Education and employment status: a test of the strong screening hypothesis in Italy

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Abstract

We apply the comparative techniques originated by Wolpin, K.I. (1977, Education and screening, American Economic Review, 67, 949–958) and Psacharopoulos (1979, On the weak versus the strong version of the screening hypothesis, Economics Letters, 4, 181–185) to discriminate between the ‘weak’ and ‘strong’ screening hypotheses. Controlling for sample selection, we find evidence for weak but not strong screening in the Italian labour market. [JEL J3, J24, J41] © 1999 Elsevier Science Ltd. All rights reserved.

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1. Introduction

The relationship between schooling and productivity has long intrigued economists and in recent years two contrasting views have emerged. Human capital theory holds that schooling directly augments individual productivity (Mincer, 1974; Becker, 1975). The screening hypothesis, in contrast, attests that schooling merely signals inherent productivity. To be sure, the strong screening hypothesis (SSH) presumes productivity to be immutable with schooling being used exclusively as a signal (Psacharopoulos, 1979). The weak screening hypothesis (WSH), on the other hand, concedes that whilst the primary role of schooling is to signal, it may also augment inherent productivity (Spence, 1973; Arrow, 1973; Stiglitz, 1975).

The observed correlation between education and earnings renders the debate over the true nature of schooling largely redundant at an individual level. Regardless of whether schooling signals or augments productivity, it certainly enhances lifetime earnings and as such represents a good investment for individual workers (Psacharopoulos, 1994). Whether or not schooling is a good investment for society is less clear.1 If its only purpose is to provide signals to prospective employers then questions arise as to the appropriateness of investing in the expansion and/or qualitative upgrading of schooling.2 Indeed, if evidence is found in support of the SSH then student-centred funding policies are perhaps justified because there is a divergence between the private and social marginal benefit of higher education. If, however, evidence is found in support of the WSH then the debate should centre upon which certificates are typically acquired as screens—and perhaps have little effect on productivity—and which augment productivity to a greater extent. Finally, if evidence is found to reject

1 It could be argued that the debate is equally redundant at the social level. The fact that firms still pay higher wages to more educated workers means that either education raises productivity or that it most efficiently signals desirable, but unobservable, individual characteristics (Lang, 1994).

2 In terms of the original Spencian analysis, there is no guarantee that a signalling equilibrium will be efficient (see Berg, 1971; Sicherman, 1991).
screening in favour of human capital theory then student-centred funding may be criticised since increased productivity via increased education represents both an individual and social benefit.

Both the SSH and WSH have been the subject of numerous empirical tests, predominately on data from the USA (see Weiss, 1995). One of the most popular approaches has been to use a particular subsample of the population as an unscreened control group and then to compare the rates of return to education across these and other screened subsamples. Psacharopoulos (1979), for example, compares returns across relatively competitive (e.g. private) and non-competitive (e.g. public) sectors, presuming that screening is more likely in non-competitive environments where bureaucratically set wage rates can deviate persistently from somewhat esoteric marginal products. Advocates of the so-called ‘P(sacharopolous)-test’ include Lee (1980); Ziderman (1992); Lambropolous (1992); Arabsheibani and Rees (1997).

A similar approach has been to focus on self-employed workers as the unscreened control group (Wolpin, 1977). The presumption here is that since the self-employed have no need to signal inherent ability, any return they make to education must represent a true return to human capital investments. Such a methodology has yielded some support for weak, but not strong, screening (Riley, 1979; Katz & Ziderman, 1980; Freland & Little, 1981; Shah, 1985; Tucker, 1986; Cohn, Kiker & Mendes De Oliveira, 1987; Grubb, 1993).3

A potential problem with both approaches is the implicit assumption that education is acquired solely with a view to future employment opportunities. But education may be acquired for non-investment purposes and employment ambitions are not always realised. Blanchflower and Oswald (1990), however, found that respondents who were self-employed at age 23 were twice as likely as employees to have predicted at age 11 their worker type 12 years hence and that such ‘childish predictions’ were not random. This is important since it is assumed in most screening models that individuals formulate their employment plans on the basis of an offered wage schedule set by potential employers. If the decision to be self-employed or employed in an unscreened sector is made prior to the acquisition of certification then, under the screening hypothesis, we would expect such individuals to acquire less certification for signalling purposes relative to both potential employees and to those who have ambiguous aims.

More generally, there is evidence to suggest that the extent to which education is used as a screen depends critically on the nature of indigenous cultures and institutions. For instance, evidence of screening has been found in Israel (Ziderman, 1992), Japan (Sakamoto & Chen, 1992), Singapore (Liu & Wong, 1982) and Australia (Miller & Volker, 1984), but not in Greece (Lambropolous, 1992), Malaysia (Lee, 1980), the Netherlands (Oosterbeek, 1992), Sweden (Albrecht, 1981) or Egypt (Arabsheibani, 1989). Mixed results have been found for the UK (Shah, 1985; Psacharopoulos, 1979) and the USA (Riley, 1979; Layard & Psacharopoulos, 1974).

We contribute to this debate by focusing on the Italian labour market. Adopting both the Wolpin (1977) and Psacharopoulos (1979) methodologies on data derived from the 1989 Banca d’Italia Survey of Household Income and Wealth, and controlling for sample-selection bias, we find evidence in favour of weak but not strong screening.

The remainder of the paper is set out as follows. Section 2 presents some background pertaining to the Italian education system. Section 3 discusses the data and methodology. Section 4 presents the results and Section 5 offers some overall conclusions.

2. Background

The Italian labour market is a particularly interesting case to explore given its apparently endemic high rates of unemployment and low rates of educational attainment. To some extent, the latter factor reflects the severe under-funding of the education system, the relatively low minimum school leaving age of 14 and the subsequent small proportion of students continuing through to university-level education (European Commission, 1994). Indeed, relative to the rest of Europe, Italy has higher average government expenditure per primary-school pupil, but lower average government expenditure per student in higher education (Anon., 1995).

The Italian education system provides non-compulsory nursery education for 3- to 5-year-olds, whilst school attendance is compulsory for children between the ages of 6 and 14 years. Primary education starts at the age of 6 and continues until the age of 11 when pupils sit the Licenza elemetare examination (primary school certificate), which enables progression to middle school. Middle school education terminates at the age of 14 when pupils sit the Licenza di scuola media examination.
(intermediate certificate) the attainment of which permits access to higher secondary schools.

Higher secondary schools educate 14- to 19-year-olds and fall into one of five categories; grammar schools, art schools, teacher training schools, technical institutes and vocational institutes. Graduation from a higher secondary school allows an individual to apply to university or allows a graduate from a vocational institute access to an intermediate profession. Italian university courses normally last for at least 4 years and very few students receive a student grant from the state. Unlike the UK, Italy has no specific student loans system and enrolment fees have to be paid by the individual.

Although re-examinations are more common in Italy than in the UK (see Raban, 1991), figures for 1989 show that approximately 6 percent of Italians (aged 25 to 64) graduated from university, in comparison to 9 percent of the population in the UK. In comparison, the population proportions with only nursery, primary or lower secondary education as their highest education level are 74 percent for Italy and 33 percent for the UK (for more details see OECD, 1992, Table 1C).

3. Data and methodology

Our data are derived from the 1989 Banca d’Italia Survey of Household Income and Wealth (SHIW). The questionnaire comprises six main sections which record household characteristics, details of income, savings, consumption, wealth and the banking behaviour of a national cross-section of Italian families.

From the 1989 survey a subset of data for male household heads who were working full-time was constructed—see Table 1 for details of the variables selected. Due to problems encountered with missing data we were obliged to use family net disposable income as a proxy for individual income. We controlled for household composition, however, by selecting only those respondents who reported that there were no other wage earners in their household.

The following Mincerian earnings equation was estimated for full-time workers:

\[ \ln W = \alpha + \beta_1 c + \beta_2 x + \beta_3 x^2 + \beta_4 d + \epsilon \]

where \( W \) = hourly earnings, \( \alpha \) = average wage for reference respondent, \( c \) = educational certification dummies, \( x \) = years of labour market experience (proxied by age), and \( d \) = vector of regional, marital status and industrial dummy variables. The certification dummies in vector \( c \) denote the respondent’s highest level of education, namely: (i) low education—i.e. no formal education or primary education; (ii) intermediate (school) education; (iii) high (school) education; (iv) university education.

Our empirical estimation is rendered somewhat problematic by the potential for sample selection bias. Our earnings data are derived from observing a particular employment contract and there may be variables that affect both the probability of observing such a contract and the return to any factor employed under such a contract. More energetic and/or ambitious individuals may, for example, be more (or less) likely to become self-employed and thus some allowance for incidental sample truncation is required. The problem is further complicated because there is strong evidence to suggest that the real dimension of employment choice in Italy is in fact trivariate: namely, private sector employment, public sector employment and self-employment (see Bardasi & Monfardini, 1997). To control for such a possibility we therefore adopted both the standard Heckman (1979) bivariate, and Lee (1983) multivariate, sample selection approaches.\(^5\)

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\(^4\) This is calculated from household net disposable income, hours and months worked in 1989 (in 1000s Italian lire).

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\(^5\) Our sample selection results are set out in Table 4.
4. Results

Table 2 presents sample statistics for the various subsamples used in the study. It is apparent that the proportion of self-employed workers with ‘low’ education is significantly higher than that for either public or private sector employees. The proportion of employees with ‘middle’ or ‘high’ education, in contrast, is significantly higher than the proportion for the self-employed. These two observations accord with the screening hypothesis in that the self-employed are relatively less interested in acquiring education than employees. Note, however, that there is no substantial difference in the subsample proportions of private sector or self-employed graduates. This might be taken as evidence that higher education levels do not differ by worker type, perhaps due to their human capital value or because self-employment plans may not come to fruition and students are hedging against their future.

Our estimated earnings equations are set out in Table 3. We present two sets of results: first, earnings equations for employees and self-employed workers with bivariate sample selection; and second, we follow Bardasi and Monfardini (1997) in presuming that the real dimension of employment sector choice in Italy is actually trivariate (private sector employee, public sector employee, self-employed). We are thus able to obtain some perspective on both the Wolpin (1977) and Psacharopoulos (1979) methodologies.

4.1. Bivariate sample selection

Considering the bivariate results first, it is apparent that age and age-squared are both significant in the determination of the earnings of both worker types and suggest a concave relationship between earnings and age. Following Riley (1979), we would predict that if education is an effective screening device, then it should be an accurate signal of worker productivity. The estimated earnings function of employees is, therefore, expected to fit the data better than that for the self-employed. This is indeed the case with approximately 24 (16) per cent of the variation in employed (self-employed) earnings being explained by the regression, suggesting a rejection of the null hypothesis that there is no evidence of screening.

The WSH presumes that all worker types invest in education for human capital to the same extent, whilst screened workers also invest as a signal of inherent productivity. Unscreened workers have no need to signal their productivity and we therefore expect their wages to be relatively less correlated with education. Any return to the these groups from education should represent a ‘pure’ return to investment in human capital since they gain nothing from education as a signal. Screened workers, in contrast, need to signal their ability in the labour market and thus accrue a return from both the signalling and productivity augmenting functions of education. The WSH implies, therefore, a higher return for the screened relative to the unscreened subsample. The SSH, in contrast, implies a significant return for the screened subsample only.

Our results would appear to support weak, but not strong, screening. It is apparent from Table 3 that, relative to respondents with only primary level or no formal education, the possession of an intermediate school certificate or university degree significantly raises the earnings of both worker types, whilst the possession of a high school certificate significantly raises the earnings of employed, but not self-employed, workers. Moreover, the rates of return to both intermediate and high school education are significantly higher for employees, whilst there is no significant difference in the rates of return to university education across the two subsamples.

4.2. Trivariate sample selection

A similar conclusion may be drawn from the trivariate sample selection results. The two employee subsample regressions explain more of the variance of earnings than the self-employed subsample regression, whilst the coefficients on the educational certificate dummy variables are significant for all three subsamples, but larger for the two employee subsamples. Thus again one would conclude tentatively in favour of weak, but not strong, screening.

Focusing exclusively on the employee subsamples allows us to perform a P-test comparison across the ‘competitive’ private and ‘uncompetitive’ public sectors. The presumption underpinning the P-test is that screening is relatively more likely in the public sector where wages are more readily linked to education via longstanding bureaucratic practice. Psacharopoulos argues that under the WSH employers will offer relatively high starting salaries to the more educated, ceteris paribus. Under the SSH, they will maintain this differential over time—i.e. even after the employee’s true productivity has been discerned.

Our results would appear to offer some support for the SSH, with the returns to education in the public sector dominating those in the private sector even when we proxy for an individual’s job tenure through age. Such a conclusion is, however, extremely tentative. We are unable to control fully for tenure and the coefficients on both age terms are insignificant. Moreover, the returns to education in the private sector are, albeit relatively low, nevertheless significant. More generally, the results, which accord with those of Bardasi and Monfardini (1997), might simply reflect the peculiar aspects of the Italian public sector:

The public sector characterises in Italy … the degree of job security (which is virtually complete), the level
### Table 2
Summary statistics

<table>
<thead>
<tr>
<th></th>
<th>All workers</th>
<th>All employed</th>
<th>Private sector employees</th>
<th>Public sector employees</th>
<th>Self-employed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
</tr>
<tr>
<td>ln earnings</td>
<td>10.182</td>
<td>0.478</td>
<td>10.109</td>
<td>0.420</td>
<td>10.097</td>
</tr>
<tr>
<td>Married</td>
<td>0.868</td>
<td>0.338</td>
<td>0.880</td>
<td>0.325</td>
<td>0.901</td>
</tr>
<tr>
<td>Divorced/widowed</td>
<td>0.028</td>
<td>0.166</td>
<td>0.024</td>
<td>0.155</td>
<td>0.023</td>
</tr>
<tr>
<td>Single</td>
<td>0.104</td>
<td>0.305</td>
<td>0.095</td>
<td>0.293</td>
<td>0.076</td>
</tr>
<tr>
<td>No. children</td>
<td>1.491</td>
<td>1.135</td>
<td>1.545</td>
<td>1.141</td>
<td>1.595</td>
</tr>
<tr>
<td>Degree</td>
<td>0.094</td>
<td>0.292</td>
<td>0.094</td>
<td>0.292</td>
<td>0.078</td>
</tr>
<tr>
<td>High education</td>
<td>0.295</td>
<td>0.456</td>
<td>0.304</td>
<td>0.460</td>
<td>0.274</td>
</tr>
<tr>
<td>Intermediate education</td>
<td>0.341</td>
<td>0.474</td>
<td>0.352</td>
<td>0.478</td>
<td>0.358</td>
</tr>
<tr>
<td>Low education</td>
<td>0.585</td>
<td>0.493</td>
<td>0.251</td>
<td>0.434</td>
<td>0.290</td>
</tr>
<tr>
<td>Age</td>
<td>42.252</td>
<td>10.317</td>
<td>41.669</td>
<td>9.726</td>
<td>41.806</td>
</tr>
<tr>
<td>North West</td>
<td>0.180</td>
<td>0.384</td>
<td>0.174</td>
<td>0.379</td>
<td>0.175</td>
</tr>
<tr>
<td>North East</td>
<td>0.128</td>
<td>0.335</td>
<td>0.115</td>
<td>0.319</td>
<td>0.111</td>
</tr>
<tr>
<td>Central</td>
<td>0.204</td>
<td>0.403</td>
<td>0.233</td>
<td>0.423</td>
<td>0.243</td>
</tr>
<tr>
<td>Island</td>
<td>0.184</td>
<td>0.388</td>
<td>0.181</td>
<td>0.385</td>
<td>0.174</td>
</tr>
<tr>
<td>Construction</td>
<td>0.175</td>
<td>0.380</td>
<td>0.183</td>
<td>0.387</td>
<td>0.224</td>
</tr>
<tr>
<td>Energy</td>
<td>0.192</td>
<td>0.394</td>
<td>0.225</td>
<td>0.418</td>
<td>0.276</td>
</tr>
<tr>
<td>Commerce</td>
<td>0.173</td>
<td>0.378</td>
<td>0.072</td>
<td>0.258</td>
<td>0.088</td>
</tr>
<tr>
<td>Transport/communications</td>
<td>0.102</td>
<td>0.303</td>
<td>0.122</td>
<td>0.327</td>
<td>0.149</td>
</tr>
<tr>
<td>Finance</td>
<td>0.026</td>
<td>0.158</td>
<td>0.033</td>
<td>0.178</td>
<td>0.040</td>
</tr>
<tr>
<td>Consultancy</td>
<td>0.028</td>
<td>0.166</td>
<td>0.026</td>
<td>0.159</td>
<td>0.032</td>
</tr>
<tr>
<td>Public sector</td>
<td>0.138</td>
<td>0.345</td>
<td>0.184</td>
<td>0.388</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Sample size 1169 853 696 157 316
of education generally required (very high, particularly in some sub-sectors like those of health and education), the structure of working hours in most sub-sectors (which offer a large amount of leisure and the opportunity of a collateral activity) and the social reputation of many occupations. On the other hand, the private sector leaves more scope for individual initiative and personal responsibility and, thanks to a greater mobility and flexibility, offers more possibilities for a career. (Bardasi & Monfardini, 1997, p. 4.)

A definitive conclusion is, perhaps, unwise and we would prefer to conclude in favour of weak screening and to offer our findings as an incitement to future research into this issue.

4.3. Consumer screening

As a final test, we considered the Lazear (1977) ‘consumer screening’ hypothesis that self-employed professionals acquire qualifications in order to signal the quality of their services to potential clients, thereby upwardly biasing the coefficients on educational certificates for this worker type. Removing self-employed professionals from the sample, re-estimating the various equations and performing Chow (1960) equality tests yielded F-statistics which in all cases rejected the presumption of such a bias (see Table 3).

5. Final comments

In this paper we have applied the comparative techniques of Wolpin (1977) and Psacharopoulos (1979) to discriminate between the ‘weak’ and ‘strong’ screening hypotheses. Comparing the relative earnings of employed and self-employed workers, and controlling for sample selection, we find evidence of weak, but not strong, screening. Focusing only on employed workers and comparing the relative earnings of private and public sector workers, we find tentative evidence of strong screening, although the peculiar aspects of the Italian public sector might warrant some caution in this conclusion.
Table 4
Sample selection

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Logit</th>
<th>Multinomial logit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reference category:</td>
<td>Reference category:</td>
</tr>
<tr>
<td></td>
<td>Self-employed (N = 316)</td>
<td>Self-employed (N = 316)</td>
</tr>
<tr>
<td></td>
<td>Employed (Public/private sector)</td>
<td>Employed (Private sector)</td>
</tr>
<tr>
<td></td>
<td>N = 853</td>
<td>N = 696</td>
</tr>
<tr>
<td></td>
<td>Coefficient</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Married</td>
<td>0.1489 (0.532)</td>
<td>0.3923 (1.474)</td>
</tr>
<tr>
<td>Divorced/widowed</td>
<td>−0.4205 (−0.866)</td>
<td>−0.0525 (−0.114)</td>
</tr>
<tr>
<td>No. of children</td>
<td>−0.0738 (0.854)</td>
<td>0.0944 (0.079)</td>
</tr>
<tr>
<td>Degree</td>
<td>−0.1602 (−0.555)</td>
<td>−0.0990 (−0.364)</td>
</tr>
<tr>
<td>High school</td>
<td>0.1112 (0.512)</td>
<td>0.0452 (0.234)</td>
</tr>
<tr>
<td>Intermediate</td>
<td>0.2974 (1.440)</td>
<td>0.0723 (0.392)</td>
</tr>
<tr>
<td>Age</td>
<td>0.1309 (2.233)</td>
<td>0.1750 (3.191)</td>
</tr>
<tr>
<td>Age²</td>
<td>−0.0018 (−2.668)</td>
<td>−0.0022 (−3.613)</td>
</tr>
<tr>
<td>North West</td>
<td>−0.1952 (−0.852)</td>
<td>0.0974 (0.460)</td>
</tr>
<tr>
<td>North East</td>
<td>−0.2491 (−1.000)</td>
<td>−0.1893 (−0.826)</td>
</tr>
<tr>
<td>Central</td>
<td>0.7414 (3.054)</td>
<td>0.8985 (4.004)</td>
</tr>
<tr>
<td>Island</td>
<td>0.1774 (0.795)</td>
<td>0.0024 (0.012)</td>
</tr>
<tr>
<td>Construction</td>
<td>−0.3504 (−1.510)</td>
<td>−</td>
</tr>
<tr>
<td>Energy</td>
<td>0.2009 (0.817)</td>
<td>−</td>
</tr>
<tr>
<td>Commerce</td>
<td>−2.4394 (−11.059)</td>
<td>−</td>
</tr>
<tr>
<td>Transport/communications</td>
<td>0.4229 (1.322)</td>
<td>−</td>
</tr>
<tr>
<td>Finance</td>
<td>1.0760 (1.427)</td>
<td>−</td>
</tr>
<tr>
<td>Consultancy</td>
<td>−0.7853 (−1.920)</td>
<td>−</td>
</tr>
<tr>
<td>Constant</td>
<td>−1.0846 (−0.882)</td>
<td>−3.0201 (−2.643)</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>−548.02 (−1028.10)</td>
<td>−</td>
</tr>
<tr>
<td>Restricted log likelihood</td>
<td>−682.20 (−1089.50)</td>
<td>−</td>
</tr>
<tr>
<td>Chi-square</td>
<td>268.35 (18) 268.35 (18)</td>
<td>122.85 (24) 122.85 (24)</td>
</tr>
</tbody>
</table>

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