

Education inequality and social reproduction: parents' aspirations versus labor market returns*

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Abstract

This paper disentangles the role of parents' aspirations against labor market returns in explaining educational choices. We use a static equilibrium unemployment search model with endogenous education. The schooling cost is conditional on parents' education and imperfectly observable, whereas parents (optimally) transmit a taste for work. Intergenerational social mobility is driven by labor market institutions, which shape schooling incentives and parents' aspirations. The latter are defined by a taste for work which increases the utility derived from the revenue of work. We can also see aspirations as a way to insure against unemployment. Indeed, the lower they are, the higher is the utility derived from unemployment income. Therefore, decreasing social inequality should not come from decreasing unemployment income. Indeed, when we decrease it by 20% we observe no change in terms of labor inequality: wage and unemployment disparities are slightly the same. On the other hand, by an insurance behavior, individuals decide to give to their children a lower taste for work in order to limit their frustration in case of unemployment. As a consequence, the average level of education in the population decreases.

Keywords: Aspirations, Education, Social mobility, Inequality

JEL classification: E24, I24, I26, J24, J62

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1 Introduction

The French education system is considered as one of the main causes of inequality and social immobility in the country. In December 2016, the OECD published the results of the 2015 wave of PISA (Program for International Student Assessment). This program's objective is to evaluate education systems by testing the skills of 15-year-old students. French students lie in the middle of the OECD countries with very heterogeneous results between social classes. The social background in France explains 20% of the results against 13% on average in the OECD. Shortly after these results were released, the eternal debate on social reproduction in France came back in newspapers. Lack of social mobility seems due to the old-fashioned schooling system, viewed as centrally designed, elitist and distrusting teachers. However, countries with the best results in PISA studies like Finland or South Korea have very different schooling systems. This observation suggests that the education system cannot explain social immobility, and that there is room for complementary explanations for education inequality between social classes.

This paper puts forward the role of labor market institutions. We argue that they shape schooling incentives through heterogeneous effects on labor market returns and parents' aspirations. We mostly focus on non-employment income (e.g., unemployment insurance or minimum income), but our views extend to other labor market institutions like the minimum wage or unions in wage setting.

We adopt a Beckerian perspective and examine the factors determining the demand for education. It is already well-known that the labor market state shapes the schooling incentives through wages, non-employment income and unemployment risks. We complete the picture by considering parents' aspirations. We model them in a specific way, which we hope has general interest for researchers and policy-makers specialized on education. Parents optimally transmit a taste for work, a parameter that affects the utility derived from income depending on its source. A higher taste for work decreases the utility derived from unemployment income, and conversely. Children draw a scholastic ability conditional on their parents' educational level. Cultural transmission is done under imperfect knowledge of child's scholastic ability. On average, parents from lower educational backgrounds transmit lower tastes for work because they expect their children to have lower scholastic ability and to face lower wages as well as higher exposure to unemployment. Decreasing the taste for work allows to insure against unemployment by increasing the utility derived from unemployment income. In turn, these children invest less in education.

We first describe a number of evidence motivating this paper (Section 2). Many

macro and microeconomic facts are at the origin of social (im)mobility in developed countries. Recent studies consider the role of assortative mating, existing inequality or parental education and labor market structure to explain social reproduction. We go further in the analysis by modeling the microeconomic responses to labor market changes. We show that social immobility comes from these changes. We motivate this hypothesis with PISA studies. There is an important relationship between the labor market state, education and social mobility in rich countries. French data from INSEE confirms this link in France where the labor market performance is clearly related to education. These observations guide our assumptions about the labor market definition. For microeconomic behavior, we base our hypotheses on several recent studies that show the determinants of educational investments. Parents' beliefs and information, as well as the social background, play a crucial role in children's aspirations and schooling decision. We show how inaccurate information implies social reproduction.

We introduce an equilibrium search model of unemployment where individuals choose their education and parents optimally transmit a taste for work (Section 3). For simplicity, individuals live for one period. They draw a scholastic ability, make a costly investment in education, search for the corresponding job in the labor market and, if search is successful, work. Before dying, they choose the taste for work of their children, rationally expecting the distribution of scholastic ability, but failing at guessing the particular one picked by their offspring.

We next study optimal schooling and cultural transmission (Section 4). At the end of their life, individuals choose the taste for work of their child. They optimally maximize their offspring's utility, but face misinformation about their child's scholastic ability. We show that the taste for work is an increasing function of parents' education. When individuals choose their level of education, they know their actual scholastic ability. They also perfectly observe the returns on the labor market, wages and unemployment rates on each sector. Finally, they take into account their inherited taste for work. A higher taste for work increases the utility derived from wage and decreases the utility derived from unemployment income as well as the insurance against unemployment, which increases the incentives to get schooling. Thus, all else equal, a higher taste for work increases the optimal level of education. We show here how social immobility occurs, since a higher taste for work also comes from a higher level of education for parents. Our model also lies with usual results. Optimal education decreases with the cost of education, and increases with the elasticity of wage with respect to education.

We turn to equilibrium determination and focus on the stationary distribution of education (Section 5). This convergence comes from the inheritance of the value of work.

Parents' education determines the distribution of the child's scholastic ability. When parents form their aspirations, they know the existence of this relationship. Thus, aspirations are related to parents' education. Since the optimal choice of the child is itself correlated to the level of aspirations, we understand how social reproduction occurs. We show that decreasing the unemployment income might not be the solution for solving social inequality and immobility. Reforming the labor market has two effects on the optimal choice of education. The first one is usual: when the labor market is reformed, incentives to educate change directly. For instance, increasing unemployment income increases the value of not working, which decreases the incentives to get schooling. The second channel is less known in the literature: reforms also change expectations of parents for their children and thus the level of aspirations they give to them. For instance, increasing the unemployment income allows to increase the utility derived from unemployment all else equal. Thus, parents can change their aspirations by decreasing the insurance against the risk of unemployment and increasing the taste for work. The utility if unemployed is the same, but individuals have then more incentives to educate.

We then calibrate our model with French data (section 6), and estimate the role of each mechanism (section 7). We consider three types of moments: wage disparities, unemployment inequality and social mobility. The model matches pretty well the wage distribution as well as the matrix of social mobility in education. In section 7 we analyze different counter-factual to determine the role played by each mechanism in the model. The first analysis determines the role of aspirations. We show that cultural transmission, as we model it, explains pretty well social immobility. Indeed, when we impose a level of aspirations fixed for everyone, we observe that individuals who have the same scholastic ability choose the same level of education, independently on their social background. Therefore, the transmission of aspirations sometimes leads to inaccurate choices of education, which increases both social immobility and unemployment disparities. We also test for the hypothesis according to which the cost of education depends on parents' education. When the cost does not depend on parents' education, all individuals inherit of the same aspirations. Therefore, the probability of choosing a certain level of education is the same for all individuals, independently on their social background. This result comes from the hypothesis made on the formation of aspirations. They depend on the anticipation of the cost by parents. When it is perfectly exogenous, all parents anticipate the same distribution, and therefore give the same aspirations to their children.

Finally, we provide policy analysis. We look at the role of unemployment income. This value takes into account unemployment insurance but also other sources of income like a minimum income (RSA in France), as well as other social transfers. We also

consider that there are social and psychological costs of being unemployed, particularly in France. These costs are also taken into account in the value of unemployment income. We find that decreasing unemployment income by 20% has no impact on labor inequality: wage and unemployment disparities are slightly the same. In the same time, individuals decide to give to their children a lower taste for work in order to limit their frustration in case of unemployment. As a consequence, the average level of education in the population decreases.

2 Facts

In this section, we present empirical and theoretical evidence that motivate our paper. First, we discuss evidence at the macroeconomic level and show the link between the situation on the labor market, the level of education and social mobility with data from OECD. Then, we present a set of papers that give microeconomic evidence and show that parents' beliefs, children's aspirations and social backgrounds play an important role on the decision to schooling.

2.1 Macroeconomic Evidence

We present a set of facts about social mobility and its nexus with inequality and education at country level. We start with recent studies and reports. Then we focus on France and compare it with OECD countries.

Worried by the rise of inequality in the US, several studies emphasize the role of low social mobility in the US. According to Restuccia and Urrutia (2004), earnings persistence is large compared to other rich countries. About 40% of parents' position in the earnings distribution is transmitted to children, against 20% in Canada and Finland and 30% in Sweden. While this phenomenon is explained by a microeconomic behavior in this paper, other researchers link social immobility to macroeconomic factors. Gayle, Golan, Soyatas (2015), for instance, emphasize the role of the labor market structure and assortative mating as explanations for the persistence of socio-economic status across generations. They also find that parental education decreases the persistence of earnings. This phenomenon is explained by the consideration of child as a normal good (Barro and Becker, 1989), which leads wealthier individuals to have more children and thus less time per child. In our model, we focus mostly on unemployment income, but our arguments extend to alternative institutions like the minimum wage.

Several micro and macroeconomic factors can explain social immobility. The labor market is one of those factors, but existing inequality seems to be another interesting

one. Following a speech of Alan Krueger in 2012, Corak (2013) presents the *Great Gatsby Curve*. This is an increasing relationship between income inequality, computed with the Gini coefficient, and social immobility. According to Corak, the existence of more disparities leads family background to have a greater impact on future outcomes of children. As a consequence, higher inequality lowers intergenerational mobility because of a shape in opportunities.

We now use PISA studies to document the links between the labor market state, education, and social (im)mobility.

Figures 1 and 2.1 show that income disparities and unemployment inequality are correlated with PISA test scores in science as well as in reading.

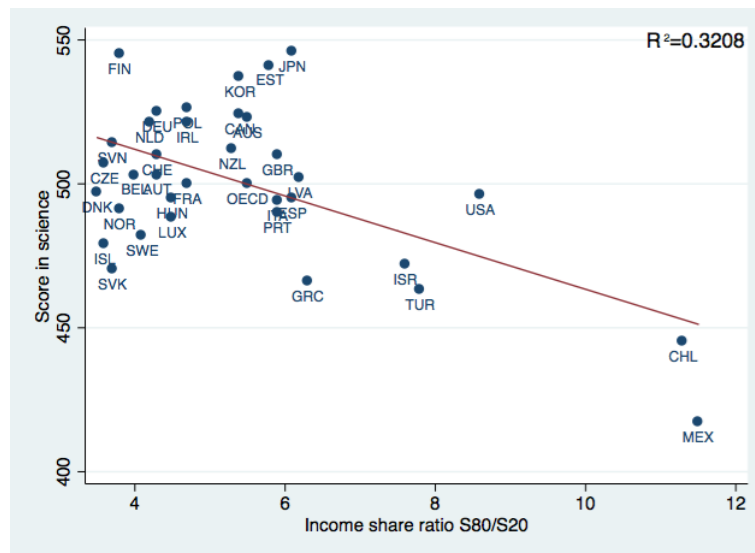


Figure 1: Income inequality and science score (2012)

Note. The ratio S80/S20 is the ratio of average incomes of respectively the 20% richest to the 20% poorest. *Data source.* Scores come from PISA (2012) and income inequality come from the OECD (2012).

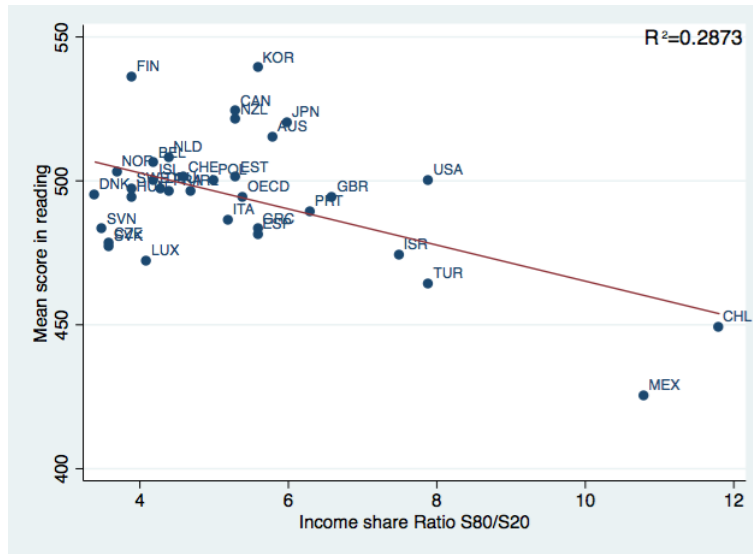


Figure 2: Income inequality and reading score (2009)

Note. The ratio S80/S20 is the ratio of average incomes of respectively the 20% richest to the 20% poorest. *Data source.* Scores come from PISA (2009) and income inequality come from the OECD (2007).

Income inequality is defined by the ratio $S80/S20$, the average incomes of respectively the 20% richest to the 20% poorest¹. The higher is this ratio, the higher are disparities. When income inequality increases, performance at school sharply decreases. In this paper we explain this phenomenon by microeconomic responses. An increase in income inequality implies reduced incentives to schooling and lower parents' aspirations for their children. As a consequence, education decreases.

A similar relationship exists between unemployment disparities and students' performances (see Figures 3 and 4). The higher is the unemployment rate differential between high skilled and low skilled workers, the larger the test score differential between students from high and low social backgrounds.

¹OECD, 2012

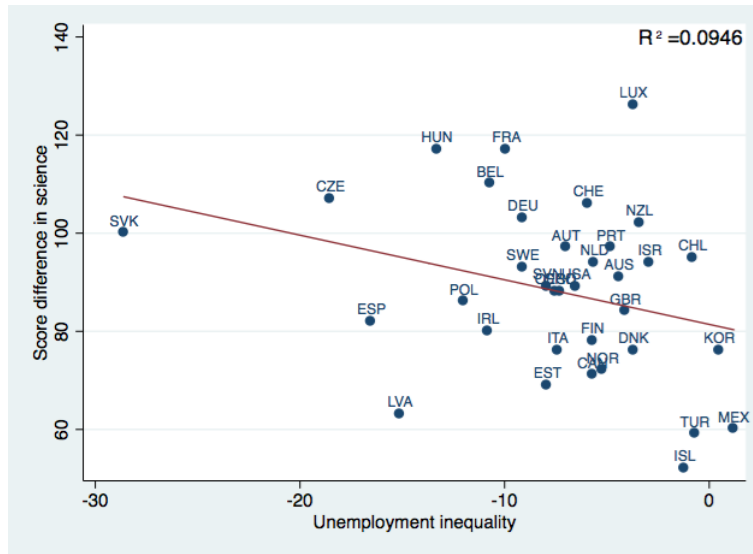


Figure 3: Unemployment inequality and science score differential (2015)

Note. Unemployment inequality is computed as the difference of unemployment rates for resp. high and low educated individuals. The score difference is computed as the difference of scores of resp. students from the top quarter and the bottom quarter of the SES distribution. *Data source.* Scores come from PISA (2015) and unemployment inequality come from the OECD (2015).

Finally, Figure 2.1 uses data on *resilience*². This index is a good proxy for social mobility in education: a higher level of resilience is equivalent to higher educational mobility. We show that resilience decreases when the unemployment rate differential between high and low skilled workers increases over time (see Figure 2.1). In other words, more unequal labor markets are associated with decreasing social mobility.

²As defined by the OECD, "*resilience is the percentage of resilient students (A student being classified as resilient if he or she is in the bottom quarter of the PISA index of economic, social and cultural status (ESCS) in the country/economy of assessment and performs in the top quarter of students among all countries/economies, after accounting for socio-economic status).*"

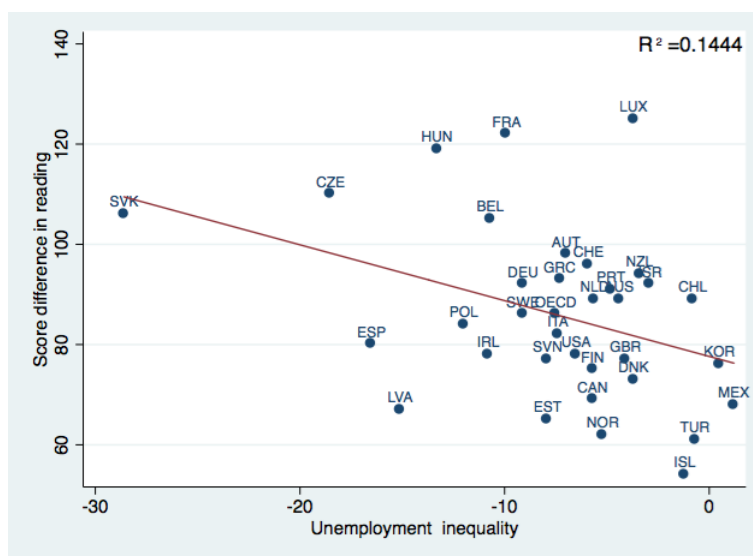


Figure 4: Unemployment inequality and reading score differential (2015)

Note. Unemployment inequality is computed as the difference of unemployment rates for resp. high and low educated individuals. The score difference is computed as the difference of scores of resp. students from the top quarter and the bottom quarter of the SES distribution. *Data source.* Scores come from PISA (2015) and unemployment inequality come from the OECD (2015).

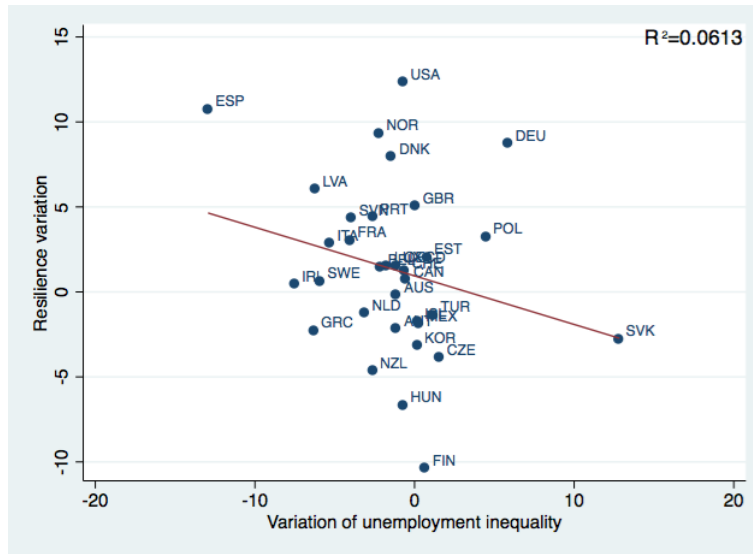


Figure 5: Co-evolution of unemployment inequality and resilience between 2006 and 2015

Note. Individuals are resilient if they score in the top quarter of scores while they come from the bottom quarter of the SES distribution. We take the evolution of the percentage of resilient students between 2006 and 2015. We also take the evolution of the difference of unemployment rates between high skilled and low skilled workers. *Data source.* Resilience comes from PISA (2006, 2015) and unemployment inequality come from the OECD (2006, 2015).

These macro correlations tie with Corak’s hypothesis: increasing labor market inequality enhances the role of the social background in education. This is a result that we partly take into account in our model. Parents with low education rationally expect that the cost of education is higher for their child than for the median person. Therefore, they transmit lower aspirations to avoid frustration. In this case, the higher is the level of inequality, the larger the difference of aspirations between two children who come from the bottom and the top of the wage distribution. Thus, the higher is inequality, the higher the impact of social background on educational attainment.

Concerning France, INSEE data highlight strong heterogeneity in educational attainment and labor market success between students from different social backgrounds. In 30 years, the average school participation rate at 15 has strongly increased from 4.7 years to 6.5 years, and fewer young people leave school without any diploma. However, schooling dropout remains high among disadvantaged social backgrounds: 21% for children of blue collar workers against 7% for children of white collar workers. Moreover, there is a large heterogeneity in diploma, which are more often vocational in low social classes (41%

for low social classes against 9% for high ones) and general in advantaged groups (76% against 33%). In France, holding a vocational diploma, especially at secondary level, is frequently associated with social stigma. At equal diploma, the social background does not seem to affect the labor market performance: two individuals coming from different social classes but with the same diploma have the same probability of getting a white-collar job. As a result, the labor market performance only depends on education in our model.

Professional insertion is way more difficult for non-graduate individuals at the end of their studies than for graduate ones: in 2009, about 50% of non graduate people were unemployed 1 to 4 years after the end of their education, while 90% of graduate individuals were employed. The recent economic crisis increased the gap of unemployment rates between graduates and non graduates. In 2012 for instance, after 10 years on the labor market, the unemployment rate of non graduates is 13% against 4% for graduates. In our model, unemployment decreases with the level of education.

2.2 Microeconomic Evidence

We now present some empirical evidence on the micro effects of the social background and individual beliefs on educational choices.

In the recent literature, education is an investment that parents make for their children, depending on the expected costs and returns. Following a beckerian approach, recent studies consider an overlapping generations model in which individuals live for at least two periods: in the first period they are children and educate themselves; in the second one, they are adult, they work and they choose the education of their children. Beliefs and expectations about costs and returns are the main determinants of schooling investments.

Dizon-Ross (2014) and Kinsler and Pavan (2016) highlight the impact of parents' beliefs on their child's education. Most of the time parents' beliefs about their children schooling returns are inaccurate. They have not enough information on their children's abilities and behavior at school, which leads them to mis-evaluate the returns. In our model, children choose their own level of education. We still observe the same result that parents' beliefs lead to a non optimal level of education for the children. They choose their investment taking into account their inherited aspirations. But the latter are chosen by parents with an incomplete information on the ability of their children. Thus, parents' beliefs lead to a non optimal schooling investment.

The social background plays a role not only on parents' beliefs but also on children's beliefs, aspirations and thus choices of education. Sewell and Shah (1967) study

a randomly selected cohort of students in Wisconsin. They find that the socio-economic status is positively and significantly correlated with college attendance. In a report on Australian students, James (2002) explains that students from lower SES have about half the likelihood to participate in higher education compared to higher SES students. In this report, the relationship between socio-economic status and education participation is explained by the impact that social background has on aspirations and intentions of students. The report shows that parents' education has an important impact on the educational aspirations of children. The way how aspirations are determined in our model is in line with this result since parents consider their own level of education to choose the taste for work of their child.

If financial constraints play a role in determining schooling investments, other non-monetary aspects such as motivation are important drivers of educational choices. Roemer (2004) explains that parents give advantage to their children through three ways: genetic transmission, social networks and culture. Corak (2013) shows that families with more human capital are more likely to invest in their children education, and this investment is not only monetary but also concerns the development of some behavior and motivation that will help children to obtain higher scores at school. In our model the taste for work chosen by parents plays the role of cultural and non monetary motivation.

The socio-economic status impacts educational choices both directly and indirectly through its influence on parents' beliefs, children's beliefs and aspirations. In our model, parents decide the taste for work of their children under imperfect information. In turn, the child takes this taste into account at the time of educational investment. Though cultural transmission is ex-ante optimal, this may be sub-optimal ex-post, and generally runs against educational investment for disadvantaged students.

Parents' beliefs are key to modeling schooling decisions. Recent work also shows the role of children's beliefs and aspirations. Kaufman (2009) shows that the decision to attend college depends mostly on one's own perception of one's skills and future earnings. He also shows that these individual beliefs are strongly correlated with social background. He finds that poor individuals need to expect significantly higher returns to decide to attend more education. In our model, pecuniary and non-pecuniary effects are combined. Children choose their education, considering both their aspirations and their expected returns of education. But since aspirations come from their parents and depend on their parents' situation, individuals coming from low social backgrounds have lower aspirations. Therefore, they need lower costs of education to educate as much as children from higher social backgrounds.

Belfield et al. (2016) develop a model based on the hypothesis that the perceived

consumption value is the main reason why children invest in education. This value corresponds to all non-pecuniary costs and benefits associated to studying. They conclude that expectations on the pecuniary and non pecuniary returns are really predictive of the effective choice of schooling, with non pecuniary returns having a higher predictive power than pecuniary ones. When looking at differences between social backgrounds, they find that the difference in beliefs is higher for non pecuniary returns. In our model, the taste for work transmitted by parents corresponds to this perceived consumption value.

Two recent papers are particularly in line with this paper. Guyon and Huillery (2016) use an experiment to show the impact of the social background on school achievement. After defining aspirations and aspirations windows, they show that both are determined by SES. They also show that aspirations cause under-performance for low backgrounds' individuals. They highlight cases where such children have relatively good schooling performances, but declare lower aspirations. They perceive this as a typical case where families lack information on schooling returns. In our model, parents from a low social background also transmit low aspirations to their children. However, these are ex-ante optimal and insure children against the likely risk of facing prohibitive costs of education.

Génicot and Ray (2017) model the co-evolution of aspirations, incentives to invest and economic outcomes such as inequality. They consider an inter-temporal model with aspirations where the latter are formed based on both personal income and society-wide distribution of lifetime incomes in the current generation. All individuals have the same aspiration formation function, and heterogeneity comes from varying wealth. Parents choose what they bequeath to their children. Parents' utility depends on their own consumption, but also on the utility of their children and the returns that parents receive from the difference between their aspirations and what they bequeathed. They show that frustration may have large impacts on the income distribution and welfare, sometimes more than do aspirations themselves. In our model, the possibility of frustration hinges on the uncertainty surrounding the child's scholastic ability. Parents minimize the risk of frustration through cultural transmission. They are altruistic with a parental style that is between authoritative and permissive (see, e.g., Doepke and Zilibotti, 2017).

The microeconomic evidence shown here provide motivations for our paper. In our model, the social background explains what parents expect for their children on the labor market. Altruistic parents transmit a taste for work that maximizes the expected utility of their children. In turn, children choose their education, conditional on inherited aspirations and expected labor market returns. Though the respective parents' and offspring's objectives coincide in principle, they differ in practice because cultural transmission is made prior to the revelation of the offspring's actual cost of schooling.

3 The model

We introduce an equilibrium search model of unemployment where individuals choose their education, depending on their aspirations, their scholastic ability and the expected returns on the labor market. Individuals draw a scholastic ability from a distribution that depends on parents' education. Aspirations also comes from parents. Indeed, they optimally transmit a taste for work without knowing the exact scholastic ability of their offspring. The labor market is defined by a continuum of sectors. Each sector corresponds to a level of education. Individuals make a costly investment in education, search for the corresponding job in the labor market and, if search is successful, work. For simplicity, individuals live for one period. Before dying, they choose the taste for work of their children, rationally expecting the distribution of scholastic ability, but failing at guessing the particular one picked by their offspring.

3.1 The matching sector

On each segment, the number of matches is defined by a matching function. Let u be the number of unemployed workers and v the number of vacancies. The total number of matches on each segment is given by: $M = m(u, v) = Bv^\rho u^{1-\rho}$, where B is the productivity parameter of the matching function, and $\rho \in [0, 1]$ is the elasticity of the matching function with respect to vacancy.

Let now θ be the labor market tightness: $\theta = v/u$. We have

$$m(1, \theta) = B\theta^\rho. \tag{1}$$

From this framework, we can derive three indicators of the labor market: the job finding probability $j(\theta) = m(1, \theta)$ which increases with θ ; the vacancy-filling probability $\eta(\theta) = j(\theta)/\theta$ which decreases with θ ; and finally the unemployment rate: $u(\cdot) = 1 - j(\theta)$ which decreases with θ .

3.2 The schooling sector

Education is costly. Let $C(e) = ce$ be the cost of education. It takes into account both financial and psychological costs. We suppose that c is partly endogenous. Indeed, individuals draw a cost c from a given distribution which depends on parents' education.

Let e_{min} and e_{max} be respectively the minimum and maximum levels of education. For instance, e_{min} corresponds to the minimum grade for leaving school and e_{max} the

maximum grade that one can obtain.

We associate to these bounds of education c_- and c_+ . These costs are such that when the cost is c_- (resp. c_+) the individual cannot choose more (resp. less) than e_{max} (resp. e_{min}).

For simplification, we suppose $c \sim \mathcal{N}(\mu(e_0), \sigma(e_0)^2)$ which is truncated between c_- and c_+ where

$$\mu(e_0) = a_0 e_0 + a_1, \quad (2)$$

with a_0 and a_1 computed such that $\mu(e_{min}) < c_{max}$ and $\mu(e_{max}) > c_{min}$. These conditions prevent individuals at the top and the bottom of the social backgrounds to be stuck in their parents' situation. We also assume

$$\sigma(e_0) = d_0 e_0^2 + d_1 e_0 + d_2, \quad (3)$$

with d_0 , d_1 and d_2 such that when $e_0 = e_{min}$ or $e_0 = e_{max}$, the standard deviation of the cost distribution is low ($\sigma = 1$), while it is high ($\sigma = 5$) when $e_0 = (e_{min} + e_{max})/2$.

The distribution from which individuals draw their cost of education depends on the level e_0 of their parents' education (see Figure 6).

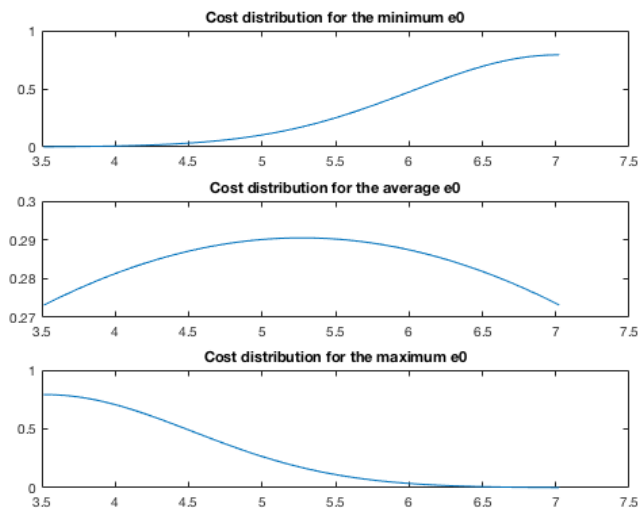


Figure 6: Different cost distribution for different parents' educational level *Reading*. When parents' education is low (minimum), the average of the cost distribution is high, and the standard deviation is low. When the parents' education is high, the standard deviation is also low, but the average cost is low too.

Parents with a higher level of education invest more in their children education. Anyway, the cost of education is not perfectly deterministic. It also takes into account ability, which is supposed to be stochastic. This way, all cases can happen. We can observe an individual from high social background with low scholastic ability, and conversely. These situations happen with lower probability than social reproduction situations.

The cost of education is perfectly observed by individuals who choose their education. Parents only know the distribution their child belongs to.

3.3 Firms' gains

On the labor market, each firm can offer at most one vacancy, paying a cost k . Once the vacancy is filled by a worker, the firm cannot dismiss him. We suppose free entry on each sector. All firms have the same production technology: $f(e) = Ae^\gamma$, where A is the productivity parameter and γ the elasticity of the production function with respect to education. Unemployed individuals get an income b . This income represents all transfers that an unemployed individual receives, such as unemployment insurance, minimum income or other social transfers. It also takes into account social and psychological costs of being unemployed.

The wage on a sector depends on its level e and is negotiated by a Nash bargaining process. We denote $\beta \in [0, 1]$ the bargaining power of an individual, supposed to be exogenous. The negotiated wage is defined as follows

$$w(e) = \beta Ae^\gamma + (1 - \beta)b. \quad (4)$$

We observe a direct return to educational investment: $dw(\cdot)/de > 0$, the wage increases with the level of education.

A vacancy is filled with the probability η . In such a case, the revenue of the firm is $f(\cdot)$. Let V be the expected profit of offering a vacancy on a sector e for a firm:

$$V = -k + \eta(\theta)[f(e) - w(e)]. \quad (5)$$

Free entry on each sector leads to $V = 0$:

$$\frac{k}{\eta(\theta)} = f(e) - w(e). \quad (6)$$

3.4 Workers' gains

Let $U(x) = x^{1-\delta}/(1-\delta)$ be the utility function, where x is the value of the revenue that the individual gets, and δ is the elasticity of utility with respect to revenue. It also represents relative risk aversion. As δ increases, risk aversion increases (cf. Holt and Laury's table, 2002).

Individuals inherit of a value $\alpha \in [0, 1]$. It corresponds to the taste for work. When α increases, the utility derived from wage is increased while the utility derived from unemployment income drops. We can also see α as a way to insure oneself against unemployment. Indeed, as α decreases, $(1-\alpha)$ increases, which allows to be happier in case of unemployment. This value is chosen by parents in order to maximize their children's expected utility. The value α takes into account the two most important trade-offs on the labor market: the trade-off between educational effort and returns of education, as well as the trade-off between labor and leisure. This is an endogenous value that depends on parents' education.

Let x be the value of the revenue in the utility function,

$$x = \begin{cases} \alpha w(e) & \text{with probability } 1 - u(.), \\ (1 - \alpha)b & \text{with probability } u(.). \end{cases} \quad (7)$$

4 Cultural transmission and optimal education

Parents determine their children's taste for work. They maximize the expected utility of the children, without knowing their exact scholastic ability. Parents only know the distribution from which their offspring draw their cost of education. It depends on their own education. Taking into account both the aspirations of their parents and their actual scholastic ability, individuals choose their optimal level of education. The first part of this section presents the equilibrium on the labor market. This is a necessary step to determine the returns individuals can expect from schooling. The second part shows the choice of parents. Finally we present the optimal investment in education.

4.1 Equilibrium on the labor market

Since wage depends on the level of education, there exists an educational threshold \underline{e} such that:

$$\tilde{w}(e) = \begin{cases} 0 & \text{if } e < \underline{e}, \\ w(e) = \beta Ae^\gamma + (1 - \beta)b & \text{if } e > \underline{e}. \end{cases} \quad (8)$$

This threshold is defined as follows

$$\underline{e} = \left(\frac{b}{A} \right)^{\frac{1}{\gamma}}. \quad (9)$$

We suppose that individuals always choose a level of education higher than the threshold \underline{e} , so that $e_{min} = \underline{e}$.

The free entry condition (equation 6) leads to define the labor market conditions. The labor market tightness is defined by:

$$\theta^*(e) = \left(\frac{B(1 - \beta)(Ae^\gamma - b)}{k} \right)^{\frac{1}{1-\rho}}. \quad (10)$$

The unemployment rate follows:

$$u^*(e) = 1 - B \left(\frac{B(1 - \beta)(Ae^\gamma - b)}{k} \right)^{\frac{\rho}{1-\rho}}. \quad (11)$$

We observe that $d\theta^*(e)/de > 0$, the labor market tightness increases with the level of education. Therefore it's easier to find a job for individuals who are more educated.

4.2 Determination of α

At the end of their period, parents determine the taste α of their child. They choose this value by maximizing their offspring's expected utility. The difference between parents and their child is the lack of information for the former. Indeed, while individuals know their own scholastic ability, they do not observe their child's one. Therefore, parents consider the distribution from which children draw their cost, instead of considering the actual one.

In a second step, individuals choose their schooling investment, taking into account both the real cost of education c and the taste for work inherited from parents. The solution of this maximization problem is denoted $e^*(\alpha, c)$.

Parents anticipate their child's behavior and take $e^*(.)$ into account while choosing α . Let e_0 be the parent's level of education. Denote then $\phi(c)$ the probability density

function of the truncated normal law with μ and σ as defined in equation 2 and 3. Therefore, the optimal choice of α^* is defined by:

$$\alpha^*(e_0) \in \operatorname{argmax}_{\alpha} \int_{c_-}^{c_+} [(1 - u(e^*(\alpha, c)))U(\alpha w(e^*(\alpha, c))) + u(e^*(\alpha, c))U((1 - \alpha)b) - ce^*(\alpha, c)]\phi(c)dc. \quad (12)$$

4.3 Optimal choice of education

Individuals choose their level of education e , taking α and c as given, and knowing the returns of the labor market as defined in equations 8 and 11.

The optimization problem is presented below.

$$e^*(\alpha, c) \in \operatorname{argmax}_e \{-ce + u(e)U((1 - \alpha)b) + (1 - u(e))U(\alpha w(e))\}. \quad (13)$$

The first order condition leads to the following proposition.

Proposition 1. *Cultural transmission and optimal education*

Let $\Delta = U((1 - \alpha^*)b) - U(\alpha^*w(e))$.

There exists a unique value $\underline{\alpha} \in [0, 1]$ such that:

- if $\alpha < \underline{\alpha}$ then $e^* < e_{min}$, i.e. the individual does not educate and is always unemployed;
- if $\alpha \in (\underline{\alpha}, 1]$ then e^* is such that $c = \frac{du(e)}{de}\Delta + (1 - u(e))\frac{dU(\alpha^*w(e))}{de}$ i.e. the child chooses to work on a sector $e > e_{min}$.

The first point of proposition 1 is particularly intuitive: individuals with a very low value of α have a low taste for the revenue of work. Therefore, they have no incentives to invest in education.

When individuals inherit of a higher α , they start appreciating the revenue of work and thus take into account the returns of education on wage and unemployment they may face.

We have $de^*/d\alpha > 0$, the level of education increases with the inherited taste for work. We can also see that $d\alpha/de_0 > 0$: more educated parents give a higher taste for work to their children. Indeed, for e_0 sufficiently high, $\mu(e_0)$ is low as well as $\sigma(e_0)$ so that

the First-Order Condition of parents leads to a higher value α , all else equal. As a consequence:

$$\frac{de^*}{de_0} > 0. \quad (14)$$

When parents are more educated, they have higher aspirations for their children and give them a higher taste for work. This leads the offspring to choose a high level of education, all else equal. Social reproduction occurs through this channel.

Therefore, the economic situation has long run effects on schooling decisions through the transmission of parents' aspirations. There is a pro-cyclical phenomenon through which individuals choose to less educate when the situation on the labor market is bad. This occurs both in the short and the long run. Indeed, parents' education impacts children' education, even if wages and unemployment rates are not the same for the two generations.

In the following section, we determine the endogenous stationary distribution of education.

5 Endogenous stationary distribution of education

In this section, we determine the stationary distribution of education. In a first step we define the bounds of the distribution. In a second step we compute it numerically.

5.1 Definition of bounds

We consider that social mobility is possible for everybody. Thus we need to avoid traps. In our model, an educational trap is a level of education from which individuals of the same family can't move as soon as one generation entered it.

Denote the bounds of the distribution e_- and e_+ both belonging to $[e_{min}, e_{max}]$. The lower bound is the lowest level of education that individuals enter if and only if their cost of education is maximal and their parents also chose this level. This level e_- is such that

$$e^*(\alpha(e_-), c_+) = e_-. \quad (15)$$

When parents have the lowest level of education and children have a very low scholastic ability, they choose the same level of education than their parents, e_- but never choose less.

The same reasoning is made for the upper bound. This is the lowest level of education that individuals enter if and only if their cost of education is minimal and their parents also chose this level. This level e_+ is defined as follows

$$e^*(\alpha(e_+), c_-) = e_+. \quad (16)$$

These two bounds allow to define a stationary distribution of education with no possible traps.

5.2 Determination of the distribution

The distribution of education is defined on $[e_-, e_+]$. For a given level of inherited taste for work α , individuals can choose an infinity of education levels, depending on their scholastic ability.

The choice of individuals is determined by three components. The first one is their taste for work. As seen before, it depends on their parents' education. The second determinant of optimal education is its cost. It also depends on parents' situation, as well as on a random draw for scholastic ability. Finally, the expected returns of education on the labor market are compared to the cost in order to maximize individuals' utility.

The cost of education is stochastically distributed. The probability distribution function of c is ϕ such that $c \sim \phi(c_-, c_+)$. The probability distribution function $\phi(c)$ is such that $\int_{c_-}^{c_+} \phi(c)dc = 1$. We suppose that ϕ is the density of the normal law, with mean $\mu(e_0)$ and standard deviation $\sigma(e_0)$, truncated between c_- and c_+ .

Let $\pi(e)$ be the probability distribution function of the stationary distribution of education. Then $\Pi(e)$ is the cumulative distribution function, i.e. the probability of having a level of education at most equal to e : $\Pi(e') = \mathbb{P}[e \leq e']$.

Define π_0 the initial distribution of education across the population. We suppose that

initially, it is uniformly distributed on $[e_-, e_+]$:

$$\pi_0(e) = \frac{1}{e_+ - e_-}.$$

To find the distribution of education at time t , denoted π_t , we define the transfer matrix, denoted P . The dimension of the matrix depends on the number of segments we define for education. For instance if we cut $[e_-, e_+]$ in 8 segments, the transfer matrix will be $(8, 8)$.

$$P = \begin{pmatrix} P_{11} & \dots & P_{1n} \\ \dots & \dots & \dots \\ P_{i1} & P_{ij} & P_{in} \\ \dots & \dots & \dots \\ P_{n1} & \dots & P_{nn} \end{pmatrix}$$

The term P_{ij} is the probability to choose the level of education j when parents were on segment i . This probability depends on the cost of education. Define, for all couples (e_i, e_j) , the cost c_{ij} that exactly leads to choose e_j when parents were on e_i . We define

$$P_{ij} = \mathbb{P}[c_{i,j+1} < c < c_{i,j}].$$

Note that $c_{i,j+1} < c_{i,j}$. Indeed, education decreases with c . Therefore, when parents are on segment i , the cost of choosing e_{j+1} is necessarily lower than the cost of choosing e_j , since $e_j < e_{j+1}$.

Finally, we have:

$$\pi_t = \pi_0 \cdot P^t, \tag{17}$$

where $\pi_0(i) = \mathbb{P}(e_0 \in [e_i, e_{i+1}])$.

In the following section, we calibrate the model.

6 Calibration

To calibrate french data, we need to define the parameters of the model as well as the different moments we want to match. Table 1 presents the parameters of our model. To be in line with the literature, some of them are directly fixed. Indeed, according to Petrongolo and Pissarides (2001), a range of plausible values for the elasticity of the

matching function with respect to vacancy (ρ in our model) is $[0.5, 0.7]$. According to the Hosios condition, the labor market is efficient if the bargaining power is equal to the elasticity of the matching function with respect to unemployment ($1 - \rho$ in our model). Finally, we set the cost of offering a vacancy such that the maximum level of education³ is normalized to 1: $k = (A - b)(1 - \beta)B^{\frac{1}{\rho}}$. This condition leads B to be useless for calibration, so that we set $B = 1$.

Parameter δ determines the relative risk aversion. According to the table in Holt and Laury (2002), individuals are risk averse if their relative risk aversion (RRA) is in $[0.41, 0.68]$. We let δ take values in $(0, 1]$ for calibration. We also calibrate $\gamma \in [0, 1]$. Define r as the ratio between unemployment income and the average wage in the population. Parameter r is $b/\text{mean}(w)$. We allow it to belong to $[0, 1]$. Finally, A is free to take any value that allow to fit the best the data.

The different moments that we want to match are summarized in table 2. There are three categories of moments. First, we consider wage inequality. We take five ratios: $P90/P10$, $P90/P50$, $P50/P10$, $P80/P20$ and $P70/P30$. The first one represents the ratio of the wage of the 10% richest over the 10% poorest. Theoretically, it is computed as follows. Denote e_{10} the level of education such that 10% of the population earn less than $w(e_{10})$ and e_{90} the education such that 10% of the population earn more than $w(e_{90})$. We then understand that:

$$\frac{P90}{P10} = \frac{\beta A e_{90}^{\gamma} + (1 - \beta)b}{\beta A e_{10}^{\gamma} + (1 - \beta)b}. \quad (18)$$

The same reasoning is made for the ratios $P90/P50$, $P50/P10$, $P80/P20$ and $P70/P30$, with $e_{10} < e_{20} < e_{50} < e_{70} < e_{80} < e_{90}$. Corresponding data come from an INSEE study (2014) on all wage earners. We do not take into account entrepreneurs' revenues, who often earn more than employees, because in our model we do not consider their income. Numerically, the parameters of interest for the calibration of these moments are A , γ , β and b . Indeed, the five ratios increase with A , β and γ and decrease with b .

We also match data on unemployment. Indeed, we consider the three following ratios: u_{mean}/u_{low} , u_{high}/u_{low} and u_{high}/u_{mean} . They represent the ratio of unemployment rates by levels of education. According to the OECD, individuals are highly educated when they attain tertiary education, and low-educated if they complete less than secondary education. To determine the levels of unemployment by education in the model we use data from INSEE about the proportion of individuals in each category in France.

³The maximum level of education, e_{max} is such that $u(e_{max}) = 0$

There are 22% of individuals who are low educated and 35.5% who are high educated. Thus, u_{mean} is the average unemployment rate in the population, and u_{low} and u_{high} are computed from the stationary distribution of education. We define e_{low} , the level of education such that 22% choose less than e_{low} and e_{high} such that less than 65.5% choose less than e_{high} . We then compute the unemployment rates in these different populations (from e_- to e_{low} and from e_{high} to e_+) to determine u_{low} and u_{high} . Theoretically, we have:

$$\frac{u_{high}}{u_{low}} = \frac{\frac{1}{e_+ - e_{high}} \int_{e_{high}}^{e_+} (1 - B(\frac{B(1-\beta)(Ae^\gamma - b)}{k})^{\frac{\rho}{1-\rho}}) de}{\frac{1}{e_{low} - e_-} \int_{e_-}^{e_{low}} (1 - B(\frac{B(1-\beta)(Ae^\gamma - b)}{k})^{\frac{\rho}{1-\rho}}) de}. \quad (19)$$

Since k is set to $(A - b)(1 - \beta)B^{1/\rho}$ in order to normalize the maximum level of education to 1, we have:

$$\frac{u_{high}}{u_{low}} = \frac{\frac{1}{e_+ - e_{high}} \int_{e_{high}}^{e_+} (1 - (\frac{Ae^\gamma - b}{A - b})^{\frac{\rho}{1-\rho}}) de}{\frac{1}{e_{low} - e_-} \int_{e_-}^{e_{low}} (1 - (\frac{Ae^\gamma - b}{A - b})^{\frac{\rho}{1-\rho}}) de} \quad (20)$$

The same reasoning is made for the ratios u_{mean}/u_{low} and u_{high}/u_{mean} , with $u_{high} < u_{mean} < u_{low}$. Numerically, the parameters of interest for the calibration of these moments are A , γ , ρ and b . Indeed, the three ratios increase with ρ , b and γ and decrease with A .

We see there exist a trade-off between the targets of the calibration. For instance, if a first estimation leads to good matches for unemployment ratios but wage disparities are too low, increasing A might improve the fitting of wage inequality to the expense of unemployment ratios. The same can be said for the value of unemployment benefits. Indeed, b raises unemployment ratios while it decreases wage disparities. Parameter γ increases both types of targets. Since the bargaining power, β , and the elasticity of the matching function with respect to vacancy ρ are related ($\beta = 1 - \rho$), when ρ increases, unemployment ratios rise and wage ratios drop.

We also consider moments on intergenerational mobility. We know e_{low} and e_{high} , the levels of education such that when individuals get a level of education lower than e_{low} they are low educated (less than secondary education), between e_{low} and e_{high} they are moderately educated (more than secondary but less than tertiary), while with an education higher than e_{high} they are high educated (more than tertiary). We can define the probabilities of social mobility as follows. For simplicity, we've discretized the levels of education. For instance, the probability to be high educated for individuals whose

parents are low educated is:

$$\mathbb{P}(\text{high education}|\text{low education}) = \frac{\sum_{j=e_{high}}^{e_+} \sum_{i=e_-}^{e_{low}} P_{ij}}{e_{low} - e_-} \quad (21)$$

An INSEE study (2014) computed all the mobility matrix from parents level of education to their child's, considering the same three levels of education as the OECD. We use this data to calibrate moments on social mobility.

The last moment of intergenerational mobility concerns the probability of choosing higher studies depending on the social status of parents. The CNESCO (Conseil National d'Evaluation du Système Scolaire) published a study showing that for two individuals with the same scholastic ability (same marks at school), the probability to choose a "BAC général" when the individual comes from a privileged social background is twice higher than the same probability for someone who comes from a low social background. We know that in 91% of cases, doing a "BAC pro" does not lead to follow long studies, while 87% of individuals who have a "BAC général" continue their studies in tertiary education. We then suppose that choosing a "BAC pro" instead of a "BAC général" is equivalent to attaining an upper secondary, but not tertiary level of education ($e \in (e_{low}, e_{high}]$). Theoretically we determine the two probabilities as follows. We define $\tilde{\epsilon} = (c_+ - c_-)/20$ because the marks at school are between 0 and 20. This value $\tilde{\epsilon}$ determines the interval corresponding to a given mark at school. The CNESCO considers individuals who come from different social backgrounds and have a mark between 8 and 10. The levels of c corresponding to these marks are defined as follows: $c \in \tilde{c} = [c_- + 10\tilde{\epsilon}, c_- + 12\tilde{\epsilon}]$. We then compute the following ratio:

$$\frac{\mathbb{P}[e > e_{high} | c \in \tilde{c} \cap e_0 > e_{high}]}{\mathbb{P}[e > e_{high} | c \in \tilde{c} \cap e_0 < e_{low}]}, \quad (22)$$

where e_0 is the parents' education.

Column 2 of Table 1 gives the values of parameters obtained from calibration. We find that the bargaining power of workers is slightly lower than 50%. This parameter represents the weight of workers in the bargaining of their wage. In France, it is not surprising to observe that firms have a higher power in terms of salary while they are particularly stuck in terms of unemployment. Indeed, we know that flexibility is not huge on the French labor market. Anyway, we still find an elasticity of the matching function with respect to vacancy between 0.5 and 0.7 which is in line with the literature. We also find an interesting feature about risk aversion. The best fit of data occurs

when individuals have a relative risk aversion around 0.34. According to Holt and Laury (2002), this means that individuals are slightly risk averse. Finally, the best calibration returns a ratio between unemployment income and average wage of 27%. In France, the replacement rate between wage and unemployment benefits is around 40-50%. Anyway, we need to be careful in the interpretation of this result because in our model b does not only represent unemployment benefits. It also takes into account other sources of transfers as well as the costs of being unemployed. Therefore, a ratio of 27% means that being unemployed can be particularly costly (psychological costs for instance), which is the case in France.

Parameter	Calibration	Description
β	0.496	Bargaining power of the worker
ρ	0.506	Elasticity of the matching function w.r.t vacancy
γ	0.46	Elasticity of the production function w.r.t education
δ	0.344	Relative Risk Aversion
A	9.92	Efficiency of the production function
B	1	Efficiency of the matching function
k	4.55	Cost of posting a vacancy
r	0.27	Ratio $b/\text{mean}(w)$

Table 1: Calibrated parameters

The first calibration results are presented in Table 2. They come from the minimization of the following criterion:

$$\sum (\text{empirical moment} - \text{theoretical moment})^2. \quad (23)$$

We minimize the sum of the squared differences between empirical moments and moments obtained through the model. Our model fits pretty well the wage distribution as we can see on Figure 7. While the ratio of the 20% richest over the 20% poorest is 2.01 in the data, the model predicts 2.14. This is also true for the ratio of the 10% (2.98 in the data against 2.65 in the model) as well as the ratio of the 50% richest over the 10% poorest (1.48 in the data and 1.51 in the model). We also predict pretty well data on social mobility. For instance, the probability of being moderately educated when parents are low educated is 49% while we find 50% with the model. In the same time the probability of being highly educated with moderately educated parents is 45% in the data while it's 34% in the model. Finally, our model helps to show the role of parents' aspirations. Indeed, the ratio of the probabilities of choosing high education, at equal

scholastic ability, for individuals from high or low social backgrounds is 2.17 in the data and 2.01 in the model. This means that parents' aspirations have a real impact on the choice of children, all else equal. In our model, parents' aspirations depend on their own social background (level of education). We show in Figure 8 the distribution of aspirations across the population. Not surprisingly, it follows the distribution of education (Figure 9).

Note that the model leads to some hypotheses in order to avoid traps. For instance, the minimum level of aspirations is not 0. It is such that with this minimum level, an individual chooses a level of education such that unemployment is lower than 1. In our numerical calibration, this leads to $\underline{\alpha} = 0.9$. In the same logic, the model is made such that education is between 0 and 1. Anyway, the definition of e_- and e_+ , which are different from e_{min} and e_{max} leads to obtain education levels between 0.01 and 0.72.

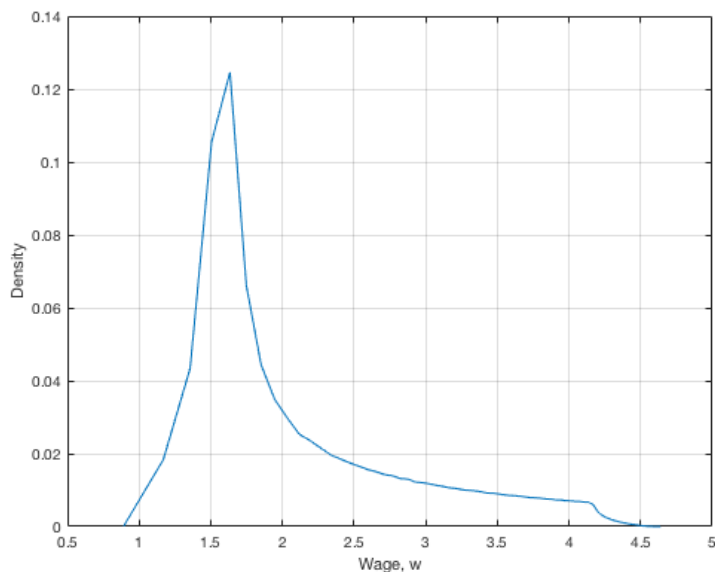


Figure 7: Calibrated wage stationary distribution

Moment	Empirical moment	Calibrated moment
Social mobility		
$\mathbb{P}[e_{low} e_{low}]$	0.24	0.34
$\mathbb{P}[e_{mid} e_{low}]$	0.49	0.50
$\mathbb{P}[e_{high} e_{low}]$	0.27	0.16
$\mathbb{P}[e_{low} e_{mid}]$	0.08	0.22
$\mathbb{P}[e_{mid} e_{mid}]$	0.47	0.44
$\mathbb{P}[e_{high} e_{mid}]$	0.45	0.34
$\mathbb{P}[e_{low} e_{high}]$	0.04	0.10
$\mathbb{P}[e_{mid} e_{high}]$	0.18	0.28
$\mathbb{P}[e_{high} e_{high}]$	0.78	0.62
$\frac{\mathbb{P}[e_{high} e_0 > e_{high} \cap c \in \bar{c}]}{\mathbb{P}[e_{high} e_0 > e_{low} \cap c \in \bar{c}]}$	2.17	2.01
Wages		
$P90/P10$	2.98	2.65
$P90/P50$	2.01	1.76
$P50/P10$	1.48	1.51
$P80/P20$	2.01	2.14
$P70/P30$	1.53	1.72
Unemployment		
u_{high}/u_{low}	0.41	0.45
u_{mean}/u_{low}	0.74	0.48
u_{high}/u_{mean}	0.55	0.94

Note. Data comes from INSEE (2014) and OECD (2015). Calibrated moments are obtained with the minimization of the criterion 23. *Reading.* Social mobility: The probability to attain a low level of education (less than secondary) when parents are highly educated (tertiary) is 4% in the data and 10% in calibration.

Table 2: Calibration versus Data

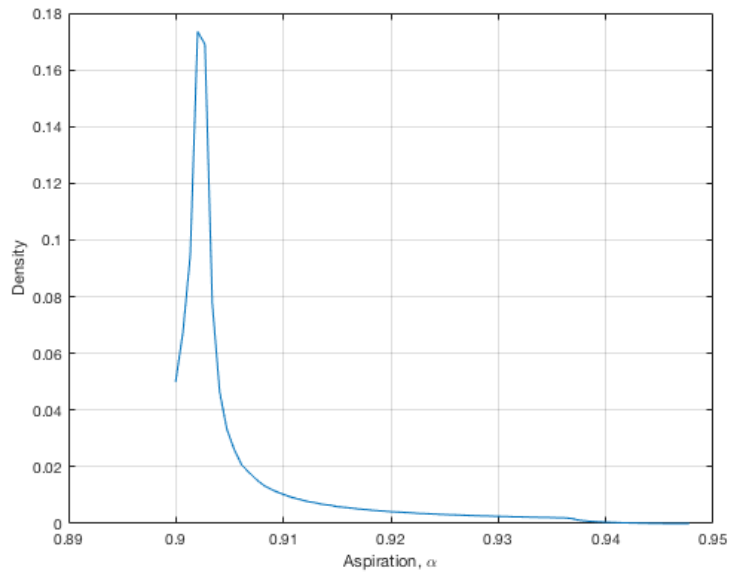


Figure 8: Calibrated stationary distribution of aspirations

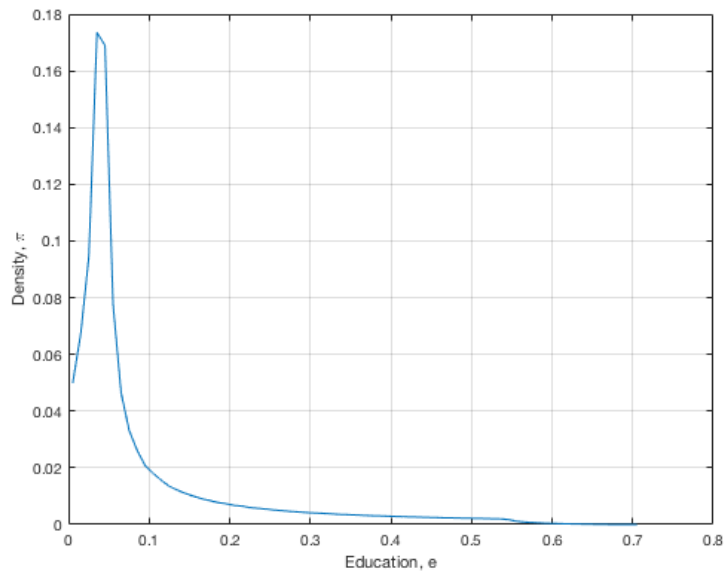


Figure 9: Calibrated stationary distribution of education

7 Counter-factual analyses

We show the role of each mechanism in our model on the choice of education. First we present a counter-factual in which the taste for work is constant and does not come from cultural transmission. This demonstrates the role of aspirations. Then we analyze the case where the cost of education does not depend on parents' education. Finally we make a policy analysis by showing the impact of increasing the replacement rate from employment to unemployment. All the results are presented in Table 3

7.1 The role of aspirations

In this counter-factual, we solve the model in which parents do not choose anything for their child. The taste for work is constant for all individuals. We suppose that α is 0.92, the median level of the calibration. We show what happens when all individuals give the same value to work. The second column of Table 3 presents the results of this first counter-factual. The first thing to observe is that the average level of education decreases, it was 0.36 in the calibration while it is 0.31 with constant aspirations. Lower aspirations lead, all else equal, to lower incentives to educate. By choosing the median level of aspirations, we increased the aspirations for 50% of the population and decreased them for the other half. If the average education is lowered, this means that the drop in the incentives to get schooling for the more educated population is higher than the rise of incentives for the low educated population. Therefore education of the population decreases. This result leads to conclude that aspirations play a more important role in rich families than in poor ones. We can observe this result in Table 3 since the probabilities to attain each level of education according to the social background is almost stable for low-educated families while it observes important changes for privileged individuals. For instance, the probability of choosing a low education when parents are highly educated increases by 70%. Not surprisingly, when the level of aspirations is constant over the population, the probability of choosing a high level of education is the same for individuals from low and high social backgrounds when they have the same scholastic ability. This result shows the impact of aspirations on social mobility. We also find that a constant taste for work leads to lower inequality in terms of unemployment and wage disparities. All these results lead to think that parents' aspirations have a negative impact on social mobility and unemployment inequality. When the taste for work is the same for everybody, the choice of education is more in accordance with scholastic ability. Therefore, the social background does not directly determine the level of education of an individual (it does it only through the level of scholastic ability).

7.2 Background-independent cost of education

We consider here the role of the social-background dependence of the cost distribution. We have supposed that the scholastic ability is drawn from a stochastic distribution with parameters that depend on parents' education. Suppose now that the cost of education of an individual is drawn from an exogenous distribution. The cost does not depend on the level of education of parents anymore. In this case, parents' aspirations come:

$$\alpha \in \operatorname{argmax}_{\alpha} \int_{c_-}^{c_+} [(1 - u(e^*(\alpha, c)))U(\alpha w(e^*(\alpha, c))) + (u(e^*(\alpha, c)))U((1 - \alpha)b)) - ce^*(\alpha, c)]\phi(c)dc,$$

where $c \sim \mathcal{N}(\mu, \sigma^2)$ with μ and σ exogenous. All parents should give the same α and education varies only through the level of cost that is actually drawn by the child. Suppose $\mu = (c_- + 2c_+)/3$ and $\sigma = 1$. The results are presented in the third column of Table 3.

The first result of this counter-factual is not surprising: all parents give the same taste for work. We find that this taste is the median one of the calibration: $\alpha = 0.93$. The constant taste for work leads here again to have the same probability of choosing a high level of education when the scholastic ability is the same, no matter the social background. In this case, the level of social mobility depends only on the distribution of scholastic ability. These results show the impact of social background on chosen education. Indeed, we show that when scholastic ability is perfectly exogenous, individuals are less stuck in their social background: the probability of being low educated when parents were themselves low educated drops from 34% to 21%. The nature of the cost distribution plays an important role on wage disparities. We observe a large decrease of wage inequality, particularly for the ratio of the 10% richest against the 10% poorest, which is divided by 2. This means that when the cost of education is totally exogenous, the distribution of wages is less unequal. This result is explained by the fact that the social background does not play any role on the choices of education. In this way, individuals from low and high SES have the exact same probability of choosing each category of education: the probability of choosing a high education is 39% for all individuals, independently on their parents' education. At the end we have a repartition of individuals across education that is less unequal, which leads to decrease wage inequality and unemployment disparities. The average level of education is also lower (0.31). This result can come from the cost distribution, but is also due to the fact that all parents give the same aspirations to their children because they (rationally) anticipate the distribution. Moreover, this level of aspiration is close to 0.93 which is the median aspiration in the calibration. As we've seen in the first counter-factual, when aspirations are constant and close to the median of the calibration, the average education decreases.

We further provide a policy analysis in order to see the role played by unemployment income.

7.3 Policy Analysis

Here, we want to show the impact of unemployment income on the stationary distributions of education and wages, as well as on aspirations. We also investigate the impact on social mobility and unemployment inequality.

Column 5 of table 3 shows the results of the policy analysis. We consider a drop of 20% in unemployment income. This leads to a decrease of the ratio $b/\text{mean}(w)$ by 18.5%. We first observe that decreasing unemployment income does not affect social inequality. Indeed, wage and unemployment disparities are quite the same as in the calibration. This means that decreasing social transfers for unemployed workers do not increase inequality. However, we find that the median aspiration is 0.90 while the minimum is 0.87. The taste for work decreases as unemployment income decreases. This is a new result in the literature which comes from the role played by aspirations. Indeed, they represent a taste for work, but we can also see them as an insurance against unemployment. Indeed, $1-\alpha$ is the weight of unemployment income in the expected utility of individuals. Thus, when the transfers that unemployed workers can expect decrease, they need to put a higher weight to this income in order to maximize their expected returns in case of unemployment. As a consequence, education decreases. The average level is 0.34 instead of 0.36 in the calibration. This result indicates that the increase in direct incentives to educate more when unemployment income decreases is more than compensated by the increase of unemployment insurance (i.e. the decrease in aspirations). The effect is not the same for all social backgrounds. Indeed, low and moderate SES individuals are less likely to choose high but also low education. Their probability of choosing a moderate education is increased by 20%. In the same time, privileged individuals are more likely to choose a high education: this probability is increased by 8%. This means that for high-SES individuals, the role of aspirations is lower than the role of unemployment income. Children from high-SES families have, on average, a higher scholastic ability. The decrease in aspirations is not of the same amplitude for individuals of different social backgrounds. On average, anyway, the effect of decreasing unemployment income is to translate the education distribution to the left. Moreover, we observe that the probabilities of choosing the same level of education as one's parent is increased: decreasing unemployment income leads to an increase in social reproduction.

The conclusion of this analysis is that decreasing social inequality should not come

from decreasing unemployment income. Indeed, when we decrease it by 20% we observe no change in terms of labor inequality: wage and unemployment disparities are slightly the same. On the other hand, by an insurance reasoning, when unemployment income decreases, individuals decide to give to their children a lower taste for work in order to limit their frustration in case of unemployment. As a consequence, the average level of education in the population decreases.

Moment	Calibration	Constant exogenous aspirations	Education cost independent on social background	High replacement rate $r = 0.22$
Social mobility				
$\mathbb{P}[e_{low} e_{low}]$	0.34	0.38	0.21	0.25
$\mathbb{P}[e_{mid} e_{low}]$	0.50	0.46	0.39	0.61
$\mathbb{P}[e_{high} e_{low}]$	0.16	0.16	0.39	0.14
$\mathbb{P}[e_{low} e_{mid}]$	0.22	0.24	0.21	0.16
$\mathbb{P}[e_{mid} e_{mid}]$	0.44	0.41	0.39	0.52
$\mathbb{P}[e_{high} e_{mid}]$	0.34	0.35	0.39	0.32
$\mathbb{P}[e_{low} e_{high}]$	0.10	0.17	0.21	0.06
$\mathbb{P}[e_{mid} e_{high}]$	0.28	0.34	0.39	0.27
$\mathbb{P}[e_{high} e_{high}]$	0.62	0.49	0.39	0.67
$\frac{\mathbb{P}[e_{high} e_{high} \cap \bar{c}]}{\mathbb{P}[e_{high} e_{low} \cap \bar{c}]}$	2.01	1	1	1.89
Wages				
P90/P10	2.65	2.54	1.33	2.65
P90/P50	1.76	1.63	1.08	1.84
P50/P10	1.51	1.55	1.24	1.44
P80/P20	2.14	2.10	1.33	2.10
P70/P30	1.72	1.77	1.1	1.82
Unemployment				
u_{mean}/u_{low}	0.45	0.54	0.49	0.48
u_{high}/u_{low}	0.48	0.49	0.49	0.46
u_{high}/u_{mean}	0.94	0.91	0.98	0.95

Note. Constant exogenous aspirations are set to the median value of the calibration $\alpha = 0.92$. When the cost of education is supposed independent on social backgrounds it follows a truncated normal law between c_- and c_+ with $\mu = (c_- + 2c_+)/3$ and $\sigma = 1$.

We obtain a ratio $b/\text{mean}(w) = 0.24$ by decreasing b by 20%.

Table 3: Calibration versus Data

8 Conclusion

We use an equilibrium search model of unemployment with endogenous choice of education, where parents optimally transmit a taste for work to their child. Individuals draw their scholastic ability from a stochastic distribution which depends on parents' education. We use French data from the INSEE and the OECD to calibrate the model. We show that aspirations have a large impact on social mobility. Indeed, when aspirations are constant and the same for all individuals, the probability of choosing a high level of education is the same for two individuals coming from different social backgrounds, all else equal. To decrease social inequality, we should allow the cost of education to be perfectly exogenous. When the cost doesn't depend on parents' education, social immobility decreases as well as wage and unemployment disparities. Education increases with unemployment benefits through an insurance behavior. Aspiration acts as a way to increase utility derived from employment income but also as an insurance against unemployment. In our future research, we plan to add a minimum wage to complete the analysis of labor market institutions on education and social disparities. We guess that the impact of the minimum wage will differ from the role of unemployment benefits. An interesting observation would be to show the combined effects of the two institutions.

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