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Women Labor Market Participation in Europe: Novel Evidence on Trends and Shaping Factors

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ABSTRACT

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We investigate the changes in women's participation patterns across 15 EU countries over the last 20 years using individual data from ECHP and EUSILC databases. Our findings reveal a role of social policies and institutional factors that is stronger than what has so far been assessed. Labor market reforms explain almost 25% of the actual increase in labor force participation for young women, and more than 30% for highly educated women. The effects of labor market reforms on the participation of low skilled women in the labor force are instead surprisingly small. We also find that reforms of the institutional framework towards a model of flexicure labor market are effective in enhancing women labor supply only when deregulation is accompanied by sufficient social compensation.

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1   Introduction

The importance given to the protection of Human Rights and fundamental freedoms in the European Community Treaties has changed considerably since the European venture was first launched. Since 1975 a series of directives have broadened the principle of equality between men and women to cover working conditions, training and promotion, social security, access to goods and services, maternity protection and parental leave. In 1997 the Amsterdam Treaty enabled the gender dimension to be integrated into all Community policies and established the principle of equal treatment as a fundamental right. Since then, the Member States have introduced different policies and activities fighting gender inequalities.[1]

As a matter of fact, the female participation rate in Europe has increased from around 55% in the early 90s to more than 66% in 2008. In the same period women's employment rate has moved to the same direction, by increasing from 49% to 61%. This steady improvement in women labor market position has led to a significant decline in the gender employment gap, which has nearly halved since 1990, from more than 25% to almost 14% in 2008.[2]

The extent to which reforms and labor market institutions have contributed to such a pattern is at the forefront of the political debate. Although there is a variety of studies looking at this issue from different perspectives, the available evidence is still inconclusive (see Costa, 2000 and Del Boca and Locatelli, 2006 for recent reviews). The main difficulty is disentangling the effect of interest from other (concurrent) factors that drive such patterns, such as: a) changes in cultural attitudes towards work especially in countries where participation is traditionally lower[3]; b) changes in the characteristics of the female population such as fertility decisions and elderly care responsibilities[4] educational choices[5] and demographic changes[6]; and c) reforms of the welfare state and changes of labor market institutions and policies specifically targeted at groups with lower attachment to the labor market such as family-related subsidies[7] and fiscal reductions[8].

Most of the studies looking at the evolution of the employment (or wage) gender gap over time using individual data focus on a single country only, thus failing to capture important differences across European countries characterized by different welfare structures and cultural attitudes to-

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[1] In 1997, the Member States of the European Union (EU) unanimously decided to add a new article to the Amsterdam Treaty (Article 13). The new article enabled the Council to take appropriate actions to combat discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation.

[2] This information is retrieved from the OECD labour market statistics, http://stats.oecd.org/.

[3] Algan and Cahuc (2007), Fernandez (2007), Fortin (2005) and Giavazzi et al. (2009).

[4] Goodpaster (2010), Leigh (2010) and Munasinghe et al. (2008).

[5] Ermisch (2003), Euwals et al. (2011), Goldin (2006) and Gustaffsson and Kenjoh (2008).

[6] Beaudry and Lemieux (1999), Fitzenberger et al. (2004) and Balleer et al. (2009).

[7] Anderson and Levine (1999), Attanasio, et al. (2008), Bardasi and Gornick (2003), Berlinski and Galiani (2007), Jaumotte (2003), Powell (1998) Sánchez-Mangas and Sánchez-Marcos, (2008).

[8] Eissa and Liebman (1996) and Alesina and Ichino (2007).

wards female labor market participation. Conversely, cross country comparisons using aggregate data typically fail to distinguish compositional effects (i.e. those arising from changes in the socio-demographic characteristics of men and women over time) and to capture the responsiveness of women with different individual characteristics to changes of the institutional settings (Jaumotte, 2003; Genre et al., 2010).

This paper investigates the changes in women's participation patterns across 15 EU countries over the last 20 years using individual data from ECHP and EUSILC databases. Two are the main contributions of our approach. First, we use individual data for an unusually large set of countries and for a long time period (twenty years). Second, we provide a quantification of the role of labor market institutional factors which is more precise than in previous studies.

Our analysis unfolds as follows.

We begin with an exploratory analysis of the data where individual information is used to compute aggregate trends. Our aim here is to present a picture of each European country where we are able to disentangle how much of the observed decline in the gender employment and participation gaps can be simply attributed to changes in demographic and social characteristics between men and females over time and how much of it needs to be attributed to changes in the institutional setting and cultural attitudes. Our findings reveal that a significant part of the catching up of women labor market performance can be attributed to forces which are not related to the increased similarity between women and men in terms of socio-demographic factors such as for example education.

Next, we use a regression analysis to understand whether the impact of individual characteristics on labor market participation varies across time and across countries in different welfare regimes. Our estimates reveal that the observed aggregate increase in female participation in Europe hides substantial differences in several dimensions, not only across different groups of women and across countries but also for the same group of women in different countries. Our findings thus uncover an important (and under-explored) cross-country heterogeneity in the factors which affect women labor market outcomes.

Finally, we further these results by exploiting a multi-level model specification to appreciate how institutional and policy factors affect women's choices between unpaid family responsibility (child rearing and elderly care) and paid occupation. In particular, our multi-level regressions allow (1) to disentangle how much of the observed variation in the female participation rate occurred in Europe since the beginning of 90s is due to unobserved (individual and country) heterogeneity versus observed labour market institutional and policy changes and (2) to assess whether such changes have affected differently the participation of women with different characteristics. Although those issues are at the forefront of the political debate, the existing empirical evidence is extremely

scarce. Differently from previous studies, which essentially capture the interplay between micro and macro characteristics using interaction terms in (single-level) regression models,[9] our approach can better handle the hierarchical structure of the data (as we observe women nested in countries), thus delivering more accurate estimates of any macro-effects.

Our findings point towards a strict interplay between the individual characteristics of female population and the institutional and policy setting, revealing a role of institutional factors that is stronger than what has so far been assessed. According to our results, the attitude to work of young women with children appears to be favoured by policies aimed to support family and by the expansion of flexible forms of employment (especially in terms of fixed term contracts) to the extent that such forms of employment are not perceived to be of low quality. In particular, we quantify the extent to which changes in the labor market behavior of women with specific characteristics (e.g. young children) are to be attributed to changes in policies and institutions. Labor market reforms and changes of social policies predict almost 25% of the actual increase in labor force participation for young women, and more than 30% for highly educated women. However, the effects of labor market reforms on the participation of low skilled women in the labor force are surprisingly small. This result is apparently in contrast with the existing empirical evidence which shows that less educated women (with a lower attachment to work) are more responsive to work incentives created by policy/institutional changes (Del Boca et al 2009). Nevertheless, we argue that in many European countries, labour market reforms has led to a deterioration of job quality, especially for low educated women, increasing the risk of dropping out from the labor force.[10]

The paper is organized as follows. In Section 2 we discuss the relevance of the institutional context in shaping women's choices between unpaid family responsibility and paid occupation and define our research questions. Section 3 describes the data and summarizes the large quantity of micro-level information available for different European countries and across time using a synthetic indicators of female labor market performance. Section 4 contains the results of a regression analysis of women's involvement in the labor market across time and countries, whereas Section 5 analyses more closely the role of the labor market institutional framework and social policies. Section 6 concludes.

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[9]See, among the others, Stier et al. (2001) and Lippe (2001).

[10]Employment in Europe 2001 reports that drop-out rates from employment into unemployment or inactivity are strongly linked to job quality. High levels of involuntary temporary contracts and part-time work are associated with high drop out rates (some 15% into unemployment and 10% into inactivity). Del Boca et al (2009) show that the influence of part-time on participation is positive only where part-time jobs are perceived to be of 'high quality'.

2 Women's family responsibility, paid work and institutions

A large empirical literature provides evidence that the provision of facilities, parental leaves and subsidies for day-care spaces and, more generally, policies aimed at alleviating the financial burden of child-rearing, have a positive effect on female labor market integration by either increasing work attachment (less women leaving occupation after childbirth) or facilitating women re-entry into the labor market as children grow up (see, e.g., Sànchez-Mangas and Sànchez-Marcos, 2008, Lefebvre et al., 2009).

Differently from child care policies, there is still little evidence on the role of elderly care policies and norms on women's attitude to paid work.[11] Policies and practices concerning the reconciliation of child care and employment may not be easily transferred to elderly care. First, caring responsibilities for elderly usually occur at a later phase of work career than child care. Second elderly care is less predictable in timing, duration and intensity (Keck and Saraceno, 2009). Theoretically, on the one hand, the presence of monetary subsidies and publicly financed elderly care services may have a positive effect on the choice of remaining in the labor force. On the other hand, unconditional cash transfers for elderly care, when combined with other sources of income, such as the dependent elderly's pension, may create an "incentive trap" by reducing the opportunity cost of informal care, thereby exerting a negative impact on labor market participation of low income and low educated women (Simonazzi, 2009)

Next to fiscal and social policies for the support of working mothers/elderly carers, the role played by more general changes in the institutional context is gaining an increasing attention in the political debate. In the last two decades, the labor markets in many European countries have experienced deep changes towards the promotion of a *flexicurity* model of labor market with the aim of increasing competitiveness, employment creation and redistribution of work. Though the idea of deregulation was the common factor behind the waves of reforms, the promotion of flexicurity was pursued through very different types of interventions on both the *flexibility* and *security* side. In the Social Democratic countries, reforms were mainly aimed to reduce the protection of insiders by reducing the degree of employment protection on regular forms of employment on the one hand, and increasing income security on the other.[12] In the Southern countries and some Continental countries, flexibility has been obtained through marginal reforms which aimed at deregulating the use of temporary or

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[11] With regard to the effect of the presence of an elderly relative on women labour supply, the existing studies have not evidenced a clear relationship. Wolf and Soldo (1994), estimating simultaneously the choice of employment and elderly care cannot find any negative relationship. Ettner (1995) for the US, Heitmueller and Michaud (2006) for the UK and Casado et al. (2007) for Spain show that co-residing with a disabled senior person has a relevant discouraging effect on participation in the labour market. Chang and White-Means (1995) find that co-residing with the senior person has a negative effect on women participation and that such effect is particularly strong for low educated women.

[12] This is the so called Danish model of *flexicurity.*

"atypical" forms of employment while leaving largely unchanged the legislation applying to the stock of workers employed under permanent (open-ended) contracts. In other countries, as for example in the Netherlands, the emphasis of the reforms was to promote flexible working time and part time arrangements. Such reforms can be regarded as beneficial to women to the extent they facilitate labor market integration. However, this integration may occur at the risk of a reinforcement of the traditional separation of gender roles in the labor market and within the family.

From the *flexibility* side, the link between labor market deregulation and women participation is not clear-cut, though there are a number of empirical studies which show that the negative effects of strict Employment Protection Legislations (EPL) are disproportionately larger for those individuals (such as prime-age women) who are more subject to labor market entry problems. As a result, in a rigid labor market, employment opportunities for prime age women are significantly reduced because they are more likely than men to move between employment and inactivity due to the competing demands of work and family life (OECD, 2004; Heckman, J. and C. Pages, 2000). From the *security* side, whether or not the presence of a generous system of unemployment benefit accompanied by active (and activation) policies increases incentives to work largely depends on the eligibility requirements. In many countries, the access to social security and to active labor policies are interdependent and depend on the past work history of workers (for example contribution records showing recent and continuous employment). These requirements may represent a barrier for women who may have interrupted careers and work part time. This implies that, while, on the one hand, the burden of flexibility is increasingly borne by women, on the other, women are more likely to be excluded from benefits and active policies. Thus, if women are in principle supposed to benefit from the combination of flexibility in the labor market and security in the social system, the tendency towards the flexibilization of the labor market may exert a negative impact on the incentives to participate when flexible occupations are of lower quality and poorly securitized.

In this paper, we investigate the role of the welfare regime-specific characteristics in explaining the observed trends in female labor market performance. We model two dimensions of welfare regimes: *(1)* the social policies in support to families involved in informal care, both child-care and elderly care, and *(2)* the institutional characteristics of the labor market in terms of the degree of flexibility and security.

More specifically, we test two main hypotheses:

H_1 : social policies more oriented to support families with young children (including the maternity, parental and childcare leaves) and dependent elderly persons have a positive impact on women participation, by weakening the trade-off between informal care and paid work and positively affecting women labor market participation;

H_2 : changes in the institutional setting towards a model characterized by lower barriers to hiring and firing combined with a higher social protection (passive labor market policies and active labor market policies) have a positive impact on female labor market activity and this effect is larger for women who are more involved in family (unpaid) occupations.

We will refer to the variables capturing the characteristics of institutional context and policies as "macro" factors.

3 Data and exploratory evidence

3.1 The data

We combine micro data from two different sources, the ECHP (European Community Household Panel) and the EU-SILC (European Union Statistics on Income and Living Conditions), to create a unique dataset of comparable household and individual level characteristics across countries and over time.

The ECHP micro data is a household survey with a common framework conducted across EU-15 Member States under the supervision of Eurostat. The total duration of the ECHP is 8 years, running from 1994 to 2001.[13] The dataset includes information on family size and composition, living conditions and several income measures. Therefore, it provides a source of mutually comparable information at individual level for the EU member countries at the turn of the twentieth and twenty-first centuries.

EU-SILC (European Union Statistics on Income and Living Conditions) is the successor of the ECHP. The EU-SILC provides harmonized cross-sectional and longitudinal multidimensional micro data on income and social exclusion in the European countries, and it is the largest comparative survey of European income and living conditions.[14]

In order to obtain a unique dataset of comparable household and individual level characteristics across the EU countries within the whole period 1994-2009, we limited the analysis to the EU-15 Member States.[15] The overall sample includes 1,657,367 individuals between 25 and 64 years old of which 851,010 women and 806,357 men. A list of the variables used in this study, as well as summary statistics for the women and men samples, are reported in Tables 1 and 2. The employment and participation rates stand at 59% and 66%, respectively, for the female sample, and increase to

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[13] ECHP data were first collected in 1994, when a sample of 60,500 nationally representative households (i.e. approximately 130,000 adults aged over 16) were interviewed in 12 member states. Austria has joined the project in the second wave in 1995, Finland in 1996, and Sweden in 1997. Therefore, since then, the data is covering all EU-15 member states.

[14] In the 2004 wave, EU-SILC covered all EU-15 member states except Germany, Netherlands and the UK. Since 2005, the dataset involves the 25 EU member states, plus Norway and Iceland. The 2009 wave has been recently released.

[15] Namely, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

approximately 80% and 86%, respectively, for the male sample. The percentage of highly educated women and men is 27% and women are slightly more represented than men among the lowest educated individuals. Over 65% of respondents in both samples declares to live in-couple. 42% of women and 23% of men live in households with at least one child under 14 years old, and 18% of them live in households with at least one pre-school age child. Co-living with elderly (that is, individuals with 70 years old or more) involves just 6% of all individuals in our sample. Approximately 27% of those living in couple, have a partner with a lower or an upper secondary education (ISCED 0-2 and ISCED 3-5); 20% of individuals have a highly-educated partner (ISCED 5-7). The variable "cycle" measures the business cycle frequencies of national GDP over the survey years, 1994-2009. This variable has been obtained by implementing the filter proposed by Hodrick and Prescott (1997).

3.2   A micro-data-based cross country comparison

We begin our analysis by providing some preliminary evidence of the changes in the gender gap for participation and unemployment. Using data feom the OECD labor Force Statistics, Figures 1 and 2 show the evolution of the activity rates and unemployment rates in the different European countries separated by gender. Figure 1 points towards the well-known onset of female labor market participation, especially in countries with a traditionally low attachment of women to the labor market such as Greece, Ireland, Italy and Spain. Interestingly, Figure 2 shows that the unemployment rates do not exhibit similarly marked trends. This evidence thus seem to suggests that the relevant achievements of women in terms of labor market performance are to be attributed to the supply side of the market. In fact, the increase in female activity rate originates from an increase of female employment due to the increased willingness of women to work rather than from a decrease in the unemployment rate. However, the relevant question that these aggregate indicators are not able to answer is how much of these trends can be attributed to forces which are not related to the increased similarity between women and men in terms of socio-demographic factors such as, for example, education. Such changes in outcomes over and above those stemming from natural demographic trends across countries and over time are of particular interest for policy purposes as they might be the consequence of reforms in the institutional setting.

In our analysis, we use micro data to disentangle aggregate trends into different sources.

We start by looking at the extent to which women differ from men along two different labor market indicators (participation and unemployment) in the different European countries, once the influence of demographic and social characteristics has been controlled for. We use the methodology introduced by Vidgor (2008) to measure differences between native and immigrants in US states along cultural and economic lines. Such an approach allow us to summarize the large quantity of micro-level information available for different European countries and across time in a way that eases

cross-country comparisons.[16] In words, the procedure predicts which individuals are females on the basis of observed characteristics and then uses this finding to measure the gap between men and females for a chosen outcome, such as the activity rate, by constructing a numeric index. The method requires no prior assumptions regarding which characteristics are most effective in distinguishing women from men. Moreover, the inclusion of irrelevant characteristics—that is, ones that do not actually help to distinguish women from men—has no impact on the index. Such an index ranges between 0 and 1. It can be interpreted as an index of dissimilarity: the larger is the distance from 1, the more females are different from men along the inspected labor market indicator, controlling for other individual characteristics. More specifically, we control for differences in demographic factors using individual information on age and the education level as well as in family structure using marital status, partner education and number of children. A value of 1 for the index indicates that, if those characteristics were equal between men and females, women and men would not differ in terms of the chosen labor market outcome. Departing from 1 indicates that there are other forces (other than those stemming from natural demographic trends) which make women's labor market performance worse than the one of men.

We construct two different indices capturing gaps between women and men in labor market participation (activity gap index) and unemployment (gap index for those in the labor force) (see Appendix 1). The activity index captures differences between women and men inside and outside the labor market, thus revealing behavioral differences more likely to come from the supply side of the labor market. The unemployment index focuses on gender differences for the individuals in the labor market only, and hence captures the behavioral differences more likely to come from the demand side.

Figures 3 and 4 show the results.[17] They reveal important cross-country differences in the determinants of the aggregate trends that were not captured in Figures 1 and 2. It appears that in most of the countries with a significant catching up of women labor market participation (such as the Mediterranean countries, plus Ireland; Figure 1) changes in demographic and social characteristics (i.e. the increasing similarity between women and men in terms of observable individual characteristics) cannot explain all the shrinking in the gap. Indeed, our corresponding micro-based gender gap indices in Figure 3 remain far from 1, although they are increasing towards 1 over time. This evidence suggests that there are other forces which contributed to the observed remarkable increase in women's involvement in the labor market. Similarly, the reduced gender gap in unemployment

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[16]Technical details can be found in Appendix 1.

[17]For each European country and each year between 1994-2000 (ECHP data) and between 2004-2009 (EU-SILC data) we compute the two different indicators and perform T-test statistics to assess significant difference between the beginning and the end of the observed time window. The complete list of results is collected in Appendix 2 Tables A1-A2.

rates in Spain and the Netherlands (Figure 2) are associated with significant movements in our micro-based gender gap indices in Figure 4, indicating a limited role for changes in the female labor force composition. On the other hand, the marked changes in female unemployment in Italy and Finland (Figure 2), seem to be mainly due to demographic trends and other characteristics of the female labor force factors rather than to changes in preferences, beliefs or labour market policies. Indeed, when controlling for these factors, i.e. when looking at the results obtained using our indicators in Figure 4, the changes in the unemployment gap between men and women in those countries are not statistically significant.

We now focus on the information provided by our different indices within the countries in the sample. Interestingly, it appears a picture with a feature that is common to most of the European countries: the marked changes in our micro-based gender gap index in activity rates are associated with a substantial stability of the same index in unemployment rates. This finding reveals that the observed changes in unemployment rates (or employment rates for those participating to the labor force) largely reflect changes in demographic and social factors, whereas other forces seem to shape female participation rates. This evidence thus seem to provide some support to the idea that female participation rates are driven by changes in country specific characteristics, such as institutional reforms and cultural attitudes towards work. As stressed in the introduction, the importance of these factors in influencing labor market performance is receiving a growing attention among economists.

In conclusion, our micro-based gender gap indices in activity and unemployment rates reveal a relevant degree of cross country heterogeneity in the way the increased similarity between women's and men's individual observable characteristics has contributed to the improvement in women's labor market performance. Indeed, while in many countries the gradual decline of the gender differences in the characteristics of the labor force are able to explain most of the observed trends, in countries traditionally characterized by a persistent male breadwinner model the remarkable increase of women's participation in the labor market must be attributed to country-specific changes which affect policies, institutions and cultural attitudes. In Europe, cultural differences across countries are largely reflected in different welfare regimes. The following section looks in detail at the role played by the welfare regimes in shaping women's labor market behavior.

4   Female labor market outcomes and welfare regimes

In this section, we evaluate how individual characteristics impact differently the probability of participating the labour market both across time and across welfare regimes. We estimate a standard probit model for female labor supply separately for countries with different welfare regimes and

then we interact the main determinants of participation with the trend variable in order to detect differences in trends for women with different characteristics.

4.1 Cross country differences

Our basic regression model specifies the labor market status as:

$$y_{ij}^t = \boldsymbol{\delta}\mathbf{X}_{ij}^t + \gamma age_{ij}^t + \lambda trend^t + \sigma cycle_j^t + cty_j + \varepsilon_{ij}^t \tag{1}$$

where y is the labor market status (active) at time t for individual (female) i in country j, age are dummies for the age group of individual i (25-34; 35-44; 45-54; 55-64), $cycle$ is a business cycle indicator (country specific and time variant), $trend$ is a common linear trend, cty are country dummies and X is a set of individual characteristics observed at time t. Following the existing empirical literature on women labor market participation, we include controls for the marital status, the level of education, the partner's level of education, and for family burden. In particular, besides the traditional controls for family care involvement such as the presence, age and number of children, we also include a dummy for the presence in the household of an elderly person above the age of 70 as a proxy for elder care burden. As Ettner (1995) points out, although the decision to care for a senior person and the decision of fertility differ in many aspects, the influence of the commitment to caring for the elderly can be studied similarly to the commitment towards children.[18]

In order to investigate the differences in the women labor market attitude across countries with different welfare regimes, we follow the Ferrera's (1996) classification and divide the countries of our sample into four major groups: Southern (Spain, Italy, Greece, Portugal), Social Democratic (Sweden, Finland, Denmark), Liberal (United Kingdom) and Continental (Austria, Belgium, France, Germany, Netherlands, Ireland, Luxemburg). Table 3 presents the estimation results for the whole pooled sample (15 countries) in column 1 and for each welfare regime separately in columns 2-5.[19]

[TABLE 3 AROUND HERE]

The results in Table 3 show that there are important differences across welfare regimes in the impact of individual characteristics. Being married is negatively related to women participation and employment and the effect is stronger in those countries characterized by more traditional family

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[18] In some respect, the presence of an elderly relative in the household can be a better proxy of care burdens than having children. This variable is indeed less affected by endogeneity issues that may arise in the estimation as a consequence of the possible inverse causal relationship between labour market status and the rational choice of having a child (Cipollone and D'Ippoliti, 2011).

[19] Not surprisingly, the results for the employment rate are qualitatively the same as those reported for the participation rate, with some differences in the magnitude of the impacts. While activity rates are widely used as an indicator of labour market involvement, it is increasingly recognized that employment and hours worked are the key indicators for assessing women labour market integration (Jonung and Persson, 1993). One reason is that women unemployment is often hidden among those defined as inactive because of the low work attachment of women of specific groups (typically low skilled women with young children). Results are available upon request.

structure such as continental and southern countries. Education is also another important determinant of the female labor market status and, as expected, a high level of education leads to more participation. The level of education of the partner has also a significant impact on female participation. Finally, the age effects show the familiar hump-shaped pattern in both the participation and employment, implying an increase in the probability of participating for the age group 35-44, and then a lower probability for older groups.

Family care burdens are strong negatively related to female labor market involvement regardless the welfare regime, though with some important differences in the magnitude of the coefficients. The presence (and the number) of young children exhibits a negative impact and this effect is significantly stronger if children are below 4 years old. Labor market participation increases gradually when the child starts attending school and the child effect reverses only when she attends secondary school (around 14 years).[20] The importance of children's age differs across regimes and is the most critical in the UK. In Southern countries, which are characterized by lower participation rates for mothers, the age of the youngest child exerts a less detrimental effect on participation[21], thought the negative effect persists even when the child is of school age. Indeed, our estimates show that the probability of participating for women with a child older than 14 (relative to women without children) is almost 4 percentage points lower in the South of Europe than in the Social Democratic countries, and 3 percentage lower than in Continental countries and the UK.

As for children, the estimated impact of elderly care responsibilities on participation is negative and significant and depends on the cultural attitude towards elderly relatives. In fact, such an effect is much lower in Southern countries where cohabiting with an elderly relative is a quite diffuse practice and it is not necessarily related to the need of providing care.

Finally, the highest female participation rate is found among those aged in their late thirties/early forties in all the welfare regimes groups we consider and the participation gap between old-aged women (55-64) and younger groups is significantly larger in Southern countries. This is explained both by cultural reasons (older women are of a generation in which low female labor market involvement is expected as part of a male breadwinner system) and by the presence of early retirement

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[20]Note that the reported coefficients should not be interpreted as causal effects, as both participation and fertility may be simultaneous decisions. This implies that the causal effect of children on participation can be lower than those estimated.

[21]This may be due to a number of factors, such as differences in the composition of the labor force and in the institutional setting. In countries where female labor force participation is low, women in employment are typically characterized by a higher level of education, implying a stronger labor market attachment. Moreover, labor market institutional rigidities in Southern countries - which make more difficult (re)entering the labor market after a period of temporary leave - may stimulate higher continuity in work attachment. This difficulty in re-entering the market seems to be confirmed by the evidence that in the Social Democratic countries (and to a less extent in the Continental countries) mothers' participation and employment increase steadily as the youngest child grows up (mostly through a re-entry to part time employment), in Southern countries the presence of children negatively affects female labor market participation, even when the child is of school age.

pension schemes which favoured an early drop out.

After controlling for personal characteristics and country unobserved time invariant effects, the trend indicator is positive and significant, implying that, on average, the probability of participating is 0.18 percent higher in 2009 than in 1994.

4.2 Trends

We then allow the impact of the determinants of female labor behavior to vary over time by estimating the following model where the trend indicator is interacted with the individual characteristics:

$$
\begin{aligned}
y_{ij}^t &= \boldsymbol{\delta}\mathbf{X}_{ij}^t + \gamma age_i^t + \lambda trend^t + \sigma cycle_j^t + \\
&\quad \omega(trend^t \times age_i^t) + \boldsymbol{\chi}(trend^t \times \mathbf{X}_{ij}^t) + cty_j + \varepsilon_{ij}^t
\end{aligned} \tag{2}
$$

where $trend^t \times \mathbf{X}_{ij}^t$ captures changes over time in the labor market status of women with certain characteristics. Such a specification answers questions such as: does the participation rate of women with a high level of education change in 2007 with respect to 1994? As before, the equation (2) is estimated on both the whole sample and each welfare regime separately. Table 4 reports the results.

[TABLE 4 AROUND HERE]

Overall, the evidence shows that there are important differences in the trends of women's participation, depending on both the personal and family characteristics of women and on the welfare regimes. While in the UK, the positive trend is quite homogenous across women in different age groups, in Continental and Southern countries, the increase in participation and employment is more evident for older age groups and this is partly explained by cohort effects.[22] Education (and partner's education) appears to have an increasing role in stimulating women labor market involvement, with some differences across regimes. Indeed, we find a significant increase in the share of high educated women leaving the inactivity status in the Continental and Social Democratic countries, while, in Southern countries, the trend is stronger for women with a low-medium level of education.

Over time, the labour market participation increases for women with small children. Again, such increase is not uniform across welfare regimes. It emerges that, between 1994 and 2009, the negative impact of young children on women labor market involvement declined significantly in Social Democratic countries and to a less extent in Continental and Southern countries, while no trend has been detected for the UK. This phenomenon may be related to a larger availability of market (child

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[22]In fact, while there is not a substantial difference in the labor market behavior of women in their mid 20s and 30s (born after the early 1960s and grew up and educated after the feminist movement in the '70s), for those in their mid 30s and 40s, the participation rate has increased by 11 percentage points, and for those older than 45 by almost 20 percentage points.

care services) or non market child care services (i.e., husband's or relative's help) accompanied by a shift in people's values in all European countries (and to a larger extent in the most traditional ones) from the traditional breadwinner arrangements in favour of a more equal gender division of roles within the household. This change in the attitude towards working mothers could also have been favoured by the expansion of flexible forms of employment which facilitates the conciliation between family responsibilities and paid work.

The negative impact of informal elderly care on participation has increased over time (with the exception of Social Democratic countries). According to our results, the presence of a co-living elderly persons has a positive (and significant) impact on female labor market involvement at the beginning of the sample period and then turns to be negative. This seems to be related to the changing role of elderly relatives within the family, from providers of unpaid help within extended family models to recipients of informal long-term care in the nuclear family (Leitner, 2003; Saraceno, 2010; Saraceno and Naldini, 2007).

In summary, the findings in tables 3 and 4 show that the impact of family burden on women labor market participation has changed in the last twenty years and such changes exhibit important country-specific patterns. In the following sections, we further our understanding of the relevance of institutional factors in shaping the women's decisions between unpaid family responsibility and paid work.

5   The macro policy and institutional indicators

The previous section provides evidence that trends in female labor market participation differ significantly across countries in different welfare regimes. In this section, we study the role of the labour market institutions and policies in explaining the observed trends by focussing on two dimensions of welfare regimes: *(1)* the social policies in support to families involved in informal care, both child-care and elderly care - hypothesis 1 in Section 2 -, and, *(2)* the institutional characteristics of the labor market in terms of the degree of flexibility and security - hypothesis 2 in Section 2 -. Given the multilevel nature of our dataset (women nested in countries), we model female labour supply in a micro-macro design using a multi-level approach. A similar approch has been used by Ward and Dale (1992).[23]

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[23] Differently from the standard difference-in-difference approach with interaction terms between micro- and macro-level variables and clustered standard errors, the multilevel method allows the researcher to estimate how much each level of analysis is contributing to explanation in the model, and how much each level is contributing to the error. More specifically, the multilevel method allows one to analyze the explanatory power of a model by estimating the variance components directly and, hence, to state what portion of a dependent variable's variance is attributable to state-level versus individual-level variation generated by both observable and unobservable factors. Moreover, the option of using clustered robust standard errors to account for the intraclass correlation is a "weaker" form of correction than using a multilevel model, which not only accounts for the intraclass correlation, but also corrects the denominator degrees of freedom for the number of clusters. When using clustered robust standard errors, indeed, the denominator degrees of freedom is based on the number of observations, not the number of clusters. Technical details and inferential issues

5.1 The macro indicators

We collect several variables related to the country-specific socioeconomic context that are expected to be important in shaping the influence of housework and family related responsibilities on women's attachment to local labor markets. We distinguish six relevant dimensions of cross-countries heterogeneity: the extent of employment protection legislation, passive and active labor market policies, subsidies targeted to elderly people, subsidies targeted to families, and the extent of parental leave. Table 5 presents a description of these dimensions, by reporting on their construction and their specific components.

[TABLE 5 AROUND HERE]

In order to obtain uncorrelated synthetic indicators from the six macro variables, we employ a Principal-Component Analysis (PCA) separately on the institutions-related dimensions and on the policies-related dimensions.[24] In keeping with common practice (Nardo et al. (2005), Nicoletti et al. (1999), Kline (1994)), we have selected the first factor of each PCA that satisfies the following requirements: eigenvalues larger than 1, individual contribution to the explanation of the overall variance larger than 10%, cumulative contribution to the explanation of the overall variance larger than 50%. Within each factor, dimensions are weighted according to the proportion of the cross-country variance explained by the factor itself. The results of the two PCA procedures are presented in Table 6.

[TABLE 6 AROUND HERE]

The factor of the first PCA (Factor 1, henceforth called POL) is highly correlated with parental leaves and family subsidies (with factor loadings larger than 0.8) and moderately correlated with the extent of subsidies to the elderly (factor loading approximately equal to 0.26). The higher the load the more relevant in defining the factor's dimensionality. Hence our first factor reasonably represents the generosity of national welfare regimes to households with dependent children. The factor of the second PCA (Factor 2, henceforth called INST) is defined by active and passive labor market policies (with factor loadings larger than 0.9), while the extent of employment protection legislation exerts an inverse impact on it (with negative factor loading, -0.15). Hence, this factor resumes the degree of flexicurity of national labor market institutions.[25]

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related to the application of the multilevel analysis techniques can be found in Hox (2010).

[24] Principal-Component Analysis (PCA) aims to convert a set of possibly correlated variables into a lower dimensional set of linearly uncorrelated variables called principal components. These relevant factors are then rotated using the varimax method to maximize the procedure's efficiency (Kline (1994)).

[25] The similarity between the standard definition of flexicurity and our second factor is straightforward. Indeed, the European Commission defines flexicurity as an integrated strategy to simultaneously enhance flexibility and security in the labor market. It is traditionally implemented by means of: 1) flexible and reliable contractual arrangements, which are negatively correlated with employment protection; 2) effective active labor market policies; and 3) modern social security systems providing adequate income support during employment transitions, which are positively correlated with passive labor market policies.

5.2 The role of policies and institutions

Our econometric specification consists of a multi-level analysis based on our baseline probit model (1). We allow both the intercept and the impacts of some individual characteristics (namely, having small children and co-living with an old-aged dependent) to depend on the two country- specific (but time variant) macroeconomic factors defined above: INST (labor market institutional context) and POL (family oriented policies).

Our random coefficient model is composed by a first-level regression at individual level specified as follows:

$$y_{ij}^t = \beta_{0j}^t + \beta_{11j}^t CHILD_{ij}^t + \beta_{12j}^t ELDERLY_{ij}^t + \boldsymbol{\beta_2}' \mathbf{x}_{2ij}^t + \varepsilon_{ij}^t \tag{3}$$

and a second level set of regressions as follows:

$$
\begin{aligned}
\beta_{0j}^t &= \delta_0 + \delta_1 INST_j^t + \delta_2 POL_j^t + \nu_j^t \\
\beta_{11j}^t &= \gamma_{10} + \gamma_{11} INST_j^t + \gamma_{12} POL_j^t + \upsilon_{1j}^t \\
\beta_{12j}^t &= \gamma_{20} + \gamma_{21} INST_j^t + \gamma_{22} POL_j^t + \upsilon_{2j}^t
\end{aligned}
$$

where $\mathbf{x}_2$ is a set of additional controls which capture the impact of others micro-characteristics on the likelihood of women participation.

We implement Generalized Linear Latent Models to estimate a two-level Random-Intercept Probit model and a two-level Random-Coefficient Probit model, taking into account the nesting of individuals in their country of origin.[26] Differently form the analysis carried on in section 4 we now focus on women in prime age group (25-54) because family care burdens, such as child care and elderly care, are less relevant for those in the elder group (55-64).[27] The model is estimated for the whole sample (pooled model) and then for each age group separately. We also test whether and to what extent changes in family policies and labor market institutions affect the labor market decisions of women with different levels of education and estimate model (3) for the three education groups (primary, secondary and tertiary education).

The results are reported in Table 7 (column 1 for the whole sample and columns 3-4 for the three age groups separately) and in Table 8 for the three education groups.[28]

[TABLES 7 & 8 AROUND HERE]

Both the POL and INST indicators exert a significant impact on women's likelihood of being

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[26] Cipollone and D'Ippoliti (2011) carried on a similar analysis for Italy, exploiting territorial heterogeneity at regional level.

[27] In particular, the "variable co-living with an elderly relative (older than 70)" can simply capture the presence of the partner rather then the presence of a relative in need of care.

[28] The estimated coefficients on individual controls are consistent with those reported in the previous sessions and and are available from the authors upon request.

active, though their effect is mediated by the type of unpaid work involvement (presence of child or/and elder person) and differs substantially across age and education groups.

Regarding the role of family policies (POL), the availability of childcare subsidies and child-friendly policies have a positive impact on the activity rate of women with children and the effect is significant for relative young women (25-34) at the early stage of their work life and, quite surprisingly, for medium and high educated women. Indeed the effect is not significant for low skilled women, whose employment opportunities are limited both in terms of the quality of jobs available and wages.[29]

Conversely, policy measures to help women to combine caring and job responsibilities affect differently the willingness to work of women co-living with an elderly person. The estimated effect is in general negative and significant for older (age group 44-55) and low educated women. These results show that the effect of policies on women's choice between paid work and unpaid care crucially depends on their outside family options and labor market potential outcomes. In general, cash benefits increase household income and rise the reservation wage at which women are available for working. Therefore, more generous supports for child-related and elder-related costs are more likely to discourage the labor market participation of low-skilled women in charge of family care, since their labor market options (in terms of wage and type of jobs) are poorer.

Turning to the effects of the institutions indicator ($INST$), more flexibility and/or more security is employment-enhancing for young women (25-34) with small children despite the level of education. These results imply that a larger availability of *flexicure* job opportunities favors the labour market participation of women with children, especially at the beginning of their working career, by reducing the labor market entry costs.

Women with elderly care responsibility respond differently to changes in the labour market institutional framework. Higher labor flexibility is detrimental for the labor market involvement of women co-living with an elderly person. This result may be related to the fact that just few countries in Europe have combined the two dimensions of flexibility and security[30], and, in most cases, deregulation is moving forward without sufficient social compensation. In this respect, the growing availability of flexible (low-paid jobs), which very often represent a forced alternative rather than an option to more stable forms of employment, makes unpaid elderly caring more attractive than paid occupations, especially in countries where family caring activities are supported by monetary

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[29]Such results may be related to the fact that the indicator POL includes both in-kind (maternity and paternity leaves, child care facilities ecc.) and monetary (family allowances) transfers. While the former have a positive impact on mothers labour market attachement, the latter may have a negative impact which is stronger for low-income mothers (Del Boca et al. 2009).

[30]Combining the two axes of flexibility and security, Tangian (2007) concludes that only Denmark and Netherlands are developing both dimensions.

allowances that can be freely used to complement the family budget.[31] This is confirmed by the fact that the effect holds for low-medium educated women whose work propensity is lower and work opportunities are in general poorer.

To summarize, the institutional characteristics of the labour market and the social policy environment affect significantly women labour market behavior, thought the effect is mediated by the women's individual characteristics. In particular, social policies aimed at those women involved in family care, have a strong a significant impact on the labour market participation of young mothers with a medium-high level of education. The effect is nevertheless negative when older and low skilled women and involved in elderly care. The institutional characteristics of the labor market impact significantly on the participation of mothers at early stage of their working career who benefit more of a larger availability of flexible forms of employment and a reduction of the labour market entry costs. The same result does not hold for low skilled women with elderly care responsibilities.

Our results indicates that social policies and labor market institutional characteristics explain a non-negligible percentage of the women's labour market participation across European countries. The variance partition coefficient (VPC) for the overall model (Table 7, column 1) is approximately equal to 0.06, which indicates that 6% of of the variability in the participation rates can be attributed to countries factors. This coefficient increases when the model is separately estimated by age-group and educational level. In particular, macroeconomic heterogeneity is particularly relevant in explaining cross-country differences in the participation rates of younger and less skilled women (VPC increases up to 20% and 11% respectively), while more than 95% of variability of participation of women between 45 and 55 years old is due to individual characteristiocs. The macro factors $INST$ and POL explain up to 67% of the overall cross-countries variance, as shown by the level-2 variance partition coefficients. Thus there remains some country-level variance unaccounted for in the model. This may be attributed to changes in cultural attitude towards female labor market involvement, as well as other country-specific time-variant factors which have not been explicitly considered in the model.

5.3 The role of flexicurity

In the last set of regressions we focus more specifically on the impact of flexicurity on women labor market involvement by disentangling the impact of the two components of the indicator $INST$: flexibility ($FLEX$) and security (SEC) and their interaction ($FLEX \times SEC$).

The results for the pooled sample (column 1) and for the three age groups separately (columns 2-4) are reported in Table 9, while in Table 10 we run the same regressions for women with different levels of education.

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[31] See Simonazzi (2009) for a detailed analysis of the recent dynamics of the care sector in the EU countries.

[TABLES 9 & 10 AROUND HERE]

Table 9 shows that a higher degree of labor flexibility has a positive effect on the activity rate only if it is accompanied by policies which are aimed to guarantee access to employment security in terms of both active labor market policies and the inclusiveness of the unemployment benefits. At the same time, a larger degree of security is beneficial for women's involvement only in sufficiently flexible labor markets which provide an easier access to employment. The impacts of flexibility, security and their interactions are significant and qualitatively the same across age groups with the exception of those in the oldest age group (44-54 in our sample). The interaction between flexibility and security are stronger for young women at the early stage of their working career and, consistently with the results found in the previous set of regressions, for those women with family care responsibilities. These results suggest that combining a high degree of labor market flexibility with a high level of social protection leads to significant gains in terms of women's labor market participation, while omitting one of the two aspects can produce sub-optimal (or even negative) outcomes in terms of labor market performance. The marginal effect of flexibility on female activity rate turns to be positive in correspondence of a value of the security indicator above 2.00 (2.05 for women with young children and 1.92 for women involved in elderly care). On the other hand, the marginal effect of security turns to be positive for value of the flexibility indicator above 1.76 (1.60 and 1.92 for women involved in child and elderly care respectively).

In Figure 5 we can observe that in the period 2004-2009, the countries for which both the flexibility and security indicators are above the estimated thresholds are the Social Democratic countries (though Sweden only marginally), Netherlands and at the margin Belgium, and Germany.[32] After the institutional reforms implemented in the late nineties and early 2000s to promote a more flexible labor market, Italy appears still deficient on the security side. The opposite holds for France and Spain which are still characterized by a rigid labor market. Greece and Portugal remain well below both the thresholds.

[FIGURE 5 AROUND HERE].

The picture that emerges from this last exercise can be summarized by saying that in the Social Democratic and some central European countries, institutional changes towards the flexicurity model are correlated with positive trends in female labor market participation and this is particular true for young women with kids. On the contrary, in southern European countries and the UK, the security and flexibility mix of workers' jobs is not enough to stimulate women's involvement in labor market.

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[32] Notice that the Social Democratic countries (and to less extent the Continental countries) are also those countries for which we estimated the strongest (negative) trend in the effect of young children on female participation (see table 4).

5.4 Quantifying the influence of institutions and social policies

We now provide a more precise quantification of the effects of labour market flexibility and security and of the social policies in support to families in shaping women' activity rate. Following the growth accounting methodology proposed by Stoker (1985), it is possible to show that, under plausible restrictions, a first-order difference of our multilevel model provides an Oaxaca-fashion decomposition of changes in women activity rates. Such a decomposition enables us to asses how much of the observed growth in female labor force participation is due to changes in the macro factors ($INST$ and POL), as opposed to changes from other sources (such as changes in the individual characteristics). More specifically, the variation of the female activity rate between two periods can be decomposed in five different components. The first term describes how much of the change in women participation rate comes exclusively from changes in individual characteristics, the second term quantifies how much of that change is due to the interplay between - individual characteristics and country-specific unobserved heterogeneity, the third term capture the effects arising from the interaction between changes in individual characteristics and observed macro factors, whereas the fourth component captures the influence of changes in the macro factors $INST$ and POL. The fifth term is a residual component. The technical details of this decomposition are reported in the Appendix 2.

Table 11 collects the estimation results which are obtained using the decomposition for the whole sample, whereas Table 12 shows the evidence for the four welfare regimes separately.

[TABLES 11 & 12 AROUND HERE]

On average, 6.2% of the overall increase in female participation between 1994 and 2009 is associated with changes in the institution and policy indicators. Only a small part of the actual rise over time in the proportion employed is associated with the changes in the indicators of institutions and policies in southern countries (around 3%), while the contribution is remarkable higher in the social democratic countries. For these countries, the $INST$ and POL indicators predict more than 14% of the actual change in the female participation. This last result is in line with the findings discussed in the previous session, which show that in the social democratic regime, institutional changes towards the flexicurity model are correlated with positive trends in female labor market participation.

Table 13 and Table 14 presents the estimation results for the three age and the three education groups respectively.

[TABLES 11 & 12 AROUND HERE]

These results indicate that the contribution of changes of institutions and policies to the growth of female participation is considerably higher when it is calculated for young (24.6%) women and for high skilled women (38.6%). In line with the previous literature, these findings confirm that the social welfare changes and the labor market regulatory reforms in Europe contribute to explain the

observed trends in the activity rate of women who face higher labour market entry costs, such as young women who are at the beginning of their working career and more involved in child care duties. Interestingly, the mix of labour market reforms and policies changes which have been implemented in Europe in the last 20 years fail to explain the observed pattern of the activity rate of low-educated women.

6   Conclusions

In this paper, we provide detailed macro evidence on trends of female labor market participation in the last twenty years for a large set of EU countries using micro data from the ECHP and EU-SILC surveys. Three main results emerge from our analysis.

First, we show that the observed remarkable increase in women's labor market participation between 1994 and 2009 can be explained by significant change in the impact of individual characteristics on women's labor supply. For example, according to our results, the negative impact of childcare on women's participation has declined over time, while informal elderly care has increasingly reduced the likelihood of women to supply labor. Moreover, we find that the observed trends in the labor market participation of women have not been uniform across welfare regimes.

Second, we find that the estimated trends in female labour market participation are related to differences of the labour market institutional setting and of the social policy environment across the countries in the sample. Such policy and institutional factors have an important impact on the labor market opportunities of women by affecting the quality of potential jobs available, the chances to (re-)enter the labor market and the opportunity costs of employment (vs non-employment). However, these effects vary across women with different characteristics, such as the type of family care involvement, the age and the level of education. In particular, the observed positive trend in the attitude to work of women with children appears to be favoured by the expansion of flexible forms of employment (especially in terms of fixed term contracts) which have progressively eased the labor market access and the reconciliation of family child responsibilities with paid work. This positive effect is stronger for women in the early stage of their work life despite the level of education. Generous child and family benefits and maternity/paternity leaves have a positive impact on women labor market attachment of young mothers, and the effect is stronger for medium-high educated individual.

Third, our analysis reveals that the positive trend in female activity rate is related to changes in the institutional framework towards the flexicurity model in countries such as Denmark and Netherlands which are characterized by a balanced mix of flexibility and security. The policy implications of this last set of results are clear: reforms of employment protection towards a larger degree of flex-

ibility need to be accompanied by an increase in state-provided security. Such a mix of institutional reforms will guarantee, on the one hand, lower entry costs for individuals with a weaker attachment to work and, on the other, a set of incentives to actively participate to the labor market.

Finally, we provide a quantification of how much of the observed trend in women labour market participation can be attributed to changes in the labour market institutional setting and family policies through a simple decomposition exercise. We find that the mix of institutional and policy changes accounts for almost 25% of the increase of the labour market participation of young women (around 2.5 percentage points) and 38% of the participation of high educated women (around 1.5 percentage points). Our results also reveal that the changing institutional and policy setting has not favoured the labour market integration of low skilled women in Europe.

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A   APPENDIX 1

A.1   Vigdor index: methodological framework

Let us define D to be a binary variable taking the value 0 if the individual is in group 0, 1 if he/she is in group 1. We are interested in assessing differences between group 0 and group 1 using a one-dimensional measure of how different are the distributions of some characteristics x between group 0 and 1.

Let us denote by $f_o(x)$ the density function of x among group 0 individuals (reference group), $f_1(x)$ the density function of x among group 1 individuals.

Vigdor (2008) estimates a model for

$$P(D = 1|x) = \frac{pf_1(x)}{pf_1(x) + (1-p)pf_0(x)} = \frac{pf_1(x)}{f(x)} = \rho(x), \tag{4}$$

where p is the proportion of group 1 individuals in the population and $f(x)$ is the density function of x in the population. A generalization of the Vidgor index which is between zero and one and is composition invariant (i.e. it does not depend on p) is

$$I = 2\int \frac{f_0(x)f_1(x)}{f_0(x) + f_1(x)} dx = 2\int \frac{1}{1+g(x)} f_1(x) dx.$$

Such an analysis is based on the ratio $g(x) = \frac{f_1(x)}{f_0(x)}$ which will be equal to 1 if group 0 and 1 have the same distribution of x. This implies that any difference in the observed x will result in a discrepancy between group 0 and 1 in the synthetic index.

An important empirical issue is that there might be some characteristics z whose differences between group 0 and 1 are not appropriate to take into consideration in infer a behavioral difference between group 0 and 1. For example, we do not want to label differences in the age structures between two groups as differences in labor market behavior between the two groups. The unconditional distribution of x (as in (4)) will be different if individuals in group 0 and 1 have a different distribution of z. An analysis based on (4) would be misleading. For example, if group 0 and group 1 are women and men, we do not want to capture differences in labor market performance between women and men due to different gender population structure. Gender demographic trends are correlated to differences in employment, labour market participation or job types, but they are not a matter of research themselves. Therefore, we need to work with the distribution of x given z.

Denote by $f_o(x|z)$ the density function of x given z among group 0 individuals, $f_1(x|z)$ the density function of x given z among group 1 individuals. Define the marginal distributions of z among group 0 and 1, $h_o(z)$ and $h_1(z)$ respectively. We are thus interested in the ratio between

density functions

$$g(x|z) = \frac{f_1(x|z)}{f_0(x|z)} = \frac{f_1(x,z)}{f_0(x,z)}\frac{h_o(z)}{h_1(z)}. \tag{5}$$

A generalization of the Vidgor index which allows for the presence of z variables, while remaining composition invariant, is[33]

$$I = 2\int \frac{1}{1 + g(x|z)}f_1(x|z)h_1(z)dxdz \tag{6}$$

Empirically, one has to get an estimate of $g(x|z)$. One way to proceed is as follows.

First, estimate a probit model for being an individual of group 1 on x and z

$$P(D = 1|x, z) = \frac{pf_1(x,z)}{pf_1(x,z) + (1-p)f_0(x,z)} = \frac{pf_1(x,z)}{f(x,z)} = \rho(x,z). \tag{7}$$

We can write

$$\frac{f_1(x,z)}{f_0(x,z)} = \frac{\rho(x,z)}{[1-\rho(x,z)]}\frac{(1-p)}{p}.$$

Substituting into (5), we have that

$$g(x|z) = \frac{\rho(x,z)}{[1-\rho(x,z)]}\frac{(1-p)}{p}\frac{h_o(z)}{h_1(z)}. \tag{8}$$

Second, estimate a probit model for being an individual of group 1 conditional on z alone

$$P(D = 1|z) = \frac{ph_1(z)}{ph_1(z) + (1-p)h_0(z)} = \varphi(z). \tag{9}$$

We can write

$$\frac{h_o(z)}{h_1(z)} = \frac{\varphi(z)}{[1-\varphi(z)]}\frac{(1-p)}{p}.$$

Substituting into (8) we have that

$$g(x|z) = \frac{\rho(x,z)}{[1-\rho(x,z)]}\frac{[1-\varphi(z)]}{\varphi(z)}.$$

In short, the relative densities of x conditional on z can be estimated from the predicted probabilities of two probit models for being an individual in group 1, one conditional on x and z and the other conditional on z alone.

---

[33] The Vidgor index (Vidgor, 2008) is derived for a value of p=0.5 and does not explicity deal with differences between x and z variables.

Having $g(x|z)$ on hand, the average value of the transformation $\frac{1}{1+g(x|z)}$ across group 1 individuals, will then give the synthetic index (6).[34]

A.2   Adaptation to our setting

In our analysis we define D as a dummy taking value 1 if the individual is female (disadvantaged group) and 0 otherwise. We consider two x variables, $x_k, \ \ k = 1, 2$:

- x_1 : dummy taking value 1 if the individual is inactive, and 0 if active (participation rate);

- x_2 : dummy taking value 1 if the active individual is employed, and 0 if unemployed (unemployment rate).

We use as control variables z the individual education level, marital status, partner education, number of children and age.

We thus derive two synthetic indicators (activity index and employment index) for each European country and each year between 1994-2000 (ECHP) and between 2004-2009 (EU-SILC) and we perform T-test statistics to assess significant difference between the begin and the end of the observed time window. Tables in Appendix 3 collects the complete list of results.

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[34] Algan et al. (2012) use this analysis to study cultural and economic integration patterns of immigrants in Europe.

B APPENDIX 2

B.1 An algebric decompostion

Let us consider model 3:

$$y_{ij}^t = \beta_{0j}^t + \beta_{11j}^t CHILD_{ij}^t + \beta_{12j}^t ELDERLY_{ij}^t + \boldsymbol{\beta_2}\prime \mathbf{x}_{2ij}^t + \varepsilon_{ij}^t$$

where

$$
\begin{aligned}
\beta_{0j}^t &= \delta_0 + \delta_1 INST_j^t + \delta_2 POL_j^t + \nu_j^t \\
\beta_{11j}^t &= \gamma_{10} + \gamma_{11} INST_j^t + \gamma_{12} POL_j^t + \upsilon_{1j}^t \\
\beta_{12j}^t &= \gamma_{20} + \gamma_{21} INST_j^t + \gamma_{22} POL_j^t + \upsilon_{2j}^t
\end{aligned}
$$

For simplicity of exposition, let us define $\mathbf{x}_{1ij}^t$ a vector of individual characteristics whose impact depends on macro-factors (which in our model 3 include $CHILD$ and $ELDERLY$).

We obtain:

$$y_{ij}^t = \beta_{0j}^t + \left(\mathbf{x}_{1ij}^t\right)\prime\boldsymbol{\beta}_{1j}^t + \left(\mathbf{x}_{2ij}^t\right)\prime\boldsymbol{\beta}_{2j}^t + \varepsilon_{ij}^t \tag{10}$$

with:

$$
\begin{aligned}
\beta_{0j}^t &= \delta_0^t + \left(\mathbf{z}_{1ij}^t\right)\prime\boldsymbol{\delta}_{1j}^t + \nu_j^t \\
\boldsymbol{\beta}_{1j}^t &= \boldsymbol{\gamma}_0^t + \left(\mathbf{z}_{1ij}^t\right)\prime\boldsymbol{\gamma}_{1j}^t + \boldsymbol{\upsilon}_j^t
\end{aligned}
$$

Hence:

$$y_{ij}^t = \delta_0^t + \left(\mathbf{z}_{1ij}^t\right)\prime\boldsymbol{\delta}_{1j}^t + \left(\mathbf{x}_{1ij}^t\right)\prime\boldsymbol{\gamma}_0^t + \left(\mathbf{x}_{1ij}^t\right)\prime\boldsymbol{\gamma}_{1j}^t\left(\mathbf{z}_{1ij}^t\right)\prime + \left(\mathbf{x}_{2ij}^t\right)\prime\boldsymbol{\beta}_{2j}^t + R^t \tag{11}$$

with: $\left(\mathbf{x}_{1ij}^t, \boldsymbol{\beta}_{1j}^t, \boldsymbol{\gamma}_0^t, \boldsymbol{\upsilon}_{1j}^t\right)$ as $m \times 1$ vectors; $\left(\mathbf{x}_{2ij}^t, \boldsymbol{\beta}_{2j}^t\right)$ as $n \times 1$ vectors; $\left(\mathbf{z}_{1ij}^t, \boldsymbol{\gamma}_{1j}^t, \boldsymbol{\delta}_{1j}^t\right)$ as $p \times 1$ vectors.

Let us take first-differences

$$
\begin{aligned}
y_{ij}^{t} - y_{ij}^{t-1} = {} & \left(\delta_0^t - \delta_0^{t-1} \right) + \left[\left(\mathbf{z}_{1ij}^t \right) \prime \left(\boldsymbol{\delta}_{1j}^t - \boldsymbol{\delta}_{1j}^{t-1} \right) + \left(\mathbf{z}_{1ij}^t - \mathbf{z}_{1ij}^{t-1} \right) \prime \boldsymbol{\delta}_{1j}^{t-1} \right] \qquad (12) \\
& + \left[\left(\mathbf{x}_{1ij}^t \right) \prime \left(\boldsymbol{\gamma}_0^t - \boldsymbol{\gamma}_0^{t-1} \right) + \left(\mathbf{x}_{1ij}^t - \mathbf{x}_{1ij}^{t-1} \right) \prime \boldsymbol{\gamma}_0^{t-1} \right] \\
& + \left[\left(\mathbf{x}_{2ij}^t \right) \prime \left(\boldsymbol{\beta}_2^t - \boldsymbol{\beta}_2^{t-1} \right) + \left(\mathbf{x}_{2ij}^t - \mathbf{x}_{2ij}^{t-1} \right) \prime \boldsymbol{\beta}_2^{t-1} \right] \\
& + \left[\left(\mathbf{x}_{1ij}^t \right) \prime \left(\boldsymbol{\gamma}_1^t - \boldsymbol{\gamma}_1^{t-1} \right) \mathbf{z}_{1ij}^t + \left(\mathbf{x}_{1ij}^t \left(\mathbf{z}_{1ij}^t \right) \prime - \mathbf{x}_{1ij}^{t-1} \left(\mathbf{z}_{1ij}^{t-1} \right) \prime \right) \boldsymbol{\gamma}_1^{t-1} \right] \\
& + \left[R^t - R^{t-1} \right]
\end{aligned}
$$

The model 12 is equivalent to Stoker (1985), which decomposes the change of an aggregate variable (here the proportion of women who participate) into a change of the behavioural micro model (coefficients of 11 foe a series of cross-sections) and a change in the distribution of the micro variables (education, fertility, marital status, etc.). Since our aim is to quantify the role of changes in macro-factors on female decisions, we impose that the coefficient estimates of model 12 do not vary over time: in this way, we are able to use our multilevel model 3 to disentangle how much of changes in behaviour over time depends on changes in policy regulations.[35] In other words, we apply the following restrictions to model 12:

- $\delta_0^t = \delta_0^{t-1} = \bar{\delta}_0$;

- $\boldsymbol{\beta}_2^t = \boldsymbol{\beta}_2^{t-1} = \bar{\boldsymbol{\beta}}_2$;

- $\boldsymbol{\gamma}_0^t = \boldsymbol{\gamma}_0^{t-1} = \bar{\boldsymbol{\gamma}}_0$;

- $\boldsymbol{\gamma}_1^t = \boldsymbol{\gamma}_1^{t-1} = \bar{\boldsymbol{\gamma}}_1$;

- $\boldsymbol{\delta}_1^t = \boldsymbol{\delta}_1^{t-1} = \bar{\boldsymbol{\delta}}_1$;

- $\boldsymbol{\delta}_0^t = \boldsymbol{\delta}_0^{t-1} = \bar{\boldsymbol{\delta}}_0$.

The simplyfied model is

---

[35] Through this simplification, we neglect variations on the coefficient estimates due to changes on preferences which are not related to macro-factors.

Since our aim is to quantify the role of changes in macro-factors on female decisions, this simplification does not affect our results.

$$
\begin{aligned}
y_{ij}^{t} - y_{ij}^{t-1} \;=\;& \left[\left(\mathbf{x}_{2ij}^{t} - \mathbf{x}_{2ij}^{t-1}\right)\prime\bar{\boldsymbol{\beta}}_2\right] + \\[4pt]
& + \left[\left(\mathbf{z}_{j}^{t} - \mathbf{z}_{j}^{t-1}\right)\prime\bar{\boldsymbol{\delta}}_1 + \left(\mathbf{z}_{j}^{t} - \mathbf{z}_{j}^{t-1}\right)\prime\bar{\boldsymbol{\gamma}}_1\left(\mathbf{x}_{1ij}^{t-1}\right)\right] \\[4pt]
& + \left[\left(\mathbf{x}_{1ij}^{t} - \mathbf{x}_{1ij}^{t-1}\right)\prime\bar{\boldsymbol{\gamma}}_0 + \left(\mathbf{z}_{1ij}^{t}\right)\prime\bar{\boldsymbol{\gamma}}_1\left(\mathbf{x}_{1ij}^{t} - \mathbf{x}_{1ij}^{t-1}\right)\right] \\[4pt]
& + \left[R^{t} - R^{t-1}\right] \\[8pt]
\equiv\;& \Delta \text{ individual characteristics } \mathbf{x}_2 \text{ whose effect does not depend on macro factors } z \\[4pt]
& + \Delta \text{ in macro factors } z+ \\[4pt]
& + \Delta \text{ individual characteristics } \mathbf{x}_1 \text{ whose effect depends on macro factors } z \\[4pt]
& + \Delta \text{ residual component}
\end{aligned}
$$

C APPENDIX 3

Synthetic indicator: complete list of results

Table C1 - Activity gap by country and year

Country	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	P-VALUE
AT		0.8742	0.9031	0.9068	0.8954	0.9139	0.9192	0.9161	0.9126	0.9176	0.9232	0.9260	0.9443	0.0000
BE	0.9427	0.9394	0.9384	0.9348	0.9550	0.9547	0.9555	0.9587	0.9676	0.9685	0.9749	0.9763	0.9754	0.0000
DE	0.9622	0.9622	0.9622	0.9622	0.9622	0.9622	0.9622		0.9622	0.9622	0.9622	0.9622	0.9622	0.5761
DK	0.9858	0.9844	0.9783	0.9829	0.9859	0.9897	0.9899	0.9834	0.9931	0.9905	0.9936	0.9907	0.9984	0.0000
ES	0.7959	0.7916	0.7958	0.8054	0.8152	0.8328	0.8408	0.8961	0.9021	0.9147	0.9285	0.9391	0.9454	0.0000
FI			0.9975	0.9972	0.9943	0.9933	0.9954	0.9872	0.9889	0.9884	0.9869	0.9856	0.9811	0.0000
FR	0.9521	0.9293	0.9234	0.9280	0.9349	0.9437	0.9444	0.9797	0.9824	0.9874	0.9888		0.9843	0.0000
GR	0.8104	0.8167	0.8089	0.8197	0.8266	0.8114	0.8405	0.8937	0.9000	0.9005	0.9073	0.9148	0.9201	0.0000
IE	0.7166	0.7383	0.7744	0.7903	0.8129	0.8430	0.8632	0.9094	0.9020	0.8871	0.9106	0.9048	0.9094	0.0000
IT	0.8110	0.8287	0.8269	0.8398	0.8477	0.8604	0.8499	0.9275	0.9191	0.9173	0.9213	0.9203	0.9287	0.0000
LU		0.7657	0.7573	0.7883	0.7929	0.7949	0.8084	0.8741	0.8829	0.8844	0.9146	0.9166	0.9128	0.0000
NL	0.9311	0.9608	0.9567	0.9623	0.9708	0.9706	0.9676		0.8974	0.9523	0.9596	0.9672	0.9747	0.0000
PT	0.8719	0.8894	0.9058	0.9132	0.9151	0.9278	0.9279	0.9537	0.9614	0.9649	0.9727	0.9638	0.9657	0.0000
SE				0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.6140
UK	0.9521	0.9578	0.9572	0.9533	0.9583	0.9622	0.9621		0.9649	0.9545	0.9738	0.9686	0.9693	0.0008

Table C2 – Unemployment gap by country and year

Country							Year							
	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	P-VALUE
AT		1,0000	0,9999	1,0000	0,9987	1,0000	1,0000	1,0000	0,9991	1,0000	1,0000	1,0000	1,0000	0.2003
BE	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0,9887	0.1005
DE	0,9986	0,9978	0,9987	0,9999	0,9993	0,9989	0,9997		0,9978	1,0000	0,9993	0,9999	1,0000	0.0001
DK	0,9975	0,9872	0,9946	0,9925	0,9931	0,9961	0,9920	0,9999	0,9994	0,9982	0,9976	0,9992	1,0000	0.0129
ES	0,9951	0,9939	0,9943	0,9948	0,9945	0,9912	0,9868	0,9833	0,9844	0,9852	0,9848	0,9949	0,9987	0.0121
FI			1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	0.2797
FR	0,9964	0,9926	0,9949	0,9931	0,9902	0,9895	0,9904	0,9997	0,9982	0,9959	0,9958		0,9999	0.0008
GR	0,9788	0,9809	0,9830	0,9851	0,9865	0,9870	0,9922	0,9870	0,9866	0,9845	0,9872	0,9920	0,9932	0.0005
IE	0,9686	0,9722	0,9771	0,9688	0,9780	0,9901	0,9996	0,9924	0,9904	0,9925	0,9945	0,9860	0,9825	0.0011
IT	0,9948	0,9961	0,9953	0,9926	0,9948	0,9935	0,9954	0,9933	0,9921	0,9914	0,9920	0,9912	0,9920	0.0869
LU		1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	0.3528
NL	0,9765	0,9637	0,9718	0,9702	0,9735	0,9704	0,9801		0,9997	0,9997	1,0000	1,0000	0,9998	0.0000
PT	0,9944	0,9983	0,9939	0,9987	0,9968	0,9981	0,9988	0,9994	0,9954	0,9984	0,9992	0,9969	0,9997	0.0226
SE			1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	0.9503
UK	0,9865	0,9966	0,9926	0,9965	0,9955	0,9956	0,9996		0,9989	0,9954	0,9967	0,9967	0,9959	0.0000

Table 1. Summary statistics: female sample[♦]

	Variable	Obs	Mean	Std. Dev.	Min	Max
Individual Characteristics	employed	851010	0.594	0.491	0	1
	active	851010	0.656	0.475	0	1
	male	851010	0.000	0.000	0	0
	age	851010	44.269	11.078	25	64
	ISCED03	832447	0.382	0.486	0	1
	ISCED35	832447	0.344	0.475	0	1
	ISCED57	832447	0.274	0.446	0	1
	single	844864	0.189	0.392	0	1
	incouple	844864	0.687	0.464	0	1
	separated	844864	0.018	0.132	0	1
	divorced	844864	0.067	0.250	0	1
	widowed	844864	0.039	0.193	0	1
Household Characteritsics	children	851010	0.713	1.008	0	15
	child	851010	0.422	0.494	0	1
	child06	851010	0.179	0.383	0	1
	child03	851010	0.096	0.295	0	1
	child36	851010	0.113	0.317	0	1
	child614	851010	0.259	0.438	0	1
	old70	851010	0.060	0.238	0	1
	pISCED03	851010	0.276	0.447	0	1
	pISCED35	851010	0.258	0.438	0	1
	pISCED57	851010	0.198	0.398	0	1
Trend	year	851010	2003	4.983	1994	2009
	cycle	842730	0.006	1.958	-8.636	4.172
Country of residence	DK	851010	0.044	0.206	0	1
	NL	851010	0.070	0.255	0	1
	BE	851010	0.045	0.207	0	1
	FR	851010	0.074	0.262	0	1
	IE	851010	0.043	0.203	0	1
	IT	851010	0.156	0.362	0	1
	GR	851010	0.060	0.237	0	1
	ES	851010	0.111	0.314	0	1
	PT	851010	0.054	0.227	0	1
	AT	851010	0.043	0.204	0	1
	FI	851010	0.068	0.252	0	1
	SE	851010	0.048	0.213	0	1
	DE	851010	0.087	0.282	0	1
	LU	851010	0.035	0.183	0	1
	UK	851010	0.062	0.241	0	1

[♦] ISCED02 (pISCED02): lower secondary education of the woman (of her partner); ISCED35 (pISCED35): upper secondary education of the woman (of her partner); ISCED57 (pISCED57): tertiary education of the woman (of her partner).

Table 2. Summary statistics: male sample [♥]

	Variable	Obs	Mean	Std. Dev.	Min	Max
Individual Characteristics	employed	806357	0.797	0.402	0	1
	active	806357	0.857	0.350	0	1
	male	806357	1.000	0.000	1	1
	age	806357	44.229	11.137	25	64
	ISCED03	788367	0.360	0.480	0	1
	ISCED35	788367	0.368	0.482	0	1
	ISCED57	788367	0.273	0.445	0	1
	single	799834	0.257	0.437	0	1
	incouple	799834	0.675	0.468	0	1
	separated	799834	0.013	0.112	0	1
	divorced	799834	0.046	0.209	0	1
	widowed	799834	0.010	0.098	0	1
Household Characteritsics	children	806357	0.435	0.925	0	14
	child	806357	0.225	0.418	0	1
	child06	806357	0.180	0.384	0	1
	child03	806357	0.100	0.300	0	1
	child36	806357	0.112	0.315	0	1
	child614	806357	0.244	0.430	0	1
	old70	806357	0.061	0.239	0	1
	pISCED03	806357	0.278	0.448	0	1
	pISCED35	806357	0.261	0.439	0	1
	pISCED57	806357	0.198	0.398	0	1
Trend	year	806357	2003.000	4.985	1994	2009
	cycle	798435	0.012	1.959	-8.636	4.172
Country of residence	DK	806357	0.045	0.207	0	1
	NL	806357	0.068	0.253	0	1
	BE	806357	0.044	0.205	0	1
	FR	806357	0.073	0.261	0	1
	IE	806357	0.043	0.202	0	1
	IT	806357	0.159	0.366	0	1
	GR	806357	0.060	0.238	0	1
	ES	806357	0.111	0.314	0	1
	PT	806357	0.053	0.224	0	1
	AT	806357	0.043	0.203	0	1
	FI	806357	0.073	0.260	0	1
	SE	806357	0.049	0.216	0	1
	DE	806357	0.083	0.276	0	1
	LU	806357	0.036	0.187	0	1
	UK	806357	0.059	0.235	0	1

[♥] ISCED02 (pISCED02): lower secondary education of the man (of his partner); ISCED35 (pISCED35): upper secondary education of the man (of his partner); ISCED57 (pISCED57): tertiary education of the man (of his partner).

Table 3: Female activity by welfare regimes

	ALL			LIBERAL			CONTINENTAL			DEMOCRATIC			SOUTHERN		
	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.
Marital status															
Single															
incouple	-0.071	***	0.003	-0.009		0.010	-0.098	***	0.005	-0.022	***	0.005	-0.109	***	0.006
separated	0.057	***	0.007	0.022		0.018	0.056	***	0.016	-0.006		0.024	0.100	***	0.009
divorced	0.05	***	0.004	0.036	***	0.012	0.033	***	0.006	-0.013	*	0.007	0.125	***	0.008
widowed	-0.067	***	0.006	0.019		0.013	-0.100	***	0.011	-0.021	*	0.013	-0.109	***	0.009
Children															
No children															
children	-0.038	***	0.003	-0.027	**	0.012	-0.036	***	0.005	-0.036	***	0.006	-0.039	***	0.004
child	0.043	***	0.005	0.064	***	0.017	0.061	***	0.008	0.073	***	0.008	0.035	***	0.007
child03	-0.174	***	0.004	-0.275	***	0.012	-0.254	***	0.007	-0.173	***	0.007	-0.073	***	0.006
child36	-0.088	***	0.003	-0.177	***	0.011	-0.082	***	0.006	-0.002		0.006	-0.064	***	0.005
child614	-0.067	***	0.003	-0.129	***	0.008	-0.064	***	0.005	0.027	***	0.005	-0.061	***	0.004
Co-habiting Elderly															
no_elderly															
old70-80	-0.068	***	0.005	-0.183	***	0.023	-0.149	***	0.014	-0.151	***	0.016	-0.029	***	0.006
old80	-0.025	***	0.006	-0.080	***	0.032	-0.036	**	0.017	-0.121	***	0.029	-0.010		0.008
Education															
Low skilled															
ISCED35	0.122	***	0.002	0.177	***	0.008	0.096	***	0.004	0.091	***	0.004	0.135	***	0.003
ISCED57	0.214	***	0.003	0.223	***	0.008	0.176	***	0.004	0.138	***	0.005	0.266	***	0.004
pISCED03	-0.016	***	0.003	0.035	***	0.011	0.000		0.007	0.049	***	0.006	-0.033	***	0.006
pISCED35	0.039	***	0.003	0.078	***	0.009	0.044	***	0.005	0.067	***	0.005	0.017	***	0.006
pISCED57	0.018	***	0.004	0.042	***	0.009	0.023	***	0.006	0.058	***	0.005	0.014	**	0.007
Age															
Age_25-34															
age_35_44	0.052	***	0.003	0.039	***	0.009	0.067	***	0.005	0.074	***	0.005	0.034	***	0.005
age_45_54	-0.013	***	0.003	-0.056	***	0.011	0.018	***	0.006	0.089	***	0.005	-0.054	***	0.005
age_55_64	-0.295	***	0.004	-0.300	***	0.012	-0.301	***	0.007	-0.078	***	0.007	-0.366	***	0.005
Macro															
trend	0.012	***	0.001	0.008	***	0.003	0.019	***	0.001	0.004	***	0.001	0.009	***	0.001
cycle	0.003	***	0.001	0.000		0.002	0.007	***	0.001	0.000		0.001	-0.001		0.001
UK				Ref.											
DK	0.075	***	0.005							Ref.					
NL	-0.039	***	0.004				0.008		0.006						
BE	0.018	***	0.004				0.065	***	0.005						
FR	0.078	***	0.004				0.128	***	0.005						
IE	-0.046	***	0.005				Ref.								
IT	-0.077	***	0.004										-0.292	***	0.005
GR	-0.041	***	0.004										-0.263	***	0.006
ES	0.012	***	0.004										-0.201	***	0.006
PT	0.159	***	0.004										Ref.		
AT	-0.053	***	0.004				0.001		0.006						
FI	0.072	***	0.004							-0.002		0.004			
SE	0.1	***	0.004							0.031	***	0.004			
DE	0.005		0.004				0.058	***	0.006						
LU	-0.04	***	0.006				0.008		0.007						
Observations	818168			50464			328750			129536			309418		
Log likelihood	-432849			-26584			-166126			-60103			-169704		
pseudo - R2	0.148			0.123			0.142			0.086			0.174		
Country dummies				yes			Yes			yes			yes		

Table 4: Female activity rate: trends and welfare regimes

	ALL			LIBERAL			CONTINENTAL			DEMOCRATIC			SOUTHERN		
	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.
Marital status															
Single															
Incouple	-0.021		0.022	0.029		0.074	-0.065	*	0.035	0.033		0.034	0.008		0.033
Separated	0.055	***	0.007	0.033	*	0.017	0.021		0.018	0.012		0.024	0.091	***	0.009
Divorced	0.029	***	0.005	0.039	***	0.013	0.006		0.007	-0.020	***	0.007	0.114	***	0.008
Widowed	-0.032	***	0.006	0.022	*	0.013	-0.049	***	0.010	-0.009		0.013	-0.045	***	0.008
Children															
No children															
Children	-0.032	***	0.003	-0.019		0.012	-0.026	***	0.006	-0.038	***	0.006	-0.031	***	0.004
Childd	0.046	***	0.017	-0.001		0.068	0.085	***	0.030	0.146	***	0.028	0.026		0.023
child03d	-0.120	***	0.026	-0.313	***	0.086	-0.186	***	0.044	-0.381	***	0.049	-0.038		0.034
child36d	-0.126	***	0.024	-0.245	***	0.087	-0.181	***	0.041	0.001		0.042	-0.104	***	0.031
child614d	-0.042	**	0.018	-0.121	*	0.068	-0.040		0.033	-0.017		0.036	-0.058	**	0.024
trend*child	0.000		0.001	0.004		0.005	-0.002		0.002	-0.005	**	0.002	0.000		0.002
trend*child03	-0.003		0.002	0.006		0.007	-0.002		0.004	0.015	***	0.003	-0.002		0.003
trend*child36	0.003		0.002	0.006		0.007	0.007	**	0.003	-0.001		0.003	0.005	*	0.003
trend*child614	-0.002		0.001	0.000		0.005	-0.002		0.003	0.003		0.003	0.000		0.002
Co-habiting Elderly															
no elderly															
old7080	0.031		0.035	-0.184		0.175	0.015		0.087	-0.100		0.111	0.028		0.039
old80	-0.062		0.044	-0.015		0.246	-0.083		0.119	-0.062		0.191	-0.067		0.046
trend*old7080	-0.008	***	0.003	0.002		0.013	-0.011		0.007	-0.003		0.008	-0.006	**	0.003
trend*old80	0.004		0.003	-0.004		0.019	0.005		0.009	-0.003		0.014	0.005		0.004
Education															
Low skilled															
ISCED35	0.074	***	0.017	0.171	***	0.065	-0.018		0.032	0.116	***	0.033	0.124	***	0.023
ISCED57	0.129	***	0.021	0.156	**	0.073	-0.002		0.038	0.154	***	0.036	0.223	***	0.027
trend*ISCED35	0.006	***	0.001	0.001		0.006	0.012	***	0.003	0.000		0.003	0.002		0.002
trend*ISCED57	0.010	***	0.002	0.007		0.006	0.019	***	0.003	0.002		0.003	0.004	**	0.002
pISCED03	-0.036		0.025	0.011		0.097	0.022		0.047	0.005		0.046	-0.065	*	0.035
pISCED35	-0.043	*	0.024	0.039		0.077	0.014		0.039	-0.010		0.041	-0.093	***	0.036
pISCED57	-0.029		0.026	0.031		0.080	-0.024		0.042	-0.020		0.045	0.004		0.041
trend*pISCED03	0.003	*	0.002	0.002		0.008	0.000		0.004	0.005		0.004	0.004	*	0.003
trend*pISCED35	0.009	***	0.002	0.004		0.006	0.004		0.003	0.008	***	0.003	0.011	***	0.003
trend*pISCED57	0.006	***	0.002	0.001		0.006	0.006	*	0.003	0.008	**	0.004	0.003		0.003
Age															
25-34															
35-44	0.006		0.022	0.084		0.079	-0.061		0.039	0.125	***	0.037	0.017		0.028
45-54	-0.085	***	0.023	-0.129		0.090	-0.177	***	0.039	0.125	***	0.041	-0.050	*	0.031
55-64	-0.383	***	0.021	-0.312	***	0.089	-0.529	***	0.025	0.010		0.043	-0.291	***	0.029
trend*(35-44)	0.005	***	0.002	-0.003		0.006	0.010	***	0.003	-0.004		0.003	0.004	*	0.002
trend*(45-54)	0.008	***	0.002	0.006		0.007	0.016	***	0.003	-0.002		0.004	0.005	**	0.002
trend*(55-64)	0.011	***	0.002	0.004		0.007	0.025	***	0.003	-0.006	*	0.003	0.005	*	0.003
Macro															
trend	0.001		0.002	0.000		0.007	-0.006		0.004	0.006		0.004	0.005	**	0.002
cycle	0.005	***	0.001	0.002		0.002	0.007	***	0.001	0.001	**	0.001	0.004	***	0.001
Observations	818168			50464			328750			129536			309418		
Log likelihood	-473009.5			-27444.5			-186695.4			-67324.4			-185333.1		
pseudo - R2	0.128			0.117			0.122			0.084			0.132		
Country dummies	yes			-			yes			yes			yes		

Table 5. Description of macro policy and institutional indicators

Final Variable	Original Varable	Description	Source
Institutions	Employment Protection Legislation	Composite indicator of employment protection which refers both to regulations concerning hiring (e.g. rules favouring disadvantaged groups, conditions for using temporary or fixed-term contracts, training requirements) and firing (e.g. redundancy procedures, mandated prenotification periods and severance payments, special requirements for collective dismissals and short-time work schemes).	OECD, various years
	Passive Labour Market Policies	Sum of national expenditures on active labour market policies (in percentage of national GDP), including: Out-of-work income maintenance and support, Early retirement.	OECD, various years
	Active Labour Market Policies	Sum of national expenditures on active labour market policies (in percentage of national GDP), including: Training, Job Rotation and Job Sharing, Employment incentives, Supported employment and rehabilitation, Direct job creation, Start-up incentives.	OECD, various years
Policies	Elderly Subsidies	Sum of national transfers to the elderly population (per head at constant prices (2000) and constant PPPs (2000), in US dollars), weighted by the percentage of old-age population (over 70 years old) within the country. This set of policies includes: Old age cash and in kind benefits, Residential care or Home-help services.	OECD, various years
	Family Susidies	Sum of national expenditures on allowances and other type of monthly transfers to the households (per family at constant prices (2000) and constant PPPs(2000), in US dollars). We consider a weighted sum of monthly family allowances for the first, second, and third child in national currency, with weights equal to the average number of children a woman would have if she lived to the end of her childbearing years (conventionally considered to be 15-44 but sometimes 15-49) and bore children at the prevailing rate for each age during that period. Value of tax and benefit transfers of one-earner-two-parent two-child families are considered. The value was calculated by subtracting the disposable income (after taxes and transfers) of a one-earner-two-parent-two-child family from that of a comparable childless single earner.	Anne H. Gauthier, 2011
	Paternal Leave	Composite indicator of national expenditures on maternity, parental, and child care leave schemes. It is a weighted sum of the total number of weeks of maternity, parental and child-care leave, with weights equal to the cash benefits paid during the leave as a percent of female wages in manufacturing.	Anne H. Gauthier, 2011

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Table 6. Principal Component Analysis: rotated factor loadings

Variable	Factor1	Factor2	Uniqueness[*]
Elderly Subsidies	0.2570		0.9339
Parental Leave	0.8251		0.3192
Family Subsidies	0.8399		0.2946
Employment Protection Legislation		-0.1499	0.9775
Passive Labour Market Policies		0.9119	0.1684
Active Labour Market Policies		0.9215	0.1509

[*] The variance of each original variable not captured by the factor is an error term called a uniqueness. Hence, the greater 'uniqueness' the lower the relevance of the variable in the resulting factor.

Table 7: Two-Level probit regression: the impact policy & institutions by age

	ALL		25-34		34-45		44-55	
	Coef.	St.Err.	Coef.	St.Err.	Coef.	St.Err.	Coef.	St.Err.
INST	-0.006	0.014	-0.031	0.037	0.008	0.015	0.024	0.015
POL	0.003	0.024	-0.009	0.045	0.013	0.026	0.006	0.020
INST × child06	0.015 ***	0.001	0.040 ***	0.002	0.002	0.002	0.008	0.006
POL × child06	0.000	0.001	0.006 ***	0.002	0.003	0.002	0.008	0.006
INST× old70	-0.020 ***	0.003	-0.013 **	0.006	-0.019 ***	0.005	-0.023 ***	0.005
POL × old70	-0.008 **	0.003	-0.008	0.007	0.004	0.006	-0.026 ***	0.005
VPC_overall	0.056		0.199		0.063		0.042	
VPC_level 2	0.426		0.675		0.439		0.439	

Table 8: Two-Level probit regression: the impact policy & institutions by education

	ISCED_03		ISCED_35		ISCED_57	
	Coef.	St.Err.	Coef.	St.Err.	Coef.	St.Err.
INST	0.004	0.028	-0.012	0.013	-0.015 ***	0.014
POL	-0.021	0.041	-0.001	0.024	-0.010	0.020
INST × child06	0.012 ***	0.003	0.014 ***	0.002	0.025 ***	0.002
POL × child06	0.001	0.002	0.004 **	0.002	0.011 ***	0.002
INST× old70	-0.041 ***	0.006	-0.020 ***	0.006	-0.001	0.006
POL × old70	-0.020 ***	0.006	-0.001	0.006	0.002	0.006
VPC_overall	0.121		0.048		0.058	
VPC_level 2	0.572		0.419		0.453	

Table 9: Two-Level probit regression flexicurity: the impact of flexicurity by age

	ALL			25-34			35-44			45-54	
	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.	Coef.	St.Err.
FLEX	-0.248	**	0.118	-0.197		0.139	-0.131		0.094	-0.057	0.072
SEC	-0.209	*	0.116	-0.168	*	0.098	-0.132		0.097	-0.044	0.07
FLEX x SEC	0.118	*	0.061	0.095	*	0.05	0.084	*	0.044	0.029	0.033
FLEX x child06	-0.057	***	0.003	-0.056	***	0.004	-0.069	***	0.004	-0.044	0.011
SEC x child06	-0.022	***	0.004	0.021	***	0.006	-0.067	***	0.007	-0.022	0.019
FLEX x SEC x child06	0.025	***	0.002	0.019	***	0.003	0.038	***	0.003	0.016	0.009
FLEX x old70	-0.022	***	0.005	-0.027	**	0.011	-0.033	***	0.009	-0.01	0.008
SEC x old70	-0.031	***	0.008	-0.042	***	0.016	-0.036	***	0.013	-0.017	0.012
FLEX x SEC x old70	0.006		0.005	0.022	**	0.01	0.01		0.008	-0.007	0.007
VPC_overall	0.224			0.257			0.308			0.333	
VPC_level 2	0.264			0.287			0.385			0.589	

Table 10: Two-Level probit regression flexicurity: the impact of flexicirity by education

	ISCED 0-2			ISCED 3-5			ISCED 5-7		
	Coef.		St.Err.	Coef.		St.Err.	Coef.		St.Err.
FLEX	-0.136		0.149	-0.002		0.064	-0.014		0.046
SEC	-0.242	*	0.149	0.022		0.063	-0.007		0.049
FLEX x SEC	0.133	***	0.054	0.026		0.032	0.022		0.025
FLEX x child06	-0.067	***	0.005	-0.084	***	0.005	-0.052	***	0.004
SEC x child06	-0.010		0.008	-0.048	***	0.006	0.014	**	0.006
FLEX x SEC x child06	0.019	***	0.004	0.038	***	0.003	0.006	*	0.003
FLEX x old70	-0.002		0.009	-0.048	***	0.010	-0.013		0.009
SEC x old70	-0.013		0.013	-0.078	***	0.014	-0.009		0.014
FLEX x SEC x old70	0.017	**	0.008	0.035	***	0.008	0.005		0.009
VPC_overall	0.365			0.211			0.211		
VPC_level 2	0.418			0.322			0.323		

Table 11: INST and POL contribution to female participation

	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)
		EU15		
1995	0.0053	0.0009	0.0007	0.170
1996	0.0165	0.0005	0.0087	0.030
1997	0.0234	0.0011	0.0183	0.047
1998	0.0318	0.0025	0.0123	0.079
1999	0.0439	0.0027	0.0130	0.062
2000	0.0515	0.0037	0.0097	0.072
2004	0.0813	0.0021	0.0558	0.026
2005	0.0888	0.0046	0.0605	0.052
2006	0.0970	0.0055	0.0626	0.057
2007	0.1023	0.0070	0.0640	0.068
2008	0.1073	0.0075	0.0614	0.070
2009	0.1130	0.0026	0.0557	0.023
mean				0.063

Table 12: INST and POL contribution to female participation by welfare regime

	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)
		Continental				Social Democratic		
1995	0.0059	0.0008	-0.0036	**0.136**	-0.001	0.0007	-0.0064	**-0.700**
1996	0.0186	0.0001	-0.0029	**0.005**	-0.001	-0.0002	-0.0198	**0.200**
1997	0.0307	0.0007	-0.0011	**0.023**	-0.0083	0.0014	-0.0192	**-0.169**
1998	0.0407	0.0032	-0.025	**0.079**	-0.0067	0.0021	-0.0184	**-0.313**
1999	0.0566	0.004	-0.0263	**0.071**	-0.0007	0.0002	-0.0175	**-0.271**
2000	0.0651	0.0051	-0.031	**0.078**	-0.0003	0.00017	-0.015	**-0.567**
2004	0.0996	-0.0003	0.0279	**-0.003**	0.0003	0.00023	0.0016	**0.767**
2005	0.109	0.0058	0.0429	**0.053**	0.0053	0.0045	0.0002	**0.849**
2006	0.1181	0.0064	0.0439	**0.054**	0.0083	0.0053	0.0009	**0.639**
2007	0.126	0.0074	0.0454	**0.059**	0.0117	0.0075	-0.0008	**0.641**
2008	0.1281	0.0098	0.0413	**0.077**	0.018	0.0079	-0.0046	**0.439**
2009	0.1357	0.0027	0.0319	**0.020**	0.016	0.0031	-0.0091	**0.194**
mean				**0.054**				**0.142**
		Liberal				Southern		
1995	0.002	-0.0002	0.0017	**-0.100**	0.0097	0.0009	0.0031	**0.093**
1996	0.007	0.0002	0.0038	**0.029**	0.0283	0.0014	0.004	**0.049**
1997	0.011	0.0003	0.0059	**0.027**	0.0375	0.002	0.0057	**0.053**
1998	0.013	0.0006	0.0534	**0.046**	0.0498	0.0025	0.0082	**0.050**
1999	0.021	0.0009	0.0585	**0.043**	0.0607	0.0019	0.01	**0.031**
2000	0.023	0.0022	0.0395	**0.096**	0.0735	0.0018	0.0125	**0.024**
2004					0.1235	0.0013	0.0499	**0.011**
2005	0.034	0.004	0.0739	**0.118**	0.1298	0.002	0.0514	**0.015**
2006	0.037	0.0038	0.0708	**0.103**	0.1415	0.0032	0.0547	**0.023**
2007	0.037	0.004	0.0774	**0.108**	0.145	0.0049	0.0563	**0.034**
2008	0.043	0.0035	0.0764	**0.081**	0.1537	0.0038	0.0552	**0.025**
2009					0.1622	-0.0006	0.0562	**-0.004**
mean				**0.055**				**0.034**

Table 13: INST and POL contribution to female participation by age groups

	25-34				35-44				45-54		
	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)
1995	0.0160	0.0073	-0.0028	0.456	0.0346	0.0003	-0.0030	0.009	0.0556	-0.0031	0.0089	-0.056
1996	0.0290	0.0032	-0.0022	0.110	0.0473	0.0013	0.0026	0.027	0.0609	0.0012	0.0276	0.020
1997	0.0342	0.0043	-0.0074	0.126	0.0549	0.0022	0.0098	0.040	0.0728	0.0024	0.0535	0.033
1998	0.0380	0.0088	-0.0172	0.232	0.0580	0.0045	0.0003	0.078	0.0876	0.0007	0.0536	0.008
1999	0.0509	0.0108	-0.0209	0.212	0.0713	0.0048	-0.0021	0.067	0.1049	0.0004	0.0629	0.004
2000	0.0598	0.0191	-0.0331	0.319	0.0796	0.0045	-0.0063	0.057	0.1121	-0.0040	0.0675	-0.036
2004	0.0741	0.0159	0.0314	0.215	0.1044	0.0006	0.0523	0.006	0.1614	-0.0031	0.1078	-0.019
2005	0.0769	0.0195	0.0019	0.254	0.1110	0.0068	0.0509	0.061	0.1772	-0.0015	0.1415	-0.008
2006	0.0842	0.0229	-0.0041	0.272	0.1194	0.0077	0.0518	0.064	0.1871	-0.0033	0.1536	-0.018
2007	0.0856	0.0289	-0.0098	0.338	0.1257	0.0094	0.0523	0.075	0.1962	-0.0060	0.1638	-0.031
2008	0.0887	0.0291	-0.0176	0.328	0.1285	0.0104	0.0493	0.081	0.2061	-0.0057	0.1657	-0.028
2009	0.0949	0.0087	-0.0207	0.092	0.1359	0.0038	0.0423	0.028	0.2107	0.0005	0.1598	0.002
mean				0.246				0.049				-0.011

Table 14: INST and POL contribution to female participation by education groups

	isced_02				isced_35				isced_67			
	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)	Δ activity rate	predicted by INST and POL	predicted by other observables	INST and POL contribution (%)
1995	0.0485	-0.0017	-0.0002	-0.035	0.0163	0.0023	-0.0001	0.141	0.0117	0.0054	-0.0038	0.462
1996	0.0401	-0.0021	0.0034	-0.052	0.0301	0.0005	0.0055	0.017	0.0163	-0.0028	-0.0006	-0.172
1997	0.0467	-0.0034	0.0106	-0.073	0.0297	0.0005	0.0165	0.017	0.0191	-0.0015	0.0021	-0.079
1998	0.0694	-0.0131	0.0046	-0.189	0.0513	0.0034	0.0152	0.066	0.0339	0.0104	-0.0164	0.307
1999	0.0608	-0.0115	0.0044	-0.189	0.0491	0.0035	0.0154	0.071	0.0301	0.0119	-0.0199	0.395
2000	0.0677	-0.0143	0.0034	-0.211	0.0574	0.0067	0.0154	0.117	0.0293	0.02	-0.0226	0.683
2004	0.0825	-0.0061	0.0435	-0.074	0.0656	0.0063	0.0383	0.096	0.0336	0.0157	-0.0012	0.467
2005	0.0866	-0.0115	0.0387	-0.133	0.0697	0.0061	0.0254	0.088	0.0361	0.0177	-0.0169	0.490
2006	0.0923	-0.0132	0.04	-0.143	0.0791	0.0071	0.0276	0.090	0.0388	0.0207	-0.0173	0.534
2007	0.1008	-0.0168	0.0402	-0.167	0.0831	0.0093	0.0254	0.112	0.0405	0.0254	-0.0161	0.627
2008	0.1017	-0.0164	0.0388	-0.161	0.0873	0.0094	0.0198	0.108	0.0409	0.0257	-0.0241	0.628
2009	0.0998	-0.0066	0.0345	-0.066	0.0913	0.0062	0.0095	0.068	0.044	0.0132	-0.0323	0.300
mean				-0.124				0.082				0.387

Figure 1. Macro data trends in Europe: Activity rate by gender, 1994-2009
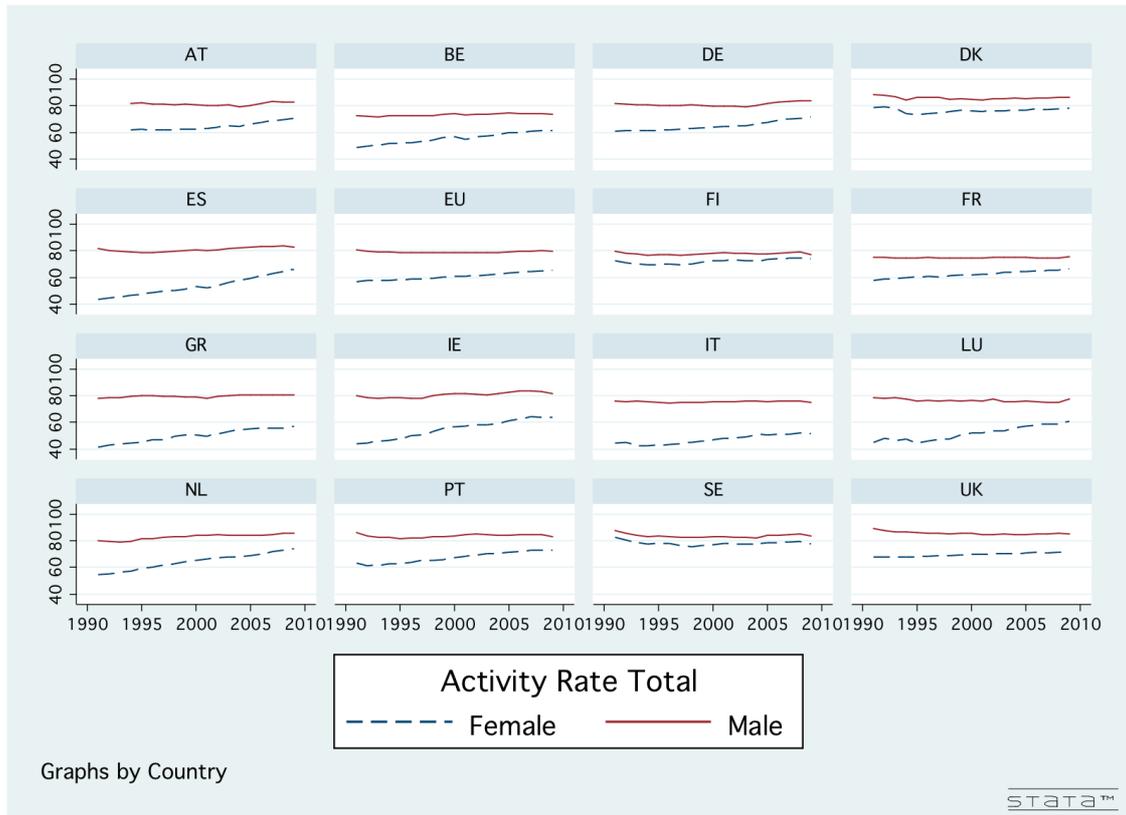
Figure 2. Macro data trends in Europe: Unemployment rate by gender, 1994-2009
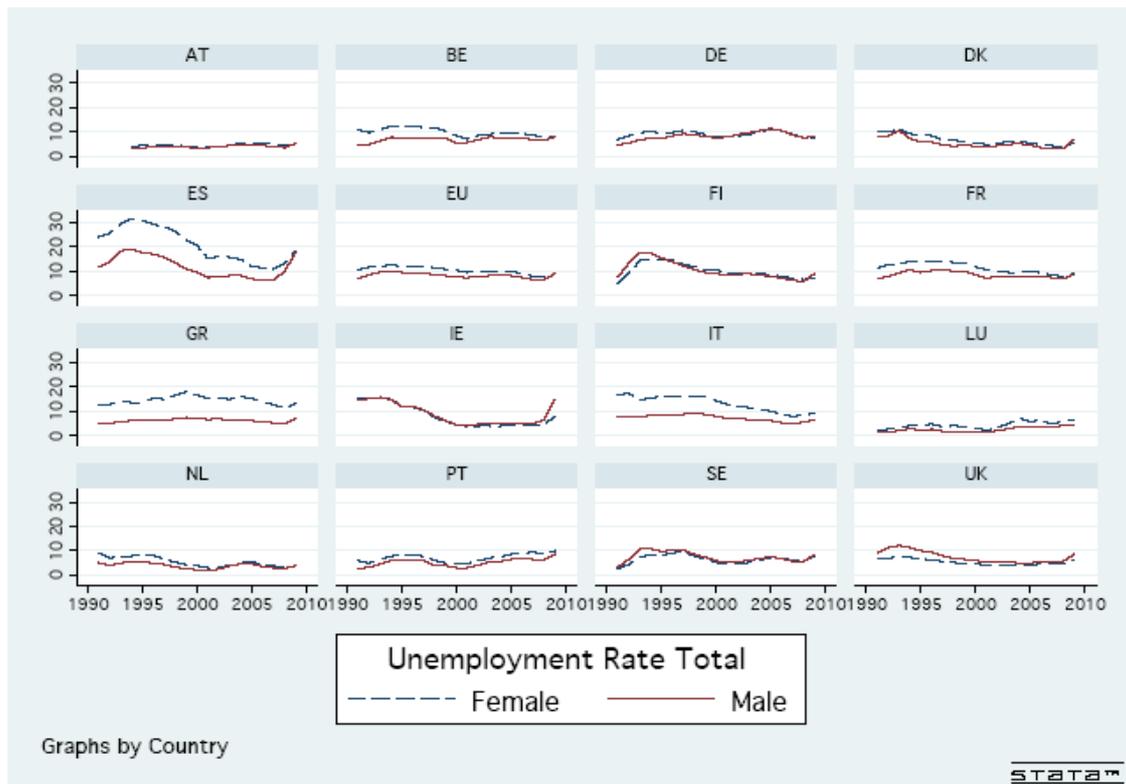
Figure 3. Micro-based gender gap index in activity rates, 1994-2009
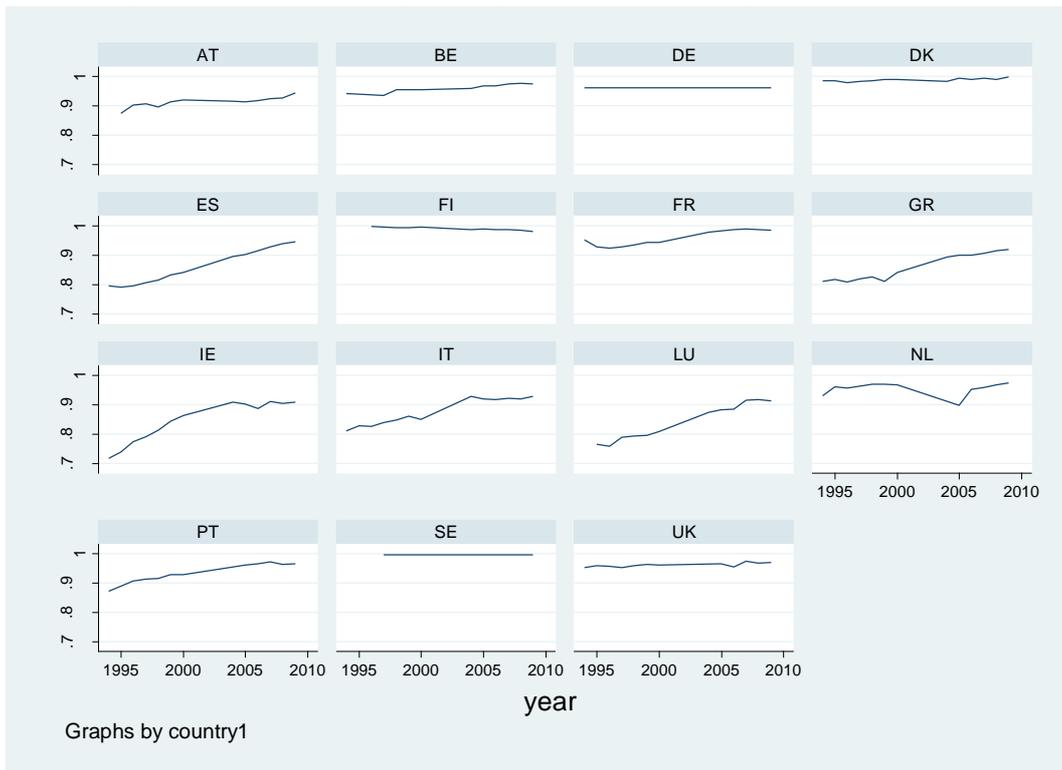
*Source:* Own elaborations from ECHP and EUSILC databases.

Figure 4. Micro-based gender gap index in unemployment rates, 1994-2009
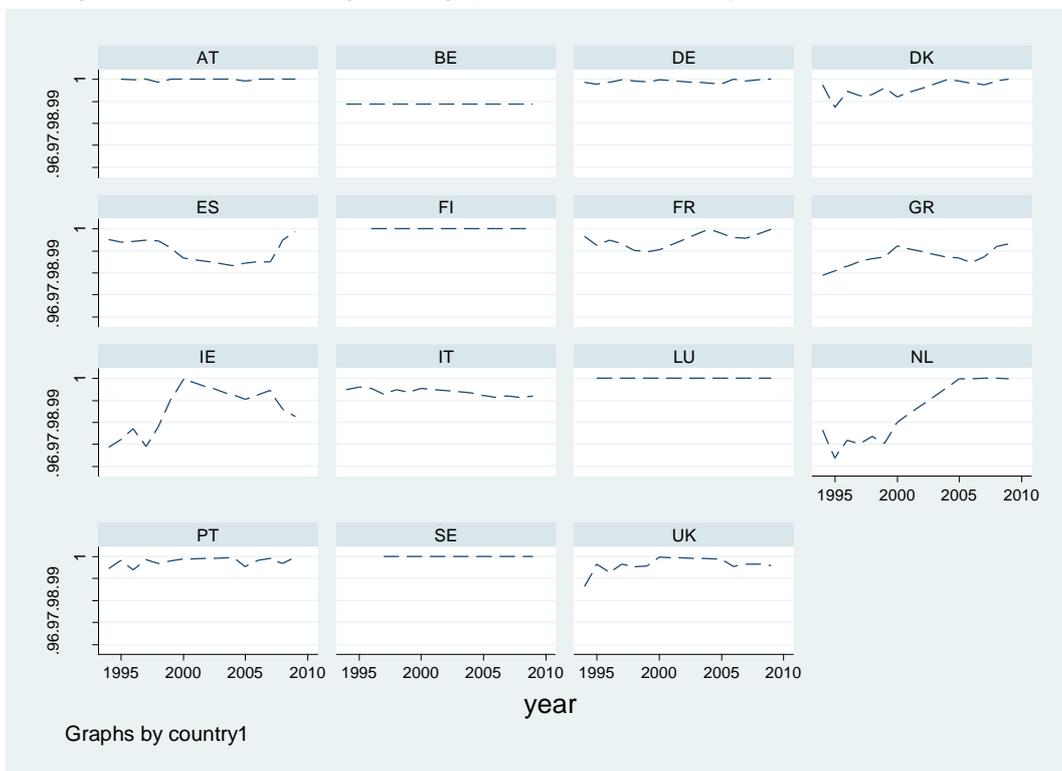
*Source:* Own elaborations from ECHP and EUSILC databases.

Figure 5: The flexicurity dimensions

2004-2009
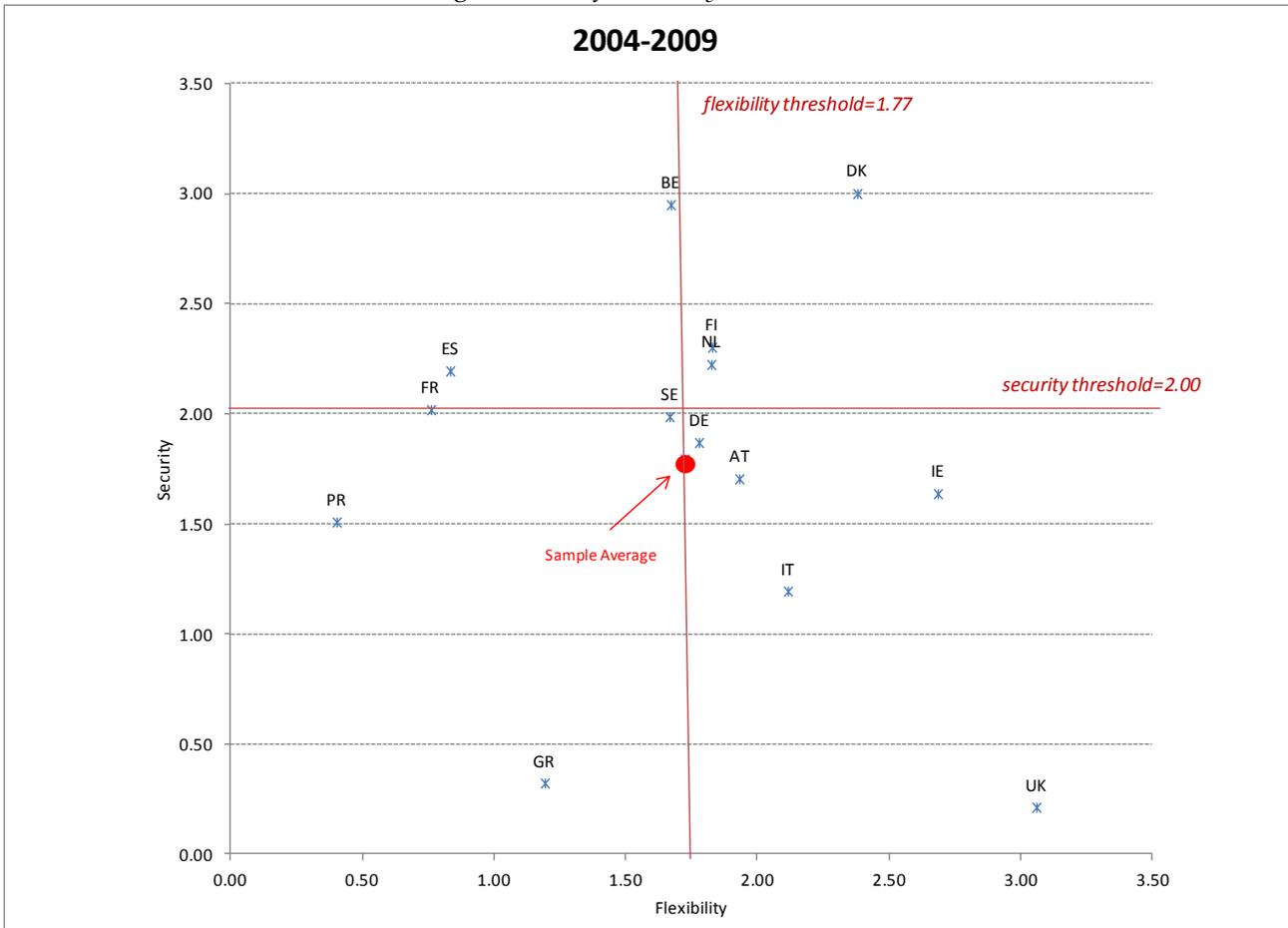
Source: Own elaborations from OECD institutions and SOCX databases