The channels of influence of parents' background on children's earnings: the role of human and relational capital in monopolistic competition

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ABSTRACT

The accumulation of human capital is considered the main channel through which parents' background influences their children's earnings. The possibility that parents affect their children's prospects through channels not directly related to productivity—i.e., their relational capital—is usually neglected. Indeed, we lack a theory explaining why firms may reward relational capital and how this affects the intergenerational transmission of inequality. In this article, we aim to fill these gaps by explaining why parents' background can affect their children's earnings through channels other than human capital. We set up a theoretical model of monopolistic competition where relational capital is a further determinant of workers' earnings. We show that the premium for human capital is higher as the sector of employment is more competitive, while the opposite holds for relational capital. Parental background is associated with both unobservable human capital and relational capital. Therefore, we can rely on our model's predictions to establish whether the influence of parental background—beyond the influence through education—is due to unobservable abilities rather than to family networks. We test these predictions for Italy and find that the additional background premium, which is not negligible, seems to depend more on relational capital than on unobservable components of human capital because it decreases when sector competition increases.

1. Introduction

A primary objective of the literature on intergenerational inequality is to understand the mechanisms that generate income persistency between parents and offspring. In general, an association between parents' characteristics and children's income emerges when children's

earnings are determined by certain traits that may be inherited by their parents either directly (without costs) or through an investment.

In attempts to distinguish the roles played by nature and nurture in the process that shapes intergenerational inequality, empirical studies have inquired about the possibility of a genetic transmission of productive traits (e.g., I.Q.) from parents to children (e.g., Bjorklund et al. 2005, Sacerdote 2007, Holmlund et al. 2011). Following the insights of the theoretical models by Becker and Tomes (1979, 1986) and Solon (2004), the economic literature usually considers the accumulation of human capital (through parental investment in education of a different level and quality or a costless transmission of soft skills and productive endowments) as the main channel through which parents' background influences children's earnings.

However, recent empirical research has suggested the existence of other, more direct channels through which parents may influence their children's outcomes, such as job referrals, nepotism and the transmission of employers (e.g., Magruder 2010, Corak and Piraino 2011). Furthermore, comparisons across EU countries have shown that a sizeable "residual" correlation between family background and children's earnings persists even when controlling for children's education in countries characterized by a higher intergenerational inequality (e.g., Italy and the UK), while in more mobile countries (e.g., Finland and Denmark), the association between parental characteristics and children's earnings seems wholly mediated by children's educational attainment (Franzini and Raitano 2009, Raitano and Vona 2015).

The residual association between parents' background and children's earnings, on top of that mediated by educational attainment, is usually interpreted as being due to unobservable individual abilities correlated to parental background (Lam and Schoeni 1993, Agnarsson and Carlin 2002). This interpretation is coherent with the fact that better parents positively affect their children's abilities through several channels beyond educational attainment (e.g., selecting better schools, informally transmitting some abilities and more favorable soft skills). However, it neglects the possibility that children's prospects may be also affected by mechanisms unrelated to the transmission of individual productive traits, as networks and social ties (Hudson and Sessions 2011), which in this article we call "relational capital".

To the best of our knowledge, the economic literature is characterized by serious shortcomings regarding the study of the links among parents' background, children's endowments of non-productive traits and children's outcomes in the labor market. On the theoretical side, the possibility that the family of origin can influence children's prospects by transmitting traits unrelated to productive skills has not yet been investigated. The literature lacks a theory explaining why firms may reward workers who are more endowed with relational capital—i.e., characteristics not directly related to productivity but inherited from their parents—and inquiring how the inclusion of a rewarding relational capital shapes the process of intergenerational transmission of inequality. On the empirical side, it is difficult to disentangle the two possible sources of the intergenerational transmission of advantages (Raitano and Vona 2015), i.e., to verify whether further advantages for those who come from a better background, educational attainment being equal, are related to unobservable abilities rather than to mechanisms related to relational capital.

This article aims to advance both the theoretical and empirical literature i) by explaining, through a theoretical model, why firms may also reward workers according to their relational capital and, then, why parents' background can affect their children's earnings in addition to the effect that they may have on their human capital (i.e., on their endowments of productive traits) and ii) by estimating, through a proper empirical strategy, whether this further influence emerges.

With this aim, we first set up a theoretical model where relational capital is introduced as a trait in addition to human capital (where all cognitive and non-cognitive abilities that affect individual productivity, i.e., hard skills, soft skills, health status and other unobservable individual abilities, are included) that can be inherited by children from their parents and can be rewarded by firms in an imperfect competition framework. Indeed, we show that in a context of monopolistic competition, the level of rents in the sector being constant, relational capital can increase rents gained by a firm and can thus engender a wage premium for those more endowed with this type of capital. For instance, workers with a higher relational capital could be valuable for firms for several reasons, i.e., if they increase firms' market share through networks of possible costumers; if they help firms decrease implicit or explicit costs related to public regulation, whenever we consider workers as stakeholders and regulation as a result of a political process; and if firms exploit workers' ties that can sustain undeserved outcomes, as corruption or tax avoidance.

Independently of the specific reason of the profitability of relational capital for monopolistic competitive firms, we model the relationships among sector competition, workers' human and relational capital and workers' earnings and show that both types of capital are rewarded by firms. Most of all, the size of the reward for both types of capital depends on the degree of competition: the premium for human capital increases as the sector of employment becomes more competitive, while the premium for relational capital decreases as the sector of employment becomes more competitive.

To check the explanatory capacity of our model, we also econometrically test its results by analyzing the associations among workers' earnings, sector competition, and the endowment of human and relational capital using a panel dataset for Italy, where detailed information about the sector of activity and individual career histories is recorded. We use workers' education as a proxy of their human capital, while, as noted, the features of workers' parental background may be associated with both unobservable human capital and different family ties, i.e., different relational capital. However, this indeterminacy does not prevent us from testing the prediction of our model; rather, it can be exploited as a strategy for identifying the source of possible effects of parental background on children's earnings, controlling for their education.

Our model predicts that the premium for human capital increases when competition increases and the premium for relational capital decreases when competition increases. Therefore, by estimating the sign of the effect on earnings exerted by the link between parental background and sector competition, we can indirectly identify whether the influence of background is mainly due to unobservable human capital (when the estimated coefficient is positive) or to relational capital (when the estimated coefficient is negative).

Italy is an intriguing country for research on intergenerational inequality: on the one hand, it has one of the lowest levels of social mobility among developed countries (Corak 2013); on the other hand, it has a tuition-free and egalitarian educational system (Checchi et al. 1999). In addition, Italy is well known as a country where family connections have a considerable effect on both job-finding rates and the probability of achieving prestigious occupations (particularly in liberal professions; Pellizzari et al. 2011, Aina and Nicoletti 2014, Mocetti 2016). In recent comparisons of EU countries, the relatively low social mobility of Italy is partially explained by a parachute effect, i.e., a wage premium to well-off individuals who end up in occupations lower than those achieved by their parents (Raitano and Vona 2015).

Our estimates show that the reward for human capital is higher as the degree of competition increases. Furthermore, an additional background premium emerges, and it seems to depend more on relational capital than on unobservable components of human capital influenced by

parental characteristics because this premium reduces when sector competition increases. The size of the estimated effect is not negligible; the decrease in the background premium for a standard deviation increase in our proxy of market competition ranges from 1.2 to 2.1 percentage points. Therefore, the results of the empirical analysis lend support to the hypothesis that relational capital is an important driver of inequality in the labor market and is a potentially powerful and particularly unfair channel of the intergenerational transmission of inequality.

More in detail, the article is organized as follows. We first present the theoretical model (section 2). Then, we discuss how the predictions of the model can be empirically tested and, most of all, may allow us to identify whether a correlation between parents' background and children's earnings—being constant children's education—is mainly due to unobservable human capital or to relational capital (section 3). We then present the data (section 4) and show the estimated equations and the main results of our analysis (section 5). Section 6 concludes, summarizing our main findings and highlighting the main policy implications of our analysis.

2. The model

In this section, we set up a theoretical model that introduces the role of relational capital in the labor market. The model is developed first considering firms' and households' choices and then deriving the equilibrium in the labor market. Concerning the demand side (i.e., regarding firms' choices; section 2.1), we explain why relational capital—defined as workers' characteristics not directly related to their productivity—is rewarded in the labor market. We consider a monopolistic competition market setting in which workers' relational capital can be used by firms to strengthen their market power. On the supply side (i.e., regarding households' choices; section 2.2), we argue that the formation of workers' relational capital is analogous to that of human capital, both types of capital being the result of a parental investment, to which an idiosyncratic shock representing workers' specific talent applies. The investments in the two types of capital are rival. The allocation of parental investment in human or relational capital is the result utility maximization by households according to the expected future rewards of the two types of capital. The relative demand and supply of the two types of capital determine equilibrium relative quantities and rewards (section 2.3) and clarify the relationships among parental background, market competition and the reward of human and relational capital (section 2.4).

2.1 Firms

We consider a monopolistic competition setting à la Dixit Stiglitz, in which a continuous of N symmetric firms hire workers not only to direct production purposes but also in accordance with workers' relational capital in order to increase its relative market share. Likewise, in advertising model of imperfect competition (see Tirole 2000, Butters 1977, Dorfman and Steiner 1954), the representative firm faces a decreasing demand curve D, defined by

$$D_n(p_n, S_n) = A(S_n)d_n(p_n) \quad (1)$$

where p_n is the price, S_n is the firm's relational capital, which has the same role as an investment in advertising, and d_n and $A()$ are monotonic continuous functions. We take

$$A(S_n) = \frac{S_n^\gamma}{\bar{S}}, \gamma \in (0,1), d(p_n) = \bar{Y}\frac{p_n^{-(1+\theta)}}{\bar{p}}, \theta \in (0,1) \quad (2)$$

where $\bar{p}$ and $\bar{Y}$ are the standard average level of the price and production of monopolistic competition settings, and $\bar{S}$ defines the average productivity of invested capital. Whenever $\bar{S}$ is proportional to the average level of S_n^γ, firms' expenses in relational capital will not affect the overall level of production $\bar{Y}$, being only one way to gain market shares. Because firms are symmetric, in this case, we have $A(S_n) = 1$. However, the effects of individual firms' choice on $\bar{p}$, $\bar{Y}$ or $\bar{S}$ will be relevant for a welfare analysis of this specific market setting. This issue is not the aim of our analysis, although it has been extensively studied in the industrial organization literature since Dorfman and Steiner's (1954) seminal paper. The general equilibrium effects of relational capital are indeed outside the scope of our article because we are mainly interested in the labor market effects in terms of relative quantities and prices.

There's only one productive factor, i.e., the level of human capital, H, where human capital includes all cognitive and non-cognitive abilities that affect individual productivity, i.e., hard skills, soft skills, health status and other unobservable individual abilities. For the sake of simplicity, we consider the case of linear production with constant productivity λ of human capital.

The firm's profit function is

$$\Pi_n = D_n(p_n, S_n)p_n - w_H H_n - w_S S_n - f \quad (3)$$

where w_H and w_S are, respectively, the prices of human capital and relational capital, and f is the fixed costs.

The first-order conditions of the profit maximization can be written to allow an economic interpretation. Deriving eq. 3 in H and rearranging it, we obtain[1]

$$H_n w_H = \frac{\theta}{1+\theta} D_n(p_n, S_n)p_n \quad (4)$$

Because investments in relational capital shift the demand curve without directly affecting the elasticity of substitution, prices are set as a fixed margin only on the costs related to productive factor h. As a result, the distribution to factor h is a constant share $\theta/(1+\theta)$ of total output.

Once deriving eq. 3 in s, we have

$$S_n w_S = \gamma D_n(p_n, S_n)p_n \quad (5)$$

The distribution towards factor S_n is a constant share of output[2]. Taking together equations 4 and 5, these two results imply that the ratio between the two factors' shares is also constant (it does not depend on the prices or on the overall production set by the firm):

$$\frac{S_n w_S}{H_n w_H} = \gamma\left(1 + \frac{1}{\theta}\right) = \frac{S w_S}{H w_H} \quad (7)$$

where last equality comes from the hypotheses of symmetric firms.

As a result, the ratio of relational capital to human capital is increasing both in the market power of the firms expressed as the markup on variable costs $1/\theta$ (related to the demand elasticity) and in the efficiency in relational capital investments γ[3]

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[1] We have $p = \left(1 + \frac{1}{\theta}\right)\frac{w_H}{\lambda}$; multiplying both sides by $D_n(p_n) = \lambda H$, we obtain eq. 3.

[2] For the firm to make non-negative profits, we thus need the condition $\frac{\theta}{1+\theta} + \gamma \leq 1 \Leftrightarrow \frac{1}{\gamma} \leq 1 + \theta \quad (6).$

For a given ratio between the prices of the two types of capital, an increase in the market power or in the productivity of relational capital brings about a decrease in the ratio of relational capital to human capital.

2.2 Households

The economy is populated by a continuum of J households, each one composed of one working parent and one child of schooling age. At each time point, consumption and investment decisions are taken according to the expected value of the following utility function:

$$U_{j,t} = \alpha \ln c_{j,t} + (1 - \alpha) \ln y_{j,t+1} \quad (8)$$

where $c_{j,t}$ and $y_{j,t+1}$ are, respectively, household present consumption and future income.

Household j's income $y_{j,t}$ depends on the endowments of the two types of capital, h and s, and their prices, w_H and w_S:

$$y_{j,t} = w_H h_{j,t} + w_S s_{j,t} \quad (9)$$

The income of each household is distributed between consumption and investments:

$$y_{j,t} = c_{j,t} + i_{j,t} = c_{j,t} + i_{j,t}^H + i_{j,t}^S \quad (10)$$

where $i_{j,t}^H$ and $i_{j,t}^S$ represent, respectively, investments in human capital and in relational capital. Both investments have decreasing returns:

$$h_{j,t+1} = P(i_{j,t}^H)^\beta \omega_{j,t+1} + \epsilon_{j,t+1}^H \; ; \; s_{j,t+1} = Q(i_{j,t}^S)^\beta \omega_{j,t+1} + \epsilon_{j,t+1}^S \quad (11)$$

where $\omega_{j,t+1}$ is a common stochastic component, including an autoregressive component ρ that will be detailed below, while $\epsilon_{j,t+1}^H$ and $\epsilon_{j,t+1}^S$ represent individual-specific talent in each of the two types of investments. If we define the share between the two types of investments as $\psi_{j,t} = i_{j,t}^S / i_{j,t}^H$, future household income can be rewritten as

$$y_{j,t+1} = \omega_{j,t+1}[w_H P(\frac{1}{1+\psi_{j,t}})^\beta + w_S Q(\frac{\psi_{j,t}}{1+\psi_{j,t}})^\beta] \, i_{j,t}^{\;\beta} \quad (12)$$

Because we include overall common stochastic component ω, we can limit the role of the two specific shocks ϵ only to the relative extent between the realization of the two types of investment. Accordingly, the two stochastic components are considered to be functions of the same underlying process η that inversely impacts the two types of capital such that

$$\eta_{j,t} \in (0,1) \, i.i.d. \, E(\eta_{j,t}) = 0 \; ; \; \epsilon_{j,t}^S = 1 + \eta_{j,t} \; ; \; \epsilon_{j,t}^H = 1 - \eta_{j,t} \frac{w_S \bar{s}_{j,t}}{w_H \bar{h}_{j,t}} \quad (13)$$

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[3] Note that if γ = 0, i.e., if relational capital is ineffective, equation 4 still holds as in standard mark-up price-setting models.

where $\bar{s}_{j,t}$ and $\bar{h}_{j,t}$ are the expected realization of the two types of investments, and $\bar{s}_{j,t}/\bar{h}_{j,t} = (Q/P)\psi_{j,t}{}^{\beta}$. With this specification in eq. 12, and rearranging it into a log, we have

$$ln\ y_{j,t+1} = \beta\ ln\ i_{j,t} + \beta\ ln[\frac{(w_H P)^{\frac{1}{\beta}}}{1+\psi_{j,t}} + \frac{\psi_{j,t}(w_S Q)^{\frac{1}{\beta}}}{1+\psi_{j,t}}] + ln\ \omega_{j,t+1}\ (14)$$

The utility function is log linear in $y_{j,t+1}$. Therefore, the optimal problem does not depend on the distribution of the shocks and can be written as

$$max_{i_{j,t};\ \psi_{j,t+1}}\ \{\frac{\alpha}{\beta(1-\alpha)} ln\ c_{j,t} + ln\ i_{j,t} + ln[\frac{(w_H P)^{\frac{1}{\beta}}}{1+\psi_{j,t}} + \frac{\psi_{j,t}(w_S Q)^{\frac{1}{\beta}}}{1+\psi_{j,t}}]\} \qquad (15)$$

s.t.

$$y_{j,t} = c_{j,t} + i_{j,t} \qquad (16)$$

This optimal problem has two independent components: i) the choice between consumption and investment $c_{j,t}/i_{j,t}$ and ii) the choice between the two types of investment $\psi_{j,t+1}$. For any level of $i_{j,t} = y_{j,t} - c_{j,t}$, the first-order condition derived on $\psi_{j,t+1}$ states the equality between the marginal returns of the two types of investment:

$$\psi_{j,t+1} = (\frac{Q w_H}{P w_S})^{\frac{1}{1-\beta}} = \psi \qquad (17)$$

The ratio between the two types of investments is constant and does not depend on parental income. Using eq. 11, we can now obtain the ratio between the realized level of capital:

$$\frac{s_{j,t+1}}{h_{j,t+1}} = (\frac{w_H}{w_S})^{\frac{\beta}{1-\beta}}(\frac{Q}{P})^{\frac{1}{1-\beta}}\frac{\epsilon_{j,t}^S}{\epsilon_{j,t}^H} \qquad (18)$$

Using these results in eq. 15, the inter-temporal maximization problem reduces to

$$max_{i_{j,t}}\ [\frac{\alpha}{\beta(1-\alpha)} ln\ c_{j,t} + ln\ i_{j,t}] \qquad (19)$$

and the first-order condition states that

$$\frac{\alpha}{\beta(1-\alpha)} = \frac{c_{j,t}}{i_{j,t}} \Leftrightarrow i_{j,t} = [1 + \frac{\alpha}{\beta(1-\alpha)}]^{-1} y_{j,t} = \sigma y_{j,t} \quad (20)$$

where σ represents the savings rate, which is a function of the effective rate of returns of investments β and of the weight of expected future income on overall household utility α.

2.3 Labor market equilibrium

Given our hypotheses on the stochastic components ϵ and ω, from the results in the previous section, we can obtain the relative labor supply curve[4]:

$$\frac{S}{H} = \frac{\int_0^J s_{j,t}dj}{\int_0^J h_{j,t}dj} = \left(\frac{w_S}{w_H}\right)^{\frac{\beta}{1-\beta}}\left(\frac{Q}{P}\right)^{\frac{1}{1-\beta}} \quad (21)$$

Taking this condition together with eq. 7, we obtain the solutions

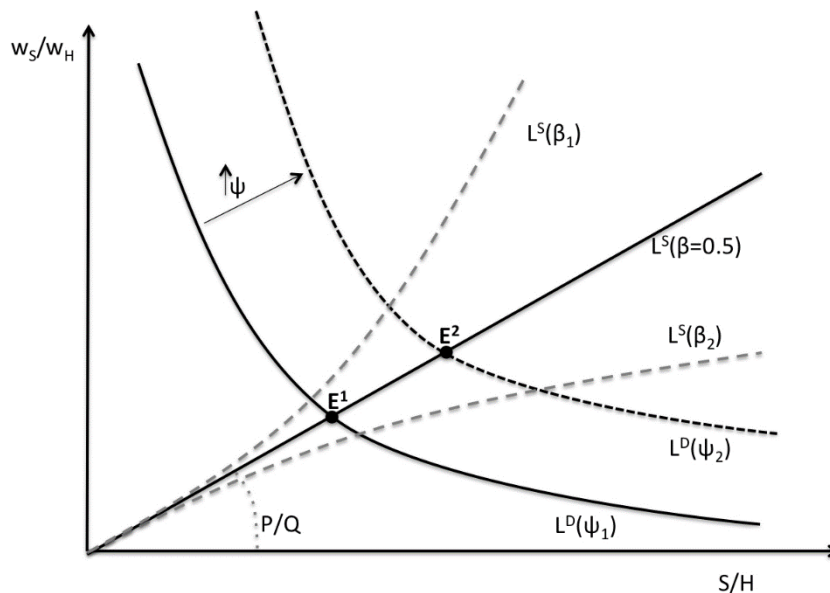$$\frac{w_S}{w_H} = (\psi)^{1-\beta}\frac{P}{Q} \qquad (22)$$

$$\frac{S}{H} = (\psi)^{\beta}\frac{Q}{P} \qquad (23)$$

$$\frac{S}{H} = (\psi)^{\beta}\frac{Q}{P} \qquad (24)$$

$$\psi = \gamma(1 + \frac{1}{\theta}) \qquad (25)$$

Summing up, the ratios between both the price and the quantity of relational capital and human capital are increasing in ψ. For a given level of ψ, the price (quantity) ratio is decreasing (increasing) in the productivity of investments β and in the respective relative productivity of parental investment Q/P.

Figure 1: Labor market equilibrium

[4] See the Appendix for the proof.

The labor market equilibrium is represented in figure 1. The two curves of labor relative supply L^S and relative demand L^D are defined, respectively, by eqs. 21 and 7. An increase in ψ due to the variation of one of its two components (a higher γ or a lower θ) shifts outward the demand curve by increasing the ratio between expenses $w_S S / w_H H$. The prices and quantities move in the same direction. The extent to which this effect is distributed on quantities or on prices depends on the curvature of the supply curve, which depends on β, and it is linear when $\beta = 0.5$, i.e., when the variations of relative prices and quantities are proportional.

2.4 Wage determination, productivity premium and parental background

Defining the relative variables $\tilde{x}_{j,t} = x_{j,t}/\bar{x}_{j,t}$ where $\bar{x}_{j,t}$ is the average at time t, it is straightforward to show that[5]

$$\tilde{y}_{j,t} = \frac{1}{1+\psi}\tilde{h}_{j,t} + \frac{\psi}{1+\psi}\tilde{s}_{j,t} \qquad (26)$$

We can conclude that the wage premium to human capital is decreasing in the markup $\frac{1}{\theta}$ and in the productivity of relational capital investments γ, and the opposite holds for the wage premium to relational capital.

If $\tilde{h}_{j,t}$ is known, applying the results in eq. 20, we can write:

$$\tilde{y}_{j,t} = \frac{1}{1+\psi}\tilde{h}_{j,t} + (\frac{\psi}{1+\psi})^{1+\beta}Q^\beta \sigma^\beta \tilde{y}_{j,t-1} + \chi_{j,t} \qquad (27)$$

where $\chi_{j,t}$ is an increasing function of the two error components, $\eta_{j,t}$ and $\omega_{j,t}$ (the relative attitude of the worker and the common autoregressive component), whose exact definition is reported in the Appendix.

If we apply the definition of income in eq. 9 also to parental income, we obtain[6]:

$$\tilde{y}_{j,t} = \frac{1}{1+\psi}\tilde{h}_{j,t} + (\frac{\psi}{1+\psi})^{1+\beta}Q^\beta \sigma^\beta \tilde{h}_{j,t-1}^\beta + \chi_{j,t} + \hat{\eta}_{j,t-1} \qquad (28)$$

where $\hat{\eta}_{j,t-1}$ is an increasing function of $\eta_{j,t-1}$.

Summing up, once the relative level of human capital is considered, the residual impact of parental background is increasing in ψ if it is expressed in terms of parental income or in terms of parental human capital.

Thus, an increase in one of the components of ψ (mark-up and relational capital efficiency) increases the correlation with parental income and parental human capital.

Finally, it is worth noting that choosing the definition of the common autoregressive component $\omega_{j,t}$ as

$$ln\,\omega_{j,t} = \zeta_{j,t} = \rho\zeta_{j,t-1} + \nu_{j,t} \quad E(\nu) = 0 \qquad (29)$$

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[5] See the Appendix for the proof.
[6] See the Appendix for the proof and the definition of $\hat{\eta}_{j,t-1}$.

we can write the solution exactly as the standard equation of the intergenerational correlation of incomes[7]:

$$ln\ y_{j,t} = a + \beta\ ln\ y_{j,t-1} + \zeta_{j,t} \qquad (30)$$

Therefore, it must be noted that the presence of two channels of parental investment in children endowments does not affect the overall intergenerational correlation of income.

3. Model predictions and empirical counterpart

The main predictions of our model can be synthesized into two statements:

1. the premium for human capital is higher when the sector of employment is more competitive;
2. the premium for relational capital is lower when the sector of employment is more competitive.

In our model, human capital includes all cognitive and non-cognitive abilities that affect individual productivity, i.e., hard skills (education and its quality, skills achieved through extra-school activities), soft skills, health status and other unobservable individual abilities. Relational capital, instead, includes other individual traits, such as the membership to privileged social networks, which can be rewarded by the market even if not productive in a strict sense.

If we had at our disposal micro-data on workers' wages and sectors of activity that correctly recorded these two types of capital, we could easily test the model's predictions. However, it is almost impossible to find a dataset on workers' careers that includes exhaustive proxies of both human and relational capital.

In the empirical literature, human capital is usually proxied by educational attainment, i.e., by a subset of hard skills; however, this information does not allow researchers to exhaustively take into account further differences in cognitive and non-cognitive abilities among workers. Likewise, the characteristics of parental background are often considered a proxy of family ties that, according to Granovetter (2005), represent a natural network. The strength of this network increases with the height of the family's social position and its capacity to leverage social relations for economic purposes, thereby also affecting the probability of finding or "inheriting" a good job (Corak and Piraino 2011).

However, a better family background is not only a signal of stronger networks and therefore of more relational capital. The effect of family background on children's educational attainment has been noted by both the theoretical and empirical literature (e.g., Becker and Tomes 1979, 1986, Holmlund et al. 2011, Blanden 2013) and can be controlled in empirical analyses when information on educational attainment is available. In addition to this effect, however, a more advantaged background can be associated with higher cognitive and non-cognitive abilities (directly transmitted without costs or acquired through specific parental investments). Indeed, education being the same, children who are better off often benefit from a higher-quality education (Bratsberg et al. 2007) and from more extra-schooling activities (Duncan and Murnane 2011). They outperform other children on test scores at age 15 (Fuchs and Woessmann 2007), are advantaged

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[7] See the Appendix for the proof and the definition of a.

in early-age skill formation (Cunha and Heckman 2007) and have a more profitable endowment of soft skills such as risk and trust attitudes, extroversion, the willingness to work on a team, and the sense of discipline or leadership, which are increasingly rewarded in the labor market (Bowles and Gintis 2002, Goldthorpe and Jackson 2008).

Therefore, also controlling for child education, the characteristics of parental background may mask unobservable abilities and networks; therefore, on empirical grounds, it is exceedingly difficult to distinguish whether a better background is more associated with higher human capital than with a better endowment of relational capital (Raitano and Vona 2015). However, the predictions of our model may help us solve the indeterminacy regarding the source of a possible wage premium for those coming from a better background on top of that acting through higher education.

Indeed, from an empirical perspective, our previous prediction 2 can be restated as follows:

2.a   if the "human capital content" of background prevails, we expect to find that a better background is associated with higher wages if the sector of employment is more competitive,;

2.b   if the "relational capital content" of background prevails, we expect to find that a better background is associated with lower wages if the sector of employment is more competitive.

Education is a proper—even if not exhaustive—proxy of human capital; therefore, prediction 1 can be simply restated as follows:

1.a   if he premium for educational attainment is higher if the sector of employment is more competitive.

The expected sign of the effect of parental background on workers' rewards according to the degree of sectorial competition (depending on the component of the background that prevails—i.e., further abilities versus networks) is different. Therefore, an empirical analysis of this relationship that also takes into account the link between education and competition could allow us to test the model predictions and to identify the component of family background that most influences children's outcomes on top of their educational attainment.

We then move on to the empirical analysis to test these three predictions obtained as empirical counterparts of the predictions of the theoretical model of section 2 and to verify whether a possible wage premium for a better background depends on a higher human capital or on a better endowment of relational capital.

4. Data

The relationships among wages, human and relational capital and market competition are analyzed considering the case of Italy and using the AD-SILC longitudinal dataset. This dataset is constructed by merging the IT-SILC 2005 cross-sectional sample (i.e., the Italian version of the 2005 wave of the European Union Statistics on Income and Living Conditions – EU-SILC) and the administrative longitudinal records provided by the Italian National Social Security Institute (INPS). In detail, the cross-sectional variables collected in IT-SILC 2005—which also records some features of family background, e.g., parents' education and occupation—have been enriched by the

longitudinal social security records since the entry in the labor market up to 2008 of those interviewed in IT-SILC.

Social security records offer a comprehensive picture of the working career of all types of Italian workers (i.e., public and private employees and all self-employed categories). They report, on a yearly basis and for each working relationship, gross earnings (including personal income taxes and social insurance contributions), working weeks and the type of working relationship (thus allowing us to exactly distinguish the various categories of employees and self-employed workers). Therefore, INPS data allow us to perfectly reconstruct year by year the effective labor market experience since the entry into the labor market, which is a crucial determinant of individual earnings.[8] Furthermore, for private employees, INPS data record the contractual arrangement (full-time versus part-time), the occupation (manager, white-collar, blue-collar, apprentice), the region of employment and, since 1990, the firm's productive sector (coded at the 2-digit NACE level). Crucial to our scopes, the AD-SILC dataset then couples very detailed information on working histories and sector of employment, which can be obtained from the social security archives with time-invariant information on workers' education and family background recorded in IT-SILC.

To study the links among competition, wages and the proxies of workers' human and relational capital, we have added to AD-SILC information on the sectorial import penetration share, which is defined as the ratio of imports to GDP (adjusted for the difference between exports and imports) and is considered in the literature as the standard proxy for market competition (e.g., Guadalupe 2007, Autor et al. 2013, Acemoglu et al. 2016). In more detail, we obtain from the STAN-OECD database the import penetration for 49 ISIC sectors, and we match these sectors to the sectors available in AD-SILC by converting the NACE classification available in INPS archives to the ISIC classification of STAN. As sectors are available in our dataset since 1990 and information on sectorial competition refers only to private employees, we limit our analysis to them, and we focus on the 1990-2008 period.[9]

Our main variables of interest are the following. The dependent variable is the log of gross weekly wages from private employment (including personal income taxes and employees' social insurance contributions), which is computed by dividing the total annual earnings of the longest working episode as a private employee in a year for the related working weeks. Wages are converted to 2014 constant prices using the consumer price index. To reduce the effect of outliers, the top 0.5% and the bottom 1% of the weekly wage distribution in each year are dropped. We focus on weekly wages rather than on annual wages because they are a better proxy of a worker's productivity.

In our dataset, we have no exhaustive proxies of workers' human and relational capital.[10] Therefore, according to what is discussed in section 3, we use workers' educational attainment as a proxy of human capital and parental background as a proxy of the possible interplay of

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[8] As noted by Blau and Kahn (2013), relying on effective rather than on potential experience or on survey data responses is crucial to correctly analyse the returns to human capital accumulation. Note also that, being based on administrative archives on the universe of Italian workers, our panel is not plagued by sample attrition. In addition, the INPS archives identify the firm for which an individual works, thus allowing us to compute workers' tenure in a firm.

[9] Note, however, that the years prior to 1990 and periods spent as public employees or self-employed workers are taken into account when computing effective experience.

[10] For instance, no proxies of the quality of education (e.g., marks, fields of study) or of family networks (e.g., the channels used to find jobs) are available.

unobservable abilities and relational capital. Because a measure of parental earnings is absent in IT-SILC, we follow a vast body of literature (e.g., Hudson and Session 2011, Chevalier et al. 2013) and use the highest educational attainment of the father or the mother as the proxy of parental background.

For each year, we consider workers aged 25-59 years. We exclude from the sample individuals who do not have Italian citizenship because the retrospective dataset under-represents immigrants in past years (the dataset is developed starting from the resident population in 2005).

Our final sample comprises 144,184 longitudinal observations concerning 14,456 individuals who worked at least once as a private employee in the 1990-2008 period (Table 1, where the main sample characteristics are reported). The longitudinal size of the sample is remarkable: on average, individuals are followed for 13.4 years; 22% of them are followed as private employees for the entire 19-year period, and 60% are followed for at least 12 years. The median number of individual observations is 14. Moreover, 75% of the sample is followed for at least 10 years and 90% is followed for at least 6 years.

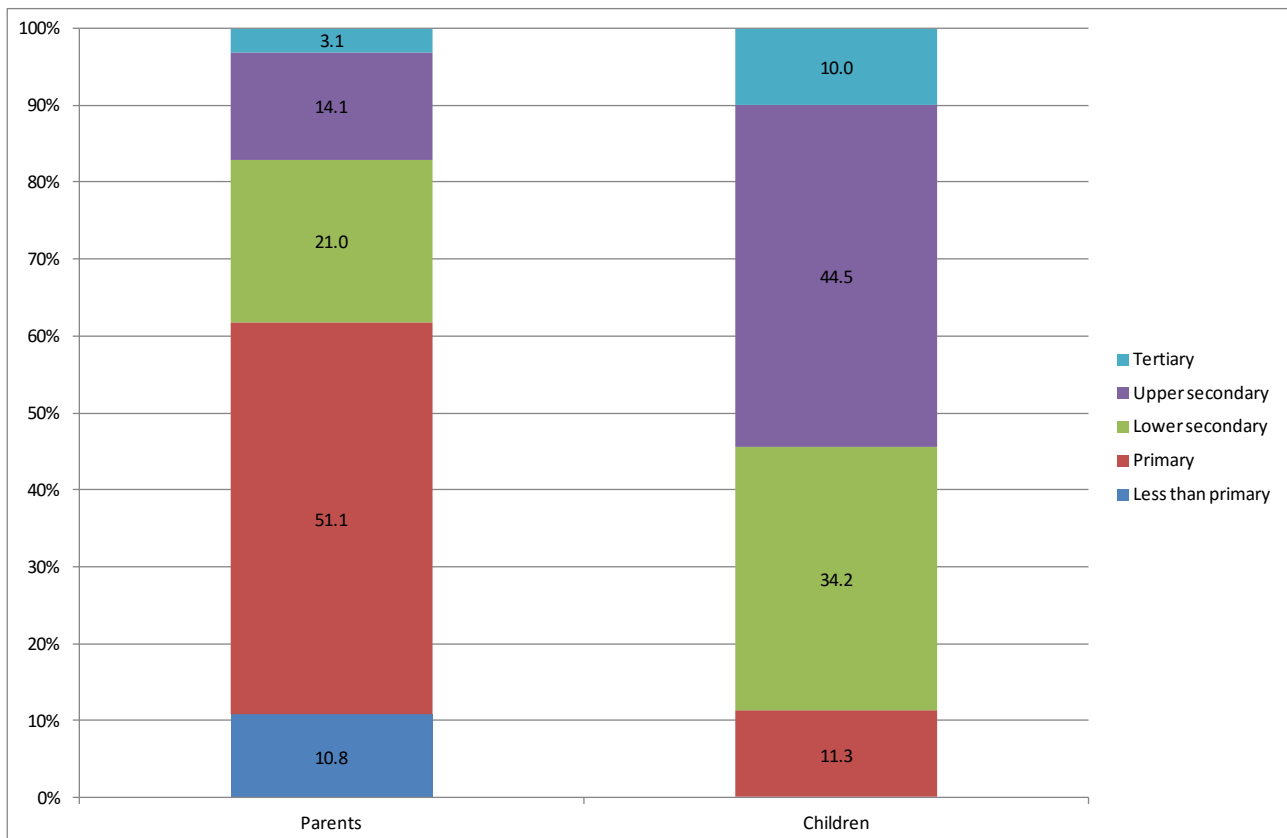Tab. 1: Sample characteristics (standard deviations in parenthesis)

Mean children years of education	10.4 *(3.7)*
Mean parental years of education	6.5 *(3.5)*
Mean real weekly wage (Euro 2014)	492.1 *(240.4)*
Mean real log of weekly wage (Euro 2014)	6.09 *(0.47)*
Mean Age	38.2 *(8.5)*
Mean Experience	799.2 *(479.1)*
Mean Import penetration index	10.16 *(15.79)*
Mean number of individual observations	13.4
P10 of individual observations	6
P25 of individual observations	10
P50 of individual observations	14
P75 of individual observations	18
P90 of individual observations	19
Sampled males	8,161
Sampled females	6,295
Sampled individuals	14,456
Males observations	89,028
Females observations	55,156
Total observations	144,184

Source: elaborations on AD-SILC data

Our sample confirms that last century, Italy experienced a clear improvement in its population's educational attainment, due to both changes in the economic structure and reforms in

compulsory education (Checchi et al. 2013). Indeed, looking at the distribution of the highest parental degree (Figure 1), 61.9% of parents achieved at most a primary degree, whereas only 14.1% and 3.1% attained, respectively, an upper secondary degree and a tertiary degree. Conversely, the share of those having attained at most a primary degree decreased to 11.3% in the children's generation, whereas the shares of upper secondary and tertiary graduates increased, respectively, to 44.5% and 10.0%.

Fig. 1: Distribution of parents and children by highest educational attainment.

Source: elaborations on AD-SILC data

Tab. 2: Mobility table of parents and children education (row percentages)

Parents education	Children education				
	Primary	Lower sec.	Upper sec.	Tertiary	Total
Less than primary	34.9	43.9	19.8	1.5	100.0
Primary	13.0	42.3	39.9	4.7	100.0
Lower secondary	3.0	28.2	57.5	11.4	100.0
Upper secondary	1.7	12.5	60.8	25.0	100.0
Tertiary	1.8	5.9	41.5	50.8	100.0

Source: elaborations on AD-SILC data

However, in spite of the increase in educational attainment, the association between parents' and children's education has remained strong. Indeed, Table 2 shows that children's education is

highly correlated with their parents' education: for instance, only 44.6% of children of parents with at most a primary education achieved at least an upper secondary degree, while the share rises to 92.3% and 85.8% among children of tertiary and upper secondary graduates, respectively.

To run regressions using a parsimonious number of coefficients, we then group the educational levels of workers and their parents into three categories: low, middle and high. Among workers, high education characterizes tertiary graduates, middle education characterizes upper secondary graduates, and low education characterizes those with at most a lower secondary degree. The classification slightly changes concerning parental education, consistently with the aforementioned structural improvement in educational attainment from parents' to children's generations. Among parents, high education characterizes tertiary or upper secondary graduates, middle education characterizes lower secondary graduates, and low education characterizes those with at most a primary degree.

5. Empirical analysis

5.1 Estimated equations

We estimate the following equation:

$$\log w_{ijt} = \alpha + \beta IMP_{jt} + \gamma ED_i + \delta ED_i * IMP_{jt} + \rho PARED_i + \varphi PARED_i * IMP_{jt} + \boldsymbol{X}_{it} + M_t + Z_j + \varepsilon_{it} \ (31)$$

where the dependent variable is the log of weekly gross wage of private employees i in sector j at year t, IMP_{jt} is the value of the import penetration index of sector j at year t, ED_i and $PARED_i$ are the educational attainments of workers and their parents, $\boldsymbol{X}_{it}$ is a set of time-varying individual controls (gender, age and its square, effective experience since the entry in the labour market and its square, dummies on occupational qualification and region of work, dummy for part-time employment), and M_t and Z_j are, respectively, year and sector fixed effects.

Workers' and parents' education are measured through dummies on educational attainment. In our baseline estimates (sections 5.2-5.3), to be parsimonious in the number of estimated interaction coefficients, we consider a dummy equal to 1 for highly educated people and 0 otherwise. However, as shown in the Appendix, our results do not change if we consider dummies based on the three groups of education for both parents and children, defined in section 4.[11]

The estimates are carried out both on the whole sample of workers aged 25-59 and on the restricted sample of only prime-age workers (i.e., those aged 34-44), following the suggestions of Haider and Solon (2006) and Grawe (2006), who note that an estimation bias of the link between children's earnings and parents' characteristics could emerge when too-young or too-old individuals are considered, due to the existence of a life cycle bias in the association between children's current and lifetime income.

Our main coefficients of interest are δ and φ, i.e., those concerning, respectively, the interactions between education and the proxy of sector competition and between parental background and

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[11] As a robustness check, we also measure workers' and parents' education in years. Our findings (available upon request) do not change, but the interpretation of the interactions between two continuous variables becomes less clear.

the proxy of sector competition. We estimate these coefficients using both OLS and panel techniques, i.e., random effects and fixed effects models, where the inclusion of individual effects in the last class of models mitigates the usual concern that the influence of unobservable skills may bias the estimates.[12]

Following the discussion of section 3, we expect to find the following signs of the estimated coefficients of the interaction variables:

- $\delta > 0$ because the premium of human capital should be associated with sector competition;
- $\varphi < 0$ if a wage premium for relational capital exists and it prevails compared to a further premium for human capital over education associated to parental background;
- $\varphi > 0$ if a further wage premium for human capital over education associated to parental background exists and it prevails compared to the premium for relational capital.

Moreover, we also focus on γ and ρ coefficients that show premia for education and parental education when the import penetration index is zero. In particular, $\rho > 0$ would confirm that a residual association of parents' background on children's earnings would emerge even controlling for their educational attainment, which, as said, is influenced by parental characteristics.

5.2 OLS estimates

We first estimate equation 31 by OLS regressions, using two-category dummies on children's and parents' education (Table 3, while results of estimates obtained using three-category dummies on children's and parents' education are shown in Table A1 in the Appendix).

Following the suggestions of the empirical estimates of the intergenerational income elasticity (e.g., Haider and Solon 2006), we first run the regression on prime-age workers and consider only the cross-sectional sample of 2004 (the reference income year for IT-SILC 2005). Then, we consider the whole 19-year period running regressions on prime-age (column 2, Table 3) and on all workers age 25-59 in that period (column 3, Table 3).

Independently of the considered subsample, the same main findings emerge. i) Concerning children's education, skill premia are positive and significant, and consistently with the prediction of the model depicted in section 2, the premium for tertiary graduates increases by the degree of sectorial competition. ii) Concerning the premium for parental education, the existence of a residual advantage for those coming from a better background in Italy is confirmed by our analyses[13]. iii) Most importantly, the influence of background on children's earnings lowers as the sector of activity becomes more competitive.

Therefore, according to the discussion of section 3 and the hypotheses set in section 5.1, an estimated negative sign of the interaction between parental background and the proxy of sectorial competition signals, on the one hand, that parental education can be considered a good proxy of relational capital. On the other hand, it indicates that the residual influence of parental

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[12] In all estimates, standard errors are computed clustering observations by individuals.

[13] Comparing selected EU countries and using EU-SILC 2005 data, Franzini and Raitano (2009) and Raitano and Vona (2015a, 2015b) find a large and significant residual correlation between family background and children's earnings, keeping constant children's education, in Italy, Spain and the UK, while this residual correlation is not significantly different from zero in Germany and in Northern European countries.

background on workers' wages is more related to factors connected to family networks and relational capital than to unobservable workers' abilities positively correlated with parental background.

Quantifying the size of the estimated effect for a one-standard-deviation change in the import penetration index (Table 3), the additional advantage for tertiary graduates (compared to upper and lower secondary or primary graduates) when competition increases ranges from 2.3% (for prime age) to 1.7% (for the whole sample) in the estimates based on the whole 1990-2008 period (columns 2 and 3). Likewise, the size of the relationship between parental education and changes in sectorial competition is large, and its size is only slightly lower than that related to the interaction between workers' education and the import penetration index. Indeed, the premium for those with highly educated parents (compared to those with middle or low educated parents) reduces by 2.1% (for prime age) and 1.5% (for the whole sample) when the index of import penetration increases by one standard deviation.

Tab. 3: Association between log of gross weekly wage from private employment, children and parental education and sectorial degree of import penetration. OLS estimates[1]

	Prime aged in 2004[2]	Prime aged in 1990-2008[2]	Full sample in 1990-2008[3]	Individuals starting a new job relationship[4]
	b/se	b/se	b/se	b/se
Import penetration	0.004675	0.001197*	0.000886*	0.001530**
	[0.004343]	[0.000719]	[0.000462]	[0.000691]
Ch. tertiary	0.192531***	0.170907***	0.138461***	0.124696***
	[0.034603]	[0.018963]	[0.012825]	[0.012651]
Ch. tert.*imp. penet.	0.002486**	0.001457**	0.001098**	0.001141**
	[0.001230]	[0.000682]	[0.000493]	[0.000534]
Par. high educ.	0.048767*	0.069191***	0.063776***	0.050486***
	[0.026229]	[0.014342]	[0.009423]	[0.010354]
Par. high ed.*imp. penet.	-0.002090**	-0.001351**	-0.000947**	-0.001163***
	[0.000975]	[0.000571]	[0.000401]	[0.000450]
Obs.	3100	52098	132155	41419
Quantification of the effect for an increase of 1 S.D. in import penetration				
Ch. tert.*imp. penet	4.0%	2.3%	1.7%	1.7%
Par. high ed.*imp. penet.	-3.4%	-2.1%	-1.5%	-1.7%

[1] Control variables included in all regressions: gender, age and age squared, actual experience and its square (in weeks), dummy on part-time, dummies on region of work, dummies on occupational qualifications, sectorial fixed effects (2 digit NACE) and year fixed effect. [2] Prime aged are the individuals aged 34-44. [3] Full sample refers to individuals aged 25-59. [4] Only individuals with tenure in the firms at most equal 2 years are included in the regression. Robust standard errors using individuals as cluster units. * p<0.10; ** p<0.05; *** p<0.01. Source: elaborations on AD-SILC data

Finally, it is also interesting measure whether the associations among human and relational capital, competition and wages develops throughout the career (e.g., when the asymmetric information between employers and employees on workers' skills reduces) or emerges at the beginning of the job relationship (thus suggesting a possible major role of relational capital in finding a good job). To this end, we also run a further OLS specification restricting the sample to those with a tenure no greater than two years in the same firm, in order to restrain our attention

to what emerges at the beginning of the job relationship (column 4 in Table 3 and in Table A1). Interestingly, our findings regarding the main coefficients are confirmed, also looking at the initial phase of job relationships; in particular, the premium for parental characteristics reduces when someone is hired in a more competitive sector.

Note also that no findings obtained through OLS estimates change if we distinguish three educational groups for children and parents instead of two (Table A1 in the Appendix).

5.3 Panel estimates

The existence of a positive link between educational premium and sector competition and a negative link between the premium for parental education and sector competition is also confirmed when panel estimates are run using both random effects and fixed effects models (where, as known, coefficients related to time-invariant variables are not estimated) and restraining or not our sample to prime-age workers (Table 4). Furthermore, the sign and the statistical significance of the coefficients of interest are also confirmed—i.e., $\delta>0$ and $\varphi<0$—when three educational groups for workers and parents instead of two are taken into account (Table A2 in the Appendix).

Tab. 4: Association between log of gross weekly wage from private employment, children and parental education and sectorial degree of import penetration.
Random effects and fixed effects estimates[1]

	Random effects. Full sample[2]	Random effects. Prime aged[3]	Fixed effects. Full sample[2]	Fixed effects. Prime aged[3]
	b/se	b/se	b/se	b/se
Import penetration	-0.00028	-0.000584	-0.000505	-0.000863
	[0.000340]	[0.000483]	[0.000353]	[0.000545]
Ch. tertiary	0.185032***	0.221578***	.	.
	[0.010750]	[0.015868]	.	.
Ch. tert.*imp. penet.	0.001482***	0.001871***	0.001394**	0.001724**
	[0.000479]	[0.000622]	[0.000577]	[0.000865]
Par. high educ.	0.093415***	0.102386***	.	.
	[0.007666]	[0.011955]	.	.
Par. high ed.*imp. penet.	-0.000764**	-0.001034**	-0.000910**	-0.001277*
	[0.000366]	[0.000507]	[0.000446]	[0.000696]
Obs.	132155	52098	132155	52098
Quantification of the effect for an increase of 1 S.D. in import penetration				
Ch. tertiary*imp. penet.	2.3%	2.9%	2.2%	2.7%
Par. high educ.*imp. penet.	-1.2%	-1.6%	-1.4%	-2.0%

[1] Control variables included in all regressions: gender, age and age squared, actual experience and its square (in weeks), dummy on part-time, dummies on region of work, dummies on occupational qualifications, sectorial fixed effects (2 digit NACE) and year fixed effect. [2] Full sample refers to individuals aged 25-59. [3] Prime aged are the individuals aged 34-44. Robust standard errors using individuals as cluster units. * p<0.10; ** p<0.05; *** p<0.01. Source: elaborations on AD-SILC data

The sizes of estimated coefficients remain not trivial in random and fixed effects models (Table 4). In the first case, the premium for human capital increases by 2.3% (full sample) or 2.9% (prime

age) for a one-standard-deviation increase in the import penetration index, while the premium for relational capital reduces by 1.2% (full sample) or 1.6% (prime age). Interestingly, when fixed effects estimates are run, thus controlling for individual time-invariant unobservable heterogeneity, the estimated size of the effect on wages of the link between the proxy of relational capital and the import penetration index enlarges. Indeed, the reduction in our φ coefficient amounts to 1.4% (full model) and 2.0% (prime age). In the fixed effects model, the estimated premium for education for a one-standard-deviation increase in the import penetration index grows by 2.2% (full model) and 2.7% (prime age).

6. Conclusions

Economists have focused their attention on education as the channel through which family background influences individuals' earnings in the labor market. Two very plausible assumptions are at the root of this approach: i) education is a means for accumulating productive abilities (i.e., human capital), and ii) productive abilities are the main determinant of earnings. However, empirical evidence suggests that in many countries, a sizeable share of the influence of the family background is not explained by education. To explain this residual effect, channels other than education must be investigated. They can be grossly identified with the transmission of productive abilities not mediated by education (i.e., unobservable human capital) or with the transmission of social connections (i.e., relational capital), both pointing to limitations of the traditional approach.

A thorny issue is how to discriminate between these two channels. The lack of a theoretical explanation regarding the reasons why relational capital may be rewarded in the labor market is the first obstacle to overcome.

In this article, we put forth a theoretical model of monopolistic competition, where wage premia can be related not only to workers' productivity (i.e., to their human capital) but also to relational capital, which allows firms to increase their rents. A crucial prediction of our model is that when the degree of sector competition is higher, the component of wages related to human capital increases, while the component related to relational capital decreases.

On the basis of this prediction, we can empirically disentangle the influence on the residual family background effect of the two competing channels. We test the prediction using a panel of Italian workers and analyzing the links among workers' wages, sector import penetration, workers' education and parental education. Our empirical strategy allows us to identify a significant negative effect on earnings of the interaction between parental background and the proxy of sectorial competition. The size of the estimated effect is not negligible; the decrease in the background premium for a standard deviation increase in our proxy of market competition ranges from 1.2 to 2.1 percentage points. In line with the theoretical model, this result signals, on the one hand, that parental education can be considered a good proxy of relational capital and, on the other hand, that the residual influence of parental background on workers' wages is related more to relational capital than to unobservable workers' abilities that are positively related to human capital.

Our findings have several implications, especially for the debate on the equality of opportunity and the best policies to achieve it. Circumstances that depend on the family background allow workers to earn wage premia according to the way markets and other institutions work. Social connections, one of the least acceptable sources of inherited advantage, are more easily rewarded by markets where competition is weak and high rents are created. Therefore, acting upon such an

important rule of the game as the degree of market competition can wipe out the influence of one of the worst circumstances and make it easier to achieve equality of opportunity. Opportunities can be levelled ex ante or compensated ex post, but it is also possible to dampen their effect on the rules of the game. If education, at least in principle, can be equalized ex ante and if genetic disadvantages can be, at least in part, compensated ex post, circumstances such as social connection should be made ineffective by a proper institutional design and in particular by preventing the creation of rents in the market.

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Appendix

Proof of eq. 21

Using the definition in 11 we have:

$$H_t = \int_0^J h_{j,t} dj = \int_0^J P(i_{j,t-1}^H)^\beta \omega_{j,t} \epsilon_{j,t}^H dj \; ; \quad (30)$$

$$S_t = \int_0^J s_{j,t} dj = \int_0^J P(i_{j,t-1}^S)^\beta \omega_{j,t} \epsilon_{j,t}^S dj \; . \quad (31)$$

Since we consider a continuum of households, by applying the law of large numbers we have $\int_0^J \epsilon_{j,t}^i dj = E(\epsilon^i) = 1$ and $\int_0^J \omega_{j,t} dj = E(\omega_t)$. Furthermore, the errors also are independently distributed across individuals and $\epsilon_{j,t}^i$ and $\omega_{j,t}$ are uncorrelated. Thus:

$$H_t = P E(\omega_t) \int_0^J (i_{j,t-1}^H)^\beta \, dj \; ; \; (32)$$

$$S_t = Q E(\omega_t) \int_0^J (i_{j,t-1}^S)^\beta \, dj \; ; \; (33)$$

All households have the same share between the investments in the two kind of capital ψ thus rearranging eq. 34 and using eq. 33 we have:

$$S_t = Q E(\omega_t) \int_0^J (\psi i_{j,t-1}^H)^\beta \, dj = \psi^\beta \frac{Q}{P} H_t \; ; \quad (34)$$

using the definition of ψ in eq. 17 and rearranging we obtain eq. 21.

Proof of eq. 25

We have:

$$\bar{y}_t = \frac{1}{J} \int_0^J y_{j,t} dj \; ; \; \bar{h}_t = \frac{1}{J} \int_0^J h_{j,t} dj \; ; \; \bar{s}_t = \frac{1}{J} \int_0^J s_{j,t} dj \; ; \; (35)$$

Taking these definitions, considering eq. 9 and the properties of the stochastic components recalled above, we have:

$$\bar{y}_t = \frac{\int_0^J (w_H h_{j,t} + w_S s_{j,t}) dj;}{J} = (w_H \bar{h}_{j,t} + w_S \bar{s}_{j,t}) \; ; \quad (36)$$

since $\frac{\bar{s}}{\bar{h}} = \frac{S}{H} = \psi \frac{w_H}{w_S}$, we obtain=

$$\bar{y}_t = w_H \bar{h}_{j,t}(1 + \psi) + w_S \bar{s}_{j,t}(\frac{1+\psi}{\psi}) \; ; \; (37)$$

Dividing both sides of eq.9 by $\bar{y}_t$ and applying eq. 37, we have eq. 25.

Proof of eq. 26 an 27 and definition of $\chi_{j,t}$ and $\widehat{\chi}_{j,t-1}$

Starting from the definition of $s_{j,t}$ in eq. 11, defining $\widehat{\omega}_{j,t} = \omega_{j,t}$-1, we have:

$$s_{j,t} = (\frac{\psi}{1+\psi})^\beta Q(i_{j,t-1}^S)^\beta (1 + \widehat{\omega}_{j,t})(1 + \eta_{j,t}) ; \qquad (38)$$

applying eq. 20:

$$s_{j,t} = (\frac{\psi}{1+\psi})^\beta Q\sigma^\beta \tilde{y}_{j,t-1}^\beta (1 + \widehat{\omega}_{j,t} + \eta_{j,t} + \widehat{\omega}_{j,t}\eta_{j,t}) . \qquad (39)$$

Defining $\chi_{j,t}$ as[14]:

$$\chi_{j,t} = (\frac{\psi}{1+\psi})^\beta Q\sigma^\beta \tilde{y}_{j,t-1}^\beta (\widehat{\omega}_{j,t} + \eta_{j,t} + \widehat{\omega}_{j,t}\eta_{j,t}) ; \qquad (40)$$

we have:

$$(\frac{\psi}{1+\psi})s_{j,t} = (\frac{\psi}{1+\psi})^{\beta+1} Q\sigma^\beta \tilde{y}_{j,t-1}^\beta + \chi_{j,t} . \qquad (41)$$

Applying the definition in eq. 9 and 11 to parental income, and considering the hypothesis on ϵ^i in eq.13, we can write:

$$y_{j,t-1} = w_H P\omega_{j,t-1}(\frac{1}{1+\psi} i_{j,t-2})^\beta + w_S Q\omega_{j,t-1}(\frac{\psi}{1+\psi} i_{j,t-2})^\beta ; \qquad (42)$$

and since $\omega_{j,t-1}(\frac{1}{1+\psi} i_{j,t-2})^\beta = \frac{h_{j,t-1}}{P\epsilon_{j,t-1}^H}$, by definition of ψ, rearranging we have:

$$y_{j,t-1} = w_H \frac{h_{j,t-1}}{\epsilon_{j,t-1}^H}(1 + \psi) = w_H h_{j,t-1}(1 + \psi)(1 + \frac{\eta_{j,t-1}\psi}{1-\eta_{j,t-1}\psi}) ; \qquad (43)$$

dividing by the lagged equivalent of eq. 37:

$$\tilde{y}_{j,t-1} = \tilde{h}_{j,t-1}(1 + \frac{\eta_{j,t-1}\psi}{1-\eta_{j,t-1}\psi}) ; \qquad (44)$$

if we define:

$$\hat{\eta}_{j,t-1} = (\frac{\psi}{1+\psi})^\beta Q\sigma^\beta (1 + \frac{\eta_{j,t-1}\psi}{1-\eta_{j,t-1}\psi})\tilde{h}_{j,t-1} ; \quad (45)$$

using these last two equations into eq. 26 we obtain eq. 27.

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[14]This and the next definitions of the stochastic components entails heteroschedasticity on the errors, that has to be tackled whenever we econometrically test the correspondent income equations. Besides, this econometric issue emerges as a result of the specific mathematical formulation more than as a result of the core hypotheses of the model.

Proof of eq. 28 and definition of *a*

Using the same argument in eq. 42 we have:

$$y_{j,t} = w_H P \omega_{j,t} (\frac{1}{1+\psi} i_{j,t-1})^\beta + w_S Q \omega_{j,t} (\frac{\psi}{1+\psi} i_{j,t-1})^\beta ; \qquad (46)$$

applying the definition of ψ, the results in eq. 20 and 22 and rearranging:

$$y_{j,t} = w_H P \omega_{j,t} (\frac{\sigma}{1+\psi} y_{j,t-1})^\beta (1 + \psi) \omega_{j,t} ; \qquad (47)$$

defining $a = \ln[w_H P \omega_{j,t} \sigma^\beta (1 + \psi)^{1-\beta}]$ and switching to log we obtain eq.28.

Tab. A1: Association between log of gross weekly wage from private employment, children and parental education and sectorial degree of import penetration. OLS estimates[1]

	Prime aged in 2004[2]	Prime aged in 1990-2008[2]	Full sample in 1990-2008[3]	Individuals starting a new job relationship[4]
	b/se	b/se	b/se	b/se
Import penetration	0.003293	0.001266*	0.000974**	0.001427**
	[0.004052]	[0.000743]	[0.000479]	[0.000707]
Ch. upper secondary	0.065644***	0.069346***	0.078472***	0.066500***
	[0.018065]	[0.010418]	[0.007372]	[0.008131]
Ch. tertiary	0.235443***	0.226964***	0.202684***	0.178027***
	[0.035603]	[0.020526]	[0.014126]	[0.014178]
Ch. upp. sec.*imp. penet.	0.00081	0.000197	-0.000079	0.00021
	[0.000701]	[0.000436]	[0.000306]	[0.000346]
Ch. tert.*imp. penet.	0.002726**	0.001772**	0.001232**	0.001462**
	[0.001239]	[0.000748]	[0.000546]	[0.000590]
Par. middle educ.	0.043545**	0.025986**	0.016777**	0.015130*
	[0.020091]	[0.012518]	[0.008308]	[0.008929]
Par. high educ.	0.042954*	0.068814***	0.059924***	0.046487***
	[0.025454]	[0.014941]	[0.009930]	[0.011041]
Par. middle ed.*imp. pen.	-0.001826**	-0.000879*	-0.00045	-0.000167
	[0.000805]	[0.000520]	[0.000356]	[0.000390]
Par. high ed.*imp. pen.	-0.001862**	-0.001625***	-0.001102***	-0.001234***
	[0.000948]	[0.000594]	[0.000421]	[0.000478]
Obs.	3418	52098	132155	41419
Quantification of the effect for an increase of 1 S.D. in import penetration				
Ch. tert.*imp. penet.	4.4%	2.8%	1.9%	2.1%
Par. high ed.*imp. pen.	-3.0%	-2.6%	-1.7%	-1.8%

[1] Control variables included in all regressions: gender, age and age squared, actual experience and its square (in weeks), dummy on part-time, dummies on region of work, dummies on occupational qualifications, sectorial fixed effects (2 digit NACE) and year fixed effect. Omitted categories for child education is at most lower secondary, for parental education is low education (i.e. at most primary educated). [2] Prime aged are the individuals aged 34-44. [3] Full sample refers to individuals aged 25-59. [4] Only individuals with tenure in the firms at most equal 2 years are included in the regression. Robust standard errors using individuals as cluster units. * p<0.10; ** p<0.05; *** p<0.01. Source: elaborations on AD-SILC data

Tab. A2: Association between log of gross weekly wage from private employment, children and parental education and sectorial degree of import penetration.
Random effects and fixed effects estimates[1]

	Random effects. Full sample[2]	Random effects. Prime aged[3]	Fixed effects. Full sample[2]	Fixed effects. Prime aged[3]
	b/se	b/se	b/se	b/se
Import penetration	-0.000383	-0.00076	-0.000526	-0.000923
	[0.000366]	[0.000537]	[0.000391]	[0.000640]
Ch. upper secondary	0.123635***	0.107192***	.	.
	[0.006264]	[0.008949]	.	.
Ch. tertiary	0.268841***	0.294104***	.	.
	[0.012097]	[0.017640]	.	.
Ch. upp. sec.*imp. penet.	0.00027	0.000671	0.000073	0.00055
	[0.000281]	[0.000429]	[0.000341]	[0.000606]
Ch. tert.*imp. penet.	0.001713***	0.002440***	0.001454**	0.002233**
	[0.000530]	[0.000701]	[0.000652]	[0.000993]
Par. middle educ.	0.031561***	0.049100***	.	.
	[0.006694]	[0.009965]	.	.
Par. high educ.	0.079681***	0.096586***	.	.
	[0.008115]	[0.012403]	.	.
Par. middle ed.*imp. pen.	-0.00012	-0.000735	-0.000057	-0.001013
	[0.000315]	[0.000504]	[0.000380]	[0.000691]
Par. high ed.*imp. pen.	-0.000871**	-0.001323**	-0.000945*	-0.001653**
	[0.000393]	[0.000537]	[0.000486]	[0.000740]
Obs.	132155	52098	132155	52098
Quantification of the effect for an increase of 1 S.D. in import penetration				
Ch. tert.*imp. penet.	2.7%	3.8%	2.3%	3.5%
Par. high ed.*imp. pen.	-1.4%	-2.1%	-1.5%	-2.6%

[1] Control variables included in all regressions: gender, age and age squared, actual experience and its square (in weeks), dummy on part-time, dummies on region of work, dummies on occupational qualifications, sectorial fixed effects (2 digit NACE) year fixed effect. Omitted categories for child education is at most lower secondary, for parental education is low education (i.e. at most primary educated). [2] Full sample refers to individuals aged 25-59. [3] Prime aged are the individuals aged 34-44. Robust standard errors using individuals as cluster units. * p<0.10; ** p<0.05; *** p<0.01. Source: elaborations on AD-SILC data