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Education in Italy: is there any return?

by

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Working paper n. 109
March 2009

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ABSTRACT

The “return to education” issue has been widely investigated in the economic literature. However, how the social value of education can affect its economic return and individual decisions on “human capital” investments has been somewhat neglected.

The paper criticises the traditional definition of human capital and the premises of Becker’s equation and considers the following questions: does education have a consistent return in Italy? If not, does education have any social value?.

From an economic point of view and at a conceptual level, numerous difficulties arise when one seeks to define “human capital”. One may make a list of factors endogenous to an individual, such as education, training and ability, and of factors exogenous to him/her such as level of family education, social capital, system of relations, freedom of knowledge transmission, institutions. All of these factors may affect “human capital”.

Moreover, the decision to invest in “human capital” may not be completely rational. Rationality would probably instead suggest on-the-job training and training. Education has a cultural, social and historical value; as a consequence, individuals may make decisions about the proper investment in education not only by considering marginal costs and future benefits of that investment, but for other reasons as well.

Keywords: human capital, bounded rationality, institutional economics.

JEL codes: J24, J31.

CONTENTS

1	INTRODUCTION	6
2	A MORE COMPREHENSIVE CONCEPT OF “HUMAN CAPITAL”	6
3	THE EMPIRICS OF “HUMAN CAPITAL”	8
4	LIMITS OF HUMAN RATIONALITY IN “HUMAN CAPITAL” INVESTMENT DECISIONS	6
5	WAGE DIFFERENTIALS IN ITALY 1977-2004	12
6	POLICY-MAKING IMPLICATIONS	16
	APPENDIX	19
	References	24

1 INTRODUCTION

The “return to education” issue has been widely investigated in the economic literature. However, how the social value of education can affect its economic return and individual decisions on “human capital” investments has been somewhat neglected.

The paper criticises the traditional definition of human capital and the premises of Becker’s equation and considers the following questions: does education have a consistent return in Italy? If not, does education have any social value?

2 A MORE COMPREHENSIVE CONCEPT OF “HUMAN CAPITAL”

The concept of “human capital” is as old as economic theory.

Adam Smith (1776) recognised its importance and considered it an important element of individual and national wealth. But only in the 1960s did fervent interest (Schultz, 1961; Becker, 1964; Kiker, 1966) arise in giving accurate definition to the concept of “human capital”, which was mainly considered as: *“The aggregation of investments, such as education and on the job training, improving the individual’s productivity in the labour market”*.

According to the early definition of “human capital”, agents demand education services not only to consume them instantaneously but also to gain a reward during their lifetimes. In other words, “human capital” is a “stock” of knowledge which makes it possible to receive a flow of income conceptually similar to the interest earned by investing in physical capital. To continue the analogy, the investment is advantageous until its marginal cost (to acquire knowledge) equals its marginal benefit (flow of income). However, because older workers nearing the ends of their working lives generally earn higher revenue given their experience and careers, they find it less profitable to invest in “human capital”. By contrast, young workers should give greater consideration to a “human capital” investment, assessing its opportunity cost.

The Nobel prize-winner Theodore Schultz was the first to use the term “human capital” in the modern neoclassical economic literature¹. His idea was taken up and spread by Jacob Mincer and Gary Becker of the Chicago School. In particular, Becker's book entitled *“Human Capital”* (1964) became the “handbook” for many years. In his view, “human capital” was a “means of production” like physical capital; therefore, even if it would not substitute land, labour, or capital, it could be included in a production function as a separate variable.

The initial definition did not take account of certain central aspects of “human capital” because of the strict analogy drawn with physical capital. But even if from an economic point of view there are some similarities², human beings are more complex than machines³.

The first and most important difference is that “human capital” creates positive externalities. A more educated, experienced and able worker is more productive, but s/he probably causes an increase in the productivity of other workers as well (Lucas R., 1988). The economics of scarcity is thus replaced by the economics of self-generation.

The second difference is that the same level and kind of “human capital” (for example a degree in economics) differs among individuals and may paradoxically entail that every person has a distinctive stock of “human capital”.

Third, “human capital” is transportable and shareable. In general, knowledge is easily moved and shared, but this transfer does not prevent the original holder from using it.

More recently, attempts have been made to formulate a more extensive definition of “human capital” as: “the knowledge, skills, competences and *other attributes* embodied in individuals that are relevant to economic activity” (OECD, 1998). Of importance in this regard is not only the part of “human capital” generally identified with education but also *other attributes*, internal and external to human beings, such as ability and social capital (institutions, norms and relationships). In the latter case, reference is made to how the social and economic environment somehow affects the behaviour of individuals. For example, a certain kind and amount of “human capital” is accumulated

¹ The article “Investment in ‘Human Capital’” was published in *The American Economic Review*, 1961. The author expanded it into a book with the same title in 1971.

² First, it can be accumulated through an investment process whereby present consumption and revenues are foregone for future benefits. Second, a depreciation of “human capital” is possible if knowledge and ability are not exercised. Third, given a production function, the marginal productivity of “human capital” may be steady, increasing or decreasing.

³ For further details see: Bottone G. “Capitale umano e crescita economica”. ISPE Working paper, “Documenti di lavoro” n. 41/96.

according to the country in which the individual lives, given the level of income, the quality of the education system, and the capacity of the social system to appreciate and disseminate knowledge.

In other words, from an economic point of view and at a conceptual level, numerous difficulties arise when one seeks to define “human capital”. One may make a list of factors *endogenous* to an individual, such as education, training and ability, and of factors *exogenous* to him/her such as level of family education, social capital, system of relations and freedom of knowledge transmission. All of these factors affect “human capital”⁴.

3 THE EMPIRICS OF “HUMAN CAPITAL”

Measuring “human capital” is even more complicated. According to the OECD (1998): “*Measures of “human capital” that have been based on completed years and levels of schooling and on the return deriving from higher earning of those with more education are far from sufficient in relation to a broad definition of human skills and other attributes*”. Educational level cannot satisfactorily approximate “human capital” because it does not perfectly reflect the individual’s ability and *other attributes*. Labour-market status may not always reveal a worker’s competences, and because wages are not perfectly related to productivity⁵, wage differentials do not represent the sole explanation of real diversity in education and skills.

In fact, different statistical methods have been used to quantify the return to schooling, for instance OLS, instrumental variables, and experimental methods. They encounter three main problems:

- Ability bias: it is assumed that high-ability individuals acquire both a higher education and higher earnings. But, in fact, it is not possible to observe an individual’s ability;

⁴ In Yu W. (2001) provides a list of indicators of “human capital”, concerning mainly education and health.

⁵ Economic theory has put forward some interesting explanations for this case: trade-union control, “efficiency wages”, unemployment rate, unemployment benefits, institutional constraints, segmented markets. For further details see: Blanchard Olivier, *Macroeconomia*, Edizione italiana a cura di Francesco Giavazzi, Il Mulino, 2003.

- Return bias: this occurs when the individual's return is correlated with the decision of which level of education to achieve, so that returns to education may be heterogeneous;
- Measurement error bias.

Finally, other bias problems - mainly biased estimates of wage differentials - derive from the complexity of empirically observing the full productivity of workers.

It is difficult to avoid these problems when attempting to provide empirical evidence, and it is not possible to specify the function including all the above-listed relevant variables representing the *other attributes* that a person may have.

Nevertheless, numerous empirical studies have shown that a return to education exists, and that the level of education is positively correlated with the level of wages (Kearney, 2003). As we shall see, however, this is not always true, and probably for all the reasons mentioned above and others besides.

4 THE LIMITS OF HUMAN RATIONALITY IN “HUMAN CAPITAL” INVESTMENT DECISIONS

We concentrate now on the process determining the decision to invest in “human capital”, which is mainly approximated by the level of education.

The decision to invest in “human capital” may not be completely rational. Rationality would probably instead suggest on-the-job training and training⁶. Education has a cultural, social and historical value; as a consequence, individuals may make decisions about the proper investment in education not only by considering the marginal costs and future benefits of that investment, but for other reasons as well.

According to Simon (1986), *“What chiefly distinguishes the empirical research on decision making and problem solving from the prescriptive approaches derived from the theory of subjective expected utility (SEU) is the attention that the former gives to the limits on human rationality. These limits are imposed by the complexity of the world in which we live, the incompleteness*

⁶ According to Becker (1975), investment in on-the-job training has a large monetary component, whereas other “human capital” investments such as in health have a large psychic component.

and inadequacy of human knowledge, the inconsistencies of individual preference and belief, the conflicts of value among people and groups of people..."

Firstly, in regard to the "human capital" decision mechanism, it is interesting to consider who decides and how - that is, the agent of decision. For example, the decision to invest in "human capital" may be taken by agents other than the individuals involved: for example, parents or firms. As a consequence, one may observe that not only the level but also the kind of education owned by parents affects that of their children.

In the overlapping generation models, researchers concentrate mainly on the link between the "human capital" stock of parents and the "human capital" stock of their offspring. They do not investigate the decision process in itself. The parents' "human capital" is undoubtedly a variable that affects the "human capital" of their offspring. In fact, parents make decisions about the time that their children must spend on study and the quality of the education system by means of voting procedures (Glomm and Ravikumar, 1992)⁷.

It would be worthwhile investigating the decision process implemented by the agent-student more thoroughly, because if agents other than the agent-student make decisions about education investment, then the decision process may be less effective in terms of preference expression, and it may create conflicts of value between the student and the other agents. Moreover, parents make decisions on the basis of their system of values and thinking, and this system may be obsolete⁸. Decision-makers usually refer to past experience (Simon and March, 1993); only if they are faced by a new situation do they begin a problem-solving procedure. Indeed, if parents make education investment decisions, they may act by considering the easiest way for their children to find jobs, for example by choosing the same profession. If parents are lawyers, it is cheaper for their children to become lawyers because they can thus avoid the cost of any initial investment⁹.

Checchi, Ichino, Rustichini (1999) show that *students choose the level and the kind of education not only in relation to their previous curricula but also according to the level and the kind of education of their parents*. Operating here

⁷ It is possible to construct a "human capital" production function depending on the parents' bequest to their offspring, private or public education expenditures, time allocated by parents to the rearing of children, and the ability of the young (Ciriani, 2001).

⁸ Fiori S. (2005) examines the literature on bounded rationality, and emphasises that subjects represent the real world by symbols. These are the bases for intellectual capacity.

⁹ This may create a conflict between individual interests and collective interests. In other words, it may create a mismatch between the kind of education needed by employers and the kind of education supplied by persons seeking employment.

is the so-called *peer effect*: that is, the social environment encourages education commitment in turn correlated to family education. This is especially the case if entry to the education and training system is unrestricted.

As a consequence, a “generation lag” can be observed in the investment decision on the stock of “human capital”. In other words, parents decide the human capital investment of their offspring according to their past experience, so that adjustment to the labour market is slowed down.

The premise of the *Optimization* theory is the acquaintance of the agent and his/her goals. If the agent cannot be identified, his/her goals cannot be known. On the other hand, goals cannot be analysed separately by agents, because rational goals may give rise to different behaviours according to the individual concerned.

Moreover, rational behaviour may pursue, besides instrumental ends such as utility, profit or wealth, social ends as well. As a consequence, action is rational if it is aimed “*not only at economic goals but also at sociability, approval, status and powers*” (Granovetter, 1985). In the case of education investment, sociability, approval, status and power may be important. In any society, but especially in post-industrial revolution ones, social status and economic power perform a valuable role.

Finally, whatever the agent of decision and whatever the goals, it is impossible to obtain all the useful information, even if today the tools with which to gather the useful information are more advanced than in the past. The main element cited in favour of Simon’s “bounded rationality” is the lack of information in the decision mechanism. For example, when people decide their level of investment in education they cannot know for certain what their future flow of income will be.

Finally, the level of investment in education may be affected not only by the expected flow of wages but also by other variables. The one most frequently discussed is the probability of finding a job. Available in Italy is a database, called Excelsior, on the education and training characteristics of labour demand¹⁰. The SEU theory does not explain why, in Italy, firms demand certain professions and people do not perfectly match this demand. As a consequence, one empirically observes a mismatch between labour demand and the supply of workers with a certain level of education and training¹¹. The possible reasons

¹⁰ The Excelsior information system run by Unioncamere and the Ministry of Labour periodically issues information on labour demand with regard to the education, training and professions required by firms at local and central level. It explains which professions are difficult to find and the reasons. For further details see www.exceslior.net.

¹¹ For further details see G. Bottone, “I fabbisogni formativi delle imprese”, *Rivista di Politica Economica*, giugno 2000.

for this mismatch are “bounded rationality”, the generation lag in the “decision process”, and the social environment, which comprises numerous variables (the parents’ values system and their ability to help their children in their careers, the society’s values system, culture).

In conclusion, one can empirically observe an increase in the level of education without an increase in wage differentials and employment, and vice versa.

5 WAGE DIFFERENTIALS IN ITALY 1977-2004

According to many empirical studies, it was not possible to observe wage differentials in Italy until 1983 because of inflation. In the 1990s, wage differentials began to be more evident, for various reasons, of which the most important were:

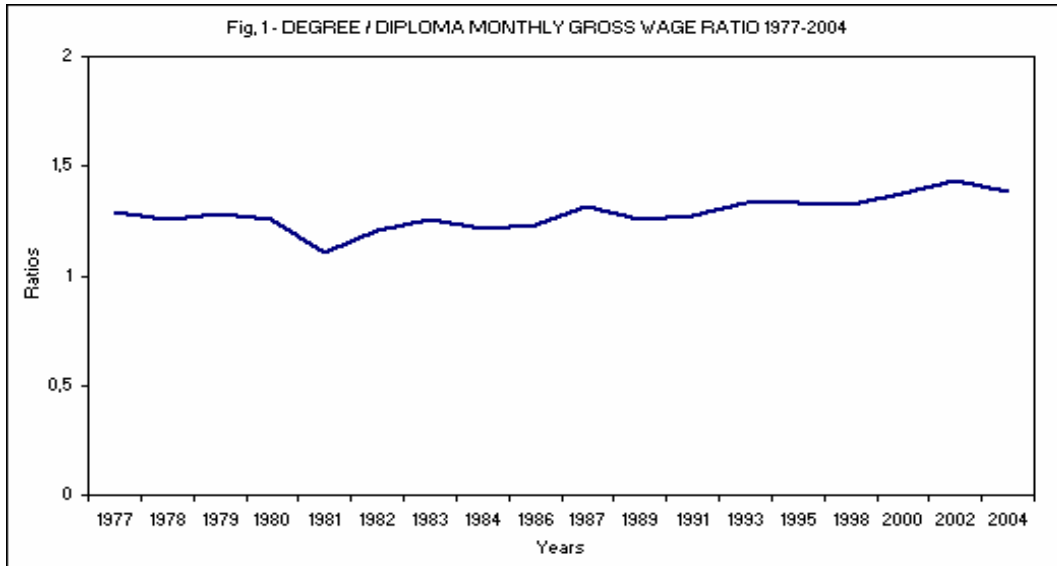
- institutional changes: trade unions lost some of their power, and policy-makers began to implement macroeconomic interventions to fight inflation;
- technological changes, mainly in the form of computerization, also played an important role in wage determination (Erikson-Ichino, 1994).

In order to verify empirically whether there is a return to education in Italy, we observed the gross wage ratio trend of graduates versus people with only an upper-secondary diploma, using the Bank of Italy Survey on Household Income and Wealth (for further details see the Appendix on database reconstruction)¹².

We divided the workers in the sample between male and female and created three age groups: 15-29, 30-49, over 50. We reconstructed the degree/diploma wage ratio by industry.. If the degree/diploma wage ratio was positive, we assumed that there was a “human capital” compensation; if it was negative, no value was given in that industry to a greater stock of “human capital” - approximated by a degree. Finally, if the wage ratio was close to one, it signified that possessing a diploma or a degree made no difference to the worker.

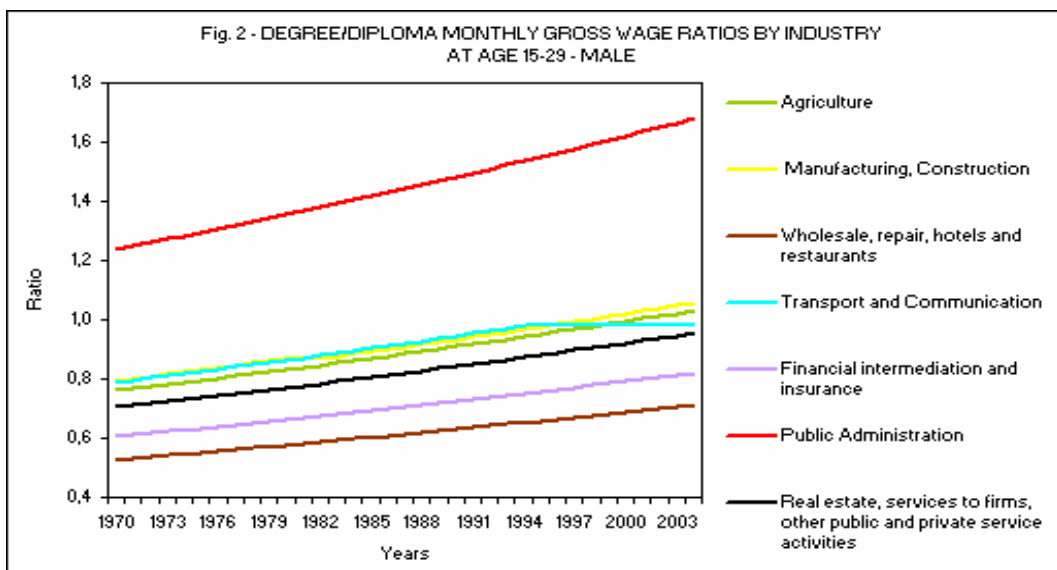
¹² Gross wages were reconstructed within the Specific Targeted Research Project “EUKLEMS-2003. Productivity in the European Union: A Comparative Industry Approach” supported by the European Commission within the Sixth Framework Programme of Research with contract No. 502049 (SCS8). For further details see www.isae.it.

Inspection of Figure 1, where wages are not disaggregated by any characteristic, shows that there is a positive correlation between education and incomes. But on considering Figures 2-7, where wages are disaggregated by sex, age and industry, the picture changes completely.

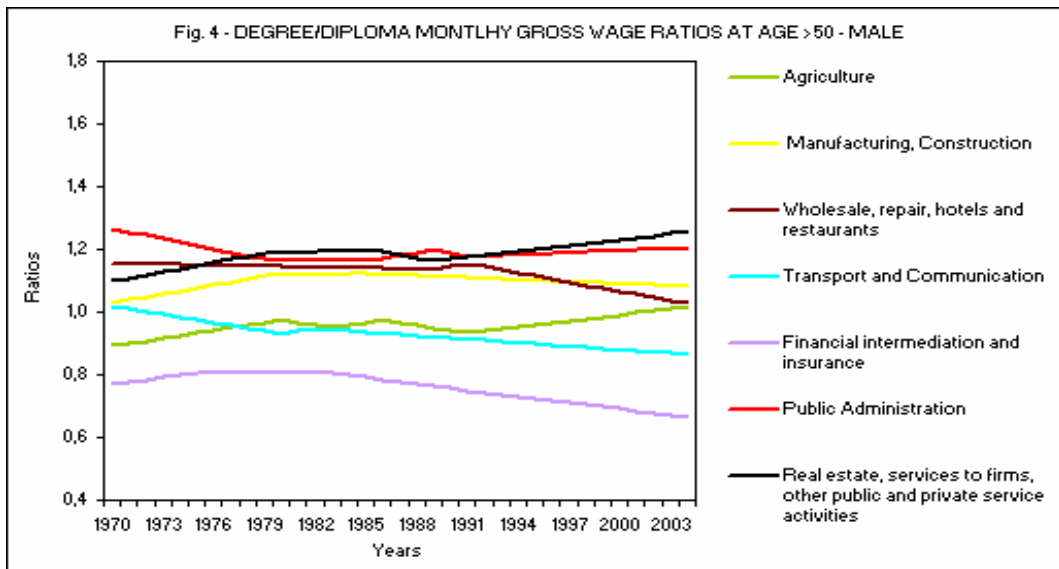
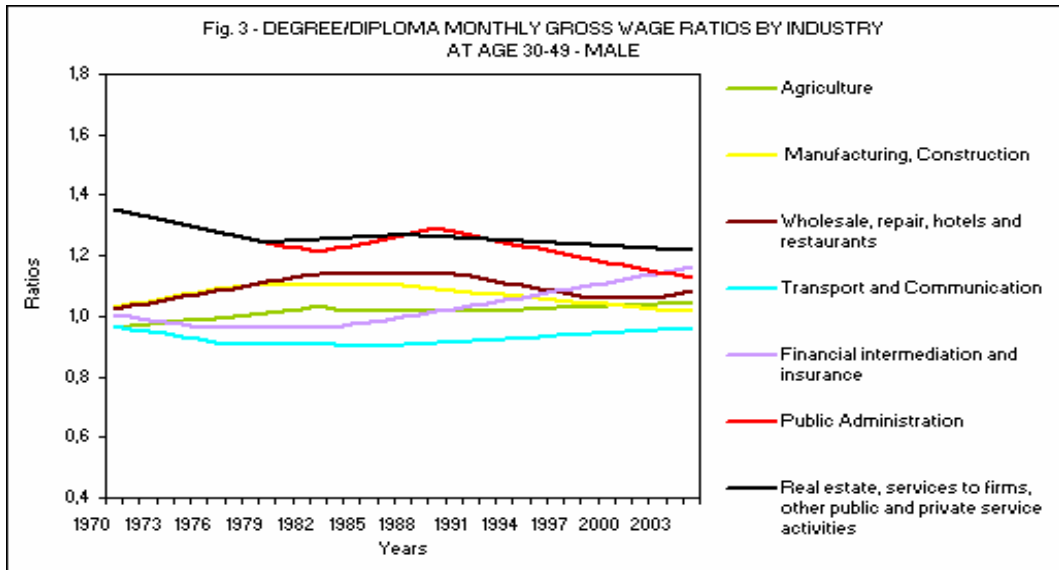


In fact, from Figure 2 to Figure 7, one may observe if a graduate worker earns more than a worker with a diploma and how the wage ratio changes over time. According to economic theory and empirical studies, one would expect there to be a positive wage ratio at least from the beginning of the 1990s, but this is not the case.

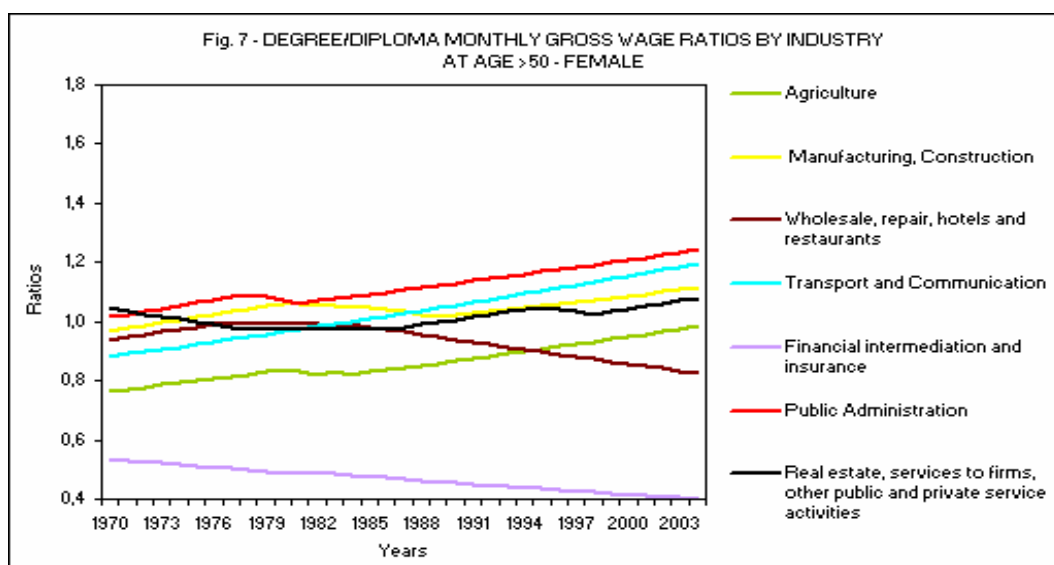
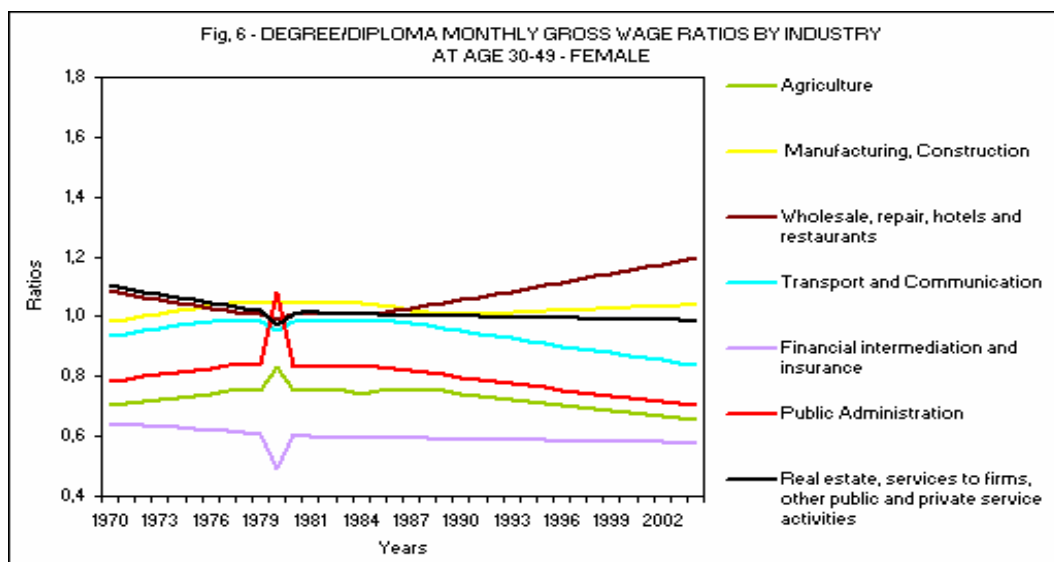
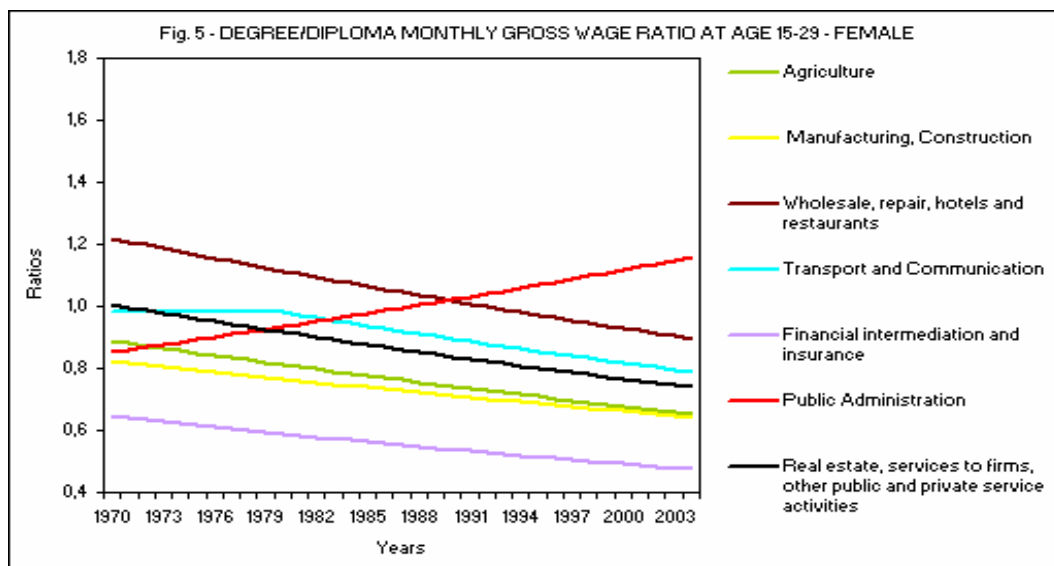
Summarising, only for males aged 15-29, working in the public administration is there a positive and increasing wage ratio. In other cases, the situation depends upon the year and the industry (Figure 2).



Also to be observed is a positive wage ratio - a “human capital” compensation - for males aged 30-49 (Figure 3) and for males aged over fifty (Figure 4) working in the public administration, wholesale, repairs, hotel and restaurants, manufacturing, construction and services, although the compensation has diminished since 1990s, except for males aged over fifty working in the services industry.



The situation appears much worse for females. In particular, for females aged 15-29 and for those aged 30-49, there was a “human capital” compensation from 1970 to 1990 in wholesale, repairs, hotels and restaurants, and from 1990 to 2004 in the public administration (Figures 5 and 6).



In general, males benefit more than females from possession of a degree (Figures 5-7). A female must wait until she is over 50 to see her degree recognised, but only from the beginning of the 1990s and not in every industry. This is true except in financial intermediation, agriculture, wholesale, repairs, hotels and restaurants.

Moreover, the data show that agriculture, transport and communications are the least competitive sectors for males and for females. Whilst it is understandable that agriculture needs fewer graduates, it is difficult to explain why in the transport and communications industry - which should be high technology industries - there is no compensation for "human capital".

In regard to the reasons for this gender gap, the literature on earning function may offer an explanation for our findings¹³. The discontinuity of the female earning function may depend upon the interruption or intermittence of labour-force participation by women. It would be worthwhile investigating whether it is possible to apply this explanation to Italy and to every historical period. Moreover, the female earning function may be the result of a voluntary choice unrelated to the level of education: for example, women may choose to work less so that they can take care of their children.

Our data do not completely confirm the theory. There is no clear economic compensation for "human capital" in Italy. There may be many reasons for this, and they are probably linked to the institutional characteristics of Italy. In other words, institutional quality and cultural specificities may affect the social and economic value attributed to human capital.

6 POLICY- MAKING IMPLICATIONS

It is important for our treatment to address the age-old question of whether demand creates supply, or whether supply creates demand. What is the process that determines the amount and the quality of public investment in education?

According to our findings, individual education demand is not guided by rational behaviour. The traditional Mincer individual human capital function is as follows:

¹³ Hwei-Lin Chuang and Hsih-yin Lee (2003), the return on Women's "human capital" and the Role of Male attitudes Toward Working Wives Gender Roles, Work interruption, and Women's Earnings in Taiwan, *American Journal of Economics and Sociology*, Vol. 62, April.

$$I_k = I_k(W, C)$$

where the individual's human capital investment I_k depends on the flow of gross income during his/her lifetime, from which one must subtract the value of the initial cost C . If we extend this function to include other relevant variable as follows:

$$I_k = I_k(W, J, K, S_e)$$

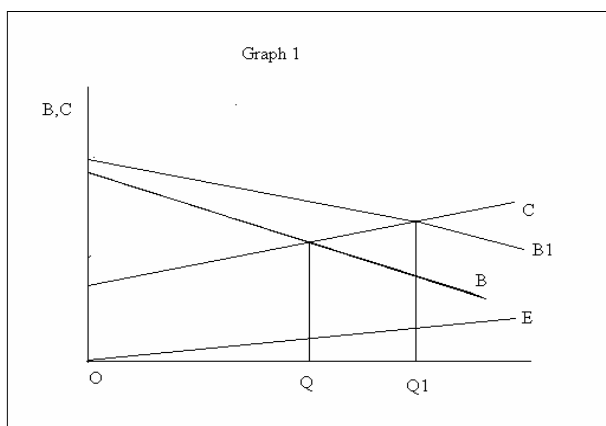
where W is the flow of income, J is the probability of finding a job, K the parents' stock of human capital, and S the level of education of the community - as an approximation of the social value given to education by a community - one can probably reduce the normal bias to be found in econometric studies on the subject.

In economic terms, however, the problem can be considered in reverse, so that W becomes the economic value given by the society to human capital: the more education is correlated to the flow of income earned during the lifetime, the greater the economic value given to education by a society. The individual's choice concerning the amount of human capital investment probably depends on the probability of finding a job and other social factors (see paragraph 4), and W becomes especially relevant because it denotes the economic value of education.

Moreover, supposing that economic value is correlated to social value, in Italy, where the human capital premium is not clearly and rationally applied, people give scant importance to education and knowledge. There are numerous institutional explanations for this phenomenon: for example, the power of trade unions in certain industries, and the absence of meritocracy.

There is, however, the other side of the issue to be considered: what about education supply? What is the proper education investment that policy-makers should make? Is education a "merit good"?

The answer may have two aspects: one related to quantity, the other to quality. Whatever the case may be, the cost/benefit evaluation of public education investment should consider the positive externalities that do not derive directly from the production process. For example, education reduces criminal behaviour, enables individuals to participate more efficiently in the political process, and carries direct consumption externalities. Because these benefits are not reflected in factor payments, they are not considered in empirical research. By definition, externalities are not reflected in the payments of the factors generating them, but they may be reflected in the payments of those benefiting from them.



When policy makers evaluate the level and the quality of investment in education, they probably do not take account of the positive externalities generated by it; so that in the cost-benefit analysis, benefits appear lower than they actually are (Graph 1).

The problem is measuring the above-mentioned externalities, the “*E*-curve”, generated by education: *E* is the social benefit curve to be added to the benefit curve *B*.

Moreover, in the public choice literature, log-rolling models exemplify the exchange procedures among pressure groups and describe the end of the process. However, analysis of the role of pressure groups in the design and promotion of public projects and programmes has been somewhat neglected. It would be useful to have a model of public investment decisions which comprises this issue (Shapiro, 1971). It may be that policy-makers do not choose the level of education investment by considering costs and benefits, but do so under the pressure of lobbies and voters¹⁴, or under the pressure of budget control¹⁵.

Summarising, the structure of social and economical incentives is important for individuals to be able to accumulate human capital. On the other hand, the quality of the education and training system, in terms of capacity to generate quality human capital, is not only determined by the composition and the amount of public expenditure devoted to it, but also by the institutional framework¹⁶.

¹⁴ In Italy, for example, since the 1970s policy-makers have sought to reform public education, but they have encountered numerous difficulties due to the power of the trade unions and obstruction by teachers, who may be considered a lobby. The result has been a great deal of confusion and a lack of certainty, because the rules often change, sometimes even in the opposite direction.

¹⁵ If the labour cost of the education system is high, there are fewer resources for investments.

¹⁶ For further details see Bottone (2008).

APPENDIX

Details on database reconstruction

The original source of the reconstructed database on total labour cost is the Bank of Italy *Surveys on Households' Income and Wealth*. The period covered is from 1977 to 2004. The Bank of Italy does not provide a survey for every year. Therefore, the years 1985, 1988, 1990, 1992, 1994, 1996, 1997, 1999, 2001 and 2003 are not available.

For our purposes, we used the data on individual wages net of taxes disaggregated by gender, age, education, and position in the occupation.

In the Bank of Italy surveys, the interviewees were asked to declare personal characteristics - sex, age, occupation, geographical area, household composition, education level - and their net wages (earnings plus monetary values of fringe benefits) as reported in the "wage packet" (*busta paga*).

In order to reconstruct total labour costs from the point of view of the firms, the following adjustments were made:

- 1) family allowances (*assegni familiari*) were deducted from net wages;
- 2) estimated labour income taxes and social security contributions were included;
- 3) the individual total labour costs of employers were estimated¹⁷.

We now furnish some details on these adjustments.

A1 Household Benefits (*Assegni Familiari*)

The first step was to subtract household benefits from net incomes, following the household benefits law.

In order to find households with a disabled member, we used the variable identifying the kind of pension received: that is, that of the member with a disability pension if s/he has no other income.

Household benefits were introduced in Italy in 1934. The Italian government established this kind of grant for households with at least two children, in order to compensate the reduction of hours worked .

¹⁷ Only compulsory social security contributions were taken into account for the adjustment, since the declared net incomes included other forms of insurance expenditure.

Since 1934, family benefit legislation has undergone numerous changes.

Over the years, the general number of recipients has increased, and the previous link with the “reduction” of hours worked has been eliminated. Household benefits were granted to employees, not only with reference to their children but also to their spouses and their parents with incomes below a certain amount fixed by law. Moreover, the amount granted was periodically revised. In other words, the benefits became a type of “wage integration”.

After the Tax Reform of 1974, Personal Income Tax (*IRPEF*) was to be paid on family benefits, but the amount granted was increased by 10% if the recipient paid taxes deducted at source. In 1977, 50% of family benefits became tax-free and were increased by 5%. In 1978, they became completely tax-free and were paid by the national Social Security System (INPS) .

Two further important reforms followed in 1983 and in 1988.

In 1983, together with the ordinary family benefit granted in the past, supplementary family benefits were introduced for households with relatively low incomes. They were granted only for children aged under 18, and their amount was related to the household income, the household size and the householder’s civil status.

In 1988, a single family benefit was created to replace the ordinary and supplementary family benefits. It was paid to households if at least 70% of their incomes was made up of work incomes and in proportion to the household size and income. In order to determine family size, the persons considered members of the household were spouses, children aged under 18, and children aged over 18 if they were students or disabled. Whether they earned less than a certain amount was no longer relevant. In addition, a single-person household was considered eligible if the person was permanently handicapped.

Since 1988, the family benefit granted has been raised in 1994, 1995 and 1996: in particular, 20,000 lire in 1994 for every child except for the first and 84,000 lire in 1995 for every child except for the first two. In 1996, the amount granted was increased only for up to four-member households and for single-person households (25% more).

Finally, income brackets have been linked to the cost-of-living index (a workers’ consumer price index).

A 2 Taxation

In order to apply the tax rates to net incomes minus family benefit, we first had to compute the net income brackets correspondent to the gross income brackets laid down by law and then calculate the gross income tax.

In Italy, after the Tax Reform of 1974, personal income tax (*IRPEF*) became largely progressive and was levied on taxable income given by gross income minus tax expenditures (such as medical expenses, mortgage interest). We did not take tax expenditures into account because they do not represent a reduction of costs for firms.

In general, from 1977 to 1983, income brackets and statutory tax rates did not change. The policy-makers regarded the great number of income brackets and tax rates as necessary to guarantee better progressiveness.

Since 1983, the number of income brackets, and consequently the number of statutory tax rates, have been reduced in order to simplify Tax System. In particular, the tax rates diminished from 1983 to 1997, and then increased again between 1997 and 2002 because of budget deficit reducing policies.

A 3 Tax Allowances

In Italy since the 1970s, tax allowances have been introduced in order to compensate for “fiscal drag”.

There are three kinds of tax allowances: for the “production” of incomes, for spouses, and for children and for other relatives living with the householder if they had very low or no income. The level of income to qualify as a “dependent relative” is established every year by law.

In general, in order to perform that last adjustment, the components of the household falling with the category “other relatives” should have been indicated, such as father, mother, sister and brother of the recipient. Unfortunately, in some years, the variable giving information on the relationship among the members of the household had only four entries: householder, spouse, sons and daughters, others. Therefore, all those living with the householder were classified with “others”, even non-relatives. We chose to consider the category “others” as comprising relatives of the householder in particular cases, making hypotheses on the kind of relation, given the age, the gender and the structure of the household.

Until 1995, tax allowances for spouses and children were fixed and not linked to the householder’s income. In 1996, the legislator instituted income limits for recipients. Moreover, if the householder did not have a spouse, the tax allowances for children were doubled.

Until 1999, tax allowances for other relatives were fixed as well, and independent from the householder’s income. However, in 2000 and 2002, income limits were set in this case as well.

Until 1992, tax allowances for the production of income were fixed. In 1979, in 1984 and in 1985 further tax allowances were scheduled in order to balance personal-income tax reforms in those years. We encountered many problems in estimating effective average tax allowances for the years 1984 and 1985. In those years, the legislator gave the people the choice between further tax allowances and the deduction from gross income of 50% of taxes or social security contributions. The choices actually made by the subjects in the sample are unknown; therefore we could not take further tax allowances into account. From 1986 to 1992, it was possible to include the further tax allowances provided by law, introduced to correct some distortions created by the personal-income tax reforms. In particular, they were used to correct tax rates for people falling in higher income brackets. Since 1993, income limits have been set for tax allowances of this kind.

When computing net income tax (gross income tax minus tax allowances), we found cases where tax allowances were higher than gross income tax. Italy does not have a negative income tax, so that in these cases net income coincide with gross income.

A 4 Social Security Contributions

In Italy, Social Security Contributions for disability, old age and surviving are paid both by workers and employers.¹⁸ They must be computed on taxable income (tax base): that is, until 2002, gross income minus tax expenditures such as medical expenses and mortgage interest. In our database, taxable income coincided with gross income. We then applied the average rates of social security contributions to gross income, which was computed as explained in paragraph 1.2. As a result, we obtained the amount of contribution paid by firms and employees.

In Italy, social security contributions are differentiated according to industry and occupation. Within industry, employers and employees pay a given “contribution rate” in relation to the firm’s size - determined by the number of employees - and the occupation - white and blue collar.

¹⁸ In Italy these are called IVS contributions and are the main social contributions.

A 5 Missing data and the problem of outliers

In the original database, in some cases net incomes were much lower than the average incomes, for two main reasons. First, we observed some duplicate cases in the original income files, because a person may have two or more jobs. Usually, in the original files, the wage or salary earned in the secondary work activity is lower than the wage or salary earned in the primary work activity. Second, sometimes the annual wage is lower in average, because people do not work for the entire year (seasonal workers, people hired during the year and so on). For the latter reason, we chose to compute monthly labour income.

Moreover, as Biancotti C. et al. (2004)¹⁹ pointed out, other types of errors were present in the database. One of these is due to the unit of measurement. In some cases, the interviewees declared their monthly wage rather than their yearly wage, or their yearly wage in millions of lire rather than in thousands. However, in general, we observed that labour incomes are more reliable than other incomes (autonomous), which are affected by under-reporting problems.

¹⁹ Biancotti C. et al., Errori di misura nell'Indagine sui bilanci delle famiglie italiane, *Temi di Discussione*, n. 522, Banca d'Italia, settembre, 2004.

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