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On the Regional Labour Market Determinants of Female University Enrolment in Europe

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CASARICO A., PROFETA P. and PRONZATO C. D. On the regional labour market determinants of female university enrolment in Europe, *Regional Studies*. This paper empirically investigates how young women's decisions of investing in post-secondary education are affected by labour market outcomes of older women living in the same region. EU-SILC data on educational decisions of women who completed secondary schooling are used and indicators of the regional labour market are constructed. Exploiting regional and time variability, it is found that the share of working women with young children, of women with managerial positions and the self-employed positively affect the probability to enrol. Significant effects of these variables for men are not found.

Post-secondary education Managerial positions Maternal employment EU-SILC data Repeated cross-section

CASARICO A., PROFETA P. and PRONZATO C. D. 欧洲女性就读大学的区域劳动市场决定因素, *区域研究*。本文就经验层面, 探讨年轻女性投资高等教育的决定, 如何受到居住于同一区域的年长女性的劳动市场结果所影响。本研究使用欧盟所得与生活条件统计 (EU-SILC) 中, 完成中等教育的女性的教育决定数据, 并建立区域劳动市场的指标。本研究利用区域及时间变异, 发现养育幼儿的上班族女性、担任管理职位的女性、以及自僱者的比例, 正向地影响就读高等教育的可能性。对男性而言, 则未发现这些变因的显著影响。

高等教育 管理职位 母亲就业 欧盟所得与生活条件统计 重复横断

CASARICO A., PROFETA P. et PRONZATO C. D. Les déterminants sur le marché du travail régional du taux d'inscription universitaire des femmes en Europe, *Regional Studies*. Ce présent article analyse comment les décisions des jeunes femmes d'investir dans l'éducation post-secondaire sont influencées par la participation sur le marché du travail des femmes plus âgées qui habitent la même région. On emploie les données EU-SILC sur les décisions relatives à l'éducation des femmes qui ont terminé les études secondaires et on construit des indices du marché du travail régional. En exploitant la variabilité régionale et temporelle, il s'avère que la part des femmes au travail ayant de jeunes enfants à charge, des femmes cadres et des travailleuses indépendantes influe de façon positive sur les intentions de s'inscrire. On ne trouve pas de tels effets significatifs pour les hommes.

Éducation post-secondaire Femme cadre Emploi maternel Données EU-SILC Données transversales répétées

CASARICO A., PROFETA P. und PRONZATO C. D. Determinanten des regionalen Arbeitsmarkts für die Hochschulbildung von Frauen in Europa, *Regional Studies*. In diesem Beitrag wird empirisch untersucht, wie die Entscheidungen von jungen Frauen zur Investition in eine weiterführende Bildung von der Arbeitsmarktsituation älterer Frauen in derselben Region beeinflusst wird. Auf der Grundlage von EU-SILC-Daten über die Bildungsentscheidungen von Frauen, die ihre sekundäre Schulbildung abgeschlossen haben, werden Indikatoren für den regionalen Arbeitsmarkt konstruiert. Bei Berücksichtigung der regionalen und zeitlichen Variabilität stellt sich heraus, dass sich der Anteil von berufstätigen Frauen mit jungen Kindern, von Frauen in Führungspositionen und von Freiberuflerinnen positiv auf die Wahrscheinlichkeit einer weiterführenden Bildung auswirkt. Für Männer werden keine signifikanten Auswirkungen dieser Variablen festgestellt.

Weiterführende Bildung Führungspositionen Berufstätige Mütter EU-SILC-Daten Wiederholter Querschnitt

CASARICO A., PROFETA P. y PRONZATO C. D. Determinantes del mercado laboral regional para el acceso de las mujeres a la universidad en Europa, *Regional Studies*. Este trabajo empírico analiza las características del mercado laboral regional que determinan

las decisiones de las mujeres jóvenes de invertir en educación post-secundaria, con particular enfoque en el papel de las oportunidades de trabajo para las madres y las oportunidades de promoción para las mujeres mayores. Utilizamos la base de datos EU-SILC para medir las decisiones de las mujeres que acabaron la escuela secundaria. Construimos indicadores del mercado de trabajo regional y consideramos la variabilidad regional y temporal para identificar cómo las decisiones de las mujeres de invertir en educación post-secundaria responden a los cambios en estas medidas. Nuestros resultados muestran que el porcentaje de mujeres trabajadoras con hijos pequeños, de mujeres con posiciones gerentes o trabajadoras autónomas afectan positivamente a la probabilidad de invertir en educación. No observamos ningún efecto significativo para los hombres.

Educación post-secundaria Posiciones gerentes Ocupación laboral de madres Datos de EU-SILC Sección transversal repetida

JEL classifications: J16, J24, R23

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’ that has characterized the US labour market starting from the 1970s (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 labour market of mothers (BRATTI, 2003; CARNEIRO *et al.*, 2013) and leads to the 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; and RAMEY and RAMEY, 2010).

Given the importance of female education, the study of its determinants is a crucial issue, especially for those countries in which human capital levels are still low and, therefore, there is room for improvement. This paper empirically investigates the role played by the labour market performance of older women on the choice of investing in post-secondary education of young women living in the same region.

The decision to acquire education is generally assumed to depend on the wage returns to education, but may also be driven by other elements influencing the broader returns to education, as argued by FREEMAN (1986). The present paper focuses on two distinctive features of female labour market participation that may have important consequences on women’s education decisions: first, the employment rate of mothers is below that of women of the same cohort without children; and second, women are under-represented in top positions. For instance, according to the European Commission database on women and men in decision-making,¹ in the EU-27 in 2012 women were only 14% of board members of the largest publicly listed companies, with only Norway reaching 42% of female representation. Among female employees, the proportion that holds a managerial

position is 16%, while the corresponding value for men is 25%. In most countries women experience discontinuities in their employment, mainly related to childcare. Typically, interruptions follow child birth and have a different duration depending upon the birth order, the individual characteristics of the mother and, most importantly here, the geographic location. According to Organisation for Economic Co-operation and Development (OECD) data, in Denmark the average employment rate of women in the 25–49-year age cohort is 80%, while that of mothers in the same age group is 75%. In Germany and the UK the difference in employment rates across the two groups is between 15 and 20 percentage points. The more limited employment opportunities for mothers and the difficulties in progressing in their career have a potential negative impact on the decision to invest in education, an issue that has not been thoroughly explored before.² Frequent career interruptions reduce the time span over which women can benefit from the human capital acquired and they generate a higher depreciation of knowledge (MINCER and OFEK, 1982); furthermore, the likelihood of hitting the glass ceiling reduces the prospect of higher wages. However, at the time of their education decision, young women cannot accurately assess the impact of maternity or barriers to promotion on their return to education.³ This paper argues that they can observe the labour market outcomes of older women who have acquired post-secondary education and who live in the same region. It is postulated that the decision to invest in education, besides being influenced by individual and family characteristics and by general features of the regional labour market,⁴ is also affected by the labour market outcomes of older women living in the same region. Where the labour market opportunities for mothers are wider and where more women reach top positions, the incentives of younger women to pursue post-secondary education are stronger.

To study whether regional labour markets have an impact on young women’s decisions to invest in education, a very simple model is first illustrated with the purpose of highlighting the main mechanisms at work. Data on the decision to invest in post-secondary education of young women between 17 and 21 years

old, who completed secondary schooling, are then used, which are drawn from EU-SILC data, a European Household Survey available for 2004–09. From the same survey labour market indicators at the regional level are constructed to capture labour market opportunities for mothers and career prospects or job promotions for women, using data on women with post-secondary education in the 25–45-year age group. Labour market opportunities for mothers are proxied by using the share of working mothers with young children, whereas career prospects are proxied by the share of women with managerial positions or in self-employment. Regional and time variability are exploited to identify how young women react in terms of educational investment to changes in these regional labour market indicators, controlling for standard labour market features, namely wages and unemployment, and for personal and family characteristics.

It is found that the share of working women with young children, the share of women with managerial positions and the share of women in self-employment positively affect the probability that young women enrol in post-secondary education. This suggests that how favourable the regional labour market is to female careers and to mothers' employment is important for women's decision to invest in education. The same does not hold for men: if one builds the same indicators of regional labour market conditions using data on 25–45-year-old men, it is found that the decision of 17–21-year-old men to invest in education is not significantly affected by them. A series of checks is performed to assess the robustness of the results and it is found that they are stable also when one takes into account the issue of the mobility of students and graduates, when cross-gender indicators are included and when alternative specifications of the model are adopted to investigate in more details geographical specificities.

Previous contributions, though not focusing on women, have discussed the role of local labour market conditions on individual incentives to invest in higher education. Measures of local labour market conditions studied in the literature that may have an impact on the educational decisions are, for instance, unemployment and wages. The empirical evidence on the impact of local unemployment on the decision to enrol at the university is mixed. For example, BOZICK (2009) using US data finds that in areas (specified by the zip code) where unemployment is high and there are few jobs that require only a high-school diploma, youth have higher odds of entering college. BETTS and FARLAND (1995) find that an increase in the unemployment rates (measured at the level of the census region) of recent high-school graduates and of all adults are associated with increases in attendance at American two-year community colleges. PETRON-GOLO and SAN SEGUNDO (2002) focus on provinces in Spain and show that there is a positive effect of youth unemployment on the demand for education,

whereas adult unemployment has a negative impact. CASQUEL and URUEL (2009), still focusing on Spain, show that higher unemployment rates diminish the probability of investing in post-compulsory education. RICE (1999) finds that participation rates in further education for both men and women are positively related to the local unemployment rate in England and Wales, measured at the level of the local education authority. MICKLEWRIGHT *et al.* (1990) and MESCHI *et al.* (2011) on UK data find no significant impact of local labour market conditions as measured by wages and unemployment at the local education authority level on enrolment. Interestingly, there may also be heterogeneous effects across gender of local labour market conditions on the human capital investment decision. CLARK (2011) focuses on regions in England and finds that youth unemployment has a large positive effect on boys' enrolment, whereas for girls the effect is smaller and examination performance seems to be a more important variable. BRADLEY and TAYLOR (1996) 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.

A different strand of the literature in the area of gender has emphasized that local conditions are particularly important for women's labour supply decision: FOGLI and VELDKAMP (2011) suggest that women learn about the effects of maternal employment by observing nearby older women who are employed and show that this learning process has an impact on their labour supply. They do not consider the decision of acquiring education, though.

The identification of the relevant local labour market is of course critical in the analysis. All the papers investigating the role of local labour markets on educational decisions are cited before developing a single-country study and using data disaggregated at the regional, province or local authority level to perform their empirical analysis. This paper, instead, develops a multi-country study focused on Europe and chooses the maximum level of disaggregation allowed by data availability: namely, the focus is on European regions using the NUTS-1 level of disaggregation as implemented in EU-SILC. On the one hand, these regions may constitute a reasonable indicator of labour markets that those who have acquired post-secondary education look at, taking into account the high mobility that characterizes the highly skilled.⁵ To corroborate this approach, the robustness analysis also includes labour market indicators of neighbouring regions and the limitations stemming from the potential mobility of students across regions are discussed. On the other hand, some of the previously mentioned studies consider local labour markets smaller than NUTS-1. Data availability prevents the analysis from being conducted at a lower level of disaggregation. However, this limitation should not crucially challenge the validity of the empirical results to the extent that

students care more about across-region, rather than within-region, variability.

The paper is organized as follows. The next section introduces the illustrative model; the third section contains the empirical strategy; the fourth section presents the data; the fifth section shows the results and the robustness analyses; and the sixth section concludes.

THE FEMALE DECISION TO INVEST IN EDUCATION

To illustrate the potential impact of maternity and barriers to job promotion on decisions about education, the following set-up is introduced. The economy lasts for two periods and is populated only by women.⁶ The total size of the population is normalized at 1 and the population growth rate is set to zero. Women are heterogeneous in α^i , which captures the time cost of investing in education for woman i and it is distributed on the interval $(0, \bar{\alpha}]$ 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 α^i . In the first period women decide whether to invest in education or not. If they acquire education, they devote a share α^i of the first period to the acquisition of education and they become skilled, earning a unit wage w_1^s for the remaining period $(1 - \alpha^i)$ if they find employment, which will happen with probability γ^s . Alternatively, they remain unemployed with probability $(1 - \gamma^s)$, earning an income equal to zero. If women do not invest, they remain unskilled and, if they find a job, which will happen with probability $\gamma^u \leq \gamma^s$, they start working immediately and receive a salary equal to w^u for the first period, with $w^u < w_1^s$. If they remain unemployed, an event that occurs with probability $(1 - \gamma^u)$, their earnings are null. In the second period, all skilled and unskilled women have a child to whom they have to dedicate care time ct . If skilled and unskilled women work, which happens with probability γ^s and γ^u , respectively, their labour supply is $1 - ct$. Thus, the higher the care time, the lower the labour supply of mothers. If women are unemployed, their income is zero and they look after the child directly, which does not involve any monetary cost. When working, skilled women may be promoted and receive a higher second period wage $w_2^s > w_1^s$ with probability π . Unskilled women earn the wage rate w^u also in the second period. All wage rates are exogenously given.

Women maximize a utility function which is linear in consumption. The decision to invest or not in education is thus based on the comparison between the expected consumption possibilities of a skilled worker and of an unskilled worker. It is assumed 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 Ec^i of a skilled worker i . They read as follows:

$$Ec^i = \gamma^s[w_1^s(1 - \alpha^i)(1 + k) + (1 - \pi)w_1^s(1 - ct) + \pi w_2^s(1 - ct)] \quad (1)$$

where all the variables have the meaning elucidated above and where the probability to be employed is collected, since, as already stated, it is assumed to be the same in the two periods.

If an unskilled woman is now considered, her expected consumption possibilities can be written as follows:

$$Ec^u = \gamma^u[w^u(1 + k) + w^u(1 - ct)] \quad (2)$$

A woman will find it profitable to invest in education if

$$Ec^i \geq Ec^u$$

Comparing (1) and (2), one can identify the threshold level of the time cost of acquiring human capital α^i , such that a woman finds it profitable to invest in education and become skilled:

$$\alpha^i \leq 1 - \frac{\gamma^u}{\gamma^s} \left[\frac{w^u}{w_1^s} + (1 - ct) \frac{(1 - \pi)w_1^s + \pi w_2^s - w^u}{w_1^s(1 + k)} \right] \equiv \hat{\alpha} \quad (3)$$

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

$$\hat{\alpha} - \alpha^i \geq 0 \quad (4)$$

Women characterized by a time to invest in education $\alpha^i \leq \hat{\alpha}$ will be better off if they invest in education, whereas all those with $\alpha^i > \hat{\alpha}$ will be better off if they remain unskilled.

It is straightforward to note that the higher the probability of employment for skilled workers compared with unskilled ones (alternatively, the lower the probability of being unemployed for skilled workers relative to unskilled ones), the stronger the incentives to acquire human capital. In addition, the larger the first period wage premium $z = w_1^s/w^u$, the larger $\hat{\alpha}$ and the stronger the incentives to invest in education. These relationships motivate the inclusion of measures of wages and of unemployment according to the educational level in the empirical analysis. However, the focus here is on the role in the education decision of the probability to be promoted π and of maternal care time ct . Recalling that $w_2^s > w_1^s$, from equation (3) it is clear that an increase in π decreases the α^i level necessary for a woman to find it profitable to invest in education. Indeed, $\partial \hat{\alpha} / \partial \pi > 0$ and more women will find it profitable to invest in education. As to the role of ct , given that $(1 - \pi)w_1^s + \pi w_2^s - w^u > 0$, it is found that $\partial \hat{\alpha} / \partial ct < 0$: an increase in maternal care time ct corresponds to a reduction in $(1 - ct)$, i.e. a decrease in the labour supply of mothers. The variable ct can be used as an indicator of labour market opportunities for

mothers with young children. If the latter decrease, the incentives to invest in education are lower.

As men generally do not reduce their labour supply for care duties, it is expected that care time does not affect male decisions to invest in education,⁷ while the opportunities to progress in the career should also play a role for men's decisions, and likewise wages and unemployment.

Now that the main mechanisms at work have been illustrated, this section now turns to the empirical analysis. The focus is on decisions taken by young women living in European regions. The educational outcome considered is the decision to attend post-secondary education. To capture the two main variables identified in this explorative section, i.e. the probability of progressing in the career and time mothers have to devote to their children, data on the share of women in managerial positions and in self-employment, and the share of working mothers, will be used, as will be detailed in the fourth section.

EMPIRICAL METHODS

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

$$Y_i^* = W_r' \beta + L_r' \varphi + X_r' + Z_i' \gamma + S_i' \delta + q_r + v_i \quad (5)$$

where Y_i^* is a latent variable that captures the probability of a young woman i to invest in post-secondary education. If $Y_i^* > 0$, the young woman invests in post-secondary education, which is observed when $Y_i = 1$. Otherwise, if $Y_i^* \leq 0$, it is observed that $Y_i = 0$, i.e. the young woman does not invest in post-secondary education. The decision to invest in post-secondary education Y_i is only taken and observed once, making the data individual cross-sectional. However, one can exploit the panel nature of the variables of interest W_r and L_r , which may be observed over time for a given European region. W_r represents the probability of having a high-skill job, L_r the labour market opportunities for women with young children. They are measured at the regional level r , in different years t . Both are considered as determinants of the individual propensity to invest in education, given the underlying decisional process described in the second section. X_r includes other characteristics of the local labour market that may influence the decision to invest in education: more precisely, different measures of wages and unemployment are controlled for. Z_i is a vector containing information about the family background of woman S_i ; S_i is a vector of time dummies; and q_r is a random error at the regional level r , normally distributed, which captures unobserved characteristics of young women belonging to the same region r . Finally, v_i is the individual error that follows a logistic cumulative distribution.

The model is estimated using maximum likelihood.

DATA, SAMPLE AND DEFINITIONS

Data for the analysis is 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. The sample units are households: in each household, each person aged 16 or more is assisted by the interviewer and asked about his/her education, work and income. Moreover, demographic information (like gender, age, nationality, relationship between members of the household) is collected for all members of the household, regardless of their age. Finally, at the household level, the survey provides information about total household income, material deprivation and other household conditions. So far, data have been collected and released for 2004–09. For 2004, the survey was conducted in 15 countries only; for 2005–07 in 26 countries; for 2008 in 27 countries; and for 2009 in 29 countries. From one wave to the other, 75% of the sample is re-interviewed and followed for at most four waves. Data are released by Eurostat in two forms: as repeated cross-section data; and as panel data (a subsample of the repeated cross-section data).

Women between 17 and 21 years of age, who complete secondary schooling during the year of the interview or the previous one, and for whom current education decisions are observed, were selected. The outcome variable is a binary variable equal to 1 if the woman states that she is attending a post-secondary educational course (International Standard Classification of Education (ISCED) 4 and 5), and 0 otherwise. Post-secondary education includes tertiary and non-tertiary education (e.g. vocational studies). More than 90% of women in the sample who are attending post-secondary education are actually attending tertiary education. Their enrolment decision is observed only once, just after the end of secondary schooling. Also selected is a similar sample of young men to test whether the indicators going to be specified have a role in determining their decision to invest in post-secondary education.

The main aim of the paper is to assess the impact that the key factors identified in the second section – the probability of having a high-skilled job and the labour market opportunities for women with young children – have on the probability that a young woman enrolls in post-secondary education. The same analysis was then performed on the sample of men to investigate whether local labour market conditions generate heterogeneous effects according to gender.

The analysis is conducted at the regional NUTS-1 level as implemented in EU-SILC.⁸ To construct indicators of local labour market conditions, EU-SILC data, using cross-sectional frequency weights, are employed, which make the indicators representative at the regional level. Indicators are calculated with reference to women aged between 25 and 45 years with

post-secondary education: they are considered as the group of population that young women may look at when making their educational choice, in order to form an opinion about their own career opportunities and the possibility to reconcile family and work. First, to capture the likelihood of working in a high-skill job (W_{π}), the regional percentage of working women in managerial positions (i.e., with supervisory duties) is included.⁹ Second, to capture the labour market opportunities of mothers with young children (L_{π}), the ratio between the number of working mothers who have children younger than five years and the number of mothers of children younger than five are used at the regional level. The number of working mothers with young children may depend on a variety of factors that cannot be disentangled, e.g. the presence and length of career interruptions, the availability of jobs for women (especially in the service sector, which generally employs a larger share of women), the existence of a pool of women with the appropriate skills for the labour force needs, adequate child care support, as well as positive attitudes towards working mothers. All these factors may be at work in the data.

Finally, the regional share of women working as self-employed is also considered. 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.¹⁰ According to the results of this literature, a higher percentage of educated women working as self-employed should positively influence the incentives to invest in education. On the other hand, a large fraction of self-employed women could signal limited labour market opportunities for women, with negative repercussions on their incentives to invest in education.¹¹ This indicator is included in the regression: given that one is only measuring self-employment among women with post-secondary education, a higher share of self-employed women is interpreted as a positive labour market signal and therefore as an additional indicator of career opportunities for women, besides the share of women with managerial positions.¹²

By employing the empirical strategies outlined in the third section, the aim is to test whether young women living in regions in which local labour market conditions – as captured by the three indicators just described – are more favourable are more likely to attend post-secondary education.

The authors are aware of the typical identification problems in this type of analysis, mainly reverse causality and omitted variable bias. Given that the impact of regional labour market conditions of women in the age group 25–45 years on the education decision of women in the age group 17–21 years is being assessed, reverse causality should not be an issue. To limit the bias by variable omission, a number of control variables

are included, some at the regional and some at the individual level. Starting from regional controls, as suggested by the literature and by the illustrative model, it is important to control for wages and unemployment, which may be correlated with the labour market indicators proposed in the paper. More precisely, one controls for the regional unemployment rate and for the average regional wage in a full time job, calculated for 25–45-year-old women with post-secondary education and with secondary education only, in order to capture a premium in terms of reduced unemployment rates and in terms of higher wages for women who attend post-secondary education. In calculating a measure of wages, a difficulty is encountered, as the different national institutions carrying out the survey collect information on this variable in different ways: net or gross, monthly or annual amounts. After dividing the annual amounts by 12, in order to take into account these differences, dummy variables are included that indicate whether wage is measured annually, in net or gross terms, rather on a monthly basis in net terms (excluded category). The same indicators are constructed for men.

Note that while part of the variability in the regional indicators is due to genuine differences across regions and over time, part of it is simply 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 subsample of the population (e.g., parents with children younger than five years old). In order to clean the data, regions-years that display outside values are excluded when considering the whole regional distribution of each indicator.¹³

The final sample is composed of 10007 women and 10213 men, in 89 and 93 European regions, respectively, and in 23 countries.¹⁴ On average, there is a sample of 112 women and 108 men for each region. Each region is observed four times, on average.

Turning now to the controls at the household level, the mother's and father's level of education, the mother's employment status, the household disposable income, the number of siblings in the household, whether the young woman or man lives out of the parental home, with two parents, or only with one parent are included. More importantly, one controls for the mother (father) being a manager or self-employed, in order to make sure that the effect of the regional labour market variables is not due to the parental position in the labour market. Note that information about the parental background is only completely observable for young women or men living with both parents. Thus, in all other cases the modal category of education and work is imputed.¹⁵ Finally, dummy variables indicating the season of the interview are included: young individuals interviewed in the fall may be more likely to attend an educational course compared with young individuals interviewed before the start of the

Table 1. Personal characteristics

	Women	Men
In post-secondary education	0.610	0.455
Age	19.3 (0.9)	19.4 (0.9)
Mother: post-secondary education	0.294	0.324
Mother: secondary education	0.466	0.459
Mother works	0.718	0.728
Father: post-secondary education	0.294	0.324
Father: secondary education	0.466	0.459
Same-sex parent manager	0.112	0.206
Same-sex parent self-employed	0.098	0.231
Household income	29916 (31305)	32338 (33768)
Number of siblings	1.0 (1.1)	1.1 (1.1)
Living with only one parent	0.169	0.163
Living on her/his own	0.120	0.066
Interview in January–March	0.135	0.160
Interview in April–June	0.524	0.507
Interview in October–December	0.249	0.252
Year 2005	0.193	0.180
Year 2006	0.224	0.245
Year 2007	0.199	0.218
Year 2008	0.178	0.165
Year 2009	0.102	0.095
Number of observations	10007	10213
Number of regions	89	93
Number of countries	23	23
Number of observations per region	112	108
Waves per region	3.8	3.8

Note: Values are averages (with standard deviations for continuous variables in parentheses).

Table 2. Regional labour market characteristics

	Women	Men
Managerial positions (%), post-secondary	24.9 (10.7)	39.6 (12.9)
Working parents (%), post-secondary	68.1 (16.6)	96.7 (5.0)
Self-employment (%), post-secondary	8.7 (4.8)	14.6 (7.3)
Unemployment rate (%), post-secondary	7.4 (5.2)	5.3 (4.5)
Unemployment rate (%), secondary	12.3 (7.1)	7.6 (5.2)
Monthly wage (€), post-secondary	1654 (808)	2120 (1184)
Monthly wage (€), secondary	1233 (623)	1589 (803)

Note: Indicators are constructed employing samples of women/men (25–45 years old) with post-secondary education or secondary education. ‘Managerial positions’ is the share of working women/men in managerial positions; ‘Working parents’ is the share of mothers/fathers – among mothers/fathers with the youngest child younger than 5 years old – who work; ‘Self-employment’ is the share of working women/men in self-employment; ‘Unemployment rate’ is the share of unemployed women/men; ‘Monthly wage’ is the average monthly wage for women/men in a full-time job. All indicators were constructed using survey weights. Average regional values are reported together with standard deviations in parentheses.

academic year (since they are not enrolled yet) or later in the academic year (if, for instance, they have dropped out), 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.

Tables 1 and 2 show summary statistics for individual and regional variables, respectively. Note 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 women. There is also 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). These data are consistent with the closing (or even reversing) of the gender gap in education not being accompanied by a reduction of gender gaps in careers (e.g. OECD, 2012; WORLD ECONOMIC FORUM, 2013). Table 2 also shows that the indicators vary across regions (as confirmed by the standard deviations in parentheses), which is important since the aim is to exploit the variability of the local labour market characteristics across regions to perform the estimation.

RESULTS

Table 3 shows the main results for the samples of women and men. A positive and significant association is found between female participation in post-secondary education and both the percentage of women in managerial positions and the percentage of working mothers with young children. The coefficient on self-employment turns out to be positive and significant too. These indicators of regional labour markets are not significant for men.

The results confirm that the measures matter for the female decision of investing in education and support the claim that the outcome of older women on the labour market influences the decision to acquire post-secondary education of younger women. The fact that the share of working fathers with young children does not play a significant role for young men’s decisions can be due to career interruptions related to care duties playing a minor role in men’s labour market performance. As far as career prospects are concerned, though in principle they should matter also for men’s choices, no evidence supporting it is found. Note, however, that as the results in Table 5 make clear, the share of managers has a positive impact on the male decision to acquire education when the mother has post-secondary education.

A context in which more women with post-secondary education reach top positions and in which mothers can more easily achieve work–life balance has a positive impact on the young women’s perceptions on their future performance on the labour market, and therefore

Table 3. Effect of regional labour market conditions on post-secondary education

	Women	Men
Female/male managerial positions, post-secondary	0.170** (0.069)	0.017 (0.061)
Working mothers/fathers, post-secondary	0.087*** (0.031)	0.152 (0.101)
Female/male self-employment, post-secondary	0.331*** (0.128)	0.084 (0.100)
Female/male unemployment rate, post-secondary	-0.006 (0.109)	0.190 (0.137)
Female/male unemployment rate, secondary	0.030 (0.076)	0.093 (0.085)
Female/male monthly wage (€), post-secondary	0.048 (0.189)	-0.006 (0.057)
Female/male monthly wage (€), secondary	-0.269 (0.253)	-0.241 (0.148)
Wage measured annually (net)	0.199 (0.189)	0.060 (0.264)
Wage measured annually (gross)	-0.650** (0.296)	-1.049*** (0.307)
Age	-0.155*** (0.028)	-0.126*** (0.028)
Mother: post-secondary education	1.029*** (0.084)	1.094*** (0.083)
Mother: secondary education	0.550*** (0.068)	0.422*** (0.069)
Mother works	0.146** (0.058)	0.144** (0.058)
Father: post-secondary education	0.735*** (0.089)	1.090*** (0.087)
Father: secondary education	0.390*** (0.072)	0.415*** (0.072)
Same-sex parent manager	0.151* (0.085)	0.240*** (0.069)
Same-sex parent self-employed	0.055 (0.084)	0.080 (0.065)
Household income	0.032*** (0.012)	0.042*** (0.011)
Number of siblings	-0.069*** (0.024)	-0.129*** (0.024)
Living with one parent	-0.229*** (0.067)	-0.145** (0.069)
Living on her/his own	-0.373*** (0.091)	0.384*** (0.114)
Interview in January–March	0.114 (0.125)	0.184 (0.129)
Interview in April–June	0.174* (0.101)	0.185* (0.108)
Interview in October–December	0.260** (0.122)	0.309** (0.134)
Year 2005	0.169* (0.097)	0.058 (0.101)
Year 2006	0.059 (0.097)	0.009 (0.100)
Year 2007	0.184* (0.100)	0.061 (0.104)
Year 2008	0.155 (0.105)	0.123 (0.109)
Year 2009	0.147 (0.113)	-0.119 (0.113)
Constant	1.351** (0.683)	-0.165 (1.201)
Number of observations	10 007	10 213

Note: Effects of female (male) indicators on the female (male) decision to enrol in post-secondary education, estimated through logistic regressions with random effects at the regional level; significance of the estimated coefficients: ***significant at the 1% level, **at 5% and *at 10%. The unit of measurement of wage is €1000; the unit of measurement of income is €10000; the unit of measurement of the regional labour market indicators (managerial positions, working parents, self-employment and unemployment rate) is 10 percentage points. 'Wage measured annually (net)' is a dummy variable equal to 1 if the wage is measured on an annual basis, in net terms; 'Wage measured annually (gross)' is a dummy variable equal to 1 if the wage is measured on an annual basis, in gross terms; reference category: wage measured on a monthly basis, in gross terms. Reference category for the year of the interview: 2004; for the month of interview: July–September.

it encourages their educational choice. Note that this significant effect for women is found also controlling for the measures of wages and unemployment, and for family characteristics. On the contrary, the measures of unemployment rates and average wages included in the analysis do not add further significant explanatory power on educational choices of both women and men. Individual/family characteristics seem, on the contrary, to play a relevant role in the educational decision for both young women and men. This is not new in the empirical literature which generally finds a strong impact of family background on educational outcomes (HAVEMAN and WOLFE, 1995). For both women and men a strong positive effect of parents' post-secondary and secondary education (compared to parents with lower levels of education), household income, having a working mother, having the same-sex parent who is a manager, and a negative effect of age and the number of siblings are found. Young individuals living with only one parent are less likely to attend post-

secondary education than individuals living with two parents. The effect of living alone on the probability of being in post-secondary education is different for young women and men, being negative for women and positive for men. This suggests that, on average, young men are more likely to be out of the parental household for the purpose of studying. Finally, no evidence is found of a time trend. The timing of the interview is instead significant: individuals interviewed during the summer are less likely to be enrolled, which can be explained by the fact that the academic year usually starts in fall and therefore young women and men may have not enrolled yet or they may have already dropped out.

Further analyses

This section performs robustness checks focusing on the issue of the mobility of students and graduates, on the role of parental education and on the impact of

Table 4. Mobility of students and graduates

(a) Excluding women and men living on their own

	Women	Men
Female/male managerial positions, post-secondary	0.294*** (0.077)	0.041 (0.064)
Working mothers/fathers, post-secondary	0.089*** (0.034)	0.153 (0.104)
Female/male self-employment, post-secondary	0.249* (0.140)	0.058 (0.104)
Female/male unemployment rate, post-secondary	0.035 (0.118)	0.191 (0.142)
Female/male unemployment rate, secondary	0.056 (0.083)	0.073 (0.089)
Female/male monthly wage, post-secondary	-0.164 (0.216)	-0.012 (0.058)
Female/male monthly wage, secondary	-0.097 (0.286)	-0.302* (0.155)
Number of observations	8804	9541

(b) Studying and moving decisions after secondary education (panel data)

	Women		Men	
	Study	Move	Study	Move
Female/male managerial positions, post-secondary	0.084 (0.204)	-0.152 (0.137)	0.121 (0.152)	-0.198*** (0.075)
Working mothers/fathers, post-secondary	0.110 (0.077)	-0.103 (0.094)	0.362* (0.200)	-0.088 (0.115)
Female/male self-employment, post-secondary	0.660* (0.340)	-0.438 (0.360)	0.147 (0.157)	-0.688*** (0.164)
Female/male unemployment rate, post-secondary	0.011 (0.239)	-0.111 (0.251)	0.285 (0.252)	-0.302 (0.295)
Female/male unemployment rate, secondary	0.079 (0.177)	-0.262 (0.185)	0.113 (0.227)	0.438*** (0.192)
Female/male monthly wage, post-secondary	0.621 (0.726)	1.498*** (0.537)	-0.848 (0.648)	0.376 (0.313)
Female/male monthly wage, secondary	-1.300 (0.976)	-0.992 (0.762)	0.606 (0.867)	-0.027 (0.432)
Number of observations	3304		3952	

(Continued)

Table 4. Continued

(c) Including indicators of the neighbouring regions

	Women	Men
Female/male managerial positions, post-secondary	0.189*** (0.073)	0.042 (0.070)
Working mothers/fathers, post-secondary	0.101*** (0.034)	0.133 (0.106)
Female/male self-employment, post-secondary	0.344** (0.137)	0.078 (0.114)
Female/male unemployment rate, post-secondary	-0.029 (0.119)	0.193 (0.147)
Female/male unemployment rate, secondary	-0.032 (0.088)	0.064 (0.107)
Female/male monthly wage, post-secondary	-0.044 (0.203)	-0.101 (0.167)
Female/male monthly wage, secondary	-0.200 (0.274)	-0.166 (0.264)
Female/male managerial positions, post-secondary (neighbour)	-0.054 (0.066)	-0.082 (0.062)
Working mothers/fathers, post-secondary (neighbour)	-0.030 (0.033)	-0.010 (0.134)
Female/male self-employment, post-secondary (neighbour)	-0.098 (0.123)	0.109 (0.088)
Female/male unemployment rate, post-secondary (neighbour)	-0.060 (0.111)	-0.056 (0.155)
Female/male unemployment rate, secondary (neighbour)	0.157 (0.106)	0.037 (0.111)
Female/male monthly wage, post-secondary (neighbour)	0.386* (0.229)	0.104 (0.167)
Female/male monthly wage, secondary (neighbour)	-0.392 (0.275)	-0.046 (0.244)
Number of observations	9939	10097

Note: (a) Effects of female (male) indicators on the female (male) decision to enrol in post-secondary education estimated through logistic regressions with random effects at the regional level. (b) Effects of female (male) indicators on the female (male) decision to enrol in post-secondary education and to move (reference category: not studying – not moving), estimated through multinomial logit models. (c) Effects of female (male) indicators – constructed for each region and for the neighbouring regions – on the female (male) decision to enrol in post-secondary education, estimated through logistic regressions with random effects at the regional level. Significance of the estimated coefficients: ***significant at the 1% level, **at 5% and *at 10%. All other control variables (see Table 3) are included but coefficients are not reported. The unit of measurement of wage is €1000; the unit of measurement of the regional labour market indicators (managerial positions, working parents, self-employment and unemployment rate) is 10 percentage points.

indicators of the other gender. Finally, alternative specifications of the model are experimented with to investigate geographical specificities in more detail.

Mobility of students and graduates. One of the main challenges for the study is the lack of information about the mobility decisions of students. Table 4 tries to explore this issue further. A first problem may arise when it is assumed that young people observed in post-secondary education in a certain region at a given point in time were attending secondary school in that region one year before. In fact some of them may have attended secondary school in another region (and thus have observed the local labour market of that region) and may have moved after completion of the secondary school. In this case, one may risk associating the decision

of investing in post-secondary education to the ‘wrong’ labour market conditions, namely, the ones characterizing the current region of residence rather than the past region of residence. In order to take this issue into account, the model is re-estimated excluding young people living on their own, under the assumption that young people residing with at least one parent while they are acquiring post-secondary education were residing with them also in the previous year and that the parent would not change residence and move to the place of study of the son or daughter. Table 4a confirms the positive effect of the key indicators – the share of women holding managerial position, the share of working mothers with young children and the share of women who are in self-employment – on the decision of attending post-secondary education for

Table 5. Role of parental education

	Women	Men
Female/male managerial positions, post-secondary	0.108 (0.069)	-0.055 (0.063)
Working mothers/fathers, post-secondary	0.083*** (0.032)	0.162 (0.109)
Female/male self-employment, post-secondary	0.365*** (0.130)	0.083 (0.102)
Female/male unemployment rate, post-secondary	-0.039 (0.113)	0.223 (0.143)
Female/male unemployment rate, secondary	0.058 (0.080)	0.114 (0.092)
Female/male monthly wage, post-secondary	0.161 (0.197)	0.099 (0.060)
Female/male monthly wage, secondary	-0.360 (0.262)	-0.314** (0.152)
Female/male managerial positions, post-secondary*MPS	0.383*** (0.075)	0.280*** (0.056)
Working mothers/fathers, post-secondary*MPS	0.047 (0.040)	-0.046 (0.169)
Female/male self-employment, post-secondary*MPS	-0.142 (0.166)	0.023 (0.105)
Female/male unemployment rate, post-secondary*MPS	0.238 (0.215)	-0.137 (0.239)
Female/male unemployment rate, secondary*MPS	-0.102 (0.125)	-0.096 (0.143)
Female/male monthly wage, post-secondary*MPS	-0.586** (0.253)	-0.277*** (0.096)
Female/male monthly wage, secondary*MPS	0.238 (0.315)	0.155 (0.143)
MPS	0.657* (0.354)	0.977 (1.661)
Number of observations	10 007	10 213

Note: Effects of female (male) indicators on the female (male) decision to enrol in post-secondary education, by mother's level of education, estimated through logistic regressions with random effects at the regional level; significance of the estimated coefficients: ***significant at the 1% level, **at 5% and *at 10%. MPS, mother has post-secondary education. All other control variables (see Table 3) are included but coefficients are not reported. The unit of measurement of wage is €1000; the unit of measurement of the regional labour market indicators (managerial positions, working parents, self-employment and unemployment rate) is 10 percentage points.

young women. It is also confirmed that none of these indicators is significant for men, whereas a negative and significant effect of wages earned by workers holding only a secondary school degree emerges for young men, indicating that an increase in returns to not acquiring post-secondary education reduces the incentives to undertake the investment.

A second issue, related to the first, concerns the fact that one cannot observe individuals who left their parental home for studying. In addition, there is no information on how this phenomenon is associated with the labour market conditions of the region of origin. In order to investigate the issue, the longitudinal component of the data set is exploited and a multinomial logit estimation is adopted. Households are selected which are observed for two consecutive waves and which, in the first wave, have a young woman or man studying and completing secondary school; in the second wave that young woman or man is either still in the household (studying or not) or s/he is not in

the household anymore (i.e., s/he left home). 16% of young women and 14% of young men leave home after completing secondary schooling. Although it is not known whether leaving the parental home is associated with the decision of studying or not, the analysis delivers interesting insights to address the general issue of students' mobility. Table 4b examines the effect of the labour market indicators on the decision of studying without moving (i.e., while residing in the same household for two consecutive years) and of moving (the reason is not known: to study, to work or for family formation), with respect to the decision of not studying and not moving. The results suggest a positive association between the key local labour market indicators and the probability of studying, and a negative relationship between them and the probability of moving out of parental home for both women and men. Though the estimated effects are of the expected sign, they are rarely significant, which could be due to the small sample size available to perform this analysis. It is also

Table 6. Indicators of the other gender

	Women	Men
Female managerial positions, post-secondary	0.170** (0.078)	0.130 (0.083)
Working mothers, post-secondary	0.085*** (0.032)	0.068** (0.031)
Female self-employment, post-secondary	0.381*** (0.135)	-0.004 (0.145)
Female unemployment rate, post-secondary	-0.030 (0.114)	0.075 (0.128)
Female unemployment rate, secondary	0.015 (0.089)	-0.098 (0.101)
Female monthly wage, post-secondary	0.097 (0.237)	0.364 (0.304)
Female monthly wage, secondary	-0.675** (0.340)	-0.327 (0.438)
Male managerial positions, post-secondary	0.010 (0.059)	0.007 (0.068)
Working fathers, post-secondary	-0.008 (0.097)	0.143 (0.106)
Male self-employment, post-secondary	-0.093 (0.096)	0.009 (0.111)
Male unemployment rate, post-secondary	0.189 (0.132)	0.186 (0.147)
Male unemployment rate, secondary	-0.044 (0.097)	0.131 (0.102)
Male monthly wage, post-secondary	-0.097** (0.043)	-0.032 (0.061)
Male monthly wage, secondary	0.361 (0.301)	-0.351 (0.388)
Number of observations	9998	10149

Note: Effects of female and male indicators on the female (male) decision to enrol in post-secondary education estimated through logistic regressions with random effects at the regional level; significance of the estimated coefficients: ***significant at the 1% level, **at 5% and *at 10%. All other control variables (see Table 3) are included but coefficients are not reported. The unit of measurement of wage is €1000; the unit of measurement of the regional labour market indicators (managerial positions, working parents, self-employment and unemployment rate) is 10 percentage points.

found that a high unemployment rate for male workers with secondary education increases the probability of moving out for men, whereas an increase in wages earned by women with post-secondary degrees increases the probability of young women to move out of the parental home.

A further issue is related to graduates' mobility. Young women and men can take their educational decisions not only looking at their regions, but also looking at other geographically close regions to which they could easily migrate after completing post-secondary education. To address this issue, and in the spirit of VENHORST *et al.* (2010, 2011), included in the main econometric specification are the labour market indicators of neighbouring regions as additional controls. For every region the average value of the regional indicators for all neighbouring regions is calculated. Table 4c shows that the results are confirmed. Also note that the labour market indicators of the neighbouring regions are not significant. This could be explained by the fact that the regions of focus are quite large. The only exception is the monthly wage of women with post-secondary education,

which has a positive impact on the educational choice of women in the neighbouring region.

The role of parental education. Parental education is strongly associated with the probability of being in post-secondary education, as the results in Table 3 show. Table 5 investigates whether mother's education reinforces or mitigates the effects of local labour market indicators by including among the regressors the interaction between the local labour market indicators (our key three indicators plus wages and unemployment) and the mother having acquired post-secondary education.¹⁶ A positive effect of the share of working mothers and the share of women in self-employment on women's educational choice is still observed, whereas for both women and men a positive effect of the share of women (men) with a managerial position is found if the mother has acquired post-secondary education (the overall coefficient is 0.490 and significant for women and it is 0.225 and significant for men). Note too that wages earned by female and male workers with post-secondary education have a lower effect on

the educational decision of young women and men if their mother has post-secondary education. This result suggests that maternal education is probably a mediating factor: well-educated mothers are more aware of the possibility of having a successful career and they influence strongly their children's decisions.

Indicators of the other gender. Two possible relevant channels through which the indicators calculated for women may affect male decisions and vice versa were investigated: the role of the marriage market and the possible competition between men and women in the labour market. One could argue that a higher probability of finding a spouse with good career opportunities may induce individuals to invest in education. One could also observe that higher career opportunities for men may limit women's chances of securing good jobs, and thus reduce women's incentives to invest in

education, if there is labour market competition between men and women for high-quality jobs (NOBACK *et al.*, 2013).

To address these issues, Table 6 introduces the share of working fathers (mothers) and the share of men (women) in managerial positions and in self-employment, as well as the other regional control variables, as possible determinants of a young woman's (man's) decision to participate in post-secondary education. The results of the main analysis are confirmed: managerial positions, working mothers and female self-employment are positively associated with the probability of studying for women. A negative effect of wages earned by women with only secondary education on the probability to acquire post-secondary education is also found, which is again consistent with the view that a relative increase in returns to not studying decreases the attractiveness of acquiring post-secondary

Table 7. Geographical variability

(a) Analyses at the national level

	Women	Men
Female/male managerial positions, post-secondary	0.126** (0.061)	0.007 (0.043)
Working mothers/fathers, post-secondary	0.025 (0.031)	0.082 (0.077)
Female/male self-employment, post-secondary	0.178* (0.101)	0.049 (0.071)
Female/male unemployment rate, post-secondary	0.102 (0.084)	0.154 (0.097)
Female/male unemployment rate, secondary	-0.014 (0.062)	0.091 (0.072)
Female/male monthly wage, post-secondary	0.098 (0.183)	0.047 (0.059)
Female/male monthly wage, secondary	-0.321 (0.258)	-0.046 (0.161)
Number of observations	10007	10213

(b) Excluding regions with data for fewer than 200 women/men, 25–45 years old with post-secondary/secondary education

	Women	Men
Female/male managerial positions, post-secondary	0.259*** (0.094)	-0.049 (0.082)
Working mothers/fathers, post-secondary	0.062 (0.042)	0.100 (0.135)
Female/male self-employment, post-secondary	0.367** (0.187)	0.068 (0.141)
Female/male unemployment rate, post-secondary	0.198 (0.179)	0.136 (0.213)
Female/male unemployment rate, secondary	-0.119 (0.103)	0.044 (0.110)
Female/male monthly wage, post-secondary	-0.391 (0.257)	0.003 (0.058)
Female/male monthly wage, secondary	0.074 (0.332)	-0.205 (0.163)
Number of observations	8388	7659

(Continued)

Table 7. Continued

(c) Taking into account the population size of the region

	Women	Men
Female/male managerial positions, post-secondary	0.059 (0.099)	0.064 (0.098)
Working mothers/fathers, post-secondary	0.168*** (0.048)	0.198 (0.174)
Female/male self-employment, post-secondary	0.319 (0.200)	0.125 (0.161)
Female/male unemployment rate, post-secondary	-0.047 (0.164)	-0.024 (0.212)
Female/male unemployment rate, secondary	0.095 (0.125)	0.251 (0.159)
Female/male monthly wage, post-secondary	0.091 (0.249)	-0.074 (0.071)
Female/male monthly wage, secondary	-0.474 (0.343)	-0.178 (0.201)
Female/male managerial positions, post-secondary*RS	0.021 (0.017)	-0.010 (0.015)
Working mothers/fathers, post-secondary*RS	-0.014* (0.008)	-0.016 (0.024)
Female/male self-employment, post-secondary*RS	-0.006 (0.029)	-0.009 (0.023)
Female/male unemployment rate, post-secondary*RS	0.012 (0.029)	0.044 (0.031)
Female/male unemployment rate, secondary*RS	-0.019 (0.022)	-0.037 (0.028)
Female/male monthly wage, post-secondary*RS	-0.005 (0.052)	0.066* (0.038)
Female/male monthly wage, secondary*RS	0.037 (0.063)	-0.072 (0.063)
RS	0.027 (0.123)	0.154 (0.260)
Number of observations	10007	10213

(d) Split panel jackknife method

	Women	Men
Female/male managerial positions, post-secondary	0.187	0.012
Working mothers/fathers, post-secondary	0.091	0.181
Female/male self-employment, post-secondary	0.342	0.070
Female/male unemployment rate, post-secondary	0.069	0.226
Female/male unemployment rate, secondary	0.030	0.100
Female/male monthly wage, post-secondary	0.087	0.006
Female/male monthly wage, secondary	-0.329	-0.151

Note: (a–c) Effects of female (male) indicators on the female (male) decision to enrol in post-secondary education, estimated through logistic regressions with random effects at the regional level; significance of the estimated coefficients: ***significant at the 1% level, **at 5% and *at 10%. (d) Simulated effects of female (male) indicators on the female (male) decision to enrol in post-secondary education. RS, region size. All other control variables (see Table 3) are included but coefficients are not reported. The unit of measurement of wage is €1000; the unit of measurement of the regional labour market indicators (managerial positions, working parents, self-employment and unemployment rate) is 10 percentage points.

education. Concerning the relationship between the decisions made by individuals of one gender and the indicators calculated for the other gender, a positive association is found between the share of working mothers and the probability of studying for men. Moreover, a negative effect of wages earned by men with post-secondary education on the probability of studying

for young women is found, which could be in line with the effect underlined by NOBACK *et al.* (2013).

Geographical variability. A first question is whether the results would differ if one worked with data at the country level. As mentioned in the introduction, it is thought that regions are a more appropriate reference

labour market for future graduates (in the absence of finer disaggregations). As a robustness check for the argument, however, the analysis is also performed at the country level. Table 7(a) shows that at the country level there is some evidence of a positive impact of the labour market indicators, but the effects are much less precisely estimated. Note that within country differences, which are quite pronounced in some European countries, are better captured by the analysis conducted at the regional level rather than by a study at the national level. Italy, for instance, shows substantial differences among the South and the North of the country in all local labour market indicators (see CASARICO and PROFETA, 2010).

A second issue concerns the construction of the labour market indicators. As already said, regions showing outside values were dropped from the analysis. As a further robustness check only regions are included in which there is at least a minimum number of women, who are 25–45 years old, and have either post-secondary or secondary education in a certain year in order to construct the indicators. By excluding regions for which the data include fewer than 200 women, a positive and significant relationship between the share of women with managerial position and in self-employment and the decision to invest in education is still found, whereas the coefficient of the share of working mothers loses its significance (Table 7(b)).

Third, it is studied whether the effects of local labour market indicators are similar across regions with a different population size. By replicating the analyses (Table 7(c)) including, among the regressors, the size of the population and the interactions between the size of the population and the main explanatory variables, some evidence of heterogeneous effects across regions of different size is found, although coefficients are not very precisely estimated. If one jointly considers the coefficients of the main explanatory variables and of the interaction terms with the regional size, population thresholds can be identified at which the explanatory variables become significant in explaining the educational decision: the share of women in managerial positions matter more in large regions, whereas the share of working mothers has a stronger effect in smaller regions.¹⁷ Note that the size of the region is not significant per se, suggesting that the educational choice does not differ across regions of different population size.

Finally, despite the large sample size, the variability exploited in the model is only due to variation in the indicators across 90 regions and six years. The regional effect is then identified only by averaging at most six points in time. This feature may influence the efficiency of the employed estimator. Simulations are thus performed to understand how this could affect the results. The sample is first split into two parts: in each region, the observations are randomly divided in two subsamples, and the parameters of interest for each of

them are estimated. The regions are then split randomly into two subsamples and two other sets of parameters are estimated. Since each subsample is half of the original one, the bias should be double that in the original sample. Therefore, for each effect of interest, the average of the four estimated parameters is subtract from twice the estimated effect in the main specification (Table 3). This procedure allows us to eliminate the bias of the main specification (DHAENE and JOCHMANS, 2010; ARELLANO and BONHOMME, 2011). Table 7(d) shows that the derived effects are rather close to the estimated effects.

CONCLUSIONS

This paper studies whether regional labour 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 with young children have an impact on young women's decisions to invest in education. To construct the indicators, the outcomes of women in the 25–45-year age group who have acquired post-secondary education and who live in the same region of Europe in which young women taking the education decision live are examined. It is found that the share of working women with young children, 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, unless they have a highly educated mother, in which case the share of men in managerial positions is positive and significant for their decision to acquire post-secondary education. It is also found that family characteristics influence significantly the decision to acquire education for both men and women, as the existing literature suggests. These results are robust to numerous validity checks involving the mobility of students and graduates, the impact of indicators of the other gender and the role of different geographical specifications.

This paper contributes to a better understanding of the potential role of regional labour market conditions on the female decision to enrol in post-secondary education. This is a crucial issue, especially in countries where human capital is scarce. The findings also suggest that measures which improve regional labour market conditions for female workers may generate positive feedback effects on women's decisions to invest in education.

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NOTES

1. See http://ec.europa.eu/justice/gender-equality/gender-decision-making/database/index_en.htm/.
2. Previous studies on career interruptions and female under-representation in top positions typically focus on the role of policies – parental leave and other family policies (e.g. PYLKKANEN and SMITH, 2003; PRONZATO, 2009) or affirmative action policies (e.g. Kogut *et al.*, 2014) or on their impact on wage profiles (ALBRECHT *et al.*, 1999).
3. In a similar spirit, there are studies that 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).
4. There is an extensive and growing literature on if and how family income, parental education and, more recently, the home environment affect children's outcomes, among which education is one of the most important (e.g. BLACK *et al.*, 2005; PLUG and VIJVERBERG, 2005; PRONZATO, 2012).
5. For a study of the mobility of university graduates compared with college graduates which also pays attention to the field of study, see VENHORST *et al.* (2010), who focus on the Netherlands.
6. For a model in which both men and women have to decide about their education and they share care responsibilities, see CASARICO and PROFETA (2009).
7. 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 unskilled men and gender wage gaps decrease in the skill level (see the evidence in OLIVETTI and PETRONGOLO, 2014), women have higher incentives than men to use education as a device against the risk of low unskilled wages.
8. EU-SILC focuses on the NUTS-1 level. Unfortunately, for some countries, data for different NUTS-1 regions are aggregated at a higher level.
9. 'Supervisory responsibility includes formal responsibility for supervising a group of other employees (other than apprentices), whom they supervise directly, sometimes doing some of the work they supervise. It implies that the supervisor or foreman takes charge of the work, directs the work and sees that it is properly done' (description of SILC User Database Variables, 2009; see http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:EU-SILC).
10. 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 women who faced increasing potential earnings in wage and salary employment, which suggests that returns to skill were increasing by even more in self-employment.
11. 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 women's decision to switch from wage employment to self-employment.
12. The elaborations based on a sample of women of 25–45 years of age and who have post-secondary education (drawn from EU-SILC 2009) suggest that, using the International Standard Classification of Occupations (ISCO) occupational categories, the most evident difference between women who are self-employed and women who are employees is the higher share of women who are legislators, senior officials and managers in the first group (14%) with respect to the second group (7%).
13. Outside values are defined as values (1) above the third quartile plus 1.5 times the difference between the third and the first quartiles; or (2) below the first quartile minus 1.5 times the difference between the third and the first quartiles.
14. Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Latvia, Luxembourg, Lithuania, Norway, Poland, Spain, Sweden and Slovak Republic.
15. Modal categories are: a mother and a father having secondary schooling, a mother working, and a mother and a father not being a manager or self-employed.
16. The same analysis was also replicated using the father's education. If the explanatory variables are interacted with the father's education, the results do not change. They are available from the authors upon request.
17. The effect of managerial positions is positive and significant in regions with 4 million or more inhabitants (59% of women in the sample, 36% of regions); the effect of working mothers is positive and significant in regions with 6 million or fewer inhabitants (60% of women in the sample, 78% of regions).

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