A Disaggregate Analysis of Private Returns to Education in Italy[1]

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The aim of this paper is to provide some further elements of analysis concerning the returns to education in Italy in a comparative perspective. The three key contributions of the analysis are: estimation of the Mincerian coefficients of the wage equations for men and women for Italy and, separately, for three macroareas (North, Center and South) and for each Regione; computation of the rates of return by gender with the same geographical disaggregation; some exercises to evaluate the impact of some public policies on the level of the rates of return.

The main motivations for a disaggregate analysis are the significant differences in the levels of schooling attainments across geographical areas of Italy and across genders.

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1. INTRODUCTION

In the last twenty years, the analysis of the role of investments in human capital has been one of the most active fields of research in both micro and macroeconomics. While investment in human capital does not reduce to investment in education (e.g., the role of learning-by-doing), formal education clearly plays a central role and is particularly relevant due to the crucial role of public intervention.

The aim of this paper is to provide some further elements of analysis concerning the returns to education in Italy.

Two important distinctions deserve to be made here. The theoretical literature on the role of schooling has developed along two different lines of analysis: the theory of human capital, initiated by Becker (1964), and a second approach, built on Spence's (1973) seminal contribution, emphasizing the signalling role of education. These two approaches have quite different theoretical, empirical and policy implications. In the sequel, I will always make reference to the human capital approach.

A second essential distinction is between private and social rates of return. The difference between the two is potentially large. In the paper, I will just consider private returns. However, it is important to bear in mind the role of both kinds of returns. For instance, the economic rationale for the heavy, generalized subsidies to education characterizing most of the economically advanced countries rests on the presumed excess of social over private returns.

Theoretical analysis has been progressing together with an increasing amount of empirical research (see, for instance, Barro (1991), Mankiw, Romer and Weil (1992), Jorgerson and Fraumeni (1992), Islam (1995), Pritchett (1996), Caselli, Esquivel and Lefort (1996), Klenow and Rodriguez-Clare (1997), Hall and Jones (1999) and Temple (2001)). These studies suffer from a variety of problems related to the (often poor) quality of the data, to the modelling and estimation strategies adopted, to the heterogeneity of the countries considered (see, in particular, Topel (1999), De la Fuente and Domenech (2002)). While there are still many open issues, the most reliable recent empirical studies, based on improved datasets and techniques of estimation, tend to confirm an important role of human capital and the relevance of formal education (see, for instance, Cohen and Soto (2001) and, for OECD countries, Bassanini and Scarpetta (2001)).

The preliminary ingredient for an estimate of the returns to education is the estimation of the effect of education on the wage profile. The standard approach has been developed building on Mincer (1974). Given a sample of individuals, denoted by the subscript i, observed at time t, we proceed to estimate the econometric model

$$\log w_i = \alpha + \theta S_i + \beta_1 x_i + \beta_2 x_i^2 + u_i, \tag{1}$$

where w_i is an earnings measure for individual i, and S_i represents a measure of his/her schooling while x_i is measure of his/her work experience. As usual, u_i is a disturbance term representing other relevant factors not explicitly measured and is assumed to be independent of the other explanatory variables. The schooling coefficient θ can be interpret as the wage premium.

The structure of the Mincerian model has several distinct empirical implications which are (see Heckman, Lockner and Todd (2003), Harmon, Oosterbeek and Walker (2003)) just partly consistent with the available data.

It is also worthwhile to bear in mind that, while the formal derivation of (1) postulates well specified assumptions concerning education costs and benefits, often, and this will be true in the sequel, the interpretation of the results is slightly different. The estimated Mincerian coefficient θ is treated as a measure of the education premium embedded in observable earnings. This coefficient is then used as an input in the computation of the internal rate of return of investments in education.

Notwithstanding its limitations, the Mincerian model is the foundation of most empirical studies of the returns to education.

As a reference for future discussion, the two Tables below report some results obtained in the literature for several countries and, in particular, for Italy.

Study	**Country**	**Year**	$\boldsymbol{\theta}$
Angrist and Krueger (1991)	US	1970/1980	6,3
Angrist and Krueger (1992)	US	1975/1985	5,9
Card (1995)	US	1976	7,3
Butcher and Case (1994)	US	1985	9,1
Miller et al (1995)	US	-	4,5
Ashenfelter and Rouse (1998)	US	-	7,8
Rouse (1999)	US	-	7,5
Isaccson (1999)	Sweden	-	4,0
Meighir and Palme (1999)	Sweden	1950	2,8
Harman and Walker (1995)	UK	1978/1986	6,1
Harmon and Walker (1999)	UK	1985/1992	4,1
Harman and Walker (2000)	UK	1950/1970	5,1
Denny and Harmon (2000)	Ireland	1978	8,0
de la Fuente, Domenech and Jimeo (2003)	Spain	-	8,4
de la Croix and Vandenberghe (2004)	Belgium	2002	5,2
Harmon, Walker and Westergaard-Nielsen (2001)	EU-14	1995	7,3
Duflo (1999)	Indonesia	1970	7,7

Study of Italian returns	**Method**	$\boldsymbol{\theta}$
Antonelli (1985)	OLS	4,6
Colombino and Del Boca (1990)	OLS	24,2
Lucifora and Reilly (1990)	OLS	4,0
Cannari and Sestito (1990)	OLS	4,6
Blau and Kahn (1992)	OLS	4,0
Erickson and Ichino (1992)	OLS	1,7
Cannari and D'Alessio (1995)	IV	7,0
Cobalti and Schizzeretto(1995)	OLS	3,3
Colussi (1996)	IV	7,6
Flabbi (1996)	IV	6,2
Flabbi (1999)	IV	3,0
Brunello, Comi and Lucifora (2000)	OLS	6,2
Ciccone (2004)	OLS	6,1
Ciccone, Cingano and Cipollone (2005)	OLS	6,9

For Italy, the estimated values of θ vary significantly across the different studies (depending upon the sample used and the econometric techniques adopted): Most of the OLS estimates obtained in the early '90 are in the range 4-5%, more recent estimates are around 6%. My results are essentially in line with the Brunello, Comi, Lucifora (2000) and Ciccone (2004) results.

They are provided in section four, where, using the Bank of Italy dataset, *Indagine sui Bilanci delle Famiglie Italiane* (2002), I directly estimate the Mincerian equations for men and women for macroareas and Regioni, using these results as inputs for the computation of the rates of return. I provide the estimates exploiting two different econometric techniques (ordinary least squares and proxy variables). Most of the estimation details are available on request, while in the text I just report and discuss the main results.

On the basis of the theoretical model described in section three, in section five I use these estimates to evaluate the gender specific rates of return for Italy, for three macroareas, and for the single Regioni, therefore extending previous work by Ciccone (2004) and Ciccone, Cingano and Cipollone (2005), who provides estimates for the same geographic areas but without gender disaggregation.

Finally, in section six, I compare the actual rates of return with the artificial values computed in several hypothetical scenarios obtained by varying the values of the policy instruments affecting the returns, therefore providing some intuition on the magnitude (and direction) of the effects of these public policies.

As a preliminary background, next section provides some descriptive statistics on educational attainments in Italy and in the main advanced countries.

2. SOME DESCRIPTIVE EVIDENCE ON THE ITALIAN CASE

As a background for the analysis in the sequel, I reproduce here some basic information regarding the levels of educational attainments in Italy, providing both a comparison with the situation in the other OECD countries and a disaggregation of the main variables at the regional level.

As well known, the average level of the educational attainments in Italy is substantially below the one of other industrialized countries. The data provided (on a consistent basis) by OECD clearly show this gap at all post-primary education levels. Table 1 show the average educational attainments of the population aged 25-64 and of several age groups.

Table 1: Average years of schooling, by age groups and gender (2003) (population 25-64 years old)

Evidently, the average schooling in Italy increased over time (more rapidly for women) and the difference with respect to the OECD average decreased over time, but it is still significant: Even for the population in the 25-34 age range, the average level of schooling is 12% below the OECD average (14% for men, 10% for women). Given mandatory education, the comparatively low level of Italian educational attainment is made more evident by Tables 2 and 3, reporting, for several age groups, the percentage of population that has attained at least upper secondary or tertiary education.

Table 2: Population that has attained at least upper secondary education, by age groups (2003)

Table 3: Population that has attained tertiary education, by age groups (2003)

In Italy, just 60% of the age group 25-34 (versus an OECD average of 75%) has attained at least upper secondary education (i.e., graduate from high school). For tertiary education (university degree), they are 12% versus 29%. Moreover, while the data show a very significant increase over time of the percentage of the population attaining at least upper secondary education (60% of the 25-34 age group must be compared with 50% of the 35-44 and with 39% of the 45-55 age groups), the percentage of the population with a tertiary degree decreases very slowly with age (11% for the age group 35-44, 10% for the 45-54 one). On the other hand, looking at the same data by gender, see again Table 1, one notices a significant inversion of the gender differences in educational attainments: While for older generation the average length of schooling and the percentage of people attaining upper secondary and tertiary education is significantly larger for men, for the 25-34 age group the educational level is significantly higher for women. A similar phenomenon takes place in the majority of OECD countries, but it appears to be especially significant in Italy.

Looking at graduation rates, the picture changes significantly, but it still persists a gap in educational attainments with respect to the other industrialized countries, see Tables 4 and 5.

Table 4: Upper secondary and tertiary graduation rates (2003)

Tables 5-7 present several indicators of the stocks and flows of schooling attainments for Italian macroareas and Regioni. They show a fairly dishomogeneous pictures, with large differences across areas.

Table 5 reports the distribution of the population (over 6 years old) for schooling attainment: Differences are significant between macroareas and Regioni. For the population at large, for instance the percentage of people with at least an upper secondary diploma varies between 36,9% in the Center and 30,2% in the South, and between 24,6% in Trentino-Alto Adige and 41% in Lazio. These results refer to the stock of schooling attainments and, obviously, heavily depend upon past history.

Table 5: Average years of schooling, by Regione and gender. Population 6 years old and older (2003)

Probably more relevant are Tables 6 and 7: High school attendance varies between 73,4% (Trentino-Alto Adige) and 100% (Marche and Lazio). At the macroarea level, North and South have values around 88-89%, while the Center is close to 100%. A similar spread is observable concerning the percentage of 19 years old people holding a diploma (60,8% to 85,1%). Also large is the dispersion of the rates of enrollment in university programs and of the percentages of University students as a share of the age group 19-25 years and, but less so, of the percentages of university graduates (by the age of 25). Concerning gender differences, the Tables confirm that the levels of educational attainments are substantially higher for women, both at the upper secondary and at the tertiary levels.

Table 6: Upper secondary school attendance rate and upper secondary graduation rate, by Regione and gender (2002-2003)

Table 7: University enrollment and attendance rates, rate of university drop out and tertiary graduation rates, by Regione and gender (2003)

The differences just observed concerning educational attainments across genders and Regioni strongly suggest the relevance of an analysis of investment in education and their returns which also takes into consideration the gender and geographical dimensions of the issue and, therefore, are one of the main motivation of my analysis.

3. DESCRIPTION OF THE THEORETICAL MODEL

The model I adopt to capture the gender-specific returns to education in Italian Regioni is close to the one adopted in de la Fuente (2003). For men, I indeed adopt the same basic model. In dealing with women, I extend his model to take into account maternity leaves and other maternity related benefits. Here, I just outline the basic structure of the model (see Mendolicchio (2005), where one can find further details and motivations).

Consider an individual who studies S years and retires at time U. Let S_0 be the average number of years spent in school. Earnings of a full-time worker with S year of schooling are given by the product of an increasing function of education, $f(S)$, and of an exogenous "technical efficiency index", $A_t \equiv A_0 e^{gt}$. After-tax earnings of a full-time employed individual are given by $[f(S) - T(f(S)]A_t$.

If unemployed, individuals obtain net benefits that may or may not be related to their previous earnings and to average earnings, $a[f(S) - T(f(S))] + b[f(S_0) - T(f(S_0))]$.

Let $p(S)$ be the probability of being employed for an agent with S years of schooling, an increasing function of S. Then, the discounted life-time earnings of a male, $I_M(S)$, are given by

$$I_M(S) \equiv \int_S^U \left\{ \begin{array}{c} p(t)\left(f(t) - T(f(t)\right) + \\ (1-p(t))\left[a'\left(f(t) - T(f\left(t\right))\right) + b'\left(f(S_0) - T(f(S_0)\right)\right] \end{array} \right\} A_t e^{-rt} dt$$

The (discounted) direct costs of education, $C_M(S)$ (estimated, per year, as a fixed fraction μ_s of the average earnings), are given by

$$C_M(S) \equiv \int_0^S \mu_s f(S_0) A_t e^{-rt} dt.$$

I assume that, while in school, individuals devote a fixed fraction ϕ of their time to studying and school attendance. Therefore, their labor supply is given by $(1-\phi)$ of the labor supply of full-time workers. Their probability of being employed is a fixed fraction η of the probability of a full-time worker. Hence, the present value of the expected life-time earning while in school, $J_M(S)$, is given by

$$J_M(S) \equiv \int_0^S \eta p(t)\left[(1-\phi)\, f(t) - T\left((1-\phi)\, f(t)\right)\right] A_t e^{-rt} dt$$

The present value of the expected net lifetime earnings for men is then

$$V_M(S) = I_M(S) \; + J_M(S) - C_M(S)$$

The private rate of return on education is defined as the value of r such that the average level of education S_0 is the optimal solution to the problem of maximizing $V_M(S)$ for the representative (male) agent. Hence, r is obtained as the value such that $\frac{\partial V_M(S)}{\partial S}|_{S_0} = 0$.

Let's define $p_0 \equiv p(S_0)$, $\theta \equiv \frac{\frac{\partial f(S)}{\partial S}|_{S_0}}{f(S_0)}$, $\epsilon \equiv \frac{\frac{\partial p(S)}{\partial S}|_{S_0}}{p(S_0)}$, $\tau_0 \equiv \frac{T(f(S_0))}{f(S_0)}$, $T' \equiv \frac{\partial T(f(S))}{\partial S}|_{S_0}$, $\tau_s \equiv \frac{T((1-\phi)f(S_0))}{(1-\phi)f(S_0)}$, where θ is the Mincerian return to schooling parameter, ϵ measures the curvature of the function $p(S)$ at S_0, normalized by $p(S_0)$, τ_0 and $T\prime$ are the average and the marginal rates of income tax for a full-time worker with education S_0, while τ_s is the average tax rate on the income of a student with education S_0 working part-time. Finally, let $R \equiv (r-g)$ and $H \equiv (U - S_0)$. From the first order condition $\frac{\partial V_M(S)}{\partial S}|_{S_0} = 0$, I obtain

$$\frac{R_M}{1-e^{-R_M H_M}} = \frac{\theta\left[\frac{p_0+(1-p_0)a}{p_0+(1-p_0)(a+b)}\right]\left[\frac{1-T'}{1-\tau_0}\right]+\epsilon\left[\frac{(1-a-b)p_0}{p_0+(1-p_0)(a+b)}\right]}{\left[1-\frac{1-\tau_s}{1-\tau_0}\frac{(1-\phi)\eta p_0}{p_0+(1-p_0)(a+b)}\right]+\left[\frac{\mu_s}{(p_0+(1-p_0)(a+b))(1-\tau_0)}\right]} \tag{2}$$

The main departure from de la Fuente (2003) is that he takes as a representative individual a single male with earnings equal to APW. I consider a couple with two children where the male has earnings equal to 100% APW, while the woman has earning equal to 67%APW.

For female individuals, I modify the basic function $V(S)$ as follows. Given that female average earnings are estimated at 67%APW, the parameter defining direct private costs of education as a fraction of the female earning is $1.5\mu_s$ (so that the actual monetary costs are gender-invariant). Therefore,

$$C_W(S) \equiv \int_0^S 1.5\mu_s f(S_0) A_t e^{-rt} dt$$

and

$$J_W(S) \equiv \int_0^S \eta p(t)\left[(1-\phi)f(t) - T(((1-\phi)f(t))\right] A_t e^{-rt} dt.$$

The key difference is in the definition of $I_W(S)$. I explicitly introduce maternity and parental leaves and child-benefits as follows: let $(1-q(S))$ be the fraction of the working life when the representative woman has maternal leaves. Evidently, it will depend upon the number of children, c, and upon the length of maternity leaves allowed by law, d : $(1-q(S)) \equiv \left(\frac{c}{W}(s)\frac{d}{H}\right)$.

During a fraction $q(S)$ of her active life, a female member of the labor-force will be employed with probability $p(S)$, unemployed with probability $(1-p(S))$. For this fraction of her active life, expected earnings are defined exactly as above. During a fraction $(1-q(S)))$ of her active life, a female member of the labor-force can, legally, be on maternal leave. During this period, she can be either employed (with probability $p(S)$) or unemployed. If employed, she will receive a fraction γ of her previous earning, plus other benefits related to child-care and typically independent of personal income, depending instead on average income, $\delta\left[f(S_0) - T((f(S_0))\right]$. If unemployed, her income will be given by the usual unemployment benefits, plus the maternity related (but employment independent) benefits. Hence,

$$\begin{aligned}
I_W(S) \equiv & \int_S^U \{q(t)[p(t)(f(t)-T(f(t)))+ \\
& +(1-p(t))(a(f(t)-T(f(t)))+b(f(S_0)-T(f(S_0))))]+ \\
& +(1-q(t))[p(t)(\gamma(f(t)-T(f(t)))+\delta f(S_0)-T(f(S_0)))+ \\
& +(1-p(t))(a(f(t)-T(f(t)))+b(f(S_0)-T(f(S_0)))+ \\
& +\delta(f(S_0)-T(f(S_0))))]\}A_t e^{-rt}dt
\end{aligned}$$

As above, the rate of return on education is the value of r such that S_0 is the optimal solution to the problem of maximizing the expected, discounted income $V_W(S)$.

Using the notation introduced above, setting $q_0 = q(S_0)$, $\xi = \frac{\frac{\partial q(S)}{\partial S}|_{S_0}}{q_0}$, and $k_0 = p_0(q_0 + (1-q_0)\gamma) + (1-p_0)(a+b) + (1-q_0)\delta$,from $\frac{\partial V_W(S)}{\partial S}|_{S_0} = 0$, I obtain

$$\frac{R_W}{1-e^{-R_W H_W}} = \tag{3}$$

$$\frac{\theta\left[\frac{1-T'}{1-\tau_0}\right]\left[\frac{p_0(q_0+(1-q_0)\gamma)+(1-p_0)a}{k_0}\right]+\epsilon\left[\frac{(q_0+(1-q_0)\gamma-(a+b))p_0}{k_0}\right]+\xi\left[\frac{(p_0(1-\gamma)-\delta)q_0}{k_0}\right]}{\left[1-\frac{1-\tau_s}{1-\tau_0}\frac{\eta p_0(1-\phi)}{k_0}\right]+\left[\frac{1.5\mu_s}{k_0}\frac{1}{1-\tau_0}\right]}$$

The interpretations of the two equations, (2) and (3) are very similar: In both, the denominators can be seen as the sum of marginal opportunity and direct costs of education (expressed as a share of the instantaneous after-tax earnings at S_0, $(f(S_0) - T(f(S_0))))$. The numerators give the marginal effect of education on earnings, once again expressed as a fraction of the after-tax instantaneous earnings at S_0. In (2), this effect can be decomposed into two components: the first is related to the Mincerian parameter θ, the second to the effect of S on the probability of unemployment. In the case of women, there is a third component, due to the effect of education on fertility, captured by the parameter ξ. The "weight" of ξ can be interpreted as the marginal increase of income (as a share of after-tax expected earnings) due to the change of the fertility rate induced by an increase in the level of education. The "weight" of ϵ measures the marginal (percentage) effect of the increase in education on income due to the change in the probability of employment. Similarly, the "weight" of θ measures the effect on after-tax incomes due to the effects that an increase in education has on the earning function $f(S)$.

4. ESTIMATION OF THE MINCERIAN COEFFICIENTS

I provide a direct estimate of the Mincerian coefficients. The most immediate motivation is that, at the level of single Regioni, recent estimates of the coefficients are not available for men and women separately. Moreover, I estimate the values of the coefficients applying different econometric techniques used in the literature (ordinary least squares and proxy variables). As usual in the literature, the estimates are based on the Survey on Household Income and Wealth of 2002 (SHIW), collected by the Bank of Italy. The dataset is based on a random sample of about 8.000 households composed by 22.148 individuals and contains information about households financial behavior and fundamental individual socio-demographic characteristics such as age, gender, highest completed school degree, net yearly earnings, Regione of residence, family composition, parents backgrounds, working status and so on. I restrict the sample to men and women 25-65 years old, full-time, full-year employees and such that information about earnings are available. I do not exclude the self-employed from the analysis (contrary to what Mincer did), because this could create a problem of selection bias (see Chiswick (2003)). Eliminating individuals who do not satisfy these conditions, I obtain a subsample of 4.588 individuals with 1.752 women and 2.836 men. Table 8 describes the selection criteria used to define this subsample. Since I use different approaches to estimate the Mincerian equations, the subsample is automatically adapted by the statistical package used to perform all the estimations (STATA), dropping the observations for which missing values of relevant variables are detected.

Table 8: Description of the selected subsample

Additional problematic issues are related to the data used in the estimation: measures of earnings, measures of schooling and measures of experience. Before moving to the detailed presentation of my estimates, let's discuss these issues, starting with the data selection problem.

In its original formulation, the Mincer equation refers to the determination of the hourly price of labour. Similarly, in my estimates, I use the log of net hourly wages as dependent variable. In a number of other studies, the model has been estimated using annual or weekly earnings. However, Mincer (1974) shows that the results are sensitive to the choice of the earnings measure and that this is related to the assumption of linearity in education. To be more precise, he rejects the hypothesis of parallel earnings profile and linear education when annual earnings are used, but he fails to reject these restrictions when annual hours are controlled for. In other words, the effect of schooling on earning is decreasing in education when annual earnings are used, but it is approximately linear for hourly earnings (see, Chiswick (2003)). In order to capture this convexity (if any) in my sample, I introduce as additional independent variable the quadratic term of schooling. As a result, the estimated values of the coefficient are positive but non statistically significant (the detailed results are available on request). Hence, I can conclude that the relation between log-earnings and education is actually linear. On the other hand, while a hourly measure of earnings can be preferable on a theoretical ground, in actual application its limit is related to the potential measurement errors due to the fact that I define hourly wages as total earnings divided by hours of work.

The standard measure of schooling attainment, adopted in all the major datasets, is the number of years of education. An alternative would be to run estimates based on the credential system (i.e., the highest diploma obtained) rather than on the years of schooling. However, this is only necessary if the wage premium deviates from linearity in years of education (see Harmon, Oosterbeek and Walker (2000)). On the basis of previous studies (and of my test for nonlinearity in S_i discussed above), the assumption of linearity is broadly consistent with the data and, therefore, I can safely adopt the numbers of years in school as an appropriate measure of formal education.

In my specification of the Mincerian equation, I use as measure of the experience the potential post-school labour market experience, computed as the age of the individual minus his/her years of schooling minus 6 (the age at which individuals start attending school). An alternative could be to take simply the age or the *actual* experience (computed as the weighted sum of the number of years of part-time and full-time work since leaving full-time education). The dataset of the Bank of Italy does not allow to compute this last measure of experience. Hence, my truly possible choices are just age alone and the measure of potential experience described above. Mincer (1974) shows that there is an important distinction between age-earning profile and experience-earning profile. Indeed, if individuals differ in their levels of schooling, they also differ in the age when their post-schooling investments began and, hence, the two profiles differ. He suggests that while age is relevant (if only because of the depreciation of human capital with age), potential experience is to be preferred in the absence of a mechanism for measuring actual experience. He also shows that potential experience has a larger partial correlation with earnings than age. Hence, I adopted potential experience as my definition of the variable x. However, bear in mind that, according to Harmon, Oosterbeek and Walker (2000), estimates based on potential experience usually give higher returns to education than the ones based on age and actual experience. Table 9 reports my OLS estimates of the Mincerian coefficients for Italian macroareas for men and women obtained using age and potential experience. The results are consistent with the previous studies: In each macroarea, the estimates obtained using potential experience as a measure of the variable x are higher than the ones obtained using age. As explained by Harmon, Oosterbeek and Walker (2000), this bias is upward because age is positively correlated with wage and negatively correlated with education. As in most of the versions of the Mincer equation, experience is included as a quadratic term to capture the concavity of the earning profile, implied by a declining investment ratio. My results are consistent with this assumption, given that the estimated values of the coefficient of x^2 are negative and significantly different from 0, as required by the theory. Some authors (for instance, Murphy and Welch (1990)) suggest to introduce higher order polynomials in experience, too. However, when I introduce this specification in my regression, using a quartic function of experience, I can conclude that it does not capture any important feature of my dataset and, therefore, I can use as reference in the estimation eq. (1) (again, the detailed results, not reported here, are available on request).

Table 9: OLS estimates of schooling using age and potential experience

4.1. OLS estimations

I first estimate the Mincerian coefficients using an Ordinary Least Squares framework. As already explained, the wage function is:

$$\log w_i(s_i, x_i) = \beta_0 + \theta S_i + \beta_1 x_i + \beta_2 x_i^2 + u_i$$

where w_i is the net hourly wage for an individual i, β_0 is a constant term (the intercept of the function), S_i is the numbers of years of schooling of individual i , x_i is his/her potential experience and u_i is a zero mean error term with $E(u_i \mid s_i, x_i) = 0$.

I compute the numbers of years spent in school combining the information about the last degree completed and the type of degree attained (*elementari* or *diploma* or *laurea*). Due to lack of information, I have to impute to individuals the number of years corresponding to the "durata legale del corso di studi" (before 2001, in Italy it was legally impossible to obtain a university degree attending less than the minimum number of years required for a given program. In primary and secondary education it is possible to obtain the degree "skipping" years of schooling, but there are many restrictions). Given that the (minimum) number of years required to obtain a degree can vary according to the type of school and to the kind of university program an individual has attended, to reduce as much as possible the measurement error, I impute to each individual the standard length of the actual diploma or laurea obtained. However, measurement error is still present, especially for people with a university degree. In fact, mostly at the university level, the average number of years spent to obtain a degree is significantly higher than the "durata legale del corso di studi" (for instance in 2002, almost 50% of the graduating students have been enrolled in some university program for at least 6 years, while, most commonly, the legal requirement is 4 years). Evidently, this induces some downward bias in the actual number of years of schooling, mostly for people obtaining tertiary degrees, and, consequently, some upward bias in my estimates of θ.

Some descriptive statistics are in Table 10.

Table 10: Descriptive statistics of years of school by Regione and by gender

The estimation of the Mincerian model faces two main technical difficulties: Multicollinearity and endogeneity.

The problem of multicollinearity is essentially due to the inclusion of both experience and its squared value among the explanatory variables. Using this variable and its square in the same regression causes multicollinearity, for all the Regioni and macroareas. This is a common problem, once we introduce in a regression several terms which are linear and nonlinear functions of the same variable (in my case, x and x^2). Even extreme multicollinearity (as long as it is not perfect) does not violate the OLS assumptions and the OLS estimators are still BLUE. Nevertheless, when multicollinearity is present, it becomes harder to reject the null hypothesis that the true value of the coefficients is zero. To solve this problem, the literature suggests that the original variable (x in my case) should be "centered" before computing the higher terms (i.e., x^2). I center potential experience by subtracting from it its mean computed by gender (of course, this does not affect the standard deviation of x). While this is *in primis* an application of a standard technique to reduce multicollinearity, it has a compelling economic interpretation. Indeed, this procedure allows me to correct my estimates for the consequences of a fix effect by gender, induced by differences in structure and performance of the labour market for men and women. Existence of such a fix gender effect is quite a reasonable assumption on a substantive economic ground. With the new specification, the problem of multicollinearity disappears. Notice that the coefficients of the school parameter are not affected by this transformation.

Table 11 shows the values of the schooling parameters θ for men and women estimated by Ordinary Least Squares. With the exception of Valle d'Aosta (where the sample is extremely small), all the coefficients are statistically significant. The values of the coefficients obtained are of the same order of the estimates reported by Ciccone (2004) and Ciccone, Cingano and Cipollone (2005).

As showed in Table 11, the values of θ_W are typically equal or larger than the ones of θ_M. For instance, for Italy at large, the OLS estimated value of θ_W is $6,9\%$, the one of θ_M is $5,8\%$. The maximum value for women is in Calabria, $15,5\%$, and the minimum is in Molise, 3%. For men, the maximum is in Sardegna, $9,3\%$, while the minimum is in Abruzzo, $3,1\%$. The complete regression and the results of the multicollinearity test are available on request.

Table 11: Estimates of the schooling coefficients for men and women by OLS

A second difficulty is related to endogeneity in the schooling variable, i.e., this variable is not exogenous and is correlated with the error term in the earning function. This is also a standard problem and it implies that OLS estimates are biased and inconsistent The sign of the induced bias is not defined, because of the different possible sources of endogeneity. In fact, endogeneity could depend either on measurement errors or on omitted unobserved individuals effects (or on both). The two possible sources of endogeneity produce distortions of opposite sign. Measurement errors are related to how accurately education attainments are measured in the micro-data. Previous empirical studies suggest that this kind of bias is downward (see, Flabbi (1999)). The second source of bias is given by omitted variables, typically exemplified by individual ability. In this case, the bias is generally upward (see Harmon, Oosterbeek and Walker(2000) and Flabbi (1999)).

A number of different approaches have been proposed and adopted to solve the problem. In the literature, the use of Instrumental Variable estimation is considered the most appropriate solution to the endogeneity problem. The assumption under which this method is consistent is that there exists some variable z correlated with the endogenous variable S but uncorrelated with the residual. The main problem is to find an instruments satisfying these requirements. However, given the information available in the dataset, it is impossible to find an instrument satisfying these requirements. The distortion of IV, if detected, is higher than the one of OLS and, consequently, IV estimates are less precise than OLS ones (see, Bound, Jaeger and Beker (1995)); this motivates my use of a different computation technique.

4.2. PV estimation

A second approach to get rid of the endogeneity bias is to introduce a proxy of the unobserved variable in the original regression. The Proxy Variable (PV) should be *redundant* in the structural equation, i.e., it should be irrelevant for the dependent variable (in a conditional mean sense). Essentially, in the PV approach, we simply run an OLS estimate of an "enlarged" model which includes both the variable of interest (S_i) and the vector of proxy variables z_i. In my case, I use as proxy variables the number of years of schooling of parents, i.e. father and mother education.

Given that the vector z is chosen so that it is correlated with S_i, in applying the PV approach, it is particularly important to test for multicollinearity. As can be checked looking at the multicollinearity tests, in no Regione (or macroarea) multicollinearity is detected. According to the literature, all the two estimators (OLS and PV) are upward biased, but, using the schooling of both the individual and his/her parents as regressors, it is possible to obtain the lowest bias. Therefore, it would appear to be better to use directly the father's and mother's education as explanatory variables, adopting the PV approach. In Table 12 I present the estimates obtained using PV in an OLS framework.

Table 12: Estimates of schooling coefficients for men and women by PV.

The education effects evaluated using as proxy variables the parents' levels of education are lower, or equal, to the ones obtained using the standard OLS. In each Regione the coefficient of schooling is highly significant. Therefore, the PV estimate should probably be preferred (to OLS) given the results of the literature mentioned above. However, they are much less satisfasfactory at the level of single Regioni, maybe due to the (occasionally) small size of the selected samples.

Considering also that, in my sample, the differences due to the estimation techniques adopted are much smaller than is sometimes reported (see Ashenfelter, Harmon and Oosterbeek (1999)) and that the aim of this paper is to analyze not only the regional differences in returns, PV estimates appear to be the most appropriate for my purposes. However, in order to test the sensitivity of the results, I will compute the returns to education using the estimations obtained from both (OLS and PV) approaches.

5. THE PRIVATE RATE OF RETURNS TO EDUCATION IN ITALY: DATA AND MAIN RESULTS

All the parameters and variables introduced are explained in Table 13. Obviously, their numerical values refer to Italy, to the macroareas or to the Regioni.

Table 13:Parameters and variables used to compute the rates of return to schooling, by gender

For this analysis, the main references are Ciccone (2004) and Ciccone, Cingano and Cipollone (2005). While their analysis refer to a representative individual who is a single person with earnings equal to 100% APW (following de la Fuente (2003)), I consider a representative married couple with two children, in which male earnings are equal to 100%APW, while female ones are 67%APW. Hence, national and regional taxes need to be changed accordingly.

For the empirical estimation of the effects of education, I use the Mincerian coefficients estimated in the previous section.

As explained above, to test the sensitivity of the results, I first compute the returns to education using the OLS estimates and, afterwards, I compare these results with the ones obtained using the Mincerian coefficients estimated using PV.

The wage used to estimate the values of the θs is the *net* hourly wage. In order to apply the de la Fuente (2003) model, I need to consider the effects of education on *gross* wages. The Bank of Italy dataset does not contain information allowing to compute the gross wages. Brandolini and Cipollone (2002) estimate the Mincerian equation using both net and gross wage. Their results suggest that the Mincerian parameters obtained using gross wage exceeds of approximately 13% the ones obtained using net wages. Following Ciccone (2004), I apply the "13% upwards adjustment" rule to obtain the gross Mincerian coefficients for the Italian Regioni. Table 14 compares net and gross Mincerian coefficients obtained from the different estimation procedures.

Table 14: Net and gross Mincerian coefficients using OLS and PV.

To compute the expected length of the working life for men and women, H_W and H_M, I subtract the maximum value between the regional average years of schooling plus six and 15 (the minimal age to legally enter the labour market in Italy) from the regional average ages of retirement, U_W and U_M. To compute the average values, I use my estimates based on the Bank of Italy dataset. As we have seen in Table 10, the average education in Italy is approximately 10 years for men and 9 years for women. The age of retirement is about 2 years longer for men than for women in most of the Regioni, exceptions are Valle d'Aosta and Molise, where the difference increases to 5 years. Descriptive statistics of the average ages of retirement in Italy are in Table 15.

Table 15: Descriptive statistics of the ages of retirement by Regioni and by gender.

One of the motivation for providing gender specific returns to schooling is given by the large differences in the rates of unemployment for men and women. Indeed, in all the Regioni, female rates of unemployment are larger than the male ones. In average the difference is approximately 5%. In the Regioni of the South, the difference increases to approximately 12%.

The negative relationship between unemployment and education is confirmed in most of the Regioni. The effect of education on the probability of employment, conditional on participation in the labour force, is captured by $\epsilon \equiv \frac{p'}{p_0}$. The data on total and by education rates of unemployment refer to the population between 25 and 65 years of age in 2002 (ISTAT(2002)).

Table 16: Data used to compute the sensitivity to education of the probability of employment, by gender

To capture the probability to be employed during the schooling years, I use the rates of unemployment by gender for the young population, between 15 and 24 years old. For both genders, separate data for young people in-education and not-in-education by Regione are not available. In order to take into account that a student has a lower probability to be employed than a full time member of the labor force, I multiply the original probability by a (gender specific) national factor of correction η_M and η_W. The rates of unemployment at the regional level are from ISTAT (2002), while the data to compute the correction factors (η_M and η_W) are from OECD (2000).

Table 17: Data used to compute η

Since I maintain the hypothesis that, while in school, individuals are taxed as single, the parameters that capture the effect of taxes refer to two different types of tax-payer. To evaluate the average tax on labour income for students (including national and regional income taxes and employment social security contributions), I use data from Ciccone (2004) which refers to 2002. For non-student workers, marginal and average income taxes refer to a married couple with two children, assuming that the man earns 100%APW while the woman earns 67%APW. Tax rates are computed applying the 2002 IRPEF rates to the actual average income of manufacturing workers in the different Regioni (source: CNEL elaboration on ISTAT data, 2002), applying the basic deductible for labor (employees) income and the two children deductible (source: Ministero dell'Economia). Differences in average and (more significant) in marginal tax rates are induced by differences in the average incomes in the different Regioni and by the differences in the "addizionali regionali" (regional income taxes). I ignore the third component of income taxes (city additional taxes) because of lack of data. These tax rates are, however, fairly small. Data for Italy and for the three macroareas are computed with reference to their average incomes. Regional tax rates are aggregate weighting the rates of each Regione by its aggregate labor income of the manufacturing industry.

In the model, I consider two different kinds of benefits. The first one is related to the unemployment status and the second one is specific for women and related to maternity. The net (after tax) replacement rates $(a + b)$ are different for male and female, but are the same in all the Regioni. The unemployment benefit for male is equal to 0,54 ($a_M = 0,51$ and $b_M = 0,03$), while for female is equal to 0,51 ($a_W = 0,49$ and $b_W = 0,03$). They are taken from OECD (1999). In Table 18, I report marginal and average tax rates by gender.

Table 18: Tax rates, by gender

The benefits related to maternity include two different categories: cash benefits, δ, and maternity leave benefits, γ. The child benefits program is a national policy and, therefore, the value I assign is Regione-invariant: δ is equal to $2,26\%$ of the average female earnings, while γ is equal to $46,20\%$ of their previous earnings (of course the impact of the last one will be different because of the different average earnings across the Italian Regioni). The value of δ refers to 2000 (OECD (2002)). The variable d used for the computation of γ refers to 1999 (Joumotte (2003)); it's measured in years and is equal to $1,25$.

The relationship between education and fertility rates is an important component of the analysis. I compute the total and by education fertility rate, referred to women aged 16-50, using the Bank of Italy dataset (2002).

The negative relationship between education and fertility is confirmed for most of the Italian Regioni (but Trentino-Alto Adige and Toscana), with an average fertility rate of $1,62\%$, $1,32\%$ and $1,09\%$ for low, medium and high levels of education. The marginal effect of education on fertility rate is captured by the parameter $\xi = \frac{q'}{q_0}$. In Table 19, I report all the variables used to compute the effects of education on fertility.

Table 19: Data used to compute the sensitivity of $q(s)$ to education

Direct private costs of education are measured as a fraction of average gross earnings of full-time worker. For men, I use the data from Ciccone (2004). For women I multiply this value by $1,5$, to take into account that female average earnings are estimated at 67%APW.

Table 20: Direct private costs of schooling by gender

As explained above, I first apply the model using the values of (gross) Mincerian coefficients obtained from the OLS estimation. In Table 21, I report the numerical values of my estimates of the rates of return for men (r_M) and the components of costs and benefits in Italy, by Regioni and by macroareas.

For men, the rates range from 3% of Molise to 10% of Sardegna. The values of r_M tend to be higher, and above the mean value of $6,9\%$, in the North and in the Center, lower in the South.

Table 21: Private rate of returns to education by component, men

Let's now look at the returns to education for women. The values of r_W range from a minimum value of $2,9\%$ in Molise and a maximum value of $16,8\%$ in Calabria. Contrary to the results for men, the higher returns for women are in the South. As I will argue in the next section, this is probably related to low participation and high unemployment rates. The average value in Italy is 8%. In Table 22, I report the numerical valued of the rates of return for women and the components of costs and benefits.

Table 22: Private rate of returns to education by component, women

Let's now apply the model using PV estimates of the Mincerian coefficients. The only components of equations (2) and (3) affected are the numerators. Table 23 and Figure 1 summarize the results. Comparing the returns on education obtained using the two estimations, we can see that the returns obtained using OLS are higher than the ones obtained using PV for both men and women. This is not surprising, given the large weight of the Mincerian coefficient in determining the value of the rates of return and the fact that OLS estimates of the values of θ are higher than the PV ones. Even if the value of the rates of returns are different, the main results are the same: women's rates of return are higher for most of the Italian Regioni; the minimum value for men is in the South , $5,75\%$, while in this area I obtain the maximum rate of return for women, $8,22\%$.

Table 23: Private rate of returns to education from OLS and PV estimation

Figure 1: Rates of return in the Italian regions, 2002

6. CONCLUSION AND PUBLIC POLICY ANALYSIS

The results of the last section show that there are large variations in the effects of education across Regioni and across genders. While it is beyond the scope of this paper to provide an in depth analysis of the factors determining the regional differences in the rates of returns, and the opposite behavior of men and females rates, I may at least formulate some observations.

Let's first consider men. Given the size of the sample at the Regioni level, to stay on the safe side, I have better to focus the analysis on the largest Regioni. Among them (see Table 23 above), the highest rates of return are in Emilia, Lombardia and Toscana. Looking at the entire macroareas the difference North-South (and Center- South) is approximately $0,7\%$. In Italy as a whole, men with a lower level of education are more likely to be unemployed than those with an higher level of education. The average rates of unemployment in Italy are $7\%, 6\%$ and 3% respectively for low, medium and high levels of education. Looking at the regional values, however, this relationships fails to hold in several Regioni of the North and of the Center (basically, the North-East and the Regioni along the Adriatic coast), where highly educated individuals actually have a lower probability to be employed.

This suggests the presence, in these Regioni, of a significant mismatch between labor supply and demand at the high level of education and the possibility of overeducation phenomena, given the actual structure of the demand for labor. As observed, for instance, in Brunello, Comi and Lucifera (2000), this is a consequence of the fact that the private industry in Italy has been (and is) characterized by low intensity of education and this has limited the demand for highly educated worker.

The picture is quite different when we consider women. For them, the highest rates of return are in the South: The differences at the macroarea levels are North-South, $-0,33\%$, Center-South, $-0,3\%$. The effect of education on the probability of employment is generally positive (exceptions are Umbria, Abruzzo and Marche): The unemployment rate decreases from 14% to 11% and to 7% when education increases.

The obvious conjecture is that, for women, relatively high rates of returns on education are correlated with lower rates of employment. The relation between the two variables is presented in Figure 2, which basically confirms the existence of this negative correlation (data on employment rates are from ISTAT (2002)). Indeed, for women, the coefficient of correlation between rates of return and rates of employment is -0.5019 (not surprising, for men the correlation is basically nihil, 0.1454).

Figure 2: Returns to education and rate of employment, by gender

As already observed, women rates of return are typically higher than the ones of men, especially in several Regioni of the South. Moreover, the difference between female and male rates is larger in the South.

The rates of participation to labour market (given by the population 15-64 years old in the labor force divided by the total population of that age group) of women decrease "geographically" if we move from the North to the South: $55,7\%$, $50,8\%$ and $36,8\%$ respectively in the North, Center and South, with an average value of $47,9\%$ (source: ISTAT (2002)). It is then natural to conjecture the existence of a negative correlation between women rates of participation to the labor force and the percentage differences between male and female returns to education. The two variables are plotted in Figure 3, which strongly suggests the existence of such a relationship (the correlation coefficient is -0.4834)

This is of some interest for two reasons:

- Given that the estimates of the Mincerian coefficients are obviously based just on currently employed people, these results suggest the presence of some selection bias (a point made, for instance, in Harmon, Oosterbeek and Walker (2000));
- It suggests (at least as a working hypothesis for further research) that the higher returns to education for women could be, at least partly, due to their lower rates of labor force participation because potentially less productive individuals are screened (or, given the labor market conditions, self-screen themselves) out of the labor force.

Figure 3: Female-male differential in returns and female participation rates

A final exercise is to asses the impact of public policies on the rates of return. To do that, I run five "experiments".

Firstly, I compute the rates of return assuming as counterfactual the absence of unemployment benefits (i.e., I compute the rates setting the parameters a and b in eqs. (2) and (3) equal to 0). The differences between actual returns and the ones computed in the experiment represent the net effect of unemployment insurance on the private returns to education. The results of this (and the other) experiment are in Tables 24 and 25. Even if their effects are not very large, unemployment benefits (by increasing the opportunity cost to be employed) in the country at large decrease the rate of return to education of about $0,2\%$ for men and $0,4\%$ for women. Not surprisingly, this negative effect is stronger in the South, where the unemployment rate and the sensitivity of the probability to be employed to education are higher. This is very clear when I look at the correlation between the impact of this policy and the unemployment rate in the Regioni, -0.8875 for men and -0.8991 for women. The negative correlation between the (negative) impact of unemployment benefits on rates of return and the sensitivity of the probability of being employed to education, ϵ, is almost perfect: -0.9965 for men and -0.9990 for women.

Secondly, I compute the impact of income taxes, by comparing the actual returns to the ones obtained if there were no income taxes on wage. Income taxes turn out to decrease the rate of returns and their effect is substantial, about $1,2\%$ for men and $1,1\%$ for women. This result is fairly intuitive and its quantitative magnitude is clearly related to the degree of progressivity of the tax system: The more progressive the tax system, the larger the negative impact on the rates of return.

Next, I compute the impact of public financing of education, by comparing the actual returns with the ones that would prevail if the individuals had to bear the total cost of education. To compute these last returns, I use the data on total (public and private) costs of education per student measured as a fraction of the average gross earnings of a full-time worker computed in Ciccone (2004).

Not surprisingly, given the structure of financing of education in Italy, public (and almost free) provision of education services has a very high impact on the rates of return: If individuals had to bear directly the full cost of their education, the rates of return would decrease of $1,7\%$ for men and of $2,6\%$ for women.

Considering just women, I also compute the impact of childcare policies, by comparing the actual rate of returns to the ones computed setting equal to 0 cash benefits, δ, and maternity benefits, γ. The decrease of the rates of return due to maternity benefits is approximately, $-0,064\%$. The coefficient of correlation between the effects of the policy and the sensitivity of fertility to education is strong, -0.8046. This implies that the effects of maternity benefits are higher in the Regioni where ξ is higher.

Table 24: Effects of various policies on men returns

Table 25: Effect of various policy on women returns

Finally, I compute the rates of return if there were no public intervention at all, i.e, setting equal to 0 all the parameters related to unemployment and childcare benefits, to income taxes and replacing the private cost of education with its total cost. Following de la Fuente (2003) and De la Croix, Vandenberghe (2004), I call this simulation "the basic scenario". Comparing the returns of the basic scenario with the ones of the actual situation, we can see that the second ones are, in most cases, higher, suggesting that the positive effects of education spending is more important than the negative effect of taxes and unemployment benefits. There exists a strong dispersion of the effective subsidy rates across Regioni. In Table 26, I report the rates of return observed for male and female, the rates of return as if there were no public policy and the values of the subsidy rates, which are (evidently) higher for women (in average 12%) than for men $(1,4\%)$. It is also interesting to observe that, for both men and women, the subsidy rates are much higher in the North and in the Center than in the South where, for men, it is actually negative.

Table 26: Basic scenario and observed situation by gender

7. TABLES AND FIGURES

Table 1: Average years of schooling, by age groups and gender (2003) (population 25-64 years old)

Country	Total	Males	Females	Males				Females			
				25-34	35-44	45-54	55-64	25-34	35-44	45-54	55-64
Australia	12,9	13,0	12,8	13,3	13,0	12,9	12,4	13,7	12,9	12,5	11,7
Austria	11,8	12,1	11,5	12,2	12,3	12,0	11,7	12,1	11,7	11,2	10,7
Belgium	11,3	11,3	11,2	12,4	11,7	10,9	10,1	12,7	11,8	10,6	9,40
Canada	13,1	13,0	13,1	13,6	13,2	12,9	12,1	14,1	13,5	12,9	11,6
Czech Republic	12,4	12,5	12,3	12,6	12,7	12,5	12,4	12,6	12,6	12,1	11,8
Denmark	13,6	13,6	13,7	13,7	13,7	13,6	13,5	14,0	13,9	13,7	13,0
Finland	12,1	11,9	12,2	12,9	12,6	11,6	10,5	13,6	13,1	12,0	10,4
France	11,5	11,7	11,4	12,8	12,1	11,3	10,3	13,0	11,9	10,7	9,50
Germany	13,4	13,7	13,1	13,5	13,7	13,7	13,6	13,4	13,4	13,1	12,4
Greece	10,5	10,7	10,3	11,8	11,4	10,3	9,00	12,5	11,1	9,50	7,90
Hungary	11,7	11,8	11,5	12,0	12,0	11,9	11,1	12,3	12,0	11,5	10,3
Iceland[1]	13,3	13,7	12,9	13,7	13,9	13,7	13,3	13,5	13,2	12,8	11,8
Ireland	12,9	12,8	13,1	13,9	13,2	12,3	11,1	14,3	13,5	12,3	11,2
Italy [1]	10,0	10,2	9,90	11,2	10,7	9,90	8,40	11,6	10,7	9,20	7,40
Japan	12,4	12,6	12,1	13,3	13,3	12,4	11,2	13,2	12,9	11,9	10,5
Korea	11,9	12,4	11,3	13,6	13,1	11,5	10,1	13,5	12,0	9,80	7,90
Luxembourg	13,4	13,7	13,2	14,0	13,7	13,5	13,3	14,1	13,4	12,6	12,2
Mexico	8,70	8,90	8,50	9,50	9,20	8,50	7,70	9,30	8,70	7,80	7,00
Netherlands[1]	12,9	13,1	12,7	13,4	13,3	13,0	12,6	13,6	13,0	12,2	11,4
New Zealand	12,6	12,5	12,7	12,8	12,6	12,5	11,9	13,2	12,9	12,6	11,6
Norway	13,8	13,8	13,9	14,3	14,0	13,6	13,2	14,7	14,2	13,7	13,0
Poland	11,6	11,5	11,8	12,0	11,6	11,3	10,8	12,7	12,1	11,5	10,4
Portugal	8,20	8,10	8,40	9,00	8,00	7,70	7,20	10,0	8,50	7,70	6,90
Slovak Republic	12,4	12,5	12,3	12,8	12,6	12,5	12,2	13,0	12,7	12,3	11,4
Spain	10,5	10,6	10,4	11,9	11,1	9,90	8,60	12,5	11,2	9,30	7,70
Sweden	12,5	12,3	12,6	13,1	12,7	12,1	11,2	13,4	12,9	12,6	11,6
Switzerland	12,8	13,4	12,3	13,6	13,5	13,2	13,0	12,8	12,4	12,1	11,5
Turkey	9,60	9,90	9,30	10,4	9,90	9,60	9,20	9,60	9,10	9,00	8,70
United Kingdom	12,7	12,8	12,6	13,1	12,9	12,8	12,4	13,0	12,6	12,5	12,1
United States	13,8	13,8	13,9	13,7	13,8	14,0	13,8	14,0	14,0	13,9	13,5
Country mean	*12,0*	*12,1*	*11,9*	*12,7*	*12,4*	*11,9*	*11,3*	*12,9*	*12,3*	*11,5*	*10,6*

Source: OECD (2005).
1. Year of reference 2002.

Table 2: Population that has attained at least upper secondary education[1], by age groups (2003)

Country	Percentage, by age group				
	25-64	25-34	35-44	45-54	55-64
Australia	62	75	64	58	47
Austria	79	85	83	75	69
Belgium	62	78	68	55	43
Canada	84	90	86	83	71
Czech Republic	86	92	90	84	77
Denmark	81	86	82	80	74
Finland	76	89	85	73	55
France	65	80	69	59	48
Germany	83	85	86	84	78
Greece	51	72	60	44	28
Hungary	74	83	81	75	53
Iceland[3]	59	64	62	58	48
Ireland	62	78	67	52	38
Italy[3]	44	60	50	39	24
Japan	84	94	94	82	65
Korea	73	97	83	55	32
Luxembourg	59	68	61	54	50
Mexico	21	25	24	18	12
Netherlands[3]	66	76	71	62	53
New Zealand	78	84	81	76	64
Norway	87	95	92	85	76
Poland	48	57	49	46	40
Portugal	23	37	22	16	10
Slovak Republic	87	94	91	84	70
Spain	43	60	48	33	19
Sweden	82	91	88	80	69
Switzerland	70	76	72	68	61
Turkey	26	33	25	21	16
United Kingdom[2]	65	71	65	64	57
United States	88	87	88	89	85
Mean	*66*	*75*	*70*	*62*	*51*

Source: OECD (2005)
1. Excluding ISCED 3C short programmes.
2. Year of reference 2002.
3. Including some ISCED 3C short programmes

Table 3. Population that has attained tertiary education[1], by age groups (2003)

Country	Percentage, by age group				
	25-64	25-34	35-44	45-54	55-64
Australia	31	36	32	31	23
Austria	15	15	16	14	11
Belgium	29	39	31	25	19
Canada	44	53	46	41	34
Czech Republic	12	12	15	11	10
Denmark	32	35	34	32	26
Finland	33	40	38	31	24
France	23	37	23	18	14
Germany	24	22	26	25	22
Greece	18	24	22	16	11
Hungary	15	17	16	15	14
Iceland[2]	26	29	30	26	17
Ireland	26	37	27	20	15
Italy[2]	10	12	11	10	7
Japan	37	52	45	33	19
Korea	29	47	32	16	10
Luxembourg	15	19	16	13	11
Mexico	15	19	17	13	8
Netherlands[2]	24	28	26	24	19
New Zealand	31	32	31	32	27
Norway	31	40	33	28	22
Poland	14	20	13	11	11
Portugal	11	16	11	9	6
Slovak Republic	12	13	11	12	9
Spain	25	38	27	18	11
Sweden	33	40	35	32	26
Switzerland	27	29	29	26	22
Turkey	10	11	8	9	7
United States	38	39	39	40	35
Mean	*24*	*29*	*26*	*22*	*17*

Source: OECD (2005)

1. Percentage of the population that has attained tertiary-type B education or tertiary-type A and advanced research programmes, by age group.
2. Year of reference 2002

Table 4: Upper secondary and tertiary graduation rates (2003)

OECD Countries	Upper secondary graduation rate			Tertiary rates of graduation[1]
	Males	Females	M + F	M + F
	(1)	(2)	(3)	
Czech Republic	88	86	90	20,6
Denmark	86	81	91	51,9
Finland	84	77	92	50,3
France	81	78	84	35,3
Germany	97	95	99	29,5
Greece	96	87	105	-
Hungary	87	84	91	37,5
Iceland	79	68	90	50,1
Ireland	91	85	97	46,1
Italy	81	79	83	27,8
Japan	91	90	93	60,6
Luxembourg	71	66	75	-
Mexico	36	33	39	-
Norway	92	82	102	44,3
Poland	86	86	85	-
Slovak Republic	56	57	55	27,6
Spain	67	59	75	47,8
Sweden	76	73	79	39,4
Switzerland	90	90	91	40,3
Turkey	41	44	37	-
United States	73	72	75	41,7
Country mean	*78*	*75*	*82*	*41,5*

1. Type A and B diplomas

Table 5: Average years of schooling, by Regione and gender. Population 6 years old and older (2003)

Regioni	Males					Females					Total				
	Tertiary degree	Upper second. degree	Short upper second. degree	Lower second. degree	Primary degree or less	Tertiary degree	Upper second. degree	Short upper second. degree	Lower second. degree	Primary degree or less	Tertiary degree	Upper second. degree	Short upper second. degree	Lower second. degree	Primary degree or less
Piemonte	6,8	24,6	4,9	34,4	29,2	6,1	21,9	5,8	29,5	36,7	6,4	23,2	5,4	31,9	33,1
Val d'Aosta	5,5	23,7	6,1	35,4	29,3	5,1	22,7	6,9	31,0	34,4	5,3	23,2	6,5	33,2	31,9
Lombardia	8,2	25,0	5,9	34,3	26,5	7,4	21,8	7,5	29,0	34,4	7,8	23,3	6,8	31,6	30,6
Trentino	6,8	17,8	11,9	36,2	27,3	5,5	19,1	11,7	31,0	32,7	6,1	18,5	11,8	33,5	30,0
Veneto	6,7	23,1	8,1	33,2	28,9	5,8	19,7	7,7	28,4	38,5	6,2	21,4	7,9	30,7	33,8
Friuli	7,5	26,3	8,4	33,3	24,5	6,6	23,6	6,0	29,2	34,6	7,0	24,9	7,2	31,2	29,8
Liguria	8,2	25,6	4,3	34,3	27,6	7,5	22,5	5,4	28,5	36,1	7,8	24,0	4,9	31,2	32,0
Emilia	8,3	25,0	5,4	30,7	30,6	8,1	22,8	5,7	24,5	38,9	8,2	23,9	5,5	27,5	34,9
Toscana	7,7	25,2	4,0	33,6	29,5	7,5	23,3	4,3	25,5	39,4	7,6	24,2	4,2	29,4	34,6
Umbria	7,7	26,8	7,0	28,2	30,3	7,6	24,0	4,8	23,5	40,0	7,7	25,4	5,9	25,8	35,3
Marche	7,0	25,6	5,1	30,2	32,0	6,9	23,1	4,8	24,8	40,4	7,0	24,3	5,0	27,4	36,3
Lazio	9,9	31,1	3,2	31,3	24,5	8,5	28,3	3,7	27,8	31,6	9,2	29,7	3,5	29,5	28,2
Abruzzo	6,8	29,2	3,2	31,3	29,6	7,0	26,7	3,0	25,5	37,7	6,9	28,0	3,1	28,3	33,8
Molise	6,4	26,9	2,5	30,0	34,2	6,5	24,6	1,9	25,6	41,4	6,4	25,7	2,2	27,7	37,9
Campania	6,3	24,4	2,7	36,2	30,4	5,5	22,0	2,7	30,8	39,0	5,9	23,2	2,7	33,4	34,8
Puglia	6,0	23,3	2,4	34,9	33,3	5,3	20,9	2,7	28,9	42,2	5,7	22,1	2,6	31,8	37,9
Basilicata	5,2	25,0	3,8	32,2	33,8	5,6	23,7	3,2	27,2	40,3	5,4	24,4	3,5	29,7	37,1
Calabria	6,0	25,4	2,6	31,9	34,1	6,3	23,9	1,9	26,9	41,1	6,1	24,7	2,2	29,3	37,7
Sicilia	6,2	22,9	2,1	35,3	33,6	5,5	22,0	2,2	29,5	40,8	5,8	22,4	2,1	32,3	37,3
Sardegna	5,3	22,3	3,0	38,2	31,1	6,8	24,0	2,3	30,6	36,2	6,1	23,2	2,7	34,3	33,7
NORTH	7,6	24,4	6,3	33,6	28,0	6,9	21,6	6,9	28,3	36,2	7,3	23,0	6,6	30,9	32,3
CENTER	8,7	28,2	4,0	31,6	27,5	7,9	25,7	4,1	26,4	35,9	8,3	26,9	4,1	28,9	31,9
SOUTH	6,1	24,1	2,6	34,9	32,3	5,8	22,5	2,5	29,2	40,0	5,9	23,3	2,5	32,0	36,3
ITALY	7,3	25,0	4,5	33,7	29,5	6,7	22,8	4,8	28,2	37,5	7,0	23,9	4,7	30,9	33,6

Source: ISTAT (2005)

Table 6: Upper secondary school attendance rate and upper secondary graduation rate, by Regione and gender (2002-2003)

Regioni	School attendance rate[1]			Upper secondary graduation rate [2]		
	M	F	MF	M	F	MF
Piemonte	88,7	93,2	90,9	66,8	73,7	70,2
Val d'Aosta	86,1	94,2	90,0	57,3	64,0	60,5
Lombardia	85,6	90,0	87,7	62,5	73,8	68,0
Trentino	65,7	81,6	73,4	51,3	70,6	60,8
Veneto	87,3	91,7	89,4	64,6	75,8	70,1
Friuli	97,9	97,2	97,6	73,6	82,9	78,1
Liguria	99,7	97,9	98,8	76,1	78,7	77,4
Emilia	96,0	97,7	96,8	68,4	84,4	76,2
Toscana	96,8	98,3	97,6	69,7	83,7	76,4
Umbria	100,9	99,7	100,3	86,8	83,3	85,1
Marche	99,8	100,5	100,2	78,6	83,7	81,1
Lazio	102,0	100,7	101,4	79,0	88,7	83,7
Abruzzo	98,6	96,2	97,4	80,0	84,0	82,0
Molise	96,8	97,4	97,1	82,2	76,7	79,4
Campania	89,8	84,6	87,3	68,1	65,1	66,7
Puglia	88,8	88,9	88,9	67,7	69,9	68,8
Basilicata	99,6	98,3	99,0	77,7	80,6	79,1
Calabria	92,8	90,0	91,5	72,5	75,7	74,1
Sicilia	87,6	87,6	87,6	65,6	68,1	66,8
Sardegna	92,3	100,0	96,1	59,6	73,0	66,1
NORTH	84,4	88,3	86,3	62,4	72,9	67,5
CENTER	100,1	99,9	100,0	82,9	90,8	86,7
SOUTH	90,4	88,9	89,7	68,3	70,0	69,1
ITALY	91,3	92,1	91,7	69,6	75,9	72,7

Source: ISTAT (2005)

1. Ratio between the number of students enrolled in upper secondary school programmes and the 14-18 years old population.
2. Ratio between the number of students who graduated upper secondary school programmes in 2001 and the 19 years old population.

Table 7: University[1] enrollment and attendance rates, rate of university drop out and tertiary graduation rates, by Regione and gender (2003)

Regioni[2]	Enrollment rate[3]			Attendance rate[4]			Drop out rate[5]			Graduation rate[6]		
	M	F	MF	M	F	MF	M	F	MF	M	F	MF
Piemonte	69,2	75,6	72,6	26,5	32,4	29,4	15,7	17,9	16,9	17,4	22,5	19,9
Valle d'Aosta	102,8[7]	104,7[7]	103,9[7]	26,9	36,3	31,5	-	-	-	15,9	20,4	18,2
Lombardia	63,5	67,2	65,5	27,3	33,5	30,4	5,9	5,9	5,9	16,6	21,5	19,0
Trentino	63,5	66,1	65,0	21,8	28,2	24,9	7,7	9,0	8,4	13,4	16,1	14,7
Veneto	61,9	70,8	66,6	27,8	35,3	31,5	5,2	3,9	4,5	16,8	22,9	19,8
Friuli	69,0	74,9	72,1	34,4	44,8	39,4	8,2	6,9	7,4	17,4	26,1	21,6
Liguria	68,9	75,6	72,3	37,6	45,2	41,4	5,4	4,6	4,9	23,3	29,4	26,3
Emilia	64,8	67,0	66,0	30,6	38,4	34,4	4,7	3,9	4,2	18,5	25,0	21,7
Toscana	70,1	71,2	70,7	34,6	44,0	39,2	5,0	3,3	4,1	17,3	24,2	20,7
Umbria	62,5	72,5	67,5	33,2	45,2	39,1	6,4	4,0	5,0	17,5	27,0	22,1
Marche	65,3	73,6	69,6	34,4	45,7	40,0	4,5	3,3	3,9	19,6	26,6	23,0
Lazio	74,2	82,5	78,5	39,4	49,9	44,6	5,7	3,8	4,6	22,3	26,2	24,3
Abruzzo	71,4	88,5	80,1	39,9	56,8	48,2	3,1	0,4	1,5	20,2	29,3	24,7
Molise	74,0	87,8	81,2	39,5	56,0	47,6	9,1	3,1	5,8	18,4	29,0	23,5
Campania	58,9	71,7	65,3	29,2	38,6	33,9	9,9	8,3	9,0	15,4	19,4	17,4
Puglia	57,8	72,1	65,1	27,0	38,1	32,5	8,8	6,2	7,2	15,4	20,4	17,9
Basilicata	58,6	70,7	64,9	34,1	49,7	41,7	3,9	3,8	3,9	16,2	24,5	20,2
Calabria	69,8	79,5	74,8	35,9	48,9	42,3	12,8	7,7	10,0	16,4	22,8	19,6
Sicilia	59,9	69,8	65,0	27,3	37,0	32,1	10,0	8,1	8,9	12,9	16,1	14,5
Sardegna	56,4	75,2	66,5	27,9	46,8	37,1	11,6	9,9	10,6	15,4	25,0	20,1
NORTH	65,0	70,1	67,7	28,3	35,3	31,7	7,1	6,8	6,9	17,3	22,9	20,0
CENTER	71,0	77,5	74,4	36,8	47,3	42,0	5,4	3,6	4,4	20,0	25,7	22,9
SOUTH	60,9	73,7	67,4	29,7	41,3	35,4	9,6	7,3	8,3	15,3	20,4	17,8
ITALY	64,3	73,1	68,9	30,4	40,0	35,1	7,5	6,2	6,7	17,0	22,4	19,7

Source: ISTAT (2005)

1. Includes 3 years or more programmes (diplomi and corsi di laurea).
2. The Regione is the one of legal residence of the student, not the one where he/she is attending the University.
3. Percentage of upper secondary school graduates in 2002 enrolled in university programmes in 2003.
4. Percentage of 19-25 years old enrolled in university programmes.
5. The denominator of the ratio is the number of students enrolled. The denominatori is obtained as follows: [(Number of students enrolled in 2001-02)-(Number of graduates in 2002)]-[(Number of students enrolled in 2002-03)-(Number of new students enrolled in 2002-03)]. The Regione is the one where the University is. There is a bias because of student transfers from one University to another of a different Regione.
6. In 2002.
7. It is above 100% due to the high number of upper secondary school graduates before 2002 who enrolled in university programmes in 2002.

Table 8: Description of the selected subsample

Limitations	Number of individuals
- Total sample	22,148
- Missing values on relevant variables	21,195
- 25 and 65 aged	12,105
- Workers	6,919
- full-time full year workers	6,129
- Missing values of net hourly wage	4,588
Estimation sample	**4,588**
- Women	1,752
- Men	2,836

Note: the last column shows the number of observation

Table 9: OLS estimates of schooling using age and potential experience

Area	MEN		WOMEN	
	Age	Potential experience	Age	Potential experience
NORTH	0.045 (0.000)***	0.060 (0.000)***	0.056 (0.000)***	0.069 (0.000)***
CENTER	0.050 (0.000)***	0.060 (0.000)***	0.052 (0.000)***	0.065 (0.000)***
SOUTH	0.047 (0.000)***	0.055 (0.000)***	0.057 (0.000)***	0.073 (0.000)***
ITALY	0.048 (0.000)***	0.058 (0.000)***	0.054 (0.000)***	0.067 (0.000)***

Robust p-value in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Source: my estimates based on the dataset of the Bank of Italy (2002)

Table 10: Descriptive statistics of years of school by Regioni and by gender

		MEN		
Regione	**Mean**	**Std. Dev.**	**Min**	**Max**
PIEMONTE	9.5	3.7	0	19
VAL D'OSTA	7.8	3.4	5	13
LOMBARDIA	10.3	4.0	0	18
TRENTINO	10.6	3.5	5	18
VENETO	10.3	3.7	0	18
FRIULI	10.9	3.6	0	18
LIGURIA	10.9	3.5	5	18
EMILIA	10.5	3.7	0	19
TOSCANA	10.1	3.9	0	19
UMBRIA	9.7	3.6	0	18
MARCHE	9.7	4.1	0	18
LAZIO	9.9	3.9	0	18
ABRUZZO	10.9	3.7	0	18
MOLISE	11.1	4.1	5	18
CAMPANIA	9.3	3.9	0	19
PUGLIA	9.4	4.2	0	19
BASILICATA	9.7	4.8	0	18
CALABRIA	10.5	4.2	0	18
SICILIA	9.9	4.5	0	19
SARDEGNA	8.6	3.4	0	18
NORTH	10.3	3.8	0	19
CENTER	9.9	3.9	0	19
SOUTH	9.6	4.1	0	19
ITALY	10.0	3.9	0	19

		WOMEN		
Regione	**Mean**	**Std. Dev.**	**Min**	**Max**
PIEMONTE	9.1	3.7	0	18
VAL D'OSTA	9.7	3.2	5	13
LOMBARDIA	10.2	4.1	0	19
TRENTINO	9.5	3.2	0	17
VENETO	9.6	3.9	0	18
FRIULI	10.0	3.6	5	17
LIGURIA	10.7	3.9	0	18
EMILIA	10.6	3.7	0	18
TOSCANA	9.7	3.9	0	18
UMBRIA	9.1	3.9	0	18
MARCHE	9.9	4.7	0	18
LAZIO	9.5	4.1	0	18
ABRUZZO	10.7	4.5	0	18
MOLISE	10.2	5.0	0	18
CAMPANIA	8.5	4.0	0	18
PUGLIA	8.8	4.4	0	19
BASILICATA	9.0	4.5	0	17
CALABRIA	9.1	4.1	0	18
SICILIA	9.2	4.4	0	19
SARDEGNA	9.4	3.7	0	18
NORTH	10.0	3.9	0	19
CENTER	9.6	4.2	0	18
SOUTH	9.1	4.3	0	19
ITALY	9.6	4.1	0	19

Source: my estimates based on the dataset of the Bank of Italy (2002)

Table 11: Estimates of schooling coefficient for men and women by OLS

Regione	MEN OLS	Obs	R^2	WOMEN OLS	Obs	R^2
PIEMONTE	0.041 (0.000)***	273	0.195	0.059 (0.000)***	211	0.284
VAL D'AOSTA	*-0.007 (-)*	3	1.000	*0.000 (.)*	3	1.000
LOMBARDIA	0.066 (0.000)***	363	0.422	0.078 (0.000)***	244	0.404
TRENTINO	0.055 (0.000)***	46	0.331	0.062 (0.003)***	27	0.410
VENETO	0.061 (0.000)***	192	0.280	0.074 (0.000)***	104	0.415
FRIULI	0.070 (0.000)***	71	0.448	0.086 (0.000)***	58	0.539
LIGURIA	0.057 (0.000)***	104	0.320	0.058 (0.000)***	89	0.381
EMILIA	0.065 (0.000)***	283	0.298	0.061 (0.000)***	224	0.128
TOSCANA	0.065 (0.000)***	179	0.379	0.068 (0.000)***	141	0.191
UMBRIA	0.040 (0.000)***	106	0.203	0.063 (0.004)***	53	0.338
MARCHE	0.062 (0.000)***	126	0.296	0.063 (0.000)***	91	0.348
LAZIO	0.065 (0.000)***	181	0.283	0.065 (0.000)***	95	0.292
ABRUZZO	0.031 (0.017)**	83	0.143	0.050 (0.000)***	67	0.128
MOLISE	0.076 (0.001)***	29	0.473	*0.030 (0.493)*	15	0.187
CAMPANIA	0.052 (0.000)***	261	0.208	0.073 (0.015)**	80	0.118
PUGLIA	0.054 (0.000)***	140	0.131	0.091 (0.000)***	59	0.318
BASILICATA	0.075 (0.001)***	26	0.482	0.089 (0.016)**	12	0.574
CALABRIA	0.078 (0.000)***	49	0.521	0.155 (0.000)***	25	0.594
SICILIA	0.054 (0.000)***	210	0.220	0.095 (0.000)***	92	0.363
SARDEGNA	0.093 (0.000)***	111	0.214	0.047 (0.052)*	62	0.132
NORTH	0.060 (0.000)***	1335	0.314	0.069 (0.000)***	960	0.290
CENTER	0.060 (0.000)***	592	0.291	0.065 (0.000)***	380	0.254
SOUTH	0.055 (0.000)***	909	0.203	0.073 (0.000)***	412	0.195
ITALY	0.058 (0.000)***	2836	0.262	0.067 (0.000)***	1752	0.240

The p-value of the robust t-statistic in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Source: my estimates based on the dataset of the Bank of Italy (2002)
Note: the coefficients in italic are not statistically significants

Table 12: Estimates of schooling coefficient for men and women by PV

Regione	MEN PV	Obs	R^2	WOMEN PV	Obs	R^2
PIEMONTE	0.037 (0.000)***	268	-	0.058 (0.000)***	203	0.271
VAL D'AOSTA	*0.000 (.)*	3	1.000	*0.000 (.)*	3	1.000
LOMBARDIA	0.061 (0.000)***	358	0.372	0.075 (0.000)***	235	0.338
TRENTINO	0.056 (0.000)***	46	0.330	0.045 (0.028)**	27	0.283
VENETO	0.053 (0.000)***	187	-	0.070 (0.000)***	100	0.396
FRIULI	0.071 (0.000)***	69	0.452	0.083 (0.000)***	58	0.454
LIGURIA	0.054 (0.000)***	103	0.228	0.060 (0.000)***	84	0.300
EMILIA	0.063 (0.000)***	276	0.182	0.059 (0.000)***	219	-
TOSCANA	0.062 (0.000)***	174	0.215	0.073 (0.000)***	138	-
UMBRIA	0.033 (0.002)***	106	-	0.066 (0.004)***	52	0.325
MARCHE	0.054 (0.000)***	124	0.278	0.060 (0.000)***	91	0.261
LAZIO	0.057 (0.000)***	179	0.150	0.070 (0.000)***	94	0.298
ABRUZZO	0.035 (0.009)***	83	-	0.043 (0.001)***	67	-
MOLISE	0.075 (0.002)***	29	0.414	*0.001 (0.976)*	15	-
CAMPANIA	0.046 (0.000)***	257	0.060	*0.054 (0.167)*	76	-
PUGLIA	0.043 (0.001)***	136	0.110	0.096 (0.001)***	58	0.297
BASILICATA	0.061 (0.036)**	26	0.351	0.093 (0.022)**	12	0.033
CALABRIA	0.083 (0.000)***	49	0.245	0.167 (0.000)***	24	0.613
SICILIA	0.047 (0.000)***	209	0.156	0.092 (0.000)***	89	0.356
SARDEGNA	0.085 (0.003)***	109	0.215	0.058 (0.018)**	61	-
NORTH	0.055 (0.000)***	1310	0.191	0.066 (0.000)***	929	0.143
CENTER	0.053 (0.000)***	583	0.134	0.067 (0.000)***	375	0.223
SOUTH	0.050 (0.000)***	898	0.149	0.068 (0.000)***	402	0.157
ITALY	0.053 (0.000)***	2791	0.140	0.065 (0.000)***	1706	0.189

The p-value of the robust t-statistic in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Source: my estimates based on the dataset of the Bank of Italy (2002)
Note: the coefficients in italic are not statistically significants

Table 13: Parameters and variables used to compute of private rates of return to schooling, by gender

	Parameters
g=	1,5%, rate of exogenous productivity growth
φ=	0,8 is the fraction of time taken up by full-time school attendance
$1\text{-}\varphi$=	0,2 is the potential labour supply of students
	Variables
U_M=	average retirement age for men
U_W=	average retirement age for women
S_{0M}=	average years of schooling of men
S_{0W}=	average years of schooling of women
H_M=	U-Max (S_{0M}+6, 15)= estimated length of the working life of men
H_W=	U-Max (S_{0W}+6, 15)= estimated length of the working life of women
θ_M=	microeconomic Mincerian returns to schooling for men. It measures the average increase in gross wage due to an additional year of schooling
θ_W=	microeconomic Mincerian returns to schooling for women
μ_s=	direct private (net) costs of scholing for men, measured as a fraction of APW gross earning
$1.5\mu_s$=	direct private (net) costs of scholing for women, measured as a fraction of APW gross earning
p_{0M}=	probability of employment after school for men, conditional on participation in the labour force
p_{0W}=	probability of employment after school for women, conditional on participation in the labour force
p_{SM}=	$\eta_M p_{0M}$= probability of employment for a students (men), conditional on participation in the labour force
p_{SW}=	$\eta_W p_{0W}$= probability of employment for a students (women), conditional on participation in the labour force
η_M=	correction factor for students, calculated as the ratio between the probability of employment of young (men) active population in education and not in education
η_W=	correction factor for students, calculated as the ratio between the probability of employment of young (women) active population in education and not in education
e_M=	Captures the effect of the increase in education on the probability of employment, for men
e_W=	Captures the effect of the increase in education on the probability of employment, for women
τ_0=	average tax rate
τ_S=	average tax rate applied to a worker earning 20% of APW
T'=	marginal tax rate
a_M=	component of net remplacement rate of men linked to previus earnings
a_W=	component of net remplacement rate of women linked to previus earnings
b_M=	component of net remplacement rate of men not linked to previus earnings
b_W=	component of net remplacement rate of women not linked to previus earnings
γ=	maternity, childcare and parential leave benefits for women as a % of previus earning
δ=	Childacare related cash benefits from government
q_0=	1-c/w*d/H= fraction of the (full-time) working life when the representative woman does not have maternal leaves, (1- q_0) is the fraction of her active life which can be spent on maternal leaves
c/w=	fertility rate of women, a decreasing function of education
ξ=	measures the change of the fertility rate of women induced by an increase in the level of education

Table 14: Net and gross mincerian coefficients using OLS and PV

MEN				
	OLS		PV	
Regione	Net	Gross	Net	Gross
Piemonte	0,041	0,046	0,037	0,042
Lombardia	0,066	0,074	0,061	0,068
Trentino	0,055	0,063	0,056	0,063
Veneto	0,061	0,069	0,053	0,060
Friuli	0,070	0,079	0,071	0,080
Liguria	0,057	0,064	0,054	0,061
Emilia	0,065	0,073	0,063	0,071
Toscana	0,065	0,074	0,062	0,070
Umbria	0,040	0,046	0,033	0,037
Marche	0,062	0,070	0,054	0,061
Lazio	0,065	0,074	0,057	0,065
Abruzzo	0,031	0,035	0,035	0,039
Molise	0,076	0,086	0,075	0,085
Campania	0,052	0,059	0,046	0,052
Puglia	0,054	0,061	0,043	0,049
Basilicata	0,075	0,085	0,061	0,069
Calabria	0,078	0,088	0,083	0,094
Sicilia	0,054	0,061	0,047	0,053
Sardegna	0,093	0,105	0,085	0,096
NORTH	0,060	0,068	0,055	0,063
CENTER	0,060	0,068	0,053	0,060
SOUTH	0,055	0,063	0,050	0,056
ITALY	0,058	0,066	0,053	0,059

WOMEN				
	OLS		PV	
Regione	Net	Gross	Net	Gross
Piemonte	0,059	0,066	0,058	0,065
Lombardia	0,078	0,088	0,075	0,084
Trentino	0,062	0,070	0,045	0,051
Veneto	0,074	0,084	0,070	0,079
Friuli	0,086	0,098	0,083	0,093
Liguria	0,058	0,066	0,060	0,068
Emilia	0,061	0,069	0,059	0,067
Toscana	0,068	0,077	0,073	0,082
Umbria	0,063	0,071	0,066	0,074
Marche	0,063	0,071	0,060	0,068
Lazio	0,065	0,073	0,070	0,079
Abruzzo	0,050	0,057	0,043	0,049
Molise	0,030	0,033	0,001	0,001
Campania	0,073	0,082	0,054	0,061
Puglia	0,091	0,102	0,096	0,109
Basilicata	0,089	0,101	0,093	0,105
Calabria	0,155	0,175	0,167	0,189
Sicilia	0,095	0,108	0,092	0,104
Sardegna	0,047	0,053	0,058	0,065
NORTH	0,069	0,078	0,066	0,075
CENTER	0,065	0,073	0,067	0,076
SOUTH	0,073	0,082	0,068	0,076
ITALY	0,067	0,076	0,065	0,073

Source: my estimates based on the dataset of the Bank of Italy (2002)

Table 15: Descriptive statistics of age of retirement by Regioni and by gender

MEN				
Regione	**Mean**	**Std. Dev.**	**Min**	**Max**
PIEMONTE	61.9	4.6	46	80
VAL D'OSTA	64.2	2.0	60	65
LOMBARDIA	62.5	4.2	50	90
TRENTINO	61.0	4.5	50	80
VENETO	62.4	4.1	50	80
FRIULI	63.7	4.2	51	75
LIGURIA	62.9	4.6	50	80
EMILIA	62.5	4.0	50	75
TOSCANA	61.9	4.0	50	80
UMBRIA	60.8	4.5	50	75
MARCHE	62.2	4.2	45	80
LAZIO	62.5	3.9	50	74
ABRUZZO	63.8	3.8	54	80
MOLISE	62.2	4.7	50	75
CAMPANIA	64.1	3.6	52	80
PUGLIA	63.4	4.5	46	76
BASILICATA	63.1	4.1	53	75
CALABRIA	64.0	2.5	54	67
SICILIA	63.6	3.2	50	80
SARDEGNA	63.5	3.9	46	80
NORTH	62.4	4.3	46	90
CENTER	62.0	4.2	45	80
SOUTH	63.7	3.7	46	80
ITALY	62.7	4.1	45	90

WOMEN				
Regione	**Mean**	**Std. Dev.**	**Min**	**Max**
PIEMONTE	60.1	3.7	50	80
VAL D'OSTA	58.8	2.5	55	60
LOMBARDIA	60.2	3.8	42	80
TRENTINO	58.7	5.5	50	90
VENETO	60.5	3.4	50	75
FRIULI	61.2	3.4	53	75
LIGURIA	60.9	3.9	53	80
EMILIA	61.4	4.0	45	72
TOSCANA	60.6	3.3	50	70
UMBRIA	59.9	3.7	50	70
MARCHE	60.0	3.7	50	65
LAZIO	60.2	3.2	52	70
ABRUZZO	60.9	3.4	54	81
MOLISE	58.0	3.3	50	65
CAMPANIA	61.5	4.4	50	70
PUGLIA	62.2	3.7	50	70
BASILICATA	61.1	4.3	50	70
CALABRIA	62.2	3.1	55	67
SICILIA	61.8	2.9	50	68
SARDEGNA	61.8	3.4	50	80
NORTH	60.5	3.9	42	90
CENTER	60.2	3.5	50	70
SOUTH	61.5	3.7	50	81
ITALY	60.7	3.8	42	90

Source: my estimates based on the dataset of the Bank of Italy (2002)

Table 16: Data used to compute the sensitivity of the probability of employment to education,by gender

			MEN				
			u(s)	Total			
Regione	low	medium	high	unempl	p(s)	p'(s)%	ϵ_M
Piemonte	0,041	0,029	0,029	0,035	0,965	0,0016	0,0011
Val d'Aosta	0,053	0,000	0,000	0,030	0,970	0,0070	0,0048
Lombardia	0,029	0,024	0,017	0,026	0,975	0,0011	0,0008
Trentino	0,015	0,019	0,044	0,019	0,981	-0,0021	-0,0014
Veneto	0,022	0,018	0,037	0,022	0,978	-0,0007	-0,0005
Friuli	0,023	0,023	0,029	0,024	0,976	-0,0004	-0,0003
Liguria	0,052	0,041	0,020	0,044	0,956	0,0028	0,0020
Emilia	0,021	0,026	0,025	0,023	0,977	-0,0006	-0,0004
Toscana	0,027	0,034	0,022	0,029	0,971	0,0000	-0,0001
Umbria	0,025	0,040	0,042	0,034	0,966	-0,0020	-0,0014
Marche	0,028	0,033	0,029	0,030	0,970	-0,0004	-0,0003
Lazio	0,071	0,067	0,039	0,065	0,935	0,0024	0,0017
Abruzzo	0,026	0,048	0,029	0,035	0,965	-0,0017	-0,0012
Molise	0,103	0,097	0,125	0,103	0,897	-0,0011	-0,0008
Campania	0,178	0,167	0,083	0,165	0,835	0,0070	0,0056
Puglia	0,107	0,121	0,058	0,107	0,893	0,0024	0,0018
Basilicata	0,117	0,118	0,083	0,114	0,886	0,0022	0,0017
Calabria	0,193	0,201	0,083	0,185	0,815	0,0068	0,0056
Sicilia	0,180	0,150	0,069	0,161	0,839	0,0095	0,0075
Sardegna	0,153	0,113	0,065	0,135	0,865	0,0086	0,0066
NORTH	0,029	0,024	0,023	0,026	0,974	0,0007	0,0005
CENTER	0,047	0,051	0,036	0,047	0,953	0,0004	0,0003
SOUTH	0,152	0,142	0,069	0,141	0,859	0,0062	0,0048
ITALY	0,079	0,065	0,040	0,069	0,931	0,0035	0,0025
			WOMEN				
		u(s)		Total			
	low	medium	high	unempl	p(s)	p'(s)%	ϵ_W
Piemonte	0,094	0,059	0,050	0,073	0,927	0,0053	0,0038
Val d'Aosta	0,083	0,000	0,000	0,042	0,958	0,0111	0,0077
Lombardia	0,072	0,049	0,035	0,056	0,944	0,0039	0,0028
Trentino	0,059	0,032	0,053	0,044	0,956	0,0022	0,0015
Veneto	0,068	0,043	0,056	0,054	0,946	0,0024	0,0017
Friuli	0,061	0,048	0,032	0,051	0,950	0,0028	0,0020
Liguria	0,106	0,081	0,071	0,089	0,911	0,0039	0,0029
Emilia	0,056	0,037	0,042	0,046	0,954	0,0022	0,0016
Toscana	0,081	0,074	0,050	0,073	0,923	0,0025	0,0018
Umbria	0,078	0,085	0,115	0,088	0,912	-0,0029	-0,0021
Marche	0,059	0,066	0,054	0,061	0,939	0,0000	0,0000
Lazio	0,149	0,120	0,077	0,121	0,879	0,0067	0,0051
Abruzzo	0,093	0,105	0,100	0,100	0,901	-0,0012	-0,0009
Molise	0,211	0,182	0,143	0,188	0,813	0,0064	0,0053
Campania	0,382	0,317	0,133	0,309	0,691	0,0209	0,0202
Puglia	0,211	0,232	0,139	0,209	0,791	0,0034	0,0028
Basilicata	0,257	0,235	0,167	0,235	0,765	0,0075	0,0065
Calabria	0,425	0,348	0,156	0,350	0,650	0,0231	0,0237
Sicilia	0,385	0,266	0,100	0,287	0,713	0,0270	0,0252
Sardegna	0,374	0,226	0,122	0,263	0,737	0,0266	0,0241
NORTH	0,073	0,047	0,043	0,057	0,943	0,0037	0,0026
CENTER	0,103	0,095	0,069	0,094	0,906	0,0028	0,0020
SOUTH	0,323	0,264	0,129	0,266	0,734	0,0169	0,0153
ITALY	0,148	0,114	0,074	0,122	0,878	0,0072	0,0055

Table 17: Data used to compute η

Regione	Prob. Emplo. Popul. 15-24, MEN			
	u	η_{nat}	$p_{st} = (1\text{-}u)\ \eta_{nat}$	$\eta_{reg} = p_{st}/\ p_0$
Piemonte	0,143	0,452	0,3874	0,4016
Val d'Aosta	0,075	0,452	0,4181	0,4312
Lombardia	0,061	0,452	0,4244	0,4355
Trentino	0,041	0,452	0,4335	0,4420
Veneto	0,056	0,452	0,4267	0,4362
Friuli	0,083	0,452	0,4145	0,4245
Liguria	0,198	0,452	0,3625	0,3792
Emilia	0,077	0,452	0,4172	0,4272
Toscana	0,127	0,452	0,3946	0,4064
Umbria	0,137	0,452	0,3901	0,4039
Marche	0,082	0,452	0,4149	0,4277
Lazio	0,282	0,452	0,3245	0,3469
Abruzzo	0,172	0,452	0,3743	0,3880
Molise	0,301	0,452	0,3159	0,3521
Campania	0,536	0,452	0,2097	0,2511
Puglia	0,319	0,452	0,3078	0,3447
Basilicata	0,377	0,452	0,2816	0,3179
Calabria	0,494	0,452	0,2287	0,2806
Sicilia	0,431	0,452	0,2572	0,3067
Sardegna	0,408	0,452	0,2676	0,3094
NORTH	0,091	0,452	0,4105	0,4217
CENTER	0,157	0,452	0,3810	0,3998
SOUTH	0,379	0,452	0,2803	0,3264
ITALY	0,239	0,452	0,3435	0,3691
Regione	Prob. Emplo. Popul. 15-24, WOMEN			
	u	η_{nat}	$p_{st} = (1\text{-}u)\ \eta_{nat}$	$\eta_{reg} = p_{st}/\ p_0$
Piemonte	0,171	0,339	0,2812	0,3033
Val d'Aosta	0,149	0,339	0,2887	0,3012
Lombardia	0,137	0,339	0,2927	0,3101
Trentino	0,062	0,339	0,3182	0,3329
Veneto	0,100	0,339	0,3053	0,3228
Friuli	0,107	0,339	0,3029	0,3190
Liguria	0,268	0,339	0,2483	0,2726
Emilia	0,106	0,339	0,3032	0,3177
Toscana	0,203	0,339	0,2703	0,2917
Umbria	0,203	0,339	0,2703	0,2964
Marche	0,131	0,339	0,2948	0,3140
Lazio	0,368	0,339	0,2144	0,2439
Abruzzo	0,244	0,339	0,2564	0,2848
Molise	0,399	0,339	0,2039	0,2509
Campania	0,677	0,339	0,1096	0,1586
Puglia	0,471	0,339	0,1794	0,2268
Basilicata	0,527	0,339	0,1604	0,2096
Calabria	0,699	0,339	0,1021	0,1570
Sicilia	0,642	0,339	0,1214	0,1702
Sardegna	0,589	0,339	0,1391	0,1888
NORTH	0,137	0,339	0,2926	0,3102
CENTER	0,226	0,339	0,2625	0,2897
SOUTH	0,531	0,339	0,1590	0,2167
ITALY	0,314	0,339	0,2327	0,2649

Source: my estimates using data from ISTAT (2002)

Table 18: Tax rates, by gender

Regione	Tax rates[1]				
	MEN		WOMEN		Student
	τ_{0M}	T'_M	τ_{0W}	T'_W	$T\ s$[3]
PIEMONTE	0,3129	0,4260	0,2540	0,4260	0,0919
VAL D'AOSTA	0,3080	0,4210	0,2490	0,4210	0,0919
LOMBARDIA	0,3150	0,4250	0,2570	0,4250	0,0919
TRENTINO	0,3059	0,4210	0,2440	0,3409	0,0919
VENETO	0,3000	0,4260	0,2389	0,3450	0,0919
FRIULI	0,3000	0,4210	0,2399	0,3409	0,0919
LIGURIA	0,3120	0,4210	0,2550	0,4210	0,0919
EMILIA	0,3050	0,4210	0,2440	0,3409	0,0919
TOSCANA	0,2899	0,4210	0,2430	0,3409	0,0919
UMBRIA	0,2969	0,4230	0,2380	0,3429	0,0919
MARCHE	0,2840	0,4310	0,2270	0,3409	0,0919
LAZIO	0,3190	0,4210	0,2660	0,4210	0,0919
ABRUZZO	0,2850	0,4210	0,2290	0,3409	0,0919
MOLISE	0,2879	0,4210	0,2310	0,3409	0,0919
CAMPANIA	0,2890	0,4260	0,2330	0,3440	0,0919
PUGLIA	0,2790	0,4260	0,2230	0,3459	0,0919
BASILICATA	0,2800	0,4210	0,2249	0,3409	0,0919
CALABRIA	0,2700	0,4260	0,2179	0,3459	0,0919
SICILIA	0,2870	0,4210	0,2310	0,3409	0,0919
SARDEGNA	0,2899	0,4210	0,2330	0,3409	0,0919
NORTH	0,3100	0,4240	0,2469	0,3440	0,0919
CENTER	0,3010	0,4230	0,2370	0,3409	0,0919
SOUTH	0,2840	0,4240	0,2290	0,3429	0,0919
ITALY	0,3050	0,4240	0,2430	0,3429	0,0919

Source: 1. My elaboration of data from CNEL and Ministero del'Economia (2002)
2. OCDE (1999)
3. Ciccone (2004)

Table 19: Data used to compute the sensitivity of q(S) to education

Country	Hw	TFR	q(S)	TFR by education low	medium	high	q'(S)	ξ
PIEMONTE	44,97	1,28	0,9618	1,28	1,35	0,95	0,00050	0,00035
VAL D'AOSTA	43,08	0,80	0,9759	0,00	1,00	0,00	0,00000	0,00000
LOMBARDIA	43,98	1,33	0,9593	1,51	1,27	1,05	0,00141	0,00098
TRENTINO	43,21	1,48	0,9556	1,72	1,32	2,00	0,00024	0,00017
VENETO	44,92	1,44	0,9565	1,69	1,13	1,39	0,00169	0,00118
FRIULI	45,18	1,20	0,9635	1,17	1,31	0,67	0,00074	0,00051
LIGURIA	44,29	1,05	0,9676	1,05	1,07	0,93	0,00019	0,00013
EMILIA	44,81	1,02	0,9686	1,14	1,01	0,60	0,00137	0,00095
TOSCANA	44,90	1,20	0,9637	1,28	1,08	1,31	0,00033	0,00023
UMBRIA	44,82	1,47	0,9564	1,52	1,44	1,25	0,00073	0,00051
MARCHE	44,15	1,49	0,9549	1,59	1,50	1,18	0,00100	0,00070
LAZIO	44,68	1,42	0,9573	1,54	1,31	1,29	0,00094	0,00066
ABRUZZO	44,21	1,37	0,9576	1,52	1,44	0,78	0,00170	0,00118
MOLISE	41,81	1,53	0,9532	1,92	1,16	1,22	0,00296	0,00207
CAMPANIA	46,53	1,88	0,9441	2,03	1,70	1,37	0,00197	0,00139
PUGLIA	47,24	1,76	0,9477	1,98	1,43	1,31	0,00241	0,00169
BASILICATA	46,03	1,45	0,9570	1,44	1,70	0,67	0,00103	0,00072
CALABRIA	47,05	1,79	0,9467	1,72	1,93	1,50	0,00002	0,00001
SICILIA	46,67	1,70	0,9492	1,86	1,62	1,08	0,00204	0,00144
SARDEGNA	46,35	1,55	0,9534	1,84	1,22	1,00	0,00291	0,00204
NORTH	44,58	1,24	0,9623	1,38	1,18	0,97	0,00123	0,00085
CENTER	44,65	1,37	0,9588	1,46	1,29	1,26	0,00072	0,00050
SOUTH	46,39	1,71	0,9490	1,86	1,56	1,15	0,00213	0,00149
ITALY	45,11	1,43	0,9968	1,61	1,32	1,09	0,00014	0,00009

Source: my estimates based on the dataset of the Bank of Italy (2002)

Table 20: Direct private costs of schooling, by gender

Regione	Direct private costs	
	Men	Women*
PIEMONTE	0,025	0,038
VAL D'AOSTA	0,019	0,029
LOMBARDIA	0,036	0,054
TRENTINO	0,017	0,026
VENETO	0,020	0,030
FRIULI	0,017	0,026
LIGURIA	0,024	0,036
EMILIA	0,023	0,035
TOSCANA	0,019	0,029
UMBRIA	0,022	0,033
MARCHE	0,028	0,042
LAZIO	0,014	0,021
ABRUZZO	0,026	0,039
MOLISE	0,017	0,026
CAMPANIA	0,018	0,027
PUGLIA	0,023	0,035
BASILICATA	0,021	0,032
CALABRIA	0,011	0,017
SICILIA	0,015	0,023
SARDEGNA	0,015	0,023
NORTH	0,027	0,041
CENTER	0,018	0,027
SOUTH	0,023	0,035
ITALY	0,021	0,032

Source : Ciccone (2004).
*Obained multiplaying the first colum by 1.5.

Table 21: Private rates of return on education, by components, men using OLS

Regione	r_M(%)	R_M (%)	DENOM	Opp. costs	Direct costs
Piemonte	4,77	3,28	0,9329	0,8959	0,0370
Val d'Aosta	-	-.	0,9166	0,8887	0,0278
Lombardia	7,82	6,32	0,9393	0,8861	0,0532
Trentino	6,55	5,06	0,9103	0,8856	0,0247
Veneto	7,20	5,71	0,9170	0,8882	0,0289
Friuli	8,36	6,86	0,9158	0,8913	0,0246
Liguria	6,83	5,34	0,9379	0,9023	0,0356
Emilia	7,67	6,17	0,9232	0,8898	0,0335
Toscana	7,59	6,09	0,9248	0,8977	0,0271
Umbria	4,37	2,88	0,9294	0,8976	0,0318
Marche	6,94	5,44	0,9329	0,8933	0,0396
Lazio	7,94	6,44	0,9320	0,9108	0,0212
Abruzzo	3,02	1,52	0,9403	0,9034	0,0370
Molise	8,57	7,08	0,9405	0,9154	0,0251
Campania	6,10	4,61	0,9694	0,9420	0,0274
Puglia	6,06	4,56	0,9520	0,9184	0,0336
Basilicata	8,40	6,91	0,9558	0,9250	0,0308
Calabria	8,67	7,17	0,9543	0,9378	0,0165
Sicilia	6,49	4,99	0,9520	0,9292	0,0227
Sardegna	10,63	9,13	0,9495	0,9270	0,0225
NORTH	7,12	5,62	0,9302	0,8906	0,0396
CENTER	7,13	5,63	0,9251	0,8988	0,0263
SOUTH	6,44	4,94	0,9583	0,9240	0,0344
ITALY	6,97	5,48	0,9385	0,9073	0,0312
	NUM	Є	weight Є	Θ	weigh θ
Piemonte	0,0391	0,0011	0,4511	0,0463	0,8346
Val d'Aosta	-	0,0048	0,4524	-	0,8359
Lombardia	0,0628	0,0008	0,4536	0,0745	0,8388
Trentino	0,0515	-0,0014	0,4552	0,0626	0,8338
Veneto	0,0564	-0,0005	0,4545	0,0691	0,8195
Friuli	0,0655	-0,0003	0,4541	0,0794	0,8266
Liguria	0,0548	0,0020	0,4488	0,0641	0,8404
Emilia	0,0605	-0,0004	0,4541	0,0729	0,8325
Toscana	0,0600	0,0000	0,4527	0,0737	0,8148
Umbria	0,0368	-0,0014	0,4513	0,0456	0,8199
Marche	0,0552	-0,0003	0,4525	0,0696	0,7940
Lazio	0,0632	0,0017	0,4435	0,0736	0,8485
Abruzzo	0,0281	-0,0012	0,4511	0,0353	0,8089
Molise	0,0694	-0,0008	0,4333	0,0861	0,8106
Campania	0,0499	0,0056	0,4157	0,0593	0,8030
Puglia	0,0489	0,0018	0,4320	0,0607	0,7934
Basilicata	0,0686	0,0017	0,4300	0,0848	0,8013
Calabria	0,0708	0,0056	0,4098	0,0877	0,7815
Sicilia	0,0524	0,0075	0,4167	0,0610	0,8078
Sardegna	0,0878	0,0066	0,4242	0,1046	0,8120
NORTH	0,0565	0,0005	0,4534	0,0675	0,8341
CENTER	0,0563	0,0003	0,4481	0,0681	0,8243
SOUTH	0,0522	0,0049	0,4225	0,0627	0,8008
ITALY	0,0557	0,0025	0,4422	0,0660	0,8270

Table 22: Private rates of return on education, by components, women using OLS

Regione	rw%	R_w %	DENOM	Direct costs	Opp. costs	NUM
Piemonte	6,22	4,73	0,9808	0,0531	0,9277	0,0527
Val d'Aosta	-	-	0,9671	0,0392	0,9279	-
Lombardia	8,07	6,57	1,0012	0,0762	0,9249	0,0697
Trentino	7,44	5,94	0,9554	0,0352	0,9201	0,0615
Veneto	8,83	7,34	0,9649	0,0414	0,9235	0,0735
Friuli	10,24	8,75	0,9595	0,0350	0,9244	0,0856
Liguria	6,08	4,59	0,9870	0,0513	0,9357	0,0521
Emilia	7,34	5,84	0,9717	0,0474	0,9243	0,0613
Toscana	8,15	6,66	0,9713	0,0397	0,9316	0,0681
Umbria	7,21	5,71	0,9775	0,0462	0,9313	0,0605
Marche	7,16	5,66	0,9843	0,0573	0,9270	0,0607
Lazio	7,16	5,67	0,9735	0,0310	0,9425	0,0599
Abruzzo	5,62	4,13	0,9895	0,0542	0,9352	0,0487
Molise	2,98	1,48	0,9832	0,0372	0,9459	0,0315
Campania	8,92	7,43	1,0111	0,0423	0,9688	0,0775
Puglia	10,05	8,56	1,0028	0,0505	0,9523	0,0874
Basilicata	10,06	8,57	1,0035	0,0467	0,9568	0,0877
Calabria	16,84	15,35	0,9968	0,0259	0,9709	0,1531
Sicilia	11,54	10,04	1,0007	0,0347	0,9660	0,1014
Sardegna	6,49	4,99	0,9958	0,0343	0,9615	0,0552
NORTH	8,17	6,67	0,9824	0,0564	0,9261	0,0691
CENTER	7,65	6,16	0,9711	0,0378	0,9332	0,0639
SOUTH	8,75	7,25	1,0085	0,0524	0,9561	0,0757
ITALY	8,04	6,55	0,9849	0,0443	0,9406	0,0681

Regione	ϵ	Weight ϵ	ξ	Weight ξ	θ	Weight θ
Piemonte	0,0038	0,4499	0,00035	0,4837	0,0662	0,7670
Val d'Aosta	0,0077	0,4623	0,00000	0,4969	-	0,7695
Lombardia	0,0028	0,4536	0,00098	0,4883	0,0880	0,7718
Trentino	0,0015	0,4556	0,00017	0,4909	0,0698	0,8696
Veneto	0,0017	0,4532	0,00118	0,4881	0,0841	0,8583
Friuli	0,0020	0,4563	0,00051	0,4911	0,0976	0,8650
Liguria	0,0029	0,4472	0,00013	0,4801	0,0655	0,7744
Emilia	0,0016	0,4591	0,00095	0,4939	0,0691	0,8698
Toscana	0,0018	0,4504	0,00023	0,4841	0,0774	0,8678
Umbria	-0,0021	0,4442	0,00051	0,4776	0,0713	0,8589
Marche	0,0000	0,4509	0,00070	0,4855	0,0711	0,8500
Lazio	0,0051	0,4354	0,00066	0,4672	0,0731	0,7849
Abruzzo	-0,0008	0,4414	0,00118	0,4742	0,0570	0,8511
Molise	0,0053	0,4149	0,00207	0,4437	0,0334	0,8505
Campania	0,0202	0,3735	0,00139	0,3960	0,0823	0,8444
Puglia	0,0028	0,4069	0,00169	0,4348	0,1024	0,8346
Basilicata	0,0065	0,4016	0,00072	0,4278	0,1006	0,8425
Calabria	0,0237	0,3602	0,00001	0,3802	0,1753	0,8243
Sicilia	0,0252	0,3826	0,00144	0,4062	0,1076	0,8471
Sardegna	0,0241	0,3915	0,00204	0,4162	0,0529	0,8502
NORTH	0,0026	0,4542	0,00085	0,4888	0,0777	0,8688
CENTER	0,0020	0,4433	0,00050	0,4763	0,0729	0,8602
SOUTH	0,0153	0,3893	0,00149	0,4140	0,0820	0,8430
ITALY	0,0055	0,4468	0,00009	0,4771	0,0758	0,8645

Table 23: Private rate of returns to education from OLS and PV estimation

Regione	MEN		WOMEN	
	OLS	PV	OLS	PV
Piemonte	4,77	4,25	6,22	6,15
Lombardia	7,82	7,20	8,07	7,74
Trentino	6,55	6,62	7,44	5,30
Veneto	7,20	6,28	8,83	8,36
Friuli	8,36	8,42	10,24	9,83
Liguria	6,83	6,46	6,08	6,33
Emilia	7,67	7,44	7,34	7,14
Toscana	7,59	7,18	8,15	8,61
Umbria	4,37	3,29	7,21	7,50
Marche	6,94	6,03	7,16	6,83
Lazio	7,94	7,02	7,16	7,70
Abruzzo	3,02	3,56	5,62	4,71
Molise	8,57	8,47	2,98	-
Campania	6,10	5,30	8,92	-
Puglia	6,06	4,76	10,05	10,59
Basilicata	8,40	6,94	10,06	10,43
Calabria	8,67	9,22	16,84	17,95
Sicilia	6,49	5,64	11,54	11,17
Sardegna	10,63	9,82	6,49	7,73
NORTH	7,12	6,59	8,17	7,89
CENTER	7,13	6,30	7,65	7,92
SOUTH	6,44	5,75	8,75	8,22
ITALY	6,97	6,27	8,04	7,81

Table 24: Effects of various policies on men returns

Regione	No unempl. benefits	No income tax	No public education
Piemonte	2,852	2,032	4,567
Lombardia	-0,575	-1,740	1,404
Trentino	-2,399	-3,677	-0,490
Veneto	0,024	-1,262	1,700
Friuli	0,003	-1,459	1,838
Liguria	-0,160	-1,104	2,143
Emilia	0,015	-1,293	1,980
Toscana	-0,012	-1,445	1,911
Umbria	0,120	-0,996	1,345
Marche	0,008	-1,496	1,638
Lazio	-0,151	-1,057	1,576
Abruzzo	0,094	-1,084	1,258
Molise	-0,003	-1,716	1,459
Campania	-0,476	-1,223	1,400
Puglia	-0,177	-1,278	1,300
Basilicata	-0,162	-1,547	2,137
Calabria	-0,472	-2,117	1,797
Sicilia	-0,633	-1,196	1,576
Sardegna	-0,504	-1,824	2,176
NORTH	-0,047	-1,180	1,884
CENTER	-0,045	-1,220	1,700
SOUTH	-0,412	-1,319	1,458
ITALY	-0,213	-1,179	1,714

Table 25: Effects of various policies on women returns

Regione	No unempl. benefits	No income tax	No public education	No childcare benfits
Piemonte	-0,283	-1,819	2,437	-0,025
Lombardia	-0,188	-2,164	2,576	-0,058
Trentino	-0,132	-0,846	2,325	-0,022
Veneto	-0,133	-1,230	2,604	-0,078
Friuli	-0,145	-1,322	2,665	-0,040
Liguria	-0,221	-1,817	2,737	-0,011
Emilia	-0,118	-1,010	2,463	-0,062
Toscana	-0,144	-1,173	2,800	-0,022
Umbria	0,107	-1,177	2,444	-0,042
Marche	-0,015	-1,202	2,312	-0,051
Lazio	-0,384	-1,867	2,235	-0,041
Abruzzo	0,0430	-0,974	1,888	-0,086
Molise	-	-	-	-
Campania	-1,479	-1,029	2,259	-0,041
Puglia	-0,248	-1,809	2,870	-0,084
Basilicata	-0,481	-1,659	3,752	-0,034
Calabria	-1,735	-3,092	4,636	0,009
Sicilia	-1,699	-1,541	3,366	-0,041
Sardegna	-1,703	-1,036	2,470	-0,075
NORTH	-0,184	-1,107	2,679	-0,054
CENTER	-0,169	-1,164	2,526	-0,037
SOUTH	-1,080	-1,260	2,465	-0,056
ITALY	-0,397	-1,104	2,557	-0,064

Table 26: Basic scenario and observed situation by gender

	MEN			WOMEN		
Regione	Observed	Basic scenario	Subsidy rate %	Observed	Basic scenario	Subsidy rate %
Piemonte	4,251	3,975	6,495	6,153	5,838	5,122
Lombardia	7,200	6,918	3,915	7,740	7,552	2,428
Trentino	6,624	6,105	7,847	5,302	4,202	20,747
Veneto	6,286	6,125	2,557	8,365	7,338	12,277
Friuli	8,429	8,347	0,980	9,836	8,836	10,160
Liguria	6,469	5,932	8,306	6,333	5,648	10,820
Emilia	7,442	7,084	4,807	7,143	6,072	14,996
Toscana	7,181	7,000	2,514	8,620	7,317	15,113
Umbria	3,293	3,108	5,627	7,501	6,322	15,719
Marche	6,032	6,102	-1,164	6,835	5,909	13,556
Lazio	7,022	6,932	1,272	7,702	7,723	-0,267
Abruzzo	3,567	3,533	0,967	4,718	3,964	15,992
Molise	8,472	8,884	-4,856	7,504	-	-
Campania	5,306	5,644	-6,370	6,898	6,709	2,736
Puglia	4,765	5,031	-5,595	10,594	9,594	9,440
Basilicata	6,947	6,639	4,425	10,4332	8,444	19,062
Calabria	9,221	9,922	-7,599	17,959	16,74	6,799
Sicilia	5,643	5,922	-4,938	11,178	10,350	7,407
Sardegna	9,824	10,021	-2,000	7,734	7,600	1,729
NORTH	6,597	6,274	4,896	7,893	6,731	14,720
CENTER	6,306	6,146	2,537	7,923	6,866	13,334
SOUTH	5,760	6,089	-5,726	8,224	7,762	5,620
ITALY	6,273	6,186	1,396	7,856	6,898	12,201

Basic scenario: no unemployment benefits, no income tax, no education spending, no childcare benefits.

Figure 1: Rates of return in the italian regions, 2002

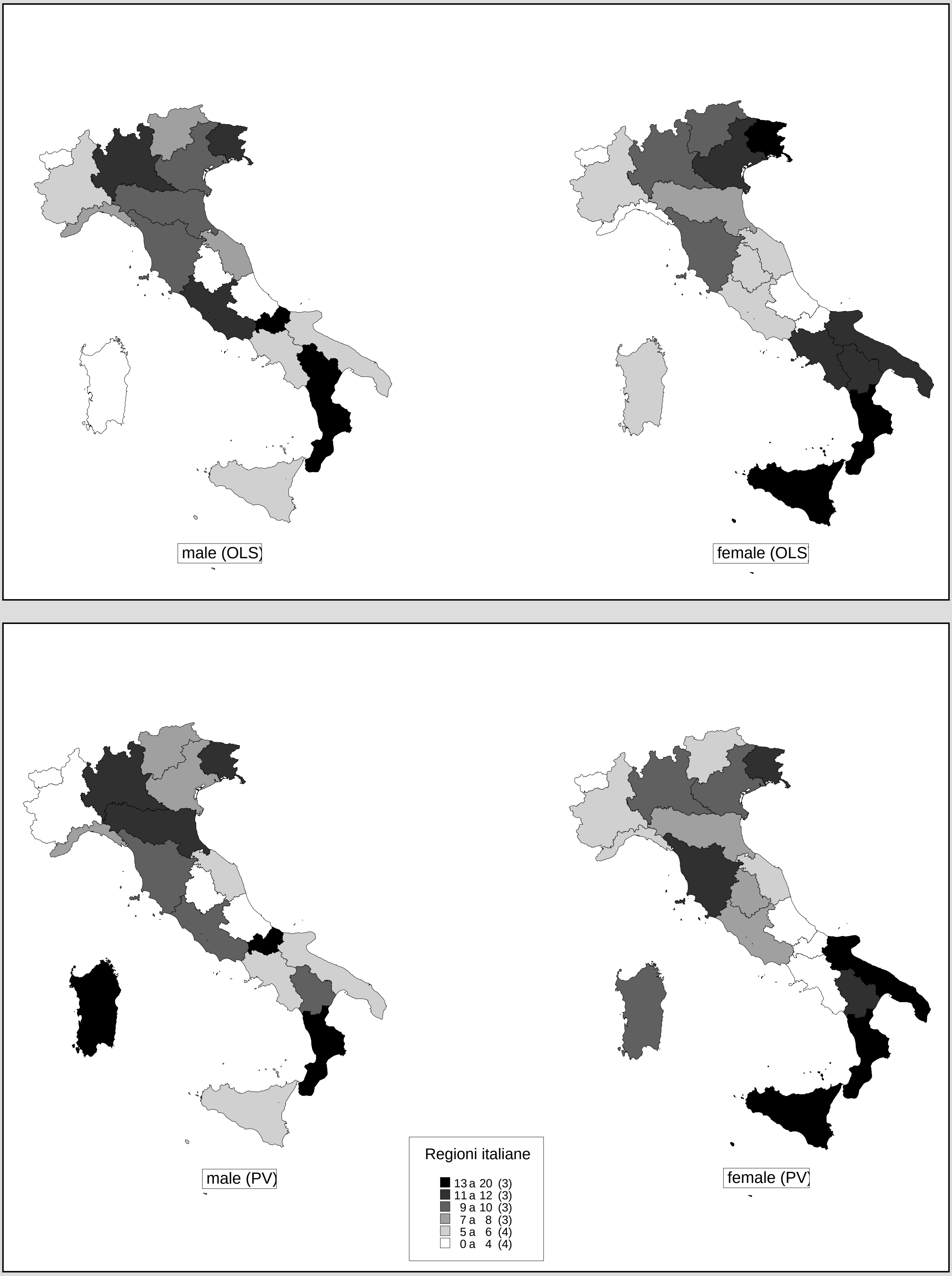
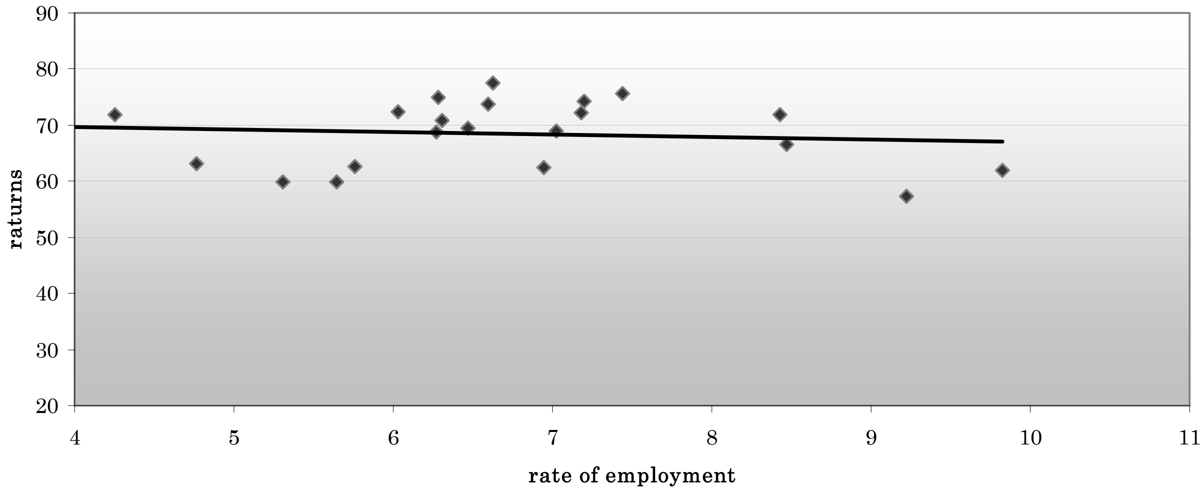


Figure 2: Returns to education and rate of employment, by gender

Men



Women

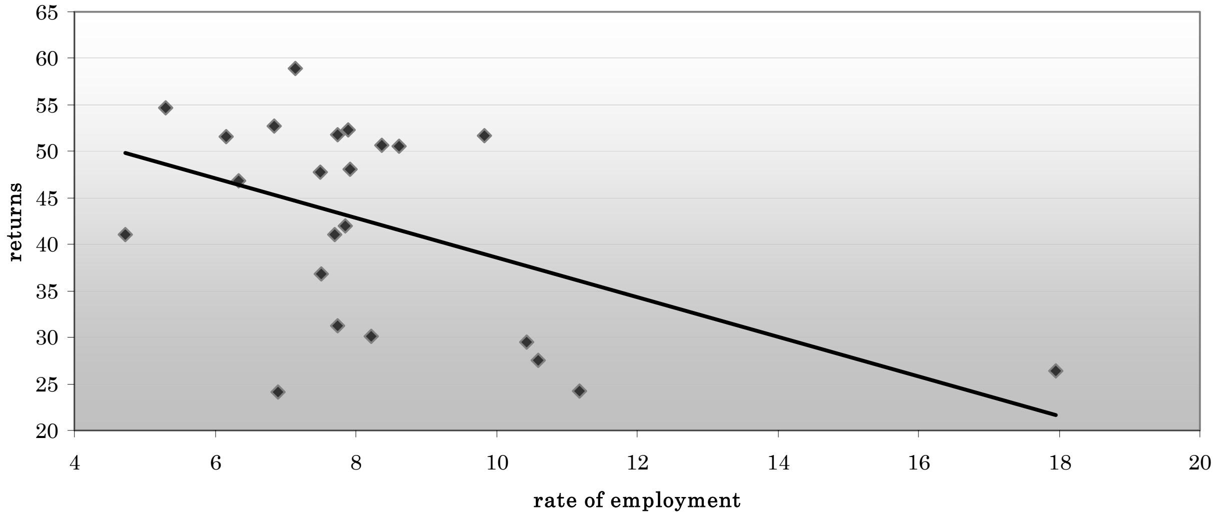
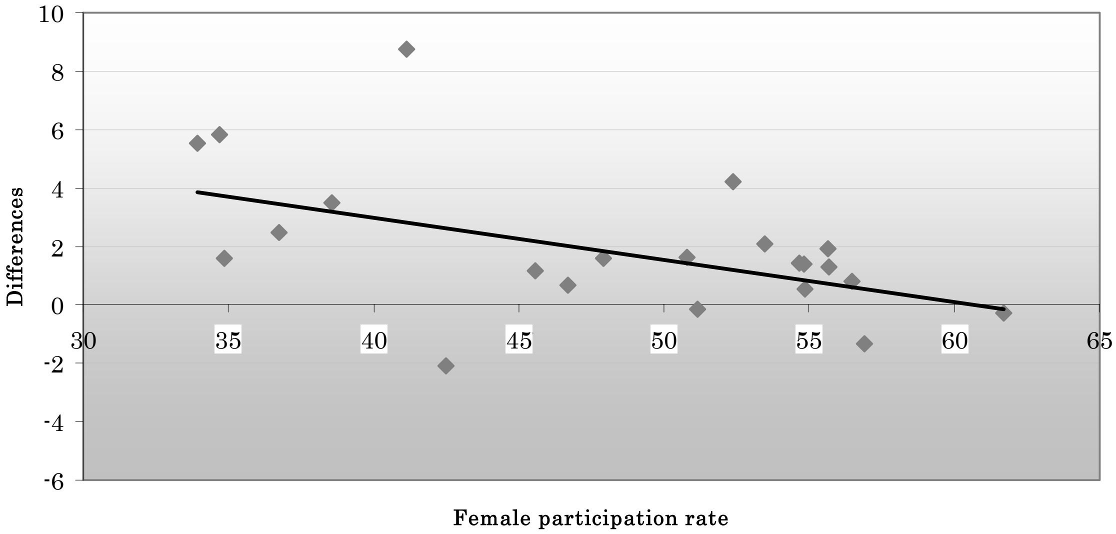


Figure 3: Female/male differential in returns and female participation rates



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