Labour Force Participation and Job Polarization: Evidence from Europe during the Great Recession

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ABSTRACT

Job polarization accelerated during the Great recession in Europe. Because of higher occupational segregation by gender and larger shocks to middling occupations that employ mostly male workers, employment opportunities declined much more for men relative to women in Europe compared to the US. We find that the labour force participation and employment rates of women increased considerably in regions most affected by the destruction of men's jobs, particularly for married women with less than high-school education. For men, the decline in demand in middling occupations explains some of the recent decline in their participation. For both men and women, the Great recession mostly accelerated pre-existing trends. This suggests that a large share of the recent increases in women's participation in Europe is a response to job polarization.

KEY WORDS

Labour Force participation, Job Polarization, Women, Europe, Great recession.

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I. Introduction

In both Europe and the US, employment dramatically declined during the Great recession, and in recent decades, the labour markets in both regions have been reshaped by the forces of mechanization and globalization. However, the response of labour force participation to these changes varied considerably across countries. One of the most important events in the US labour market in the last decade has been the decline in labour force participation among the population. From 2004 to 2013, the labour force participation rate for people between the ages of 25 and 54 declined by 2.6 p.p. – from 83.8 to 81.1% – and this decline has persisted well beyond the end of the Great recession (Hall and Petrosky-Nadeau, 2016). In the EU 15, on the other hand, the participation rate for people between the ages of 25 and 54 increased by 2 p.p. – from 83.7 to 85.6% – during the same period, despite the growth and persistence of a high level of unemployment.

What explains these differences on both sides of the Atlantic? To answer this question, this paper studies the determinants of the evolution of labour force participation in the last two decades across twelve European countries using individual-level data. While our main focus is on Europe, we draw several comparisons with the US to understand which factors are at play.

Consistent with previous work on the US, we find that recent demographic shifts explain a substantial share of cross-country differences. As the share of retired baby-boomers increased more rapidly in the US, it triggered a larger decline of participation rates there than in Europe. In the most recent decade, Europe has also been characterized by an increase in university and college graduation rates that are twice as high as those in the US – most notably in Southern Europe, and particularly for women. Women with higher levels of education are more likely to join the labour force, and they have contributed dramatically to the rise in labour force participation in Europe.

However, these compositional changes cannot explain everything. We observe large differences by gender and across education groups in recent years. For the population with education below high school, the labour force participation rates of men declined in all countries. For women, they increased rapidly, particularly in countries most affected by unemployment. In Spain, Greece and Italy, the participation of women with education below high school increased by 12 p.p., 5.5 p.p. and 2 p.p., respectively from 2007-13, while these economies were in the midst of a severe recession.

To explain these facts, we investigate the role of changes in patterns of labour demand during the last decades and in particular during the Great recession. We show that, as in the US (Jaimovich and Siu, 2012; Foote and Ryan, 2015), job polarization (which denotes the reallocation of employment toward the lowest- and highest- paying occupations) accelerated in Europe during the Great recession. However, as a consequence of greater job destruction in middling occupations, the recent polarization was more intense in Europe. Another important difference with respect to the US is that men and women are more segregated by gender across occupations in Europe. Middle-skill routine jobs, which are rapidly disappearing, are much more likely to employ male workers in Europe, while expanding low-skill occupations disproportionately employ female workers. As a result, job polarization and the destruction of

[1] We thank the Eurostat for having made the data available. The data used in this paper are available to researchers upon request from Eurostat. The results and conclusions are ours and not those of Eurostat, the European Commission or any of the national statistical authorities whose data have been used. Many thanks to Hélène Périvier and seminar participants at the OFCE and the Rencontres d'Aussois 2016 for insights that helped to shape the paper.

middle-skill jobs have produced a dramatic decline in male labour market opportunities – compared to opportunities for females – in Europe than in the US.

We investigate whether this asymmetric shock has provided women with incentives to participate in the labour market. Standard models of labour force participation predict that, unlike men, married women are influenced in their decision to participate not only by their own labour market opportunities but also by their husband's employment opportunities. We can also expect single women to modify their behaviour if the decline in labour market opportunities for male workers affects the probability of marriage (Bertrand et al., 2015) and thus increases the incentives to accumulate experience in the labour market.

To test these hypotheses, we adopt a local labour market strategy that exploits variations in the intensity of job polarization across regions. To isolate demand from supply shocks, we construct a Bartik, or "shift-share," instrumental variable based on the initial distribution of employment across occupations by gender in 1995. The logic of this widely used instrument is that job polarization affected European regions differently in the last decades because regions differed in their initial composition of employment. These differences made some regions more vulnerable than others to job polarization and the destruction of male jobs. To construct the instrument, we combine the initial distribution of employment by gender across occupations in 1995 with the employment growth of the same occupations in the US during the 2000s.[2] Finally, to capture gender differences in labour demand, we decompose the Bartik instruments into separate demand shocks for males and females and test for a differential response to these shocks by gender.

We present results based on different complementary data sources and estimation methods. First, using data from the Labour Force Surveys, we relate the 2000-2013 changes in participation across regions to gender-specific changes in labour demand. Across various alternative specifications, our regressions confirm that the participation and employment rates for women *increased* in response to the decline in male labour demand, particularly for low-educated married women. While the effects are twice as large for married women, we find that the participation of single women increased in reaction to male labour demand shocks. We also find that women were much more likely to join the labour force in regions that experienced the largest increases in demand for jobs that are more likely to be occupied by women in Europe. These results are robust to the inclusion of country-by-year fixed effects in the model and region-specific time trends.

For men, our estimates indicate a small procyclical response to labour demand shock that appears to be driven by the contraction of middle-skill occupations. Once the effect of middle-skill occupations is accounted for in the model, we find no impact of changes in labour demand on other occupations or sectors.

An important question is whether these changes reflect structural or cyclical forces specific to the Great recession. While our sample uses a relatively limited longitudinal dimension to answer these questions, the evidence suggests that, to a large extent, the Great recession accelerated the response to pre-existing trends in job polarization.

One concern with the previous results is that because they are based on repeated cross-section data, they might also reflect changes in the composition of workers across regions due to migration in response to local shocks. Another concern, particularly for women, is that the results may reflect cohort effects unrelated to changes in labour demand. We assess the importance of these issues by exploiting data from the European panel on Income and Living Condition, where we can track how the participation of the same individual changed in response to gender-specific labour demand shocks in her region from 2003 to 2013. Using specifications with individual fixed effects, and focusing on individuals who stay in the same region, the results largely confirm our previous findings for women.

In the last section of the paper, we quantify how much labour demand shocks can explain aggregate differences in the evolution of participation rates across the countries in our sample.

[2] As discussed below, we use employment growth from the US instead of following the more standard approach of using growth at the national level for each country. Doing so mitigates the risk that the aggregate changes in employment across occupations and industries that are used to construct the instrument are driven by national-level shocks to labour supply.

For women, the fit of the model is quite good for most countries, with the exception of Ireland. This suggests that most of the increase in the participation of women during the Great recession (net of the effect of education and ageing) can be attributed to differences in gender-specific demand shocks across regions. For men, on the other hand, the model explains very little of the decline in participation, either before or during the Great recession.

This paper extends at least three distinct literatures. First, various authors have shown that labour market opportunities for women depend on the structure of available occupations in the economy.[3] Our results extend this work by pointing out how the acceleration of job polarization in Europe during the last recession disproportionately benefited women relative to men. The second literature our work extends is that documenting the decline in participation over the last two decades in the US. Our results expand the earlier literature, such as Juhn (1992), that identified the role of diminishing opportunities for males in the labour market to explain the decrease in their participation rates. Ours is the first paper to investigate whether the recent evolution of participation rates in Europe is also related to a decline in labour demand in middle-skill occupations.[4] The third body of work to which our paper contributes is on whether structural or cyclical factors are driving recent labour market changes. Our paper is the first to examine these questions across European countries and to highlight and explain the strikingly divergent consequences of the Great recession on the participation of men and women in Europe.

The remainder of the paper proceeds as follows. In section II, we present the data we use in the paper. Section III describes changes in participation across the 12 European countries in our sample and assesses the respective roles of the ageing of the population and changes in education levels in explaining differences across countries. Section IV investigates how job polarization has influenced the labour force participation of men and women. Section V assesses the robustness of the previous results using panel data. In Section VI, we use our local labour market estimates to account for some of the national trends since 2000. The last section concludes.

II. The Data

We consider 11 core Eurozone countries plus the UK.[5] Thus, our sample includes large countries such as Germany, France, Spain and Italy and also smaller countries such as Ireland, Greece and Portugal, which suffered particularly during the crisis. Also included in the sample are Austria, Belgium, Finland, and the Netherlands.

Our analysis is based on two complementary sources of harmonized European microdata. First, we exploit the European Union Labour Force Survey (LFS) over the period 1995-2013.[6] These data contain harmonized information on labour force status, occupation, industry affiliation and household composition across European Union countries. Data are available on an annual basis until 2002 and at a quarterly frequency thereafter.[7] Major strengths of this dataset are that it is available for many countries over a relatively long period of time and that it has a relatively large sample size, with approximately 200,000 annual observations per country per year. A limitation is that neither workers nor households can be tracked over time.[8]

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[3] See Olivetti and Petrongolo (2014), who documented that gender biases in labour demand across European countries are related to differences in the sectoral composition of the economy. Goldin (2006) shows that the expansion of the services sector has made available jobs that were physically less demanding and more respectable for women joining the labour force than typical jobs in factories. Ngai and Petrongolo (Forthcoming) show how the rise in the service sector explains the narrowing of gender gaps in the labour market in the US.

[4] Aaronson et al. (2014, p. 214) and Foote and Ryan (2015) found a strong negative relationship between the decline in participation and the destruction of employment in middle-skill jobs across regions in the US.

[5] We do not include Eastern-European and Baltic countries that have recently joined the Euro. These countries are at a different stage of economic development and tend to have very different labour market institutions.

[6] The restricted time span for the analysis is dictated by the availability of data on occupations in the LFS. While harmonized microdata are available for some countries since 1983, information on occupations is missing before 1995 for many countries.

[7] There are some exceptions for a small number of countries. See the data Appendix for details.

[8] While most countries adopted a rotating panel sampling scheme to collect the data, as in the CPS for the US, it is not possible to follow individuals over time in the harmonized sample because of confidentiality issues.

To study transitions in the labour market, we exploit the European Union Statistics on Income and Living Conditions (SILC), longitudinal panel data collected from 2004 to 2014.[9] The SILC is a rotating panel where an individual is surveyed annually over four years.[10] This panel contains a rich set of information on household composition and employment, as well as retrospective information for each month indicating whether an individual was in the labour force or not, employed or unemployed, and working full or part time.[11] The panel contains individual transitions across employment, unemployment and non-participation for each member of the household, which allows us to relate these transitions to the economic status of the spouse. A year contains, on average, from 10,000 to 50,000 observations per country. Unfortunately, in the SILC panel, data are missing for Germany and Greece after 2008.[12] Finally, to compare labour markets in Europe with the US, we exploit public use data from the US Current Population Survey (Flood et al., 2015).[13]

III. The Facts: Past and Present Trends in Participation

A. The European convergence

We start by describing the trends in labour force participation in Europe and the US over the last two decades, with a particular focus on what happened during the Great recession. Figure 1 shows how participation rates for the population aged 15 and above evolved from 1995 to 2013.[14] The first 18 years of this period are characterized by a remarkable convergence in participation rates: in all European countries, participation rates increased, and they increased much more rapidly where they were originally lower. That convergence came to a halt with the Great recession, as participation rates remained flat from 2007 to 2013. Remarkably, participation rates were stable in Spain and Italy, which were hit quite hard by the crisis, and also in France, where the unemployment rate increased substantially. Two exceptions are Ireland and Portugal, where participation rates declined by approximately 3 points during the Great recession.

The picture is very different in the US. While the US participation rate was relatively high in 1995, the gap with Europe narrowed considerably due to the combination of faster growth in Europe and decreased growth in the US. The level of participation in the US also began to decline much earlier than the time of the Great recession.

The participation rates of the population mask contrasted evolutions by age group and gender.[15] Figures 2 and 3 separately show the participation rates of men and women of prime age (aged 25-54). Differences by gender are particularly dramatic in Europe. For women, participation rates increased spectacularly until 2007, and at a particularly rapid pace in countries with an initially lower participation rate. This is quite different from the US, where the participation of women reached a plateau in the late 1990s (Krueger, 2016) and declined by 2 p.p. thereafter.

Also in contrast to the US, Figure 2 shows that the participation of prime age men was stable from 1995 to 2007 in Europe and started to decline only after the Great recession. Another notable fact is that, when restricted to the prime age population, the participation rate in the US has become quite low relative to other countries in our sample for either men or women. Figure

[9] The data in SILC are periodically revised, and various errors are corrected in each release. To allow for replication of the results in this paper, the appendix indicates the version of the data that we used. See Verdugo (2016) and the references therein for a discussion of the strengths and limitations of the SILC dataset.

[10] An exception is France, where an individual can be interrogated up to nine times.

[11] The SILC panel is not based on a harmonised questionnaire but is constructed using a set of 'target variables' specified by EU regulations. Countries can choose – relatively independently – how to collect each variable. This implies that the SILC is potentially less homogenous than other surveys. On the other hand, this decentralised approach allows the data to be collected and released more rapidly.

[12] The data appendix contains additional details on the construction of the sample.

[13] We use the Annual Social and Economic Supplement of the Current Population Survey.

[14] The official BLS figures for the US report participation rates for the population aged 16 and above while Eurostat provides the participation rates for the population aged 15 and above. To provide a comparable picture, we tabulated the rates for the population aged 15 and above with the individual-level CPS data.

[15] See Périvier (2016) for a detailed discussion of recent trends by gender in Europe.

3 shows that, in 2013, only Ireland and Italy had a participation rate of prime age women inferior to the US.

B. When the baby boomers retire

In practice, changes in the unadjusted participation rates reflect not only changes in participation but also changes in the age of the population. The large cohorts of the baby boom that were born around the 1950s started to reach retirement age at the beginning of the 2010s. These large cohorts increased the age of the population and, as a result, the share of the population with lower participation rates. Aaronson et al. (2014) showed how these demographic changes explain a large share of the decrease in participation in the US in the last decade.

Table 1 indicates how the share of prime age workers has varied in recent years among our panel of countries. While a baby boom occurred almost everywhere, some countries experienced a milder or late version of it, and there are large differences in the share of baby boomers across countries.[16] In particular, the share of the prime age population declined more rapidly in the US.

How much do these demographic factors explain differences across countries during the Great recession? Note that the participation rates in year t and country c can be written as $l_t^c = \sum_i l_{it}^c s_{it}^c$, where s_{it}^c is the population share of demographic group i and l_{it}^C measures its participation rate.[17] Based on this decomposition, we construct two counterfactual participation rates for each country. First, to account for demographic changes within countries, we estimate $l_{13}^C(s_{07}) = \sum_i l_{i,13}^C s_{i,07}^C$; that is, the counterfactual participation rate that would have been observed in 2013 had the age distribution across 14 age groups in the population remained fixed at the 2007 level. Second, to assess the role of demographic differences with the US, we estimate for each country $l_t^c(US) = \sum_i l_{it}^c s_{it}^{US}$, which captures the counterfactual participation rates that would have been observed had the age distribution been the same as in the US during those years. Then, we estimate $l_{13}^c(US) - l_{07}^c(US)$, which is the counterfactual change in participation over 2007-13 that would have been observed had the demographic composition of these countries been similar to that of the US in those two years.[18]

The last two columns of Table 2 show the results of these decompositions. Demographic factors appear to have a non-negligible effect. According to the second-to-last column of the Table, had the demographic distribution remained constant at the 2007 level, the participation rates would have been much higher in 2013. Similarly, with the same demographic composition as the US, most European countries would have had higher participation rates both in 2007 and 2013. However, except in Belgium and Germany, where the effects are quite large, the decline in the counterfactual participation rate is inferior to 1 p.p., which is small in comparison to the 2.8 p.p. decline in the US. In sum, demographic differences far from fully account for the gap with the US and explain, on average, only a third of these differences.

C. The European education expansion

To understand the evolution of participation for prime age adults, it is also important to take into account the rapid growth in educational attainment in Europe. Table 3 shows that education

[16] See e.g. Avdeev et al. (2011). Obviously, these demographic differences are also exacerbated by the lower, often considerably lower, fertility rates in Europe.

[17] For confidentiality reasons, age is reported in 5-year brackets in the European LFS. We use the 14 available age groups that are available: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, and more than 80 years of age.

[18] Obviously, such decomposition abstracts from general equilibrium effects that arise if there are interactions in participation decisions between groups, which is likely in practice.

levels in the last decades have increased much more rapidly in Europe than the US.[19] The increase in tertiary education has been much larger for women than for men, and differences are particularly large in some countries.

To assess the consequences of the increase in education on the participation rates, column (1) of Table 4 shows the results of observed and regression-adjusted changes in the labour force participation rate of prime age workers in 2007 and 2013, taking into account the effect of education. The adjusted changes were obtained from the average of residuals from a regression of the probability to participate on three education dummies.[20] The results show that controlling for education does not have much effect on the change in participation rates in the US. We also find relatively small effects on the participation of males in most countries. In contrast, for women, the increase in education explains up to 2 p.p. of the increase in participation during the Great recession in Belgium, Ireland, France, Italy, Portugal and the UK. On the other hand, in Spain, Greece and also to a lesser extent Austria, the growth in participation of women, net of the effect of education, remains substantial.[21]

Finally, it is also important to notice that there were important changes in participation *within* education-based groups over the period under study. Table 5 shows that there were much larger increases in participation among women with less than high-school education and for high-school graduates. We also find substantial increases in the participation rates of married women. In most countries, the participation of married women increased substantially relative to the participation of single women. In the rest of the paper, we investigate whether these patterns can be explained by changes in labour demand.

IV. Did Job Polarization Affect Participation?

A. How participation responds to the business cycle

To guide the empirical analysis below, we discuss theoretically how labour demand shocks affect labour force participation. Following Becker (1965), the labour supply of an individual is based on a comparison between the marginal benefits and costs of taking a job. In a standard static model, labour force participation increases when wages are high, the probability of finding a job is high, and the disutility cost of labour low. During recessions, wages tend to decrease and finding a job becomes harder; thus, marginal workers could be discouraged and drop out of the labour force or refrain from entering in the first place. The "*discouraged worker effect*", as it is known in the literature, would predict a decline in participation during the Great recession.

The labour supply decision is more complicated in households where the decision of each spouse affects the other (Doepke and Tertilt, 2016). In traditional gender roles, women are the secondary earners and, unlike married men, they make an arbitrage between market work and home production – not only between work and leisure – and thus have a higher opportunity cost of work (Mincer, 1962). Households also offer the possibility of insurance within the family.[22] The theory of the "*added worker effect*" posits that if one spouse experiences a decline in income or faces higher unemployment risks, the other spouse will temporarily increase her labour supply (Lundberg, 1985; Juhn and Potter, 2007).[23]

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[19] See for example Carrasco, Jimeno and Ortega (2015) and Verdugo (2014) for studies emphasizing the consequences of this education expansion on the wage structures of Spain and France, respectively.

[20] These regressions were performed on individual-level data and estimated separately for each country.

[21] Of course, interpreting the increase in the level of education during the Great recession as reflecting purely composition effects is probably erroneous. It is likely that both the boom that preceded the Great recession in some countries and the Great recession itself modified the incentives to attend higher education. See Charles, Hurst and Notowidigdo (2015) for causal evidence of a link between the construction booms and the decline in college attendance in the US during the 2000s.

[22] The theories underlying the notion of spousal labour supply as insurance against unemployment were originally developed in Ashenfelter (1980), Heckman and MaCurdy (1980) and Lundberg (1985).

[23] Empirically, the literature reports much stronger evidence for discouraged worker effects (Benati, 2001) than for added worker effects (Lundberg, 1985). Two major explanations have been advanced. First, in a dynamic setting, individuals smooth their labour supply over the life cycle (Heckman and MaCurdy, 1980). Another issue is that the job prospects of husbands and wives might be correlated. During downturns, labour market opportunities might decline for both spouses, thus diminishing the

Changes in the labour market opportunities of men could also influence the marriage market and thus indirectly the participation of single women in the labour force. Bertrand et al. (2015) show that women are less likely to get married when male labour market opportunities decline. As the pool of employed men shrank dramatically with the Great recession, labour force participation and the associated accumulation of human capital might have become more attractive for single women.

The Great recession in Europe offers an interesting setting in which to test these theories. First, the shock has been exceptionally large. Second, as we document below, and unlike during previous recessions, the shock has been disproportionately concentrated on males in Europe.

B. Men and women during the Great Recession: why so different?

As demonstrated by Shin (2000), men and women tend to be employed in occupations with different levels of volatility, and the cyclicality of aggregate employment differs by gender. [24] This has clearly been the case during the Great recession in Europe. Table 6 shows that net employment losses were much larger for men than women in countries that experienced the deepest recessions, such as Spain, Ireland, Portugal and Italy. For example, in Spain, total employment plummeted by 23% for men but by 'only' 8% for women.

These gender differences reflect, to a large extent, the decline in middle-skill jobs and the associated polarization of employment. Recent work has emphasized that job polarization accelerated during the recent recessions in the US (Jaimovich and Siu, 2012; Foote and Ryan, 2015; Hershbein and Kahn, 2016). In the US, Jaimovich and Siu (2015) estimate that 88% of job losses in routine occupations since the mid-1980s occurred during recessions. We find similar patterns in Europe during the Great recession. Table 7 documents job polarization in Europe following the categorization of jobs by Goos, Manning and Salomons (2014) into three groups: low-paying, middling occupations and high-paying occupations.[25] In most countries, employment in middling occupations fell rapidly, by 20 to 30% in Ireland, Greece, Italy and Spain in particular. In contrast, in high- and low-paying occupations, the number of employees declined much less, and in some cases it actually increased. As the share of total employment in middling occupations remains quite large, approximately 40% on average in our sample, most of the net job losses during the Great recession were concentrated in occupations in the middle of the distribution.

The recent polarization had more adverse consequences for men than women because of higher levels of occupational segregation by gender in Europe. Table 7 shows that in Europe, in 2007, approximately 70% of employees in middling occupations were male. Women, in contrast, account for more than 60% of employees in the rapidly expanding low-paying occupations and 40% in high-paying occupations, against 50% in both cases in the US.

To understand which occupations drive these differences between the US and Europe, Appendix Table A3 compares the distribution of men and women across 20 occupation groups in the US and Europe (excluding the UK) in 2007. In Europe, a much larger proportion of women work in low skill service occupations compared to the US: European employees who are female are much more likely than men to be "models, salesperson and demonstrators" and to be in "sales and elementary service occupations". In the high-paying group, they are more likely to be "associate professionals".

These higher levels of occupational segregation in Europe have not diminished in the last decades. Following Dolado et al. (2001, 2003), we summarize segregation across occupations and industries by gender using dissimilarity indexes across 20 occupation groups, 16 industries

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incentives to participate for the added worker. However, using longer and more recent data, Mankart and Oikonomou (2015) found stronger evidence of added worker effects in the US.

[24] One explanation for the division of labour by gender is that men and women have, on average, different endowments of factors such as 'brain' and 'brawn,' which explains why labour supply and demand vary by gender in many occupations. See e.g. Cortes et al. (2016) for recent evidence regarding the comparative advantages of women in high-wage occupations.

[25] To form these three groups, Goos, Manning and Salomons (2014) rank occupations by ISCO codes at the two-digit level by their average wage measured in the 1990s. See the appendix of their paper for details.

and their interactions.[26] Table 8 shows that the indexes of dissimilarity are systematically much higher in Europe across occupations but not industries. Importantly, and in spite of the convergence in the participation rates of men and women documented previously, gender segregation has not declined in the last decades.

As documented by Goos, Manning and Salomons (2014) and Harrigan et al. (2016), the polarization of employment has both a within- and between-industry component. Clearly, employment losses were concentrated in particular industries during the Great recession: Table 7 shows that in most countries, employment in the manufacturing sector in Europe declined to a much greater extent than in the US. Additionally, in the construction sector, more than half of the jobs were destroyed in Spain, Greece, Ireland and Portugal. Unsurprisingly, the most intense job polarizations are also observed in these countries.

C. Empirical approach

To understand how changes in labour demand in the last decades affected the participation decisions of men and women, we exploit variations across European regions over the period 2000-2013 estimated in the LFS. [27] One important empirical challenge is how to measure changes in labour demand. While using potential wages would be consistent with a standard labour supply model, we instead use changes in (instrumented) employment to approximate labour demand shocks. We do so for three main reasons. First, wages are quite hard to measure over the cycle because of composition biases (Solon, Bils and Parker, 1994), and this bias has been particularly important during the Great recession in Europe (Verdugo, 2016). Using wages would also be problematic if they were rigid in Europe during the Great recession, as argued by Schmitt-Grohé and Uribe (2013), as the large underlying demand shocks would be masked. Second, potential wages are also complicated to estimate for non-participants who might have been out of the labour force for a while. Third, and maybe more important, finding exogenous changes in wages to estimate labour supply responses is notoriously difficult.[28]

We start with a simple model that relates regional participation rates to labour demand shocks captured by variations in total employment:

$$LFPR_{rt} = \gamma emp_{rt} + \phi_r time + \alpha_r + \alpha_{ct} + u_{it} \quad (1)$$

where $LFPR_{rt}$ is the adjusted labour force participation rate in region r (in percentage points) for prime age workers, net of the effect of education and age, emp_{rt} is the log of total employment in the region, α_r are a region's fixed effects, and u_{it} is an error term. The model includes region-specific time trends ϕ_r that absorb the effects of deterministic trends in participation in the region. The model also includes a set of time-by-country fixed effects α_{ct} that accounts nonparametrically for any common variations in the participation rates in the country over time. We therefore fully absorb any shocks to the participation rates at the national levels and identify the model using variations within countries over time. We estimate this model separately by gender and also across various demographic groups.

A potential concern with the previous model is that it does not distinguish between changes in labour demand specific to each gender. Women should respond differently to each in the presence of added worker effects. To test this hypothesis, we estimate:

$$LFPR_{rt} = \gamma_1 emp_{rt}^{Male} + \gamma_2 emp_{rt}^{Female} + \phi_r time + \alpha_r + \alpha_{ct} + u_{it} \quad (2)$$

where the variables emp_{rt}^{Male} and emp_{rt}^{Female} capture changes in log employment of men and women, respectively.

[26] One standard interpretation of the dissimilarity index is that it captures the share of women who would have to change their occupation for the occupational distribution of men and women to become similar. The index is described in the Appendix.

[27] Many recent papers studying the impact of trade or technology during the last decade followed a labor market approach. See in particular Charles, Hurst and Notowidigdo (2016) or Chodorow-Reich and Wieland (2016) for recent work on the Great recession.

[28] See Devereux (2004).

The marginal worker might also be more likely to respond to shocks in demand that are skill-specific. For example, the decline in demand for routine jobs in the manufacturing sector might not be compensated by the growth of employment in the service sector if mobility across occupations is low. To test this hypothesis, we estimate:

$$LFPR_{rt} = \pi_1 emp_{rt} + \pi_2 midd_{rt} + \pi_3 low_{rt} + \phi_r time + \alpha_r + \alpha_{ct} + u_{it} \quad (3)$$

where $midd_{rt}$ and low_{rt} test for a specific effect of changes in total employment in middling and low-paying occupations, respectively, while emp_{rt} controls for changes in overall employment.

The previous models are estimated using an instrumental variable approach to isolate shocks to labour demand. Following Autor, Dorn, and Hanson (2013), our identification strategy exploits the fact that job polarization and its acceleration during the Great recession reflects, to a large extent, the consequences of *global* labour demand shocks in response to technological change and the growth of international trade. To create this instrument, we construct a variant of the well-known shift-share or "Bartik" instrument following Bartik (1991) and Blanchard and Katz (1992).[29] The instrument exploits differences in initial specialization across local labour markets that make regions more or less vulnerable to globalization or technological change. As a result of differences in the composition of industries and occupations across local labour markets, some of them were much more exposed to the import competition and technological change that polarize employment.[30] As these shocks affected labour demand globally in the last two decades, an instrument using these sources of variation should be orthogonal with the unobserved local factors that influence the participation across regions and are correlated with employment changes.

We define occupations as being industry specific in order to exploit both the between- and within-industry components of job polarization.[31] We use the interactions between 20 occupations and 16 industries that can be reasonably tracked over time in the data. To construct the instrument, we use the initial composition from the more distant year available in the data. The reference year is 1995, 12 years before the start of the Great recession, and also before major shocks such as the beginning of China's access to the WTO and the housing booms of the 2000s that followed the implementation of the Euro.

To predict employment growth, the standard Bartik approach is to use variations in the growth of these occupations at the national level within each country. Such an approach might be problematic in our case if changes in participation, in particular women's participation, drive differences in employment growth across occupations at the national level. To address this concern, we use instead the observed employment growth of these occupations in the US to construct our instrument. As discussed previously, the participation rate of women in the US reached a plateau in the late 1990s and declined thereafter (Krueger, 2016). This implies that it is quite unlikely that the differences in employment growth across occupations in the US were substantially driven by labour supply-induced changes in the participation rate of women, which are common across developed countries.[32]

The instrument is constructed as follows. In region r, in 1995, total employment can be defined as the sum of employment across occupations k: $Emp_{r,95} = \sum_k Empl_{kr,95}$. For each year, we estimate using CPS data $\Delta S_{kt}^{US} = \left(\frac{Emp_{kt}^{US} - Emp_{k,95}^{US}}{Emp_{k,95}^{US}} \right)$ where Emp_{kt}^{US} denote the number of

[29] This approach has been followed recently in many influential papers such as Autor, Dorn, and Hanson (2013) and Charles, Hurst and Notowidigdo (2016).

[30] Autor, Dorn and Hanson (2015) demonstrated that the initial specialization of a region determined how it responded to technology and globalization during the last decade.

[31] The construction of these occupations and industries is detailed in the supplementary Appendix.

[32] The approach of using foreign instead of national-level shocks to construct a shift-share instrument has been recently adopted by Autor, Dorn, and Hanson (2013).

employees in occupations k in period t in the US. Then, by combining the two previous elements, we obtain a counterfactual employment level in period t for region r: $\widehat{Emp}_{rt} = \sum_k \Delta S_{kt}^{US} Emp_{rk,95}$. Our final instrument for overall employment change emp_{rt} is obtained by using the log of the previous expression.

To create two separate instruments for the employment growth of men and women, we proceed in the same manner but use instead the initial distribution of men and women across occupations in 1995 to calculate $\widehat{Emp}_{rt}^{S} = \sum_k \Delta S_{kt}^{US} Emp_{rk,95}^{S}$ where S denotes the sex. Our instruments predict differences in employment growth by gender based on the initial distribution of employed men and women across occupations in 1995 and the growth of these occupations in the US over the period. We also create a set of instruments for changes in employment in middling and low-paying occupations for the model of Eq. (3) following a similar approach. In that case, differences in employment growth in middling occupations across regions predicted by the instrument reflect differences in the composition of this group of occupations across regions.

Our IV strategy will isolate labour demand shocks under two conditions: first, the initial specialization of the region should not be correlated with unobserved factors influencing participation and correlated with changes in employment during the Great recession. To mitigate this concern, the model includes a determinist regional trend and our estimation sample starts in 2000, 5 years after the reference year used by our Bartik instrument. Second, the shocks to employment across occupations in the US should be unrelated to unobserved factors driving labour supply in Europe. An important threat to our empirical strategy is that common supply labour shocks drive both the participation of women and job polarization across developed countries. The evidence presented earlier suggests this is quite unlikely, as the participation of women followed very different patterns in the US and Europe before and during the Great recession. In addition, our estimates are conservative, as they include time-by-country fixed effects in the model, which flexibly controls for changes in participation at the country level. This implies that we identify the key coefficients from differences in economic specialization across regions within countries rather than relying on the national shocks themselves.

V. Results

Estimation results for the period 2000-2013 are presented in Table 9. In all specifications, the dependent variable is the participation rate of prime age workers that has been adjusted to account for the effect of changes in the distribution of education and experience in the population.[33] The regressions are weighted by the initial population of the region in 1995 to ensure representativeness.[34] Reported standard errors are two-way clustered by year and region to address possible serial correlation within a region (Cameron and Miller, 2015).

The tables report the Kleibergen-Paap Wald F statistics, which indicate whether our instruments are a strong predictor of observed changes in employment. The F-stats confirm the highly predictive power of our instruments. While the instruments are clearly stronger for total employment in isolation, the F-Stat remains above 10 when the regression includes male and female employment separately, as in column (4), or when the model is estimated in long differences, as in Column (5).

The results in columns (1) and (2) indicate that both male and female participation respond procyclically to overall labour demand shocks. While the coefficients are positive and statistically significant, their effects are very small. The coefficient from 2SLS estimates

[33] The adjusted participation rates were obtained by using the residuals from a regression of the probability to participate to the labour force on 3 education dummies and 6 age dummies performed separately for each country over the entire period 2003-13.

[34] The weights applied to each year are fixed and thus do not vary with future changes in population. Unweighted results are very similar and are available upon request.

indicates that an increase of 10 log points of employment (driven by a change in labour demand) increases participation rates by 0.12 p.p. for men and 0.19 p.p. for women.

In columns (3) and (4), the model distinguishes between changes in female and male labour demand. For men, both coefficients are small and statistically insignificant. In contrast, for women, we find that participation *increases* in response to negative shocks to male labour demand. The 2SLS estimates in column (4) suggest that a decline in male employment of 10 log points increases the participation of women by 4.4 p.p., while an increase of 10 log points in female employment increases their participation by 4.4 p.p. This magnitude is non-trivial: over the 2007-2013 period, total male employment declined by 4 log points while female employment increased by 2 log points on average across regions. Thus, the model predicts an increase of 2.7 p.p. in the adjusted participation rate of women over the 2003-2013 period in the average region in our sample, with two third of this increase triggered by negative shocks to male labour demand.

In column (5), we check the robustness of our results to alternative estimation methods by using long differences, from 2000-2013, instead of the within estimator. This specification provides very similar results, albeit with slightly lower coefficients. In column (6), we use the employment rate of women instead of the participation rate as a dependent variable. The results indicate that the employment rate of women increased substantially in response to the decline in employment opportunities for men.

In Figure 4, we illustrate graphically the variations underlying the long differences model using the residuals of the previous 2SLS model. The figures make clear that no outlier or specific country or group of countries is driving the results. In supplementary Appendix Table A1, we explore whether outlier countries drive our results by excluding each country one by one from the sample. In Table A2, we also assess whether the results vary between countries from Northern and Southern Europe, where the crisis differed in intensity. We find the results to be very similar across the two groups of countries.[35]

A. Are some occupations more influential than others?

As discussed above, the marginal male worker may be more influenced by demand shocks to the manufacturing or construction sectors than to demand shocks to overall employment. To test this hypothesis, Table 10 shows regressions including changes in employment in manufacturing and construction as covariates in columns (1) and (2). We find a small response from both men and women to changes in manufacturing employment. For men, column (2) shows that changes in employment in the construction sector have no influence on participation.[36]

Columns (3) and (4) assess the effects of employment in middling and low skill occupations instead of by industry. For both genders, we find that participation is correlated with employment in middling occupations but not with changes in the lowest-paying occupations. In column (5), the model includes both manufacturing and middling occupations. Conditional on including middling occupations in the model, employment in manufacturing has no effect on men.

Overall, these results suggest that the participation of men reacts more to labour demand shocks in middling occupations than in other occupations or groups of industries. However, the coefficients are small and, while being statistically significant, the predicted economic effects are not large. Additionally, empirically disentangling the importance of each factor is difficult because, in these specifications, we address at most 4 different endogenous variables. Because of the high level of correlation among these variables, the Bartik instruments are weaker and the point estimates of some coefficients are imprecise. To avoid weak instrument concerns, we keep the specifications of the models relatively parsimonious in the rest of the paper. For men, we

[35] We include Ireland in the group from Southern Europe because it also suffered a very deep recession. This choice has no influence on the results.

[36] Clearly, our Bartik instrument that relies on US polarization is not appropriate to capture changes in demand in the construction sector in Europe. Recent construction booms and busts did not follow the same cycle across developed countries. We have constructed alternative Bartik instruments for changes in employment in the construction sector using national-level variations in total employment in the industry instead. While the instrument was clearly stronger, the results were qualitatively similar.

include demand shocks in overall employment and in middling occupations. For women, we concentrate on a simple model that controls separately for male and female employment.

B. How much do the results vary across demographic groups?

Table 11 investigates how the response to labour demand shocks varied across groups of men and women. In panel A, we find that the participation of men between 40 and 55 years of age reacts much more than the participation of younger men to a change in labour demand. Surprisingly, we find no effect of employment changes on the participation of workers with less than a high-school education, which is the group of workers that has experienced the largest decline in participation in recent years.

In panel B, we find that while both single and married women respond to changes in male employment opportunities, the coefficients are twice as large for married women than for single women. Across education groups, the coefficients are also larger for women with less than high-school education, for whom labour supply might be more elastic. On the other hand, we find a low response of university graduates, who have a stronger attachment to the labour market.

C. How different was the Great recession?

An important issue in the interpretation of our results and in determining what happened in recent years is whether these results were driven by the Great recession or whether the Great recession only accelerated pre-existing trends. To answer this question, we extend our estimation period to 1996-2013 and estimate separate models for the periods 1996-2007 and 2007-2013. These results are reported in Table 12. For both men and women, the results are qualitatively very similar in both periods, but the coefficients are 20% lower when they are estimated before the Great recession. Overall, it is clear that the relationship between participation and labour demand shock described above is not specific to the Great recession.

D. Robustness to alternative Bartik instruments

While using a Bartik approach to disentangle demand from supply shocks is now standard, the use of another country to construct the instrument is less usual. We check the extent to which our results depend on the particular instrument construction that we adopted in Table 13. We compare our baseline results, reproduced in column (1), with those obtained from a traditional Bartik in column (2). The traditional Bartik predicts employment changes using the growth in each occupation at the national level, instead of using the growth of these occupations in the US. While, unsurprisingly, the first-stage F-stat tends to be stronger in these specifications, we find very little difference in the estimated coefficients. In column (3), we experiment with a Bartik constructed using employment growth across occupations in Europe instead of the US (each time excluding the reference country). The results are also very similar. Overall, we conclude that our results are robust to alternative constructions of the Bartik instrument.

VI. Evidence from panel data, 2003-2013

A concern with the previous results is that they are based on repeated cross-section data from the LFS. Over a decade, the changes in the participation rates of prime age workers used to estimate the previous models do not completely correspond to the changes in participation of the same individuals, for two reasons. First, if some workers respond to local labour demand shocks by moving across regions, some of the changes in participation rates will reflect changes in the composition of the population across regions.

Second, the previous estimates were based on the population of prime age workers to avoid complications related to retirement and education decisions. Obviously, the composition of our sample changes over time. When they reach 55 years of age, older cohorts leave the sample, while younger cohorts enter when they reach 25 years of age. As a result, changes in the participation of prime age workers in the last decades also reflect cohort effects. This might be an important issue for women if attitudes with respect to participation in the labour market have evolved across cohorts. Social norms might have shifted towards more egalitarian gender roles as cultural values and attitudes evolved with respect to the costs and benefits of participation (Fernandez, 2013; Petrongolo and Olivetti, Forthcoming). While the inclusion of time-by-year

fixed effects at the country level should absorb some of these cohort effects, a large literature reports that attitudes vary within countries (see, e.g., Duranton et al., 2009).

Another issue is that the LFS data do not allow us to distinguish between the direct and indirect effects of changes in male labour demand. The previous evidence of increased participation among women in reaction to negative male labour demand shocks could reflect either a response to direct income shocks, such as the unemployment of the spouse, or a response to indirect shocks, such as lower expected incomes or higher unemployment risks.

To investigate these questions, we exploit data from the SILC panel data from 2004-2013. This panel follows individuals over a period of four year and thus allows us to measure the participation response from individual trajectories and not cross-cohort variations. The panel provides richer information on labour force participation than the LFS because it contains a retrospective calendar indicating, for each month, whether the individual was employed, in the labour force or out of the labour force. Comparisons between estimates from the LFS and SILC samples are nevertheless complicated by the facts that Germany does not participate in the SILC panel and that data for Greece is missing after 2008.[37] We estimate variants of the following model:

$$SHPR_{irt} = \alpha_i + \gamma_1 empl_{rt}^{Male} + \gamma_2 empl_{rt}^{Female} + \eta_1 SPUnemp_{it} + \eta_2 SPUnemp_{it-1} + \alpha_{ct} + u_{it}$$

where $SHPR_{it}$ is the share of the year where the individual declared she was in the labour force, and $SPUnemp_{it}$ is a dummy variable equal to one when the spouse is unemployed and zero otherwise. We introduce both the contemporary and lagged employment status to allow for a delay in the labour supply response of the spouse. The model includes an individual fixed effect α_i, and the effects of labour demand shocks are identified using within-individual variations over time.[38] We restrict our sample to individuals remaining in the same region during the years they are observed in the sample.

The results are reported in Table 14. For men, we are not able to reproduce our previous findings. The point estimates tend to be imprecise, and the signs of the coefficients shift depending on whether they are estimated for the group of 25-40 or for the group of 41-55-year-old workers. One important issue is that the instruments are weaker in this specification compared with the LFS model.

For women, on the other hand, the coefficients are very similar to those estimated with the LFS data. In columns (2) and (3), we find, consistent with the previous results, that labour demand shocks affecting men have twice as large effects on married women than on single women. In column (4), we add controls for the contemporary and lagged unemployment of the spouse. The results suggest that having a husband unemployed during the last two years increases participation in the labour force by 4.4 p.p. A comparison between columns (3) and (4) indicates that controlling for the employment status of the spouse decreases the coefficient of male labour demand by a third. This implies that approximately one-third of the effect of male labour demand on participation estimated in column (3) captures direct unemployment shocks at the household level. Other variables that capture changes in the opportunity cost of employment for women have a large effect on the participation of women, as expected. The results show that having a child younger than 3 years of age decreases participation by 2.5 p.p., while getting married decreases participation by 5.6 p.p. Overall, the evidence in this section indicates that the previous results for women were not driven by migration or changes in the composition of cohorts; the key coefficients have been identified using individual variations, not cross-cohort changes.

[37] Another difference is that the sample size is much smaller: fewer years are available in the sample, and the definitions of regions in the panel are more aggregated in most countries to preserve confidentiality. Among the 10 countries in the SILC sample, we have 100 regions in the LFS but only 69 regions in the SILC.

[38] Region-specific time trends are not included in this model. The results tend to be noisy when both individual fixed effects and regional trends are included in such a limited period of time.

VII. How much did job polarization matter?

In this section, we use the previous estimations to assess the extent to which our simple regression model is able to explain cross-country differences during the Great recession. We perform an out-of-sample prediction by combining estimates from the period 1995-2007 from columns (1) and (4) in Table 12 to predict aggregate changes in participation rates from 2007 to 2013 for men and women. For women, $\widehat{LFPR}_{rt}(Emp_{rt}^{Male}, Emp_{rt}^{Female})$ denotes the predicted labour force participation rate in region r and period t, predicted using 2SLS estimates from model (2). We consider $\Delta\widehat{LFPR}_{r07-13}(\Delta Emp_{rt}^{Male}, \Delta Emp_{rt}^{Female})$ the predicted change in participation between 2013 and 2007 and $\Delta\widehat{LFPR}_{r07-13}(0,0)$ the predicted change when Emp_{r07}^{Male} and Emp_{r07}^{Female} are fixed at their 2007 levels. The difference between the two isolates the predicted contribution of labour demand shocks: $\Delta\widehat{LFPR}_{r07-13}(Emp_{rt}^{Male}, Emp_{rt}^{Female}) - \Delta\widehat{LFPR}_{r07-13}(0,0) = \hat{\gamma}_1 \Delta Emp_{rt}^{Male} + \hat{\gamma}_2 \Delta Emp_{rt}^{Female}$.

To aggregate predictions at the country level, we use the population-weighted average of the regional predictions. For men, instead of using the model of equation (2), we use the model of equation (3), which includes a specific response to labour demand shocks in middling occupations.

Figure 5 compares, for each country, the predicted and the actual change in participation rates before and during the Great recession. For men, the fit of the model is very poor in both periods. The model predicts larger decreases in participation in Greece, Ireland and Spain, where job destructions were the most intense, but it misses the large decline in the participation of men in Italy, Belgium and Portugal. The model predicts no change in participation in Germany, when a decline of one point is observed. This suggests that, for men, very few cross-country differences in the evolution of the participation rate can be explained by our model.

The picture is very different for women. The fit of the model during the Great recession is reasonably good: most countries are close to the 45° line, particularly Greece, Spain and Germany. There are, nevertheless, some important exceptions. First, the model is off the mark in Ireland, as it predicts an increase of 4 p.p. in participation, while a decline of 2 p.p. has actually been observed. Second, the model also predicts an increase in participation in Italy and Portugal, which did not actually occur. While far from perfect, this result confirms that gender-specific labour demand shocks explain a significant share of recent aggregate changes in labour force participation in these countries.

VIII. Concluding Remarks

This paper has investigated the determinants of labour force participation in Europe in the last two decades, devoting particular attention to what happened during the Great recession. We have shown that some recent variations in participation rates are driven by changes in the composition of the populations and that these changes differed across countries, particularly between Europe and the US. We find that some of the recent decrease in participation rates reflects the ageing of the large baby boom cohorts. The rapid increase in women's education levels in Europe also explains a large share of the increase in their workforce participation in the last decade, and particularly during the Great recession.

Focusing on prime age workers and adjusting the participation rates for changes in demographic and educational composition, we find that changes in labour demand that were more favourable to women explain a large share of the increase in their participation in the labour market in the last decade. These differences in labour demand by gender in Europe reflect the consequences of job polarization, where middling occupations that employ mostly men are declining, while occupations more likely to employ women are expanding. Overall, a model estimated using the 1996-2007 period rather effectively predicts aggregate cross-country differences in changes in the participation of women during the Great recession from 2007-2013, with the important exception of Ireland.

One limitation of our analysis is that we treat the increase in the education level of women as a composition effect. The large increase in the graduation rates of women observed during the period might be driven by the expansion of their opportunities in the labour market. Therefore, we are missing an important channel through which the recomposition of employment and the associated labour demand shocks are influencing participation.

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X. Appendix

LFS: We use annual files from the European LFS from the Dec 17th 2015 release from Eurostat. The labour force status is obtained with the variable ILOSTAT, which refers to the International Labour Organization's definition of labour force status. Accordingly, labour force participation is defined as being employed during the reference week or seeking employment and being available for work.

Industry definition: Throughout the paper, we use Nace Rev. 2 from 2008 at the 1 digit level that has 21 industries. For the years before 2008, the industry information is coded in Nace Rev. 1 in the LFS. We convert this classification to Nace Rev. 2 using a cross-walk table that we manually created. To preserve consistency over time, we aggregated D (*Electricity*) with E (*Water supply*), H (*Transportation*) with J (*Information*) and L (*Real Estate*), M (*Professional activities*) with N (*Administrative and support service activities*), and we exclude agriculture from the sample. This leaves us with a total of 16 industries.

Aggregate industry definitions: "Manufacturing" is defined as aggregating B, C, D and E in Nace Rev. 2. "Construction" includes industry F. "Services" include all other sectors except agriculture (sector A). *Occupations*: Following Goos et al. (2014), we use ISCO88 at the two digit level. For years after 2011, we convert data from ISCO08 into ISCO88 using a cross-walk table that we constructed. As in Goos et al. (2014, Table 1, p. 2512 and Appendix Table A3), low-paid occupations includes occupations 93, 51, 52 and 91. Middling occupations includes 81, 72, 83, 73, 71, 42, 82, 74. High-paying occupations include 12, 21, 22, 24, 13, 31, 34 and 32. See.

CPS: Industries: To match CPS industries codes with the codes in the LFS, we created a correspondence table between the variable IND1990 into Nace Rev. 2 from CPS at the 1 digit level. For occupations, we combine the variable OCC2000 from CPS with codes ISCO88 using the cross-walk table established by the Center for Longitudinal Studies from UCL and available online at http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=351&sitesectiontitle=Occupational+segregation (accessed January 26th, 2017).

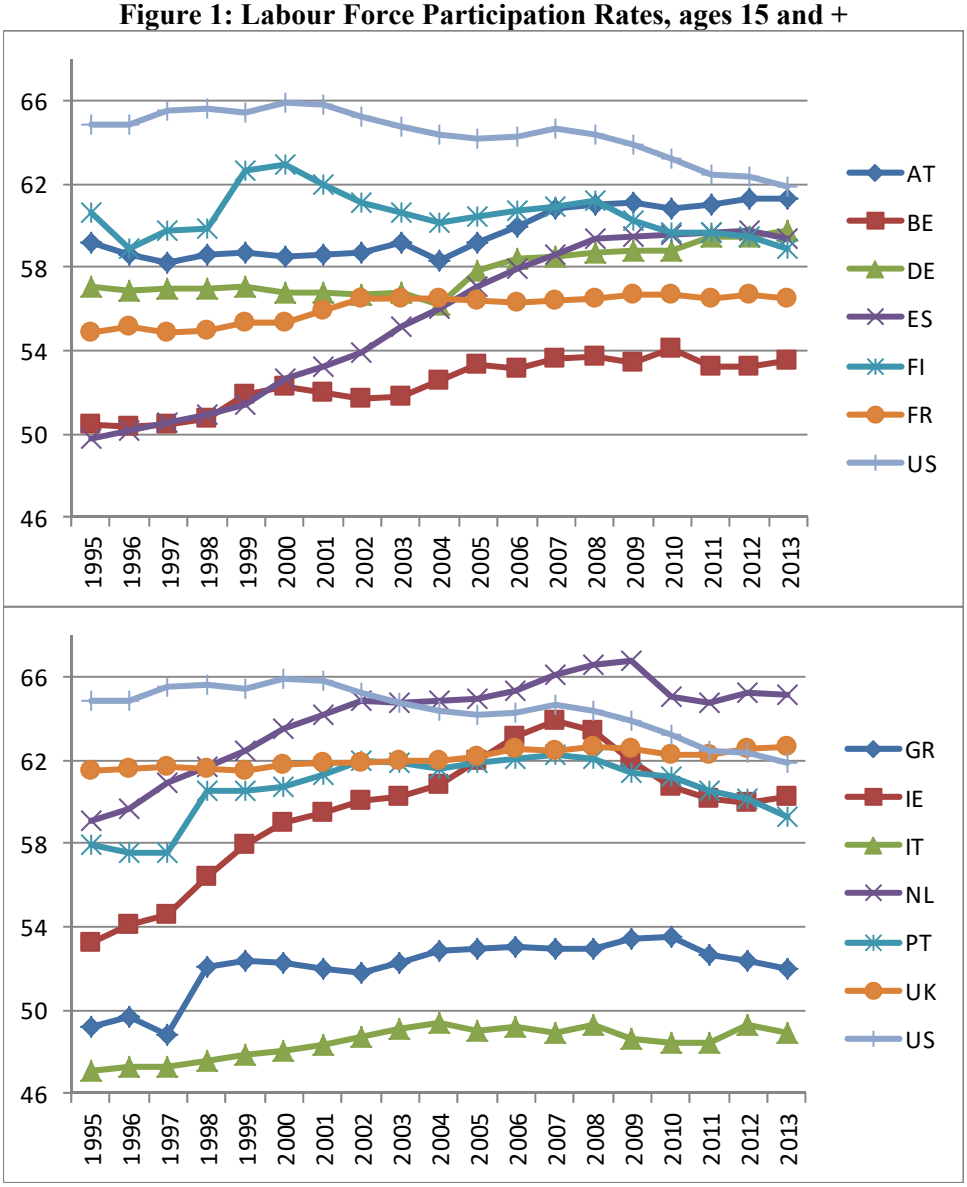
Dissimilarity Indexes: The formula of the dissimilarity index is given by $D_t = \frac{1}{2}\sum_k |m_{kt} - f_{kt}|$

where m_{kt} and f_{kt} are respectively the share of men and women employed in occupation k in year t.

SILC Data: We use longitudinal SILC database from the July 28th 2016 release. We estimate the number of months in the labour force using the variables 211A-211L and 210A-210L. Individuals are classified as being in the labour force if the respondent declares that he is unemployed, employed or self-employed either full or part-time. We correct for panel errors by checking that there are no changes in sex or age of the respondent over time. In the regressions, we eliminate from the sample those that move to another region during the four years period in the sample.

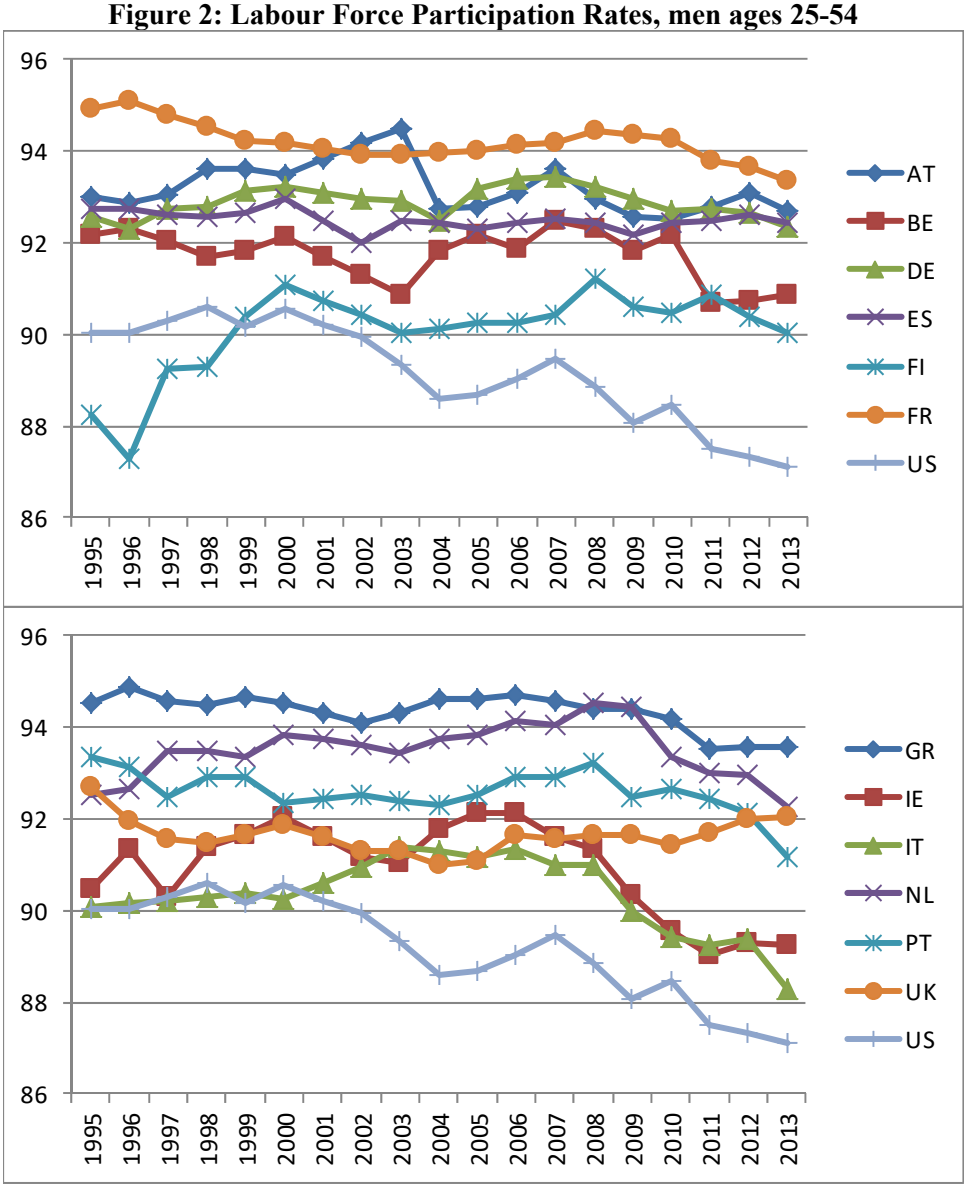
XI. Figures

Figure 1: Labour Force Participation Rates, ages 15 and +



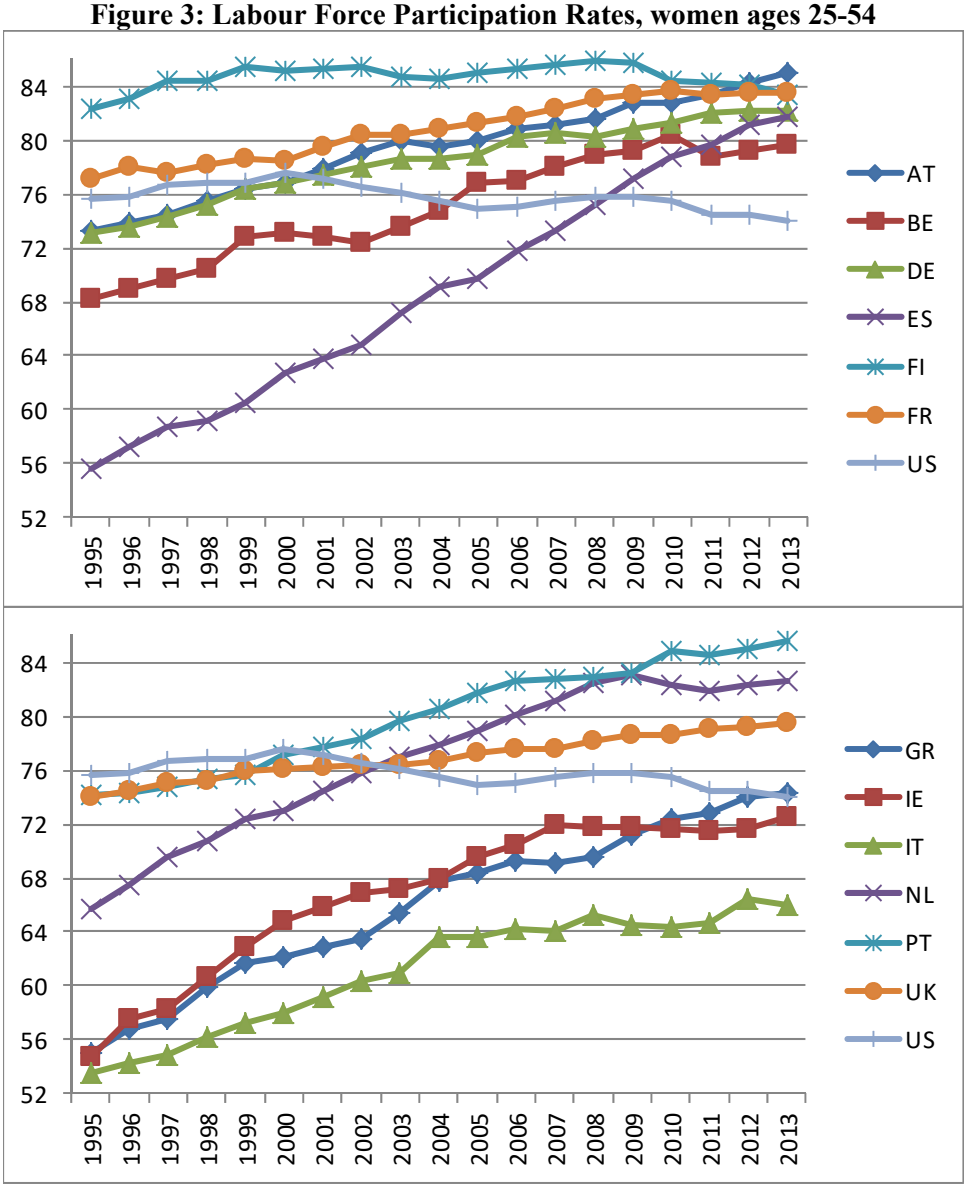
Sources: EU-LFS and CPS ASEC for the US. Tabulations by the authors.

Figure 2: Labour Force Participation Rates, men ages 25-54



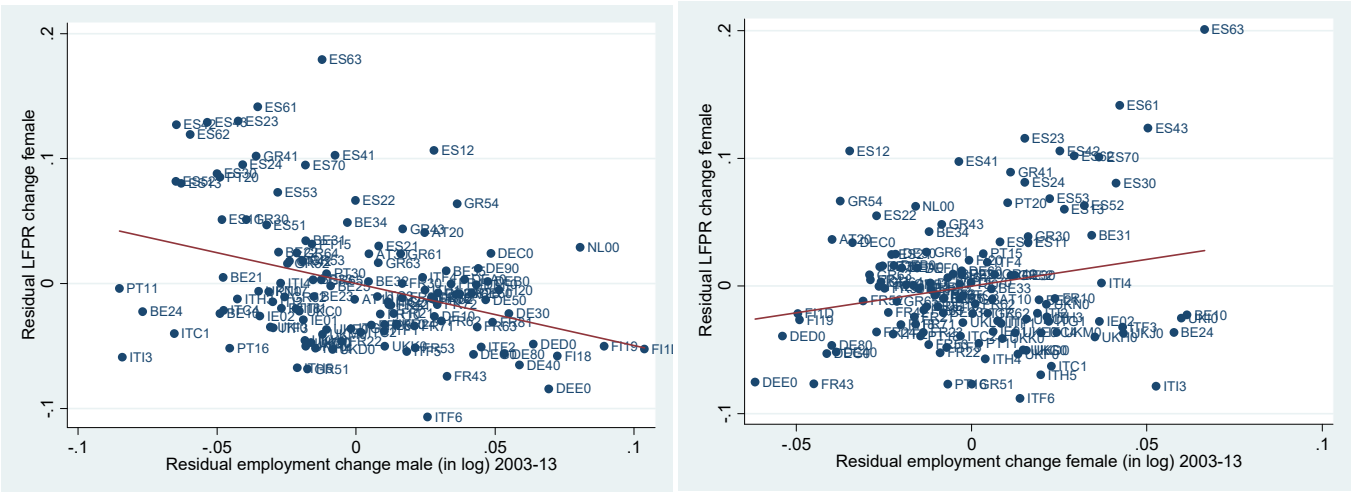
Sources: EU-LFS and CPS ASEC for the US. Tabulations by the authors.

Figure 3: Labour Force Participation Rates, women ages 25-54



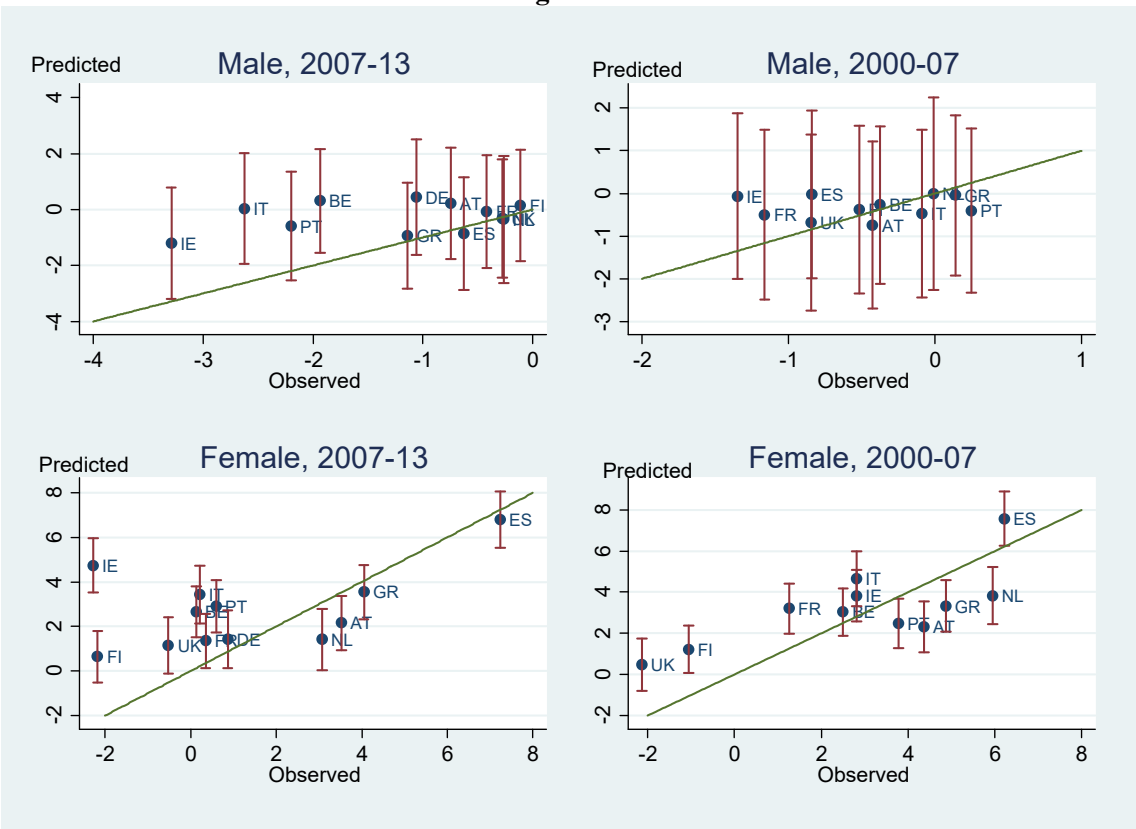
Sources: EU-LFS and CPS ASEC for the US. Tabulations by the authors.

Figure 4: Residuals changes in participation and employment 2003-13



Notes: The figures show the residuals of the first difference regression reported in column 5 to Table 9 for the coefficient of male employment change (left) and female employment change (right).

Figure 5: How well does the model predict cross-country differences in participation before and during the Great recession?



Notes: The figure compares the predicted and actual changes in adjusted participation rates for men and women from 2007-13 and from 2000-07. The predictions are based on a model estimated over the 1990-2007 period. The models are reported in column (1) and (3) for men and women, respectively, in Table 12. The figures report 95% confidence interval of the prediction. To facilitate comparisons, a 45 degree line is draw on each graph.

XII. Tables

Table 1: Share Prime Age Population, 25-54

	2007			2013			Change in share prime age 2007-13
	Share 15-24	Share 25-54	Share 55+	Share 15-24	Share 25-54	Share 55+	
US	17	53.3	29.7	16.3	50.2	33.5	-3.1
Austria	14.6	52.5	32.9	14.1	51.2	34.7	-1.3
Belgium	14.5	50.7	34.8	14.3	49.2	36.4	-1.4
Germany	13.8	49.3	36.9	12.6	47.9	39.5	-1.4
Spain	13.4	55.2	31.4	11.6	54.2	34.2	-1.0
Finland	15	48.3	36.7	14.5	46.0	39.6	-2.4
France	15.3	50.3	34.4	14.5	48.5	37	-1.8
Greece	13.6	51.2	35.2	11.9	50.0	38	-1.1
Ireland	18.3	56.0	25.7	14.9	56.0	29.1	0.0
Italy	12.0	51.1	37.0	11.5	49.8	38.6	-1.2
Netherlands	14.9	52.8	32.4	14.8	49.6	35.6	-3.2
Portugal	13.8	51.5	34.7	12.5	49.5	38	-2
UK	16.2	50.4	33.4	15.4	50.1	34.5	-0.3

Sources: EU-LFS and CPS ASEC for the US. Tabulations from the authors.

Table 2: Observed and Counterfactual Participation Rates

	Labor force participation rate in 2007		Labor force participation rate in 2013		Percentage point change 2007-13		
Country	Observed	Counterfactual using US demographics in 2007	Observed	Counterfactual using US demographics in 2013	Observed	Counterfactual change using 2007 demographics	Counterfactual change using US demographics
US	64.7	64.7	61.9	61.9	-2.8	-1.6	-2.8
Austria	60.8	63.2	61.3	62.5	0.5	1.6	-0.8
Belgium	53.6	56.8	53.6	55.2	0.0	0.8	-1.6
Germany	58.6	63.6	59.7	63.6	1.2	2.0	0.0
Spain	58.6	59.0	59.4	58.6	0.8	1.9	-0.4
Finland	61.0	64.8	58.9	62.9	-2.1	0.3	-1.9
France	56.4	59.6	56.5	59.0	0.1	1.8	-0.6
Greece	52.9	55.7	52.0	54.1	-0.9	0.4	-1.6
Ireland	63.9	61.7	60.2	57.9	-3.7	-2.6	-3.8
Italy	48.9	51.9	49.0	50.8	0.0	1.0	-1.1
Netherlands	66.1	67.8	65.2	67.0	-0.9	1.5	-0.8
Portugal	62.2	64.0	59.3	61.1	-2.9	-1.3	-3.0
UK	62.4	65.2	62.6	64.3	0.2	0.9	-0.9

Sources: EU-LFS and CPS ASEC for the US. Notes: The table compares observed and counterfactual participation rates in 2007 and 2013. The counterfactual participation rates were obtained by reweighting the sample to match the demographic composition of the US in either 2007 or 2013 (columns 3 and 5) and the demographic composition of the country in 2007 (column 7) using 14 age groups. See text for details.

Table 3: The Growth in Tertiary Education, ages 25-54

Share of the population with a tertiary education level								
	Men				Women			
	1995	2007	2013	Percentage point change 2007-13	1995	2007	2013	Percentage point change 2007-13
US	54.1	54.5	58.2	3.7	53.9	61.2	65.2	4.0
Austria	9.8	20.6	23.2	2.5	7.9	16.4	20.6	4.2
Belgium	26.4	32.0	34.4	2.4	28.2	37.7	42.5	4.8
Germany	28.8	27.2	30.2	3.0	18.6	22.2	28.0	5.8
Spain	20.0	30.5	34.2	3.7	18.2	34.3	40.1	5.8
Finland	na	32.2	35.9	3.7	na	46.3	51.9	5.5
France	19.9	27.4	33.1	5.7	21.1	31.7	38.6	6.9
Greece	18.7	24.4	27.9	3.5	15.1	24.4	30.6	6.2
Ireland	22.4	30.7	39.5	8.8	21.3	37.8	48.1	10.3
Italy	8.7	13.0	15.0	2.0	8.0	16.5	20.1	3.6
Netherlands	na	32.7	34.8	2.1	na	31.1	35.6	4.5
Portugal	10.9	11.8	16.7	5.0	14.6	18.6	26.3	7.6
UK	25.0	32.9	39.4	6.5	21.8	33.8	43.0	9.3

Sources: EU-LFS and CPS ASEC for the US. Notes: The table reports the share of the prime age population 25-54 with a tertiary education. The group of tertiary education includes short-term tertiary, Bachelor, Master and Doctoral or equivalent level.

Table 4: The Effect of Education on Participation in 2007-13, ages 25-54

Changes in participation rates (in percentage points)						
	Male			Female		
	2007-13 change	2007-13 adjusted for education	Effect of education	2007-13 change	2007-13 change adjusted for education	Effect of education
	(1)	(2)	(1)-(2)	(4)	(5)	(4)-(5)
US	-2.6	-2.9	0.3	-1.4	-2	0.6
Austria	-0.9	-1.1	0.2	3.9	2.9	1.0
Belgium	-1.6	-2.1	0.5	1.7	-0.1	1.8
Germany	-1.1	-1.2	0.1	1.6	0.9	0.7
Spain	-0.1	-0.2	0.1	8.5	7.2	1.3
Finland	-0.4	-1	0.6	-2.3	-3.2	0.9
France	-0.8	-1.3	0.5	1.2	-0.3	1.5
Greece	-1	-1.1	0.1	5.1	3.1	2.0
Ireland	-2.4	-3.3	0.9	0.6	-2.5	3.1
Italy	-2.7	-2.9	0.2	1.9	0.3	1.6
Netherlands	-1.8	-1.8	0.0	1.4	0.5	0.9
Portugal	-1.7	-2.1	0.4	2.8	0.5	2.3
UK	0.5	0.0	0.5	2.0	-0.3	2.3
Education dummies	No	Yes		No	Yes	

Sources: EU-LFS and CPS ASEC for the US. Notes: Column 1 and 4 show unadjusted changes in participation rates of respectively male and female prime age individuals during 2007-13. Column 2 and 5

show changes in participation rate that have been adjusted for changes in the level of education using a regression controlling for 3 education dummies estimated separately for each country.

Table 5: Change in Participation Rates by Education and Marital Status, 2007-13

Changes in participation rates, 2007-13								
	Men, 25-54			Women, 25-54				
	Below High-School	High-School Graduates	College Graduates	Below High-School	High-School Graduates	College Graduates	Married	Unmarried
US	-3.7	-3.4	-2.4	-2.1	-4.3	-1.0	-1.8	-1.5
Austria	-3.8	-0.6	-1.0	0.1	3.9	2.4	4.5	-1.1
Belgium	-4.2	-1.4	-1.2	-2.4	1.2	0.1	2.0	-1.0
Germany	-5.2	-0.6	-0.7	-3.3	2.2	0.5	2.0	-1.4
Spain	-0.6	0.3	-0.1	12.1	6.1	2.7	8.7	1.8
Finland	-1.8	-0.9	-0.7	-12.4	-2.5	-2.0	-2.1	-2.3
France	-3.1	-1.3	0.1	-4.4	0.0	2.1	1.4	-1.0
Greece	-1.5	-1.1	-0.7	5.5	3.4	0.1	5.2	0.1
Ireland	-4.5	-4.2	-1.4	-4.6	-2.2	-1.9	0.6	-1.4
Italy	-4.0	-2.1	-1.8	2.4	-1.4	0.1	1.5	0.6
Netherlands	-3.7	-1.6	-0.9	1.2	-0.5	1.5	2.2	-2.9
Portugal	-3.3	2.1	-2.0	-0.6	3.8	0.6	2.7	1.8
UK	-0.1	0.2	-0.3	-2.2	0.9	-0.4	2.2	-0.4

Sources: EU-LFS and CPS ASEC for the US. Notes: The table shows changes in participation rates in percentage points from 2007-13 for the indicated groups.

Table 6: Employment Change by Gender during the Great recession

Growth rate in employment, 2007-2013			
country	Women	Men	Percentage point difference Women-Men
US	0.1	-2.1	2.0
Austria	7.3	0.7	6.6
Belgium	7.4	0.3	7.1
Germany	8.2	4.6	3.6
Spain	-8.1	-22.8	14.7
Finland	-0.6	-2.2	1.6
France	2.5	-0.7	3.2
Greece	-19	-25.6	6.7
Ireland	-4.8	-15.9	11.1
Italy	1.8	-6.9	8.7
Netherlands	1.2	-3.2	4.4
Portugal	-9.6	-16	6.5
UK	3.6	1.2	2.4

Sources: EU-LFS and CPS ASEC for the US. Notes: The table shows the growth rate of the number of employees per gender from 2007-13.

Table 7: Occupations and Industries during the Great recession

	Employment change 2007-13						Share women in 2007		
	Occupations			Industries					
Country	Lowest paying occupations	Middling occupations	Highest paying occupations	Manufacturing	Construction	Services	Lowest paying occupations	Middling occupations	Highest Paying occupations
US	2.1	-10.7	1.9	-13.4	-20.0	4.0	50.4	38.1	50.8
Austria	2.7	9.0	6.0	-7.9	13.3	7.3	64.5	32.4	40.1
Belgium	-0.9	11.1	13.2	-14.9	9.1	8	59.9	35.0	40.5
Germany	1.7	17.9	15.0	-4.4	9.2	10.8	66.3	31.4	45.5
Spain	-19.6	-30.1	-5.3	-28.3	-61.9	-4.7	60.7	24.0	42.0
Finland	-3.1	4.0	3.1	-17.7	1.1	3.0	72.6	28.9	46.8
France	6.0	-1.8	15.0	-12.4	1.2	3.4	69.5	36.6	43.3
Greece	-24	-35.8	-2.7	-38.7	-59.2	-17.8	55.6	26.1	37.9
Ireland	-8.6	-32.9	-6.5	-18.6	-63.8	1.1	56.8	31.8	40.2
Italy	-19.3	-2.1	29.7	-10.5	-18.6	1.3	53.4	28.9	38.7
Netherlands	-7.8	-9.6	19.2	-20.8	-17.2	-1.3	61.3	35.3	43.1
Portugal	12.5	-23.3	-12.4	-22.7	-48.1	-0.8	67.5	30.9	40.9
UK	15.9	-5.7	0.1	-15.3	-9.9	6.5	59.1	39.4	40.2

Sources: EU-LFS and CPS ASEC for the US.

Table 8: Dissimilarity Indexes of Segregation by Gender across Occupations

Definition of occupation	ISCO 2 digit: *20 occupations*			Nace 1 digit : *16 industries*			Nace x ISCO: *20 occupations x 16 industries*		
	1996	2007	2013	1996	2007	2013	1996	2007	2013
Austria	46.6	47.9	47.8	34.0	31.0	32.6	52.2	50.6	50.5
Belgium	43.1	41.7	46.4	31.8	31.2	33.5	50.4	48.1	49.3
Germany	49.0	47.9	45.9	31.6	31.9	31.8	52.1	50.8	49.9
Spain	39.8	46.7	42.8	33.5	37.1	31.7	48.0	52.8	48.2
Finland	50.0	53.5	51.0	38.1	38.6	40.7	56.7	56.7	54.8
France	49.9	48.9	45.8	28.3	30.7	31.3	51.4	50.1	50.1
Greece	36.4	40.2	31.7	22.3	26.6	21.8	40.2	43.6	36.4
Ireland	44.1	46.7	45.6	33.9	41.4	34.6	50.2	55.2	52.1
Italy	35.2	39.3	41.0	22.8	29.4	32.3	40.9	44.5	47.2
Netherlands	45.6	42.9	43.4	32.7	32.7	33.7	51.5	48.8	48.6
Portugal	38.0	42.1	42.3	25.2	30.0	32.7	44.0	48.2	49.0
UK	43.1	46.6	42.7	32.7	32.8	32.0	52.3	50.4	48.1
EU 11	43.0	45.2	44.0	28.5	31.0	30.9	45.5	47.8	47.6
US	37.4	36.5	34.5	29.6	30.4	30.2	45.8	43.7	42.0
Difference EU 11-US	*5.64*	*8.76*	*9.5*	*-1.1*	*0.62*	*0.75*	*-0.28*	*4.11*	*5.59*

Sources: EU-LFS and CPS ASEC for the US. Notes: The table shows the dissimilarity index of the distribution of men and women across the indicated definition of occupations and industries. The group of EU11 countries includes all European countries in our sample with the exception of the UK.

Table 9: Did Gender Specific Labour Demand Shock Influence Participation Rates?

Dependent variable						
Adjusted labour force participation rate of the region, 2000-13						Adjusted Employment rate, 00-13
A. Male, 25-54						
	(1)	(2)	(3)	(4)	(5)	(6)
Log employment	0.012***	0.010***				
	(0.004)	(0.004)				
Log employment male			0.015	-0.045	-0.027	-0.154
			(0.025)	(0.040)	(0.085)	(0.118)
Log employment female			-0.003	0.054	0.022	0.169
			(0.022)	(0.037)	(0.079)	(0.110)
B. Female, 25-54						
Log employment	0.013**	0.013**				
	(0.006)	(0.006)				
Log employment male			-0.311***	-0.444***	-0.335***	-0.587***
			(0.023)	(0.041)	(0.111)	(0.087)
Log employment female			0.317***	0.445***	0.322***	0.593***
			(0.021)	(0.039)	(0.099)	(0.080)
N	1760	1760	1760	1760	128	1760
Kleibergen-Paap rk Wald F statistic		5089		11.4	10.7	11.4
Estimation method	OLS	2SLS	OLS	2SLS	2SLS, Long Differences 00-13	2SLS

Sources: EU-LFS. Notes: In column 1-5, the table shows regression results of the adjusted labor force participation rates of a region on the indicated variables. In column 6, the dependent variable is instead an adjusted employment rate. The participation rates are adjusted for the effect of changes in age and education over time. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are two-way clustered by year and region. The regressions are weighted by the initial population of the region in 1995.

Table 10: The Consequences of Job Polarization and Manufacturing Decline

Dependent Variable: Adjusted labour force participation rate of the region, 2000-13					
	A. Male, 25-54				
	(1)	(2)	(3)	(4)	(5)
Log employment	-0.011	-0.011	-0.066***	-0.047	-0.040
	(0.009)	(0.016)	(0.024)	(0.038)	(0.040)
Log employment	0.014**	0.014**			-0.023
manufacturing sector	(0.007)	(0.007)			(0.018)
Log employment		0.000			
contruction sector		(0.015)			
Log employment			0.069***	0.063***	0.117**
middling occupations			(0.020)	(0.020)	(0.046)
Log employment				-0.013	-0.050
lowest-paying occupations				(0.024)	(0.042)
N	1760	1760	1760	1760	1760
Kleibergen-Paap rk Wald F statistic	207.1	22.8	20.6	10.4	3.9
Estimation method	2SLS	2SLS	2SLS	2SLS	2SLS
	B. Female, 25-54				
Log employment male	-0.469***	-0.502***	-0.496***	-0.508***	-0.488***
	(0.052)	(0.053)	(0.064)	(0.073)	(0.085)
Log employment female	0.455***	0.420***	0.383***	0.325***	0.334***
	(0.046)	(0.049)	(0.045)	(0.049)	(0.060)
Log employment	0.011	0.012*			-0.069**
manufacturing sector	(0.008)	(0.007)			(0.031)
Log employment		0.065***			
contruction sector		(0.015)			
Log employment			0.107***	0.130**	0.288***
middling occupations			(0.036)	(0.051)	(0.074)
Log employment				0.047	-0.067
lowest-paying occupations				(0.041)	(0.080)
N	1760	1760	1760	1760	1760
Kleibergen-Paap rk Wald F statistic	11.4	24.3	8.7	6.8	4.0
Estimation method	2SLS	2SLS	2SLS	2SLS	2SLS

Sources: EU-LFS. Notes: The table shows regression results of the adjusted labor force participation rates of a region on the indicated variables. The participation rates are adjusted for the effect of changes in age and education over time. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are two-way clustered by year and region. The regressions are weighted by the initial population of the region in 1995.

Table 11: What Group Responded the Most to the Demand Shocks?

Dependent variable: Adjusted labour force participation rate of the region, 2000-13					
	(1)	(2)	(3)	(4)	(5)
	A. Male, 25-54				
	Age 25-40	Age 40-55	Less than high-school education	High-school graduates	University graduates
Log employment	-0.002	0.102***	0.008	0.001	-0.027
	(0.026)	(0.038)	(0.042)	(0.029)	(0.021)
Log employment	0.064***	0.039***	0.028	0.058***	0.048***
middling occupations	(0.008)	(0.011)	(0.022)	(0.009)	(0.008)
Kleibergen-Paap rk Wald F statistic	75.2	75.2	75.2	75.2	75.2
	B. Female, 25-54				
	Married	Single	Less than high-school education	High-school graduates	University graduates
Log employment male	-0.626***	-0.272***	-0.566***	-0.457***	-0.081*
	(0.062)	(0.071)	(0.084)	(0.055)	(0.044)
Log employment female	0.629***	0.286***	0.572***	0.457***	0.079*
	(0.060)	(0.070)	(0.083)	(0.054)	(0.044)
Kleibergen-Paap rk Wald F statistic	11.3	11.3	11.3	11.3	11.3
Estimation method	2SLS	2SLS	2SLS	2SLS	2SLS
N	1760	1760	1760	1760	1760

Sources: EU-LFS. Notes: The table shows regression results of the labor force participation rates of the region on the indicated variables. For men in Panel A, columns 1 and 2 use the participation rates of those at age 25-40 and age 40-55, respectively. For women in panel B, columns 1 and 2 use the participation rates of married and single individuals, respectively. In columns 3, 4, 5, the participation rates are distinguished by education, with those having less-than high-school education, high-school graduates, and university graduates. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are two-way clustered by year and region. The regressions are weighted by the initial population of the region in 1995.

Table 12: Did the Response to Labour Demand Shocks Change during the Crisis?

Dependent Variable: Adjusted labour force participation rate of the region				
	Male, 25-54		Female, 25-54	
	(1)	(2)	(3)	(4)
Estimation period	1996-2007	2007-13	1996-2007	2007-13
Log employment	0.014	0.045		
	(0.020)	(0.029)		
Log employment middling occupations	0.045***	0.048***		
	(0.012)	(0.006)		
Log employment male			-0.390***	-0.481***
			(0.031)	(0.062)
Log employment female			0.389***	0.482***
			(0.030)	(0.061)
N	1296	896	1296	896
Kleibergen-Paap rk Wald F statistic	12	9.4	14.1	16.2
Estimation method	2SLS	2SLS	2SLS	2SLS

Sources: EU-LFS. Notes: The table shows regression results of the adjusted labor force participation rates of a region on the indicated variables. The participation rates are adjusted for the effect of changes in age and education over time. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are two-way clustered by year and region. The regressions are also weighted by the initial population of the region in 1995.

Table 13: Do the results change with alternative Bartik instruments?

Dependent Variable: Adjusted labour force participation rate of the region			
Construction of the instrument	US growth (occupations x Industries)	National growth of (occupations x Industries)	European growth (occupations x Industries)
	A. Male, 25-54		
Log employment	0.034	0.027	0.028
	(0.024)	(0.023)	(0.022)
Log employment middling occupations	0.050***	0.044***	0.047***
	(0.006)	(0.006)	(0.007)
Kleibergen-Paap rk Wald F statistic	6.1	20.1	13.2
	B. Female, 25-54		
Log employment male	-0.444***	-0.377***	-0.412***
	(0.041)	(0.043)	(0.048)
Log employment female	0.445***	0.380***	0.414***
	(0.039)	(0.039)	(0.045)
Kleibergen-Paap rk Wald F statistic	11.4	16.6	12
N	1760	1760	1760

Sources: EU-LFS. Notes: The table shows regression results of the adjusted labor force participation rates of a region on the indicated variables. The participation rates are adjusted for the effect of changes in age and education over time. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Column 1, 2 and 3 uses Bartik instruments constructed respectively with US, national level, and European growth across occupations. Reported standard errors are two-way clustered by year and region. The regressions are also weighted by the initial population of the region in 1995.

Table 14: Panel data Evidence on the Response of Participation to Demand Shocks

Dependent variable: Share of the year in the labour force, 2003-13					
A. Male, 25-54 of age					
	(1)	(2)	(3)	(4)	(5)
	All	Age 25-40	Age 41-55	Married	All
Log employment	-0.330	0.318	-0.826**	-0.506*	-0.355
	(0.217)	(0.288)	(0.364)	(0.273)	(0.235)
Log middling occupations	0.222	-0.413**	0.697**	0.380*	0.242
	(0.148)	(0.207)	(0.302)	(0.203)	(0.165)
Spouse unemployed				0.002	0.004*
				(0.002)	(0.002)
Spouse unemployed last year				-0.001	-0.001
				(0.002)	(0.002)
Child				0.000	0.002
				(0.002)	(0.001)
Married					0.009***
					(0.003)
Child less than 3 years of age					-0.002
					(0.001)
Kleibergen-Paap rk Wald F statistic	5.1	4.9	4.3	4.4	4.7
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
N	382 514	139 581	172 109	251 508	382 514
B. Female, 25-54 of age					
Sample composition	All	Singles	Married	Married	All
Log employment male	-0.527***	-0.386*	-0.560***	-0.370**	-0.321**
	(0.165)	(0.210)	(0.161)	(0.159)	(0.159)
Log employment female	0.560***	0.290*	0.634***	0.492***	0.366***
	(0.132)	(0.170)	(0.135)	(0.130)	(0.121)
Spouse unemployed				0.021***	0.021***
				(0.005)	(0.004)
Spouse unemployed last year				0.023***	0.021***
				(0.005)	(0.005)
Child				-0.018***	-0.010***
				(0.002)	(0.002)
Child less than 3 years of age					-0.015***
					(0.004)
Married					-0.056***
					(0.012)
Kleibergen-Paap rk Wald F statistic	18.8	21.5	17.1	15.8	17.5
N	413 669	124 613	282 419	282 419	413 669
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Method	2SLS	2SLS	2SLS	2SLS	2SLS

Sources: EU-SILC Panel. Notes: The table shows regression results where the dependent variable is the share of the year in the labor force for an individual in the panel. That variable is normalized to 1 when the entire year was reported in the labor force. The

models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are clustered by region. All regressions include individual fixed effects.

XIII. Appendix Tables not for publication

Table A1: Are the results in Table 9 robust to the exclusion of a country from the sample?

	Dependent variables : Adjusted labour force participation rates of the region, 2000-13											
	A. Men											
Country Excluded	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT	UK
log employment	0.009**	0.008*	0.007	0.018***	0.011***	0.014***	0.012***	0.010***	0.011***	0.010***	0.012***	0.010***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
N	1718	1606	1568	1508	1704	1466	1578	1732	1480	1746	1662	1592
Kleibergen-Paap rk Wald F statistic	5323.2	3245.3	4277.8	5844.9	5094.4	2052.6	2240.6	5102.4	5068.5	5103.9	5261.3	4960.4
	B. Women											
Country Excluded	AT	BE	DE	ES	FI	FR	GR	IE	IT	NL	PT	UK
log employment male	-0.449***	-0.475***	-0.410***	-0.401***	-0.443***	-0.402***	-0.448***	-0.444***	-0.442***	-0.444***	-0.445***	-0.432***
	(0.041)	(0.042)	(0.039)	(0.080)	(0.041)	(0.063)	(0.044)	(0.041)	(0.040)	(0.041)	(0.042)	(0.040)
log employment female	0.448***	0.471***	0.411***	0.411***	0.445***	0.408***	0.451***	0.445***	0.443***	0.445***	0.449***	0.434***
	(0.039)	(0.040)	(0.036)	(0.076)	(0.039)	(0.060)	(0.042)	(0.039)	(0.038)	(0.039)	(0.040)	(0.038)
N	1718	1606	1568	1508	1704	1466	1578	1732	1480	1746	1662	1592
Kleibergen-Paap rk Wald F statistic	11	11.4	14.2	4	11.4	21	10.4	11.4	11.3	11.4	11.5	11.1

Note: The table shows regression results of the adjusted labor force participation rates of a region on the indicated variables. In each column, the indicated country has been excluded from the sample. The labor force participation rates are adjusted for the effect of changes in age and education over time. The models are estimated with 2SLS using the Bartik instruments detailed in the text. Reported standard errors are two-way clustered by year and region. The regressions are weighted by the initial population of the region in 1995.

Table A2. Are the Results Similar in Countries from the South and the North of Europe?

Dependent variable: Adjusted labour force participation rate of the region, 2000-13				
	Men		Women	
	North	South	South	North
Log employment	0.007**	0.029***		
	(0.003)	(0.006)		
Log employment male			-0.450***	-0.490***
			(0.038)	(0.099)
Log employment female			0.452***	0.513***
			(0.039)	(0.105)
N	1134	626	1134	626
Kleibergen-Paap rk Wald F statistic	605.2	691.9	18.1	7.4

Note: Ireland is included in the South. Countries in the group of the North are Austria, Belgium, Germany, Finland, the Netherlands, and the United Kingdom. Countries in the South are Spain, Greece, France, Italy, Portugal, and Ireland.

Table A3 Distribution across occupations of men and women in 2007

		US			EU11 (excl UK)		
	ISCO 88 Codes	Male	Female	Diff M-F	Male	Female	Diff M-F
High-Paying Occupations							
Corporate Managers & Managers Small Enterprises	10,11,12,13	15.5	12.1	3.4	9.5	5.7	3.8
Professionals	20,21,22	7.2	5.8	1.4	6.8	3.7	3.1
Teaching professionals	23	2.7	7.4	-4.6	2.5	5.7	-3.2
Other professionals	24	4.8	7.4	-2.6	4.2	4.7	-0.5
Physical, mathematical, and engineering associate professionals	30,31	3.2	1.6	1.6	6.2	1.7	4.5
Other associate professionals	33,34	8.0	10.2	-2.2	8.0	14.7	-6.7
Life science and health associate professionals	32	1.2	5.1	-3.9	1.1	5.1	-4.0
Middling occupations							
Stationary plan and related operators	80,81,82	2.6	2.0	0.6	5.6	2.6	2.9
Metal, machinery and related trade work	72	10.2	1.6	8.7	8.7	0.4	8.3
Drivers and mobile plan operators	83	6.5	0.9	5.6	6.8	0.4	6.5
Office clerks	41	4.2	13.9	-9.8	5.9	14.2	-8.2
Precision, handicraft, craft printing and related trade workers	73	0.7	0.2	0.5	0.9	0.4	0.4
Extraction and building trades workers	70,71	8.5	0.2	8.2	11.3	0.8	10.5
Customer service clerks	42	1.7	6.9	-5.2	0.9	3.6	-2.7
Other craft and related trade workers	74	0.7	0.5	0.2	2.4	1.5	0.9
Low-Paying Occupations							
Laborers in mining, construction, manufacturing, and transport	92,93	5.2	1.2	4.0	4.7	2.2	2.5
Personal and protective service workers	50,51	7.6	14.8	-7.2	5.1	13.1	-8.0
Models, salespersons, and demonstrators	52	2.9	3.2	-0.3	2.2	7.3	-5.1
Sales and elementary service occupations	90,91	3.9	4.5	-0.7	3.4	9.9	-6.5
Skill agricultural worker	61	2.8	0.5	2.3	3.9	2.3	1.6
	Total	100	100		100	100	

Sources: CPS for the US, LFS for Europe.

ABOUT OFCE

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