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On the local labor market determinants of female university enrolment in European regions[‡]

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Abstract

We empirically investigate the local labor market determinants of female decisions of investing in post-secondary education, focusing on the role of career interruptions and barriers to job promotions. We use EU-Silc data on educational decisions of women who completed secondary schooling. We construct indicators of the regional labor market, and exploit regional and time variability to identify how female educational investments react to changes in local labor markets. We find that the share of working women with children below 5, of women with managerial positions and self-employed positively affect the probability to enrol. The same does not hold for men.

Keywords: post-secondary education, managerial positions, self-employment, EU-Silc data, repeated cross-section.

JEL Classification: J16, J24, R23.

1 Introduction

Female education plays a key role in modern societies. The investment in human capital by women is seen as one of the triggers of the "quiet revolution" which has characterized the US labor market starting from the Seventies (Goldin, 2006). It is the key for female empowerment and for the rise in female bargaining power within the family (Iyigun and Walsh, 2007; Chiappori et al., 2009). Increasing education also raises the attachment to the labor market of mothers (Carneiro, Meghir and Parey, 2007; Bratti, 2003 on Italy) and it leads to postponement of first births away from teenage motherhood (e.g. Monstad et al., 2008). Prominently, maternal education is shown to have large effects on children's outcomes (Haveman and Wolfe, 1995 provide a useful survey) and it increases the time devoted to children in human capital enhancing activities (see the evidence provided by Guryan et al., 2008).

Given the importance of female education, the study of its determinants is a crucial issue, especially for those countries where human capital levels are still low and therefore there is room for improvement. In this paper we empirically investigate the role played by the labor market conditions in the area where young women take their education decision as a possible element that matters for their choice of investing in post-secondary education.

Previous contributions, though not focusing on females, have discussed the role of local labor market conditions on individual incentives to invest in higher education. The local unemployment rate is the most widely adopted measure of local labor market conditions in the literature. The empirical evidence on the impact of local labor market conditions on the decision to enrol at the university is however mixed. For example, Bozick (2009) studies the impact that local unemployment rates and the percentage of local workers employed in jobs that require a bachelor's degree have on the decision to attend post-secondary school in the US. He finds that in areas where unemployment is high and there are few jobs that require only a high school diploma, youth have higher odds of entering college. Petrongolo and San Segundo (2002) focus on the effects of local youth and adult unemployment on enrolment rates in Spain. They show that there is a positive effect of youth unemployment on the demand for education, while adult unemployment has a negative impact. Betts and Farland (1995) analyze the interplay between economic conditions and labor market conditions on enrollment in American two-year

community colleges. They find that an increase in the unemployment rates of recent high school graduates and of all adults are associated with increases in attendance. Rice (1998) finds that participation rates in further education for both males and females are positively related to the local unemployment rate in England and Wales. No significant impact of local labor market conditions on enrolment is detected by Micklewright et al. (1990) and Meschi et al. (2011) on UK data, while Casquel and Uriel (2009), focusing on Spain, show that higher unemployment rates diminish the probability of investing in post-compulsory education.

The unemployment rate may not be the only relevant variable capturing the local labor market conditions that affect individual education decisions. Bradley and Taylor (1996), for instance, focus on the stock of high-skill workers and find that this indicator affects the economic performance of the local economy and thus it feeds back on the stock of high-skill workers. Interestingly, there may also be heterogenous effects across gender of local labor market conditions on the human capital investment decision. Clark (2011) finds that youth unemployment has a large positive effect on boys' enrolment. For girls the effect is smaller and exam performance seems to be a more important variable.

Given our interest in investigating the female decision to invest in education and in exploring differences across gender, we focus on two distinctive features of female local labor markets: the widespread presence of career interruptions, and the under-representation of women in top positions. For instance, in the EU-27 in 2009 women were only 10% of board members of the largest publicly listed companies, with only Norway reaching 40% of female representation. In most countries women experience discontinuities in their employment, mainly related to child care. Typically, interruptions follow child birth and have different duration depending upon the birth order, the individual characteristics of the mother, and, most importantly for us, the geographic location. Our two distinctive features have a potential negative impact on the decision to invest in education, an issue which has not been thoroughly explored before:[1] more frequent career interruptions reduce the time span over which women can benefit of the human

[1] Previous studies on career interruptions and female under-representation in top position typically focus on the role of policies (parental leave and other family policies -see for instance Pylkkänen and Smith, 2003 and Pronzato, 2009 or affirmative action policies -e.g. Belinky and Kogut, 2009) or on their impact on wage profiles (Albrecht et al. 1999).

capital acquired and they generate a higher depreciation of knowledge (Mincer and Ofek, 1982); the higher likelihood of hitting the glass ceiling reduces the prospect of higher wages. At the time of the education decision, young women cannot accurately assess the impact of career interruptions or barriers to promotion on their returns to education.[2] We argue that they can however observe the labor market outcomes of older women living in the same region. We postulate that the decision to invest in education, besides being influenced by individual and family characteristics,[3] is also affected by the local labor market outcomes of older women. Where female careers are less discontinuous and where more women reach the top positions, the incentives of younger women to pursue post-secondary education are stronger.

To study whether local labor markets have an impact on women's decisions to invest in education we first illustrate a very simple model with the purpose of highlighting the main mechanisms at work. We then use data on educational decisions of young women who completed secondary schooling, drawn from EU-Silc data, a European Household Survey, available for the years 2004-2009. From the same survey we construct three labor market indicators at the regional level for women belonging to the 25-45 age group who have acquired post-secondary education, and exploit regional and time variability to identify how women react in terms of educational investment to changes in local labor market conditions: to measure career interruptions we use the proportion of working mothers with children younger than 5 years old and to capture career prospects or job promotions we calculate the regional percentage of working women in managerial positions (with supervisory duties) and the regional percentage of self-employed women. We are aware that these indicators may be raw proxies of the two local labor market features we are interested in. For instance, the share of working mothers with children younger than 5 may also reflect cultural attitudes or the availability of child care services. Our empirical strategy will take care of this identification issue. Finally, in line with previous contributions, we also include the unemployment rate as a local labor market condition which may affect the education

[2] Similarly, there are studies which question the knowledge that students have of their future wages, which are generally considered among the main determinants of the returns to education (Manski, 1993; Betts, 1996, Brunello et al., 2004).

[3] There is an extensive and growing literature on if and how family income, parental education and, more recently, the home environment affect children outcomes, among which education is one of the most important (see, among others, Plug and Vijverberg, 2005; Black, Devereux and Salvanes, 2005; Pronzato, 2011).

decision.

We find that the share of working women with children below 5, the share of women with managerial positions and the share of women in self-employment positively affect the probability that women enrol in post-secondary education. The same does not hold for men: their decision to invest in education is not significantly affected by our indicators measured for males rather than for females. This suggests that how favorable the labor market is to female careers and to mothers' occupation is important for the female educational decision.

The paper is organized as follows: the next Section introduces the illustrative model, Section 3 presents our empirical strategy, Section 4 presents the data and Section 5 the results. Section 6 concludes.

2 The female decision to invest in education

To consider the potential impact of career interruptions and barriers to job promotion, we introduce the following set-up. The economy lasts for two periods and is populated only by women.[4] The total size of the population is normalized to 1 and the population growth rate is set to zero**.** Women are heterogeneous in talent α^i. Talent α^i captures the time woman i requires in order to become skilled and it is distributed on the interval $(0, \overline{\alpha}]$ with continuous density function $f(\cdot)$. The lower α^i, the shorter the time required to become skilled, the more talented the woman and the lower the foregone earnings. Each woman knows her own talent type. In the first period of time women decide whether to invest in education or not. If they invest, they devote a share α^i of the first period to education and they become skilled, earning a unit wage w_1^s for the remaining period $(1-\alpha^i)$. If they do not invest, they remain unskilled and they start working immediately and receive a salary equal to w^u for the entire first period, with $w^u < w_1^s$. In the second period, both skilled and unskilled women experience a job interruption ct and the skilled may be promoted and receive a higher second period wage $w_2^s > w_1^s$ with probability π. Wages are exogenously given.

Women maximize a utility function which is linear in consumption. The decision to invest or

[4] For a model where both males and females have to decide about their education and share care responsibilities, see Casarico and Profeta (2009).

not in education is thus based on the comparison between the expected consumption possibilities as skilled rather than as unskilled worker. We assume that consumption takes place at the end of the second period and that wages can be transferred to it at the interest rate k**.** Consider first the expected consumption possibilities of a skilled worker. They read as follows:

$$Ec^i = w_1^s(1-\alpha^i)(1+k) + (1-\pi)w_1^s(1-ct) + \pi w_2^s(1-ct) \tag{1}$$

where all the variables have the meaning elucidated before.

If we now consider an unskilled woman, her consumption possibilities can be written as follows:

$$c^u = w^u(1+k) + w^u(1-ct) \tag{2}$$

A woman will find it profitable to invest in education if

$$Ec^i \geq c^u.$$

Comparing (1) and (2) one can identify the threshold level of ability such that women find it profitable to invest in education and become skilled:

$$\alpha^i \leq 1 - \frac{w^u}{w_1^s} + (1-ct)\frac{(1-\pi)w_1^s + \pi w_2^s - w^u}{w_1^s(1+k)} \equiv \widehat{\alpha}. \tag{3}$$

Rewriting (3), one can say that a woman will find it profitable to invest in education if:

$$\widehat{\alpha} - \alpha^i \geq 0. \tag{4}$$

Women whose ability (that is time required to invest in education) is $\alpha^i \leq \widehat{\alpha}$ will find it profitable to invest in education, while all those whose ability is above $\widehat{\alpha}$ will remain unskilled. It is straightforward to notice that the larger the first period wage premium $z = \frac{w_1^s}{w^u}$, the larger $\widehat{\alpha}$ and the stronger the incentives to invest in education. This is a well known result in the economic literature. We want to focus our attention on the role in the education decision of the probability to be promoted π and of career interruptions. Recalling that $w_2^s > w_1^s$, from equation (3) it is clear that an increase in π decreases the ability level which is necessary for a woman to find it profitable to invest in education. Indeed, $\frac{\partial \widehat{\alpha}}{\partial \pi} > 0$. As to the role of ct, given that $(1-\pi)w_1^s + \pi w_2^s - w^u > 0$, we find that $\frac{\partial \widehat{\alpha}}{\partial ct} < 0$: the more discontinuous careers are, the lower the incentive to invest in education.

As career interruptions and glass ceilings do not play an important role in male labor market outcomes, we expect these two variables not to affect male decisions to invest in education.[5]

Now that we have illustrated the main mechanisms at work, we turn to the empirical analysis. Our focus is on decisions taken by young women living in European regions. The educational outcome we consider is the decision of attending post-secondary education. The measures we adopt to capture the two main variables identified in this section are introduced formally in Section 4.

3 Empirical methods

The decision to invest in post-secondary education is defined as follows:

$$Y_i = W'_{rt}\beta + L'_{rt}\varphi + Z'_i\gamma + S'_t\delta + \varepsilon_i. \tag{5}$$

Y_i is a binary variable which takes value 1 when woman i invests in post-secondary education, 0 otherwise; W_{rt} captures the probability of having a high-skill job and L_{rt} identifies the probability of a career interruption related to childbirth. They are measured at the regional level r, in different years t. We consider both as determinants of the individual propensity to invest in education, given the underlying decisional process described in Section 2. Z_i is a vector containing information about the family background of woman i; S_t is a vector of time dummies and ε_i is a disturbance error that can be written as follows:

$$\varepsilon_i = q_r + v_i, \tag{6}$$

where q_r is a time-invariant region-specific error and v_i is normally distributed.

The decision to invest in post-secondary education Y_i is only taken and observed once, making our data individual cross-sectional. However, we can exploit the panel nature of our variables of interest W_{rt} and L_{rt} which may be observed over time for a given European region.

[5] Notice that this does not necessarily imply that men have more incentives to invest in education than women. If, for instance, the wage of unskilled women is lower than the wage of an unskilled men and gender wage gaps decrease in the skill level (see the evidence in Olivetti and Petrongolo, 2011), women have higher incentives than men to use education as a device against the risk of low unskilled wages.

We make two different assumptions about the region-specific error. In the first econometric specification, we assume q_r to be fixed over time, to follow a normal distribution and to be uncorrelated with the included regressors at the regional level, W_{rt} and L_{rt}.

These assumptions may be considered quite strong. Suppose, for example, that W_{rt} is measured by the share of women in managerial positions. It is possible that more gender-equality oriented regions (for historical or political reasons, for example) are also more progressive in terms of providing educational opportunities. The correlation between the share of women in managerial positions and (unobserved) gender-equality orientation, in this example, may lead to overestimate the true relevance of our indicator. In order to avoid this problem, in the second econometric specification, we still assume q_r to be fixed over time, but we do not impose any relationship between W_{rt} and q_r (and between L_{rt} and q_r). They may be correlated and may have any unrestricted relationship. We employ a fixed effects model, where the term q_r is eliminated by differentiating the data at regional level:

$$(Y_i - \overline{Y_r}) = (W_{rt} - \overline{W_r})'\beta + (L_{rt} - \overline{L_r})'\varphi + (Z_i - \overline{Z_r})'\gamma + (S_t - \overline{S_r})'\delta + (v_i - \overline{v_r}). \qquad (7)$$

We assume that unobservable characteristics of the region, which may be correlated with the observed characteristics we include in the model, do not vary over time. This assumption guarantees that our estimates are not biased.[6]

We estimate a linear probability model in the two specifications. Robust standard errors are calculated to take into account heteroskedasticity, and adjusted for the non-independence of observations within each region (Moulton, 1990; Primo et al., 2007).

[6] One may argue that, for example, a particularly progressive regional council could promote female labor market opportunities and, at the same time, increase the number of scholarships, year after year. Typically, scholarships are available both for women and men. Thus, if the change in the number of scholarships is the true driver, rather than the change in local labor market conditions, we should also observe a positive effect of our variables of interest on male decisions. In the robustness checks, we show that this is not the case. Another possibility, though not very likely given the limited time period covered in the analysis, is that gender-equality feelings are self-reinforcing, therefore spreading more rapidly in some regions than in others: in this case, the included year-trend cannot capture the phenomenon.

4 Data, sample and definitions

Data are drawn from EU-Silc, a European harmonized survey, released by Eurostat, which makes the comparison of numerous social and economic dimensions among several European countries possible. So far, data have been collected and released for the years 2004-2009. For the year 2004, the survey was conducted only in 15 countries, for the years 2005-2007 in 26 countries, for the year 2008 in 27 countries and, finally, for the year 2009 in 29 countries. Data may be used cross-sectionally or in a panel structure. By considering survey weights, each wave of the data is nationally representative of each country in that year. Furthermore, from one wave to the other, 75% of the sample is re-interviewed, and followed for at most four waves, which allows researchers to follow part of the sample over time. Information is collected at both household and individual level. At the household level, we know the number of members and the relationship among them, the main demographic information, and other pieces of information regarding the different sources of income, deprivation, and household conditions. At the individual level, we have detailed information about work, income, child care and education.

For our purposes, we select 13,679 women between 17 and 21 years old, who complete secondary schooling during the year of the interview or the previous one, and for whom we may observe current education decisions. To be included in the sample, they need to reside in a region which is observed for at least two years of the survey, to exploit the panel structure of the data. The outcome variable is a binary variable equal to 1 if the woman attends a post-secondary educational course, and 0 otherwise. More than 90% of women in our sample, who are attending a post-secondary course, are actually attending a tertiary educational course.[7] The enrolment decision is observed only once, just after the end of secondary schooling. We also select a similar sample of 13,259 young men, to test whether the indicators we are going to specify for females have a role in determining the male post-secondary investment decisions.

The main aim of the paper is to assess the impact that the two variables identified in Section 2 - career interruptions and the chances to be promoted - have on the probability that a young woman enrols in a post-secondary educational course. Additionally, we expect not to observe any significant impact for males.

[7] Thus, we can also talk more generally of "university enrolment".

To measure the two variables, we construct indicators of local labor market conditions. All measures are derived from EU-Silc data, using cross-sectional frequency weights, which make the indicators representative at the regional level. As it will be explained in more details below, the number of regions included in the study is 93. All indicators are calculated with reference to women aged between 25 and 45 with post-secondary education: we consider them as the group of the population which young women look at to form an opinion about their career opportunities and the possibility to reconcile family and work. First, to capture the likelihood of working in a high-skill job (W_{rt}) we include in the model the regional percentage of working women in managerial positions (with supervisory duties). Second, to capture the probability of career interruptions we use the proportion of working mothers with children younger than 5 years old (L_{rt}).[8] Note that the two are inversely related: as career interruptions are mainly due to care responsibilities, the longer they are, the lower the labor force participation of mothers with young children. Finally, we also consider the regional share of women working as self-employed. Female self-employment has a double interpretation according to the existing literature. On the one hand, self-employment can be seen as a strategy to balance family and career (Wellington, 2006) and as a measure of career opportunities available to educated women. Devine (1994), for example, studies the relationship between the recent rise in female self-employment shares and changes in returns to skill. She finds that self-employment increased more for females who faced increasing potential earnings in wage-and-salary employment, which suggests that returns to skill were increasing by even more in self-employment. According to the results of this literature, a higher percentage of women working as self-employed should positively influence the incentive to invest in education. On the other hand, a large fraction of self-employed women could signal limited labor market opportunities for women: the observation of a high share of self-employed women could therefore have negative repercussions on the incentive to invest in education. Boden (1999), for example, examines how gender inequality in wage earnings may precipitate some women out of wage employment and into self-employment. He finds that women's lower wage returns to observed worker characteristics have a positive and significant effect on female decision to switch from wage employment to self-employment. Given that we

[8] The indicator is calculated as the ratio between the number of working mothers of children younger than five and the number of mothers of children younger than five.

are only measuring self-employment among women with post-secondary education, we interpret a higher share of self-employed women as a positive labor market signal for females. Note that we construct the same indicators for men.

While part of the variability in the regional indicators is due to genuine differences across regions and over time, part of the variability is just due to the sampling procedure. Sampling variability may have quite severe consequences on indicators of regions with a small number of observations in the survey, and on indicators constructed on a sub-sample of the population (for example, parents with children younger than 5 years old). In order to clean the data, we exclude regions-years which display outside values when considering the whole regional distribution of each indicator. The distribution of the regional indicators is shown through box-plot graphs in the Appendix (Tables A1-A6): small circles represent outside values for a certain region-year, which have been deleted from our samples.

Our final sample is composed of 11,052 observations, in 93 European regions, in 23 countries.[9] On average, we have a sample of 119 women for each region. Each region is observed 4 times, on average. The sample of males is composed of 11,466 individuals, in 94 regions, in 23 countries; the average sample size for each region is 122 and each region is observed, on average, for 4 waves.

By employing the empirical strategies outlined in Section 3, we are going to test whether women living in regions where local labor market conditions have become more favorable, are more likely to attend post-secondary educational courses. We are aware of the typical identification problems in this type of analysis, mainly reverse causality and omitted variable bias. As to the reverse causality problem, notice that we are assessing the impact of the local labor market condition of women in the age group 25-45 on the education decision of women in the age group 17-21. Our within-region estimation should limit the omitted variable bias; nonetheless, we also include a number of control variables. At the household level, we consider mother and father's level of education, whether the mother works, household disposable income, number of siblings in the household, whether the young woman lives out of the parental home, with the two parents, or only with one of the two parents. More importantly, we control for the mother (father)

[9] Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Hungary, Iceland, Italy, Latvia, Luxembourg, Lithuania, Norway, Poland, Sweden, Slovak Republic.

being a manager or self-employed, in order to make sure that the effect of the regional labor market variables is not due to the parental position in the labor market. We also include dummy variables indicating the season of the interview: young women interviewed in the fall may be more likely to attend an educational course compared to young women interviewed later in the academic year, and the timing of the interview can be systematically different from one country to another. Year dummies are also included to take into account the time trend. At the regional level, we consider the unemployment rate of women and men in the 25-45 age bracket, without reference to their education. The inclusion of this control is suggested by the existing literature and can help to control for the economic cycle, which may affect both schooling decisions and the other regional indicators. There are other important variables which we cannot control directly for, such as culture or the quality of education. For example, in some regions a higher quality of education may guarantee higher wages to educated women and higher earnings reduce the likelihood of withdrawing from the labor market after childbirth. As long as the changes in the quality of education over the six years covered by the analysis are limited, our results should not be biased. The same holds for gender culture. Finally, we do not include the expected wage as a control, since wages are measured differently (net/gross, monthly/yearly) in different countries and their inclusion would create serious measurement errors. We note also that it would be hard to disentangle a direct impact of wages from our indicators since, for example, as Table 3 shows, wages are positively correlated with the share of managerial positions, both for women and men.

Notice that information about the parental background is only observable – completely – for young women or men living with both parents. Thus, in all other cases we will impute the mode category of education and work.

Tables 1 and 2 show summary statistics for personal and regional variables respectively. Notice that women are on average more likely to invest in post-secondary education than men. The personal characteristics are quite similar for men and women, apart from the proportion of young people living on their own, which is higher among females. As expected (see Table 2), we also have a higher percentage of men in managerial positions and in self-employment, and fathers with young children are more likely to work than mothers. Table 2 also shows that our indicators vary across regions (as confirmed by the standard deviations in brackets) and,

to a lower extent, within regions (ratio between within variance and total variance in squared brackets). This is important, since we are going to exploit the variability of the local labor market characteristics within, and across regions. Figures 1-6 present data on the level and on the variability of the regional indicators across the 23 countries in the study, and within each of the countries. Figures 3 and 6 represent the share of working mothers and fathers. The data reported confirm that mothers in Northern Europe have a higher employment rate than elsewhere. Figures 2 and 5, showing the share of self-employed workers, single-out countries where the economy is typically organized in small firms, such as Italy and Greece. Figures 1 and 4 which display the share of managers, i.e. the share of workers with supervisory duties, do not follow any particular geographical trend: however, the definition of "supervisory duties" may be quite country-specific; the fixed-effect specification should however take these aspects appropriately into account.

5 Results

Table 4 shows the main results for women. We find a positive and significant association between female participation in post-secondary education and, respectively, the percentage of women in managerial positions, the percentage of women who are self-employed, and the percentage of working mothers with young children (random effects model). By allowing for correlation between the included characteristics of the regional labor market and other unobservable characteristics at the regional level (fixed effects model), we still observe a positive – but less significant – effect of all three indicators. On the one hand, by using the fixed effects model, we have more robust estimates but, on the other hand, we exploit the available information less efficiently.[10]

The effects of our indicators of local labor markets are also positive for men, with only the share of working fathers being significant (Table 5). However, none of our indicators remains significant in the fixed effects model.[11]

[10] Throughout the paper we have employed a linear probability model, adjusting for heteroskedasticity in the standard errors. The Chamberlain fixed-effect logit model produces similar marginal effect estimates. For brevity, the results are omitted but are available upon request.

[11] The estimated coefficients of women in managerial positions and in self-employment are significantly different from the estimated coefficients of men in managerial positions and in self-employment, as the comparison between

As far as individual characteristics are concerned (Tables 4 and 5), we find a positive effect of parental education, household income, of having a mother who works and who is a manager, and a negative effect of age and the number of siblings. Young individuals living with only one parent or on their own are more likely to attend a post-secondary educational course than individuals living with one/two low educated parent/s. We do not identify any time trend. The timing of the interview is instead significant: individuals interviewed during the summer are less likely to be enrolled, since usually the academic year starts in the fall. Finally, the unemployment rate increases the probability of attending a post-secondary educational course, especially for men.

A joint look at Tables 4 and 5 confirms our main argument: our measures matter for the individual decision of investing in education and they are more important for women than for men. An increase of 10 percentage points in the share of women in managerial positions, in self-employment and in the share of working mothers with young children is associated with an increase of the probability of enrolling at the university, of 2.8, 6.9 and 1.6 percentage points, respectively. These gender differences may be due to the fact that, as suggested in Section 2, when deciding whether to invest in education or not, women do not have complete information over their career opportunities and they take into account the possibility of interrupting their career. Obviously, even men do not have complete information about their opportunities, although their career is generally not affected by glass ceiling phenomena, and career interruptions are not important in their calculations.

5.1 Robustness checks

In the main specification, we do not include any variable describing the potential marriage market that young individuals face. A higher probability of finding a "better" spouse may induce individuals to invest in education. The incentive is particularly high if the spouse has good career opportunities. This is why in Table 6 we introduce as possible determinants of a woman's (man's) decision to participate in post-secondary education the share of working fathers (mothers) and the share of men (women) in managerial positions and in self-employment. Table 6 suggests that the only significant effect is the one of female variables on female decisions. The

the random effect specifications highlights. The estimated coefficients for self-employment between women and men are also statistically different in the fixed effect estimation.

share of women in managerial positions is no longer significant in the fixed effects specification, which may be explained by its high correlation (0.73) with the share of men in managerial positions in the same region. Moreover, we find that the share of men in managerial positions, as well as the share of self-employed and working fathers do not affect female education decisions. We find, on the contrary, a positive association between female variables and male decisions. This positive association however disappears in the fixed effects specification, with the exception of the share of men in managerial positions.

These results confirm that female local labor market conditions matter for female decisions; moreover, they suggest that it is unlikely that there are some time-varying regional unobservable characteristics which affect both female opportunities in the labor market and female access to post-secondary education (a progressive regional council, for example).

Another issue to be considered is the lack of complete information about family background for young people living on their own or with only one parent. In Table 7 we repeat the analysis by excluding, in the top panel, young people living on their own (for whom parental information is completely unobserved) and, in the bottom one, by also excluding young people living with only one parent (for whom information on the non-resident parent is not observed). Our results are confirmed, but with lower statistical significance due to the reduction of the sample size.

A limit of our dataset is that we cannot observe individuals who left their parental home for study. When using cross-section information, we observe wo/men in the region where they are (not) studying. The region in which they study may be different from the region in which they completed their secondary school, and observed the behavior of women belonging to older age groups. Studying away from home is a very common phenomenon in Northern European countries. In order to understand the direction of selection in our sample, we exploit the longitudinal component of the dataset. We select households observed for two consecutive waves: in the first wave, there is a young wo/man studying and completing secondary school; in the second wave that young wo/man is either still in the household (attending a post-secondary course or not, "stayer") or she/he is not in the household anymore ("mover"). We do not know whether the movers are away for studying or for working, but their characteristics in the first wave may be compared to the ones of the stayers. In Table 8 we compare the average characteristics of young people who stay at home (stayers) and who leave home (movers). We observe that movers

are somewhat younger, their mothers are more likely to work, and their fathers seem to be less educated. More interestingly, movers belong to richer families and come from regions with worse local labor market indicators. The size of the different sub-samples suggests that around 17% (15%) of young wo/men leave the household at the end of the secondary school. These figures give an idea of the size of the selection and suggest that our main samples (of stayers) include young women and men who are, on average, from regions where our indicators of local labor market conditions are "better", but from relatively less wealthy families.

Despite the large sample size, the variability exploited in the model is only due to variation in our indicators across 93/94 regions and 6 years of time. The regional effect is then identified only by averaging - at most - 6 points in time. This feature may impact on the efficiency of the employed estimator. We work through simulations to understand how this could affect our results. We first split the sample into two parts: in each region, we randomly divide the observations in two sub-samples, and estimate our parameters of interest for each of them. We then split randomly the regions into two sub-samples, and estimate two other sets of parameters. We define β_4 as the average of the four estimated parameters for each of the effects of interest, as shown in the second and fifth columns of Table 9. Since each sub-sample is half of the original one, the bias should be double that in the original sample. We therefore subtract β_4 from twice the estimated effect in our main specification (first and fourth columns of Table 9). This procedure allows us to eliminate the bias of our main specification (Dhaene and Jochmans, 2010; Arellano and Bonhomme, 2010). The third and sixth columns show that the derived effects are rather close to our estimated effects.

6 Concluding Remarks

The paper studied whether local labor market conditions as measured by the share of women in managerial position, the share of women who are self-employed, and the share of working mothers whose children are below 5 have an impact on female decisions to invest in education. To construct our indicators we look at the outcomes of women in the 25-45 years old age group living in the same region of Europe in which young women taking the education decision live. We find that the share of working women with children below 5, the share of women in managerial

positions and that of the self-employed positively affect the probability that women participate in post-secondary education. The same does not hold for men.

A better understanding of the potential role of local labor market conditions on the female decision to enrol at university may be crucial, especially in countries where human capital is scarce. In Italy and Portugal only about 15% of women in the 25-64 cohort acquired tertiary education in 2009, in Sweden the percentage was 32%, in Norway, Belgium and Denmark 34%. If we focus on younger cohorts this gap is smaller but not yet closed: in the cohort 25-34, 23% of Italian women and 28% of the Portuguese have attained tertiary education, while this percentage is 53% in Norway and in Ireland and 49% in Finland.

Field of study is an important dimension of the education decision, which we could not take into account in our analysis, as we only have information about whether a student is enrolled or not, but not the course of study she (he) decides to attend. Knowing the field of study could allow us to assess whether the variables we have identified have a stronger impact on the choice of opting for some courses of study rather than for others and whether, for instance, fewer opportunities in the labor market induce women to invest in less labor market oriented disciplines. Further studies are needed in this direction.

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Tables

Table 1: Personal characteristics

	Women	Men
University	0.600	0.438
Age	19.3	19.4
	(0.9)	(0.9)
Mother: tertiary education	0.301	0.330
Mother: secondary education	0.468	0.464
Mother works	0.729	0.741
Father: tertiary education	0.301	0.330
Father: secondary education	0.468	0.464
Same-sex parent is a manager	0.109	0.201
Same-sex parent is self employed	0.095	0.225
Household income	30,610	33,280
	(31,038)	(33,386)
Number of siblings	1.03	1.11
	(1.05)	(1.09)
Living with only one parent	0.169	0.165
Living on her/his own	0.124	0.065
Interview in Jan-Mar	0.148	0.166
Interview in Apr-June	0.510	0.495
Interview in Oct-Dec	0.249	0.253
Year 2005	0.175	0.159
Year 2006	0.203	0.216
Year 2007	0.182	0.193
Year 2008	0.180	0.172
Year 2009	0.167	0.174
Observations	11,052	11,466
Regions	93	94
Countries	23	23
Observations per region	119	122
Waves per region	4.0	4.0

Notes: average values (standard deviations for continuous variables, in brackets).

Table 2: Regional labor market indicators

	Women	Men
Managerial positions (%)	24.8	38.9
	(10.9)	(12.6)
	[0.119]	[0.174]
Working parents (%)	67.9	96.7
	(17.9)	(4.5)
	[0.223]	[0.517]
Self employment (%)	8.5	14.1
	(4.7)	(6.9)
	[0.225]	[0.151]

Notes: indicators have been constructed using weights and employing samples of wo/men (25-45 years old) with post-secondary education. "Managerial positions" is the share of working wo/men in managerial positions; "Self employment" is the share of working wo/men in self employment; "Working parents" is the share of working mo/fathers with the youngest child younger than 5 years old. Average regional values are reported, together with standard deviations in brackets, and ratio between within-variance and total variance in square brackets.

Table 3: Correlation between the share of Managerial Positions and Wages

Women	**Net monthly wage (€)**	**Net yearly labor income (€)**	**Gross yearly labor income (€)**
Managerial positions (%)	0.316***	0.367***	-0.062
Regions	253	270	51
Countries	11	16	7
Men	**Net monthly wage (€)**	**Net yearly labor income (€)**	**Gross yearly labor income (€)**
Managerial positions (%)	0.249***	0.277***	-0.157
Regions	260	271	55
Countries	11	16	7

Notes: correlations, at regional level, between the share of managerial positions and the average labor income (measured in three different ways: net monthly, net yearly, gross yearly).

Table 4: The Effect of the Regional Labor Market Conditions on Female University Enrolment

	RE			FE		
	Beta	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Age	-0.031	0.007	***	-0.029	0.007	***
Mother: tertiary	0.199	0.017	***	0.203	0.017	***
Mother: secondary	0.113	0.014	***	0.117	0.014	***
Mother works	0.027	0.013	**	0.029	0.013	**
Mother is a manager	0.029	0.013	**	0.026	0.013	**
Mother is self employed	0.009	0.019		0.007	0.019	
Father: tertiary	0.128	0.017	***	0.131	0.018	***
Father: secondary	0.070	0.014	***	0.073	0.014	***
Household income	0.002	0.002		0.003	0.002	
Number of siblings	-0.010	0.004	**	-0.011	0.004	**
Living with one parent	-0.048	0.013	***	-0.049	0.014	***
Living on her own	-0.074	0.027	***	-0.071	0.027	**
Interview in Jan-Mar	0.030	0.020		0.015	0.022	
Interview in Apr-June	0.042	0.020	**	0.013	0.023	
Interview in Oct-Dec	0.036	0.025		0.045	0.025	*
Year 2005	0.026	0.013	**	0.030	0.012	**
Year 2006	0.014	0.015		0.005	0.014	
Year 2007	0.045	0.021	**	0.030	0.020	
Year 2008	0.036	0.021	*	0.022	0.021	
Year 2009	0.046	0.018	**	0.035	0.018	*
Female unemployment rate	0.037	0.021	*	-0.013	0.025	
Women in managerial positions	0.059	0.017	***	0.028	0.017	*
Female self employment	0.070	0.024	***	0.069	0.029	**
Working mothers	0.019	0.006	***	0.016	0.008	**
Constant	0.605	0.148	***	0.702	0.149	***
Observations	11,052					

Notes: linear probability model, robust standard errors clustered by region; significance of the estimated coefficients: *** significant at 1% level, ** at 5%, * at 10%. RE stands for random effects model; FE stands for fixed effects model. The unit of measurement of the regional labor market indicators (managerial positions, self employment, working parents) and of the unemployment rate is 10 percentage points.

Table 5: The Effect of the Regional Labor Market Conditions on Male University Enrolment

	RE			FE		
	Beta	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Age	-0.025	0.008	***	-0.023	0.008	***
Mother: tertiary	0.201	0.021	***	0.206	0.021	***
Mother: secondary	0.085	0.018	***	0.091	0.018	***
Mother works	0.025	0.014	*	0.026	0.014	*
Father: tertiary	0.190	0.021	***	0.194	0.021	***
Father: secondary	0.074	0.018	***	0.078	0.018	***
Father is a manager	0.052	0.015	***	0.048	0.015	***
Father is self employed	0.016	0.014		0.015	0.014	
Household income	0.006	0.002	***	0.006	0.002	***
Number of siblings	-0.021	0.006	***	-0.021	0.006	***
Living with one parent	-0.023	0.013	*	-0.025	0.013	*
Living on his own	0.083	0.028	***	0.083	0.028	***
Interview in Jan-Mar	0.031	0.015	**	0.028	0.017	
Interview in Apr-June	0.033	0.014	**	0.020	0.017	
Interview in Oct-Dec	0.034	0.017	**	0.035	0.017	**
Year 2005	0.005	0.018		0.006	0.019	
Year 2006	0.002	0.017		0.000	0.018	
Year 2007	0.008	0.020		0.000	0.021	
Year 2008	0.014	0.024		0.011	0.025	
Year 2009	-0.006	0.019		-0.009	0.020	
Male unemployment rate	0.053	0.020	***	0.033	0.020	*
Men in managerial positions	0.019	0.012		0.007	0.011	
Male self employment	0.003	0.020		-0.017	0.025	
Working fathers	0.027	0.016	*	0.011	0.016	
Constant	0.376	0.207	*	0.496	0.218	**
Observations	11,466					

Notes: linear probability model, robust standard errors clustered by region; significance of the estimated coefficients: *** significant at 1% level, ** at 5%, * at 10%. RE stands for random effects model; FE stands for fixed effects model. The unit of measurement of the regional labor market indicators (managerial positions, self employment, working parents) and of the unemployment rate is 10 percentage points.

Table 6: The Role of the Marriage Market

	RE			FE		
WOMEN	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Women in managerial positions	0.047	0.015	***	0.026	0.017	
Female self employment	0.071	0.023	***	0.076	0.029	**
Working mothers	0.020	0.006	***	0.018	0.008	**
Men in managerial positions	0.015	0.014		0.000	0.013	
Male self employment	-0.005	0.018		-0.017	0.022	
Working fathers	0.004	0.020		-0.037	0.017	**
MEN	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Men in managerial positions	0.006	0.012		0.004	0.011	
Male self employment	0.005	0.020		-0.016	0.023	
Working fathers	0.031	0.018	**	0.018	0.017	
Women in managerial positions	0.043	0.015	***	0.015	0.015	
Female self employment	0.005	0.021		-0.009	0.022	
Working mothers	0.006	0.006		-0.005	0.005	

Notes: linear probability models, robust standard errors clustered by region; significance of the estimated coefficients: *** significant at 1% level, ** at 5%, * at 10%. RE stands for random effects models; FE stands for fixed effects models. The unit of measurement of the regional labor market indicators (managerial positions, self employment, working parents) and of the unemployment rate is 10 percentage points. All other control variables, as in Tables 4 and 5, and dummies concerning both parents being managers or self-employed, are included but coefficients are not reported.

Table 7: Sub-samples with complete parental information

LIVING WITH AT LEAST ONE PARENT						
		RE			**FE**	
Women (N = 9,679)	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Women in managerial positions	0.078	0.018	***	0.042	0.018	**
Female self employment	0.055	0.024	**	0.050	0.031	
Working mothers	0.016	0.006	***	0.011	0.008	
Men (N = 10,720)	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Men in managerial positions	0.020	0.012	*	0.009	0.011	
Male self employment	-0.006	0.021		-0.027	0.025	
Working fathers	0.028	0.017		0.010	0.017	
LIVING WITH BOTH PARENTS						
		RE			**FE**	
Women (N = 7,812)	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Women in managerial positions	0.082	0.019	***	0.039	0.019	**
Female self employment	0.074	0.027	***	0.077	0.037	**
Working mothers	0.012	0.007	*	0.004	0.009	
Men (N = 8,825)	**Beta**	**St err**	**Sig**	**Beta**	**St err**	**Sig**
Men in managerial positions	0.026	0.013	**	0.017	0.013	
Male self employment	-0.007	0.022		-0.031	0.026	
Working fathers	0.029	0.017	*	0.007	0.017	

Notes: linear probability models, robust standard errors clustered by region; significance of the estimated coefficients: *** significant at 1% level, ** at 5%, * at 10%. RE stands for random effects models; FE stands for fixed effects models. The unit of measurement of the regional labor market indicators (managerial positions, self employment, working parents) and of the unemployment rate is 10 percentage points. All other control variables, as in Tables 4 and 5, are included but coefficients are not reported.

Table 8: Sample Selection due to Mobility

	Women		Men	
	Stayers	**Movers**	**Stayers**	**Movers**
Age	18.2	18.1	18.3	18.0
Mother: tertiary	0.292	0.323	0.303	0.294
Mother: secondary	0.515	0.430	0.497	0.494
Mother works	0.741	0.769	0.730	0.770
Father: tertiary	0.292	0.323	0.303	0.294
Father: secondary	0.515	0.430	0.497	0.494
Same-sex parent is self employed	0.078	0.132	0.198	0.219
Household income	26,740	43,774	28722	43631
Number of siblings	2.50	2.56	2.64	2.67
Living with one parent	0.184	0.214	0.183	0.192
Living on his own	0.073	0.195	0.051	0.167
Fe/male unemployment rate	11.6	7.9	8.7	7.1
Wo/men in managerial positions	22.3	19.0	36.4	30.7
Fe/male self employment	7.6	5.6	13.9	10.9
Working mo/fathers	68.0	68.0	96.7	95.7
Observations	3,605	728	4,059	694

Notes: average value of the independent variables for samples of young people staying at home after the end of secondary school ("stayers") or leaving the parental household ("movers"). Data: EU-SILC longitudinal data 2004-2008. The longitudinal data do not contain information on parents' being a manager.

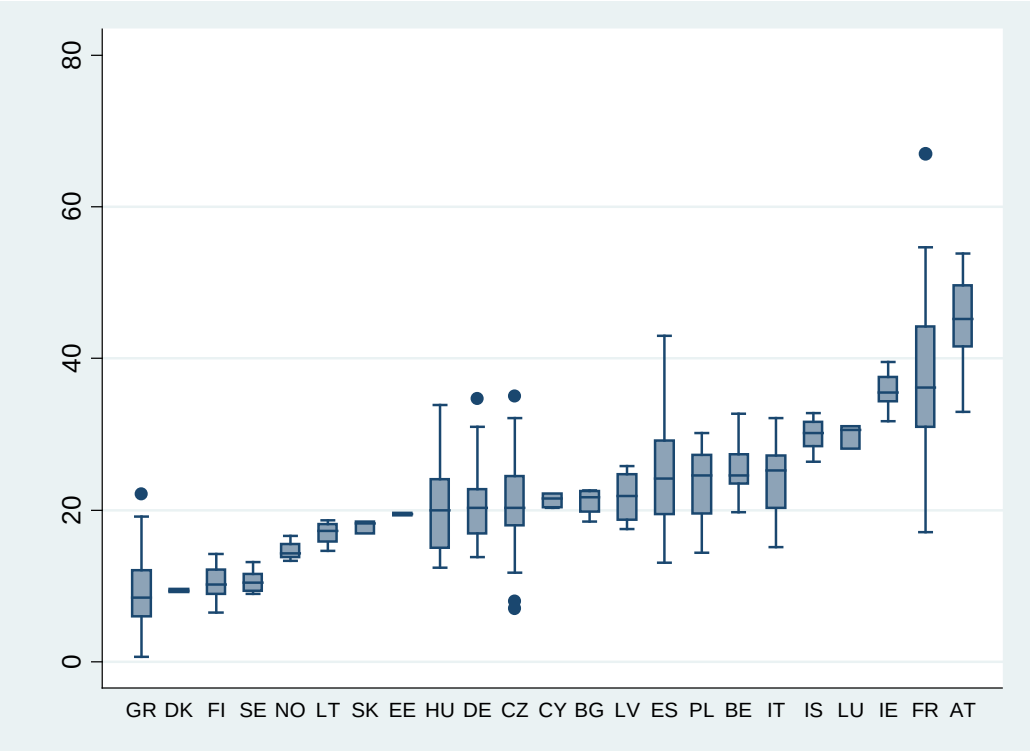
Table 9: Split panel jackknife method

	RE			FE		
	β	β_4	$2\beta - \beta_4$	β	β_4	$2\beta - \beta_4$
Women						
Women in managerial positions	0.059	0.064	0.054	0.028	0.027	0.029
Female self employment	0.069	0.071	0.067	0.069	0.068	0.070
Working mothers	0.019	0.019	0.019	0.016	0.016	0.016
Men						
Men in managerial positions	0.019	0.023	0.015	0.007	0.006	0.007
Male self employment	0.003	0.011	-0.006	-0.017	-0.016	-0.017
Working fathers	0.027	0.035	0.019	0.011	0.012	0.011

Notes: β is the estimated effect of the regional labor market conditions as in Tables 4 and 5; β_4 is the average of 4 effects estimated using the 4 sub-samples.

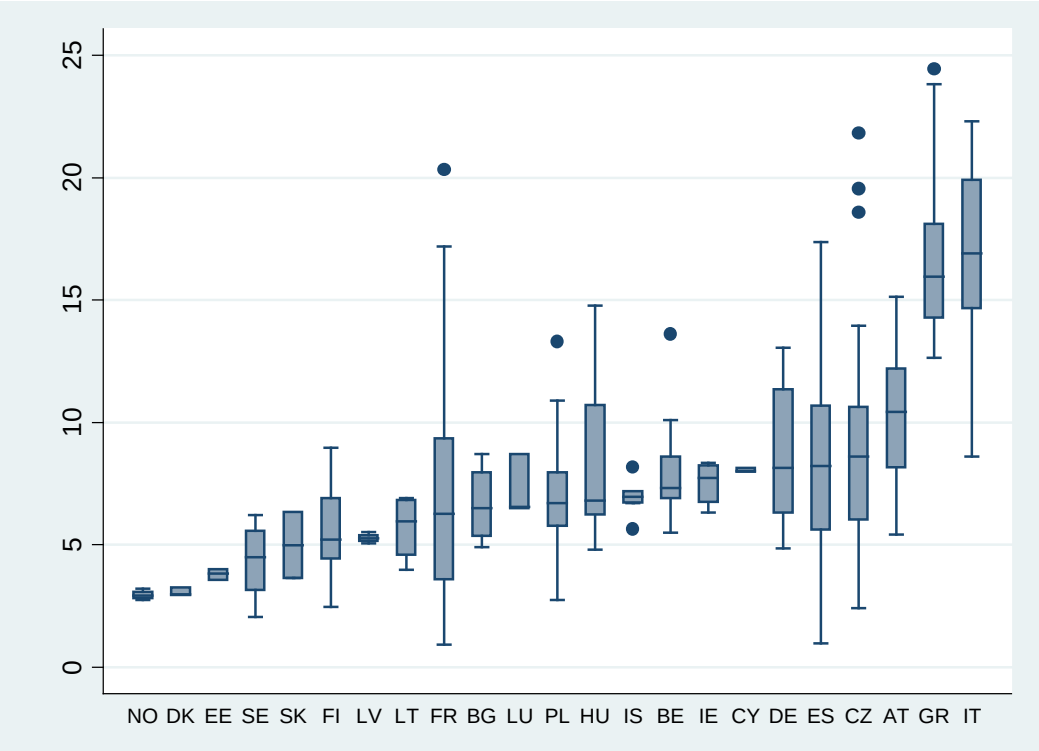
Figures

Figure 1: Regional share of women in managerial positions, by country



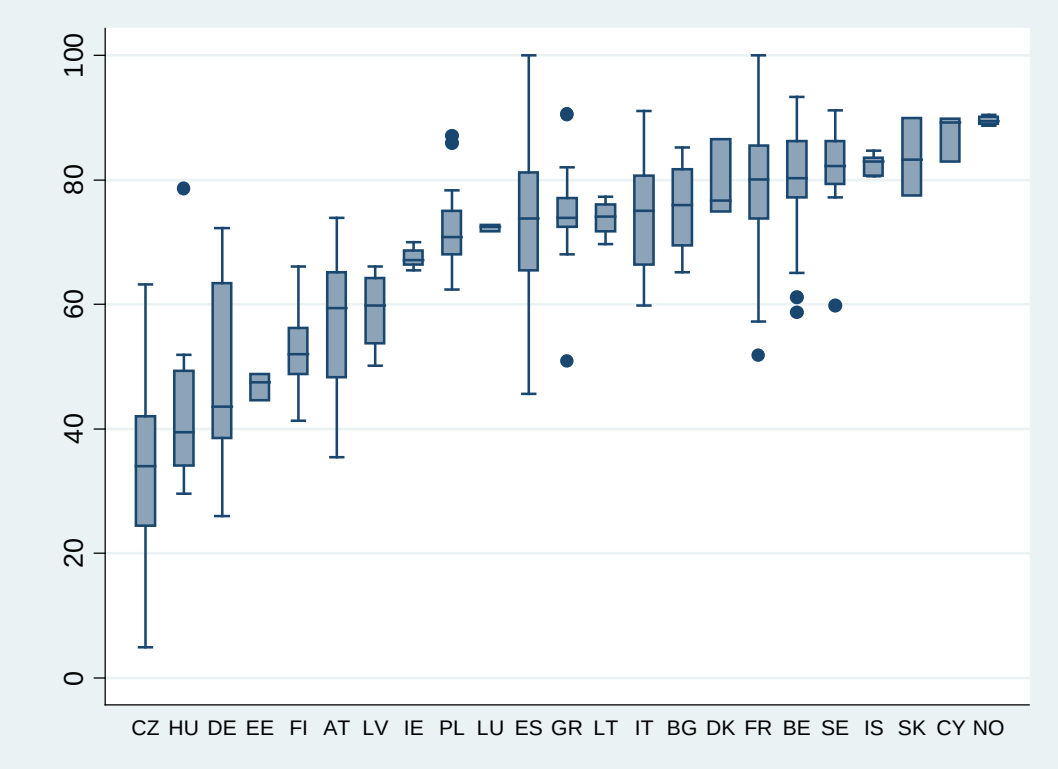
Notes: regional indicators calculated over regions and years are shown in box-plot graphs by country. Box-plot graphs display first and third quartile, median, adjacent and outside values, and are ordered by median.

Figure 2: Regional share of self employed women, by country



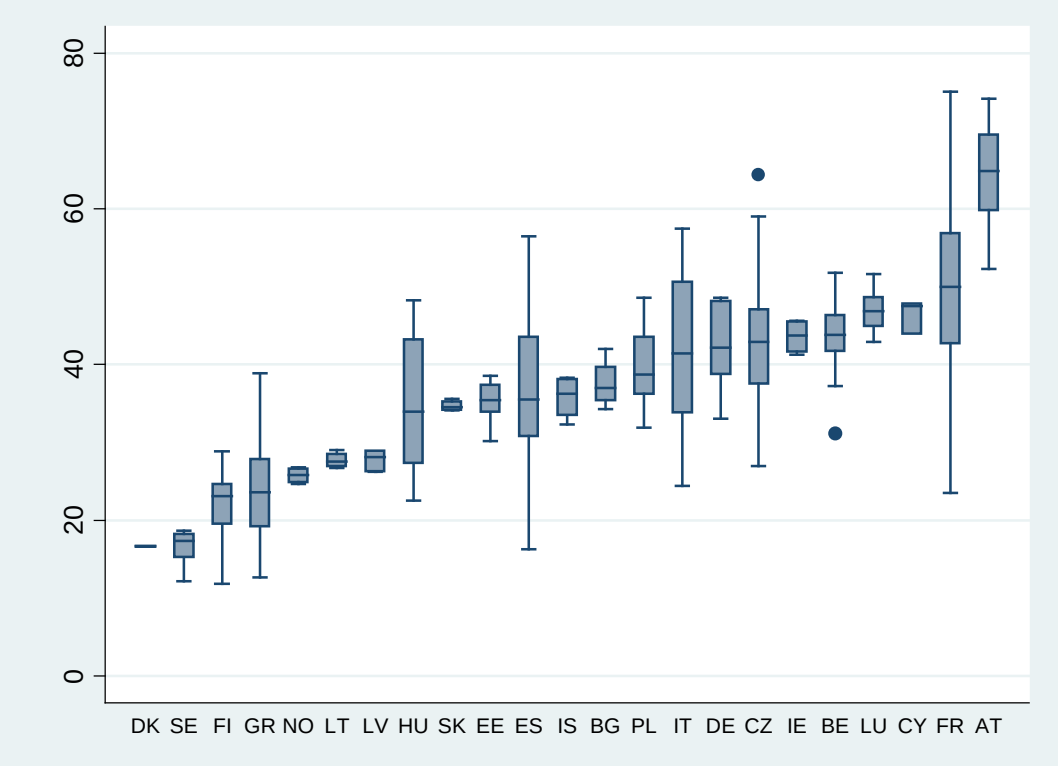
Notes: see Notes Figure 1.

Figure 3: Regional share of working mothers, by country



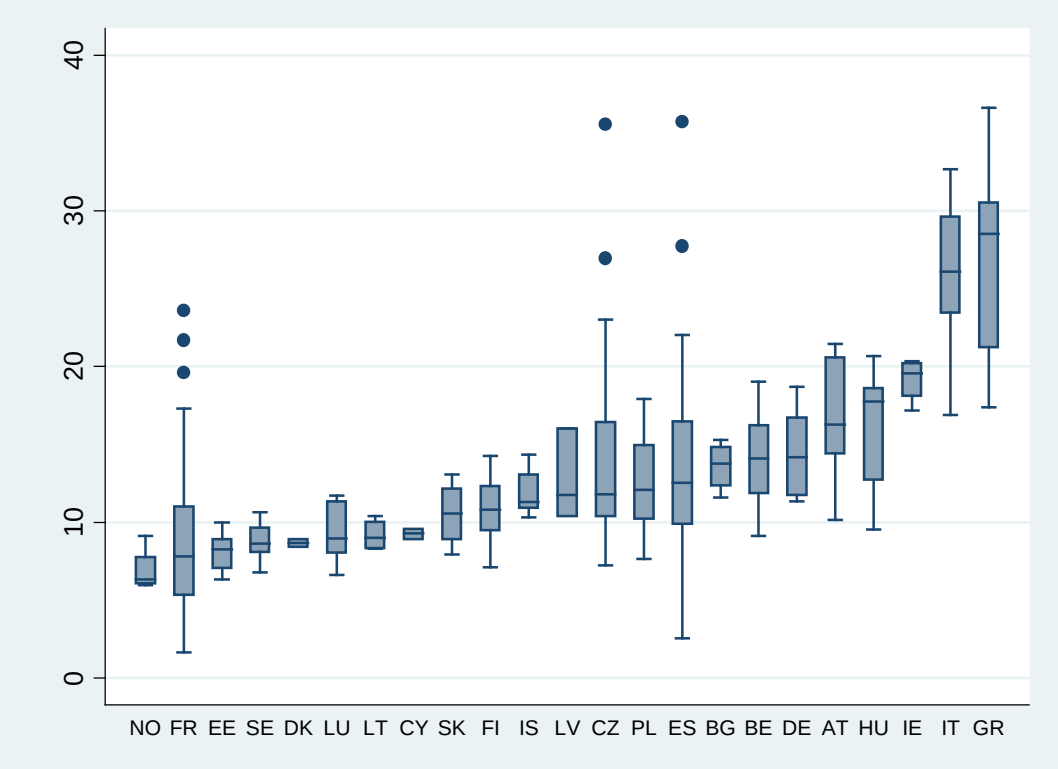
Notes: see Notes Figure 1.

Figure 4: Regional share of men in managerial positions, by country



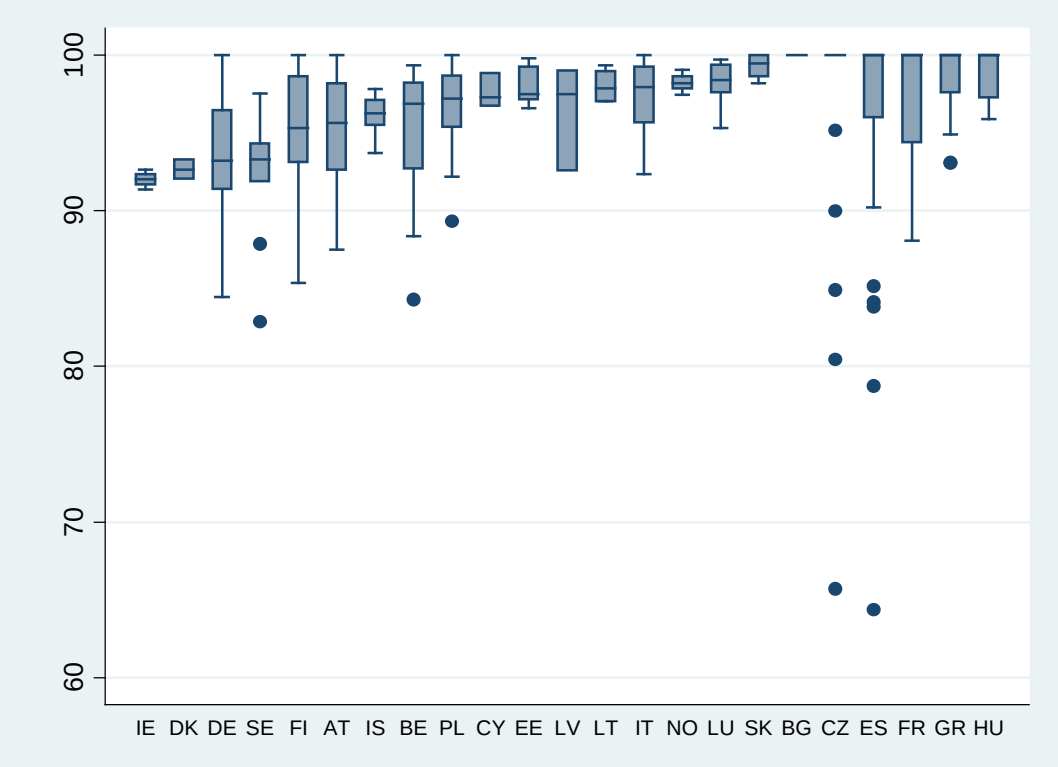
Notes: see Notes Figure 1.

Figure 5: Regional share of self employed men, by country



Notes: see Notes Figure 1.

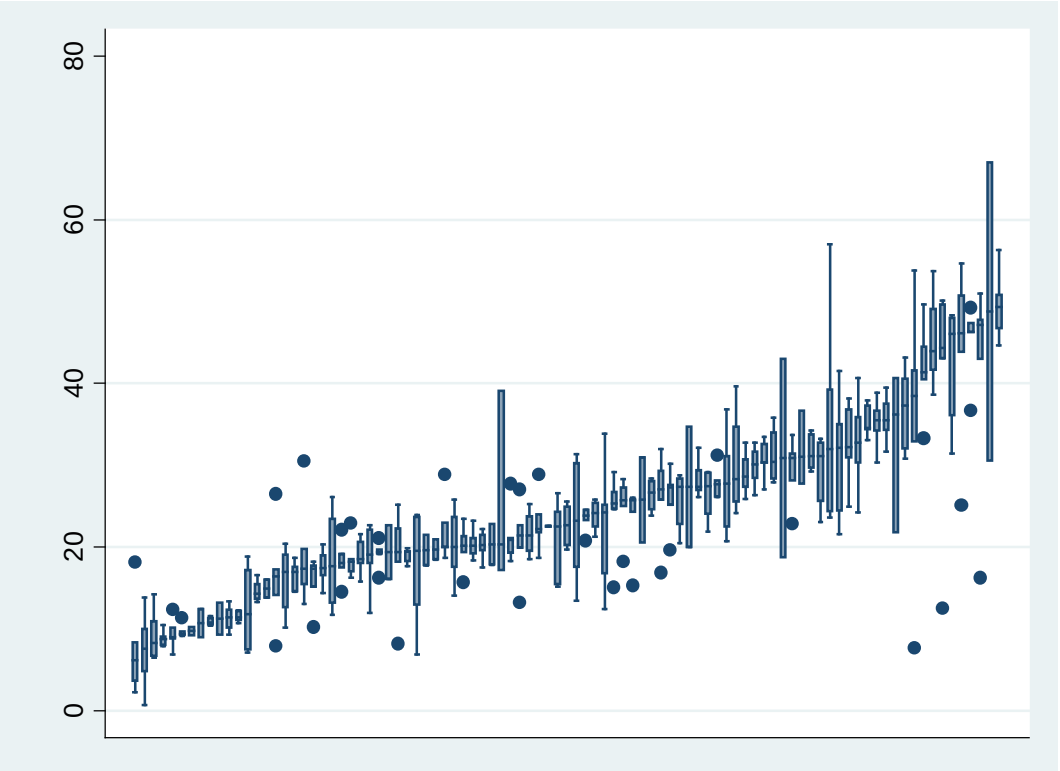
Figure 6: Regional share of working fathers, by country



Notes: see Notes Figure 1.

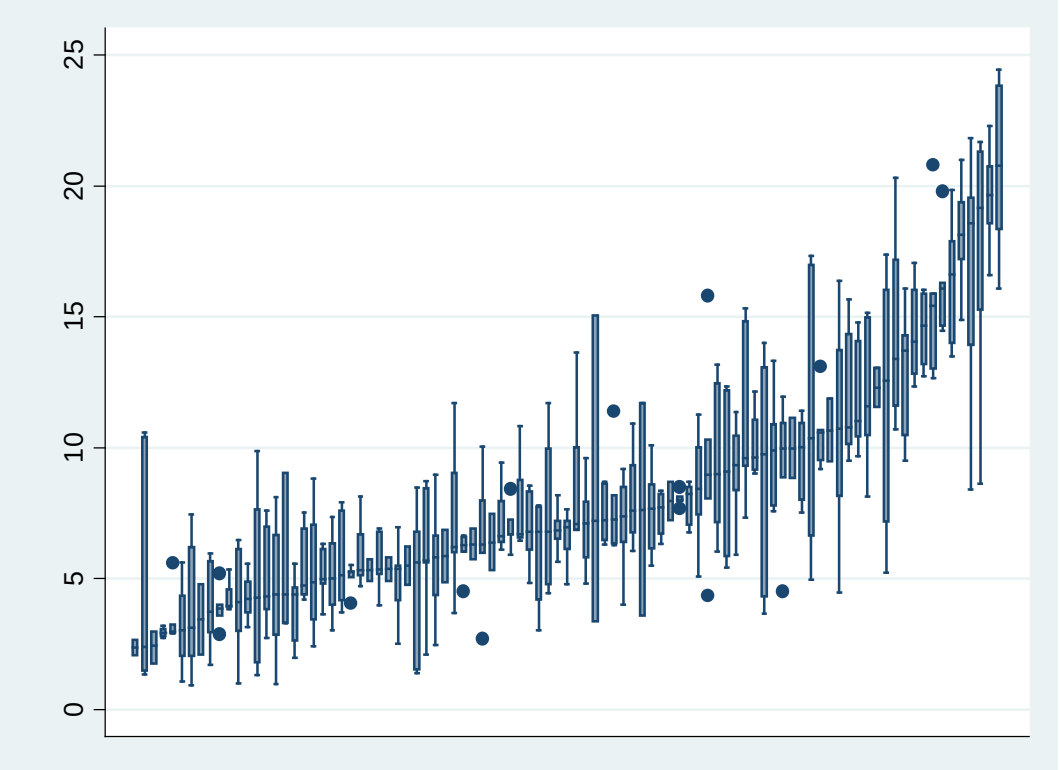
Appendix

Figure A1: Regional share of women in managerial positions, by region



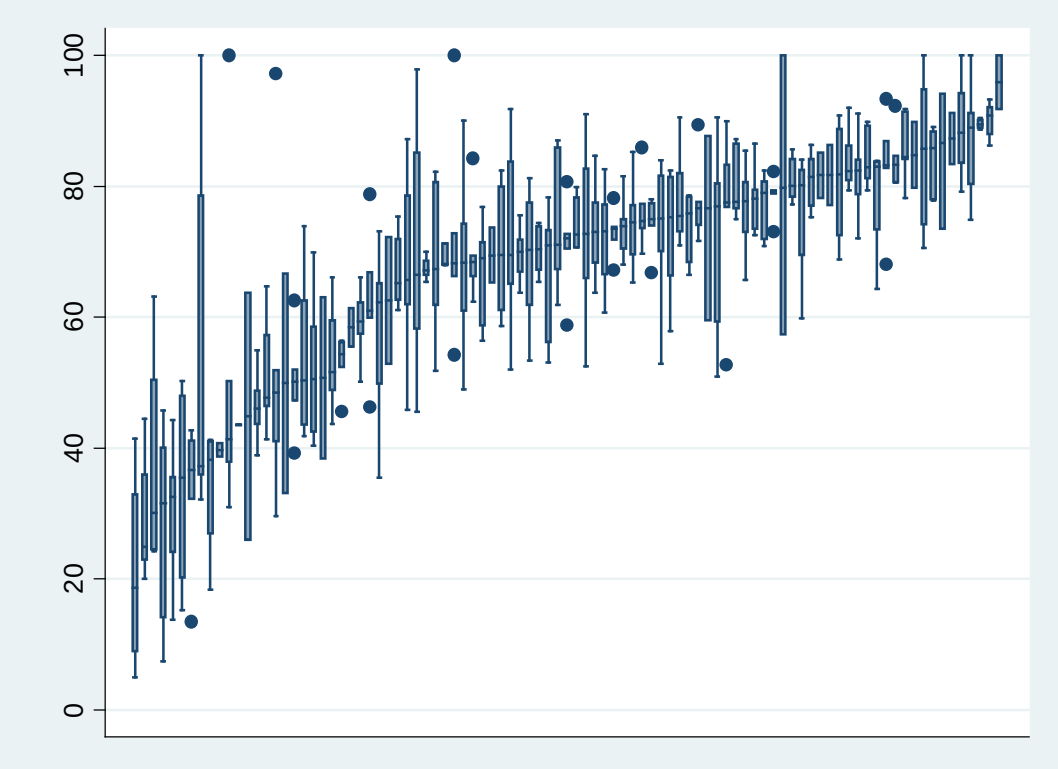
Notes: regional indicators calculated over regions and years are shown in box-plot graphs by region. Box-plot graphs display first and third quartile, median, adjacent and outside values, and are ordered by median.

Figure A2: Regional share of self employed women, by region



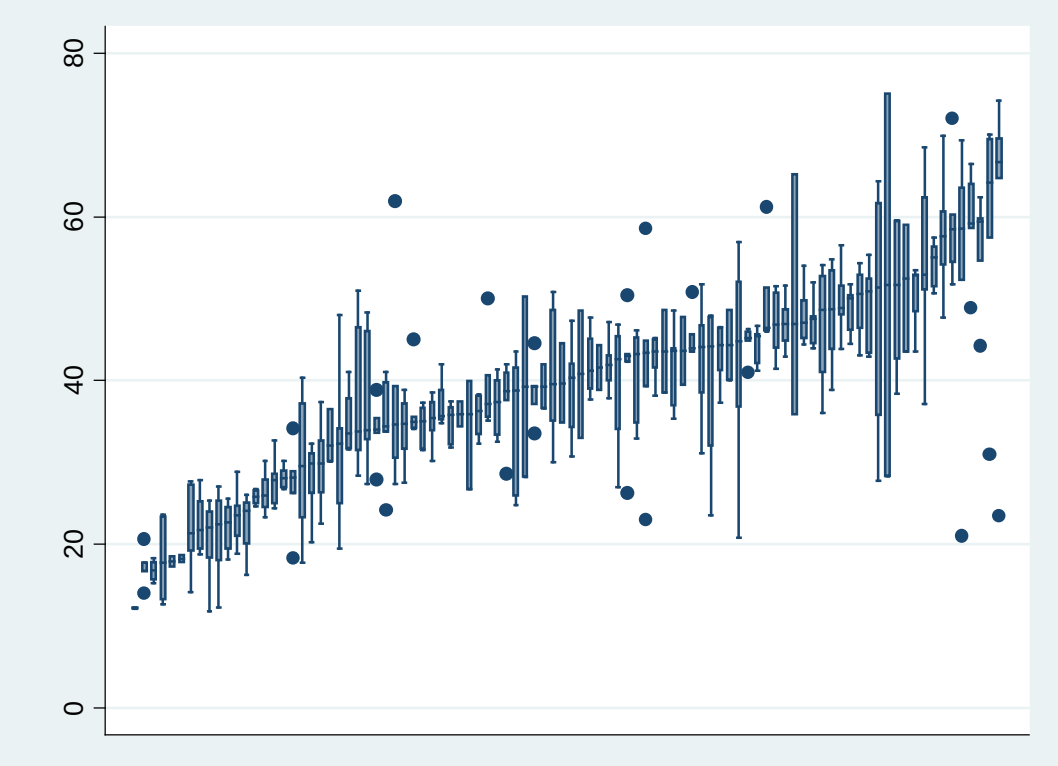
Notes: see Notes Figure A1.

Figure A3: Regional share of working mothers, by region



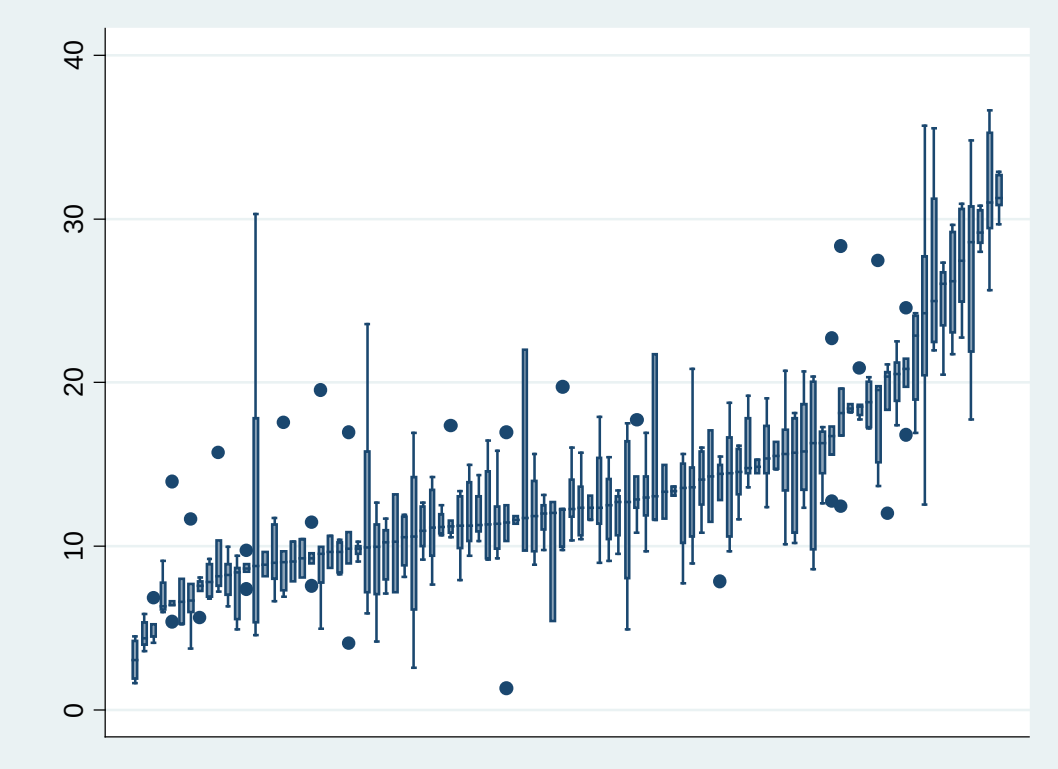
Notes: see Notes Figure A1.

Figure A4: Regional share of men in managerial positions, by region



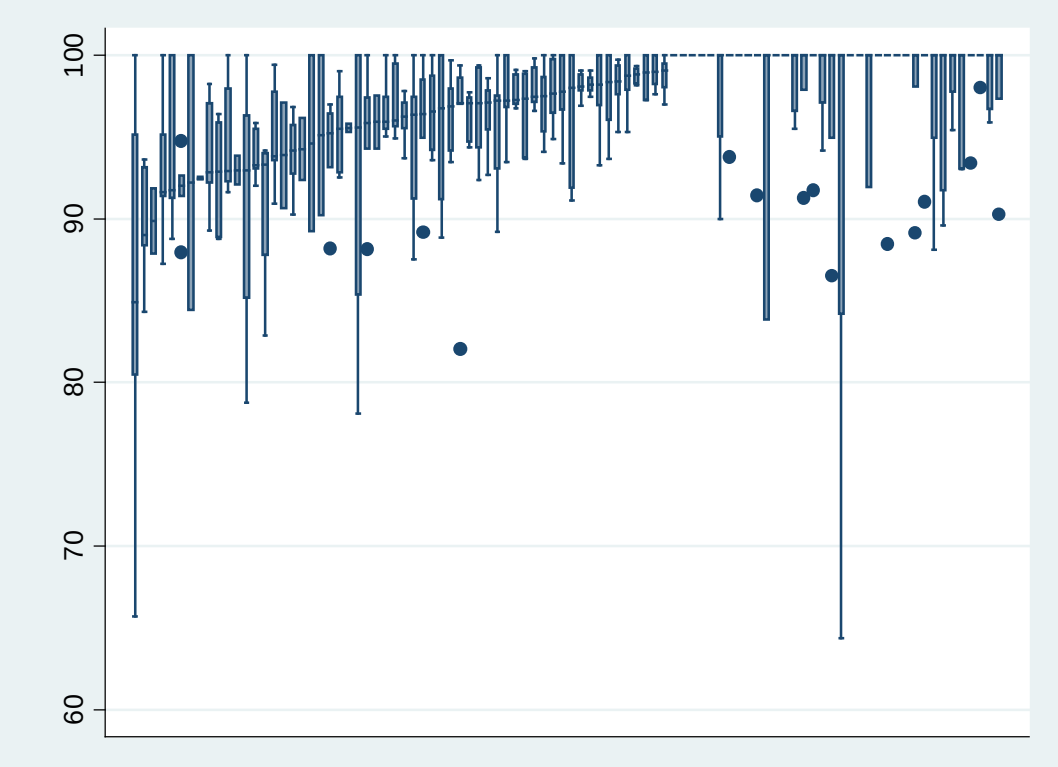
Notes: see Notes Figure A1.

Figure A5: Regional share of self employed men, by region



Notes: see Notes Figure A1.

Figure A6: Regional share of working fathers, by region



Notes: see Notes Figure A1.