of the 1990s, beginning of the 2000s. Panel regressions constrained to this period show that there is a significant negative relationship between old and youth employment (running a regression on the country level for all time points yields – unsurprisingly – the same qualitative results as presented by (Herbertsson, 2001) – see his Table 7 on page 57). Thus what we are looking at is an effect that is not always present, but appears only in specific points in historic time and is perhaps connected to specific countries too. Narrowing our view to the EU15 (as in Figure 2), we see a similarly mixed pattern, hence conclusions are unchanged.

Even though short-term changes and differences in behaviour among countries stress the limits of visual inspection, it is instructive to look at employment trends by sexes. Figure 3 shows male, while Figure 3 shows female employment trends for the period of interest. While employment rates of the older are almost exclusively increasing, overall employment rates are often decreasing for males. This difference however does not seem to matter to the presence of the “crowding out” effect.

4 Estimating the strength of the cross-age crowding out effect

Based on a formal labour demand framework, Jimeno and Palenzuela (2003) close their model by supposing a monopolist employer and base the analysis of wage dynamics on a bargaining framework. Using an approximation for the unemployment rates, an equation they estimate is

$$u_{1,it} = \alpha + \beta u_{2,it} + \gamma(\ln s_{1,it} - \ln s_{2,it}) + f_i + e_{it},$$

where s_i is the population share of group i and f_i is a country-specific fixed-effect that represents wage differentials set by institutions. This is the equation that will motivate my empirical analysis. However, because the correspondance between the two problems is not exact, I shall be liberal in substituting measures of employment of the youth. The equation will be of the form:

$$\ell_{y,it} = \alpha + \beta_1 e_{p,it} + \beta_2 e_{o,it} + \gamma_1 \ln s_{y,it} + \gamma_2 \ln s_{o,it} + f_i + v_{it},$$

where $\ell_{y,it}$ is some measure of youth employment, f_i is the fixed effect specific to a country (or other unit of observation). Note that we are including $e_{p,it}$, employment rate of the prime age as well, which can be motivated by a conditional factor demand idea.

As already mentioned in the Data section, more than one indicator will take the place of $\ell_{y,it}$. These are employment rate, unemployment rate, entry employment rate, entry unemployment rate of the young. The logic of the estimation is that in a full specification, deviations from a predicted youth labour market indicator, as predicted by country-fixed effects, prime-age employment and the share of the age-group are ascribed to the changes in older employment rate.

The analysis might suggest that this equation can be estimated only on data that refers to the whole economy. This is however not the case. Estimation of such an equation is meaningful at any level of aggregation that can reasonably be characterised as a coherent “unit” of labour demand and for any type of labour that can be a separate factor in production. In the estimates, I shall exploit this possibility. Indeed, in searching for signs of the presence of crowding out, it is useful to look at potentially closed labour markets.

I estimate the crowding out effect in various configurations. As already mentioned, there are two potential tasks here to accomplish. Firstly, we are interested in the mere presence of the cross-age crowding out effect, secondly, we are interested in the size of it. Raw data suggests that before 2000 (and from 1982), there is possibly no crowding out, at least at the EU-level. Along with trying out some specifications, the first question we look at is if crowding out can be considered a general phenomenon or it is localised to the post-1999 period. Here and also later in every estimation, we look at employment as well as unemployment on the left hand side.

The simple approach to estimation is to use the greatest natural labour market, which most often means a country in Europe. Within the EU, migration is relatively frequent within, but much more rare between countries. Based on this, we expect that the crowding out effect is stronger if we use larger, but coherent labour markets, as one can not move away from them easily.

Tighter and “inescapable” labour markets are more prone to crowding out. The second, rather large set of estimates deal with this question, breaking down the market by gender and education within the chosen geographic unit. Segmentation of any market, including the labour market is however never perfect, as there is almost always at least a little substitution beside products or facts. Because of this, we allow for cross-group effect as an analogue to cross-price effects in demand.

The third set of estimates considers the possibility of crowding out differences across industries. As already mentioned, there are at least two reasons for such differences. Both recruitment schemes and technologies can be different across industries, most notably the presence or absence of seniority-based promotion and a LIFO recruitment mechanism, that puts younger people at the very edge of the adjustment margin.

Note that the different specifications do not all fit in a theoretical framework based only on substitution within a single production technology. In some cases, a quite close correspondence exists, while in others, it would be hard to bridge the gap. There is a special case however, which deserves closer attention. To see this, we have to look at the first order condition of simple CES cost minimisation problem of the firm with demand for heterogeneous labour (N_1 and N_2). Introducing the D_1 and D_2 as the size of group 1 and group 2 in the population and rearranging, we get

$$\frac{N_1}{D_1} = \frac{N_2}{D_2} (w_2/w_1)^\sigma, \quad \sigma = 1/(1 - \rho).$$

In the special case when $w_2/w_1 = 1$, running a regression of employment rate of the young on employment rate of the old yields the elasticity of substitution as a parameter estimate. In all other cases, such an exact connection is missing.

4.1 Basic specifications and the choice of regional units

First I compare simple panel estimates to somewhat richer specifications including generational crowding and conditional on prime-age employment, use different indicators for youth employment and estimate parameters for the pre- and post-1999 periods. Including fixed-effects for the regional units of choice is motivated by institutional differences, including legislation and wage-setting. Besides the simple fixed-effect estimator, we instrument employment of the older using the size of the older age group within the society, based on the positive empirical relationship between older employment and size of the age-group *conditional on the fixed effects*.

Given the somewhat surprising correlation that motivates the IV strategy, a comment is in order here. The generational crowding idea would suggest a *negative* relationship between share of older workers and their employment rate, instead of a positive one, and such relationship is indeed apparent in the raw data (although with little significance). But at a late age, such an argument is somewhat difficult to defend, given the diversity of factors influencing the evolution of labour market potential. Given the fixed effects, the positive relationship is to be interpreted as an increase in employment of the older as a result of an increased share of older within the society (given the predetermined and slow to change nature of the share of older, the direction of “causality” seems to be clear). Lacking hard evidence and based on descriptions of ongoing EU-level policies, my intuition is that cohort size in this case acts as a proxy for “policy concern” about the older. If this is so, the instrument is probably not correlated with unobservables affecting employment of the young. The most important case this would *not* hold is when governments suppose that there is a crowding out (or other indirect effects) between the two age-groups and take measures accordingly. Based on available communications, this concern is not yet raised to the level of policy and thus can be relaxed.

Table 1 shows estimates using employment rate as an outcome. It is apparent that the explanatory power of the estimating equation is vastly improved with the addition of prime-age employment and the population share of the young, even though the effect of the latter is not clearly defined. Specifications (1) and (2) confirm what we have already seen in the raw data: there seem to be no crowding out effect at work before 2000. On the contrary, older and younger employment goes hand in hand, just as the EES report quoted in the Introduction stresses. Conversely, in the post-1999 period, we do see a crowding out effect after controlling for overall labour demand. Both FE and FE-IV estimates suggest a 0.4 percentage point decrease in younger employment as a response to a 1 percentage point increase in older employment.

Results are in general similar if we use unemployment as the outcome variable (estimates shown in Table 2). In the first period, simple FE estimates confirm results from estimates in Table 1, but the negative (positive) correlation vanishes if we use trend and crowding variables - it is difficult to see if the significant *positive* correlation – suggesting the presence of crowding out – would remain after standard errors are corrected. Estimates from the post-1999 period are more conclusive. Estimated around 0.23 and 0.4 percentage point, they suggest a smaller (in the second case: slightly smaller) crowding out effect than do the estimates based on employment rate. This makes sense: among worsening labour market conditions, young people can enter the schooling system instead of searching for

a job, providing an additional margin of adjustment. If this possibility is actually used, the crowding out effect will be smaller in terms of unemployment change.

There is a most important lesson to learn from these estimates already. If output, proxied here by prime-age employment, can grow immediately, we can not detect a cross-age crowding effect. If however it does not, we do see such an effect.

Because effective labour markets are not country-wide, an argument can be put forward to use these as units of observation instead of countries. Also, wages or relative wages might easily be different by regions, not only by countries. Switching from countries to regions does bring a difference in results. With FE estimation, parameter estimates are smaller than those obtained when using countries as observation units, but they are significant again. This observations is consistent with regions “hit” by more active older being escapable. Generational crowding effects present a puzzle. Using employment on the LHS, they suggest that having more young is bad for young employment, while using unemployment suggests the opposite, having a negative parameter again.

After comparing different time periods and estimating procedures, I shall be using the FE and FE-IV estimators on the post-1999 data in what follows. When not used as an IV, the share of the older age group might be expected to play a part in explaining labour market chances of the young, perhaps with an interaction between the rate and the share. Entering these variables however yields insignificant results in both cases.

Additionally to employment rate of the whole age-group, I have calculated employment and unemployment rates for entrants to the labour market, ie. for those previously in education or in compulsory military service (mostly after completing education). Although perhaps this is the specification that departs furthest from the static production-function framework, it is very close to the idea of crowding out both through a vacancy-chain idea and asymmetric adjustment costs. Table 5 and 6 on page 21 show estimates using these rates. In both cases, the simple fixed-effects results do not show significant results, while instrumenting older workers’ employment does.

4.2 Gender differences

Unlike region of living, gender is very costly to change. Table 7 and 8 on page 22 show estimates for both genders, columns 1-3 and 2-4 being comparable to column 3 and 6 (FE and IV) on 1 and 2. As already mentioned, these and coming estimates use post-1999 data only.

Responsiveness to old and prime-age employment appears to be similar for the two sexes, the difference seems to be present in magnitude only (although it reverses when passing from FE to IV estimates). There is no cohort crowding-effect to speak of and prime-age employment has the already seen effect. The picture changes considerably however, if – in line with an equation derived from a conditional production function – we include cross-gender effect as well in columns 3-4 and 7-8. In the case of women, we see no significant effect apart from the trend and a peculiar (positive) own-age effect. In the case of men however, we see a negative generational crowding effect, and a positive from women, with a negative cross-generational crowding effect coming from older women. IV estimates are significant for men only and coming from older women again. Strangely, generation crowding effects are very strong and are of the

“wrong” sign. Results from using unemployment on the LHS are somewhat different. There is no significant OLS estimate for cross-age, but for generational crowding. Using the IV estimator, gender-specificity of the results change, as it is not older women, but men who seem to have a positive, detrimental effect on unemployment.

4.3 Differences by schooling

Just as in the case of genders, people with different education can constitute separate labour markets. Also, because of the differences in skill, it is to be expected that they will constitute different inputs in production. Education however has two peculiarities. On the one hand it can be changed similarly to location of residence (albeit only in one way), but on the other hand this change has the potential to temporarily remove the person from the labour force too. If public funding of higher education is generous enough, exiting the labour market in the case of labour market pressure is a feasible alternative to unemployment.

Table 9 and 10 on 23 show estimates for 3 single-digit ISIC educational categories, “L” being low, including primary and simple secondary vocational education, “M” being medium including secondary schools and higher vocational secondary education, and “H” being higher education, or college as a minimum. As in the case of genders, columns 1-3 give effect of “own” group variables, while columns 4-6 show also cross-group effects. Looking at estimates in Table 9 with employment only, we see that both FE and IV estimates agree in one thing: it is only the low educated who are affected by employment of older in the same group. The same effect is absent in the second set of estimated, using unemployment as outcome. On the other hand, if we look at those with higher education, we do see an effect on unemployment.

Is this result strange? Not necessarily. What we see in the first table can either be a “real education effect”, meaning that individuals in jobs that require low education are affected, or the sign of flight to education and out of the labour market (people who get into a next level education carry their previous credentials in the data). The absence of effects in unemployment however make it certain that young people indeed move “up” in education if employment chances tighten. The unemployment effect of the higher educated on the other hand fits well the vacancy chain part of the story. Those with one degree are much less likely to study further, than people with less education, as they face the largest opportunity cost doing so.

4.4 Crowding out in different industries

Finally, we narrow down the definition of the labour market in a different way. In previous estimates, we estimated cross-age crowding parameters derived from the notion that the labour market is country-wide or segmented along geographic units. However, because of the differences in technology, personnel policy and demand shocks, there might be significant differences among industries as well. One method of quickly checking the possibility of cross-age crowding is what the communication of the EC employed, namely looking at the co-movement of employment shares within an industry. Such an analysis can be standardised if we put it into regression terms and regress shares of young employees in a given industry among all working-age individuals on the same measure for older

workers. The first column in Table 13 on page 27 shows parameter estimates of a simple OLS regression of the share of the young on the share of the old in a given industry. Results show even less correlation what the EES communication shows using raw data: there is no particular correlation between old and young workers' shares.

Going further and introducing also prime age employment as a proxy for overall employment trend in an industry does change the picture. OLS estimates reproduce the EES report's findings on a negative correlation in the case of Manufacturing, adding Trade and Transport services. Fixed-effect and simple IV estimates are all negative and significant - a somewhat surprising, although not a priori impossible result. Looking at the FE-IV estimates makes it suspicious, that we might see the effect of reverse or joint causality in these cases. FE-IV estimates are more modest and surprisingly close the OLS ones. It shows significant negative correlations for Manufacturing, Construction, Trade, Hotels and Real estate services. Repeating the same exercise with regions yields surprising and (although in absence of apparent mistakes) suspicious results. These have to be re-examined and not taken seriously until then.

As it was the case of countries and regions, we look at the entry employment at the level of industries too (entry unemployment is not defined here). Results are given in Table 15 on page 15 and do not seem to be stable. There is no pattern of improvement as we approach our preferred specification as before, even though in the case of IV-FE, it is only Manufacturing that is left were a significant (negative) effect appears.

5 Conclusions and further research

This paper considered crowding out younger workers by the older, ie. a decrease in the labour market chances of the younger as the older work more. The mechanisms behind such an effect can be many-fold. One major one is direct competition between older and younger workers, if they work on sufficiently close labour markets. The other one is recruitment and layoff schemes working even without direct competition. Panel estimates based on aggregate data show that crowding out is present after 2000, once we take country-specific effects and the effect of overall labour demand into account. The phenomenon is robust to using different outcome indicators. Results coming from using regional units hint at the importance of migration, while differences by schooling point at vulnerability of the least educated. Industry-specific results are not conclusive, but appear to indicate that individuals working in manufacturing and services are most prone to cross-age crowding out. Looking at women and men separately, we see that there is no significant cross-effects between genders and that crowding out is most strong by older women on younger men. This results confirm empirical evidence on the q-substitutability of younger men and older women.

There are several questions this paper could not address - indeed it is only a first step in exploring cross-age-group effects of increased employment in the 2000s. Firstly, a custom-made theoretical model, taking into account the dynamics of labour demand might help to understand the mechanics behind the crowding out. It could also give more intuition to the precise definition of the concept by providing a natural idea of "normal" employment in various submarkets. Such submarkets separated only individuals with different gender or

education, but differences across industries or occupations are of interest too, especially if changes in labour demand are triggered by non-neutral shocks.

Temporal adjustment should be looked at more closely. Apart from experiments with different timings, the current research could not explore over-time change in the crowding out effect. Characterising such a change is of great interest, because we can expect that adjustment eliminates the effect over time. Finally, but still regarding the adjustment path, the current analysis is focussed on a reduced form only, excluding wage dynamics because of data availability issues. Because perfect wage adjustment alone excludes crowding out, exploring this area might prove to be key to the understanding of the presence of crowding out and perhaps also yield more precise estimates.

All of the potential enhancements to the simple approach presented earlier could be used, if more data were available, especially on wages and their adjustment. Given data availability, this possibility is best approached by looking at a single country, where wage data is of good quality and availability.

References

- Biagi, F. and C. Lucifora (2005, October). Demographic and education effects on unemployment in europe: Economic factors and labour market institutions. IZA Discussion Papers 1806, Institute for the Study of Labor (IZA).
- Boeri, T. (2005, November). The Lisbon process and european women at work. Prepared for the Conference Political Economy and Social Policy of Western Europe.
- Burniaux, J.-M., R. Duval, and F. Jaumotte (2004, June). Coping with ageing: A dynamic approach to quantify the impact of alternative policy options on future labour supply in oecd countries. OECD Economics Department Working Papers 371, OECD Economics Department.
- Carlson, K. M. and R. W. Spencer (1975). Crowding out and its critics. *Review* (Dec), 2–17.
- Fertig, M. and C. M. Schmidt (2003, December). Gerontocracy in motion? european cross-country evidence on the labor market consequences of population ageing. IZA Discussion Papers 956, Institute for the Study of Labor (IZA).
- Grant, J. H. and D. S. Hamermesh (1981, August). Labor market competition among youths, white women and others. *The Review of Economics and Statistics* 63(3), 354–60.
- Hamermesh, D. S. (1987, october). *The demand for labor in the long run*, Volume 1 of *Handbook of Labor Economics*, Chapter 8, pp. 429–471. Elsevier.
- Herbertsson, T. T. (2001). Why do icelanders not retire early? Technical report, Pensionsforum, Stockholm.
- Hopenhayn, H. and R. Rogerson (1993, October). Job turnover and policy evaluation: A general equilibrium analysis. *Journal of Political Economy* 101(5), 915–38.

- Jimeno, J. F. and D. R. Palenzuela (2003, March). Youth unemployment in the oecd: Demographic shifts, labour market institutions and macroeconomic shocks. Economics Working Papers 019, European Network of Economic Policy Research Institutes.
- Korenman, S. and D. Neumark (1997, May). Cohort crowding and youth labor markets: A cross-national analysis. NBER Working Papers 6031, National Bureau of Economic Research, Inc.
- Layard, R., S. Nickell, and R. Jackman (1991). *Unemployment: Macroeconomic Performance and the Labour Market*. Oxford University Press.
- Pagés, C. and C. E. Montenegro (2007, December). Job security and the age-composition of employment: evidence from chile. *Job security and the aEstudios de Economía* 34(2), 109–139.
- Skans, O. N. (2005). Age effects in swedish local labor markets. *Economics Letters* (86), 419–426.
- Stewman, S. (1988). Organizational demography. *Annual Review of Sociology* 14, 173–202.

A Descriptive statistics

Descriptive statistics refer to country-level data. Abbreviations are as follows:

- empr: employment rate
- unempr: unemployment rate
- agesr: age share of the given age group within the working age (1564) population
- “B” after both rates indicate “entry” rates. For the 1524 age group only
- 1564, 1524, 2554, 5564 are indicators of the age-group in question
- m/f stand for male/female
- L/M/H stand for 3 digit ISCO skill categories

Variable	Obs	Mean	Std. Dev.	Min	Max
empr1564	132	.6442667	.0693926	.4734273	.7631537
empr2554	132	.7721286	.0558941	.6034691	.8470508
empr1524	132	.4048628	.1332114	.2310897	.7053277
emprB1524	86	.4717392	.3154585	0	.8867519
empr5564	132	.4149847	.1207795	.2178515	.6896423
empr1564m	132	.7307051	.0462736	.6143624	.8285505
empr2554m	132	.8719526	.0329761	.77017	.9329885
empr1524m	132	.4314094	.1257392	.2599187	.7180462
emprB1524m	86	.4851084	.3199229	0	.9659829
empr5564m	132	.5198805	.1110331	.3207253	.7175206
empr1564f	132	.5577016	.1059231	.3282216	.726172
empr2554f	132	.6718583	.1041083	.4193544	.8268348

empr1524f 132	.3775668	.1429587	.1925097	.6921822
emprB1524f 83	.4597174	.3081141	0	.9235454
empr5564f 132	.3143429	.1463041	.1017144	.7090138
empr1564L 129	.5107816	.0712866	.3880295	.6763464
empr2554L 129	.6648615	.0652978	.5341156	.8014635
empr1524L 129	.3100637	.1410498	.0917944	.6478564
emprB1524L 86	.4281623	.2984281	0	.8334476
empr5564L 129	.3486171	.1271699	.1290585	.5999954
empr1564M 129	.6818648	.081107	.4301435	.8000578
empr2554M 129	.7963425	.0488796	.6662654	.8680575
empr1524M 129	.4841174	.1719832	.15313	.7977246
emprB1524M 85	.4839795	.3182173	0	.9307557
empr5564M 129	.4527851	.1235049	.2671488	.7202968
empr1564H 129	.8328781	.0387566	.6862466	.8986683
empr2554H 129	.8801315	.0339092	.7616523	.9392527
empr1524H 129	.6294517	.1566386	.2210179	.9281562
emprB1524H 80	.5598964	.3458641	0	1
empr5564H 129	.6216163	.0940457	.4093049	.8276307
unempr21564 132	.0521545	.0240376	.0115906	.1357496
unempr22554 132	.0525008	.0247644	.0113178	.1466397
unempr21524 132	.0759365	.0395802	.0216777	.1886708
unemprB1524 86	.1342779	.1200434	0	.401259
unempr25564 132	.0226913	.0149534	0	.0671915
unempr21564m 132	.0517093	.0236368	.0118986	.132711
unempr22554m 132	.0503948	.0237518	.0104908	.1406316
unempr21524m 132	.0748556	.0375244	.02023	.1899395
unemprB1524m 86	.1293977	.1117656	0	.3398023
unempr25564m 132	.029011	.0176308	0	.0804071
unempr21564f 132	.0525626	.0264701	.0112767	.1388025
unempr22554f 132	.054605	.0283535	.0121662	.1526772
unempr21524f 132	.07701	.0439177	.0173886	.1872873
unemprB1524f 83	.1459702	.1382787	0	.5076684
unempr25564f 132	.0166325	.0133578	0	.0542876
unempr21564L 129	.0589468	.0260903	.0132043	.1348745
unempr22554L 129	.0670585	.0291291	.0135412	.1517027
unempr21524L 129	.07683	.0450285	.0191838	.2085502
unemprB1524L 86	.1372161	.1182179	0	.3783564
unempr25564L 129	.0228157	.0163829	0	.0809982
unempr21564M 129	.0557338	.028431	.010102	.1329564
unempr22554M 129	.0526173	.0276473	.0072154	.1483363
unempr21524M 129	.0792955	.0444332	.0154214	.2036826
unemprB1524M 85	.1387838	.1256133	0	.4277579
unempr25564M 129	.0256864	.017467	0	.0765365
unempr21564H 129	.0394511	.0236369	.0085686	.1424047
unempr22554H 129	.038696	.0223861	.0074	.1301717
unempr21524H 129	.0945803	.0735411	0	.2999868
unemprB1524H 80	.1349142	.1396221	0	.442244
unempr25564H 129	.0173538	.0124255	0	.050549
unempr1564 132	.0760394	.0376551	.0180785	.222841
unempr1524 132	.1686947	.0948748	.0429738	.4182035

unempr2554	132	.0642468	.0320095	.0141838	.1954913
unempr5564	132	.0500686	.0292474	0	.1477614
unempr1564m	132	.066565	.0314668	.0156438	.1767913
unempr1524m	132	.1551281	.0814841	.0359868	.416893
unempr2554m	132	.0548224	.0261357	.0111346	.151654
unempr5564m	132	.0516722	.0300125	0	.164702
unempr1564f	132	.0902029	.0540679	.0217128	.2972062
unempr1524f	132	.1854312	.1173711	.0442747	.4818258
unempr2554f	132	.0779808	.0475187	.0187186	.2669035
unempr5564f	132	.0486851	.0319512	0	.1357421
unempr1564L	129	.1045913	.0464689	.0252576	.238076
unempr1524L	129	.2129326	.1098588	.0564485	.5482554
unempr2554L	129	.0920567	.0401151	.0187565	.2211995
unempr5564L	129	.0597192	.037943	0	.187303
unempr1564M	129	.0773565	.0437423	.0143259	.2361151
unempr1524M	129	.1553388	.0998372	.0227453	.4419086
unempr2554M	129	.0623512	.0337011	.0089748	.1820967
unempr5564M	129	.0518969	.0324669	0	.1659537
unempr1564H	129	.0454871	.0282353	.0103543	.1718512
unempr1524H	129	.1342455	.1078865	0	.4132343
unempr2554H	129	.042306	.0250612	.0082812	.1459612
unempr5564H	129	.0266815	.0182812	0	.0868512
agesr1524	132	.1919493	.0238232	.1577839	.2709406
agesr5564	132	.1617984	.0170688	.1236676	.2025893

B Tables

C Additional figures

Table 1: Estimates using all time periods (1-3) and only the post-1999 period (4-6) with countries as observation units - employment on LHS

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	1	1-2	2	2-3	3	plain
ln _{gdp2000me}	-0.590 (0.39)					
ln _{nempr2554}	4.031*** (0.86)	2.870*** (0.34)	1.553* (0.79)			
ln _{nempr5564}	-0.0877 (0.23)	-0.261 (0.32)	-0.0946 (0.19)	0.196 (0.19)	0.215 (0.14)	0.361 (0.25)
ln _{agecnt1524}	0.346* (0.17)	0.392** (0.14)	0.323* (0.18)	0.0995 (0.15)	0.131 (0.15)	
ln _{agecnt2554}	-0.319 (0.31)	-0.288 (0.27)	-0.202 (0.22)			
ln _{agecnt5564}	0.0369 (0.28)	-0.0258 (0.27)	-0.0323 (0.19)	-0.00985 (0.12)	-0.0406 (0.13)	
ln _{unempr1524}			-0.213** (0.086)	-0.277*** (0.057)	-0.233*** (0.062)	
Constant	7.194 (5.68)	-0.804 (0.75)	-1.610** (0.63)	-2.123*** (0.44)	-2.230*** (0.40)	-0.623** (0.23)
ln _{unempr5564}					-0.0617* (0.030)	
Observations	132	132	132	132	131	132
Number of s _{vcntry}	15	15	15	15	15	15
R-squared	0.53	0.46	0.63	0.57	0.64	0.11

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Estimates using all time periods (1-3) and only the post-1999 period (4-6) with countries as observation units - unemployment on LHS

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	FE0	FE	FE-IV	FE0	FE	FE-IV
ln _{unempr5564}	0.429*** (0.095)	0.298*** (0.056)	0.826*** (0.24)	0.266*** (0.075)	0.235*** (0.072)	1.251** (0.58)
ln _{nempr2554}		-3.382*** (0.84)	-0.910 (1.40)		-2.942* (1.59)	-0.0523 (3.98)
ln _{ageroldy}		0.265 (0.18)	0.228 (0.28)		0.648 (0.40)	-0.180 (0.78)
Constant	-0.585* (0.30)	-1.835*** (0.30)	0.473 (1.06)	-1.169*** (0.24)	-1.904*** (0.49)	2.006 (2.38)
Observations	131	131	131	83	83	83
Number of s _{vcntry}	15	15	15	15	15	15
R ²	0.34	0.46	.	0.16	0.22	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

FE-IV standard errors are not reliable!

Table 3: Estimates using all time periods (1-3) and only the post-1999 period (4-6) with regions as observation units - employment on LHS

	(1)	(2)	(3)	(4)	(5)	(6)
	FE0	FE	FE-IV	FE	FE	FE-IV
empr5564	0.149*** (0.055)	-0.0629 (0.059)	0.981*** (0.30)	-0.0462 (0.045)	-0.108*** (0.037)	-2.780 (7.39)
empr2554		0.705*** (0.10)	-0.378 (0.32)		0.359*** (0.088)	2.715 (6.51)
agesr1524		-0.0619 (0.13)	-0.979*** (0.28)		0.00222 (0.11)	2.668 (7.37)
Constant	0.285*** (0.022)	-0.143* (0.079)	0.421** (0.17)	0.375*** (0.019)	0.127* (0.074)	-1.063 (3.29)
Observations	1163	1163	1163	748	748	748
Number of cntreg	160	160	160	142	142	142
R^2	0.03	0.24	.	0.00	0.05	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimates using all time periods (1-3) and only the post-1999 period (4-6) with regions as observation units - unemployment on LHS

	(1)	(2)	(3)	(4)	(5)	(6)
	FE0	FE	FE-IV	FE0	FE	FE-IV
empr5564	-0.324*** (0.097)	0.105 (0.11)	0.219 (0.34)	-0.0195 (0.058)	0.157** (0.074)	12.24 (32.0)
empr2554		-1.426*** (0.13)	-1.544*** (0.36)		-0.712*** (0.16)	-11.36 (28.3)
agesr1524		0.118 (0.18)	0.0178 (0.31)		-0.227** (0.11)	-12.28 (32.0)
Constant	0.347*** (0.039)	1.212*** (0.092)	1.273*** (0.19)	0.199*** (0.024)	0.710*** (0.11)	6.090 (14.3)
Observations	1163	1163	1163	748	748	748
Number of cntreg	160	160	160	142	142	142
R^2	0.05	0.33	.	0.00	0.05	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimates using the post-1999 period only, using FE (1) and FE-IV (2) with countries as observation units - entry employment on LHS

COEFFICIENT	(1) FE	(2) FE-IV
lnempr5564	-0.214 (0.21)	-1.769** (0.90)
lnempr2554	2.573** (0.89)	3.712*** (1.41)
lnageroldy	-0.276 (0.26)	0.697 (0.63)
Constant	-0.0293 (0.27)	-1.118 (0.69)
Observations	47	47
Number of sventry	9	9
R^2	0.22	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Estimates using the post-1999 period only, using FE (1) and FE-IV (2) with countries as observation units - entry unemployment on LHS

COEFFICIENT	(1) FE	(2) FE-IV
lnunempr5564	0.311*** (0.064)	0.950 (0.70)
lnempr2554	-5.238 (4.99)	-3.310 (6.07)
lnageroldy	3.105* (1.66)	2.171 (1.68)
Constant	-1.915 (1.29)	0.624 (3.08)
Observations	47	47
Number of sventry	9	9
R^2	0.29	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Estimates by gender using only the post-1999 period. Estimates using FE (1-3) and FE-IV (4-6) with countries as observation units - employment on LHS

COEFFICIENT	(1) Men	(2) Women	(3) Men	(4) Women	(5) Men	(6) Women	(7) Men	(8) Women
lnempr5564m	-0.200 (0.13)		0.298 (0.23)	0.416 (0.42)	-0.362 (0.28)		0.540 (0.80)	1.019 (1.07)
lnempr2554m	3.393*** (0.68)		2.035** (0.70)	1.745 (1.04)	3.264*** (0.64)		1.403 (1.02)	1.012 (1.36)
lnageroldym	-0.0666 (0.066)		-0.276 (0.32)	0.0761 (0.39)	-0.0358 (0.093)		-0.283 (0.36)	-0.029 (0.47)
lnempr5564f		-0.313** (0.14)	-0.391** (0.14)	-0.351 (0.29)		-0.350*** (0.12)	-0.589* (0.34)	-0.65 (0.45)
lnempr2554f		0.959* (0.47)	1.044*** (0.35)	0.663 (0.70)		1.061** (0.42)	1.520** (0.76)	1.309 (1.01)
lnageroldyf		-0.171** (0.066)	-0.0179 (0.23)	-0.220 (0.28)		-0.183** (0.087)	-0.0981 (0.23)	-0.28 (0.30)
Constant	-0.555*** (0.13)	-1.042*** (0.19)	-0.513*** (0.13)	-0.691*** (0.20)	-0.673*** (0.22)	-1.049*** (0.092)	-0.501* (0.30)	-0.53 (0.40)
Observations	83	83	83	83	83	83	83	83
Number of svcentry	15	15	15	15	15	15	15	15
R ²	0.39	0.19	0.53	0.29	.	.	.	.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Estimates by gender using only the post-1999 period. Estimates using FE (1-3) and FE-IV (4-6) with countries as observation units - unemployment on LHS

COEFFICIENT	(1) Men	(2) Women	(3) Men	(4) Women	(5) Men	(6) Women	(7) Men	(8) Women
lnunempr5564m	0.129** (0.050)				0.727 (0.57)		0.272 (0.42)	0.615 (0.77)
lnempr2554m	-12.71*** (4.09)		-13.73** (6.23)	-8.437 (6.90)	-7.339 (6.03)		-8.817* (5.14)	1.790 (9.43)
lnageroldym	0.783** (0.32)		0.0954 (1.93)	-0.914 (2.18)	0.435 (0.53)		-1.129 (2.12)	-3.331 (3.88)
lnunempr5564f		0.0418 (0.14)	0.00301 (0.092)	-0.0154 (0.12)		0.923* (0.56)	0.578 (0.65)	1.233 (1.19)
lnempr2554f		-0.513 (0.77)	0.776 (2.30)	0.420 (2.47)		0.176 (1.52)	1.502 (1.79)	2.219 (3.29)
lnageroldyf		0.193 (0.29)	0.434 (1.09)	0.659 (1.20)		-0.105 (0.49)	1.046 (1.39)	1.826 (2.55)
lnempr5564m			-0.0158 (0.82)	0.567 (0.89)				
Constant	-3.214*** (0.65)	-2.007*** (0.57)	2.3541*** (0.66)	-2.696*** (0.80)	-0.647 (2.47)	1.103 (2.03)	-0.00737 (2.78)	4.714 (5.10)
Observations	83	80	80	80	83	80	80	80
Number of svcentry	15	15	15	15	15	15	15	15
R ²	0.46	0.01	0.44	0.16	.	.	.	.

Table 9: Estimates by schooling using only the post-1999 period with countries as observation units - employment on LHS

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	L	M	H	L	M	H
lnempr5564L	-0.997** (0.40)			-0.562** (0.24)	-0.278 (0.20)	-0.235 (0.15)
lnempr2554L	0.478 (1.00)			-1.411 (1.88)	0.407 (0.37)	0.628** (0.29)
lnageroldyL	-0.0656 (0.15)			0.0306 (0.19)	-0.197 (0.11)	-0.127 (0.077)
lnempr5564M		-0.192 (0.22)		0.153 (0.34)	-0.0155 (0.27)	-0.0778 (0.14)
lnempr2554M		3.071*** (0.93)		2.882 (2.30)	2.272*** (0.71)	-0.0784 (0.90)
lnageroldyM		0.115* (0.054)		-0.0895 (0.14)	0.147* (0.073)	-0.0928 (0.067)
lnempr5564H			-0.358 (0.23)	0.0348 (0.20)	-0.188 (0.17)	-0.201 (0.20)
lnempr2554H			3.433*** (0.87)	4.846*** (1.57)	0.570 (0.72)	2.053* (1.02)
lnageroldyH			0.121** (0.045)	-0.0537 (0.12)	0.0383 (0.034)	0.190*** (0.042)
Constant	-2.191*** (0.71)	-0.164 (0.33)	-0.318** (0.15)	-1.103** (0.41)	-0.388 (0.32)	-0.638** (0.28)
Observations	83	83	83	83	83	83
Number of sventry	15	15	15	15	15	15
R^2	0.32	0.39	0.33	0.48	0.51	0.42

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Estimates by schooling using only the post-1999 period with countries as observation units - unemployment on LHS

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	L	M	H	L	M	H
lnunempr5564L	0.0747 (0.14)			0.0693 (0.11)	-0.0172 (0.12)	0.160 (0.32)
lnempr2554L	-1.759 (2.03)			0.720 (2.54)	0.314 (2.67)	-1.195 (5.57)
lnageroldyL	0.00393 (0.31)			-0.0364 (0.35)	-0.176 (0.29)	0.534 (0.59)
lnunempr5564M		0.183 (0.12)		0.0873 (0.13)	0.191 (0.13)	0.482** (0.22)
lnempr2554M		-10.16*** (2.15)		-2.452 (2.52)	-7.998** (3.22)	2.714 (5.97)
lnageroldyM		0.358** (0.16)		0.00924 (0.21)	0.196 (0.24)	-0.247 (0.51)
lnunempr5564H			0.0336 (0.080)	0.0609 (0.058)	0.0637 (0.055)	-0.0716 (0.097)
lnempr2554H			-19.26** (6.92)	-10.84** (3.69)	-5.214 (4.53)	-23.21** (10.6)
lnageroldyH			0.804* (0.43)	0.455** (0.17)	0.178 (0.13)	0.940 (0.55)
Constant	-2.225** (0.96)	-3.575*** (0.42)	-5.552*** (1.18)	-3.055*** (0.72)	-3.732*** (0.74)	-4.557** (1.56)
Observations	83	81	78	78	78	78
Number of sventry	15	15	15	15	15	15
R^2	0.03	0.41	0.19	0.36	0.45	0.26

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Estimates by schooling using only the post-1999 period with countries as observation units - employment on LHS, IV

COEFFICIENT	(1) L	(2) M	(3) H	(4) L	(5) M	(6) H
lnempr5564L	-1.403*** (0.31)			-0.834 (1.00)	-0.454 (0.63)	-0.240 (0.59)
lnempr2554L	0.778 (0.75)			-0.740 (2.41)	0.998 (1.53)	0.981 (1.44)
lnageroldyL	-0.125 (0.15)			-0.0741 (0.22)	-0.274** (0.14)	-0.167 (0.13)
lnempr5564M		-0.159 (0.37)		0.691 (1.70)	0.709 (1.07)	0.765 (1.01)
lnempr2554M		3.069*** (0.57)		2.319 (4.37)	1.619 (2.77)	-0.549 (2.60)
lnageroldyM		0.111* (0.060)		0.111 (0.18)	0.270** (0.12)	-0.0556 (0.11)
lnempr5564H			-0.686 (0.48)	-1.918 (1.76)	-1.672 (1.12)	-1.160 (1.05)
lnempr2554H			3.803*** (1.05)	7.248 (4.43)	2.932 (2.81)	4.321 (2.64)
lnageroldyH			0.124*** (0.040)	-0.0884 (0.15)	-0.00182 (0.097)	0.139 (0.091)
Constant	-2.522*** (0.38)	-0.140 (0.29)	-0.430** (0.21)	-1.288 (1.19)	-0.193 (0.75)	-0.0207 (0.71)
Observations	83	83	83	83	83	83
Number of sventry	15	15	15	15	15	15
R^2	.	.	.	.	.	.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Estimates by schooling using only the post-1999 period with countries as observation units - unemployment on LHS, IV

COEFFICIENT	(1)	(2)	(3)	(4)	(5)	(6)
	L	M	H	L	M	H
lnunempr5564L	2.307 (1.53)			-1.733 (10.4)	-0.172 (1.01)	1.483 (1.99)
lnempr2554L	1.552 (4.73)			-7.496 (56.8)	-0.237 (6.84)	5.048 (13.5)
lnageroldyL	-1.353 (1.23)			1.773 (9.72)	-0.254 (0.73)	-0.213 (1.44)
lnunempr5564M		1.320 (1.17)		0.756 (5.53)	0.0732 (0.82)	-0.0883 (1.62)
lnempr2554M		-7.449* (4.43)		-11.38 (26.6)	-5.759 (8.53)	3.545 (16.8)
lnageroldyM		-0.0697 (0.52)		-0.837 (2.76)	-0.265 (0.59)	-0.984 (1.17)
lnunempr5564H			0.663 (0.53)		0.873 (0.65)	0.707 (1.27)
lnempr2554H			-17.35** (7.40)	-13.73 (20.7)	-2.440 (9.81)	-31.64 (19.4)
lnageroldyH			0.905*** (0.31)	0.153 (2.15)	0.413 (0.30)	1.629*** (0.60)
Constant	5.933 (5.84)	0.363 (4.11)	-3.021 (2.35)	-6.059 (18.4)	-1.407 (2.17)	1.094 (4.28)
lnempr5564H				13.43 (45.7)		
Observations	83	81	78	81	78	78
Number of svctry	15	15	15	15	15	15
R^2	.	.	.	.	.	.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Estimates at the industry level using only the post-1999 period with and without the prime age as a control; observation units are countries - share in total employment on LHS

	OLS, simple		Not instrumented				Instrumented			
			OLS		FE		IV		FE-IV	
Agriculture	0.34	(0.27)	-0.09	(0.19)	-0.46*	(0.25)	-0.53	(0.36)	-0.14	(0.22)
Fishing	0.13	(0.23)	-0.13	(0.17)	-0.57**	(0.17)	-0.75*	(0.44)	-0.2	(0.22)
Mining	0.16	(0.24)	-0.14	(0.17)	-0.57**	(0.17)	-0.68	(0.41)	-0.18	(0.22)
Manufact.	0.22	(0.34)	-0.39**	(0.18)	-0.59**	(0.15)	-0.84**	(0.31)	-0.4**	(0.19)
Utilities	0.04	(0.21)	-0.05	(0.23)	-0.56**	(0.18)	-1.41*	(0.76)	-0.16	(0.21)
Construct.	0.17	(0.3)	-0.21	(0.19)	-0.6**	(0.16)	-0.44	(0.3)	-0.37*	(0.21)
Trade	0.01	(0.29)	-0.43**	(0.19)	-0.74**	(0.25)	-0.9**	(0.28)	-0.52**	(0.2)
Hotels	-0.03	(0.2)	-0.24	(0.18)	-0.7**	(0.22)	-0.89**	(0.4)	-0.38*	(0.22)
Transport	0.14	(0.26)	-0.25*	(0.15)	-0.56**	(0.19)	-0.47*	(0.28)	-0.24	(0.2)
Financial	0.09	(0.23)	-0.17	(0.19)	-0.54**	(0.19)	-0.65**	(0.33)	-0.18	(0.2)
Realestate	0.07	(0.29)	-0.13	(0.19)	-0.56**	(0.19)	-0.93**	(0.43)	-0.35*	(0.21)
Public adm.	0.12	(0.24)	-0.23	(0.17)	-0.52**	(0.2)	-0.57*	(0.29)	-0.14	(0.21)
Education	0.09	(0.27)	-0.18	(0.17)	-0.49**	(0.19)	-0.66*	(0.35)	-0.2	(0.2)
Health	0.03	(0.29)	-0.1	(0.2)	-0.45*	(0.24)	-0.99**	(0.45)	-0.09	(0.21)
Otherpublic	-0.03	(0.22)	-0.1	(0.24)	-0.56**	(0.24)	-1.35**	(0.64)	-0.23	(0.2)
Private hh-s	0.14	(0.23)	-0.13	(0.18)	-0.56**	(0.19)	-0.69	(0.43)	-0.22	(0.22)

Robust standard errors in parentheses for FE estimates

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Estimates at the industry level using only the post-1999 period with and without the prime age as a control; observation units are regions - share in total employment on LHS

	OLS, simple		Not instrumented				Instrumented			
			OLS		FE		IV		FE-IV	
Agriculture	-0.19	(0.21)	-0.43**	(0.18)	-0.74**	(0.21)	-1.23**	(0.1)	-1.04**	(0.07)
Fishing	-0.34*	(0.21)	-0.44**	(0.19)	-0.82**	(0.21)	-1.31**	(0.11)	-1.06**	(0.07)
Mining	-0.34*	(0.21)	-0.45**	(0.19)	-0.82**	(0.21)	-1.32**	(0.11)	-1.06**	(0.06)
Manufact.	-0.46**	(0.23)	-0.64**	(0.16)	-0.79**	(0.18)	-1.37**	(0.1)	-1.03**	(0.06)
Utilities	-0.36*	(0.21)	-0.45**	(0.19)	-0.81**	(0.21)	-1.33**	(0.11)	-1.05**	(0.06)
Construct.	-0.44**	(0.22)	-0.51**	(0.2)	-0.8**	(0.18)	-1.37**	(0.1)	-1.03**	(0.06)
Trade	-0.58**	(0.22)	-0.67**	(0.19)	-0.91**	(0.19)	-1.43**	(0.1)	-1.16**	(0.06)
Hotels	-0.46**	(0.21)	-0.53**	(0.19)	-0.98**	(0.22)	-1.42**	(0.11)	-1.25**	(0.07)
Transport	-0.44**	(0.22)	-0.53**	(0.2)	-0.81**	(0.2)	-1.33**	(0.1)	-1.05**	(0.06)
Financial	-0.37*	(0.21)	-0.46**	(0.18)	-0.81**	(0.21)	-1.33**	(0.11)	-1.06**	(0.06)
Realestate	-0.49**	(0.22)	-0.54**	(0.21)	-0.79**	(0.19)	-1.38**	(0.11)	-1.03**	(0.06)
Public adm.	-0.36*	(0.22)	-0.5**	(0.19)	-0.8**	(0.22)	-1.22**	(0.1)	-1.02**	(0.06)
Education	-0.42*	(0.23)	-0.49**	(0.21)	-0.83**	(0.21)	-1.26**	(0.1)	-1.01**	(0.06)
Health	-0.52**	(0.24)	-0.55**	(0.23)	-0.84**	(0.23)	-1.29**	(0.1)	-1.06**	(0.06)
Otherpublic	-0.45**	(0.21)	-0.53**	(0.19)	-0.88**	(0.21)	-1.36**	(0.11)	-1.12**	(0.06)
Private hh-s	-0.34	(0.21)	-0.45**	(0.19)	-0.79**	(0.21)	-1.31**	(0.11)	-1.03**	(0.06)

Robust standard errors in parentheses for FE estimates

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Estimates at the industry level using only the post-1999 period with and without the prime age as a control; observation units are countries - share in entry employment on LHS

	OLS, simple		Not instrumented				Instrumented			
			OLS		FE		IV		FE-IV	
Agriculture	0.35*	(0.2)	0.03	(0.4)	0.55	(0.63)	-3.66	(6.55)	0.93	(4.1)
Fishing	0.11**	(0.04)	-0.58**	(0.28)	-0.84	(0.95)	16.81	(164.17)	-7.26	(8.1)
Mining	0.72	(0.99)	0.54	(0.73)	0.9	(0.84)	5.09	(7.6)	490.03	(1386)
Manufact.	1.88	(1.37)	-0.47	(1.08)	-4.09	(2.84)	1.67	(1.97)	-13**	(6.1)
Utilities	-0.17**	(0.05)	0.28	(0.73)	1.73	(2.14)	-3.78	(2.37)	1.44	(7.1)
Constr.	0.2	(3.38)	-4	(2.72)	-2.88	(4.6)	-1.69	(3.14)	-10.47	(8.1)
Trade	0.63	(1.96)	1.47	(1.75)	-0.47	(2.56)	-0.67	(2.13)	-1.17	(4.1)
Hotels	-0.57	(0.85)	0	(3.18)	-3.66**	(0.96)	9.3**	(4.47)	-0.95	(3.1)
Transport	1.2	(0.97)	0.42	(1.59)	3.94**	(1.5)	-2.25	(2.07)	-6.08	(7.1)
Financial	1.04	(0.95)	-1.32**	(0.46)	-1.81	(4.13)	-2.21*	(1.13)	-4.17	(3.1)
Realestate	2.3**	(0.54)	1.21**	(0.53)	-0.03	(1.84)	0.85	(0.81)	4.2	(2.1)
Public adm.	-1.79	(1.26)	-1.24	(1.98)	3.27	(2.35)	-5.6**	(2.43)	2.92	(3.1)
Education	-0.14	(0.99)	-0.3	(1.11)	-0.78	(1.38)	-4.14**	(1.47)	-1.64	(2.1)
Health	2.38**	(0.92)	0.95	(1.63)	1.9	(1.52)	-0.54	(1.15)	1.24	(2.1)
Otherpublic	-0.02	(0.72)	2.54	(1.93)	0.43	(0.41)	3.75**	(1.23)	2.08	(1.1)
Private hh-s	0.49**	(0.22)	0.61*	(0.35)	0.71	(1.38)	1.94	(1.26)	1.82	(4.1)

Robust standard errors in parentheses for FE estimates

*** p<0.01, ** p<0.05, * p<0.1

Figure 2: Time series of employment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - both sexes

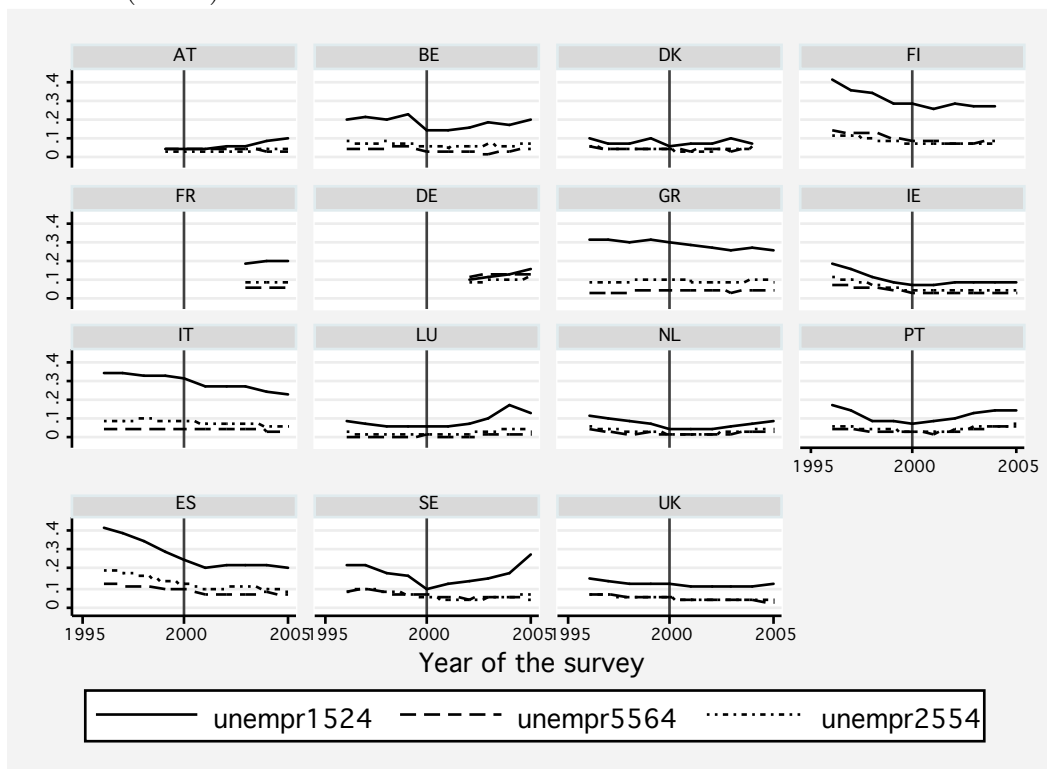


Figure 3: Time series of employment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - males

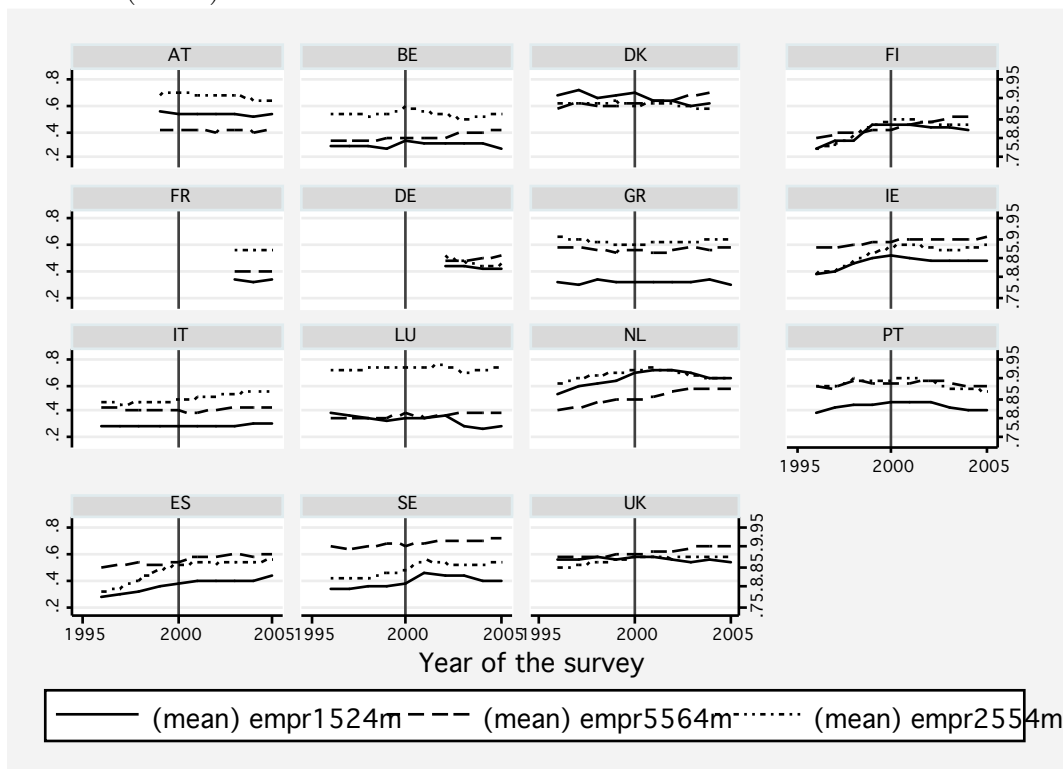


Figure 4: Time series of employment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - females

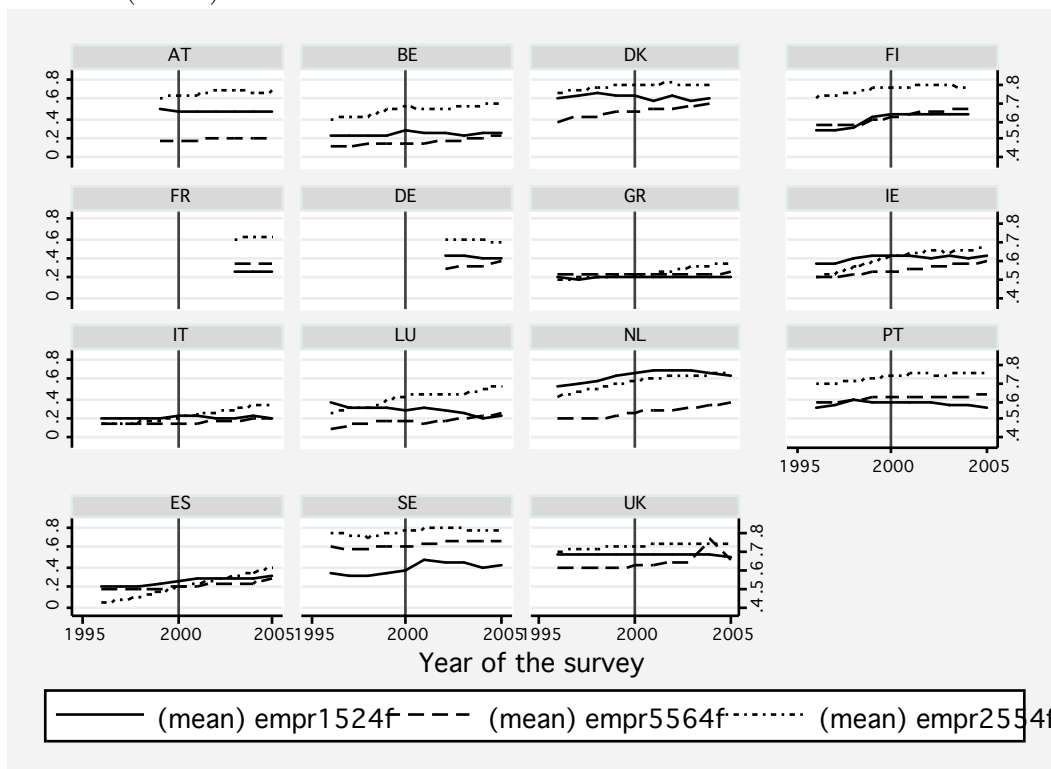


Figure 5: Time series of unemployment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - both sexes

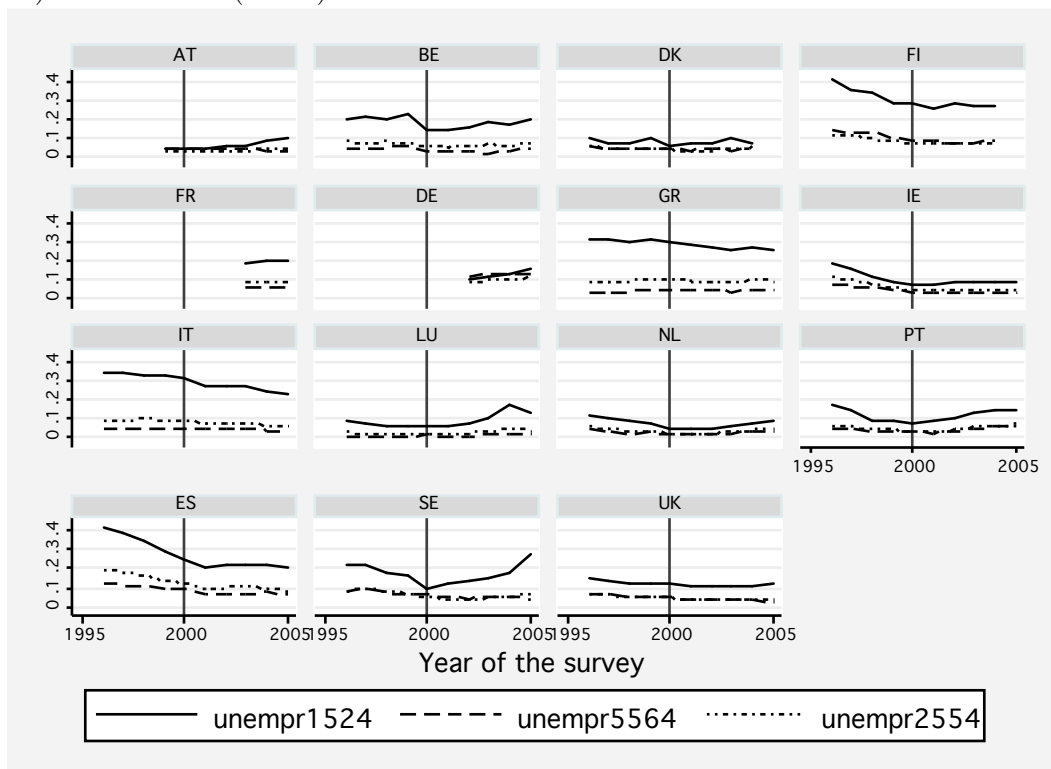


Figure 6: Time series of unemployment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - males

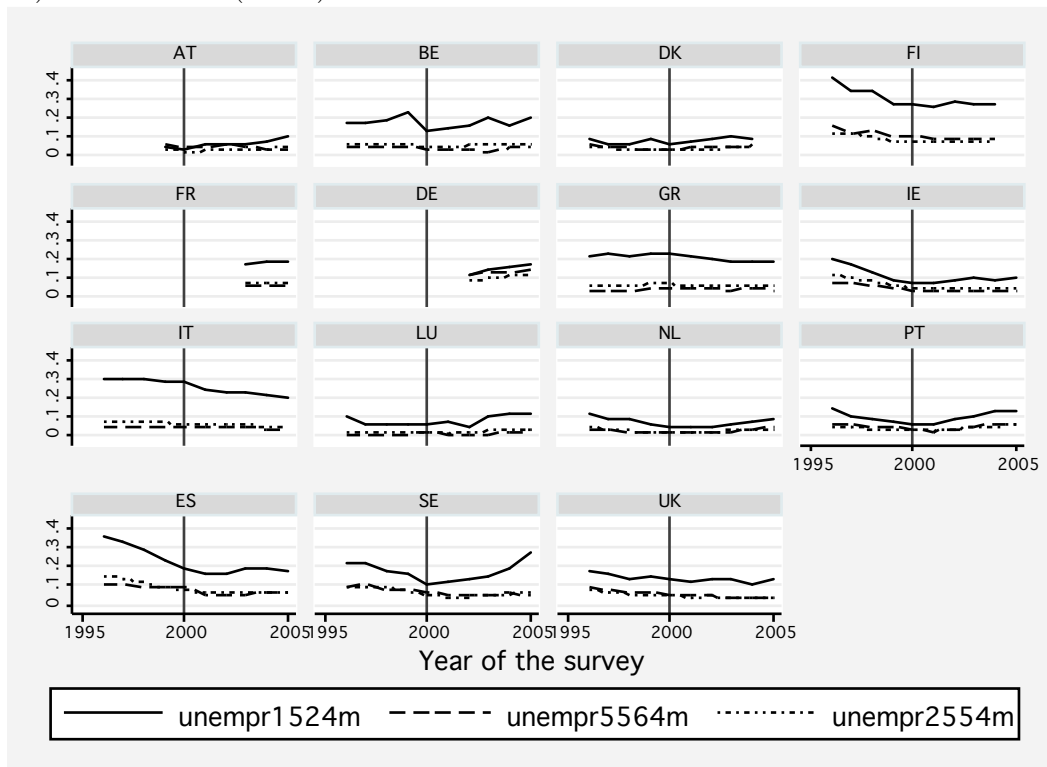


Figure 7: Time series of unemployment rates for the young (15-24), the prime age (25-54) and of older (55-64) workers within countries in the EU15 - females

