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Joint Decisions on Household Membership and Human Capital Accumulation of Youths - The role of expected earnings and local markets

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The role of expected earnings and local markets

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ABSTRACT

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This paper analyses the effects of expected earnings and local markets conditions on the behaviour of young adults with high school diplomas. Decisions to either remain in the parental home or form a new household are modelled jointly with those of either gaining work experience or investing in a university education. A multinomial probit model estimates the probabilities of the different pairs of outcomes. Expected lifetime earnings of youths are modelled and estimated, and serve as choice-specific regressors in the probit model. According to our results, the most important factor influencing the choice of studying and residing with parents is expected lifetime earnings from a university degree. A sizeable discouraged worker effect induces young people to study when labour market opportunities are poor. The cost of housing greatly influences the choice of working and living in the parental home. Two policy experiments offer some suggestions for policy makers. The first one measures the extent to which housing policies, targeted at reducing housing costs, would allow youths to live away from the parental home. A second indicates how much labour market policies, targeted at lowering youth unemployment to some desired levels, could decrease the number of discouraged workers that choose to study.

JEL Classification: C25, J12, J24, J31

Keywords: Human capital, living arrangements, local labour markets, multinomial probit

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1 Introduction.

Is there a role for expected lifetime earnings and local markets conditions in influencing young people's behaviour? Human capital theory predicts that expected lifetime earnings from either acquiring a job or investing in higher education should affect the work/study decisions of youths. Moreover, disincentives to family formation and labour supply may stem from adverse housing markets conditions and unemployment. Evidence of different attitudes towards work and study of young people who reside with their parents, as opposed to those who have formed their own family nucleus (particularly in the Southern European countries), motivates the use of a household framework in our analysis.

Let us define coresidence as adult children domiciled in the parental home. This has important economic consequences. First, it may affect young adults' reservation wages, either positively or negatively, and therefore their participation rates. Second, coresidence and investment in human capital become interdependent under certain economic conditions. For example, with imperfect capital markets, parents may loan or grant housing services to their adult children, thus allowing them to engage in on-the-job-training at low offered wages or to obtain a university education. Third, coresident youths may postpone forming a new household which leads to obvious demographic consequences such as the progressive ageing of the population and of the labour force.

Recent literature keeps young people's work decisions and family arrangements separate, and either work status or household membership are taken as exogenous (Iacovou, 1998; Martinez and Ruiz Castillo, 1999; Rice, 1999). An alternative approach assumes that market work or investment in education are determined jointly with family status (McElroy, 1985; Rosenzweig and Wolpin, 1993; Ermisch,1997).

In this paper living arrangements, work and study decisions are all interdependent[1]. We set up a model to test the predictions of human capital theory and to measure the effects of local markets under our assumption of joint decisions.

[1] See also Giannelli and Monfardini (2000). There we focus on the effect of family background on young adults' decisions.

The econometric approach uses a multinomial probit model which allows us to release the restrictive zero-covariance assumption imposed by the logit model[2]. This generalisation introduces two kinds of econometric difficulties. Firstly, it makes the estimation of the model more complicated, as multiple integrals appear in the likelihood function. This computational problem is solved by applying numerical integration methods. Secondly, identification of the model requires the presence of choice-specific explanatory variables (Keane, 1992). This non-trivial problem has mostly been ignored in empirical applications, since frequently choice-specific variables are not available and must be appropriately chosen and estimated. We obtain choice-specific regressors by including the expected lifetime earnings from two alternative investment choices available to young adults as determinants of the stochastic utilities. This implies, on the one hand, the extension of the choice model to include equations explaining the earnings expectation mechanism, but also implies the exclusion of the non-investors category (i.e. housewives, for whom it is not possible to calculate a measure of expected earnings) from the sample.

We study the Italian case using the Bank of Italy (BI) sample survey of household budgets. Young Italians postpone leaving their parental home, even beyond the age of thirty. This phenomenon is extensive and increasing. According to a multipurpose survey, conducted by the Italian National Statistical Institute, 52% of Italians aged 18-34 lived with their parents in 1990 and the percentage increased to 59% in 1998. This tendency is particularly true of young adults in their thirties: in 1990, 18% of males and 10% of females aged 30-34 resided with their parents, while in 1998 this percentage increased to 29% for males and 15% for females. It could be argued that this behaviour is due to the growing levels of youth unemployment, but the BI sample implies that this is not the case: in 1995, excluding the unemployed, the share of males over 29 who were working and coresiding was 22%, and the share of females 16%[3].

[2] We used the logit model in our previous work.

[3] These percentages were calculated from the sample presented in section 3.

From a regional perspective, the Italian labour market is strongly dualistic exhibiting a North-South divide. Two extreme cases are represented by the Northeast and the South of Italy. In the Northeast, with the unemployment rate hovering around frictional levels and with employers facing a limited supply of workers, there is a strong incentive for young people to enter the labour market at an early age. In the South, young people experience dramatic levels of unemployment (over 50% in some areas!) and remain in the education system until their thirties. These phenomena are certainly better understood if studied in conjunction with household membership. The paper is organised as follows: Section 2 sketches the theoretical model; Section 3 describes the data and our sample; Section 4 presents the econometric model and the methodology for predicting expected lifetime earnings; Section 5 presents the results and Section 6 concludes.

2. The theoretical model

Young adults are assumed to maximise expected lifetime utility, U_t , of goods and leisure, C_t and L_t, subject to a number of constraints, which vary according to the joint alternatives of coresidence or not coresidence and work or study[4] :

$$\max E \sum_{t=1}^{\infty} (1+\delta)^{t-1}\left[U(C_t, L_t)\right]$$

where preferences are intertemporally separable and δ is the rate of time preference. This utility maximisation problem is subject to:

1) a budget constraint:

$$\sum_{t=1}^{\infty} (1+r)^{t-1}\left[W_t + \alpha_t R_t - C_t - Q_t\right]$$

where r is the interest rate, W_t is labour income. Parents make transfers, R_t, to their adult coresident children. Transfers may both be explicit and include the implicit value of housing services for

[4] Given the emphasis we put on expected lifetime earnings, we concentrate on human capital accumulation in the form of education or labour market experience, leaving the residual choice (not to study, not to work - typical of housewives) out of the analysis. This state is included in Giannelli and Monfardini, 2000.

coresident adult children; $\alpha_t = 1$ if the young adult coresides and $\alpha_t = 0$ if he/she lives away from parents (non-coresident adult children are assumed not to receive private transfers); Q_t are the housing costs faced by young adults (either explicit for the non-coresident youths or equal to the implicit value of housing services for the coresident youths).

2) A labour earnings constraint:

$$W_t = wK_tH_t$$

where *w* is the wage per unit of capital stock, K_t is the human capital stock and H_t are hours of work;

3) a time constraint:

$$T = \beta_t H_t + L_t + (1-\beta_t)S_t$$

where T is time endowment, note that study and work are mutually exclusive, i.e. β_t = 1 if the young adult works, β_t = 0 if the young adult studies, and S_t are hours of study.

Human capital is accumulated either with hours of work or with hours of study. This leads us to 4):

$$K_t = \begin{cases} K_{t-1} + F[(1-\beta_{t-1})S_{t-1} + \beta_{t-1}H_t] & \text{for} \quad t = 1,\ldots,t^* \\ K_{t-1} + G[H_t] & \text{for} \quad t = t^*+1,\ldots,t^{end} \end{cases}$$

the human capital accumulation rule, given K_0, where F and G are functions. At time t=1 (the date at which the youth is observed to choose), we assume that the process of human capital accumulation is expected to continue until t^* with either study or work. At t* the youth has reached

the age where future human capital can only be accumulated through labour market experience until the end of active life, t^{end}. t* is assumed to be the same for all individuals.

The young adult is assumed to choose the human capital accumulation process and living arrangement combination that maximises his/her utility. The indirect utilities are as follows:

$v_{w,co}$, $v_{w,nco}$:work and coreside/not coreside

$v_{s,co}$, $v_{s,nco}$:study and coreside/not coreside.

For example, to observe a youth working and coresiding implies that:

$$\max(v_{w,co}, v_{w,nco}\ v_{s,co}, v_{s,nco}) = v^*_{w,co}$$

The above assumptions imply that each indirect utility depends on the following set of variables:

$$v = (W_w^E, W_s^E, Y, P, M)$$

where W_w^E and W_s^E are expected lifetime labour earnings from human capital investment in either labour market experience or education respectively; Y is the set of individual characteristics of the young adult such as K_0 and age at $t=1$; P is a vector of "parental" variables, including income and transfers made to coresident young adult children, R_t. M is a vector of "market" variables, such as Q_t and the unemployment rate, which proxy the housing and labour market conditions.

We focus on the following testable predictions that:

1) the young adult is more likely to choose to study and coreside the higher the level of expected earnings from this choice;

2) at certain levels of expected lifetime labour earnings from obtaining a university degree a youth will be indifferent between studying and working at t=1. Also if preferences are heterogeneous, the level of this "reservation wage" will vary across individuals or groups of individuals;

3) less young adults will leave the parental home the higher the price of housing;

4) the youth is more likely to choose to study, the higher the level of unemployment.

3 Data and sample

Our data is drawn from the 1995 Bank of Italy sample survey on family budgets of Italian households (Banca d'Italia, 1997). The survey, covering 8,135 households and 23,924 individuals, provides information relating to both the household and its members. We select young people aged 18-32[5], with both parents present, who have a high school diploma and are not unemployed. The reason for this last selection is that we want to measure the "discouraged worker effect" (inducing young adults to study when labour market opportunities are poor) by assessing the affect of the regional youth unemployment rate on the probability of studying (and coresiding or not). This affect cannot be correctly estimated if labour market agents include the unemployed, since they share many common characteristics with discouraged workers[6].

Table 1 displays the sample frequencies of the different pairs of outcomes by sex.

Table 1
Observed sample frequencies of young adults aged 18-32. BI survey, 1995

	Living with parents	Not living with parents	Total
	FEMALES		
Working	284	179	463
	29%	19%	48%
Studying	490	10	500
	51%	1%	52%
Total	774	189	963
	80%	20%	100%
	MALES		
Working	377	135	512
	38%	14%	51%
Studying	485	0	485
	49%	0%	49%
Total	862	135	997
	86%	14%	100%

[5] In Italy young people with a high school diploma choose either to enter the labour market or to invest in university education at eighteen.

[6] Although unemployed youths amount to 17% of the sample, we carefully argue that it is not appropriate to include them in our sample selection. Given that we are interested in human capital investment, the unemployed should be included in the sample of labour market agents. However, this inclusion creates a heterogeneity problem. This may be dealt with in two alternatives ways. First, by forming a separate category (in addition to those of workers and students) of human capital investors, i.e. those choosing to invest in a job search. However, this is not a reasonable assumption. The vast majority of unemployed young adults are concentrated in the South of Italy, a region where youth unemployment has reached dramatic proportions, incompatible with any explanation of equilibrium unemployment. Second, by including unemployed people in the category of labour market agents together with workers, and control for heterogeneity with a dummy for unemployment. This is not viable because all unemployed people live with their parents. A dummy for the unemployment status would then perfectly predict the outcome "invest in the labour market and reside with parents", thus creating an identification problem.

The decision to coreside is taken in more than 80% of the cases sampled. The frequency distribution indicates the most relevant outcomes for our analysis. Both males and females decide either to work and live with their parents, or study and live with their parents or work and form a new household. Nobody is observed studying and living away from his/her parents' household. Consequently, we assume that for all individuals the indirect utility associated to the state "study and not coreside", $v_{s,nco}$, is lower than utilities deriving from other states[7].

The most frequent state for both sexes is to be a student and to coreside with parents. Males choose to work and coreside with parents more than females.

Thus, even excluding unemployed young adults, coresidence of workers turns out to be a very pronounced phenomenon.

4 The econometric model

The following empirical discrete choice model emerges from our utility maximisation framework. Individual *i* gains utility from choosing state *j* represented by the utility latent indicator:

$$u_{ij} = \underline{x}_{ij}' \beta_j + \varepsilon_{ij}$$

i=1,…,N, j=1,…,J, where *N* is the total number of individuals in the sample, and *J* is the number of states the individual can choose. x_{ij} is a vector of observed explanatory variables describing individual and other specific characteristics which are assumed to determine the young adult's choice. We are interested in deducing what the unknown parameter vectors β_j , *j=1,…,J,* are. The utility indicator u_{ij} is latent, but we observe the realisation: $I_i = j$ iff $u_{ij} > u_{ik} \ \forall k \neq j$, i.e. we observe individual *i* in state *j* if he/she acquires the greatest utility from this state.

[7] The survey is structured in such a way that students living apart but legally residing with their parents are not distinguishable from those actually living with their parents. However, the absence of any public grant scheme for Italian university students makes them entirely dependent on their parents' income.

We use a probit formulation, where the stochastic component ε_{ij} is normally distributed. In particular, $\underline{\varepsilon}_i = (\varepsilon_{i1},...,\varepsilon_{ij},...,\varepsilon_{iJ})'$, *i=1…N,* is assumed to be independently and identically distributed across individuals as a *J*-dimensional multivariate normal distribution. In most applied studies, discrete choice is analysed by adopting the logit formulation, which follows from the assumption that $\underline{\varepsilon}_i$ has type 1 extreme value distribution. The probit formulation is distinguishable from the logit on account of its capacity to allow for a covariance pattern across the error components of the utility indicators attached to different alternatives. In the logit model the distributional assumption forces these covariances to equal zero. This pattern is known in the literature as the Independence of the Irrelevant Alternative (IIA) hypothesis.[8] The multinomial probit model outlined above suffers from two identification problems. The first emerges from the fact that since the observed choices, I_i , give no information about the level of utilities, the model must then be rewritten in differences. It follows that the relevant multivariate distribution of the error terms has dimensions equal to *J-1*. Secondly, since the levels of the utilities are not identified, the variance of one of the error terms must be set equal to unity. Taking state *J* as the base category, the resulting model is given by:

$$u_{ij}^* = \underline{x}_{ij}'\beta_j^* + \varepsilon_{ij}^*$$
$$\underline{\varepsilon}_i^* = (\varepsilon_{i1}^*,\ldots,\varepsilon_{ij}^*,\ldots,\varepsilon_{iJ-1}^*)' \sim IIDN_{J-1}(\underline{0},\Sigma^*)$$

j=1,…,J-1, where: $\sigma_{11}^* = 1$, and the parameters β_j^* are differenced from the original β_j. The log-likelihood function to be maximised is given by:

[8] IIA means that the utility obtained from a given choice is not correlated with the utility obtained from any other choice. This is a very strong statement. The unobservable components of different alternative utility functions could contain common terms which, for example, could make two states more similar to each other than another state for an individual with given observed attributes. The probit model does not impose the IIA assumption *a priori*, but greater generality is achieved at the cost of a more complicated setting for the estimation of its parameters, as will be shown below.

$$L(\beta^*, \Sigma^*) = \frac{1}{N} \sum_{i=1}^{N} \sum_{j=1}^{J} m_{ij} \ln P_{ij} (\beta^*, \Sigma^*)$$

where $P_{ij} = \Pr(u_{ij}^* > u_{ik}^*, k \neq j = 1,..., J-1)$ and $m_{ij}=1$ iff individual *i* is observed in state *j*. The probabilities P_{ij} contain a *(J-1)*-dimensional integral which can be computed by resorting to numerical methods[9].

The evidence provided in table 1 suggests the use of a three-point choice model for both females and males. The states are summarised in the following scheme:

choice j	***Description of the state***
1	Work & live with parents
2	Work & not live with parents
3	Study & live with parents

Life-cycle earnings prediction

According to our theoretical model, expected lifetime earnings from either studying or working (W_w^E and W_s^E in Section 2) should be included in the explanatory variables of the stochastic utilities. In other words, we are assuming that the decision to either attend university or to enter the labour market after high school is based on a comparison of the expected returns from each type of human capital investment. There is also an important econometric reason for this. Namely, the probit model outlined above is formally identified, but identification problems will arise unless the regressors of u_{ij}^* include an alternative-specific attribute (Keane, 1992)[10].

In this case, identification of the probit model is achieved by assuming that the expected life-

[9] Such as quadrature when *J* is not greater than 4.

[10] This means that the data must contain some variables - observed for all individuals - which should only enter the utility associated with one state and not the others. Such alternative-specific variables are usually available in studies concerning brand or transportation mode choices, where, for example, the price or a quality indicator faced by the individual in each alternative can be observed. In our case, the choice-specific regressors must be appropriately chosen and built, bearing in mind their relevance for the underlying economic theory.

cycle earnings from each type of investment are the appropriate choice-specific variables for our problem. We call "University-Life-Cycle-Expected Earnings" (*ULCEE*) the expected life-cycle earnings from investment in higher education after high school, and "High school-Life-Cycle-Expected-Earnings" (*HLCEE*) that expected from on-the-job-training. These variables are not observed, and have to computed for all individuals in the sample. Therefore, we need to model the mechanism by which young people form their expectations. The period following the high school diploma is assumed to be an investment period for both outcomes. Consequently, it seems natural to assume that young adults evaluate their stream of expected returns by looking at the earnings pattern of people who have completed this investment period - in our setting people over 32 years.

This led us to an out-of-sample estimation of two earnings equations, one for graduates and one for non-graduates. These have to be corrected for self-selection, as we observe only the wages of individuals who have chosen a given alternative - to enter the labour market or a university degree program. In order to correct for self-selection, the earnings equations are jointly estimated using a bivariate probit model to determine the probability of obtaining a university degree (or a high school diploma)[11]. This estimation is performed by maximum likelihood according to the model proposed by Heckman (1979)[12].

We use these estimated parameters to build the expected variables. We first predict the two wages (one for graduates and one for non-graduates) according to the individual characteristics of young adults in our sample.

We then compute expected life-cycle earnings, *ULCEE* and *HLCEE*, by summing the

[11] It is worth emphasising that this selection mechanism is not in contrast with the one constituting the focus of our analysis (i.e. the mechanism determining investment jointly with coresidence) as it applies to a sample of adults, for which the coresidence decision is no longer relevant.

[12] The results are not presented for the sake of brevity, but are available on request. The wage equation for graduation includes as explanatory variables age, sex, parents' education, father's position in the labour market, individual's position and sector of employment, type of university degree, and area of residence. The selection equation contains age cohorts instead of age and number of siblings as further explanatory variables.

predicted stream of earnings from age 33[13] to retirement (i.e. age 65)[14].

These expected earnings are included in the specification of the original utilities associated with the different states:

$$u_{ij} = \underline{w}_i' \gamma_j + \vartheta_{jH} HLCEE_i + \vartheta_{jU} ULCEE_i + \varepsilon_{ij}$$

where *j=1,2,3,* and $\underline{w}_i'$ contains individual specific, parental and market variables.

We investigate whether these predicted wages are appropriate alternative-specific regressors in our differenced model. To test their significance, we estimate the following logit model:

$$u_{ij}^* = \underline{w}_i' \gamma_j^* + \vartheta_{jH}^* HLCEE_i + \vartheta_{jU}^* ULCEE_i + \eta_{ij}^*$$

where *j=1,2,3* and $u_{i1}^* = 0$, stars denote the difference in quantities between states. Let *j=1* be the base state. This allows us to directly compare the most different states, i.e. working and not living with parents *versus* studying and coresiding with parents. We then test the exclusion restrictions that $\vartheta_{2U}^* = 0, \vartheta_{3H}^* = 0$. On the basis of the appropriate likelihood ratio tests we cannot reject the exclusion restriction hypothesis in either models for males or females. Therefore, in terms of our model, the differenced utility associated with a given state depends only on the expected returns from investment in human capital. This restricted model yields the initial values of the parameters necessary to estimate the probit model.

[13] In a first stage we took into account the opportunity cost associated with studying. We therefore subtracted from the expected university-life-cycle earnings the foregone earnings incurred during the investment period. This procedure, however, raises a problem of endogeneity, since, by assumption, young people are taking investment decisions until the age of 33. Having verified that accounting for the opportunity cost had no affect on the final estimated effect of this predicted variable in our choice model, we preferred to exclude it from our calculations.

[14] Each term is discounted by an individual-specific factor involving the interest rate on ten-year bonds (equal to 9.37% in 1995) and the number of years separating each individual from age 33. Let *r* denote the interest rate, $UE(age)_i$ and $HE(age)_i$ the predicted earnings of graduates and non-graduates respectively, then the life cycle wages are calculated as follows:

$$ULCEE_i = \frac{UE(33)_i}{(1+r)^{33-age_i}} + \ldots + \frac{UE(65)_i}{(1+r)^{65-age_i}},\ HLCEE_i = \frac{HE(33)_i}{(1+r)^{33-age_i}} + \ldots + \frac{HE(65)_i}{(1+r)^{65-age_i}}.$$

Local market variables

The labour and housing market performance (*M*) are the two market constraints we focus on[15]. Unemployment may induce some young people, through a discouraged worker effect, to invest in university education. To control for this effect we include the unemployment rate of 15 to 29 year olds by sex and region. A high cost of housing is likely to constrain some young people to delay leaving their parental home. Housing costs (*Q*) faced by youths are represented by rent, bills, and maintenance. This indicator is preferred to a housing price index[16], as it is also a proxy of the implicit transfer (included in *R*) from parents to their coresident adult children (see Section 2).

5 Results

Probit coefficients

We estimate separate models for males and females. For both models we proceed stepwise. First, we estimate an independent probit model, i.e. we set $\Sigma^* = I$, using the estimated parameters of the logit specification as initial values[17]. Second, we let the covariance parameter σ_{12}^* vary freely and use the independent probit estimated parameters as initial values for the numerical maximisation. In this case we are in fact estimating the correlation between the two differenced utilities [18] since the variance elements all equal 1. The null hypothesis that the log likelihood

[15] We also control for a number of individual and family background variables. Individual variables (*Y*) include age, type of high school diploma, region of residence. Parental variables (*P*) include the level of education and professional qualification of youths' fathers. Family background is a good control for individual ability (which we use both in the model and for the prediction of expected earnings) since, according to some recent econometric evidence, it plays a more important role than income in determining children's development (see Blau, 1999). A demographic variable for the number of siblings in the parental family takes account of the dimension of the family of origin, and should also proxy the income share allocated to each child (the larger the family the smaller the income share). A detailed description of all the variables is provided in Appendix 1.

[16] A housing price index would be more suitable if we were analysing home-ownership decisions. Moreover, a housing price index is more likely to be correlated with income. In this context, we should also take account of borrowing constraints, since these might play an important role (see Guiso and Jappelli, 1999). The BI survey contains some information on rationing in the financial market, but this is unsuitable for our model.

[17] The logit parameters, which are automatically implemented by STATA 6, are made comparable with those of the independent probit using the multiplicative factor suggested by the Stern (1989) for the trivariate case, i.e. $0.7877 / \sqrt{2}$.

[18] We have performed a maximum likelihood estimation using the numerical maximisation routine provided by GAUSS 3.2 and exploiting its numerical computation of bivariate integrals of the normal density function that are needed for estimation of the trivariate probit model. Maximisation of the loglikelihood function is achieved through the "BHHH" algorithm, which uses the information matrix equality and approximates the (negative) Hessian by the cross-product matrix. The cross-product matrix is computed providing analytical expressions for the first derivatives of the likelihood function, resulting in a considerable decrease in computational time. Once maximisation is achieved, a further run with the Newton-Rapson method computes the heteroscedasticity-consistent covariance matrix of the estimated parameters.. The estimator is computed as: $J_T^{-1} I_{\bar{T}}^{-1} J_T^{-1}$, where I_T is the cross-

function is maximised subject to the restrictions being true is tested using the likelihood ratio test (LRT). This test is based on a comparison of the restricted estimation (obtained in the first step) with the unrestricted one. The test suggests that the null can be rejected at the 5% significance level (although for women ρ is significantly different from zero at a 10% level). It is difficult to give an economic interpretation of this result, as $\rho = corr\,(\varepsilon_{i2} - \varepsilon_{i1}, \varepsilon_{i3} - \varepsilon_{i1})$ and the correlations among original utilities are not identified. Tables 2 and 3 summarise the estimation results.

INSERT TABLE 2 AND 3 HERE

An inspection of the tables above shows the significance of the explanatory variables included in our model (see Table A1.1 for the descriptive statistics), and their different relative effects across the considered states and the two models. Evidence of the importance of expected earnings emerges from the coefficient and standard error of ULCEE for both sexes. Notice that the coefficient of the HLCEE variable is not significant, this could be due to the fact that our base category is a working state. The cost of housing and the unemployment rate are important explanatory variables, especially for females. Individual characteristics such as age, area of residence and type of secondary education are found to be important determinants of a youth's decision. Of the family background variables, fathers' human capital estimated coefficients are not significantly different from zero for both females and males. If expected earnings are omitted (as in Giannelli and Monfardini, 2000), family background becomes an important determinant of young adults' behaviour. This suggests that the effect of such variables are contained within the earnings expectation mechanism.

As a goodness-of-fit measure we report the comparison between actual and predicted

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product matrix and J_T is the negative Hessian. The numerical maximisation algorithm converged after 32 iterations, with a tolerance level for the gradient set at 0.00001. The computation time was about 1.5 seconds per iteration on a Pentium 150 Mherz.

choices[19], obtained by allocating a youth in the state with the highest predicted probability (see Table A2.2). The percentage of correctly classified individuals (i.e. the fraction of people observed in a given state who are predicted to choose that state) is very satisfactory in both models.

Expected lifetime earnings.

Table A2.3 reports the estimated marginal effects and elasticities of the continuous economic variables on the probability of studying and coresiding. Our results show the crucial role played by expected lifetime earnings in the determination of young adults' decisions, as this variable has the largest effect on the choice to go to university.

Fig.1-4 present regional and gender differences in the predicted probabilities by level of expected life-cycle earnings from a university degree. For expositional purposes, these graphs focus on the choice between either working or studying while residing with parents and calculate these probabilities for the reference age 24 (see table A2.1; at that age the relevant joint decision collapses to the two states study/coreside and work/coreside, except for a positive and slightly decreasing probability of marrying for females in the northern regions). The intersection point of these probabilities might be interpreted as the estimated "reservation wage", which is the expected wage from a university degree that leaves the young adult indifferent between studying and working (i.e. the wage at which the young adult has approximately a fifty per cent probability of either studying or working).

Three important results need to be stressed. First, young females have a higher "reservation wage" than young males. This means that young females, for any given increase in expected earnings from a university degree, are less inclined to invest in a university education than young males[20]. Second, our model predicts, for both sexes, stronger preferences for work in the Northeast than in the South. This result confirms the evidence presented in many other studies on the regional

[19] We attempted to evaluate the so-called pseudo R^2 indicator, but did not manage this due to the failure of the maximisation procedure to estimate the probit model when only a constant term was included as a determinant of the utilities.

[20] This "present-oriented" behaviour may be explained by a simple two-period intertemporal labour supply model, where in period 1 wages are lower than in period 2. For any given increase in future earnings, young women have stronger preferences for working in period 1 than men of the same age. Females substitute leisure in period 2 for leisure in period 1 less easily than young males, because a larger amount of non-market work is deemed necessary in period 2 due to family formation.

differences that distinguish the Italian labour market from the rest of Europe (see e.g. Brunello et al. 1999). Third, for a given pattern of expected university earnings, young women from the Northeast choose the state "work and not live with parents" more frequently than in the South. This piece of evidence, suggesting that Mediterranean women are less inclined than northern women to early family formation, is a behavioural reversal with respect to past traditions.

INSERT FIG. 1-4 HERE

The local cost of housing.

The cost of housing significantly reduces the probability of leaving the parental home for both sexes. A simple simulation gives an idea of the potential effects on family formation of policies aimed at reducing the cost of housing (see table 4). Our housing cost index measures the relative increase of housing costs in comparison with a basket of consumption goods (for example, the average value for the North West, 1.10, implies that since the base year 1985 the cost of housing price index has increased 10 percentage points above the consumer price index, CPI; see Appendix 1).

Table 4

Effects of a reduction in the housing cost index relative to the CPI on the probability of working and not living in the parental home at 30

(Percentage points)

	FEMALES				MALES			
	NORTHEAST		SOUTH		NORTHEAST		SOUTH	
HOUSING COST INDEX	PROB.	CHANGE	PROB.	CHANGE	PROB.	CHANGE	PROB.	CHANGE
100	79		45		45		32	
90	89	*+10*	54	*+14*	60	*+15*	47	*+15*
80	95	*+6*	66	*+12*	74	*+14*	62	*+15*
70	98	*+3*	77	*+11*	85	*+11*	76	*+14*
60	99	*+1*	85	*+8*	92	*+7*	86	*+10*
50	100	*+1*	91	*+6*	96	*+4*	93	*+7*

Comparing two extreme cases, that of young people living in the South to those living in the Northeast, the table shows the increase in the probability of living away from the parental home and working for subsequent reductions of 10 percentage points of the housing cost index relative to the CPI. Firstly, note that the probability of 30 year old females in the Northeast of being married or living with a partner is double that of the South. For females, a reduction in the index from 100 to 90, increases the probability of being married and working by 10 percentage points in the Northeast and 14 percentage points in the South. Further decreases in the index induce larger increases in the South, since females in the Northeast are nearly all married when the index is reduced to 80. The pattern for males is more similar across the two regions and a reduction of 10 percentage points in the index leads to a similar average increase in this probability.

Local unemployment.

The phenomenon whereby young people decide to study when labour market opportunities are poor is believed to have reached worrying dimensions in Italy. This effect, however, has never been satisfactorily measured. Our model allows estimation of this "discouraged worker" effect, and this is advantageous when targeting education and labour market policies. Those students who are essentially discouraged workers contribute to the increasing duration of studies and to the number of university drop-outs, thus augmenting the loss of human resources. We compare the estimated effects of changes in the unemployment rate on the decision to study in the Northeast (lowest unemployment rates, see table A2.1) and in the South (highest unemployment rates). Table 5 reports the changes in the predicted probabilities of studying if the unemployment rates of the South are substituted to the unemployment rates of the Northeast and vice versa[21]. The table also gives some indirect information on work preferences across ages, sexes, and regions. If the unemployment rate in the Northeast rose to that experienced in the South, young males of 24 in the Northeast would increase their probability of studying by 9 percentage points. In contrast, if the unemployment rate in the South dropped to that of the Northeast, for young males of 24 in the

[21] Note, however, that for males the coefficient of unemployment is poorly estimated.

South the probability of studying would decrease by about 12 percentage points. Discouragement is stronger for younger males in the Northeast and for older males in the South. One particular aspect of region-specific behaviour appears to be very pronounced for females: 20 and 24 year old females from the Northeast exhibit stronger preferences for work than southern females of the same age. In fact, if the Northeast experienced the same unemployment rate as in the South, a large increase in the number of young females who study because they cannot find a job would occur. In the South, this only happens to older females aged 28. In the South, human capital decisions of young people aged 20, the approximate age when a youth begins his/her university studies, are much less influenced by the high level of unemployment. For example, if the female unemployment rate of the South dropped to that of the Northeast, the probability of studying would only decrease by 2 percentage points. In the South, then, young people are not discouraged from entering the labour market when they are in their first twenties. Discouragement occurs after their mid-twenties, when the mismatch between the skills acquired in the university system and those demanded in the labour market becomes apparent

Table 5
"Discouraged worker" effects
Estimated changes in the probabilities of studying and coresiding*

	FEMALES		MALES	
AGE	NORTHEAST	SOUTH	NORTHEAST	SOUTH
20	25	-2	10	-6
24	19	-13	9	-12
28	6	-27	3	-9

**The change is calculated by predicting the probability at the unemployment rate of the other region*

6. Summary and conclusions

Our conclusions relate to both substantive and methodological issues. First, among the variables we have focussed on, expected lifetime earnings from investment in university education has the largest impact on the decision to study and coreside of young Italians. The estimated "reservation wage" - the expected wage from a university degree that leaves young adults

indifferent between studying and working - is significantly different between the sexes and across regions. Young females, who have in general a higher expected reservation wage, are less inclined to invest in university education with respect to young males. For them, the returns of this investment in terms of future wage increases may be ambiguous as family formation plans may alter their future work careers. Differences by regions of residence suggest that young adults living in the Northeast have higher reservation wages than young adults of other regions. This result gives quantitative support to the observation of stronger work preferences of people living in the Northeast.

Second, our results help to explain the widespread tendency of young adult workers to live with their parents. Some policy simulations based on our estimated coefficients support the hypothesis that the increase in the cost of housing relative to other consumer prices, observed over the past ten years, has contributed to delaying family formation. This is apparent countrywide and also true for both sexes. All else being equal, a 10 percentage point decrease in this relative index would induce, among workers in their thirties, an average increase of approximately 10% in the probability of leaving their parental homes.

Third, the unemployment rate of the region of residence turns out to be a significant proxy of poor labour market conditions. A strong “discouraged worker” effect induces young people to invest in university education and to coreside when labour market opportunities are poor. It might be argued, paradoxically, that unemployment has a positive side, increasing investment in education (if this is more productive than investment on the job). However, this is certainly not true for youths living in the South, where discouragement is concentrated among those who should already have completed their course of studies. It may well be true, however, for youths living in the Northeast. Our results suggest that increases in the unemployment rate above the actual rate would induce more young people to choose to go to university directly from high school. The latter situation may be interpreted as evidence that too low unemployment rates may deter investment in university education.

Turning to our methodology, we assumed a joint decision mechanism and used a multinomial probit to model it. The probit allows us to relax the IIA assumption, on which the more commonly used logit model is based. This modelling technique is increasingly popular among researchers, yet little attention is paid to the identification problem that arises due to lack of required choice-specific variables. We have dealt with this problem by enlarging the model with equations for predicting expected earnings that serve as our choice-specific regressors.

Implications for policy may naturally be drawn from the results presented. Housing policy measures targeted to young people, for example, would reduce the tendency continue residing at the parental home observed among young workers. Youth labour market policies, coupled with reforms within the university system, would help to reduce the number of young people who decide to study because of poor labour market conditions, a phenomenon which has recently reached worrying dimensions.

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APPENDIX 1: description of the variables

Individual variables

Age, Age^2: age and age squared

Education:

Voc. dipl.: vocational training school certificate. It provides job-specific education (mainly for skilled blue-collar jobs).

Tech. dipl.: technical school certificate; this provides a technical education (mainly for non-graduate white-collar jobs, such as accountancy and engineering).

Lyceum: a high school/secondary school certificate preparing students in the main for a university education. It specialises students either in scientific studies – "liceo scientifico" – or in classical studies – "liceo classico".

North W., North E., Centre: regional dummies; Northwest, Northeast, centre of Italy. South is the base.

Family background variables

Father ret.: father retired (born before 1931)

Father 60-65, **Father 50-60**: cohort of the father; up to 1936, 1936-1946

Father univ.: father with a university degree

Father dip.: father with a high school diploma
Father mid. sch.: father with middle school diploma
Father Pub. Adm.: father working in the public administration
Father Manager: father with a managerial job. These last two variables for: a) a coresident youth refer to father's position at the time of the interview; b) a non-coresident youth approximate father's position at the time the youth left home.
N. siblings: total number of siblings in the family of origin.

Market variables

These variables are constructed using official statistic provided by the Italian Statistical Office (Istat).

Un. rate 15-29: the unemployment rate by region and sex of people aged 15 to 29 (Source: "Rilevazione delle forze di lavoro – media 1995", ISTAT). Unemployed people include those: strictly unemployed, looking for the first job, other people looking for a job (see Eurostat definitions).

Housing cost: the ratio of the housing cost index to the consumer price index. The base year is 1985. (For example the average value for the NORTH W., 1.10, means that, since 1985 (base year) the cost of housing price index has increased 10 percentage points above the consumer price index). The housing cost index includes: rent, water, maintenance and repair of domestic equipment (see "Consumption prices, base 85=100", Metodi e Norme Series A, no.23, ISTAT, 1995). For coresident youths we use the 1995 index. For non-coresident youths we use the value of the index at the time the youth left home. The data used covers 1981 to 1995 and refers to the main town of each Italian region. Since the decision to leave the parental home, once taken, is assumed to be irreversible, the relative index in the year of marriage (or the year of the beginning of cohabitation with a partner) is the relevant variable for the group of non-coresiding young people. In contrast, coresiding young people are assumed to be able to revise this decision at any point in time, and for them, the 1995 index is the variable chosen to proxy this effect on their household formation decisions.

Lifetime expected earnings (see Section 4)

ln(ULCEE):logarithm of expected life-cycle wages for those with a university degree.

ln(HLCEE):logarithm of expected life-cycle wages for those with a high school diploma. The interest rate used for actualisation of lifetime earnings is 9.37% ; this is a ten year interest rate (1995-2005 Treasury bonds issued 29.12.1995. Source: Banca Commerciale Italiana, Ufficio Studi, "Vademecum del risparmiatore", Anno LXIII, January 1996, n.1).

APPENDIX 2

Table A2.1
Reference individual by region

FEMALE

	Northwest	**Northeast**	**Centre**	**South**	**All**
age	24.80	24.77	24.19	24.09	24.43
age^2	630.90	628.41	602.26	597	613.14
voc.dipl.	0	0	0	0	0
tech.dip	1	1	1	0	1
lyceum	0	0	0	1	0
Father ret.	0	0	0	0	0
Father 60-65	0	0	0	0	0
Father 50-60	1	1	1	1	1
Father univ. or dip.	0	0	1	0	0
Father mid. sch.	0	0	0	0	0
Father Pub. Adm.	0	0	0	0	0
Father manager	0	0	0	0	0
N. siblings	1	1	1	1	1
Un. rate 15-29	21.73	16.92	30.33	53.45	32.72
Housing cost	1.11	1.11	1.04	1.07	1.08
ln(ULCCE.)	4.35	4.32	4.26	4.29	4.30
ln(HLCEE.)	4.22	4.21	4.09	4.10	4.15

MALE

age	24.93	24.45	24.77	24.30	24.59
age^2	637.84	611.39	629.21	606.77	620.46
voc.dipl.	0	0	0	0	0
tech.dipl.	1	1	1	1	0
lyceum	0	0	0	0	0
Father ret.	0	0	0	0	0
Father 60-65	0	0	0	0	0
Father 50-60	1	1	1	1	1
Father univ..	0	0	0	0	0
Father dip.	0	0	0	0	0
Father mid. sch.	0	0	0	0	0
Father Pub. Adm.	0	0	0	0	0
Father manager	0	0	0	0	0
N. siblings	1	1	1	1	1
Un. rate 15-29	14.30	8.31	17.90	36.22	20.23
Housing cost	1.12	1.13	1.05	1.092	1.09
ln(ULCEE.)	4.45	4.37	4.40	4.38	4.40
ln(HLCEE)	4.30	4.26	4.21	4.19	4.24

Table A2.2
Predicted versus observed choices (percentage of correct classification)

Predicted / *Observed*	FEMALES				MALES			
	WORK & CORES.	WORK & NOT CORES.	STUDY & CORES.	***Total Observed***	WORK & CORES.	WORK & NOT CORES.	STUDY & CORES.	***Total Observed***
WORK & CORES	197 **(69%)***	24	63	284	291 **(77%)***	16	70	377
WORK & MARRIED	39	119 **(72%)***	7	165	47	68 **(57%)***	4	119
STUDY & CORES	58	8	402 **(86%)***	468	78	3	381 **(82%)***	462
Tot. Predicted	294	151	472	917 **(78%)****	416	87	455	958 **(77%)****

*Ratio of correctly predicted values (diagonal values) over the total number of observations in that state

**Sum of correctly predicted values (i.e. sum of diagonal values) over the number of observations

Table A2.3
Marginal effects and elasticities

	STUDY & CORESIDE			
	FEMALES		MALES	
	m.e.	el.	m.e.	el.
NORTH WEST				
Un. Rate 15-29	0.00501	0.57687	0.00395	0.19433
Housing cost	0.17494	1.0301	-0.02225	-0.08604
Ln (ULCEE)	0.35545	8.18671	0.73154	11.19261
Ln (HLCEE)	-0.01126	-0.25142	-0.140967	-2.08373
NORTHEAST				
Un. Rate 15-29	0.00372	0.52015	0.00346	0.112431
Housing cost	0.11732	1.07608	-0.0759	-0.33592
Ln (ULCEE)	0.26690	9.51265	0.68483	11.7096
Ln (HLCEE)	-0.00466	-0.16221	-0.07332	-1.22304
CENTRE				
Un. Rate 15-29	0.00650	0.63717	0.00408	0.21264
Housing cost	0.18474	0.62029	-0.05889	-0.17912
Ln (ULCEE)	0.47080	6.48934	0.78442	10.03009
Ln (HLCEE)	-0.00222	-0.02939	-0.11386	-1.39498
SOUTH				
Un. Rate 15-29	0.00172	0.09613	0.00384	0.21337
Housing cost	0.07596	0.08481	-0.11526	-0.19296
Ln (ULCEE)	0.11818	0.52986	0.78524	5.27990
Ln (HLCEE)	-0.00855	-0.03660	-0.05403	-0.34716

Table 2 Estimated probit coefficients – Females (917 observations)

	State 2 – Work & not coreside		State 3 – Study and coreside	
	Coeff.	s.e.	Coeff.	s.e.
Age	1.31080*	0.50521	-0.54126*	0.27167
Age^2	-0.02161*	0.00693	0.00327	0.00562
Voc.dipl.	0.35221**	0.20929	-0.73217*	0.19347
Tech. dipl.	0.12556	0.18244	-0.28782**	0.15469
Lyceum	-0.31942	0.29719	1.15685*	0.18441
North W.	0.03062	0.50035	-0.41046	0.28739
North E.	-0.16682	0.50490	-0.57694**	0.31362
Centre	-0.25780	0.35660	-0.41360**	0.25183
Father ret.	-0.09247	0.22524	-0.37399	0.22937
Father 60-65	-0.68875*	0.31914	0.26962	0.21463
Father 50-60	-0.45039**	0.27956	-0.07906	0.16052
Father univ. or dip.	-0.52683*	0.26128	0.13085	0.15290
Father mid. sch.	-0.07876	0.23138	-0.07857	0.15838
Father Pub. Adm.	-0.49579	0.33303	0.12345	0.13942
Father manager	-0.14059	0.29185	0.28058	0.20125
N. siblings	0.56514*	0.08853	-0.18593*	0.07322
Un. Rate 15-29	**-0.01240**	**0.01066**	**0.01842***	**0.00809**
Housing cost	**-4.16280***	**1.10151**	**0.50199**	**0.65961**
Ln(ULCEE)	-	-	**1.33903***	**0.46859**
Ln(HLCEE)	**1.12397**	**3.63867**	-	-
Const	-19.99224*	8.46758	4.67490	3.34415
ρ	-0.41407**	0.22434		
Log-likelihood	-0.52524			
Log-likelihood ($\rho=0$)	-0.52613			
LR test ($\rho=0$)	0.00178			

Table 3 Estimated probit coefficients – Males (958 observations)

Males - 958 observations				
	State 2 – Work & not coreside		State 3 – Study and coreside	
	Coeff.	s.e.	Coeff.	s.e.
Age	0.18671	0.57223	-0.62511*	0.22880
Age^2	-0.00656	0.00797	0.00422	0.00462
Voc. dipl.	-0.04848	0.43174	-1.01151*	0.27435
Tech. dipl.	-0.22955	0.39217	-0.40001	0.25053
Lyceum	-0.27697	0.46942	0.95872*	0.27049
North W.	-0.13160	0.42436	-0.55639*	0.23857
North E.	-0.48902	0.45196	-0.64830*	0.27754
Centre	-0.20829	0.34002	-0.44647**	0.23242
Father ret.	-0.16138	0.19787	-0.22059	0.24355
Father 60-65	-0.14698	0.33328	-0.01706	0.22687
Father 50-60	-0.22635	0.32504	0.11889	0.17290
Palau	-0.67777	0.68385	0.16253	0.33454
Padip	0.38101	0.28738	0.22304	0.16557
Father mid. sch.	-0.25274	0.27689	-0.01651	0.15229
Father Pub. Adm.	-0.27420	0.35428	0.35898*	0.13340
Father manager	-0.52359**	0.29161	0.00498	0.17804
N. siblings	0.64860*	0.08463	-0.12186	0.07603
Un. Rate 15-29	**-0.01705**	**0.01258**	**0.00975**	**0.00845**
Housing cost	**-3.87884***	**0.91941**	**-0.44757**	**0.64550**
Ln(ULCEE)			**2.11700***	**0.55786**
Ln(HLCEE)	**4.12957**	**3.89871**		
Const	-14.9712	9.93004	4.29239	3.18648
ρ	0.24974	0.32181		
Log-likelihood	-0.51981			
Log-likelihood	-0.52004			
LR test ($\rho=0$)	0.0004			

Note: one star denotes significance level of 5% , two stars a level of 10%. Due to missing values of some explanatory variables some observations of Table 1 had to be dropped for estimation.

PREDICTED PROBABILITIES BY EXPECTED LIFETIME EARNINGS FROM A UNIVERSITY DEGREE

Fig. 1

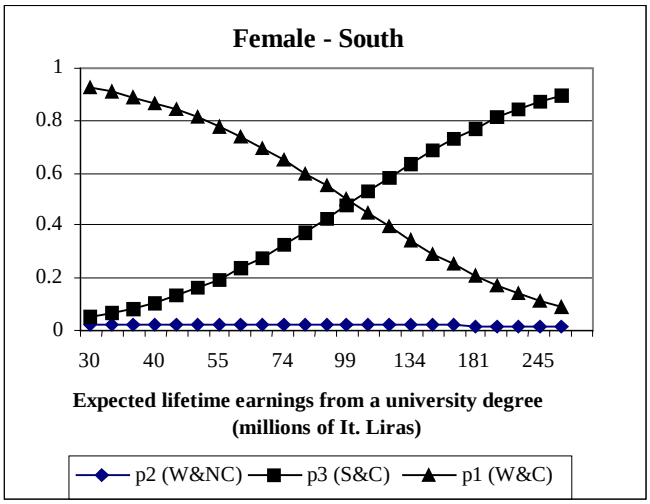


Fig. 2

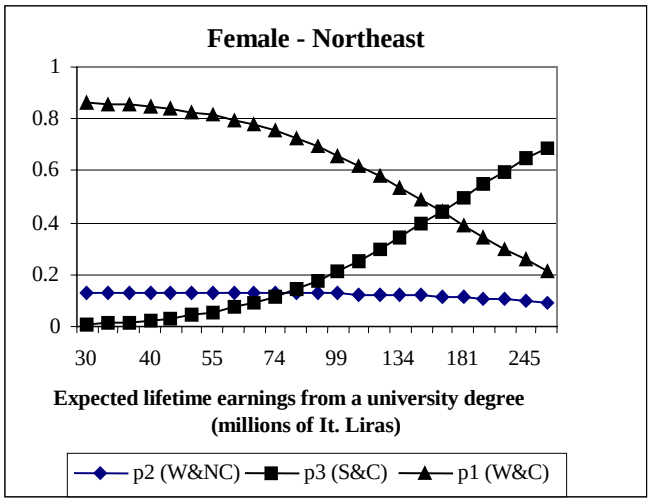


Fig. 3

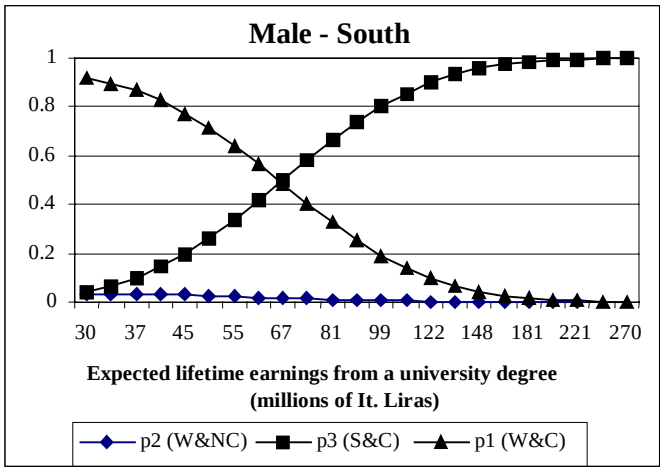
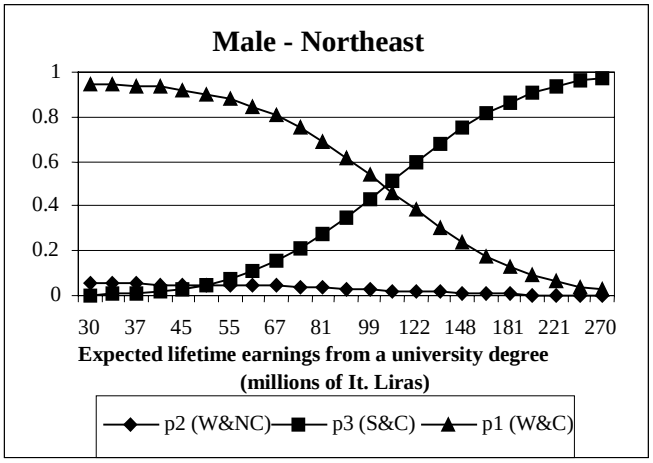


Fig. 4



p2 (W&NC): probability of Working and Not Coresiding
p3 (S&C): probability of Studying and Coresiding
p1 (W&C): probability of Working and Coresiding

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