

## Women's Labour Market Performance in Europe: Trends and Shaping Factors

Angela Cipollone  
Eleonora Patacchini  
Giovanna Vallanti

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### Abstract

We investigate the changes in women's employment patterns across EU countries over the last 20 years both in terms of labour market participation and type of jobs using individual data from ECHP and EUSILC databases. Using a logistic multilevel model, we then pin down the role played by institutional and policy changes in explaining women's employment. The key results indicate that women's employment trends are related to the institutional and policy changes that have been introduced in almost all European countries since the end of the 1990s. Such changes had an important impact on the labour market 'opportunities' of women by affecting the quality of potential jobs available, the chances to (re-)enter the labour market and the opportunity costs of employment (vs. non-employment).

**Keywords:** Female labour force participation, Trends, Labour Market Institutions, Flexicurity, Multilevel analysis

**JEL Classification codes:** J11, J21, J22



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Angela Cipollone, Eleonora Patacchini and Giovanna Vallanti\*  
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## 1. Introduction

Over the last two decades, many European countries experienced an increase in female labour force participation and employment. On average, the participation rate has increased from around 55% in the early 1990s to more than 66% in 2008 (Figure 1). In the same period the women's employment rate has moved to the same direction, by increasing from 49% to 61% (Figure 2). This steady improvement in women's labour market position has led to a significant decline in the gender employment gap, defined as the difference in the employment rate between men and women, which have nearly halved since 1990, from more than 25% to almost 14% in 2008. The observed aggregate increase in participation and employment hides substantial differences both across different groups of women and across countries suggesting an important role for cross-country heterogeneity in the factors that affect women's labour market outcomes.

The existing literature has identified a number of factors that could have contributed to the overall changes in women's labour market behaviour: changes in cultural attitudes towards work (especially in countries where participation is traditionally lower), demographic factors (with a larger share of population in prime working age), changes in the characteristics of the female population (e.g. fertility decisions both in terms of the number of children and age at which having the first child) and educational choices. Other pertinent factors include reforms of the welfare state and changes of labour market institutions and policies specifically targeted at groups with lower attachment to the labour market. Changes in the labour market behaviour of women with specific characteristics (e.g. a desire for smaller families) may reflect changing preferences (cultural attitudes towards work) but also changes in restrictions that prevented women from participating in the past.

Recent empirical literature (Petrongolo, 2004) has questioned the role played by the growth of 'atypical' jobs during the last decade, typically part-time and temporary occupations, in explaining recent labour market developments. Part-time work represents an opportunity for flexible hours of work and for combining wage work with family commitments, especially for women. However, in some cases, part-time work might as well be considered as a form of underemployment, when lower wages are combined with low job security and weak occupational attachment (OECD, 1999). Similarly, temporary contracts may provide firms with a useful means of screening workers, and therefore represent stepping-stones towards permanent employment. However, they have been frequently used as a cheaper option to adjust firm-level employment, especially in countries where regular worker are over-protected. The incidence of part-time jobs and, to a lesser extent, of temporary jobs is traditionally higher among women than men (see Figures 3 and 4). On average, more women work part-time in central and northern Europe than in the south, while no major

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\* Angela Cipollone, LUISS University and CeLEG; Eleonora Patacchini, La Sapienza University of Rome, CEPR, EIEF and IZA; Giovanna Vallanti, LUISS University, LuissLab and CeLEG.

geographical pattern can be detected for men. The incidence of temporary contracts seems slightly higher among women than men, although it varies more across countries than across genders. Although men and women both experienced an increase in part-time and temporary employment over the last 20 years, the progressive deregulation of the labour market could not necessarily be gender neutral. As a matter of fact, occupational flexibility typically affects men at the beginning and at the end of their working life, whereas women are more frequently involved in temporary and part-time occupations throughout their working life.<sup>1</sup>

As a consequence, on the one hand, the increasing availability of 'atypical' jobs and more flexible forms of employment may have helped women to better integrate in the labour market and narrow the employment gap with men. On the other hand, this integration process may have occurred at the expense of increasing gender job segregation, to the extent that differences across genders in the 'quality' of occupation are not fully explained by different preferences or productivity of men and women.

The objective of the paper is two-fold. The first is to assess the recent trends in women's employment and labour market participation with a focus on the changes in the 'type' of occupation (temporary vs. regular and part-time vs. full-time) women are involved in. We begin our analysis by developing a time-variant country-specific synthetic indicator for quantifying the female labour market performance (relative to men) by considering both the quantitative (employment and participation) and qualitative (type of contract) dimensions of labour market attachment. This is done by estimating simple binary choice regression models for the period 1994-2009 for the probabilities of participating in the labour force, being employed, working part-time and holding a fixed-term contract, controlling for a number of individual and job characteristics. In the second part of the paper, we focus on the role played by the interplay of macro-institutional factors and policies and individual characteristics in explaining the observed trends and cross-country differences by means of a multi-level approach. In particular, we question the role that the reforms towards a model of a 'flexicure' labour market have played in explaining recent trends in women's participation.

The rest of the paper is organized as follows. Section 2 presents a brief review of the related literature and section 3 describes the data used throughout the analysis. We summarize the large quantity of micro-level information available for different European countries and across time using synthetic indicators of female labour market performance in section 4. The results of the multivariate regression analysis of women's involvement in the labour market across time and countries are reported in section 5. Finally, the relevance of the institutional framework of the labour market and family policies in explaining the trends and cross-country differences in woman's labour market involvement is explored using a multilevel approach in section 6. Section 7 concludes.

## 2. Literature review

With foundations in microeconomics, the traditional economic literature on women's employment has largely focused on the costs and benefits of paid labour relative to domestic

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<sup>1</sup> There is a large literature showing that part-time work may have negative effects on wages and career prospects (especially in countries where it is widespread). Part-time jobs tend to be more frequent in low-qualified occupations with a negative impact on women's career opportunities. In the UK and US, mothers are more likely to work in part-time jobs and earn lower wages compared with women without children. Mothers working part-time also have significantly lower hourly wages in Germany and Sweden (Ermisch & Wright, 1993; Gustafsson, 2006).

work and other pursuits. According to neoclassical models of labour supply, a woman's attachment to the labour market is strictly related to the balance between her reservation wage and her market wage. The reservation wage is the lowest wage rate at which a worker would be willing to accept a particular type of job. It depends on several factors and may also change over time. In this view, housework and family-care duties typically reduce women's involvement in labour force by increasing their reservation wage. Indeed, families with women in paid labour need to outsource household labour; hence, when the hourly market price for household labour is larger than the hourly woman's market wage, the woman typically opts out of the labour force. A large number of research papers has proved the negative association between household-related responsibilities and women's employment (see, among many others, Goodpaster, 2010; Leigh, 2010; and Munasinghe et al., 2008). Education has been found as another major determinant of women's employment: by increasing women's potential market wages, it affects fertility and labour supply decisions (Gustaffsson & Kenjoh, 2008; Euwals et al., 2011).

Recent research contends that the overall increase in women's labour force participation and attachment to work may be attributed to structural changes in the economy that influence the demand for, and supply of, women workers. In particular, cultural norms on gender roles and welfare state developments are found to be responsible for the general increase in women's labour force participation in OECD countries from 1960 to 1990.

Several studies find that women's employment responds positively to policies alleviating the financial burden of child-rearing, both in the form of family-related subsidies (see, for example, Bardasi & Gornick, 2003; Jaumotte, 2003; Sánchez-Mangas & Sánchez-Marcos, 2008) and fiscal reductions (Eissa & Liebman, 1996; Alesina et al., 2007). In particular, countries with more generous parental leave schemes or public childcare facilities are characterized by a larger involvement of women in paid labour (see, for example, Berlinski & Galiani, 2007; Powell, 1998; Anderson & Levine, 1999; Attanasio, et al. 2008). Interestingly, some researchers compare the effectiveness of monetary support versus the public provision of child-care services. For example, Apps & Rees (2004) find that, among OECD countries, those supporting motherhood through childcare facilities rather than child benefits tend to exhibit both higher rates of women's labour supply and higher fertility rates. Similarly, Lundin et al. (2008) point out that women's labour supply may be more elastic to the quantity of publicly provided childcare facilities than to their price.

The available evidence on the effect of parental care on the propensity to be employed provides mixed results and mostly in the US context. Early studies by Wolf & Soldo (1994) and Stern (1995) provide no evidence of a negative relationship between elderly care and women's employment. Conversely, more recent findings show that caring for parents living outside the household and intergenerational co-residence exerts a large negative impact on the labour supply of both men and women (see Ettner, 1996; Heitmueller, 2007; Johnson & Lo Sasso, 2000).

Finally, a number of studies have documented the impact of labour market institutions on women's employment and labour market participation in European countries (see, among others, Jaumotte, 2003 and Genre et al., 2005 and 2010). They find that labour market institutions matter for women's attachment to employment and labour force. In particular, according to Genre et al. (2005 and 2010), higher union density, more employment protection and more generous unemployment benefits lower participation rates. Conversely, Balleer et al. (2009) find that a number of institutional factors, such as labour taxes, union density, unemployment benefits and the average number of children, has an impact on women's labour force participation rates, although the specific impact varies across age groups and countries.



### 3. Data and descriptive statistics

We combine annual 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. 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 cover all (old) EU-15 member states. The total duration of the ECHP is eight years, running from 1994 to 2001. The dataset includes information on family size and composition, living conditions and several income measures. Therefore it provides a source of mutually comparable income data of EU member countries at the turn of the 20<sup>th</sup> and 21<sup>th</sup> centuries.

EU-SILC is the successor of the ECHP. The EU-SILC provides harmonised cross-sectional and longitudinal multi-dimensional micro-data on income and social exclusion in European countries. After its start in 2003 with seven European countries, in the 2004 wave it covered all old EU-15 member states except Germany, the Netherlands and the UK. Since 2005, the dataset involves the 25 EU member states, plus Norway and Iceland, and it is the largest comparative survey of European income and living conditions. The 2009 wave has been recently released.

In order to obtain a unique dataset of comparable household and individual level characteristics across EU countries within the period 1994-2009, we limited the analysis to the EU-15 member states<sup>2</sup> and selected individual and household characteristics. Summary statistics of the women and men samples are presented in Tables 1 and 2. All illustrative materials (Tables and Figures) can be found in the Annex.

The overall sample includes 1,657,367 individuals between 25 and 64 years of age of which 851,010 are women and 806,357 are men. The employment and participation rates stand at 59% and 66%, respectively, for the female sample, and increase to 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 describe themselves as live in-couple. 42% of women and 23% of men live in households with at least one child under 14 years of age, 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. Among those living as a couple, approximately 27% reported that their partner has achieved a lower or an upper secondary education (ISCED 0-2 and ISCED 3-5); 20% reported highly-educated partners (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 & Prescott (1997).<sup>3</sup>

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<sup>2</sup> Namely, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.

<sup>3</sup> Italy and Spain are over-represented in the sample (16% of the surveyed respondents live in Italy and 11% live in Spain).

Table 1. Summary statistics: Female sample\*

	Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Individual characteristics</b>	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
	ISCED02	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
<b>Household characteristics</b>	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
	pISCED02	851010	0.276	0.447	0	1
	pISCED35	851010	0.258	0.438	0	1
	pISCED57	851010	0.198	0.398	0	1
<b>Trend</b>	year	851010	2003	4.983	1994	2009
	cycle	842730	0.006	1.958	-8.636	4.172
<b>Country of residence</b>	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
<b>Individual characteristics</b>	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
	ISCED02	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
<b>Household characteristics</b>	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
	pISCED02	806357	0.278	0.448	0	1
	pISCED35	806357	0.261	0.439	0	1
	pISCED57	806357	0.198	0.398	0	1
<b>Trend</b>	year	806357	2003.000	4.985	1994	2009
	cycle	798435	0.012	1.959	-8.636	4.172
<b>Country of residence</b>	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).



#### 4. A micro-data-based unified framework for cross-country comparisons

The purpose of this section is to present some evidence about trends of women's labour market performance in Europe, which would be valuable for cross-country comparisons. The analysis introduces a synthetic index of labour market performance, which measures the extent to which women and men can be distinguished from each other on the basis of commonly observed social and economic characteristics in different countries and across time. The results are thus able to convey information relevant to the ongoing political debates about changes in female work status by measuring the degree of distinction between women and men along different labour market indicators and controlling for a set of standard individual characteristics.<sup>4</sup>

The index can be computed for different education and age groups and by splitting countries according to the institutional regime they belong to. It can then serve to provide reliable answers to questions such as: Are the differences between women and men today larger than they were in the recent or distant past? In which countries are these tendencies more pronounced? And how rapidly do these differences shrink? Are there differences by education or age groups? We compute the index using data capturing conditions in 15 European countries as recent as 2009, and as early as 1994 and performing statistical tests assessing the statistical significance of the observed differences across time.

Borrowing from Vigdor (2008), who measures differences between native and immigrants in the US along cultural and economic lines, we measure differences between men and females in Europe using as labour market performance indicators the activity rate, the employment rate and the type of contract (permanent vs. temporary, full-time vs. part time). Such an approach summarizes the large quantity of micro-level information available for different European countries and across time in a way that eases cross-country comparisons. Technical details can be found in Appendix 1 of this report. In other 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 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 the distance from 1, the more females are different from men along the inspected labour market indicator, controlling for other individual characteristics.

We construct four different indices capturing gaps between women and men in labour market participation (activity gap index), unemployment (employment gap index), employment with a temporary contract (type of contract index 1) and employment with a part-time contract (type of contract index 2), which are detailed in Appendix 2.

An important methodological achievement of our framework with respect to broad statistical analysis of labour market aggregate indicators lies in its ability to separate behavioural trends from that simply reflect changes in demographic and social characteristics of men and women across countries and over time. Indeed, changes in outcomes reflecting changes in preferences and beliefs over and above those stemming from natural demographic trends are of particular interest for policy purposes. Our methodological framework uncovers

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<sup>4</sup> Appendix 1 provides both a general and a more technical overview of the method used to compute the index.

aggregate tendencies with the ability to control for a variety of confounding factors. In our analysis 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.

The activity index, capturing differences between women and men inside and outside the labour market, reveals the behavioural differences more likely to come from the supply side of the labour market, whereas the employment index, focusing on gender differences for the individuals in the labour market only, captures the behavioural differences more likely to come from the demand side. The indices by type of contract are finally designed to uncover further differences within employment schemes.

For each European country and each year between 1994-2000 (ECHIP data) and between 2004-2009 (EU-SILC data), we compute the four different indicators and perform T-test statistics to assess significant difference between the beginning and ending of the observed time window. The complete list of results is collected in Appendix 2, Tables A1-A4.

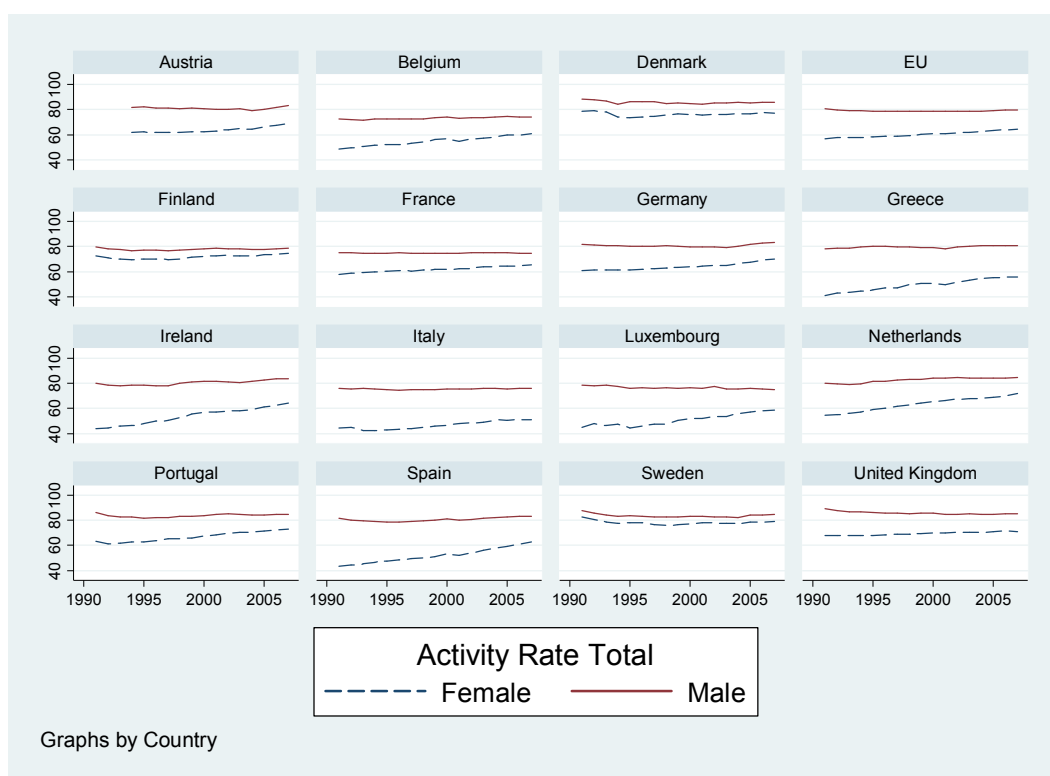
In order to understand the ability of our framework to convey more precise information about women's labour market performance as against the one revealed by the analysis of aggregate labour market indicators, we discuss our evidence in contrast to the facts that would emerge when using OECD aggregate data. Figures 1-4 show the activity rates, employment rate, permanent employment rates and full-time employment rates using the Labour Force Statistics collected by OECD, which are separated by gender. Figures 5-8 display the results of our analysis using our corresponding summary indicators of women-men gaps. Countries for which the gaps over the period are found to be statistically insignificant are depicted using a constant line.

Both sets of tables point towards the well-known onset of female labour participation and employment with a gender gap shrinking over time. However, a closer look at Figures 5-8 reveals important cross-country differences that were not captured in Figures 1-4. It appears that only some of the marked trends in Figures 1-4 are statistically significant, once we control for changes in demographic and social characteristics between men and females over time. On the other hand, some of the less pronounced trends in Figures 1-4 turn out to be instead statistically significant using our methodology in Figures 5-8. It appears, for example, that the marked change in female employment in Figure 2 (OECD aggregate data) in Belgium and Luxembourg is mainly due to demographic trends and other characteristics of the female labour force rather than to changes in preferences and beliefs. Indeed, when controlling for these factors, i.e. when looking at the results obtained using our indicators (Figure 6) the changes in the employment gap between men and women in Belgium and Luxembourg are not statistically significant. On the other hand, minor differences emerging from aggregate data can reflect important behavioural differences if other characteristics remain roughly constant during the inspected period. For example, the weak increase in the female activity rate in Germany (Figure 1) seems to be an important trend in the observed period, with a male-female gap closing by about 20% (Figure 5).

Let us now focus our attention on the information delivered by our different indices within countries.

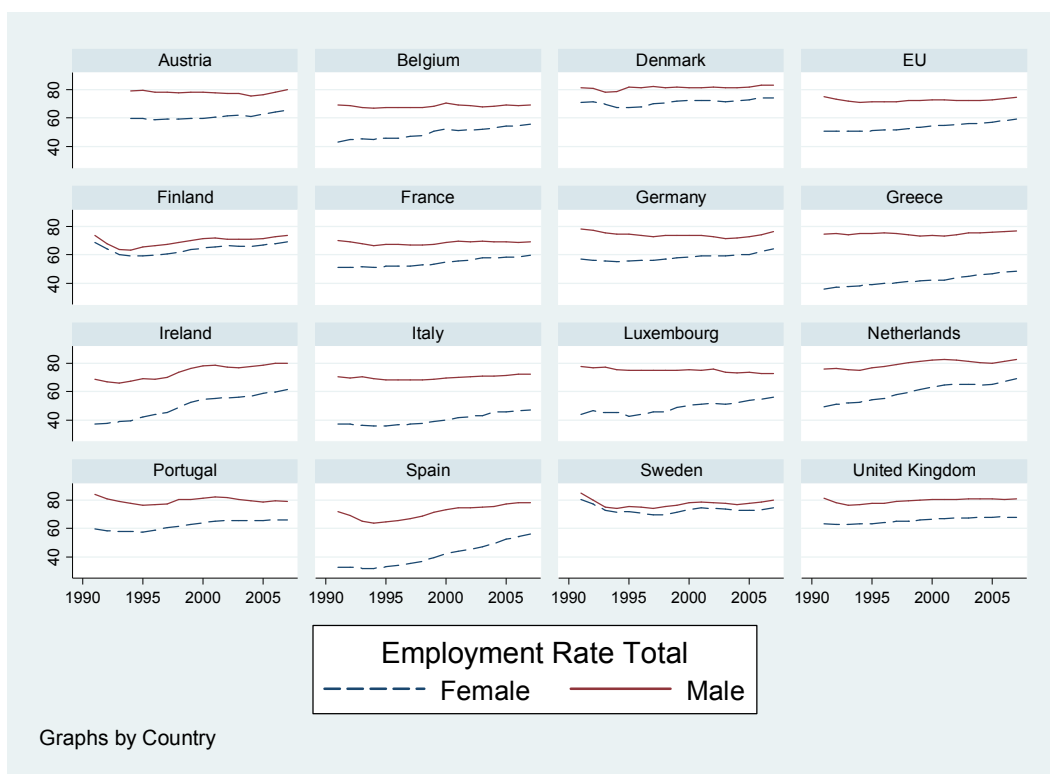
Figure 9 plots our four summary indicators of dissimilarity between women's and men's behaviour for each country and over time. Interestingly, the picture that emerges has features that are common to most European countries. Firstly, we find a marked increase in female labour market participation, which does not correspond to a similarly pronounced increase in employment rates. Secondly, there emerges a relevant increase in both temporary and part-time employment of women compared to men. This is an important fact that deserves further investigation. Although these types of contracts can be chosen in certain circumstances, a larger incidence of temporary and part-time jobs for women can also reflect a transition phase towards the integration of such a group into permanent and full-time occupations. Distinguishing between those different explanations is a complex issue, which we cannot address here with the available data. Nevertheless, we continue our explorative analysis to document in which countries and for which age and education groups the relationship between a higher female labour market participation and higher share of female temporary and part-time employment is stronger.

Figure 1. Macro data trends in Europe: Activity rate by gender, 1994-2009



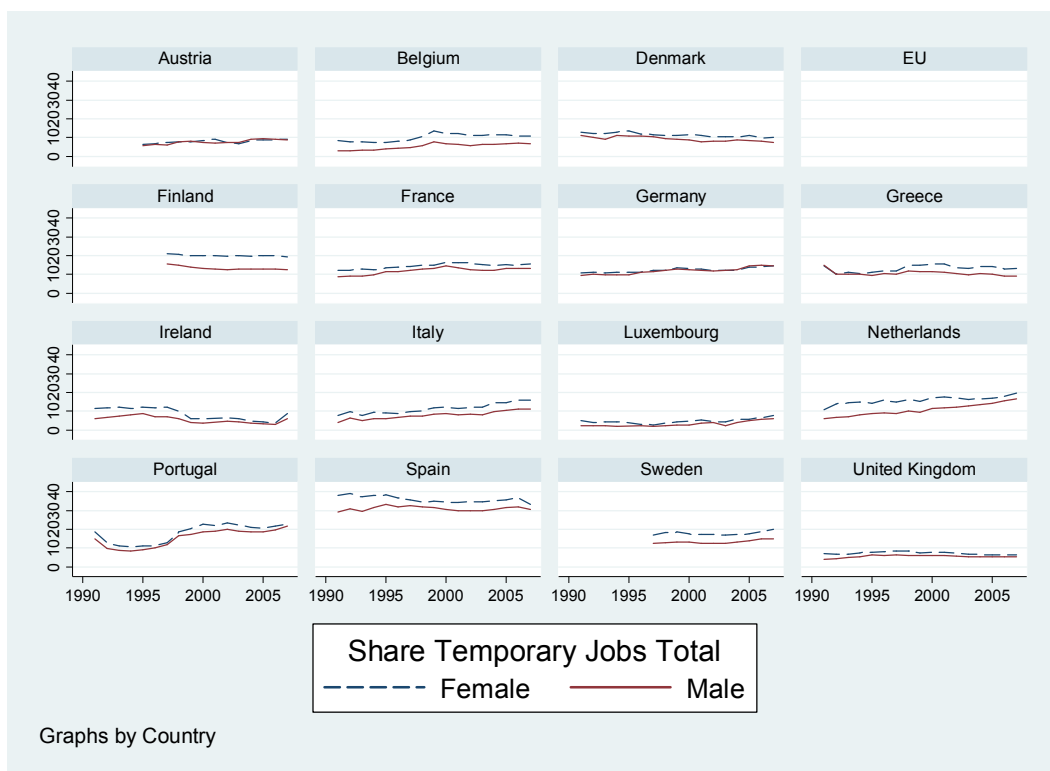
Source: OECD Labour Market Statistics retrieved from <http://stats.oecd.org/>.

Figure 2. Macro data trends in Europe: Employment rate by gender, 1994-2009



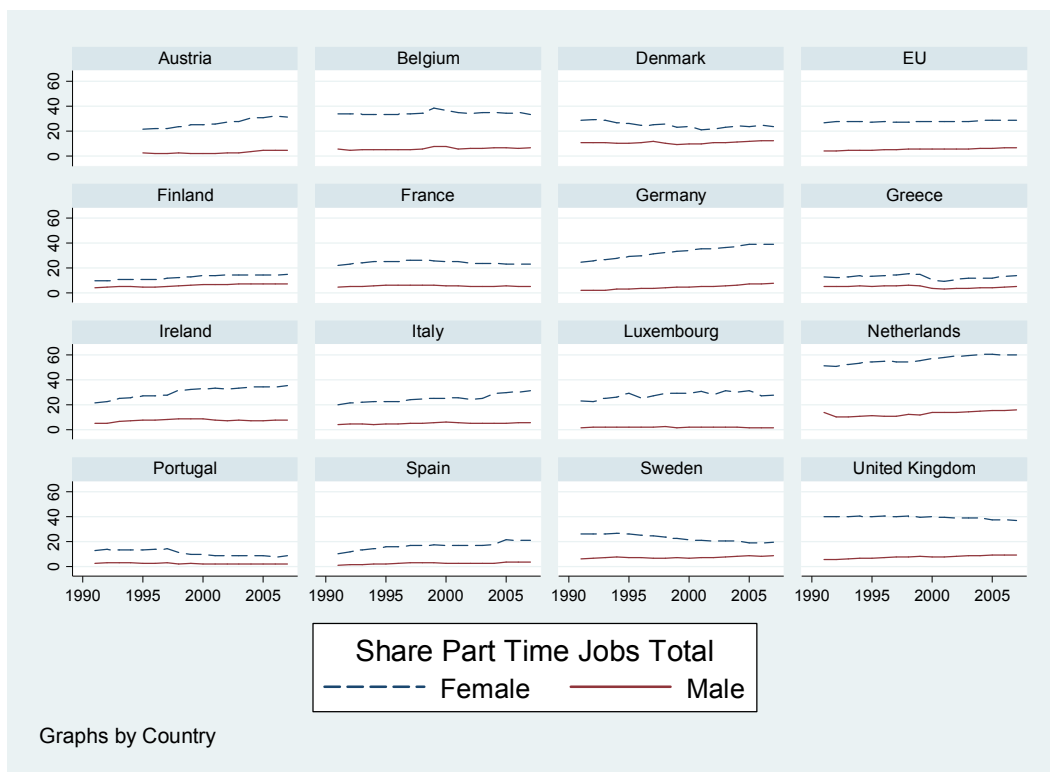
Source: OECD Labour Market Statistics retrieved from <http://stats.oecd.org/>.

Figure 3. Macro data trends in Europe: Share of temporary jobs by gender, 1994-2009



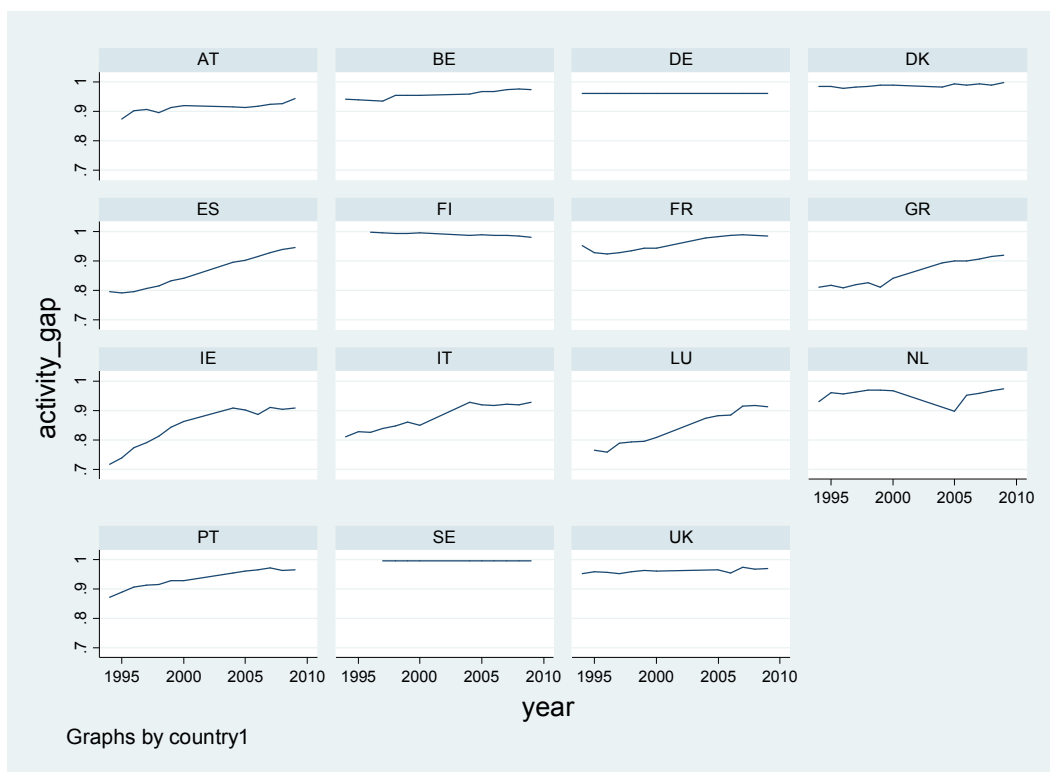
Source: OECD Labour Market Statistics retrieved from <http://stats.oecd.org/>.

Figure 4. Macro data trends in Europe: Share of part-time jobs by gender, 1994-2009



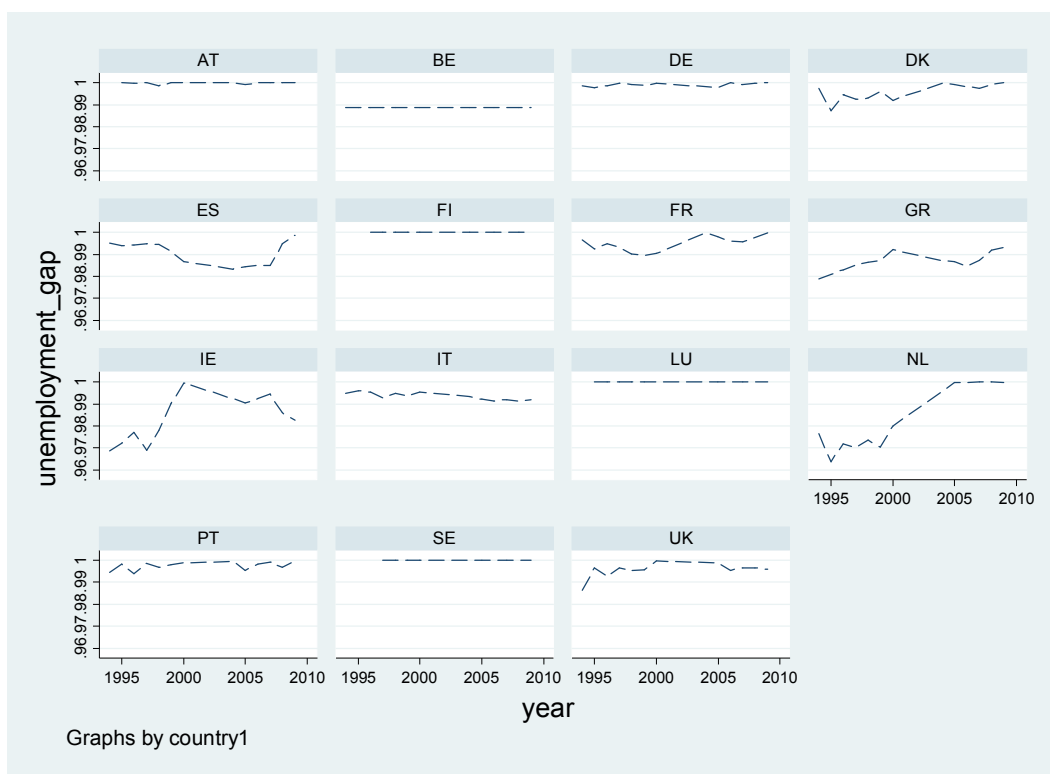
Source: OECD Labour Market Statistics retrieved from <http://stats.oecd.org/>.

Figure 5. Micro-based gender gap index in activity rates, 1994-2009



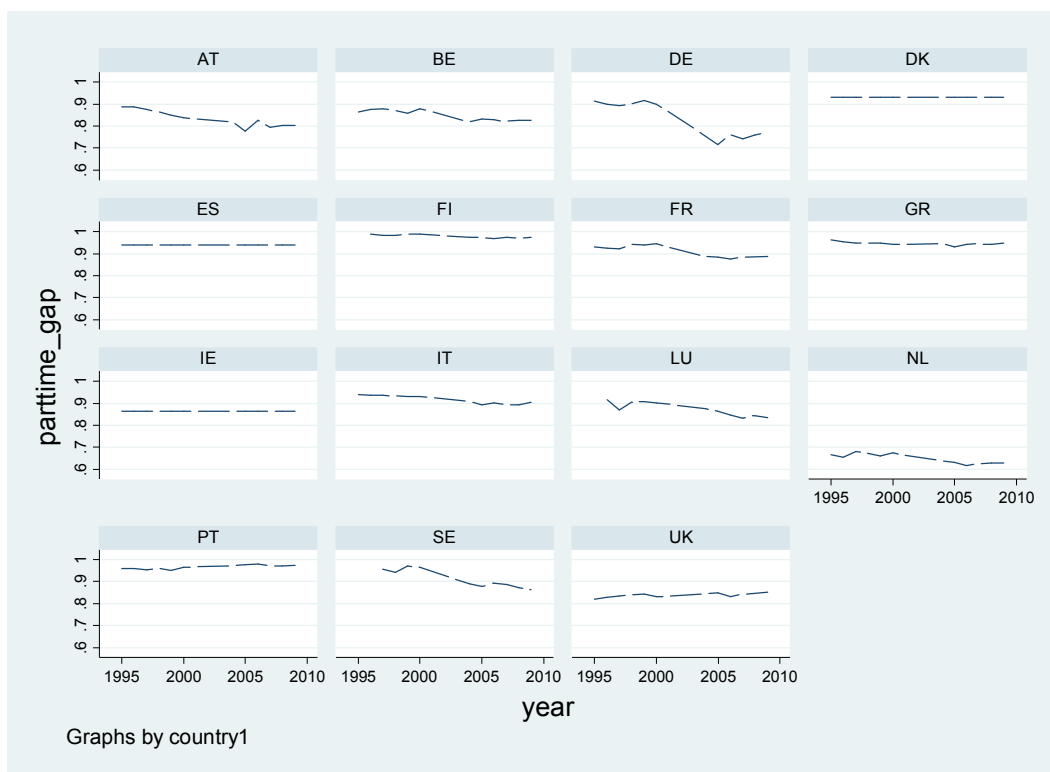
Source: Own elaborations from ECHP and EUSILC databases.

Figure 6. Micro-based gender gap index in unemployment rates, 1994-2009



Source: Own elaborations from ECHP and EUSILC databases.

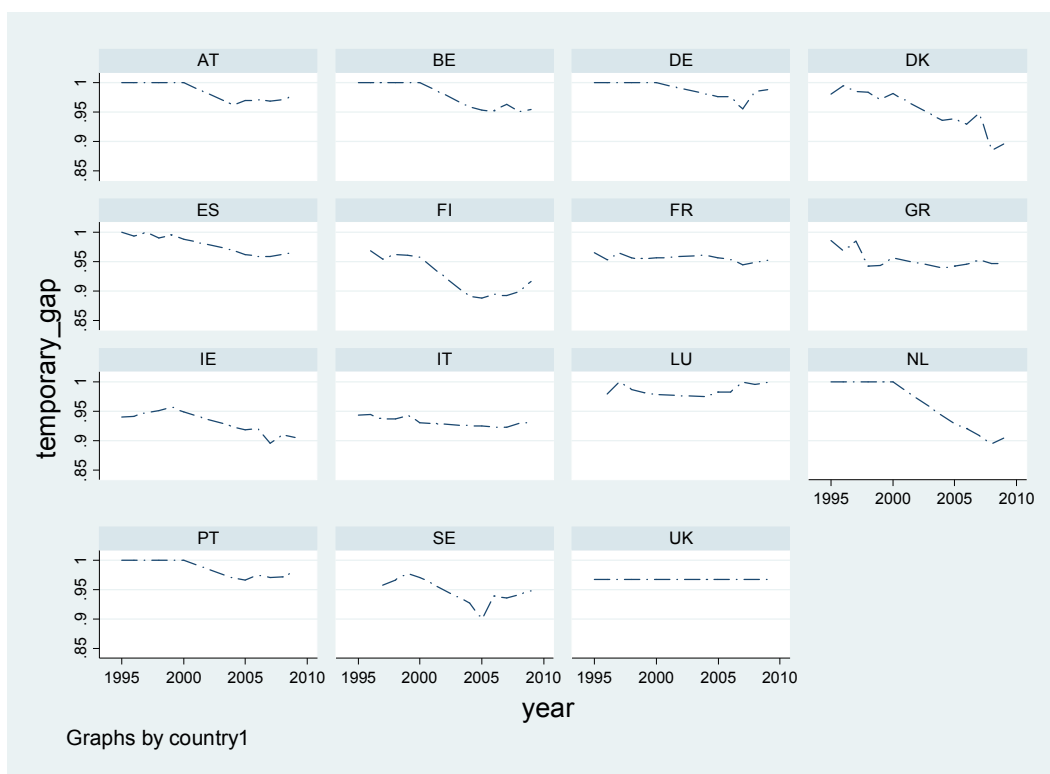
Figure 7. Micro-based gender gap index in the share of part-time jobs, years 1994-2009



Source: Own elaborations from ECHP and EUSILC databases.

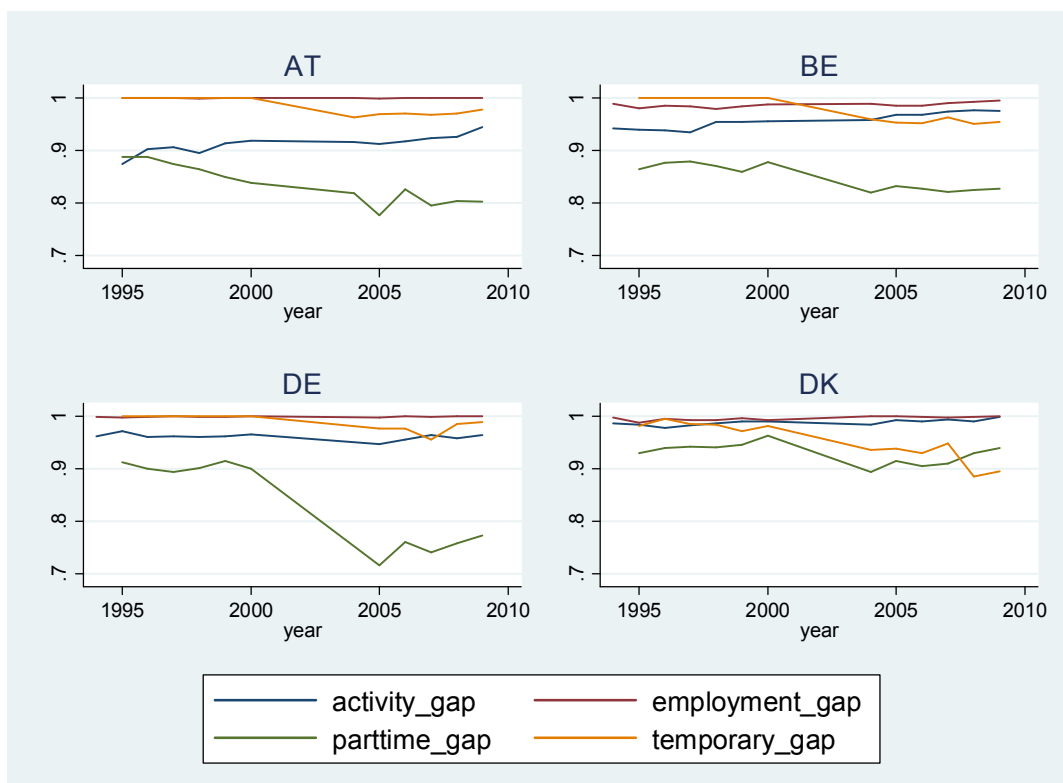


Figure 8. Micro-based gender gap index in the share of temporary jobs, 1994-2009

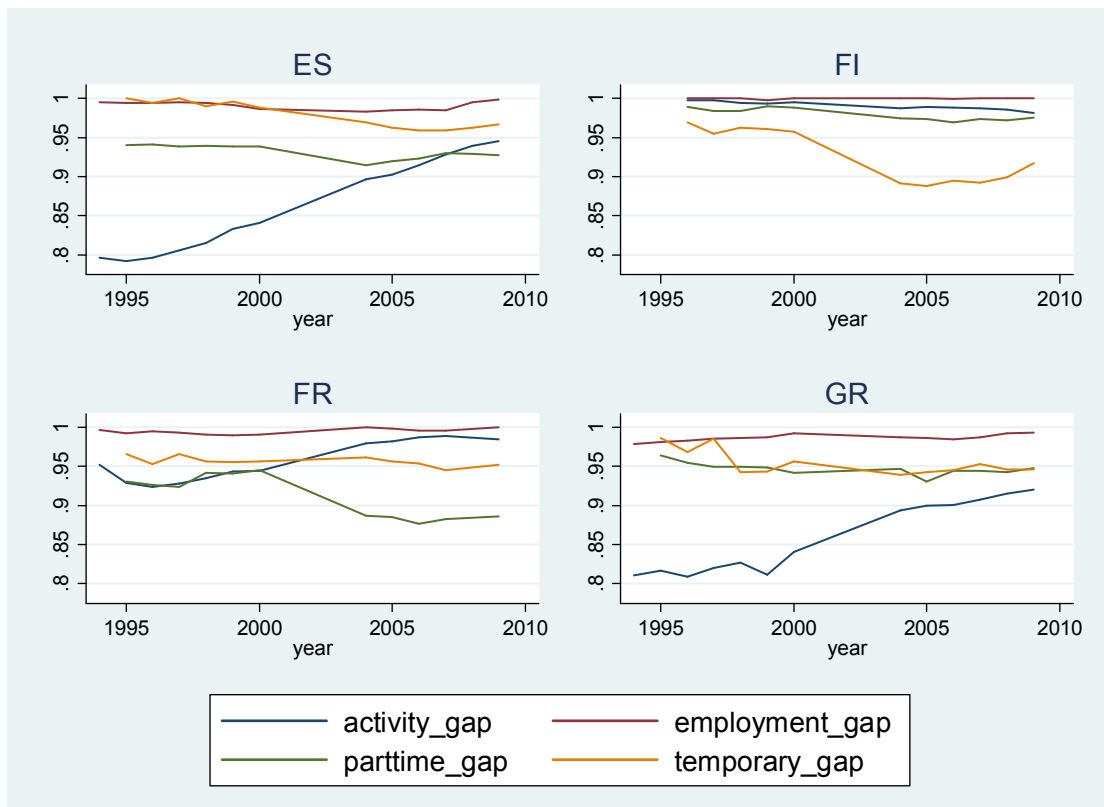


Source: Own elaborations from ECHP and EUSILC databases.

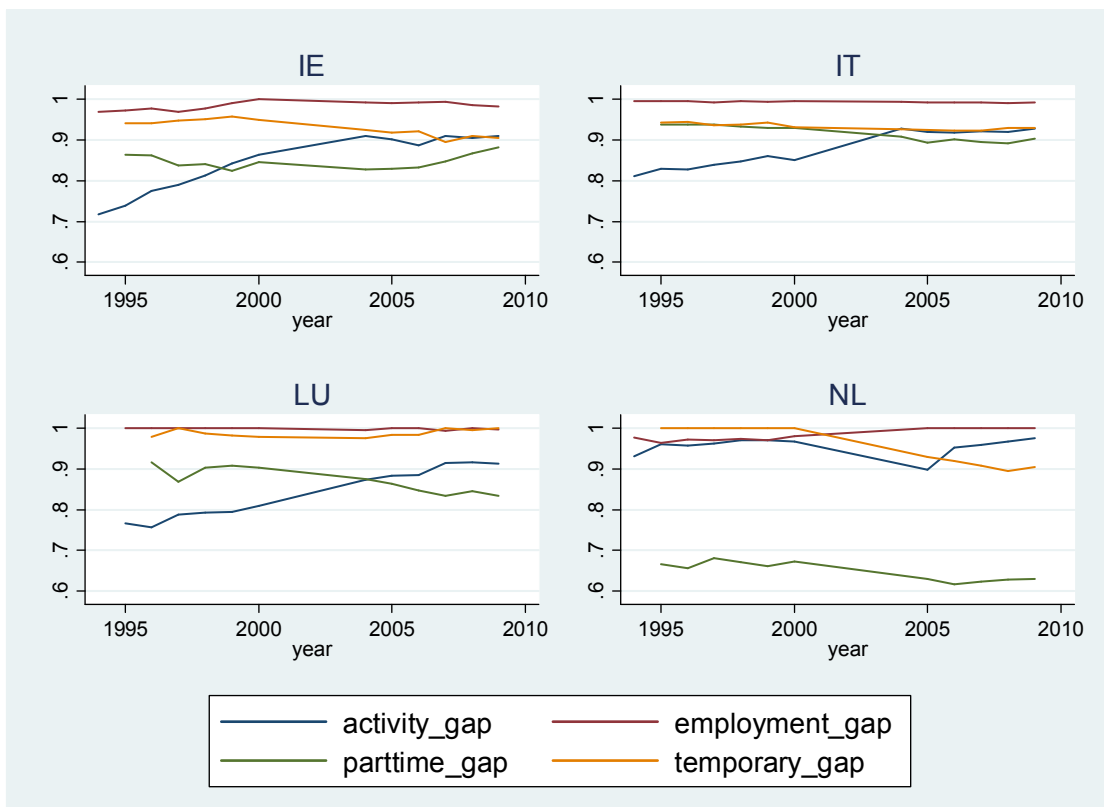
Figure 9. Synthesis of micro-based gender gap indicators in the labour market in Europe, 1994-2009



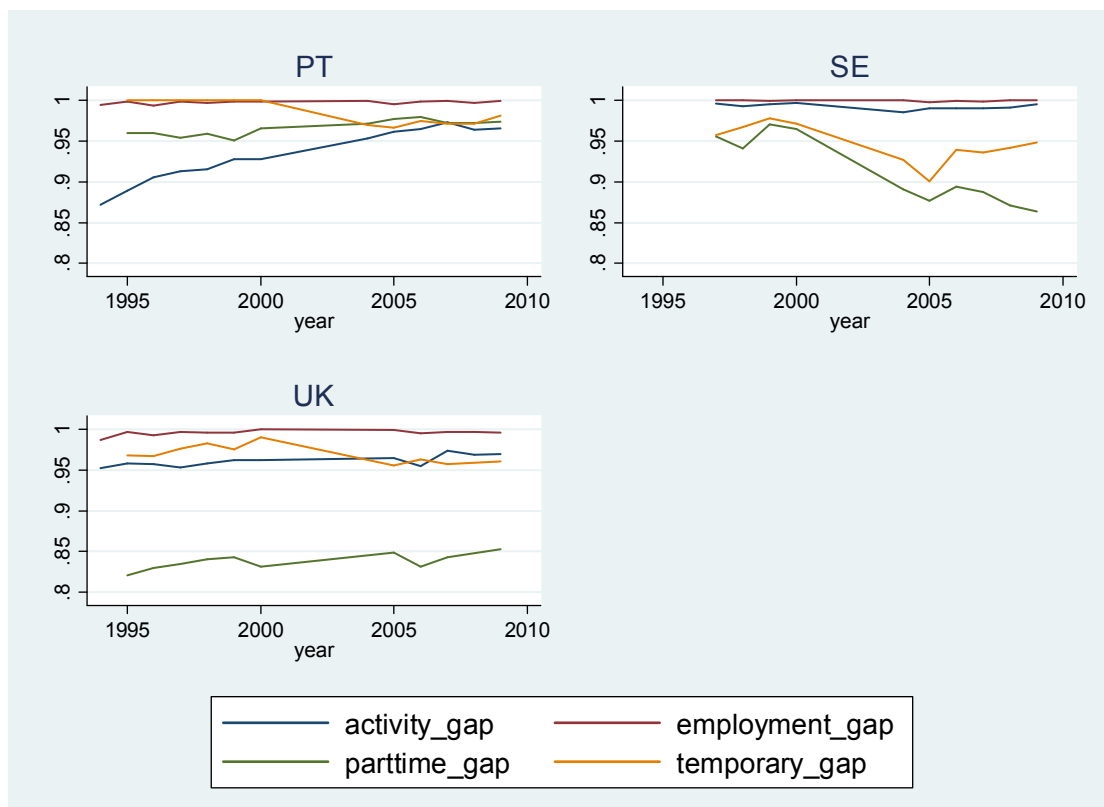
Source: Own elaborations from ECHP and EUSILC databases.



Source: Own elaborations from ECHP and EUSILC databases.



Source: Own elaborations from ECHP and EUSILC databases.



Source: Own elaborations from ECHP and EUSILC databases.

For this purpose, we follow Ferrera's (1996) classification and split countries by institutional regimes, distinguishing between the traditional four groups: liberal countries (the UK), continental countries (Austria, Belgium, Luxembourg, the Netherlands, Germany, Ireland and France), Nordic countries (Denmark, Sweden and Finland) and southern countries (Greece, Spain, Portugal and Italy). Observe that, following Siaroff's (1994) intuition, Ireland is included among later female mobilization countries. We investigate the correlation between female labour force participation and type of employment using the following baseline regression model:

$$I_{it}^{AC} = \delta I_{it}^{EC} + \sum_{j=1}^4 \gamma_j r_{ij} I_{it}^{EC} + cty_i + \varepsilon_{it} \quad (1)$$

where  $I_{it}^{AC}$  is the activity index of country  $i$  at time  $t$ ,  $I_{it}^{EC}$  is the type of employment contract index of country  $i$  at time  $t$  (type of contract 1, i.e. temporary versus permanent, or 2, i.e. full time versus part time),  $r_{ij}$  denotes dummy variables taking value 1 if country  $i$  is in regime  $j$  ( $j=1, \dots, 4$ ) and 0 otherwise,  $cty_i$  denotes country dummies and  $\varepsilon_{it}$  is a random error term. Table 3 collects the OLS results. Column one and two report on the specifications including the two types of contract indicators separately whereas in the last column both indicators are included. Looking at column one, it appears that the countries where an increase in women's labour market participation is significantly associated with a larger share of temporary jobs for women are southern European countries. Those countries are also the ones lagging behind the Nordic countries and the US in terms of women's labour market participation

rates. Male-female participation gaps by the end of the 20th century in Greece, Spain and Italy were still around 30%, as opposed to 12.9% in the US. When the other indicator of type of employment is taken into consideration (column two) we find a significant negative association for all countries, except for the UK (in the liberal regime).

This evidence thus depicts a picture of Europe where for those countries with higher rates of participation, i.e. the UK, a favourable trend in women's labour market participation is also accompanied by a favourable trend in full-time employment. Whereas in the rest of Europe (with lower rates of participation), an increase in the number of women in the labour force (compared to men) comes at a cost of lower-quality jobs, i.e. of larger shares in temporary employment.

Table 4 collects the results that are obtained when performing the same analysis by age groups. It appears that these trends are driven by prime-age women (Table 4), while fewer and less pronounced correlations are revealed for old and young women. Finally, Table 5 collects the results which are obtained by performing the same analysis when splitting our sample by education level. Interestingly, we find that these tendencies are not true for skilled women. The effects seem to be driven by women in the least skilled group (columns 1-3).

*Table 3. Activity rate, temporary employment and part-time employment*

VARIABLES	(1)	(2)	(3)
I_TEMP	-0.2512 (0.174)		-0.1317 (0.169)
I_TEMP_2	0.1784 (0.185)		0.2115 (0.196)
I_TEMP_3	-1.8602*** (0.293)		-1.7324*** (0.272)
I_TEMP_4	0.2663 (0.177)		0.1240 (0.173)
I_PART		0.4442*** (0.122)	0.3899*** (0.104)
I_PART_2		-0.6954*** (0.154)	-0.6860*** (0.166)
I_PART_3		-2.4406*** (0.334)	-1.8006*** (0.209)
I_PART_4		-0.3919*** (0.124)	-0.3329*** (0.109)
Constant	0.9780*** (0.031)	2.8675*** (0.301)	4.1492*** (0.262)
Observations	171	171	171
R-squared	0.788	0.757	0.819

*Notes:* OLS results of model (1). Dep. Variable: Activity I. I\_TEMP denotes the type of contract I temporary versus permanent, I\_PART denotes the type of contract I full time versus part time. The subscript \_2, \_3, \_4 indicates institutional regimes: \_2 includes continental countries (Austria, Belgium, Luxembourg, Netherlands, Germany, Ireland and France), \_3 Southern countries (Greece, Spain, Portugal and Italy), \_4 Nordic countries (Denmark, Sweden and Finland) and the group of liberal countries (UK) is the reference category. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4 Activity rate, temporary employment and part-time employment by age groups

VARIABLES	Prime age			Old			Young		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
I_TEMP	-0.2110 (0.201)		-0.1973 (0.200)	0.0647 (0.097)		0.0942 (0.072)	-0.0135 (0.068)		-0.0876 (0.247)
I_TEMP_2	0.1059 (0.215)		0.3147 (0.238)	-0.0734 (0.101)		-0.1044 (0.079)	0.0362 (0.071)		0.0904 (0.248)
I_TEMP_3	-2.3508*** (0.350)		-2.0609*** (0.331)	-0.1906 (0.126)		-0.2097* (0.118)	-0.0764 (0.081)		-0.0113 (0.251)
I_TEMP_4	0.2754 (0.205)		0.2354 (0.206)	-0.1681 (0.104)		-0.1855** (0.077)	0.0312 (0.071)		0.1149 (0.249)
I_PART		0.4607*** (0.106)	0.4491*** (0.143)		0.0796 (0.049)	0.0859** (0.041)		0.0105 (0.058)	0.0601 (0.173)
I_PART_2		-0.7658*** (0.151)	-0.8141*** (0.210)		-0.1454* (0.076)	-0.1522** (0.072)		0.0456 (0.064)	-0.0063 (0.176)
I_PART_3		-2.5758*** (0.366)	-1.8683*** (0.292)		-0.2696 (0.169)	-0.1428 (0.184)		-0.0136 (0.092)	-0.1060 (0.187)
I_PART_4		-0.3738*** (0.111)	-0.3809** (0.149)		0.0221 (0.084)	-0.0065 (0.069)		-0.0284 (0.071)	-0.1017 (0.181)
Constant	3.4631*** (0.282)	2.9840*** (0.341)	4.5391*** (0.292)	0.9945*** (0.081)	1.1227*** (0.153)	1.0373*** (0.145)	1.0655*** (0.043)	1.0123*** (0.037)	0.9352*** (0.027)
Observations	171	171	171	171	171	171	171	171	171
R-squared	0.756	0.718	0.792	0.807	0.806	0.810	0.451	0.445	0.460

Notes: OLS results of model (1) by age groups. "Prime age" are individuals between 25-54, "Old" are individuals between 55-64, "Young" are individuals between 15-24. Dep. Variable: Activity I. I\_TEMP denotes the type of contract I temporary versus permanent, I\_PART denotes the type of contract I full time versus part time. The subscript \_2, \_3, \_4 indicates institutional regimes: \_2 includes continental countries (Austria, Belgium, Luxembourg, Netherlands, Germany, Ireland and France), \_3 Southern countries (Greece, Spain, Portugal and Italy), \_4 Nordic countries (Denmark, Sweden and Finland) and the group of liberal countries (UK) is the reference category. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5. Activity rate, temporary employment and part-time employment by education level

VARIABLES	Unskilled			Medium-skilled			Skilled		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
I_TEMP	-0.0967 (0.124)		-0.0955 (0.396)	-0.0816* (0.046)		0.0322 (0.072)	-0.1138 (0.089)		-0.0477 (0.206)
I_TEMP_2	0.1276 (0.158)		0.1908 (0.417)	0.0846 (0.072)		0.2161* (0.121)	0.2550* (0.135)		0.1941 (0.229)
I_TEMP_3	-0.7085*** (0.265)		-0.4538 (0.450)	-0.3161 (0.196)		-0.2608 (0.171)	-0.0672 (0.180)		-0.1354 (0.259)
I_TEMP_4	0.0604 (0.130)		0.0717 (0.398)	0.1259** (0.049)		-0.0061 (0.076)	0.0992 (0.099)		0.0253 (0.211)
I_PART		0.1228 (0.205)	0.0018 (0.582)		-0.2452*** (0.079)	-0.2563*** (0.097)		0.1581 (0.245)	0.1296 (0.358)
I_PART_2		-0.1936 (0.214)	-0.1218 (0.589)		0.0852 (0.093)	-0.0138 (0.122)		-0.1902 (0.249)	-0.1666 (0.360)
I_PART_3		-1.7531*** (0.279)	-1.4816** (0.619)		-0.5939*** (0.208)	-0.5410** (0.223)		-0.2128 (0.292)	-0.1223 (0.390)
I_PART_4		0.0819 (0.210)	0.1995 (0.584)		0.3073*** (0.082)	0.2978*** (0.101)		-0.1480 (0.247)	-0.1089 (0.359)
Constant	1.6223*** (0.236)	2.4596*** (0.179)	2.7338*** (0.262)	1.0444*** (0.043)	0.9269*** (0.021)	1.9951*** (0.208)	1.0842*** (0.089)	1.0515*** (0.156)	0.9037* (0.509)
Observations	171	171	171	171	171	171	171	171	171
R-squared	0.808	0.833	0.841	0.802	0.836	0.850	0.596	0.589	0.597

Notes: OLS results of model (1) by education levels. "Unskilled" are individuals with primary education only, "Medium-skilled" are individuals with secondary education only, "Skilled" are individuals with tertiary higher education. Dep. Variable: Activity I. I\_TEMP denotes the type of contract I temporary versus permanent, I\_PART denotes the type of contract I full time versus part time. The subscript \_2, \_3, \_4 indicates institutional regimes: \_2 includes continental countries (Austria, Belgium, Luxembourg, Netherlands, Germany, Ireland and France), \_3 Southern countries (Greece, Spain, Portugal and Italy), \_3 Nordic countries (Denmark, Sweden and Finland) and the group of liberal countries (UK) is the reference category. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



## 5. Multivariate regression analysis

### 5.1 The empirical strategy

In this section, we use multivariate regression analysis to look at the determinants of women's labour market status and occupational characteristics. We estimate probit models for the probabilities of participating in the labour force, being employed, holding a fixed-term contract and working part-time. Indicating individual  $i$  and (discrete) time  $t$  by corresponding subscripts, our basic regression model specifies the employment status as:

$$y_{ijt} = \delta \mathbf{X}_{ijt} + \gamma age_{ijt} + \lambda trend_t + \sigma cycle_{jt} + \kappa cty_j + \varepsilon_{ijt} \quad (2)$$

where  $y$  is the labour market status (active, employed and type of contract, namely temporary and part-time) at time  $t$  for individual (female)  $i$  in country  $j$ ,  $\mathbf{X}$  is a set of individual characteristics observed at time  $t$ ,  $age$  are dummies for the age group of individual  $i$  (25-34; 35-44; 45-54; 55-64) capturing cohort effects,  $cycle$  is a business cycle indicator (country specific and time variant),  $trend$  is a common linear trend and  $cty$  are country dummies.

In order to investigate the differences in women's labour market behaviour across countries with different welfare-regimes (which also partly reflect differences in cultural attitudes to female labour market participation), we follow the classification used in the previous section and divide countries of our sample into four major groups: southern (Spain, Italy, Greece and Portugal), Social Democratic (Sweden, Finland and Denmark), liberal (the United Kingdom) and continental (Austria, Belgium, France, Germany, the Netherlands, Ireland and Luxembourg). The welfare regime is then included among the observed determinants of women's labour market performance according to the following specification:

$$y_{ijt} = \delta \mathbf{X}_{ijt} + \gamma age_{ijt} + \lambda trend_t + \sigma cycle_{jt} + \omega(welfare_j \cdot age_i) + \nu(welfare_j \cdot \mathbf{X}_{ijt}) + \rho(welfare_j \cdot trend_t) + \tau welfare_j + \varepsilon_{ijt} \quad (3)$$

where  $(welfare_j \cdot age_i)$  captures differences across welfare regimes in the age-effects of individual  $i$  (e.g. individuals of the same age group may behave differently in different welfare regimes);  $(welfare_j \cdot \mathbf{X}_{ijt})$  captures the effect of the welfare regimes on the attitude towards work of women with certain characteristics (e.g. does the number of children affect differently the participation rate of women in countries like Italy and Sweden?);  $(welfare_j \cdot trend_t)$  captures changes over time of the labour market status of women in countries characterized by different welfare regimes.

Finally we account for changes over time in women's attitude to work by estimating the following model where the trend indicator is interacted with the relevant individual characteristics:

$$y_{ijt} = \delta \mathbf{X}_{ijt} + \gamma age_{ijt} + \lambda trend_t + \sigma cycle_{jt} + \omega(trend_t \cdot age_i) + \nu(trend_t \cdot \mathbf{X}_{ijt}) + \kappa cty_j + \varepsilon_{ijt} \quad (4)$$

where  $(trend_t \cdot \mathbf{X}_{ijt})$  captures changes over time in the labour market status of women with certain characteristics (e.g. does the participation rate of women with a high level of education change in 2007 with respect to 1994?). Specification 4 is run both for the pooled sample (15 countries) and for each welfare regime separately.

## 5.2 Results

### 5.2.1 Baseline model

Table 6 presents the estimation results of specification 2 and provides the impacts of the variables of interests on the probability of participating (column 1), being employed (column 2), holding a fixed-term contract (column 3) and working part-time (column 4).

Table 6. Female labour market participation and type of occupation

	active			employed			temporary			parttime		
	Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.		Coef.	Std. Err.	
<i>Marital status</i>												
Single												
incouple	-0.071	***	0.003	-0.044	***	0.003	-0.021	***	0.003	0.095	***	0.004
separated	0.057	***	0.007	0.055	***	0.007	-0.018	***	0.006	0.019	**	0.009
divorced	0.050	***	0.004	0.029	***	0.004	-0.014	***	0.004	-0.016	***	0.005
widowed	-0.067	***	0.006	-0.031	***	0.006	-0.012	**	0.005	0.066	***	0.008
<i>Children</i>												
No children												
children	-0.038	***	0.003	-0.031	***	0.003	0.013	***	0.003	0.019	***	0.004
child	0.043	***	0.005	0.043	***	0.005	-0.005		0.005	0.014	**	0.006
child03	-0.174	***	0.004	-0.162	***	0.003	-0.018	***	0.003	0.140	***	0.005
child36	-0.088	***	0.003	-0.088	***	0.003	0.007	**	0.003	0.142	***	0.004
child614	-0.067	***	0.003	-0.066	***	0.003	0.023	***	0.002	0.166	***	0.003
<i>Co-habiting Elderly</i>												
no_elderly												
old70-80	-0.068	***	0.005	-0.075	***	0.005	0.012	***	0.005	0.009		0.007
old80	-0.025	***	0.006	-0.015	**	0.006	-0.011	**	0.006	0.002		0.009
<i>Education</i>												
Low skilled												
ISCED35	0.122	***	0.002	0.145	***	0.002	-0.062	***	0.002	-0.044	***	0.003
ISCED57	0.214	***	0.003	0.253	***	0.003	-0.067	***	0.002	-0.104	***	0.003
pISCED03	-0.016	***	0.003	0.006	*	0.003	0.010	***	0.003	-0.016	***	0.004
pISCED35	0.039	***	0.003	0.064	***	0.003	-0.031	***	0.003	0.007	*	0.004
pISCED57	0.018	***	0.004	0.050	***	0.004	-0.037	***	0.003	0.011	***	0.004
<i>Age</i>												
Age_25-34												
age_35_44	0.052	***	0.003	0.067	***	0.003	-0.077	***	0.002	0.024	***	0.003
age_45_54	-0.013	***	0.003	0.013	***	0.003	-0.113	***	0.003	0.056	***	0.004
age_55_64	-0.295	***	0.004	-0.247	***	0.004	-0.128	***	0.002	0.132	***	0.005
<i>Macro</i>												
trend												
trend	0.012	***	0.001	0.014	***	0.001	0.002	***	0.001	0.003	***	0.001
cycle	0.003	***	0.001	0.005	***	0.001	0.001	***	0.001	0.005	***	0.001
UK												
DK	0.075	***	0.005	0.050	***	0.005	-0.171	***	0.002	-0.170	***	0.004
NL	-0.039	***	0.004	-0.038	***	0.004	0.169	***	0.009	0.311	***	0.005

BE	0.018 ***	0.004	-0.058 ***	0.004	0.166 ***	0.008	0.047 ***	0.005
FR	0.078 ***	0.004	0.019 ***	0.004	0.179 ***	0.008	-0.085 ***	0.004
IE	-0.046 ***	0.005	-0.061 ***	0.006	0.106 ***	0.009	0.036 ***	0.007
IT	-0.077 ***	0.004	-0.116 ***	0.004	0.197 ***	0.007	-0.094 ***	0.004
GR	-0.041 ***	0.004	-0.100 ***	0.005	0.353 ***	0.009	-0.164 ***	0.005
ES	0.012 ***	0.004	-0.070 ***	0.004	0.391 ***	0.008	-0.160 ***	0.004
PT	0.159 ***	0.004	0.109 ***	0.005	0.206 ***	0.009	-0.282 ***	0.004
AT	-0.053 ***	0.004	-0.085 ***	0.004	0.059 ***	0.007	0.018 ***	0.005
FI	0.072 ***	0.004	0.019 ***	0.004	0.264 ***	0.009	-0.224 ***	0.004
SE	0.100 ***	0.004	0.076 ***	0.004	0.203 ***	0.009	-0.057 ***	0.004
DE	0.005	0.004	-0.068 ***	0.004	0.154 ***	0.008	0.137 ***	0.005
LU	-0.040 ***	0.006	-0.053 ***	0.006	0.038 ***	0.009	-0.014 *	0.007
Observations	818168		818168		427128		492929	
Log likelihood	-4328486		473241.1		179740.1		285804.1	
pseudo - R2	0.148		0.128		0.113		0.128	

Not surprisingly, the results reported in columns (1) and (2) are qualitative the same, 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's labour market integration (Jonung & Persson, 1993). One reason is that women's unemployment is often hidden among those defined as inactive because of the low work attachment of women holding to some specific groups (typically low-skilled women with young children). Considering the impact of household and personal characteristics on women's labour market status (active and employed), the results are in line with those reported in the previous empirical literature. Being married is negatively related to women's participation and employment. Children have a negative impact on female participation and the effect is significantly stronger in presence of children under 4 years of age. Participation (and employment) goes up gradually when the child starts attending school and the child effect reduces significantly only when he or she attends secondary school (around 14 years). Also the number of children has a significant disincentive effect on labour market participation. Note that the reported coefficients should not be interpreted as casual effects, as both participation and fertility may be simultaneous decisions. This implies that the casual effect of children on participation can be lower than that estimated.

In the face of the ongoing dramatic development of the aging population in Europe, 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.<sup>5</sup>

In many countries the responsibility of providing care for elderly persons is likely to fall on families, and in practice on women. Moreover, the choice of having an elderly relative living in the household is 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 & D'Ippoliti, 2011). As expected, the estimated impact of

<sup>5</sup> Ettner (1995) points out that, 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.

elderly care responsibilities on both participation and employment status is negative and significant.

Education is also another important determinant of the female labour market status. Within the context of our model, the control for education is mainly a proxy for the wage rate. According to our estimates, a high level of education leads to more participation. The level of education of the partner has also a significant impact on female participation and employment: the coefficients of the dummies for secondary education and tertiary education are indeed positive and highly significant. 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. Notice that the probability of being employed is significantly lower only for women in the old group (55-64), while the turning point for participation occurs earlier in the life-cycle.

After controlling for personal characteristics and country unobserved time invariant effects, the trend indicator is positive and significant for both the probability of being employed and being in the labour force, implying that on average, the probabilities of participating and being employed in 2009 are 0.18 and 0.20 percent higher than in 1994 respectively.

Columns (3) and (4) provide estimates of the impact of personal/household characteristics on the probability of holding a fixed-term contract and working part-time. Temporary work is more frequent among single women and women without children. Among women with kids, the incidence of temporary workers is larger for those who have children in pre-primary (3-6 age old) and primary education (6-14 age old). Temporary work arrangements are more likely for women with a low level of education and for women with a partner with a low level of education. Finally, the probability of holding a fixed-term contract declines with age, and this is in line with evidence for Europe which suggests that the share of temporary contracts is much higher in the inflow of newly-created jobs than in the existing stock.<sup>6</sup>

Regarding part-time employment (column 4), the results show that part-time among women is largely explained by family ties, the incidence being significantly higher for married women with small children. It declines with women's education levels and, interestingly, increases with the partner's level of education as the presence of a higher family income make women more willing to accept a reduction in worked hours in order to reconcile paid activity and unpaid domestic labour. Differently from temporary employment, the probability of holding a part-time job increases with age.

### 5.2.2 *Female labour market outcomes and welfare regimes*

Table 7 reports the results of model 3, in which the coefficients of the probit model are allowed to vary across countries characterized by different welfare regimes (the base group is the UK).

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<sup>6</sup> See Blanchard & Landier (2002) for France and Dolado et al. (2002) and Guell & Petrongolo (2007) for Spain.

Table 7. Female labour market participation and type of occupation: Welfare regimes

	active			employed			temporary			parttime		
	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
<i>Marital status</i>												
Single												
incouple	-0.020	***	0.008	-0.011		0.008	-0.010		0.015	0.146	***	0.009
separated	0.046	***	0.007	0.038	***	0.007	-0.020	***	0.006	0.044	***	0.009
divorced	0.042	***	0.004	0.027	***	0.005	-0.018	***	0.004	-0.003		0.005
widowed	-0.073	***	0.005	-0.040	***	0.006	-0.016	***	0.005	0.092	***	0.008
married*dem	0.004		0.009	0.002		0.010	-0.036	***	0.014	-0.122	***	0.009
married*cont	-0.075	***	0.009	-0.045	***	0.010	-0.024		0.015	-0.032	***	0.010
married*south	-0.063	***	0.009	-0.048	***	0.010	-0.013		0.015	-0.119	***	0.010
<i>Children</i>												
No children												
children	-0.034	***	0.003	-0.029	***	0.003	0.016	***	0.003	0.020	***	0.004
child	0.074	***	0.008	0.071	***	0.008	-0.007		0.014	0.019	**	0.010
child*dem	0.009		0.009	0.011		0.009	-0.010		0.015	-0.057	***	0.009
child*cont	-0.018	**	0.008	-0.015	*	0.009	-0.010		0.014	0.009		0.009
child*south	-0.045	***	0.008	-0.049	***	0.009	0.016		0.015	-0.038	***	0.009
child03	-0.239	***	0.010	-0.228	***	0.010	-0.011		0.019	0.285	***	0.014
child03*dem	0.055	***	0.011	0.061	***	0.012	0.002		0.022	-0.161	***	0.011
child03*cont	0.020	*	0.011	0.031	***	0.012	-0.015		0.020	-0.139	***	0.011
child03*south	0.156	***	0.008	0.158	***	0.010	-0.002		0.020	-0.164	***	0.010
child36	-0.157	***	0.009	-0.157	***	0.009	0.003		0.017	0.246	***	0.013
child36*dem	0.136	***	0.009	0.135	***	0.010	0.000		0.019	-0.119	***	0.011
child36*cont	0.075	***	0.010	0.066	***	0.011	-0.006		0.018	-0.081	***	0.012
child36*south	0.098	***	0.009	0.110	***	0.010	0.015		0.019	-0.143	***	0.010
child614	-0.117	***	0.007	-0.114	***	0.007	0.040	***	0.014	0.234	***	0.009
child614*dem	0.134	***	0.008	0.135	***	0.009	-0.024	*	0.013	-0.120	***	0.008

child614*cont	0.055 ***	0.008	0.052 ***	0.009	-0.021 *	0.013	-0.036 ***	0.009
child614*south	0.070 ***	0.007	0.071 ***	0.008	-0.010	0.013	-0.139 ***	0.008
<i>Co-habiting Elderly</i>								
noelderly								
old7080	-0.166 ***	0.019	-0.159 ***	0.019	-0.002	0.042	-0.029	0.028
old7080*dem	0.017	0.022	0.019	0.024	0.013	0.052	0.058	0.038
old7080*con	0.027	0.021	0.031	0.022	0.019	0.047	0.013	0.034
old7080*south	0.122 ***	0.016	0.105 ***	0.018	0.013	0.044	0.027	0.031
old80	-0.075 ***	0.028	-0.069 **	0.029	-0.041	0.060	-0.057 *	0.034
old80*dem	-0.049	0.039	-0.053	0.040	0.106	0.112	0.018	0.055
old80*cont	0.033	0.030	0.042	0.032	0.047	0.085	0.025	0.044
old80*south	0.069 ***	0.025	0.061 **	0.028	0.050	0.082	0.065	0.041
<i>Education</i>								
<i>Low skilled</i>								
ISCED35	0.167 ***	0.007	0.186 ***	0.008	0.020	0.021	-0.051 ***	0.011
ISCED35*dem	-0.058 ***	0.010	-0.056 ***	0.010	-0.007	0.021	0.072 ***	0.014
ISCED35*cont	-0.073 ***	0.009	-0.062 ***	0.009	-0.062 ***	0.018	0.010	0.013
ISCED35*south	-0.077 ***	0.009	-0.067 ***	0.009	-0.088 ***	0.015	0.029 **	0.012
ISCED57	0.221 ***	0.008	0.253 ***	0.008	0.073 ***	0.022	-0.111 ***	0.011
ISCED57*dem	-0.052 ***	0.011	-0.037 ***	0.011	-0.050 ***	0.018	0.045 ***	0.014
ISCED57*cont	-0.039 ***	0.010	-0.012	0.010	-0.110 ***	0.015	-0.002	0.013
ISCED57*south	0.009	0.009	0.002	0.010	-0.112 ***	0.013	0.067 ***	0.013
pISCED03	0.030 ***	0.010	0.039 ***	0.011	-0.053 ***	0.019	-0.055 ***	0.013
pISCED03*dem	0.036 ***	0.013	0.036 ***	0.013	0.054 **	0.028	0.100 ***	0.017
pISCED03*cont	-0.032 ***	0.013	-0.006	0.013	0.057 **	0.027	0.050 ***	0.017
pISCED03*south	-0.078 ***	0.013	-0.067 ***	0.013	0.080 ***	0.027	0.093 ***	0.016
pISCED35	0.074 ***	0.008	0.091 ***	0.009	-0.052 ***	0.015	-0.043 ***	0.010
pISCED35*dem	0.013	0.011	0.017	0.011	0.035 *	0.020	0.090 ***	0.013
pISCED35*cont	-0.031 ***	0.010	-0.016	0.011	0.027	0.019	0.075 ***	0.013
pISCED35*south	-0.097 ***	0.011	-0.085 ***	0.011	0.030	0.019	0.096 ***	0.013
pISCED57	0.039 ***	0.009	0.046 ***	0.009	-0.020	0.016	-0.051 ***	0.010



pISCED57*dem	0.039 ***	0.011	0.052 ***	0.011	0.001	0.018	0.094 ***	0.014
pISCED57*cont	-0.025 **	0.011	0.005	0.011	-0.002	0.017	0.130 ***	0.013
pISCED57*south	-0.045 ***	0.011	-0.021 **	0.011	-0.014	0.016	0.084 ***	0.014
<i>Age</i>								
<i>Age25-34</i>								
35-44	0.042 ***	0.009	0.047 ***	0.009	-0.050 ***	0.014	0.056 ***	0.011
45-54	-0.045 ***	0.010	-0.040 ***	0.010	-0.054 ***	0.015	0.119 ***	0.011
55-64	-0.271 ***	0.011	-0.252 ***	0.010	-0.040 **	0.017	0.259 ***	0.012
(35-44)*dem	0.043 ***	0.010	0.040 ***	0.011	-0.047 ***	0.014	-0.041 ***	0.012
(45-54)*dem	0.133 ***	0.010	0.139 ***	0.011	-0.057 ***	0.015	-0.083 ***	0.012
(55-64)*dem	0.140 ***	0.010	0.154 ***	0.011	-0.091 ***	0.013	-0.098 ***	0.012
(35-44)*cont	0.022 **	0.010	0.013	0.011	-0.046 ***	0.014	-0.009	0.012
(45-54)*cont	0.059 ***	0.011	0.054 ***	0.012	-0.067 ***	0.014	-0.031 ***	0.012
(55-64)*cont	-0.016	0.012	-0.021 *	0.012	-0.091 ***	0.014	-0.092 ***	0.012
(35-44)*south	-0.018 *	0.010	0.015	0.010	-0.023	0.014	-0.036 ***	0.011
(45-54)*south	0.001	0.011	0.059 ***	0.011	-0.073 ***	0.013	-0.097 ***	0.011
(55-64)*south	-0.052 ***	0.011	0.019 *	0.011	-0.112 ***	0.012	-0.167 ***	0.010
<i>Macro</i>								
trend	0.008 ***	0.002	0.010 ***	0.002	0.004	0.005	0.011 ***	0.002
trend*dem	0.000	0.002	0.002	0.002	0.005	0.005	0.003	0.003
trend*cont	0.004 *	0.002	0.005 **	0.002	0.003	0.005	0.008 ***	0.003
trend*south	0.002	0.002	0.001	0.002	-0.004	0.005	-0.007 ***	0.003
cycle	0.003 ***	0.001	0.005 ***	0.001	0.003 ***	0.001	0.008 ***	0.001
<i>Liberal</i>								
Democratic	-0.038	0.031	-0.110 ***	0.030	0.186 **	0.088	-0.067 *	0.035
Continental	0.040	0.029	-0.072 **	0.030	0.237 ***	0.059	-0.020	0.035
Southern	0.038	0.027	-0.063 **	0.030	0.462 ***	0.058	0.079 **	0.034
Observations	818168		818168		427128		492929	
Log likelihood	-432852		-473874.9		-184200.2		-293087.0	
pseudo - R2	0.148		0.127		0.091		0.105	

The marital status has a larger negative impact on women's labour market involvement in those countries characterized by more traditional family structure, such as found in continental and southern countries. The presence of young children has a negative impact on both participation and employment rates regardless the welfare regimes, though with some important differences in the magnitude of the effects. It is in the UK that the age of the latest child appears to be most critical, while in the southern countries, which are also the countries with lower employment rates for mothers, the age of the youngest child has a lower impact on both participation and employment. This may be simply due to differences in the composition of the labour force. In countries where female labour force participation is low, women in employment are typically characterized by a higher level of education - implying a stronger labour market attachment. Moreover in countries such as Italy, Greece and Spain, family networks compensate for the lack of availability of the service system. For example, extended family members, normally grandparents, often provide child care services, allowing the mother to continue work when their children are young due to the limited services provided by publicly-funded daycare facilities. Finally, labour market institutional rigidities in southern countries - which make (re)entering the labour market more difficult 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 while mothers' participation and employment increase steadily as the youngest child grows up (mostly through a re-entry to part-time employment mainly in Social Democratic countries but also in the UK and continental Europe), in the southern countries the presence of children negatively affects female labour market integration, even when the child is of school age. The estimates show that the probability of participating (being employed) for women's with a child older than 14 in the south of Europe is almost 5 percentage points lower than in the UK and Social Democratic countries, and 2 percentage lower than in continental countries.

The impact of an elderly relative at home on labour behaviour is found to depend on the cultural attitudes towards elderly relatives. In fact, while the overall effects of elder care is negative despite the welfare regime we consider, it is much lower in southern countries where co-habiting with an elderly relative is a quite diffuse practice and it is not necessarily related to the need of providing care to senior persons.

Finally, the highest female participation (and employment) rate is found among those aged in their late 30s/early 40s in all the welfare regimes groups we consider. However the decline in women involvement occurs at a later stage of the life cycle in Social Democratic and continental countries. Moreover, the participation (employment) 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 labour market involvement is expected as part of a male breadwinner system) and by the presence of early retirement pension schemes which favoured an early drop-out. In column (3) we report the results concerning the differences across welfare regimes of female temporary occupation. After controlling for individual characteristics we notice that the incidence of temporary contracts is much higher in Southern countries and, to a less extent, in continental and Social Democratic countries than in the UK. Moreover, countries in the south of Europe exhibit also a positive trend over the last 15 years. The most striking cross-countries difference in the personal characteristics of women holding fixed-term positions is the level of education. While in the UK and Social Democratic countries women with higher educational qualifications are more likely to hold fixed-term contracts, this tendency is reversed in the southern and continental Europe. This suggests the different nature of fixed-temporary contracts in the two groups of countries: they are more likely to be stepping

stones towards permanent high-skilled jobs in the former, and cheaper options, with lower wages and severance payments, and poor human capital accumulation in the latter.

Regarding part-time incidence (column 4), the results show that part-time occupation is mainly an option for married women with kids regardless of the welfare regimes, although the presence of small children has a strong impact on part-time decisions in the UK rather than in the other countries. Once we control for the presence of children, the incidence of part time jobs differs across age groups with a larger share of part-timers in the older groups in the UK, and to a less extent in continental and Social Democratic countries. Differences across age groups appear to be much less marked in the southern regime where, differently from the other countries in the sample, the incidence of part-time jobs drops significantly for women in the oldest age group (55-64).

### 5.2.3 *Trends across welfare regimes*

In Table 8, we report the estimated coefficients of specification 4, in which we allow the impact of the main determinants of female labour behaviour to vary over time. Tables 9 and 10 show the results for participation and employment using the same specification as in Table 3, estimated for each welfare regime separately.

Overall, the evidence shows that the positive trends in both female employment and participation differ substantially depending on the personal and family characteristics of women. Over time, the participation/employment increases for women with small children. However, such increase is not uniform across welfare regimes. From the results reported in Tables 9 and 10, it emerges that, between 1994 and 2009, the negative impact of young children on women's labour market involvement declined significantly in Social Democratic countries and to a lesser extent in continental and southern countries, while no trend has been detected for the UK. This phenomenon may be partly related to a larger availability of market (childcare services) or non-market substitutes (husband's or relative's help in childcare activities) accompanied by a shift in people's values in all European countries, and to a larger extent in more traditional countries, from the traditional breadwinner arrangements in favour of a more equal role for men and women within the household. This change in the attitude of women with children towards work has also been favoured by the expansion of flexible forms of employment (fixed-term contracts and part-time jobs), albeit from different starting points, which have allowed mothers to better combine traditional family responsibilities such as child-rearing with paid work.

The negative impact of informal elderly care on employment and participation has increased over time (with the exception of Social Democratic countries). According to our results, the presence of a co-inhabitation elderly person has a positive (and significant) impact on female labour 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 & Naldini, 2007).

Education (and partner's education) appears to have an increasing role in stimulating women's labour market involvement. Tables 4 and 5 show that the estimated trend is positive in both participation and employment in Continental countries. We also estimate a significant increase in the share of highly educated women leaving the inactivity status in the UK, and leaving the unemployment status in the Southern countries.

Table 8. Female labour market participation and type of occupation: Trends

	active			employed			temporary			parttime		
	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
<i>Marital status</i>												
Single												
incouple	-0.041	**	0.021	-0.021		0.022	-0.005		0.020	0.060	**	0.025
separated	0.056	***	0.007	0.055	***	0.007	-0.017	***	0.006	0.019	**	0.009
divorced	0.049	***	0.004	0.029	***	0.005	-0.014	***	0.004	-0.016	***	0.005
widowed	-0.067	***	0.006	-0.032	***	0.006	-0.011	**	0.005	0.066	***	0.008
<i>Children</i>												
No children												
children	-0.038	***	0.003	-0.032	***	0.003	0.013	***	0.003	0.020	***	0.004
childd	0.052	***	0.016	0.046	***	0.017	0.000		0.017	-0.034		0.021
child03d	-0.160	***	0.026	-0.120	***	0.026	-0.050	***	0.020	0.012		0.033
child36d	-0.133	***	0.024	-0.126	***	0.024	0.003		0.022	0.066	**	0.029
child614d	-0.046	***	0.018	-0.042	**	0.018	0.034	**	0.018	0.008		0.021
trend*child	-0.001		0.001	0.000		0.001	0.000		0.001	0.004	**	0.002
trend*child03	-0.001		0.002	-0.003		0.002	0.003		0.002	0.010	***	0.003
trend*child36	0.004	*	0.002	0.003		0.002	0.000		0.002	0.006	***	0.002
trend*child614	-0.002		0.001	-0.002		0.001	-0.001		0.001	0.012	***	0.002
<i>Co-habiting Elderly</i>												
no elderly												
old7080	0.063	**	0.032	0.031		0.035	0.035		0.035	-0.083	*	0.048
old80	-0.082	*	0.043	-0.062		0.044	0.121	**	0.052	-0.023		0.061
trend*old7080	-0.010	***	0.003	-0.008	***	0.003	-0.002		0.003	0.008	*	0.004
trend*old80	0.004		0.003	0.004		0.003	-0.009	***	0.003	0.002		0.005
<i>Education</i>												

Low skilled											
ISCED35	0.086	***	0.016	0.074	***	0.017	-0.079	***	0.016	-0.033	0.023
ISCED57	0.152	***	0.019	0.129	***	0.021	-0.053	***	0.017	0.003	0.025
trend*ISCED35	0.003	**	0.001	0.006	***	0.001	0.001		0.001	-0.001	0.002
trend*ISCED57	0.005	***	0.002	0.010	***	0.002	-0.001		0.001	-0.009	***
pISCED03	-0.056	**	0.025	-0.036		0.025	0.041	*	0.024	-0.063	**
pISCED35	-0.058	**	0.024	-0.043	*	0.024	-0.002		0.023	0.008	0.029
pISCED57	-0.064	***	0.026	-0.029		0.026	0.039		0.027	0.028	0.030
trend*pISCED03	0.003	*	0.002	0.003	*	0.002	-0.002		0.002	0.004	0.002
trend*pISCED35	0.008	***	0.002	0.009	***	0.002	-0.002		0.002	0.000	0.002
trend*pISCED57	0.006	***	0.002	0.006	***	0.002	-0.006	***	0.002	-0.001	0.002
<i>Age</i>											
25-34											
35-44	-0.042	**	0.021	0.006		0.022	-0.093	***	0.016	0.026	0.025
45-54	-0.157	***	0.023	-0.085	***	0.023	-0.170	***	0.015	-0.010	0.028
55-64	-0.455	***	0.020	-0.383	***	0.021	-0.128	***	0.016	0.087	***
trend*(35-44)	0.008	***	0.002	0.005	***	0.002	0.002		0.001	0.000	0.002
trend*(45-54)	0.012	***	0.002	0.008	***	0.002	0.006	***	0.002	0.005	**
trend*(55-64)	0.013	***	0.002	0.011	***	0.002	0.000		0.002	0.004	0.003
<i>Macro</i>											
trend	0.000		0.002	0.001		0.002	0.003	**	0.002	-0.004	0.002
cycle	0.003	***	0.001	0.005	***	0.001	0.002	***	0.001	0.005	***
Observations	818168			818168			427128			492929	
Log likelihood	-432641.4			-473009.5			-125878.3			-282816.9	
pseudo - R2	0.148			0.128			0.087			0.129	

Table 9. Female activity rate: Trends and welfare regimes

Active	ALL		LIBERAL		CONTINENTAL		DEMOCRATIC		SOUTHERN					
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.				
<i>Marital status</i>														
Single														
incouple	-0.041	**	0.021		-0.034	0.073	-0.060	*	0.035	0.023	0.031	-0.029		0.032
separated	0.056	***	0.007		0.022	0.017	0.055	***	0.017	-0.003	0.023	0.088	***	0.009
divorced	0.049	***	0.004		0.036	***	0.013		0.033	***	0.007	-0.012	*	0.007
widowed	-0.067	***	0.006		0.016	0.013	-0.094	***	0.010	-0.021	*	0.012	-0.090	***
<i>Children</i>														
No children														
children	-0.038	***	0.003		-0.026	**	0.012		-0.036	***	0.005	-0.035	***	0.006
childd	0.052	***	0.016		0.047	0.067	0.133	***	0.027	0.122	***	0.026	0.002	0.022
child03d	-0.160	***	0.026		-0.272	***	0.092		-0.263	***	0.044	-0.354	***	0.053
child36d	-0.133	***	0.024		-0.209	**	0.090		-0.201	***	0.042	0.027	0.037	-0.110
child614d	-0.046	***	0.018		-0.118	*	0.069		-0.047		0.032	0.003	0.033	-0.069
trend*child	-0.001		0.001		0.001	0.005	-0.006	***	0.002	-0.004	*	0.002	0.002	0.002
trend*child03	-0.001		0.002		0.001	0.007	0.003		0.003	0.011	***	0.003	0.000	0.003
trend*child36	0.004	*	0.002		0.003	0.007	0.009	***	0.003	-0.002	0.003	0.005	*	0.002
trend*child614	-0.002		0.001		0.000	0.005	-0.001		0.003	0.002	0.003	0.001		0.002
<i>Co-habiting Elderly</i>														
no elderly														
old7080	0.063	**	0.032		-0.174	0.179	0.051		0.078	-0.151	0.110	0.059	*	0.035
old80	-0.082	*	0.043		-0.025	0.248	-0.166		0.119	-0.007	0.155	-0.064		0.046
trend*old7080	-0.010	***	0.003		0.000	0.013	-0.014	**	0.007	0.000	0.007	-0.007	**	0.003
trend*old80	0.004		0.003		-0.004	0.019	0.010		0.009	-0.007	0.012	0.004		0.004
<i>Education</i>														

Low skilled												
ISCED35	0.086 ***	0.016	0.128 *	0.067	0.016	0.031	0.082 ***	0.031	0.112 ***	0.021		
ISCED57	0.152 ***	0.019	0.106	0.074	0.045	0.036	0.108 ***	0.033	0.252 ***	0.025		
trend*ISCED35	0.003 **	0.001	0.004	0.006	0.006 ***	0.002	0.001	0.003	0.001	0.002		
trend*ISCED57	0.005 ***	0.002	0.010 *	0.006	0.011 ***	0.003	0.003	0.003	0.000	0.002		
pISCED03	-0.056 **	0.025	-0.009	0.099	0.019	0.045	0.000	0.044	-0.073 **	0.033		
pISCED35	-0.058 **	0.024	0.065	0.076	0.001	0.039	-0.015	0.039	-0.106 ***	0.035		
pISCED57	-0.064 ***	0.026	0.028	0.080	-0.059	0.042	-0.026	0.043	-0.018	0.039		
trend*pISCED03	0.003 *	0.002	0.003	0.008	-0.001	0.004	0.004	0.004	0.003	0.003		
trend*pISCED35	0.008 ***	0.002	0.001	0.006	0.003	0.003	0.007 **	0.003	0.010 ***	0.003		
trend*pISCED57	0.006 ***	0.002	0.001	0.006	0.006 **	0.003	0.007 **	0.003	0.002	0.003		
Age												
25-34												
35-44	-0.042 **	0.021	0.101	0.077	-0.107 ***	0.039	0.093 ***	0.035	-0.039	0.027		
45-54	-0.157 ***	0.023	-0.119	0.091	-0.239 ***	0.037	0.107 ***	0.038	-0.139 ***	0.029		
55-64	-0.455 ***	0.020	-0.281 ***	0.094	-0.585 ***	0.025	0.005	0.040	-0.387 ***	0.029		
trend*(35-44)	0.008 ***	0.002	-0.005	0.006	0.014 ***	0.003	-0.002	0.003	0.006 ***	0.002		
trend*(45-54)	0.012 ***	0.002	0.005	0.007	0.021 ***	0.003	-0.002	0.003	0.008 ***	0.002		
trend*(55-64)	0.013 ***	0.002	0.000	0.007	0.027 ***	0.003	-0.006 *	0.003	0.005 **	0.002		
Macro												
trend	0.000	0.002	0.000	0.008	-0.003	0.004	0.002	0.004	0.002	0.002		
cycle	0.003 ***	0.001	0.000	0.002	0.007 ***	0.001	0.000	0.001	-0.001	0.001		
Observations	818168		50464		328750		129536		309418			
Log likelihood	-432641.4		26576.7		-165905.6		-60043.2		-169651.0			
pseudo - R2	0.148		0.123		0.143		0.086		0.175			
Country dummies	yes		-		yes		yes		yes			



Table 10. Female activity rate: Trends and welfare regimes

Employed	ALL		LIBERAL		CONTINENTAL		DEMOCRATIC		SOUTHERN		
	Coef.	Std. Er.	Coef.	Std. Er.	Coef.	Std. Er.	Coef.	Std. Er.	Coef.	Std. Er.	
<i>Marital status</i>											
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
<i>Children</i>											
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
<i>Co-habiting Elderly</i>											
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
<i>Education</i>											
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
<i>Age</i>										
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
<i>Macro</i>										
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	-		-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	

Finally, the trend effect also differs substantially across age groups and across welfare regimes. While in the UK, the trend effect 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. In fact, while there is not a substantial difference in the labour market behaviour of women in their mid-20s and 30s (having been born after the early 1960s and grown up and educated after the women's movement in the 1970s), 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.

Regarding the trend in part-time occupations (Table 8, column 4), the most interesting result is the increasing involvement in part-time jobs of women with children, and this trend is much stronger for women with children younger than 14. This result is in line with the existence of a relationship between the observed increase in the labour market activity of women with children over the sample period and the increasing availability of part-time jobs. Moreover, since the trend effect on part-time mothers' occupations is much stronger than the estimated trends on mother's participation/employment, the result suggests a shift from full-time positions to part-time positions of women with children who were already in employment.

## 6. Multi-level analysis

In this section we investigate the relevance of the labour market institutional framework and family policies in explaining the trends and cross-country differences in woman labour market involvement that we pointed out in the previous section. We will refer to the variable of institutional context and policies as 'macro' factors. In the analysis we will allow the interactions between micro- (individual characteristics) and macro-factors in order to detect any possible indirect effect of institutions and policies on employment and participation through the impact of micro determinants. The intuition is straightforward: both macro-factors and individual characteristics may be systematically related to the probability of being active/employed. However, an indirect impact may be in place when macro-factors affect also the way micro-characteristics impact women's behaviour. In order to simultaneously estimate the impact of micro- and macro-factors within a unified regression model, we use a multi-level analysis approach. This method allows us to consider a wider set of determinants of women's employment than is possible with a standard regression approach and to disentangle the direct and indirect effect of both micro- and macro-determinants (e.g. to estimate the simultaneous role of family care responsibilities, such as childcare and elderly care and family policy in determining female participation).<sup>7</sup>

In our multi-level analysis we focus on how institutional and policy factors affect women's behaviour between unpaid family responsibility and paid occupation. There is a large consensus on the role played by institutions and policies in affecting women's labour market behaviour and work attachment. The empirical analysis in the previous section shows that the impact of household-related responsibilities on woman labour market behaviour exhibits a country-specific patterns,<sup>8</sup> and recent empirical works provide evidence that the provision

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<sup>7</sup> In contrast to the standard difference-in-difference approach, which uses interaction terms between micro- and macro-level variables, the multi-level method allows us to control for the fact that observations may be clustered by country and therefore, standard error estimates are more reliable.

<sup>8</sup> Our results are in line with the findings in several related papers (see among others Bardasi & Gornick, 2003; Jaumotte, 2003; Del Boca et al., 2009).

of childcare facilities, parental leave and subsidies for day care spaces and, more generally, policies aimed to alleviating the financial burden of child-rearing, have a positive effect on female labour integration by either increasing work attachment (less women leaving occupation after childbirth) or facilitating women's re-entry into the labour market as children grow up (Sánchez-Mangas & Sánchez-Marcos, 2008; Lefebvre et al., 2009). Next to fiscal and social policies for the support of working mothers, the role played by changes in the institutional context is gaining increasing attention in the political debate. In the last two decades, the labour markets in many European countries have experienced deep changes towards the promotion of a so-called 'flexicurity' model of labour market with the aim of increasing competitiveness, employment creation and redistribution of work. Although the idea of deregulation was the common factor behind the waves of reform, the promotion of flexicurity was pursued through very different types of intervention on 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.<sup>9</sup>

In the southern countries and some continental countries, flexibility has been obtained through marginal reforms aimed at deregulating the use of temporary or 'atypical' forms of employment while leaving largely unchanged the legislation applying to the stock of workers employed under permanent (open-end) 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 labour market integration. However, this integration may occur at the risk of a reinforcement of the traditional separation of gender roles in the labour market and within the family.

From the flexibility side, the link between labour market deregulation and women's participation is not clear-cut, although there are a number of empirical studies showing how the effects of strict employment protection legislation (EPL) are disproportionately larger for those individuals (such as prime-age women) who are more subject to labour market entry problems. As a result, in a rigid labour market, employment opportunities for prime-age women are significantly reduced because they are more likely than men to move between employment and inactivity, in particular when seeking to balance the competing demands of work and family life (OECD, 2004; Heckman & Pages, 2000). From the security side, whether the presence of a generous unemployment benefit system 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 labour policies are interdependent and depends 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 the access to benefits and active policies. So if women are in principle supposed to benefit from the combination of flexibility in the labour market and security in the social system, the tendency towards greater flexibility of the labour market may exert a negative impact on the incentives to participate when flexible occupations are perceived to be of lower quality and poorly securitized.

Based on the results obtained in the previous section and on the findings of the related literature, we test two main hypotheses:

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<sup>9</sup> This is the so-called Danish model of 'flexicurity'.

H<sub>1</sub>: In countries with more progressive social policies in terms of support to families with young children (including the maternity, parental and childcare leave) and dependent elderly persons, housework and family-related responsibilities have a weaker impact on women's involvement in the labour market.

H<sub>2</sub>: Changes in the institutional setting towards a model characterized by lower barriers to hiring and firing combined with a higher social protection (passive labour market policies and active labour market policies) have a positive impact on female labour market activity/employment of women and the impact is larger for women who are more involved in family (unpaid) occupations.

## 6.1 The macro-policy and institutional indicators

We collect several variables related to the country-specific socioeconomic context that are expected to affect the influence of housework and family-related responsibilities on women's attachment to local labour markets. We distinguish six relevant dimensions of cross-country heterogeneity: the extent of employment protection legislation, passive and active labour market policies, subsidies targeted to elderly people, subsidies targeted to families, and the extent of parental leave. Table 11 presents a detailed description of these dimensions, by focusing on their construction and their specific components.

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 to extract the relevant factors, which are then rotated using the varimax method. In keeping with common practice (Nardo et al., 2005, Nicoletti et al., 1999, Kline, 1994), two factors satisfying the following requirements have been selected: eigenvalues larger than 1, individual contribution to the explanation of the overall variance larger than 10%. Within each factor, dimensions are weighted according to the proportion of the cross-countries' variance explained by the factor itself.

The results of the two PCA procedures are presented in Table 12. Each factor explains 50% of the underlying variance. The first factor (henceforth called POL) is highly correlated with parental leave 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 second factor (henceforth called INST) is defined by active and passive labour market policies (with factor loadings larger than 0.9), while the extent of employment protection legislation exerts an inverse impact on the factor (with negative factor loading, -0.15). Hence, this factor resumes the degree of flexicurity of national labour market institutions. 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 labour market. It is traditionally implemented across three main components: 1) flexible and reliable contractual arrangements, which are negatively correlated with employment protection; 2) effective active labour market policies and 3) modern social security systems providing adequate income support during employment transitions, which are positively correlated with passive labour-market policies.

Table 11. Description of macro-policy and institutional indicators

Final variable	Original variable	Description	Source
	<b>Employment protection legislation</b>	Synthetic index 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
<b>Institutions</b>	<b>Passive labour market policies</b>	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
	<b>Active labour market policies</b>	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
	<b>Elderly subsidies</b>	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
<b>Policies</b>	<b>Family Subsidies</b>	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.	Gauthier (2011a and 2011b)
	<b>Paternal leave</b>	Synthetic 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.	Gauthier (2011b)



Table 12. 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

## 6.2 The empirical specification and results

### 6.2.1 The role of policy and institutions

Our econometric specification consists of a multi-level analysis based on our (simplified) baseline probit model [M1n](#). We then allow both the intercept and the impacts of some individual characteristics (namely having small children and co-residing with an old-aged dependent) to depend on two country-specific (but time variant) macroeconomic factors: INST (labour-market institutional context) and POL (family-oriented policies).

Our random coefficient model is composed of an individual first-level regression, estimated for each age group separately, of the following type:

$$y_{ijt} = \gamma_{0jt} + \gamma_{1jt}CHILD_{ijt} + \gamma_{2jt}ELDERLY_{ijt} + \sum \delta_k x_{kijt} + \varepsilon_{ijt} \quad (5)$$

and a second level set of regressions as follows:

$$\gamma_{0jt} = \omega_{00} + \omega_{01}INST_{jt} + \omega_{02}POL_{jt} + u_{0jt}$$

$$\gamma_{1jt} = \omega_{10} + \omega_{11}INST_{jt} + \omega_{12}POL_{jt} + u_{1jt}$$

$$\gamma_{2jt} = \omega_{20} + \omega_{21}INST_{jt} + \omega_{22}POL_{jt} + u_{2jt}$$

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.<sup>10</sup>

In contrast to the analysis carried out in section 5, we now focus on women in the prime age group (25-54) because family care burdens, such as childcare and elderly care, are less relevant. 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 labour-market institutions affect the labour-market decisions of women with different levels of education and estimate (5) for the three education groups (primary, secondary and tertiary education).

<sup>10</sup> Cipollone & D'Ippoliti (2011) carried out a similar analysis for Italy, exploiting territorial heterogeneity at regional level.



The results are reported in Tables 13 and 14 for the activity rate and participation rate respectively.

Table 13. Two-level probit regression: Activity rate by age groups

Active	ALL		25-34		34-45		44-55	
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
ISCED35	0.131 ***	0.001	0.082 ***	0.003	0.136 ***	0.002	0.143 ***	0.002
ISCED57	0.213 ***	0.002	0.154 ***	0.003	0.219 ***	0.003	0.235 ***	0.003
incouple	-0.045 ***	0.002	-0.033 ***	0.003	-0.069 ***	0.003	-0.069 ***	0.004
separated	0.059 ***	0.004	0.070 ***	0.008	0.034 ***	0.006	0.038 ***	0.007
divorced	0.044 ***	0.003	0.071 ***	0.006	0.010 ***	0.004	0.007	0.004
widowed	-0.056 ***	0.004	-0.038 **	0.018	-0.069 ***	0.008	-0.079 ***	0.006
children	-0.030 ***	0.001	-0.064 ***	0.002	-0.028 ***	0.001	-0.017 ***	0.001
child06	-0.118 ***	0.001	-0.137 ***	0.002	-0.104 ***	0.002	-0.078 ***	0.006
old70	-0.020 ***	0.003	-0.011 *	0.007	-0.019 ***	0.005	-0.027 ***	0.005
pISCED03	-0.038 ***	0.002	0.008 **	0.003	-0.046 ***	0.003	-0.047 ***	0.004
pISCED35	0.004 *	0.002	0.053 ***	0.003	-0.013 ***	0.003	-0.012 ***	0.004
pISCED57	-0.008 ***	0.002	0.042 ***	0.003	-0.028 ***	0.003	-0.025 ***	0.004
cycle	0.001 **	0.000	-0.001	0.001	0.001	0.001	0.002 ***	0.001
trend	-0.002	0.000	-0.009	0.000	-0.003	0.000	0.005	0.000
democratic	0.037	0.123	0.263	0.179	0.058	0.126	-0.129	0.092
continental	-0.041	0.115	0.251	0.169	-0.008	0.118	-0.264	0.085
southern	-0.056	0.119	0.267	0.174	0.005	0.122	-0.303	0.086
inst	-0.006	0.014	-0.061 *	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
age35-44	0.020 ***	0.020						
age45-54	-0.030 ***	-0.030						
VPC_overall	0.056		0.199		0.063		0.042	
VPC_level 2	0.426		0.675		0.439		0.439	

The influence of individual-level variables on female labour-market decisions is in line with the results in the previous section. Both the POL and INST indicators exert a significant impact on likelihood of the women being employed and being active, although the effect is mediated by the type of unpaid work involved (presence of child or/and elderly person) and differs substantially across age groups. Regarding the role of family policies, the availability of child subsidies and child-friendly policies has a positive impact on the activity rate, although the effect appears to be significant only for relatively young women (25-34) at the early stage of their work life. Measures to help women combine caring responsibilities appear also to have a positive and significant effect on the employment opportunities of women's co-habiting with an elderly person. The effect reverses in the later stages of work

life, when the presence of family subsidies reduces the incentives to remain in the labour force for those women living with an elderly person.

More flexibility combined with more security (represented by INST indicator in the regression) is employment-enhancing for young women with small children, but the effect disappears for women in the older age groups. Quite surprisingly, higher labour flexibility is detrimental for the labour market involvement of women co-habiting with an elderly person. This result may be related to the fact that just a few countries in Europe have combined the two dimensions of flexibility and security,<sup>11</sup> 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, make unpaid elderly caring more attractive than paid occupations, especially in countries where family-caring activities are supported by monetary allowances that can be freely used to complement the family budget.<sup>12</sup>

Tables 15 and 16 present the impact of the macro-factors estimated for the three education groups separately. The results confirm substantially those reported in s 13 and 14.

Interestingly, the impact of family-care burdens on women participation/employment declines with the level of education. Indeed, highly educated women show a higher propensity to be involved in paid work even in presence of family care responsibilities.

Family policies provide a set of incentives/opportunities to remain in the labour market for medium- and highly educated women with children, but the effect is negative for low-skilled women, whose employment opportunities are limited both in terms of quality of jobs available and wages. Similarly, larger family subsidies have a negative impact on the labour-market participation of low-educated women who are involved in elderly care. The effect turns to be positive for medium-educated women and not significant for highly educated women. These results show how women's choices between paid work and unpaid care and the effects of policies crucially depend on the outside family options and their potential labour-market outcome. In general, cash benefits increase household income and raise the reservation wage at which women are available for work. Therefore, more generous supports for child- and elderly-related costs discourage labour market participation those in charge of family care, typically women, when the labour market opportunities are poor.

Consistent with the results found in the previous set of estimations, the INST indicator is positively related to the likelihood of participating and being employed regardless of the level of education of the mother, implying that a larger availability of flexicure employment systems increases the likelihood of entry (or re-entry) into the labour market for women with young children. However, the negative effect of elderly care on participation and employment is larger in a more deregulated labour market. Such effect holds for low-medium educated women (whose work propensity is lower and work opportunities are in general poorer) but not for highly educated women whose labour market opportunities are less vulnerable to institutional changes.

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<sup>11</sup> Combining the two axes of flexibility and security, Tangian (2007) concludes that only Denmark and the Netherlands are developing both dimensions.

<sup>12</sup> See Simonazzi (2009) for a detailed analysis of the recent dynamics of the care sector in the EU countries.

Table 15. Two-level probit regression: Activity rate by education groups

Active variable	ISCED_03		ISCED_35		ISCED_57	
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
incouple	-0.08 ***	0.004	-0.05 ***	0.003	-0.04 ***	0.002
separated	0.056 ***	0.007	0.061 ***	0.007	0.019 ***	0.007
divorced	0.034 ***	0.005	0.045 ***	0.004	0.013 ***	0.004
widowed	-0.08 ***	0.007	-0.05 ***	0.007	-0.03 ***	0.008
children	-0.03 ***	0.001	-0.03 ***	0.001	-0.01 ***	0.001
child06	-0.13 ***	0.003	-0.12 ***	0.002	-0.11 ***	0.002
old70	-0.04 ***	0.006	-0.02 ***	0.006	-0.02 ***	0.006
pISCED03	-0.05 ***	0.004	-0.01 **	0.003	0.001	0.004
pISCED35	-0.02 ***	0.004	0.01 ***	0.003	0.026 ***	0.003
pISCED57	-0.03 ***	0.006	-0.02 ***	0.003	0.014 ***	0.003
age35-44	-0.03 ***	0.003	0.031 ***	0.002	0.041 ***	0.002
age45-54	-0.11 ***	0.003	-0.01 ***	0.003	0.024 ***	0.002
inst	0.004	0.028	-0.02	0.013	-0.05 ***	0.014
pol	-0.02	0.041	-0	0.024	-0.01	0.020
cycle	0.002 **	0.001	0.002 ***	0.001	0.001 **	0.001
democratic	0.091	0.142	0.163	0.142	0.194	0.117
continental	-0.08	0.132	0.054	0.135	0.16	0.111
southern	-0.03	0.136	0.024	0.138	0.132	0.114
trend	-0	0.001	-0	0.000	-0	0.000
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	-0.04 ***	0.006	-0.02 ***	0.006	-0	0.006
pol*old70	-0.02 ***	0.006	-0	0.006	0.002	0.006
VPC_overall	0.121		0.048		0.058	
VPC_level 2	0.572		0.419		0.453	

The variance partition coefficient (VPC) of the pooled model is approximately equal to 0.06, which indicates that 6% of the variance in employment and participation rates can be attributed to differences between countries. This coefficient globally increases when the models are separately estimated by age group and educational level. In particular, it seems that macroeconomic heterogeneities are particularly relevant in explaining cross-country differences in employment and participation rates of younger and less skilled women (VPC increases up to 20% and 11% respectively), while individual heterogeneity accounts for more than 95% of those differences for women between 45 and 55 years of age. Our macro-factors are able to explain almost 50% of the overall cross-country variance, as shown by the level-2 variance partition coefficients of our employment and participation rate estimates.

Table 16. Two-level probit regression: Employment rate by education groups

Active variable	ISCED_03		ISCED_35		ISCED_57	
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
incouple	-0.043 ***	0.004	-0.035 ***	0.003	-0.032 ***	0.003
separated	0.048 ***	0.008	0.052 ***	0.008	0.032 ***	0.008
divorced	0.023 ***	0.006	0.030 ***	0.004	0.009 **	0.004
widowed	-0.027 ***	0.007	-0.030 ***	0.008	-0.015 *	0.009
children	-0.031 ***	0.001	-0.028 ***	0.001	-0.011 ***	0.001
child06	-0.139 ***	0.003	-0.129 ***	0.003	-0.108 ***	0.002
old70	-0.022 ***	0.007	-0.021 ***	0.006	-0.037 ***	0.006
pISCED03	-0.013 ***	0.004	0.023 ***	0.004	0.022 ***	0.004
pISCED35	0.027 ***	0.005	0.049 ***	0.003	0.055 ***	0.003
pISCED57	0.022 ***	0.006	0.027 ***	0.004	0.048 ***	0.003
age35-44	0.003	0.003	0.046 ***	0.003	0.062 ***	0.002
age45-54	-0.056 ***	0.003	0.015 ***	0.003	0.051 ***	0.003
inst	-0.018	0.028	-0.044 **	0.018	-0.063 ***	0.015
pol	-0.037	0.041	-0.005	0.030	-0.002	0.027
cycle	0.003 ***	0.001	0.002 ***	0.001	0.001 **	0.001
democratic	0.078	0.139	0.128	0.172	0.236	0.134
continental	-0.121	0.129	0.004	0.165	0.141	0.128
southern	-0.102	0.133	-0.076	0.169	0.095	0.132
trend	0.000	0.001	-0.001	0.000	-0.003	0.000
inst*child06	-0.009 **	0.004	0.001	0.003	0.017 ***	0.003
pol*child06	0.002	0.003	0.007 ***	0.002	0.011 ***	0.002
inst*old70	-0.030 ***	0.006	-0.009	0.007	0.002	0.007
pol*old70	-0.011 *	0.006	0.012 *	0.007	0.007	0.006
VPC_overall	0.114		0.067		0.073	
VPC_level 2	0.593		0.489		0.525	

### 6.2.2 The role of flexicurity

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

The results for the activity rate and participation rate are reported in Table 17.

The table shows that a higher degree of labour flexibility has a positive effect on employment and activity rates only if it is accompanied by policies aimed at guaranteeing access to employment security. At the same time, a larger degree of security is beneficial for women involvement only in sufficiently flexible labour markets that provide easier access to employment. Such effects are stronger for women who are more involved in family duties such as childcare and elderly care. These results suggest that combining a high degree of labour-market flexibility with a high level of social protection leads to significant gains in terms of women labour-market participation, while omitting one of these two factor can produce a sub-optimal (or even negative) outcome in terms of employment performance. The marginal effect of flexibility on the employment (activity) rate turns out to be positive in correspondence to a value of the security indicator above 1.66 (1.57). On the other hand, the

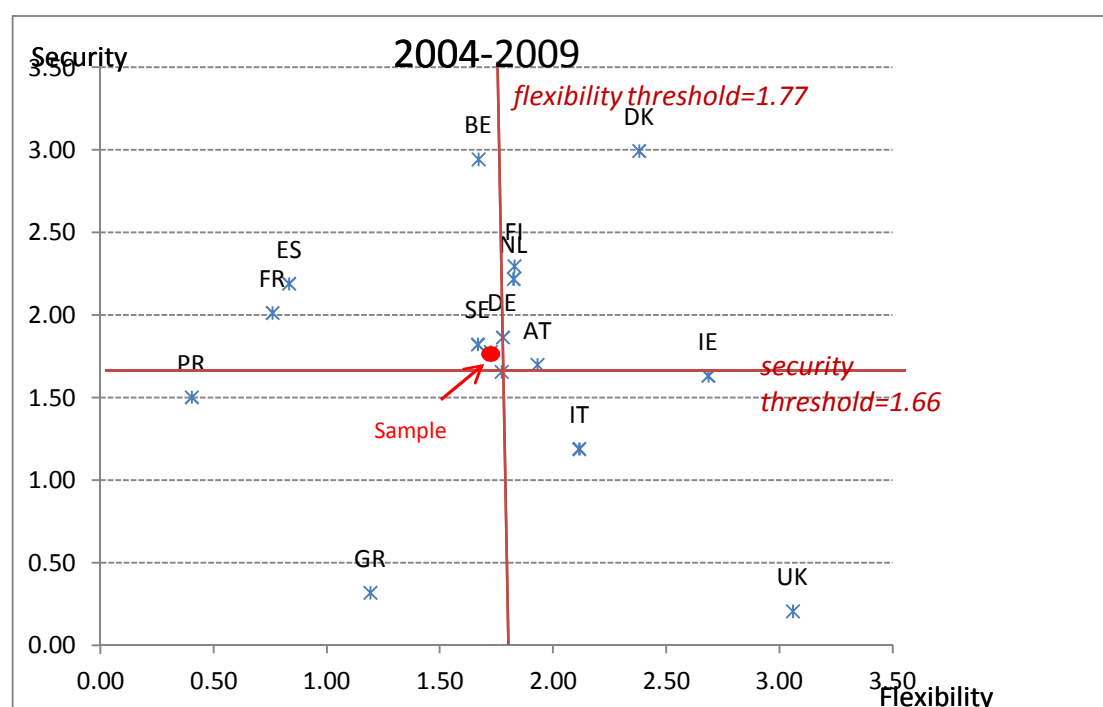
marginal effect of security on the employment (activity) rate turns out to be positive for a value of the flexibility indicator above 1.77 (1.75).

Table 17. Two-level probit regression: The impact of flexibility and security - whole sample

	Employment			Activity		
	Coef		Std. Err	Coef.		Std. Err
flex	-0.274	**	0.129	-0.157	*	0.091
security	-0.287	**	0.113	-0.175	**	0.089
flexicurity=flex x security	0.164	***	0.057	0.099	**	0.039
flex_child-0-6	-0.069	***	0.003	-0.067	***	0.003
security_child-0-6	-0.038	***	0.004	-0.014	***	0.004
flexicurity_child0-6	0.026	***	0.002	0.020	***	0.002
fex_old_70	-0.019	***	0.006	-0.021	***	0.005
security_old_70	-0.031	***	0.008	-0.036	***	0.008
flexicurity_old-70	0.008		0.005	0.007		0.005
VPC_overall	0.041			0.224		
VPC_level 2	0.042			0.264		

In Figure 10 we can observe that in the period 2004-09, the countries for which both the flexibility and security indicators are above the estimated thresholds are the Nordic countries (although only marginally for Sweden), the Netherlands and at the margin Belgium, Austria, Germany and Ireland. After the institutional reforms implemented in the late 1990s and early 2000s to promote a more flexible labour market, Italy still appears deficient on the security side. The opposite holds for France and Spain, which are still characterized by a rigid labour market. Greece and Portugal remain well below the thresholds.

Figure 10. The two dimensions of flexicurity - Flexibility vs. security



Finally, in Tables 18 and 19 we run the same regressions for women in different age groups and with different levels of education respectively. The impacts of flexibility, security and their interactions are significant and qualitatively the same across age groups, although the estimated coefficients are stronger for women at the early stages of their working careers. The disincentive effect of flexibility on labour supply appears significantly stronger among low-skilled women; this effect is statistically significant when women are involved in childcare activity despite their level of education.

Table 18. Two-level probit regression: The impact of flexibility and security - age groups

Employment									
	25-34		35-44		45-54				
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err			
Flex	-0.195	0.136	-0.313	**	0.137	-0.106		0.074	
security	-0.218	*	0.121	-0.306	**	0.126	-0.129	***	0.052
flexicurity=flex x security	0.129	**	0.055	0.171	***	0.069	0.076	***	0.026
flex_child-0-6	-0.081	***	0.004	-0.067	***	0.005	-0.048	***	0.012
security_child-0-6	-0.046	***	0.006	-0.067	***	0.007	-0.037	*	0.020
flexicurity_child0-6	0.039	***	0.003	0.036	***	0.004	0.021	**	0.010
flex_old_70	-0.009		0.012	-0.043	***	0.009	-0.014		0.009
security_old_70	-0.022		0.017	-0.040	***	0.014	-0.026	**	0.013
flexicurity_old-70	0.013		0.011	0.019	**	0.008	-0.003		0.008
VPC_overall	0.287		0.041		0.259				
VPC_level 2	0.328		0.042		0.564				
Activity									
	25-34		35-44		45-54				
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err			
flex	-0.197	0.139	-0.131		0.094	-0.057		0.072	
security	-0.168	*	0.098	-0.132		0.097	-0.044		0.070
flexicurity=flex x security	0.095	*	0.050	0.084	*	0.044	0.029		0.033
flex_child-0-6	-0.056	***	0.004	-0.069	***	0.004	-0.044		0.011
security_child-0-6	0.021	***	0.006	-0.067	***	0.007	-0.022		0.019
flexicurity_child0-6	0.019	***	0.003	0.038	***	0.003	0.016		0.009
flex_old_70	-0.027	**	0.011	-0.033	***	0.009	-0.010		0.008
security_old_70	-0.042	***	0.016	-0.036	***	0.013	-0.017		0.012
flexicurity_old-70	0.022	**	0.010	0.010		0.008	-0.007		0.007
VPC_overall	0.257		0.308		0.333				
VPC_level 2	0.287		0.385		0.589				

Table 19. Two-level probit regression: The impact of flexibility and security - education levels

Employment									
	ISCED 0-2		ISCED 3-5		ISCED 5-7				
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err			
flex	-0.393	**	0.201	-0.024	0.068	-0.051	0.063		
security	-0.379	***	0.115	-0.041	0.067	-0.072	0.064		
flexicurity=flex x security	0.241	***	0.056	0.011	0.032	0.015	0.029		
flex_child-0-6	-0.066	***	0.005	-0.090	***	0.005	-0.056	***	0.005
security_child-0-6	-0.038	***	0.008	-0.073	***	0.007	-0.004	0.007	
flexicurity_child0-6	0.024	***	0.005	0.045	***	0.004	0.012	***	0.004
flex_old_70	-0.008		0.009	-0.023	**	0.011	-0.008	0.011	
security_old_70	-0.010		0.013	-0.056	***	0.016	-0.016	0.016	
flexicurity_old-70	-0.012		0.008	0.025	***	0.009	0.010	0.010	
VPC_overall	0.053			0.201			0.209		
VPC_level 2	0.054			0.319			0.306		
Activity									
	ISCED 0-2		ISCED 3-5		ISCED 5-7				
	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err			
flex	-0.136		0.149	-0.002	0.064	-0.002	0.046		
security	-0.242	*	0.149	0.022	0.063	0.022	0.049		
flexicurity=flex x security	0.133	***	0.054	-0.026	0.032	-0.026	0.025		
flex_child-0-6	-0.067	***	0.005	-0.084	***	0.005	-0.084	***	0.004
security_child-0-6	-0.010		0.008	-0.048	***	0.006	-0.048	***	0.006
flexicurity_child0-6	0.019	***	0.004	0.038	***	0.003	0.038	***	0.003
flex_old_70	-0.002		0.009	-0.048	***	0.010	-0.048	***	0.009
security_old_70	-0.013		0.013	-0.078	***	0.014	-0.078	***	0.014
flexicurity_old-70	-0.017	**	0.008	0.035	***	0.008	0.035	***	0.009
VPC_overall	0.365			0.211			0.211		
VPC_level 2	0.418			0.322			0.323		

## 7. Conclusions

Female participation and employment rates in the EU have increased substantially over the last two decades, yielding to a gradual decline in the employment gender gap. In many countries the observed patterns in both participation and employment have occurred in conjunction with a progressive deregulation of the labour market and a growing attention to policy interventions aimed at increasing women's labour market participation.

Our analysis provides evidence on trends of women labour market involvement (both in quantitative and qualitative terms) by looking at the evolution of women labour market outcomes over time and across different welfare regimes.



Once individual characteristics and country-specific factors have been controlled for, we document an increase in female labour force participation with respect to men with comparable qualifications across welfare regimes. We also find that an increase in women labour market participation (with respect to men) is associated with larger shares of women in temporary and part-time jobs in southern European countries. In contrast, in Nordic countries the increase in women labour participation is associated with larger shares of women in full-time employment. These results are mainly driven by women in prime-age, i.e. 25-54 years of age, and with a low level of education. This suggests that on the one hand the increasing availability of 'atypical' jobs and more flexible forms of employment may have helped women to better integrate in the labour market and narrow the employment gap with men. On the other, this integration process has mainly occurred at the expense of an increasing gender gap in terms of quality of occupation, to the extent that differences across genders in the 'quality' of occupation are not fully explained by different preferences or productivity of men and women. This seems to be particularly true in those countries, such as the southern countries, where family-oriented policies are still less developed and, at the same time, the extended family (traditionally a source of support) has been gradually evolving into the smaller nuclear family.

Our regression analysis reveals that individual characteristics still play an important role in shaping women labour market behaviour, although the impact is mediated by the institutional and political context in which women function. In particular, household-care burdens appear as the key factors influencing participation rate. In this respect, along with the presence of children especially of pre-school age, the rapid ageing of the population has motivated an increasing interest towards the effects of elderly care on female labour supply. Our results show that, between 1994 and 2009, participation and employment increased for women with small children. However, such an increase has not been uniform across welfare regimes. Indeed, the negative impact of young children on women labour 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. At the same time, the negative impact of informal elderly care on employment and participation has increased over time. Indeed, according to our results, the presence of a co-habiting elderly person has a positive (and significant) impact on female labour market involvement at the beginning of a sample period and then turns negative. This seems to be related to the changing role of elderly relatives within the family, from providers of unpaid help in household and childcare activities within the extended family to recipients of informal long-term care in the nuclear family.

These trends are related to the institutional and policy changes that have been introduced in almost all European countries since the end of the 1990s. Such changes had an important impact on the labour market 'opportunities' of women by affecting the quality of potential jobs available, the chance to (re-)enter the labour market and the opportunity costs of employment (vs. non-employment).

A central result of our multi-level analysis is that, contrary to conventional assumptions, women's labour supply response to childcare and elderly care may be different, because women react differently to policy incentives and institutional roles according to the type of household care burden. One possible reason for the observed differences is the fact that an elderly person often contributes with his or her pension to the household income, thus increasing the reservation wage at which women are available to work. This implies that the discouraging impact of care for the elderly is different from that of children care and it is stronger for low-skilled women (whose labour market opportunities are poor) and in the presence of large cash benefits.

The results of the multi-level estimation go to this direction. The observed change in the attitude towards work of on the part women with children has been encouraged by the expansion of flexible forms of employment (fixed-term contracts and part-time jobs), which have progressively eased the labour 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 regardless of their level of education. Generous child benefits and maternity/paternity leave have a positive impact on labour market attachment of young women, and the effect is stronger for medium/highly educated groups.

Family subsidies work in the opposite direction for low-skilled women with elderly care responsibilities, since monetary subsidies have a stronger income effect on those individuals with a lower market wage. Interestingly, the deregulation of the labour market has a negative impact on the participation rate of women co-habiting with an elderly relative. Such effect holds for low-medium educated women (whose work propensity is lower and work opportunities are poorer in general) but not for well educated women whose labour market opportunities (and the quality of job opportunities) are less susceptible to institutional changes.

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## Appendix 1. The Vigdor Index

### A1.1 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  $f_0(x)$  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

$$P(D = 1 | x) = \frac{pf_1(x)}{pf_1(x) + (1-p)f_0(x)} = \frac{pf_1(x)}{f(x)} = \rho(x) \quad (\text{A1.1})$$

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 Vigdor 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  $g(x) = f_0(x)/f_1(x)$  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 – let us denote these by  $z$  – whose differences between group 0 and 1 are not appropriate to take into consideration in inferring a behavioural difference between group 0 and 1. For example, we might not want to label differences in the age structures between the two groups as differences in labour market behaviour between the two groups. The unconditional distribution of  $x$  (as in (A1.1)) will be different if individuals in group 0 and 1 have a different distribution of  $z$ . An analysis based on (A1.1) would be misleading. For example, if group 0 and group 1 are women and men, we do not want to capture differences in labour 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  $f_0(x|z)$  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,  $h_0(z)$  and  $h_1(z)$  respectively. We are thus interested in the ratio between density functions:

$$g(x|z) = \frac{f_1(x|z)}{f_0(x|z)} = \frac{f_1(x|z) h_0(z)}{f_0(x|z) h_1(z)} \quad (\text{A1.2})$$



A generalization of the Vigdor index that allows for the presence of  $z$  variables, while remaining composition invariant, is:<sup>13</sup>

$$I = 2 \int \frac{1}{1 + g(x|z)} f_1(x|z) h_1(z) dx dz \quad (\text{A1.3})$$

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

Estimate a probit model for being an individual of group 1 on  $x$  and  $z$ :

$$P(D = 1 | x, z) = \frac{pf_1(x, z)}{pf_1(x, z) + (1-p)pf_0(x, z)} = \frac{pf_1(x, z)}{f(x, z)} = \rho(x, z) \quad (\text{A1.4})$$

We can write:

$$g(x|z) = \frac{\rho(x, z)}{(1-\rho(x, z))} \frac{(1-p)}{p}$$

Substituting into (A1.2) we have that:

$$g(x|z) = \frac{\rho(x, z)}{(1-\rho(x, z))} \frac{(1-p)}{p} \frac{h_0(z)}{h_1(z)} \quad (\text{A1.5})$$

Estimate a probit model for being an individual of group 1 conditional on  $z$  alone:

$$P(D = 1 | x, z) = \frac{ph_1(z)}{ph_1(z) + (1-p)ph_0(z)} = \varphi(z)$$

We can write:

$$g(x|z) = \frac{\varphi(z)}{(1-\varphi(z))} \frac{(1-p)}{p}$$

Substituting into (A1.5) we have that:

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

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

Having  $g(x|z)$  on hand, the average value of the transformation  $1/(1 + g(x|z))$  across group 1 individuals, will then give the synthetic index (A1.3).<sup>14</sup>

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<sup>13</sup> The Vigdor index (Vigdor, 2008) is derived for a value of  $p=0.5$  and does not explicitly deal with differences between  $x$  and  $z$  variables.

<sup>14</sup> Such an analysis has been used in the book *Cultural Integration of Immigrants in Europe*, edited by Yann Algan, Alberto Bisin, Alan Manning and Thierry Verdier, Oxford: Oxford University Press, forthcoming (<http://ukcatalogue.oup.com/product/9780199660094.do#.UGG03c2RY8Z>) to study cultural and economic integration patterns of immigrants in Europe.



## A1.2 Adaptation to our setting

In our analysis we define  $D$  as a dummy taking 1 if the individual is female (disadvantaged group) and 0 otherwise. We consider four  $x$  variables,  $x_k, k = 1, \dots, 4$ :

- $x_1$ : 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);
- $x_3$ : dummy taking value 1 if the employed individual is temporary, and 0 if permanent; and
- $x_4$ : dummy taking value 1 if the employed individual is part-time, and 0 if full-time.

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

We thus derive four synthetic indicators (activity index, employment index, type of contract index 1 and type of contract index 2, respectively) for each European country and each year between 1994-2000 (ECHIP) and between 2004-09 (EU-SILC) and we perform T-test statistics to assess significant difference between the begin and the end of the observed time window.

## Appendix 2. Synthetic indicator: Complete list of results

Table A1. Activity gap by country and year

Country	Year													P-VALUE
	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	
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

Note: Missing values denote missing information in the original sample. P-values contain significance values of mean-comparison tests between the synthetic indicators at the beginning and at the end of the time window.

Table A2. Employment gap by country and year

Country	Year													P-VALUE
	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	
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	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 A3. Part-time employment gap by country and year

Country	Year													P-VALUE
	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	
AT	0.8877	0.8875	0.8749	0.8645	0.8493	0.8383	0.8190	0.7773	0.8259	0.7954	0.8041	0.8027	0.0000	
BE	0.8650	0.8763	0.8797	0.8704	0.8593	0.8785	0.8197	0.8328	0.8281	0.8217	0.8249	0.8270	0.0197	
DE	0.9128	0.8997	0.8938	0.9007	0.9153	0.8998		0.7167	0.7605	0.7412	0.7585	0.7726	0.0000	
DK	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.9302	0.3640	
ES	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.9402	0.1604	
FI		0.9891	0.9842	0.9842	0.9902	0.9881	0.9749	0.9737	0.9694	0.9737	0.9715	0.9750	0.0004	
FR	0.9307	0.9265	0.9234	0.9421	0.9412	0.9450	0.8870	0.8850	0.8764	0.8829		0.8862	0.0000	
GR	0.9644	0.9544	0.9497	0.9495	0.9483	0.9421	0.9467	0.9304	0.9439	0.9441	0.9423	0.9477	0.0353	
IE	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.8635	0.2439	
IT	0.9383	0.9379	0.9372	0.9325	0.9295	0.9303	0.9089	0.8939	0.9011	0.8953	0.8923	0.9038	0.0000	
LU		0.9160	0.8690	0.9036	0.9077	0.9025	0.8747	0.8628	0.8467	0.8332	0.8449	0.8336	0.0001	
NL	0.6658	0.6556	0.6811	0.6707	0.6614	0.6733		0.6299	0.6175	0.6240	0.6280	0.6292	0.0088	
PT	0.9596	0.9598	0.9543	0.9591	0.9506	0.9654	0.9714	0.9771	0.9799	0.9721	0.9718	0.9736	0.0468	
SE				0.9558	0.9413	0.9708	0.9647	0.8911	0.8770	0.8939	0.8871	0.8714	0.8638	0.0000
UK	0.8210	0.8300	0.8346	0.8405	0.8429	0.8310		0.8485	0.8317	0.8431		0.8531	0.0138	

Table A4. Temporary employment gap by country and year

Country	Year													P-VALUE
	1994	1995	1996	1997	1998	1999	2000	2004	2005	2006	2007	2008	2009	
AT	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9626	0.9698	0.9708	0.9687	0.9710	0.9786	0.0000
BE	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9590	0.9531	0.9523	0.9634	0.9508	0.9548	0.0000
DE	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000		0.9762	0.9760	0.9554	0.9853	0.9884		0.0000
DK	0.9812	0.9951	0.9856	0.9834	0.9716	0.9821	0.9357	0.9385	0.9290	0.9479	0.8848	0.8952		0.0000
ES	1.0000	0.9937	1.0000	0.9902	0.9957	0.9882	0.9696	0.9621	0.9594	0.9593	0.9625	0.9669		0.0000
FI		0.9690	0.9547	0.9627	0.9610	0.9572	0.8910	0.8878	0.8945	0.8919	0.8989	0.9168		0.0000
FR	0.9658	0.9528	0.9655	0.9561	0.9558	0.9561	0.9616	0.9561	0.9539	0.9449		0.9521		0.0000
GR	0.9865	0.9684	0.9852	0.9424	0.9435	0.9564	0.9393	0.9422	0.9452	0.9533	0.9464	0.9463		0.0000
IE	0.9407	0.9418	0.9479	0.9509	0.9575	0.9487	0.9238	0.9179	0.9210	0.8955	0.9104	0.9049		0.0000
IT	0.9430	0.9444	0.9363	0.9373	0.9433	0.9305	0.9256	0.9247	0.9226	0.9231	0.9298	0.9302		0.0000
LU		0.9794	1.0000	0.9874	0.9821	0.9783	0.9747	0.9830	0.9832	1.0000	0.9956	0.9995		0.0000
NL	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000		0.9286	0.9201	0.9082	0.8950	0.9038		0.0000
PT	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9696	0.9668	0.9744	0.9711	0.9717	0.9811		0.0000
SE				0.9576	0.9668	0.9778	0.9712	0.9269	0.9003	0.9395	0.9357	0.9416	0.9483	0.0027
UK	0.9677	0.9677	0.9677	0.9677	0.9677	0.9677		0.9677	0.9677	0.9677		0.9677		0.1160

## Appendix 3. Multi-level Analysis

### The methodological framework

#### A3.1 The random intercept model

Let  $y_{ij}^*$  be the latent variable for individual  $i$  in region  $j$ . We observe the dichotomous response variable  $y_{ij}$ , which takes value 1 if the individual individual  $i$  in country  $j$  is employed (or active) and 0 otherwise. Let  $\mathbf{x}_{ij}$  be a  $r \times 1$  vector of individual and household characteristics and  $\mathbf{z}_j$  be a  $t \times 1$  vector of characteristics of the country of residence.  $u_{0j}$  is the random effect, or level-2 residual for region  $j$ , with  $u_{0j} \sim N(0, \sigma_{u_0}^2)$ ;  $\varepsilon_{ij} \sim N(0, \sigma_\varepsilon^2)$  is the level-1 residual.  $u_{0j}$  and  $\varepsilon_{ij}$  are independent.

The random intercept model is composed of a level-1 model (the individual level):

$$y_{ij} = \alpha_{0j} + \mathbf{a}_j \mathbf{x}_{ij} + \varepsilon_{ij} \quad (\text{A3.1})$$

and a level-2 model (the country-level):

$$\begin{aligned} \alpha_{0j} &= \beta_0 + \boldsymbol{\beta} \mathbf{z}_j + u_{0j} \\ \mathbf{a}_j &= \mathbf{a} \end{aligned} \quad (\text{A3.2})$$

where  $\beta_0$  is a constant and  $\boldsymbol{\beta}$  is a  $t \times 1$  vector of coefficients. Notice that, at this stage,  $\mathbf{a}_j$  is constant across countries. This notional complication will turn useful later on. Hence, the combined random-intercept model is given by:

$$y_{ij} = \beta_0 + \boldsymbol{\beta} \mathbf{z}_j + \mathbf{a} \mathbf{x}_{ij} + \varepsilon_{ij} + u_{0j}$$

The probability of observing a positive response on the outcome variable is specified as:

$$\Pr(y_{ij} = 1) = \Phi(\beta_0 + \boldsymbol{\beta} \mathbf{z}_j + \mathbf{a} \mathbf{x}_{ij}) = \Phi(\Theta)$$

where  $\Phi(\cdot)$  is the standard normal cumulative distribution function. The likelihood contribution of an individual  $i$  in region  $j$ , conditional on  $u_{0j}$ , is:

$$L_{ij}(\Theta | u_{0j}) = \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}}$$

Integrating the random term  $u_{0j}$  out, the previous likelihood reads as:

$$L_{ij}(\Theta) = \int_{-\infty}^{+\infty} \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}} \varphi(u_{0j}) du_{0j}$$

Hence, let  $\Omega$  be the variance matrix of the regional random effects, the overall likelihood function is:

$$L(\Theta, \Omega) = \prod_j \prod_i \int_{-\infty}^{+\infty} \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}} \varphi(u_{0j}) du_{0j}$$

The likelihood function is approximated via a Gauss-Hermite quadrature.

### A3.1.1 The random coefficient model

The random intercept model above is a simplified version of more complex multilevel models, where the relationships between the first level explanatory variables and the outcome of interest may differ across level-2 units. This possibility is modelled by introducing random slopes for level-1 explanatory variables.

The random-coefficient model is composed by the two levels described in the previous section (A3.1) and (A3.2), where the vector of regression coefficients on the level-1 explanatory variables is allowed to depend on a set of country-specific characteristics  $\mathbf{z}_j$  and on a further stochastic component:

$$\mathbf{a}_j = \gamma_0 + \boldsymbol{\gamma}\mathbf{z}_j + \mathbf{u}_j \quad (\text{A3.3})$$

Combining (A3.1)-(A3.2)- (A3.3), the random-coefficient model is given by:

$$y_{ij} = \beta_0 + \boldsymbol{\beta}\mathbf{z}_j + (\gamma_0 + \boldsymbol{\gamma}\mathbf{z}_j + \mathbf{u}_j)\mathbf{x}_{ij} + \varepsilon_{ij} + u_{0j}$$

The model is then composed of  $r+1$  vector of random coefficients,  $u_{0j}$  and  $\mathbf{u}_j$ . The vector  $(u_{0j}, u_{1j}, \dots, u_{rj})$  has a multivariate normal distribution with zero mean and constant covariance matrix, which is independent on  $\varepsilon_{ij}$ .

The probability of observing a positive response on the outcome variable is specified as:

$$\Pr(y_{ij} = 1) = \Phi(\beta_0 + \boldsymbol{\beta}\mathbf{z}_j + (\gamma_0 + \boldsymbol{\gamma}\mathbf{z}_j)\mathbf{x}_{ij}) = \Phi(\Theta)$$

The likelihood contribution of an individual  $i$  in region  $j$ , conditional on  $u_{0j}$  and  $\mathbf{u}_j$ , is:

$$L_{ij}(\Theta | u_{0j}, \mathbf{u}_j) = \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}}$$

Integrating the random terms  $u_{0j}$  and  $\mathbf{u}_j$  out, the previous likelihood reads as:

$$L_{ij}(\Theta) = \int_{-\infty}^{+\infty} \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}} \varphi(u_{0j}) \varphi(\mathbf{u}_j) du_{0j} d\mathbf{u}_j$$

Hence, let  $\Omega$  be the variance matrix of the regional random effects, the overall likelihood function is:

$$L(\Theta, \Omega) = \prod_j \prod_i \int_{-\infty}^{+\infty} \Phi(\Theta)^{y_{ij}} (1 - \Phi(\Theta))^{1-y_{ij}} \varphi(u_{0j}) \varphi(\mathbf{u}_j) du_{0j} d\mathbf{u}_j$$

The likelihood function is approximated via a Gauss-Hermite quadrature.





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- Provide a regular flow of authoritative publications offering policy analysis and recommendations,

### Assets

- Multidisciplinary, multinational & multicultural research team of knowledgeable analysts,
- Participation in several research networks, comprising other highly reputable research institutes from throughout Europe, to complement and consolidate CEPS' research expertise and to extend its outreach,
- An extensive membership base of some 132 Corporate Members and 118 Institutional Members, which provide expertise and practical experience and act as a sounding board for the feasibility of CEPS policy proposals.

## Programme Structure

### **In-house Research Programmes**

Economic and Social Welfare Policies  
Financial Institutions and Markets  
Energy and Climate Change  
EU Foreign, Security and Neighbourhood Policy  
Justice and Home Affairs  
Politics and Institutions  
Regulatory Affairs  
Agricultural and Rural Policy

### **Independent Research Institutes managed by CEPS**

European Capital Markets Institute (ECMI)  
European Credit Research Institute (ECRI)

### **Research Networks organised by CEPS**

European Climate Platform (ECP)  
European Network for Better Regulation (ENBR)  
European Network of Economic Policy  
Research Institutes (ENEPRI)  
European Policy Institutes Network (EPIN)