Discriminating Factors of Women's Employment.

Using territorial heterogeneity to inform policy

ABSTRACT

We employ the dramatic heterogeneity across Italy's Regions to assess the impact of selected context factors on men's and women's employment by means of multilevel analysis. Observing that individual factors strongly interact with local policies and institutions in determining women's employment, we claim that any attempt to explore solely its supply-side determinants might lead to biased estimates.

Aggregate growth and tertiarisation of the economy are surprisingly found beneficial only to men's employment, while culture and discrimination are relevant for women's. Social Assistance is found highly significant, with the provision of services being more beneficial to women's employment than monetary transfers.

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KEYWORDS: gender differentials, employment policy, regional development policy

An extensive and growing literature exists on women's employment in Europe. This paper aims at contributing to the debate employing the specific and high territorial heterogeneity exhibited by Italy's Regions as an internationally relevant case study. Such an analysis provides results partly different from what expected on the basis of cross-country aggregate evidence on industrialized countries.[1] Aim of this paper is to investigate the extent to which these different context conditions affect women's employment, and possibly to disentangle the main components of these effects.

Some main conclusions are drawn from our analysis, which are indeed interesting beyond the borders of Italy's experience. Firstly, it is shown that context and policy variables differently affect men's and women's behaviours both quantitatively and qualitatively, in that a number of variables affect only one of the two genders, while others exhibit an opposite impact on men's and women's employment. Hence, no labour market policy can be deemed gender-neutral, and, conversely, pursuing inclusive labour-market policies requires gender-specific targets and instruments, even if gender differentials were not the specific goal of policy. Secondly, it is found that explicitly considering territorial heterogeneity can indeed lead to a better fit of the data while providing new relevant information to policymakers: by showing that individual factors strongly interact with context factors in determining women's employment, we claim that any attempt to explore solely supply-side determinants of women's employment, discarding these interactions, might lead to biased estimates.

The policy implications of our finding point in the direction of a greatly enhanced role for

[1] For extensive evidences of socio-economic differences within Italian regions, see Putnam (1993), Tabellini (2006). We refer to Boeri *et al*. (2005) for an international assessment of Italy's specific situation, and to Battistoni (2006) for a historic national perspective. For our purposes we limit to highlight that women's employment rates (ER) in Italy still lack well behind the Lisbon Agenda target level of 60%, amounting to 46% on average in year 2006 (a level above only the case of Malta, within EU-25). Crucially, significant differences across Regions exist: women's ER in the North of Italy are almost 30 percentage points higher than in the South, and while as of 2005 the Region Emilia Romagna (Centre) has filled the gap with the European target, women's ER in Campania (South) is as small as 27%. As Corsi *et al*. (2006) show, men's patterns of employment are less diverse across Regions than women's, and it has been noted that the very high gap in per-capita income between Regions could be completely filled in by the removal of the gap in women's employment.

local development strategies, as opposed to the exclusive focus on individuals' *employability* (which would now constitute only a part of the story) which currently characterizes Europe's and Italy's policy. We find that Social Assistance and the provision of public services to households determines a significant part of the observed differentials in employment, as well as civic development and gender-based discrimination. Contrary to what frequently assumed, pure macroeconomic variables, such as GDP growth or the extent of the Services Sector, seem to significantly affect only men's employment. These two findings suggest that no reliance can be put on self-correcting mechanisms of economic growth to automatically address gender unbalances in the labour market, and that women's full inclusion requires the provision of effective public services as well as the pursue of wide-ranging regional development policies, well beyond strictly-focused labour market interventions.

The paper proceeds as follows. Paragraph 1 introduces a brief survey of the economic literature on the determinants of women's employment. Paragraph 2 proposes a standard investigation of the individual probability of employment by means of probit analysis: it is shown that the consideration for Regional dynamics allows for a better representation of observed patterns. However -as such- generic Regions' effects are not instructive for policy, as Regions may simultaneously differ in terms of several dimensions, such as social and cultural characteristics, local institutions and policy, economic conditions. Hence, paragraph 3 introduces an original way of dealing with Regions' heterogeneity, developing three main macro indicators that synthesize (1) the degree of civic development and gender discrimination, (2) the extent and forms of social assistance, and (3) regional macroeconomic conditions. The aggregate relation of these indicators to women's employment is briefly investigated. Finally, by means of a multilevel modelling approach, paragraph 4 explores the joint impact of these macro indicators (level 2 dimension) and of several observable micro characteristics (level 1 dimension) on the employment status of women and men. Paragraph 5 concludes.

1. Women's Employment in OECD countries

The economic literature has adopted several approaches to explore the determinants of women's participation to the labour market, frequently by distinguishing individual factors from institutional factors, socio-cultural norms and changes in market technology.

Following the seminal works of Becker (1965) and Mincer (1969), neoclassical theory predicts that individuals' choice between family and work is based on the comparison between "full wage" and "reservation wage". The *full wage* represents the opportunity cost of staying at home and it is computed as the sum of the present value of i) the salaries offered in the market and ii) future earning losses caused by non-accumulation and depreciation of human capital, due to inactivity (Even, 1987). The *reservation wage* represents the minimum wage at which a person might be willing to enter the labour market and it values the time spent at home. The *full wage* is mainly dependent on education, work experience, career breaks; the *reservation wage* mostly depends on family status and structure, such as marital status, presence of young children, and social and cultural frictions between work and family activities. Under this neoclassical model, women maximize their utility and choose to enter the labour market only if the *full wage* exceeds the *reservation wage.*

A large number of studies emerged, testing the neoclassical model of female labour supply, partly validating the model's predictions. Several studies confirm that family-related responsibilities negatively affect women's participation to paid employment (e.g. Adam, 1996; Connelly, 1991; Drobnic, 1997; Giannelli, 1996; Grimm and Bonneuil, 2001; Hotchkiss and Pitts, 2005; Iázaro *et al*., 2004; Xie, 1997). However, cross-national studies find that the influence of children on women's labour supply follows country specific patterns (Bardasi and Gornick, 2003; Gustaffson *et al.*, 1996; Jaumotte, 2003). National differences are often explained in terms of public policies for the support of working mothers, such as parental leave schemes (e.g. Hofferth and Curtin, 2003;

Ruhm, 1998; Pylkaenen and Smith, 2003), or social benefit and tax systems (e.g. OECD 1996, 2002, 2003, 2004) or the availability and features of childcare facilities (e.g. Connelly and Kimmel, 2003; Cleveland *et al.*, 1996; Connelly, 1991, 1992; Del Boca and Locatelli, 2006; Hofferth and Wissoker, 1992; Powell, 1998).

Among personal characteristics, education is found as a major factor influencing women's employment. It is thought to be so by affecting wages and, in turn, labour market participation and fertility decisions, and the timing of these events (Al-Qudsi, 1998; Gustaffsson and Kenjo in Del Boca and Wetzles (eds), 2007; Johnes, 1999). Internationally, countries with high levels of education are characterized by lower fertility rates and vice versa. However, several recent studies at the micro level find positive correlations between education and fertility (Bloemen and Kalwij, 2001; Del Boca and Pasqua, 2005; Moffit, 1984).

Among households' characteristics, the presence and the socio-economic background of a partner is found to play an important role in the probability for a woman to be employed, especially in presence of children. The theory of the household's allocation of time (Becker, 1965) states that an increase in husbands' income may induce women to consume additional non-market time, thereby reducing their participation to the labour market. However, some studies found that this predicted negative correlation between husband's income and wife's employment has fallen in the recent years. Two reasons might stand behind this evidence: the rising level of women's education and the positive trend of mating by education (Becker, 1973; Mare, 1991; Schwartz and Mare, 2005).

Finally, the institutional determinants of women's employment are frequently considered not less important, as the patterns of combining work and family activities are very different across countries, depending on economic structure, institutional arrangements and socio-cultural norms. Faggio and Nickell (2007) find that structural characteristics of the social security system (such as, early retirement benefits, sickness and disability benefits and unemployment benefits) are able to

explain part of changes in unemployment and female participation across OECD countries, with countries with more generous welfare benefits experiencing small fall in labour input and higher rate of female employment. By exploring the relationship between welfare benefits and female labour supply, Bingley and Walker (2001) confirm that women's labour supply in UK is significantly responsive to housing benefits and direct rent subsidies.

A wide number of studies emerged, exploring the role of social policies in combining work and family, in particular the availability and the quality of public childcare. When childcare services are of bad quality, expensive, or scarcely available, mothers' reservation wage increases, lowering thereby women's labour supply (e.g. Anderson and Levine, 1999; Conelly, 1991, 1992; Hofferth and Wissoker, 1992; Kimmel, 1995; Powell, 1998). Apps and Rees (2004) adds that, within OECD countries, those countries supporting motherhood through childcare facilities rather than child benefits tend to have both higher rates of women's labour supply and higher fertility rates.

Among social policies, also the impacts of parental leave and of tax and social benefits on women's employment have been analyzed. Parental leaves allow to support women's labour market attachment by facilitating their return into employment (Hofferth and Curtin, 2003; Ruhm, 1998); while means-tested benefits, joint taxation and tax reductions on the dependent spouse, create work disincentives and inactivity traps on the secondary earner. With respect to the latter, Apps and Rees (2004) find that, within OECD countries, countries with individual rather than joint taxation are characterized by higher fertility rates and greater women's labour supply. Adopting a model of labour supply and fertility choice under credit rationing and market imperfections, Del Boca (2002) explores the impact of several social policies on women's labour supply in Italy. The results seem to point that the decisions to work and to have a child are similarly affected by the same factors, being positively influenced by the availability of childcare and of part-time jobs.

Recently, a strand of literature emerged, to analyze the role played by socio-cultural norms in determining women's labour supply. Researches in this area showed that countries with more

liberal attitudes toward gender roles, higher work orientation of women and higher acceptance towards young children's working mother show higher women's employment rates (for the relationship between women, work and culture, see Antecol, 2000; Fernández, 2007; Fernández, Fogli and Olivetti, 2004; Pencavel, 1998; Reimers, 1985; Vella, 1994).

This paper aims at investigating the issue from an innovative point of view: by showing that individual factors strongly interact with context factors in determining women's employment, we claim that any attempt to explore solely supply-side determinants of women's employment, discarding these interactions, might lead to biased estimates. The policy implications of our finding point in the direction of a greatly enhanced role for local development strategies, as opposed to the exclusive focus on individuals' *employability* (which would now constitute only a part of the story) which currently characterizes Europe's and Italy's policy.

2. Stylized facts: the individual level

Individual and household characteristics play a relevant role in shaping gender differences in employment in European countries and Italy. This evidence is straightforward addressed by looking at the results of a simple probit modelling the determinants of employment. We investigate men's and women's probability of being employed using the Bank of Italy's *Survey of Households' Income and Wealth* (SHIW), a representative sample of the Italian population in year 2004. Although not specifically designed to analyze labour market dynamics, the *Survey* enables us to account for a number of variables not included in the *Labour Force Survey* from the national statistical office. The sample is composed of more than 8000 households: we limit our analysis to individuals in prime age (from 25 to 55 years old).

We selected a number of family variables (marital status, real assets (in logarithmic form), presence in the household of at least one child below the age of three or of at least an elderly person above the age of 70), context variables (proxied by the dimension of the urban agglomeration), and individual variables (age, educational attainment, gender). A simple probit model is estimated for both women and men together (pooled model), and then for women and men separately. Results are displayed in Table 1 in terms of marginal effects.

Overall it seems that urban dimension does not play a statistically significant role on the probability of being employed, while individual characteristics are all significant at the 1% significance level. Mixed evidence is found with respect to household variables.

Table 1. ***Determinants of Employment Status: Probit Analysis (marginal effects)***

	BASELINE			**FIXED EFFECTS**		
	POOLED	**MEN**	**WOMEN**	**POOLED**	**MEN**	**WOMEN**
Women	-0.3104			-0.3179		
	*(0.0126)***			*(0.0127)***		
Married	-0.0392	0.0933	-0.1767	-0.0310	0.1023	-0.1853
	*(0.0169)***	*(0.0163)****	*(0.0272)****	*(0.0171)**	*(0.0163)****	*(0.0278)****
Children	0.0220	0.0347	-0.0338	(0.0365)	0.0394	-0.0133
	(0.0231)	*(0.0192)*	*(0.0405)*	*(0.0224)*	*(0.0160)***	*(0.0413)*
Aged	-0.1736	-0.0921	-0.2158	-0.1464	-0.0663	-0.1914
	*(0.0290)****	*(0.0252)****	*(0.0417)****	*(0.0287)****	*(0.0223)****	*(0.042)****
Wealth	0.0099	0.0104	0.0117	0.0064	0.0080	0.0073
	*(0.0032)****	*(0.0026)****	*(0.0055)***	*(0.0033)**	*(0.0024)****	*(0.0059)*
Small town	0.0219	-0.0151	0.0483	0.0106	-0.0224	0.0360
	(0.0198)	*(0.0185)*	*(0.0340)*	*(0.0209)*	*(0.0186)*	*(0.0369)*
Town	0.0363	0.0179	0.0435	-0.0116	-0.0029	-0.0326
	*(0.0188)**	*(0.0153)*	*(0.0336)*	*(0.0207)*	*(0.0165)*	*(0.0367)*
City	-0.0141	-0.0222	0.0015	-0.0289	-0.0248	-0.0240
	(0.0165)	*(0.0146)*	*(0.0279)*	*(0.0171)**	*(0.0141)***	*(0.0296)*
Big City	0.0251	-0.0064	0.0481	0.0251	-0.0046	0.0425
	(0.0210)	*(0.0186)*	*(0.0347)*	*(0.0209)*	*(0.0176)*	*(0.0369)*
Age	0.0933	0.0698	0.0822	0.0932	0.0634	0.0876
	*(0.0079)****	*(0.0065)****	*(0.0131)****	*(0.0079)****	*(0.0061)****	*(0.0134)****
Age^2	-0.0011	-0.0009	-0.001	-0.0011	-0.0008	-0.0010
	*(0.0001)****	*(0.0001)****	*(0.0002)****	*(0.0001)****	*(0.0001)****	*(0.0002)****
Elementary	0.1941	0.0733	0.3334	0.1913	0.0651	0.3557
	*(0.0307)****	*(0.0204)***	*(0.0698)****	*(0.0288)****	*(0.0178)***	*(0.0667)****

Lower Sec.	0.3383	0.1626	0.4937	0.3064	0.1339	0.4775
	*(0.0426)***	*(0.0375)***	*(0.0763)***	*(0.0435)***	*(0.0342)***	*(0.0825)***
Higher Se.	0.4606	0.2152	0.652	0.4180	0.1815	0.6244
	*(0.0438)***	*(0.0428)***	*(0.0674)***	*(0.0453)***	*(0.0393)***	*(0.0752)***
Tertiary	0.3068	0.1070	0.5225	0.2861	0.0885	0.5127
	*(0.0150)***	*(0.0137)***	*(0.0276)***	*(0.0156)***	*(0.0137)***	*(0.0297)***
Observations	8716	4240	4476	8716	4240	4476
logLikelihood	-4240.61	-1360.84	-2711.35	-4002.67	-1295.95	-2505.6

Notes: robust standard errors in brackets. Reference Region is Lazio. Estimates of the regional fixed effects are reported in annex A1.

****: significant at 1%, **: significant at 5%, *: significant at 10%*

From the pooled estimation, it emerges that *ceteris paribus* being woman is associated with a probability of being employed lower on average by more than 30%. Age exhibits a positive not-linear effect (inverse U-shaped relation), possibly as a result of cohort effects, beyond pure age effects.[2] The probability of being employed increases at higher educational attainments, with a non-linear pattern: odd result is that holding a tertiary education degree is associated with a lower probability of employment than secondary education. Concerning household characteristics, the presence of an old-aged person in the household significantly decreases the probability of being employed, while the presence of at least one child below three years old seems negligible. Real assets are significantly associated with an increasing probability of employment.

When estimated separately for men and women, the same specification highlights relevant differences between the genders. This evidence is not surprising in the light of the most recent theoretical literature on family labour supply of the "New Household Economics": indeed, it is frequently found that the standard pooling hypothesis of the unitary labour supply model, that consumption and labour supply decisions are modelled as if households' members behaved as a single rational agent, maximizing a unique utility function subject to a unique budget constraint,

[2] With a different dataset from Italy, Racioppi and Bambini (2006) find that for women the most part of the age effect on activity rates consists of cohort-effects, with younger generations exhibiting *ceteris paribus* a higher propensity towards participating to formal labour market at every age.

does not necessarily hold and it proves to be unable to explain several empirical findings (see Donni, 2007; Blundell, Chiappori, Magnac and Meghir, 2007; Lundberg and Pollak, 1996).

Gender-specific estimates find that, crucially, age and education are much more important for women than for men in determining the probability of being employed, both in terms of significance and of magnitude of the relevant coefficients. The presence of co-living old-aged persons reduces women's probability of being employed by more than double compared to men's. Not surprisingly, the coefficients on marital status and children are reversed for men and women: being married or having at least one child below three years old is negatively correlated with the probability of employment for women and positively related for men's. This evidence reflects the well-established breadwinner role of Italian men, and the full responsibility of women in care activities.[3]

Under the second model (reported in the three columns on the right-hand side of Table 1), Region-specific intercepts are added, in order to emphasize the contribution of regional provenience on the probability of being employed, given the other observable characteristics. F-tests on the joint significance of the fixed effects confirm their informational value, while, according to BIC and AIC tests, the improvement in the log-Likelihood justifies the inclusion of the additional variables, for women (and in the pooled regression) even more than for men. This result highlights that women's employment is more affected by context variables, while the determinants of men's are more uniformly distributed across Regions. A clear North-South divide emerges not only in absolute terms, but also in gender differentials, with Regions from the South contributing more negatively to women's than to men's employment.

[3] It is worth noting that in the estimation of women's employment, the coefficient on Children exhibits a high variance and the results in terms of statistical significance are not robust to some alternative functional specifications of the model, although frequently not significant at the conventional significance levels as in the case reported.

For the pooled and the male samples, the model with regional fixed effects produces lower impacts (in absolute value) of family and individual variables on the probability of employment. Compared to the previous model, having at least one child below three years old in the household becomes statistically significant and positive for men; moreover, men who reside in cities have a significant lower probability of employment. Compared to the previous model, being married produces a higher impact on the probability of men's employment and a lower impact on women's, while co-living with an old-age person decreases in absolute value (becoming less negative) for both women and men. There is a slight reduction in the coefficients of education for men (not significant for women) vis-à-vis a small increase of the effect of age.

Two main conclusions can be drawn from this preliminary analysis. Firstly, the determinants of women's employment prove essentially different from men's and from the aggregate (pooled): hence, designing policies with the aggregate as reference group would lead to serious biases and possibly inefficacy (as it emerges by comparing the estimations on the pooled and women's samples). Secondly, consideration for context-related dynamics allows for a better fit of the data and modifies both the significance and the magnitude of the impact of family and individual variables, suggesting that such effects should not be disregarded.

However, the interpretation of these regional effects is not straightforward, as they might summarize the impact of a heterogeneous set of contextual factors, such as macroeconomic conditions, the social and cultural environment, regional policies and institutions. Disentangling these factors is of outmost importance in terms of policy design as many Regional dummy variables prove statistically significant and not negligible in terms of magnitude. Hence, the next paragraph will develop a synthetic way to explicitly consider a number of these potential factors.

3. The macro level: a framework for evaluating the socio-economic milieu

We collected several variables related to the social-economic context, which we expect to affect gender differentials in the labour market at a regional level.[4] We consider the impact of tertiarisation and GDP growth, whose role for the promotion of women's employment in Italy is most recently discussed by Boeri *et al.* (2005) and Simonazzi (2006). Next, social policy is taken into account. Being Social Assistance in Italy largely managed by local administrations, it suits well into our regional-focused analysis. Del Boca and Locatelli (2006) provide an up to date comparative review of the role of social policy in shaping women's employment in Europe. Following Goldin (2002), Riach and Rich (2002) and the literature cited, we develop an index of gender-based discrimination, while we refer to Barker and Kuiper (2003) and Fernandez (2007) for an economic analysis of the role of cultural constraints and gender roles.

All the variables were normalized by their national average, and some were aggregated into homogeneous indexes through harmonic means: Table 2 reports the original variables, their description and aggregation. Following this procedure, we distinguished five main dimensions of heterogeneity across Regions: gender-based discrimination, the nature and extension of publicly-provided Social Assistance, Regional GDP growth, the extent of the Services Sector and a modified index of human development (MDI). This last index is different from the HDI in two respects: on the one side aggregation is obtained by harmonic instead of arithmetic mean, in order to prevent Regions exhibiting high unbalances in the component variables to obtain extreme values of the index, while ranking higher those Regions exhibiting a more equilibrated development of all the selected variables (see Casadio and Palazzi, 2004). On the other side, the variables chosen for the construction of the MDI are slightly different from those of the standard HDI in order to better catch relevant differences among the Italy's Regions, and to avoid the inclusion of some variables

[4] We refer to Corsi *et al.* (2006) for an explanation of the variables and of the rationale behind their selection.

that in our framework have instead been adopted as micro determinants in the probability of employment.

Table 2: ***Selection and aggregation of context variables***

Variable	Description	Source of data	Index
Tertiarisation	Share of employment in the Services Sector (men and women)	ISTAT	Tertiarisation
GDP growth	Regional aggregate GDP growth rate, two-years basis	ISTAT	GDP Growth
Social assistance expenditure	Per-capita Public Expenditure on Social Assistance	ISTAT	Social Assistance
Kindergarten	Number of children hosted in public-financed kindergartens, per thousands of children 0-3 years old	Centro nazionale di documentazione e analisi per l'infanzia e l'adolescenza (2006)	
Direct social expenditure	Direct public expenditure as a fraction of total public expenditure on social assistance	ISTAT	
Public services	Expenditure for in-kind services over expenditure for cash transfers	ISTAT	
Gender segregation	As defined by the European Commission and Council (2005)	ISTAT (LFS)	Gender Discrimination
Prominent Employment	Share of women's self-employment as a fraction of total self-employment	ISTAT (LFS)	
Per-capita GDP		ISTAT	MDI - Modified Human Development Index
Infant mortality	Raw infant mortality rate	EUROSTAT	
Culture	Average households' expenditure on cultural and entertainment activities as a fraction of average households' disposable income	ISTAT	
Information	Average households' expenditure on newspapers and periodicals as a fraction of average households' disposable income	ISTAT	

Note: the Table reports the plan of aggregation of the context variables, which have been used in the Factor Analysis below.

In order to obtain synthetic variables for the macro characteristics considered in Table 2, we employed a principal-component factor analysis. Principal component analysis was used to extract the factors, and rotation of factors has been adopted using the varimax method, which attempts to

minimize the number of variables that have high correlation coefficient on a factor. In keeping with common practice,[5] three factors have been selected, which satisfy the following requirements: exhibiting eigenvalues larger than unity; individual contribution to the explanation of the overall variance of the data greater than 10%; cumulative contribution to the explanation of the total variance of the data greater than 60%. Within each of these factors, the single indicators are weighted according to the proportion of their cross-region variance explained by the factor. As a result, regions can be scored on each of the factors using the estimated weights.

The results of the factor analysis are presented in Table 3. We are able to express 74% of the total variance of the five variables by means of three factors, and all variables are well represented by the set of the three factors, ranging from 58% of the variance of the development of the Service Sector to 82% of the variance of the discrimination index. Furthermore, these factors identify socio-economic sub-domains, which have a rather straightforward economic interpretation.

TABLE 3: ***Principal Components Factor Analysis: Rotated Factors Loadings***

Variable	**Factor 1**	**Factor 2**	**Factor 3**	***Uniqueness***
MDI	0.8097		0.3302	*0.2173*
Gender Discrimination	-0.8399			*0.1836*
Social assistance		-0.8491		*0.2480*
GDP Growth			0.8828	*0.2201*
Tertiarisation		0.6684	-0.3451	*0.4172*

Note: the Table reports the construction of the three synthetic indexes (columns) from the five basic indicators obtained as shown in Table 2.

The first factor is highly correlated with MDI (+0.8) and the discrimination index (-0.8). Due to the specific socio-economic differences among Italy's Regions, we are inclined to interpret this factor as an index of *Regional Civic Progress* (henceforth RCP). The second factor is in turn

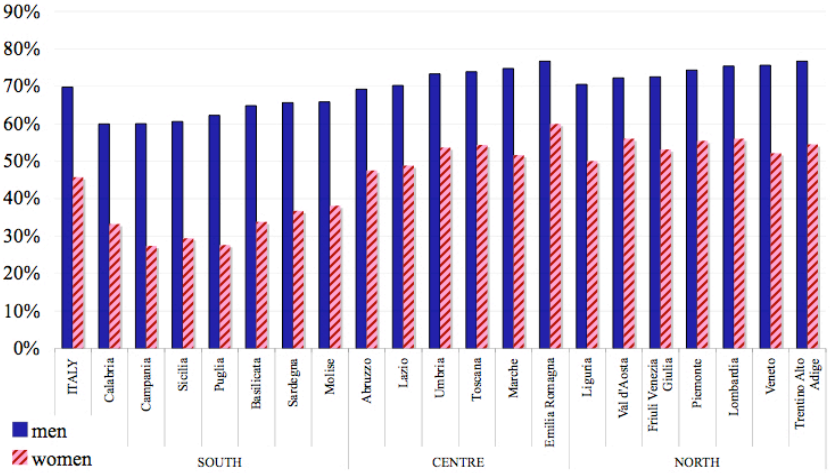
[5] See Nardo *et al*. (2005).

negatively correlated with the public provision of Social Assistance (-0.8) and positively with the extension of the Service Sector (+0.7): a plausible interpretation of this factor is as a measure of the extent of the *Private Provision of Services* to household (henceforth PPS). Finally, the third factor is highly correlated with regional economic growth (+0.9) and mildly correlated with MDI (+0.3), possibly due to the level of income per-capita being one of the components of the latter. Hence, this factor can be deemed a measure of *Regional Macroeconomic Conditions* (henceforth RMC). These three factors will be employed in the following multilevel analysis as explanatory variables for the level-2 units.

At the aggregate level, evidence of the relevance of the factors in shaping gender differentials in the labour market is mixed. Graph 1 displays men's and women's employment rates for the 20 Italian Regions in year 2004 (to which the microeconomic *Survey* is referred). Graphs 2 to 4 display the correlation between the three factors and a synthetic measure of gender differentials in the labour market, the gender employment gap (GEP, absolute difference in employment rates). Substantial negative correlation is found between RCD and GEP, while virtually no correlation is found between RMC and GEP. A positive correlation is found between PPS and GEP, provided that the impact of at least an outlier Region (out of three outliers) is ignored.

Figure 1. ***Employment rates by gender and region, year 2004***

Figure 2. ***Correlation between Gender Employment Gap and Regional Civic Development***



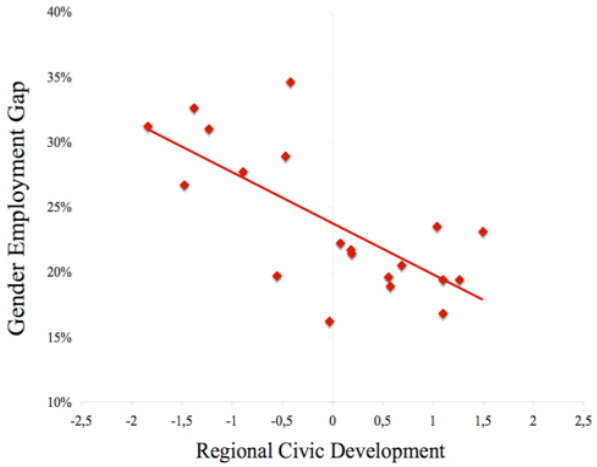
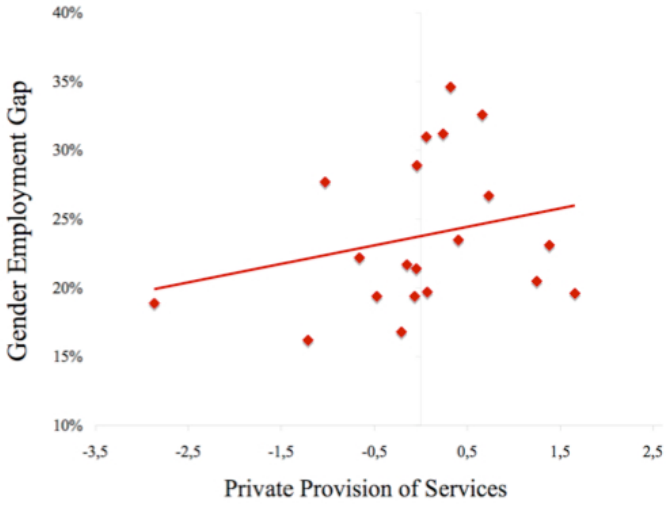
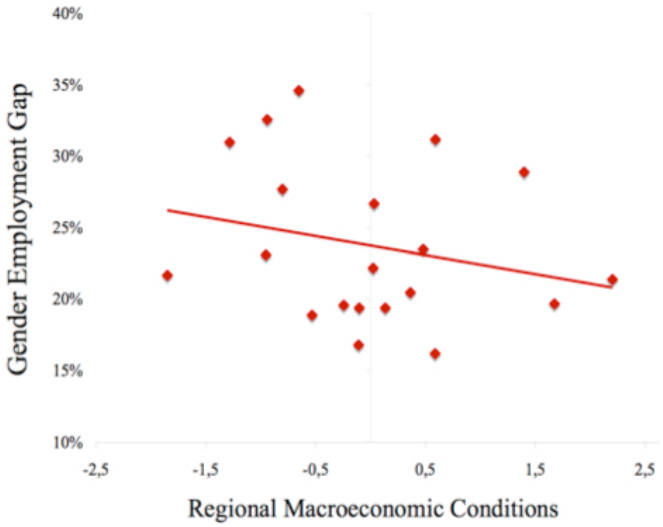


Figure 3. ***Correlation between Gender Employment Gap and Private Provision of Services***

Figure 4. ***Correlation between Gender Employment Gap and Regional Macroeconomic Conditions***





4. Relevance of socio-economic conditions for employment differentials

A multilevel approach allows us to take into account the effect on employment status of the grouping of observations into homogenous geographical areas. What in the baseline estimation is a disturbance (correlation in the error terms) now constitutes an informative feature of the population

structure: it is included in the model and it may contribute to a better understanding of the relations among the investigated variables. In our sample the first level units are 8716 individuals, of which 4476 women. The second level units are the 20 Italian regions, whose impact is described by the three factors derived in paragraph 3: RCD - Regional Civic Progress, PPS - Private Provision of Services, RMC - Regional Macroeconomic Conditions, simultaneously summarizing the following socio-economic variables: degree of tertiarisation, GDP growth, social assistance, gender discrimination, (modified) human development index. The estimation packet we used is GLAMM, a module for the software STATA version 9 (Rabe-Hecketh and Skrondal, 2005).[6]

Our econometric specification consists of a probit model on the determinants of employment with observed heterogeneity at the individual (first) and regional (second) levels, and unobserved heterogeneity at the regional level. As observations within groups (within region) are more likely to be correlated than observations across different groups (across regions), failure to control for heterogeneity may lead to inconsistent estimates and misleading inferences. Hence, we implement Generalized Linear Latent Models to estimate a two-level random-intercept probit model and a two-level random-coefficient probit model,[7] taking into account the nesting of individuals in their region of residence.

4.1 Results

Under the random intercept model we assume that the three macro-indexes affect region-specific intercepts: the factors directly affect individuals' probability of being employed, uniformly

[6] The software requires the specification of a linear predictor, as a function of the explanatory variables, and of a *link* function. When convergence is reached, the output of this procedure provides parameters estimates with standard errors, and, for each parameter, a test of significance through a Wald *t*-statistic. GLLAMM maximizes a numeric approximation of the exact marginal likelihood of not-linear models, through the method of adaptive quadrature of Gauss-Hermite.

[7] Rabe-Hesketh, S., Skrondal A., Pickles, A. (2005); Rabe-Hesketh, S., A. Pickles, A. Skrondal, (2004); Rodriguez, G., Goldman, N. (2001).

within each Region but differently across Regions. Results are reported on the left-hand side of Table 4, under the columns "Random-Intercept Models". Although the model is not directly comparable with the estimation in paragraph 2, results are consistent with each other and instructive comparisons of insights can be considered.

Most individual and household variables estimated under the previous fixed-effects hypothesis increase in absolute magnitude, and some in statistical significance. In particular, the impact of family-related variables strengthens for both women and men, enhancing the impact of traditional gender roles and sexual division of labour on the probability of being employed. Married women exhibit a 44% lower probability of being employed than non-married women; for men, marriage is instead a positive determinant of employment. Co-living with an old aged person decreases women's probability of being employed more than men's; while the impact of having at least one child less than 3 years old is significant and positive for men but not for women. The confirmation of this rather peculiar result is particularly interesting in the light of the significance of the context variables. Finally, the impact of education is strengthened, especially for women: it retains the peculiar inverse-U shape only for men, while it proves monotonically increasing in women's and in the pooled estimations.

Concerning the socioeconomic environment, PPS (negatively related to public Social Assistance) is found to significantly affect only women's probability of being employed, in a negative direction, whereas regional civic progress (RCD, a compound index of civil development and (negatively) gender discrimination) exerts a significant positive effect in all samples, though smaller in women's than in men's. Differently from what frequently assumed, favourable macroeconomic conditions (RMC) significantly affect only men's (and the average) probability of being employed. Finally, Regions' unobserved heterogeneity terms are highly significant in all specifications, suggesting that further relevant Region-specific effects are at play, which could not be summarized by the three indexes.

Table 4: ***Determinants of Employment Status: Two-Level Probit Estimation (marginal effects)***

	Random-Intercept Model			***Random-Coefficient Model***		
	POOLED	**MEN**	**WOMEN**	**POOLED**	**MEN**	**WOMEN**
Women	-1.1382					
	*(0.0756)***					
Married	-0.1767	0.6021	-0.4425	-0.1837		
	*(0.0611)***	*(0.0699)***	*(0.0532)***	*(0.0595)***		
Children	0.0590	0.2796	-0.0526	0.0356	0.3755	-0.0504
	(0.0747)	*(0.0897)***	*(0.0876)*	*(0.0697)*	*(0.0712)***	*(0.0825)*
Old-Aged	-0.4276	-0.3606	-0.4137	-0.4430		
	*(0.0767)***	*(0.1138)***	*(0.0639)***	*(0.0718)***		
Wealth	0.0196	0.0577	0.0211	0.0257	0.0659	0.0288
	(0.0123)	*(0.0162)***	*(0.0157)*	*(0.0129)**	*(0.0154)***	*(0.0159)**
Small town	0.0507	-0.0258	0.0986	0.0496	-0.0207	0.1069
	(0.0573)	*0.1527*	*0.0805*	*(0.0532)*	*(0.1619)*	*(0.0813)*
Town	-0.0869	-0.0244	-0.0946	-0.0446	-0.0445	-0.0920
	(0.0748)	*0.1392*	*(0.0618)*	*(0.0597)*	*(0.1308)*	*(0.0639)*
City	-0.0909	-0.1682	-0.0252	-0.0707	-0.1389	-0.0178
	(0.0747)	*(0.0834)***	*(0.0615)*	*(0.0628)*	*(0.0833)**	*(0.062)*
Big City	0.0512	-0.0654	0.1137	0.0601	-0.0643	0.0743
	(0.1031)	*0.1379*	*(0.1124)*	*(0.1026)*	*(0.1488)*	*(0.1079)*
Age	0.2535	0.3787	0.1998	0.2607	0.4173	0.1937
	*(0.0236)***	*(0.0468)***	*(0.0253)***	*(0.0225)***	*(0.0556)***	*(0.0269)***
Age^2	-0.0030	-0.0046	-0.0024	0.0031	-0.0051	-0.0023
	*(0.0003)***	*(0.0006)***	*(0.0003)*	*(0.0003)***	*(0.0007)***	*(0.0003)***
Elementary	0.8223	0.6424	1.1061	0.8243	0.9609	1.1947
	*(0.1915)***	*(0.2287)***	*(0.2743)***	*(0.1899)***	*(0.2217)***	*(0.4099)***
Lower Sec.	1.0944	1.1040	1.3813	1.1209	1.4453	1.5009
	*(0.2034)***	*(0.2085)***	*(0.3147)***	*(0.1942)***	*(0.1997)***	*(0.4587)***
Higher Sec.	1.4815	1.2300	1.8446	1.5099	1.5794	1.9532
	*(0.2055)***	*(0.2115)***	*(0.3276)***	*(0.1931)***	*(0.1775)***	*(0.4703)***
Tertiary	1.7637	0.8821	2.2271	1.8095	1.2639	2.3658
	*(0.2487)***	*(0.1842)***	*(0.3219)***	*(0.2574)***	*(0.1602)***	*(0.4657)***
			Regional Level			
Women				**-0.6506**		
				(0.0898)**		
Regional Int.	**0.0668**	**0.0169**	**0.0429**	-0.3457	**-8.3418**	**-5.5201**
	(0.0111)*	***(0.0044)*****	***(0.004)*****	*(0.0462)***	***(1.1016)*****	***(0.9014)*****
Married					**0.1988**	**-0.276**
					(0.0838)*	***(0.0343)*****
Old-Aged					**-0.0808**	**-0.0928**
					(0.0394)*	***(0.0265)*****
RCD	0.1653	0.2366	0.058	0.1114	0.0894	0.1305
	*(0.0093)***	*(0.0203)***	*(0.0137)***	*(0.0136)***	*(0.0211)***	*(0.0159)***
PPS	-0.0079	-0.010	-0.0567	-0.0538	0.0603	-0.0586
	(0.0147)	*0.0143*	*(0.0085)***	*(0.0122)***	*(0.0265)**	*(0.0124)***
RMC	-0.0050	0.0390	0.0082	0.0291	0.0569	-0.0258
	(0.0107)	*(0.0138)***	*(0.0111)*	*(0.014)**	*(0.0106)***	*(0.0207)*

Level 1 units	8716	4240	4476	8716	4240	4476
Level 2 units	20	20	20	20	20	20
log-Likelihood	-12226610	-2981899	-7792817	-12312747	-2794929	-7698210

Notes: robust standard errors in brackets. Coefficients in bold fonts denote 2nd-level impacts.
****: significant at 1%, **: significant at 5%, *: significant at 10%*

We finally estimate a random-coefficient model (right-hand side of Table 4), under the assumption that the three indexes of regional socio-economic conditions exert not only a direct effect on individuals' probabilities of employment, but that they also affect the impact of some of the first level explanatory variables. As a result, a final compound effect of micro and macro characteristics on the probability of being employed emerges, differentiated even across individuals within the same Region**.** We selected gender (only for the pooled estimation), marital status and co-living with an old-aged person as the variables whose impact might be affected by the regional context, in addition to the general Region-specific effect (in other words, we previous model can be considered as a special case of the random-coefficient).[8]

A considerable variance is found in Regions' unexplained impact, suggesting that even beyond the variables considered there is still variation across Regions in their impact on the probabilities of employment. The three indexes maintain their statistical significance. In particular, while it is confirmed that RMC increases only men's (and the average) probability of being employed, we find that PPS significantly affects –negatively– women's and –positively– men's probabilities. The impact of RCD is confirmed to be significantly positive, with a marginal variation increasing the probability of employment by 11% in the pooled sample. Interestingly, the relative magnitude of the impact of RCD is now reversed between women and men, proving to be greater in women's than in men's estimation.

[8] The number of variables had to be limited due to computational requirements. We decided not to include the variable Children due to the related not robust estimates.

Cross-level interaction effects -i.e. the impact of context conditions on the coefficients of individual characteristics- are significant, especially for women (see Annex A3 for full results in terms of the impact of the indexes on the specific variables). Focusing on women's sample, the degree of Regional Civic Progress (RCP) emerges as the macro index the most significantly affecting the impact of being married and co-living with an old-aged person. Interestingly, the extent of private provision of services differently impacts on women's and men's employment: it significantly affects the probability of employment for married women, while it impacts only on men co-living with an old-aged person (thus confirming the negative role played by marriage on women's employment) as well as the positive impact of marital status and paternity on men's sample also found in the other estimations).

Compared to the random-intercept model, the coefficients of education improve in magnitude, maintaining the monotonically increasing pattern for women and the inverse-U shape for men. Instead, the unexplained residual impacts of being woman, being married and co-living with old-aged person reduce in absolute value. Evidently, this result does not imply a reduction of the relevance of gender-specific or care-related hindrances to women's employment, but rather a shift from a completely empirical explanation, based on observed correlations of residuals, to a much more informative model, which can provide an explanation for those correlations in terms of policy (PPS), economic (RMC), and social variables (RCD).

5. Conclusions

Due to historical reasons, Italy exhibits a dramatic level of territorial heterogeneity both in terms of socioeconomic context and specifically in the economic position of women**.** This paper used multilevel modelling to explore the impact of this geographical variation on women's

employment status, thus establishing some interesting correlation between men's and women's employment and local policies and institutions. From a methodological point of view, we find that such an analysis provides results partly different from what expected on the basis of cross-country aggregate evidence or pure microeconomic databases.

Firstly, we confirm that "women are more than dummies" (Figart, 2005), in the sense that their behaviour cannot be simply modelled as parametrically different from men's, nor through the use of uncomplicated gender-related dummy variables. Indeed, under gender-specific estimates, a number of household and context variables exhibit opposite effects between men and women, in terms of statistical significance or sign of the coefficients. Crucially, by showing that individual factors strongly interact with context factors in determining women's employment, we find that any attempt to explore solely supply-side determinants of women's employment, discarding these interactions, might lead to biased estimates.

Concerning policy implications, our analysis highlights a relevant role for education, even beyond what usually implied. In Italy, age and possibly cohort largely affect women's employment: it has been noted (Corsi, 2006), that this might be the result of insufficient employability of the older cohorts of women in active age. The two findings point in the direction of a fundamental role for life-long learning and the diffusion of training programs for older working-age persons, and for women in particular.

The policy implications of our finding point in the direction of a greatly enhanced role for local development strategies, as opposed to the exclusive focus on individuals' *employability* (which would now constitute only a part of the story) which currently characterizes Europe's and Italy's policy. Italy's experience suggests that trust cannot be posed on aggregate growth or the expansion of the Services Sector as automatically leading to higher women's employment rates. Rather, culture (in terms of gender roles) and discrimination (in terms of barriers to entry to specific professions and qualifications) play a crucial role, together with social policy. It seems that not only

the efficacy of Social Assistance expenditure (measured as direct expenditure as a percentage of total expenditure), but the composition of this expenditure can positively affect women's employment, to the extent that the provision of services proves more effective than monetary subsidizing.

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ANNEXES

Annex 1. Probit Estimation, Regional Fixed Effects

Table A1. Determinants of Employment Status, marginal effects

	POOLED	MEN	WOMEN
Piemonte	0.0879	0.0309	0.1449
	*(0.0255)***	*(0.0174)*	*(0.0468)****
Lombardia	0.0704	0.0402	0.0911
	*(0.0282)***	*(0.0183)**	*(0.0517)**
Trentino- A.Adige	0.1524	0.0680	0.2231
	*(0.0231)****	*(0.0118)****	*(0.0532)****
Veneto	0.1173	0.0506	0.1741
	*(0.0245)****	*(0.0153)***	*(0.0489)****
Friuli V.Giulia	0.1142	0.0345	0.1931
	*(0.0279)****	*(0.0199)*	*(0.0532)****
Liguria	0.0841	0.0009	0.1599
	*(0.0288)****	*(0.0260)*	*(0.0508)****
Emilia Romagna	0.1581	0.0574	0.2482
	*(0.0194)****	*(0.0126)****	*(0.0395)****
Toscana	0.0891	0.0298	0.1408
	*(0.0259)****	*(0.0192)*	*(0.0482)****
Umbria	0.1165	0.0334	0.2066
	*(0.0273)****	*(0.0214)*	*(0.0526)****
Marche	0.0646	0.0198	0.1084
	*(0.0288)***	*(0.0211)*	*(0.0516)***
Abruzzi	-0.0719	-0.0399	-0.0955
	(0.0538)	*(0.0431)*	*(0.0787)*
Campania	-0.1524	-0.0790	-0.2340
	*(0.0374)****	*(0.0344)****	*(0.0534)****
Puglia	-0.1359	-0.0620	-0.2245
	*(0.0424)****	*(0.0382)***	*(0.0627)****
Basilicata	-0.0234	-0.0210	-0.0295
	(0.0503)	*(0.0439)*	*(0.0851)*
Calabria	-0.0976	-0.0768	-0.0769
	*(0.0483)***	*(0.0457)***	*(0.0739)*
Sicilia	-0.0981	-0.0492	-0.1561
	*(0.0392)****	*(0.0329)**	*(0.0613)****
Sardegna	-0.0233	-0.0089	-0.0595
	(0.0370)	*(0.0291)*	*(0.0637)*
Observations	8716	4240	4476
logLikelihood	-4002.67	-1295.95	-2505.6

Note: robust standard errors in brackets. Reference Region is Lazio.
****: significant at 1%, **: significant at 5%, *: significant at 10%*

Annex 2. The Econometric Model

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}*, assuming value 1 if the individual i in region j is employed, 0 otherwise. Let $\mathbf{x}_{ij}$ be a $r \times 1$ vector of individual and household characteristics (continuous or categorical, denoted by h) for the individual i in region j; and $\mathbf{z}_j$ be a $t \times 1$ vector of characteristics for each region j (denoted by m), summarized by the three factors obtained through the principal component analysis (see above). U_{0j} is the random effect, or the level-2 residual for region j, $U_{0j} \overset{iid}{\sim} N\left(0,\sigma_{u0}^2\right)$; while $\varepsilon_{ij} \overset{iid}{\sim} N\left(0,\sigma_{u0}^2\right)$ is the level-1 residual; U_{0j} and ε_{ij} are independent of anything else.

Defining $\tilde{\mathbf{a}}_j$ the $r \times 1$ vector of regression coefficients on the level-1 explanatory variables $\mathbf{x}_{ij}$ of the ith unit in region j, and γ_{0j} the regional intercept, the random-intercept model is composed by a level-1 model (the individual level):

$$y_{ij} = \gamma_{0j} + \mathbf{x}'_{ij}\,\tilde{\mathbf{a}}_j + \varepsilon_{ij}, \tag{1}$$

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

$$\begin{aligned} \gamma_{0j} &= b_0 + \mathbf{z}'_j\,\mathbf{b}_j + U_{0j} \\ \tilde{\mathbf{a}}_j &= \hat{\mathbf{a}} \end{aligned} \tag{2}$$

where b_0 is a constant and $\mathbf{b}_j$ is the $t \times 1$ vector of regression coefficients on the level-2 explanatory variables. Notice that $\tilde{\mathbf{a}}_j$, the $r \times 1$ vector of regression coefficients on the level-1 explanatory variables, is at this stage constant across regions, and equal to $\hat{\mathbf{a}}$. This notational complication will turn fruitful later on.

Hence, the combined random-intercept model is given by:

$$y_{ij} = b_0 + \mathbf{x}'_{ij}\,\hat{\mathbf{a}} + \mathbf{z}'_j\,\mathbf{b}_j + U_{0j} + \varepsilon_{ij} \tag{3}$$

The model for the probability that, conditionally on a set of random effects, a positive response be observed on the i-th unit in the j-th cluster is specified as:

$$P\left(y_{ij}=1\right) = \Phi\left(b_0 + \mathbf{x}'_{ij}\,\hat{\mathbf{a}} + \mathbf{z}'_j\,\mathbf{b}_j\right) = \Phi\left(\Theta\right) \tag{4}$$

where Φ is the standard normal cumulative distribution function. The likelihood contribution of an individual *i* in region *j*, conditioned to a value for U_{0j} is:

$$L_{ij}\left(\Theta\middle|U_{0j}\right)=\left[\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{y_{ij}}\left[1-\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{1-y_{ij}} \tag{5}$$

Integrating out the random term U_{0j}, it reads:

$$L_{ij}=\int_{-\infty}^{+\infty}\left[\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{y_{ij}}\left[1-\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{1-y_{ij}}\varphi_j\left(U_{0j}\right)dU_{0j} \tag{6}$$

Hence, defining Ω the variance matrix of the regional random-effects U_{0j}, the Likelihood Function is

$$\begin{aligned}L(\Theta,\Omega)&=\prod_{j=1}^{J}\prod_{i=1}^{N}L_{ij}=\\&\prod_{j=1}^{J}\prod_{i=1}^{N}\int_{-\infty}^{+\infty}\left[\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{y_{ij}}\left[1-\Phi\left(b_0+\mathbf{x}'_{ij}\,\hat{\mathbf{a}}+\mathbf{z}'_j\,\mathbf{b}_j\right)\right]^{1-y_{ij}}\varphi_j\left(U_{0j}\right)dU_{0j}\end{aligned} \tag{7}$$

where φ are the density functions of the random effects. The likelihood function is approximated via a Gauss-Hermite quadrature.

2. The random-coefficient model

The random-intercept model of the previous paragraph is a simple case of the multilevel model, where the only random level-2 effect is a random intercept. But the relationship between explanatory and response variables can differ between level-2 units in more ways and the effect of the three regional factors on the probability of being employed could differ across regions. In the multilevel model, we model this by a random slope for the factors.

The random-coefficient model is composed by a level-1 model (the individual level), as in equation (1) above, and the following level-2 model (the regional level):

$$\begin{aligned}\gamma_{0j}&=b_0+\mathbf{z}'_j\,\mathbf{b}_j+U_{0j}\\\tilde{\mathbf{a}}_j&=\hat{\mathbf{a}}_0+\hat{\mathbf{A}}\mathbf{z}_j+\mathbf{U}_j\end{aligned} \tag{8}$$

This time, the coefficient on level-1 variables varies across Regions according to a stochastic component $\mathbf{U}_j$ ($r\times 1$ vector), and a deterministic component $\hat{\mathbf{A}}\mathbf{z}_j$, where $\hat{\mathbf{A}}$ is a $r\times t$ matrix of the deterministic component of region-specific coefficients on the level-1 variables. $\hat{\mathbf{a}}_0$ is a $r\times 1$

vector. We assume that $\tilde{\mathbf{a}}_j$ depends on the same three factors as the regional intercept. Hence, the combined random-coefficient model is given by:

$$y_{ij} = b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j + \mathbf{U}_j\right) + U_{0j} + \varepsilon_{ij} \tag{9}$$

There are $r+1$ random coefficients U_{0j} and $\mathbf{U}_{hj}$. The assumptions over the first and second level residuals are the following: the level-1 residual ε_{ij} has a normal distribution with constant variance σ^2_ε; the vector $\left(U_{0j},...,U_{rj}\right)$ has a multivariate normal distribution with zero mean and a constant covariance matrix; $\left(U_{0j},...,U_{rj}\right)$ and ε_{ij} are independent on anything else. Hence, the probability of being employed for the individual *i* in region *j* can be expressed as:

$$\Pr\left(y_{ij}=1\right) = \Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right) = \Phi(\Theta) \tag{10}$$

The likelihood function for an individual *i* in region *j*, conditioned to a value for U_{0j} and $\mathbf{U}_{hj}$ is:

$$L_{ij}\left(\Theta \middle| U_{0j}, \mathbf{U}_j\right) = \left[\Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{y_{ij}} \left[1 - \Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{1-y_{ij}} \tag{11}$$

The likelihood for an individual *i* in region *j*, integrating out the random term U_{0j} and $\mathbf{U}_{hj}$ reads:

$$L_{ij} = \int_{-\infty}^{+\infty} \left[\Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{y_{ij}} \left[1 - \Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{1-y_{ij}} \varphi_j\left(\mathbf{U}_j\right) d\left(\mathbf{U}_j\right) \varphi_j\left(U_{0j}\right) dU_{0j}$$

(12)

And the Likelihood Function is:

$$L(\Theta,\Omega) = \prod_{j=1}^{J}\prod_{i=1}^{N} L_{ij} =$$

$$\prod_{j=1}^{J}\prod_{i=1}^{N} \int_{-\infty}^{+\infty} \left[\Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{y_{ij}} \left[1 - \Phi\left(b_0 + \mathbf{z}'_j \mathbf{b}_j + \mathbf{x}'_{ij} \left(\hat{\mathbf{a}}_0 + \hat{\mathbf{A}}\mathbf{z}_j\right)\right)\right]^{1-y_{ij}} \varphi_j\left(\mathbf{U}_j\right) d\left(\mathbf{U}_j\right) \varphi_j\left(U_{0j}\right) dU_{0j} \tag{13}$$

where φ are the density functions of the random effects. The likelihood function is approximated via a Gauss-Hermite quadrature.

Annex 3. Random Coefficients Model, Detailed Results

Estimates of the probability of being employed are displayed in the text in forms of marginal effects, i.e. average variation in the probability attributable to a marginal variation of the single covariates. As the models introduced in Table 4 imply simultaneous effects of the three regional indexes on a number of variables, the following Table reports separately the single coefficients of these effects and their significance in the original probit model.

Table A2: Two-Level Probit Estimation: Probability of Employment

	POOLED	MEN	WOMEN
	Individual Level		
Woman	-1.191609		
	*(0.0717461)****		
Children	0.0448026	0.3755147	-0.0503914
	(0.0690254)	*(0.071238)****	*(0.0825353)*
Primary Education	0.8689056	0.9609686	1.194.652
	*(0.1802441)****	*(0.221667)****	*(0.4099462)****
Lower Secondary Education	1.150361	1.445284	1.500.877
	*(0.1757436)****	*(0.1996779)****	*(0.4586911)****
Higher Secondary Education	1.538213	1.579361	1.953.203
	*(0.1785545)****	*(0.1774659)****	*(0.4702893)****
Tertiary Education	1.875299	1.263956	2.365.708
	*(0.2254235)****	*(0.1602145)****	*(0.4656475)****
Age	0.2608357	0.4172521	0.1937119
	*(0.027402)****	*(0.0555997)****	*(0.0269775)****
Age^2	-0.0031212	-0.0051169	-0.0023157
	*(0.0003195)****	*(0.0007088)****	*(0.0003133)****
Wealth	0.027412	0.0659624	0.0288107
	*(0.0117648)***	*(0.0154205)****	*(0.0159704)**
Small Town	0.0637092	-0.0207003	0.1069303
	(0.0727353)	*(0.1619059)*	*(0.0812812)+*
Town	-0.0774794	-0.0445376	-0.0920375
	(0.0817568)	*(0.1307804)*	*(0.0639553)+*
City	-0.0646903	-0.1388706	-0.0178005
	(0.0793662)	*(0.0832782)**	*(0.0620011)*
Big City	0.0368573	-0.0643159	0.0742706
	(0.1005158)	*(0.148789)*	*(0.1079663)*
Constant	-0.956613	-1.201279	-0.8311257
	*(0.0232776)****	*(0.0591076)****	*(0.0175455)****

	II Level		
Unobserved Heterogeneity	0.3980459	0.282948	0.320138
	*(0.0179315)***	*(0.0306502)***	*(0.0190012)***
Married: Variance	0.1700957	0.3383158	0.2208801
	*(0.0094067)***	*(0.0265364)***	*(0.0195525)***
Old-Aged: Variance	0.324315	0.4180325	0.2283212
	*(0.0209677)***	*(0.0470853)***	*(0.0100695)***
	Regional Intercept		
Constant	-4.939505	-8.470175	-5.355.203
	(0.6249916)	*(1.087318)***	*(0.8949124)*
RCD	0.0939993	0.0930589	0.162623
	(0.0284677)	*(0.0256877)***	*(0.0261783)*
PPS	-0.0404524	0.027069	0.028083
	(0.0186003)	*(0.0192895)+*	*(0.0355609)*
RMC	0.005162	0.0568682	-0.0258033
	(0.0073503)	*(0.0106219)***	*(0.0207384)*
	Married		
Constant	-0.2697218	0.197888	-0.2601433
	*(0.0464806)***	*(0.0833143)**	*(0.0350525)***
RCD	-0.2616223	-0.0094085	-0.0515657
	*(0.0239134)***	*(0.045607)*	*(0.0259505)**
PPS	-0.0099525	0.0465404	-0.1243765
	(0.0176782)	*(0.038273)*	*(0.0383007)***
	Old-Aged		
Constant	-0.2129047	-0.0858494	-0.0967995
	*(0.0356156)***	*(0.0411544)**	*(0.0279306)***
RCD	-0.0087901	0.0214222	0.0389283
	(0.0214772)	*(0.0446488)*	*(0.0231199)**
PPS	0.111766	0.04545	-0.0120209
	*(0.0219678)***	*(0.0273606)**	*(0.0137965)*
Level 1 units	8716	4240	4476
Level 2 units	20	20	20
Log-Likelihood	-11990131	-2794929.7	-7698210.8

Note: robust standard errors in brackets.
****: significant at 1%, **: significant at 5%, *: significant at 10%*