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SUDDEN STOPS IN SOCIAL MOBILITY:

EXPLAINING THE EVOLUTION OF THE INTERGENERATIONAL MOBILITY OF EDUCATION IN CHILE BY COHORTS

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ABSTRACT

We estimate the evolution of intergenerational mobility of education in Chile for synthetic cohorts born between 1930 and 1978. The correlation coefficient between children and parent education falls from 0.67 for the cohort born in 1930 to 0.41 for that born in 1956, a process of improvement that suddenly stops, followed by stagnation. We find that the stagnation is explained by the effect on tertiary education coverage of low incomes when the children were born (long-run credit constraints) and the restrictions to the supply side of tertiary education (that had a particularly strong effect on children from less educated parents) during the late seventies and early eighties.

Keywords: Intergenerational mobility, Synthetic cohorts, Education

JEL Classifications: J62, I20

I. Introduction

Up until now sudden stops had been studied in macro papers as a consequence of a crisis. In this paper we detect permanent social effects from fiscal crisis and other macro events. We examine the evolution of intergenerational mobility of education in Chile for cohorts born between 1930 and 1978, which went through the educational system between 1936 and 2002. The key conclusion is that mobility significantly improved, and reached levels that could be considered high in international comparison, for those cohorts born from the mid-fifties onwards. However, after that, the process of improvement suddenly stopped and mobility stagnated for many years (up to the end of the period we study).

To measure mobility we estimate the regression coefficient of parent's education on children's education. We then analyze the causes behind the evolution we uncover. We study the factors that explain the improvement in mobility, but we put emphasize in understanding the stagnation that followed. We find that two factors explain the stagnation. First, the effect on tertiary education coverage of low parental incomes when the children were born (long-run credit constraints) and second, the restrictions on the supply side of tertiary education coverage produced by the fiscal crisis that occurred in the mid-seventies and early eighties (particularly relevant for children of less educated parents). We explain both findings in greater detail below.

Through testing different hypothesis we find that the stagnation of mobility of education is due to the difficulty of certain groups to access tertiary education. In turn, this is explained by two factors. At least for the cohorts we study, access to tertiary education depends strongly on family background. First, we find that one of the variables that explain the evolution of the coverage of tertiary education is the income of parents when children were born (referred as long-run credit constraints henceforth). Students whose parents had relatively low incomes when they were born enter the educational system with a (relatively) low level of human capital which makes future investments less productive, and since the Chilean educational system is not able to make up for this handicap, these children arrive to the end of high school with a low productivity of human capital investments. Hence tertiary

education may not be profitable for them, i.e. they may be better off with on-the-job training.

The second element is the stagnation in tertiary education supply experienced by cohorts born in 1956 onwards. This stagnation was motivated by the fiscal adjustment that occurred in the mid-seventies and early eighties. Since tertiary education was mostly publicly funded (and provided) the reduction in funding in effect resulted in a freeze in vacancies[1]. This was an exogenous change, not motivated by any demand-side factors. Even though children may have had the necessary abilities to access tertiary education, they were not able to do it due to capacity constraints, making the process of increasing mobility stop[2]. The rationing was done by the academic aptitude test, in which student's performance is highly influenced by the quality of their previous education.

To understand this process we examine the evolution of educational attainment, separating the attainment of children according to their parent's educational level. We find that the offsprings of adults with low levels of education (i.e. those only with primary education or with some secondary schooling) present a very small increase in access to tertiary education. In fact we observe a divergence in the evolution of their access to tertiary education with respect to children of parents with more education. This divergence in access is not observed in the access to primary or secondary education.

This is coherent with our two preferred hypothesis, since they would imply a negative impact on the coverage of tertiary education for these children of less-educated parents. On the one side these relatively less-educated groups are more exposed to long-run credit constraints. Using data on wages for non-qualified workers, we find a period of stagnation in long-term incomes (or estimated permanent incomes), which we show have a strong relationship with both the mobility of education and tertiary education coverage for less-educated parents.

[1] At the time there was no procedure to open new tertiary education institutions.
[2] In Appendix 2 we also test other hypothesis, such as mandatory education laws and family background. Although some of them explain the pattern of mobility by themselves, when we interact them with long-run credit constraints and supply stagnation they have no explicative power.

On the other side, regarding our second explanation, it is natural that the sons and daughters of less-educated groups are those relatively closer to the margin of entrance to higher education i.e. to the cutoff point in the academic aptitude test. When the total available vacancies in tertiary education stagnated (actually they slightly decreased) those affected were the sons of less-educated parents.

Our results pose an important challenge in terms of public policy. While the stagnation of higher education supply ended around 1990, thus solving the supply-side issues, the greater concern is related to early-childhood human capital investments and long-run credit constraints[3] [4].

The rest of the paper is organized as follows. Section II discusses the relevant literature, section III presents a brief theoretical framework of analysis, including the rationale for the basic equations; section IV describes the data and presents some summary statistics and the empirical strategy; section V presents the results of the empirical analysis for the evolution of educational mobility; section VI tests several hypothesis to explain that evolution. Section VI addresses the main channel for the stagnation, tertiary education coverage for children of parents with different educational levels. Finally, section VII concludes.

II. Literature Review

Social mobility has become a widely studied phenomenon. Traditionally the literature has used two ways to measure social mobility: mobility in education and income mobility. Unfortunately, we need panel data to study these questions, and in most cases the data is not available. This makes the study of mobility in developed countries a difficult task.

It would be useful to have results for both variables, since one could argue that they can account for different elements of mobility, but to measure income mobility we need a variable that does not exist – parent's permanent income –, and estimations with available

[3] See also Cunha, Heckman, Lochner and Masterov (2006) for a complete review of the related literature. Hidalgo and Urzúa (2010) argue that in Chile the effect of attendance to a PCC is positive and statistically (and economically) significant and argue that public policy should be focused in the extension of coverage of PCCs, especially for disadvantaged children.

[4] See Cunha and Heckman (2007) for a model and results for developed countries.

data (such as parents education used as a proxy for parents income) are biased. The bias is in the direction of finding that countries are less mobile than they actually are.

Researchers have preferred to estimate mobility in education, which can be thought as a better approximation of permanent income for both parents and children. Mobility in education has been largely studied in developed countries, especially the US (Spady (1967), Bowles (1972), Hauser and Featherman (1976), and Blake (1985)), though other rich nations also have been studied and compared (see Couch and Dune (1997) for the US and Germany and de Broucker and Underwood (1998) for eleven developed nations[5]).

For the US, Mulligan (1997) estimates intergenerational elasticities in several variables, including education. He finds relatively large differences between values of intergenerational mobility for income, which shows a value of 0.43, earnings (i.e. wages) and education (values of 0.34 and 0.29 respectively). Hertz et al. (2007) estimate the persistence of educational levels using a 42 countries sample[6]. They find that the Latin American countries occupy the top seven positions among the sample (ordered from less mobile to more mobile), with an average correlation between parent and child education of 0.56[7], compared with 0.41 for Eastern bloc nations, 0.39 for Asian and developed countries and 0.36 for the African sample.

There is a relatively high variation within Latin American countries in terms of mobility of education. Behrman, Gaviria and Székely (2001), analyze household surveys taken mostly during the 1990s in Brazil, Colombia, Mexico, Peru and the U.S.. They find that for the entire population, the coefficient of correlation between parents and children education ranges between 0.5 (Mexico and Peru) and 0.7 (Brazil). Additionally, they find an ongoing process of higher mobility and larger educational coverage –with some stages of deceleration or even reversion of the mobility process–. In their decomposition of the population in cohorts, they show that both average schooling and mobility have risen for Latin American countries. The correlation between parent's and children's education falls

[5] The countries are: Australia, Belgium, Canada, Ireland, Netherlands, New Zealand, Poland, Sweden, Switzerland and the UK.
[6] The sample includes seven Latin American countries, eight countries from the "Eastern bloc" (former communist economies), ten Asian nations, four African countries and 13 Western developed countries.
[7] For Adults aged between 20 and 69.

from 0.8 to 0.5 in Brazil and Colombia, from 0.6 to 0.35 in Peru and from 0.6 to 0.45 in Mexico. The Mexican pattern is confirmed by Binder and Woodruff (2002), who study the evolution of the mobility of education during 47 years. They divide the sample into four cohorts: those born between 1925 and 1944, between 1944 and 1955, between 1955 and 1964 and between 1965 and 1971 (cohorts 1 to 4 respectively). Their results show that mobility increases (the correlation falls from 0.57 in cohort 1 to 0.42 in cohort 3, but then raises to 0.5 in cohort 4). In general, empirical evidence for Latin America shows that average schooling has grown through time, and this growth has been accompanied by an improvement in mobility.

There are few studies of intergenerational mobility in Chile, and in general they have investigated the evolution of income mobility, even though to do this they must "estimate" parent's permanent income. The preference to estimate income mobility is curious since the study of the mobility of education would not require the construction of any missing variable (data is available from several sources). This literature uses parents' education to estimate parents' income (see for example Núñez and Risco (2004) and Núñez and Miranda (2006)) and hence their estimates are upward biased. This methodology uses a proxy for parents' income[8] in a regression between child's income and this proxy. As a consequence the parameters will be inconsistent (i.e. overestimated) which will result in underestimating mobility.

Núñez and Risco (2004) also estimate the mobility of education in terms of elasticities using three different cohorts and find a fall in the coefficient (i.e. an improvement in mobility) from 0.47 for those born between 1949 and 1961 to 0.32 for people born between 1969 and 1981. These latter results are highly comparable to ours, though we find that the actual decrease in the regression coefficient is even larger.

Núñez and Miranda (2006) examine other studies that discuss the question about income mobility, and present their own estimations using four different cohorts: those born in 1958,

[8] They construct parent permanent income using a Two-Sample Instrumental Variables (2SIV) method. Using one source which has income data available, they estimate a regression between income and a list of expected "determinants", such as education, job experience and occupation. Then, taking the coefficient of such regressions, they predict father's income in the other sample, which now includes both parent and child variables (but only child's income).

1967, 1977 and 1987. They cite Núñez and Risco (2004) and Contreras, Fuenzalida and Núñez (2006), where child income elasticity with respect to parents income lies between 0.43 and 0.67, with a mean value of 0.55. They estimate the correlation of children and parent´s education and find that, for the entire sample, it is 0.21, and falls from 0.37 for those born between 1939 and 1949 to 0.15 for those born in 1970 and 1981. These latter estimates are very low. Our results, though different in magnitude, have a similar trend. Their results not only differ in magnitude with ours but with many others studies, for example d'Addio (2007) finds for a group of OECD countries levels that range from 0.28 (Australia and UK) to 0.45 (Ireland)[9]. While our results suggest that mobility of education in Chile is very similar to OECD countries, Núñez and Miranda results would suggest that mobility in Chile is significantly higher than in advanced economies.

III. Framework

The basic framework to study social mobility comes from the seminal paper by Becker and Tomes (1986), which allows us to model the transmission of income, assets and consumption from parents to children. If there are no credit constraints, parents invest in human capital acquisition for their children, until the rate of return of this investment is equal to the market rate. Under this scenario, parent's income is not relevant in the determination of child's income, which is only determined by his innate skills, thus social mobility is only determined by such abilities[10].

However, in the presence of market failures, specifically credit constraints, parents' income turns into a determining factor in the educational level of their children. Thus the cost of education is not only given by the market rate of return, but for the shadow cost of forgone consumption. Credit constraints divide population into two groups, on the one side those families which are not credit constrained; on the other, those who are credit constrained, and make a suboptimal investment in human capital, which in turn results in higher income persistence (i.e. lower mobility).

[9] Sweden has a value of 0.30, while it is 0.34 for the US.
[10] According to this model, the correlation cannot be zero, since it is at least determined by the transmission of abilities and by the effect of these abilities over education and income (Grawe and Mulligan (2002)).

The general conclusion is that in presence of credit constraints mobility is lower in the more constrained groups. It is important to point out that these groups are not necessarily at the bottom part of the income distribution (Grawe and Mulligan (2002)); a group is constrained when his optimal investment in education cannot be reached by his available income. Then, if ability is positively correlated with income, the more constrained families could counter-intuitively be in the upper part of the income distribution[11].

More formally, assume that each individual lives for two generations[12], the first represents his childhood and the second his adulthood. Each individual has only one child. Suppose that human capital in the generation t is determined by investments made by parents (x), public expenditure (s) and by endowments (E)[13]:

$$H_t = \Psi(x_{t-1}, s_{t-1}, E_t) \quad \text{with } \Psi_j > 0 \qquad j = x, s, E \qquad (1)$$

A larger endowment usually raises the marginal benefit of both private and public expenditures, so

$$\frac{\partial^2 H_t}{\partial j_{t-1} \partial E_t} > 0 \qquad j = x, s \qquad (2)$$

With perfect access to capital markets the optimal investment in human capital will equalize its marginal rate of return with the market interest rate

$$\frac{\partial H_t}{\partial x_{t-1}} = \Psi_x = 1 + r_m(x_{t-1}, s_{t-1}, E_t) \qquad (3)$$

With $\partial r_m / \partial E > 0$ (by inequality (2)). Let r_t be the market interest rate in period t, then

$$r_t = r_m \qquad \text{or} \qquad x^*_{t-1} = g(s_{t-1}, E_t, r_t) \qquad (4)$$

At the optimum

[11] Grawe and Mulligan (2002) and Núñez and Miranda (2006) find that mobility is higher in the bottom part of the distribution rather than in the upper part, where persistence is larger. However Corak and Hiesz (1999) argue that middle-class families are more credit constrained and present lower levels of mobility.
[12] The model is based on Becker and Tomes (1986); see also Becker and Tomes (1979) and Bevan (1979).
[13] Endowments can be thought as the heirloom from parents to children in terms of biological and cultural elements that shape child's personality and behavior.

$$g_E > 0 \text{ (by equation (3))}, \qquad g_r < 0 \text{ and} \qquad g_s < 0 \qquad (5)$$

This means that (i) parents whose children have larger endowments will invest more in them, (ii) if the alternative cost of human capital raises, the optimal investment will fall, and (iii) public and private investments are substitutes.

Replacing (4) into (1)

$$H_t = \Psi(g(s_{t-1}, E_t, r_t), s_{t-1}, E_t) = \phi(s_{t-1}, E_t, r_t) \qquad (6)$$

With $$\phi_E = \frac{\partial \Psi}{\partial g} \cdot \frac{\partial g}{\partial E} + \frac{\partial \Psi}{\partial E} > 0$$

$$\phi_s = \frac{\partial \Psi}{\partial g} \cdot \frac{\partial g}{\partial s} + \frac{\partial \Psi}{\partial s} \gtreqless 0$$

$$\phi_r = \frac{\partial \Psi}{\partial g} \cdot \frac{\partial g}{\partial r} < 0$$

And children better endowed will accumulate a larger amount of human capital.

But, what if not every family has full access to capital markets? To see this, imagine that some parents cannot finance their optimal investment, and neither can access capital markets fully. Parents must finance the investment by reducing consumption (theirs or their children's), by selling assets or by raising labor supply (again, theirs or their children's). This will make private expenditures dependant on not only endowments, public investments and the interest rate as in equation (4), but also on parent's income. If income is a function of human capital, then parent's education will influence the levels reached by their children.

To see this suppose that

$$Y_t = H_t + l_t \qquad (7)$$

Where Y_t is income in period t and l_t represents "luck" (another way to express any unsystematic variation in income). As optimal private investment in human capital now depends on income, we can reformulate equation (4) as

$$x_{t-1}^{**} = f(s_{t-1}, E_t, Y_{t-1}, r_t) \qquad (8)$$

Replacing equation (7) in (8)

$$x_{t-1}^{**} = f(s_{t-1}, E_t, H_{t-1}, r_t, l_{t-1}) \qquad (9)$$

And optimal investment will depend on parent's human capital. Putting (9) into (1)

$$H_t = \Psi(f(s_{t-1}, E_t, Y_{t-1}, r_t, l_t), s_{t-1}, E_t) = \omega(s_{t-1}, E_t, H_{t-1}, \mu_t) \qquad (10)$$

Where $\mu_t = r_t + l_t$. The total derivates for s_{t-1}, , E_t and μ_t (instead of r_t) have the same sign, while now $\omega_H = {\partial \Psi}/{\partial f}\,{\partial f}/{\partial H} > 0$ and children from parents with higher human capital will in turn accumulate a larger amount of it. Also assume that $\omega_{HH} < 0$, so human capital accumulation will converge up to some point[14].

Throughout the rest of the paper, we examine the evolution of intergenerational mobility of education (i.e. the relationship between H_{t-1} and H_t) by cohorts. We will see that the relationship fell for those born in the first part of the XXth century (increasing mobility), while it stagnated for cohorts born from the late-fifties onwards. We then test some possible causes for this stagnation, and find that the stagnation of permanent income of less educated parents and the stagnation of tertiary education supply are the main factors behind the lack of access to the higher educational levels. Each explanation corresponds to one of the factors the model predicts will affect human capital accumulation. First, since $\omega_H > 0$, the stagnation of parent's income during early childhood made the children of less educated families lack the necessary resources to achieve their optimal level of schooling. Second, the stagnation of higher education supply can be thought as decrease in public expenditure in human capital. Although we know that the theoretical effect of this reduction is ambiguous, since $\phi_s = \omega_s$ (see derivates after equation (6)), after the reduction in total vacancies in universities, parents cannot substitute with private investment, so in fact ${\partial \Psi}/{\partial g}\,{\partial g}/{\partial s} = 0$. These two effects (or the interaction of both) can explain the stagnation in mobility of education for cohorts born in the latter part of the XXth century.

[14] This convergence point could be different for different subgroups in the population. For example, some group's convergence may be around complete secondary school (i.e. 12 years of education), though for other may be complete higher education (17 or 18 years of education). See Sab and Smith (2002), and the references they cite for evidence of convergence in human capital.

IV. Data and Empirical Strategy

IV.1. Data sources

We use data from the Encuesta de Protección Social (EPS) of 2002 and 2004[15]. We include all cohorts born between 1930 and 1978 (in order to have enough mass on each cohort). The EPS has questions related to the education of the parents (father and mother) and their children. In total we have 73,493 data points.

To find actual rates of mobility, we first estimate a regression between the child of the parent and his parents. We estimate using both educational levels and logs. This is what is most frequently done in the literature to analyze mobility. Table 1 presents some summary statistics of the number of observations by cohorts, along with the average schooling for children and parents (the corresponding cohorts corresponds to the children year of birth). The mean education by cohort almost doubled between those born in 1930 and the cohort born in 1978, figure 1 shows this evolution. It increased from 6 years for the 1930 cohort to 11.7 for the generation from 1978. We can see two different stages in this evolution; first, there is a sharp expansion of the mean between the cohorts born in 1930 and 1956. During this first stage the average education for a cohort grew from 6 to 10 years (at a rate of growth of 1.8% per year). For those cohorts born between 1958 and 1978 the rate of growth was much slower (0.8%).

Another important feature of the data is that the difference between child's and parents' education for cohorts in the first period (1930-1956) starts at 1.5 years, and increases in the middle part of the century, reaching a more-than-four-years difference for cohorts born between 1956 and 1971; then it eventually starts to decrease (the difference in the 1978 cohort is 3.4 years). In the early part of the century the average schooling of new cohorts started to diverge from the levels achieved by their parents, but due to factors that we will

[15] We actually work with three different data sets, but only report here the results for one of them. The first two data sets (the Encuesta de Caracterización Socio-Económica (CASEN) and the Encuesta de Movilidad Social de Chile (EMSC)) do not have sufficient data by cohort and hence require the aggregation of different cohorts to obtain statistically significant results. The third (the EPS) does allow us to work with each cohort individually and it is these results that we report. The results with the three data sets follow very similar patterns. We also study mobility of the child's education with respect to both the father's and the mother's education, but only report here the results regarding the correlation with the father's education. This is because when we include both parents' education in the regression, only the father's education is statistically significant. In any case, results for the mother and the father are very similar.

examine later, this difference stopped increasing and then began to decrease for those born in the second half of the century.

Someone could argue that this decrease in the difference is to be expected, since the years of schooling are bounded from above. This may represent a problem only if the average level of schooling is close to that bound, but this was not the case for those cohorts where the difference began to decrease. The average schooling for the generation born in 1956 is 9.4 years, barely higher than complete primary education, thus a large space for growth was still available.

Hence there must have been other factors that affected the educational level achieved by these cohorts. In this paper we find that there are two crucial factors (and in other work we discard another two). First, since we do not have information on permanent incomes for parents to test the credit constraints hypothesis, we use the wages series for non-qualified workers from Braun, Braun, Briones and Díaz (2000) as a proxy for current income for low education parents. With this data we make several alternative estimates of permanent income at the cohort-level[16].

Second, we use data for total enrolment in tertiary education from Díaz, Lüders and Wagner (2010), who constructed the series for the entire history of Chile.

IV.2. Empirical Strategy

For the entire population we estimate:

$$S_{i1} = \alpha + \beta S_{i0} + \varepsilon_{i1} \qquad (11)$$

Where S_{ij} represent the schooling of an individual from family i and of the generation j, where $j = 1$ represents the children, while $j = 0$ represents his parents. The schooling can be measured in levels or in logs, in the latter case we will be measuring the intergenerational elasticity. We expect that $0 < \beta < 1$, and the closer to 0 β is, the more mobile the society is. But taking the entire population may confound different generations that were educated in different environments, in terms of public policy and development.

[16] Our preferred estimations use the 10-years average income of parents before the birth of the cohort as a measure of permanent income. We also estimate 5- and 3-year averages, with highly similar results.

This is why it is useful to separate the population in cohorts, which we define as the sub-group born in a specific year. We will then estimate:

$$S_{ic1} = d_c + \beta_c S_{ic0} + \varepsilon_{ic1} \qquad (12)$$

Here the level of schooling from a child from family i born in cohort c has a correlation of β_c with his parent's. Also, d_c is a cohort-specific constant (that controls for year-of-birth effects). Also, under this specification we estimate a complete vector of β, one for each cohort.

Then, to test the different explanations we pose, we take the coefficient of parent's education and run a regression of the form

$$\beta_c = Z_c'\gamma + \epsilon_c \qquad (13)$$

Where the Z_c' matrix contains the variables corresponding to each explanation. The specific regressors included will be explained later[17].

V. Intergenerational mobility of education by cohorts

Figure 2 and table 2 show the intergenerational correlations of education, from a regression of children´s years of education on the education of his father (equation 12). We ran regressions both in levels and in logs and the results present the same trend (table 3 shows the results of the regression in logs), we will concentrate only on the results in levels. The evolution of the coefficient (in levels) graphed in figure 2 shows two stages. A first stage for cohorts born between 1930 and 1957, in which the coefficient drops from 0.67 to 0.41 (a decrease in the dependence of the education of the child on the education of the father, hence an increase in mobility). In a second stage from 1957 to 1978, the coefficient drops only slightly and is practically constant. These stages coincide with the evolution of the

[17] We ran the traditional Dickey-Fuller (D-F) test (see Dickey and Fuller (1979, 1981)) to test whether the intergenerational mobility (i.e. the β_c vector) corresponds to a stationary series. We did it in both levels and logarithms. The only case where we are not able to reject at the 5% level the null hypothesis of unit-root is when we test D-F for a random-walk without a drift or a time trend in the levels case (we reject the null for five other cases: random walk with trend or drift in the levels regression and the three cases in the logs regression).

average years of schooling, when the mean grew substantially mobility also increased. Then, when the mean education grew more slowly, mobility stopped increasing[18].

While cohorts born in the first part of the sample (between 1930 and 1940) present relatively low levels of mobility (higher levels of correlation), comparable with other Latin American immobile countries, like Peru, Ecuador, Brazil, or Colombia; those born after the forties show levels closer to those of the less mobile developed countries, like Italy. Finally, the cohorts form 1957 onwards show levels comparable to more mobile countries, like the US, or Sweden (Hertz et. al. (2007))[19].

VI. How can we explain the stagnation in mobility?

There are two main explanations for the "sudden-stop" in the evolution of mobility[20]. That is, for the difference in the evolution of mobility between cohorts born between 1930 and 1957, and generations born from 1958 onwards. The first is credit constraints (we test two different margins as in Carneiro and Heckman 2002: credit constraints at birth and when the decision to enter college is taken). This explanation focuses on the demand side of the market, while the second focuses on supply factors. The second explanation is the freeze in the supply of tertiary education that started in the mid-seventies (which affected entrance to tertiary education of cohorts born in the late-fifties).

We find that these two variables, credit constraints at birth and the stagnation of tertiary education supply in the seventies, are the two factors that best explain the stagnation of intergenerational mobility of education.

VI.1. Hypotheses

a. Human capital accumulation

[18] In terms of elasticities (regressions in logs, in table 3) the results are very similar, elasticity falls from 0.5 to 0.29 for the whole period. For the cohorts born between 1930 and 1957 the elasticity falls from 0.5 to 0.24; for cohorts born between 1958 and 1978 the elasticity moves in a narrow range (between 0.26 and 0.29).

[19] This comparison between correlations for cohorts in the case of Chile and for the whole population for the other countries is done for illustrative purposes only.

[20] We also test two other hypotheses. First, since family composition has changed in Chile as it has changed in developed countries, we test whether the increase in single parent families had effects on mobility. We find an effect, though it vanishes when we control for the credit constraints hypothesis. Second, we test a command explanation: we test for the effect of mandatory schooling laws. We find that minimum schooling laws did not have any effect on the evolution of the intergenerational mobility of education. See Appendix 2 for details on each hypothesis.

An argument that has gained weight among social and natural sciences says that the main determinants of the achievement gap between groups in a society are differences in investments in human capital in the first stages of life. According to this hypothesis the accumulation of human capital in early childhood has a large impact on both cognitive (test scores, IQ) and non-cognitive (motivation, perseverance, tenacity) skills.

At early stages of life the child's brain has still not completed its formation, thus there are some areas susceptible to be shaped through different stimulus. The different stages of the formation of human capital are highly complementary (see Heckman (2006), Heckman and Masterov (2007), Doyle, Harmon, Heckman and Tremblay (2009)) thus the lack of early investment will have a detrimental effect on the productivity of higher educational levels.

This explanation relates closely to the model proposed in section II, where, in the absence of credit constraints, parents can endow their child with the optimal amount of human capital. But if there are credit constraints, parents face a trade-off between child's education and consumption. We need to discriminate between these two competing hypothesis in the literature. The first is the argument found in Carneiro and Heckman (2002) (see also Heckman (2006), Cunha, Heckman et al (2006), Doyle et. al (2009)) and says that, given the dynamic complementarities of investments at different stages of life, if a child does not receive the necessary stimulus in the early stages of his childhood, all investments made later will have a lower return (e.g. see figure 2 in Doyle et. al (2009)). This is consistent with long-run credit constraints, where the lack of necessary investments early in life hurts the child's entire development path.

The second hypothesis is short-run or contemporaneous credit constraints (Card (1999, 2001), Cameron and Taber (2004)). Children from less educated parents may face credit constraints for direct costs of schooling (monetary costs of tuition, books, transportation and board and room), and for indirect costs of schooling (forgone earnings). We will refer to this hypothesis as short-run credit constraints.

Although these two hypotheses are not mutually exclusive, there has been some debate in the literature regarding the validity of each of them[21]. We test whether the stagnation in intergenerational mobility of education was driven by long- or short-run credit constraints, if any.

Figure 3 shows the evolution of our measure of permanent income by cohort (see section III.1), both short term (at 18) and long term (at birth). We estimate both series by the ten year average of income before the year when the cohort reaches the respective age (birth or 18). We average the (real) income for low-skilled workers for the respective cohorts, measured in thousands pesos.

Looking at both series we can see a marked divergence for cohorts born in the fifties, those that were first affected by the stagnation. While contemporaneous permanent income increases, permanent income at birth stays flat. Permanent income at birth begins to grow for cohorts born in the early sixties, and this different path between long- and short-run credit constraints may help us to discriminate between the two hypotheses competing to explain the stagnation of mobility. It is this divergence we can exploit to determine which of them affected access to education by children of low education parents. Since it is the cohorts born in the fifties that are affected at first, if one of these two hypotheses has explanatory power it looks like it should be income at birth. However, if it were so, that explanatory power would run out for those cohorts born in the late sixties and beyond. So we would need a complementary hypothesis to explain the persistence in the stagnation. We find that in the supply side.

b. The supply side

The human capital accumulation decision is a choice made by families through an optimal allocation of resources, taking supply conditions as given. Furthermore, models in this literature such as Becker-Tomes assume that if a parent wants to buy one more unit of human capital, it will be available. But this may not be the case, since governmental

[21] For example, Carneiro and Heckman (2003) argue that "Conditioning on long term factors eliminates most of the effect of family income in the adolescent years on college enrolment decisions for most people, except for a small fraction of young people (p.709)".

policies may arbitrarily expand or reduce the supply of vacancies in a certain educational level. Therefore, we examine the effect of tertiary education supply on mobility.

Central to our analysis is the reduction in the higher education vacancies during the fiscal crisis of the mid seventies (caused by the combination of a high fiscal deficit plus the dramatic change in the terms of trade produced by the 1974 oil shock). Empirically, we find that supply also played an important role in the stagnation of mobility. When we include both hypotheses we find that it is long-run credit constraints together with the stagnation of higher education supply that explains the interruption in the improvement of mobility.

Starting in 1967 there were pressures to increase vacancies in universities, channeled through a movement denominated as "university reform" (see Brunner (1984), Brunner (1986) Bernasconi and Rojas (2004)). It also sought to increase enrollment for children of families with low incomes[22]. Following up on these pressures, the government financed a large increase in the supply of vacancies in universities[23]. Public expenditure in tertiary education almost doubled. Between 1967 and 1973 higher education enrolment grew from 56,000 to 140,000, an increase of 150% (see Díaz, Lüders and Wagner (2010)).

Starting in 1974 the government reduced sharply the supply of publicly funded vacancies in higher education (along with a sharp reduction in real public expenditure, of between 15% and 35%, depending on the CPI used to correct for inflation). Provision of private supply was not possible until 1981, when the government introduced a new legal framework for higher education[24]. This reform authorized the opening of two new types of providers of higher education: the Technical Formation Centers (TFC) and the Professional Institutes (PI), and assigned to them the provision of non academic and technical degrees[25]. While TFCs were entrusted the provision of low-skilled professional degrees (for relatively low-skilled white-collar occupations), PIs were assigned the provision of technical degrees (i.e.

[22] As shown below, the difference between coverage of tertiary education between different groups was relatively high in the sixties. For example, in 1965 only 7% children of parents with 6 or less years of schooling were enrolled in higher education.

[23] Before the reform of 1981 the only tertiary education institutions were universities, which had "*the legal monopoly over professional titles and academic degrees*". (Brunner (1984), p.8).

[24] See Brunner (1984) (and his references), or Bernasconi and Rojas (2004) for a more detailed explanation of the new reforms.

[25] In fact there were some informal institutions of this type before the reform. This was precisely one of the objectives of it: formalize and regulate these institutions which were giving informal education, and were not subject to any control or regulation. We have no data of the supply of vacancies by these entities.

for blue-collar occupations, see Ministry of Education (1981b, 1981c)). Universities kept the monopoly of professional degrees (for high-skilled white-collar occupations). A key element of the new legal environment was that it created a framework in which new universities could enter the market for the provision of professional degrees: "[*t*]*he Ministry of Education cannot deny the register of a university…*" (see Ministry of Education (1981a), Art.18°). However, during 1982-1989 there was almost no entrance of new competitors in the universities' segment[26]. This is strange, since there is evidence that there were rents for potential entrants[27]. What happened was that the new law established a "double filter" for the creation of a new university. It had to be cleared both by the Ministry of Education and the Ministry of Interior. The Ministry of Interior could deny entrance when it judged the entrant threatened public order or national security (Ministry of Education (1981a), Art.4°), and it is this filter that became binding.

Figure 4 shows the evolution of total tertiary education enrollment and the evolution for each segment of the market. The evolution of total enrollment (the continuous line) shows three different periods. First, it shows a period of continuous growth between the late forties and the early seventies (with an average growth rate between 1948 and 1973 of 13%[28]). The second period is from 1974 to 1981 (when the higher education reform occurs), with an average decline rate of -2.0%. The third period goes from 1981 to the end of the period analyzed, with an average growth rate of 8.1% a year.

A deeper look into the evolution of the different segments sheds some further light on what happened. The reform marked a change in the structure of the tertiary market that cannot be appreciated when looking at the series for total enrollment. We will refer to the period before 1981 as the pre-reform period, and the period from then on as the post-reform period. Total enrollment and universities' enrollment is identical in the pre-reform period (by definition, since only universities participated in the market). In the post-reform period

[26] Between these years only three universities entered in the market: Universidad Central, Universidad Gabriela Mistral and Universidad Diego Portales.

[27] Gallego (2010) shows an increase in the relative demand for skilled workers in the 1980s and 1990s, which in turn should increase demand of tertiary education. This should have created positive rents in the market, encouraging new entrants, which did not happen.

[28] In fact this period contains two subperiods. The first is between 1948 and 1963, where the average growth rate was relatively high (10.6%) and the post-reform period (from 1964 and 1973) where the rate of expansion was even higher, with an average value of 16.9%.

the two series present very different behaviors. The biggest difference lies in the 1982-1989 period, in which total enrollment grows, while universities' enrollment remains practically constant[29].

The hypothesis is that the stagnation of university enrollment is one of the principal reasons behind the stagnation of mobility. Enrollment stopped growing in 1974, which coincides exactly with the year of entrance to higher education of the cohort where the stagnation began (i.e. 1956). The impossibility of further enrollment prevented many of them from achieving a higher educational level, stagnating mobility.

VI.2. Estimation results

We estimate equation (13) allowing for different "versions" of the matrix Z_c'. We test each hypothesis separately, first including our measure of permanent income at birth and at age 18, to make both hypotheses "compete". Then we test the "higher education hypothesis" estimating the effect of university enrollment and total tertiary education enrollment. Finally we test credit constraints and higher education jointly, allowing both demand and supply factors to enter together.

Table 4 shows the results for the different hypotheses. In panel A, columns 1 and 2, we estimate the effect of long- and short-run credit constraints separately, which show a very similar impact, with a coefficient of around -0.003. Then, we regress both permanent income at birth and at age 18 and find that short-run credit constraints "win". That is, if we include only demand-side factors, long-run credit constraints do not show a significant effect on the evolution of intergenerational mobility. But as figure 3 shows, permanent income at 18 began to raise and then fell before mobility stagnated, thus it cannot explain both the improvement and the stagnation[30].

[29] The respective growth rates are 9.4% for total and 1.7% for university enrollment.

[30] We performed three different robustness checks for this result. First we estimate using the log of incomes instead of levels (see columns 1 to 3 in table 9). Second we estimate using the intergenerational elasticity of education as dependent variable (see columns 4 to 6 in table 9). Finally we use a different definition of permanent income; we average 5 (instead of 10) lags of low-skilled workers wages (see table 10). Overall, tables 4 (panel A), 9 and 10 tell us that (i) income is an important determinant of intergenerational mobility of education, and (ii) the measure of income that we choose matters, since while incomes at birth and age 18 for generations born before the fifties decade were highly similar, for those born on the early fifties and after

Panel B in table 4 explores the effect of the evolution of higher education supply on the mobility of education. Here we can also see some interesting patterns. As we saw that in the post-reform period the universities and total tertiary-education supplies behave very differently, we estimate using both series separately. Column 1 uses enrollment only in universities, while column 2 uses total tertiary enrollment and column 3 also uses total enrollment but disaggregated by type of institution (universities, TFCs and PIs). The results are robust to the use of logs instead of levels of supply, see table 11.

Higher education supply had a positive and significant effect on mobility (this is true for both universities and total supply). What may seem surprising is that the separate effect of PIs and TFCs is not significant, when we would expect that the possibility of achieving less skilled tertiary degrees would be a preferred option for some families, which should improve mobility[31]. In the next section we will combine both demand and supply factors in our empirical work.

VI.3. The combined effect of supply and demand factors

Here we estimate the combined effect of permanent income at birth, at age 18 and the supply of tertiary education on intergenerational mobility. Table 5 shows the results.

The results from table 4 are confirmed by this "combined" estimation. Tertiary education enrollment measured both as universities' and total enrollment show a robust and positive effect on mobility. The mobility improvement during the entire period was 0.262 (see table 2) while the total expansion of universities supply was 236,523. Using the coefficient in column 1, table 5, we see that universities' enrollment by itself predicts a reduction of 0.227 in intergenerational mobility, 86% of the total actual reduction. The coefficient of universities supply remains constant across the three different specifications in columns 1 to 3, which is evidence that independently of credit constraints, the expansion of tertiary education was an important factor in the process of improvement and stagnation of intergenerational mobility.

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permanent incomes for low-skilled workers stagnated (specially incomes at birth), which in turn contributed to the stagnation of mobility.

[31] Our measure of intergenerational mobility just takes years of education, without any corrections for some "quality" factor that may be important. Thus, a year in a PI or a TFC is equivalent to a year of university according to our measure.

On the demand side, there are differences in the results whether we use university or total enrollment. The results are also different to those in table 4, where we tested each hypothesis alone. The only case in which permanent income is strongly significant is when only permanent income at birth is included together with university enrollment. That is also the estimation that explains more of the variance of intergenerational mobility.

The main conclusions on the demand side are two. First, permanent incomes at birth can explain a part of the reduction that supply cannot. In the previous paragraph we saw that universities supply can account for 86% of the reduction. The growth in our measure of permanent income at birth was 28.6 (thousands) 1996 Chilean pesos. Using the coefficient in column 1, table 5, we can see that the share of the reduction explained by income is a 12%, which leaves a (relatively insignificant) 2% unexplained. Second, permanent income at age 18 is no longer important after including supply. The coefficient is no longer statistically significant (the p-value is 11%) in column two, neither it is in column 3, where the three hypotheses compete. Only supply and long-run credit constraints "survive"[32].

Thus, we find that permanent income at birth, which is a rough measure of the capacity of parents to provide their offspring of abilities and human capital in the early stages of life, and higher education supply, which at first was rapidly expanding but then suddenly stopped, are the factors behind the large improvement in intergenerational mobility of education measured by cohorts and the posterior stagnation.

To substantiate our results we can analyze whether access to tertiary education was effectively the main channel through which mobility stagnated. Following literature for developed countries (see Carneiro and Heckman (2002) and d'Addio (2007)) we examine the evolution of coverage of tertiary education for different groups, in terms of parent's education.

VII. The Main Channel: Educational attainment of children according to parents' attainment

VII.1. Absolute coverage

[32] Table 12 shows the results using logs in both dependent and independent variables (panel A) and defining permanent incomes as 5 years average instead of 10 (panel B). Results are not very different from those discussed in the text.

We define four educational levels and divide the sample according to the higher level they attained. Then, we estimate how many individuals in a specific cohort end up in each of these educational levels. The four categories are: those we will say have *incomplete primary* (one year of education or more); those that we will say have *incomplete secondary* (7 years of education or more), those that have *complete secondary* (12 years of education or more); and finally those that have *incomplete tertiary* (13 years of education or more)[33]. It is important to note that the different categories are not mutually exclusive. An individual who belongs to *complete secondary* will also belong to the two previous levels, *incomplete secondary* and *incomplete primary*. We now discuss the educational attainment of children from parents in each category (that can be seen in figures 5 to 9).

What first strikes when looking at figure 5 is the fact that attainment has grown for all the population. The percentage having at least one year of education grows from 89% to 99% of the population. Coverage of incomplete secondary grows from 29% for the cohort born in 1930 to 92% for the cohort born in 1978. Coverage of complete secondary also grows substantially (from 18% to 67%). That is, two thirds of the population of the last cohort we study had at least complete secondary. The percentage of the population that has at least one year of tertiary education also grows sharply: from 7% to 28%.

These percentages first grow sharply and then much more moderately. In the first stage the rates of growth of coverage are: 0.3%, 3.6%, 3.5% and 3.1% for the four educational levels. In the second stage (1958-78) these percentages drop to 0%, 0.9%, 2% and 2.9%. The only rate of expansion that is not substantially lower and actually is similar in both stages is that for tertiary coverage (3.1% vs. 2.9%). Hence it does not appear that tertiary education coverage is at issue. Surely it cannot explain the stagnation of mobility if it continued to grow at similar levels as before.

To better understand the evolution of coverage we look at children's coverage according to their parents' educational attainment. We classify them in overlapping groups (children are present in the highest educational category they achieved and in all previous educational categories). Parental coverage is classified into non overlapping categories: they are included only in the highest educational level they achieve. For example, a child that has

[33] Although the group is labeled as "incomplete" it includes people with complete higher education.

some tertiary education, of a parent with complete secondary, will be part of the group of children from parents with complete secondary, though he will appear in all the educational categories within this group: incomplete primary, incomplete secondary, complete secondary and incomplete tertiary.

Table 8 shows the percentage of parents that belong to each group for the respective cohorts, defined as the year of birth of their sons. We make this classification to pay attention to the question whether the increase in coverage in children we described earlier is due to (i) an increase in coverage independent of the education of the parents, (ii) an increase in coverage only for children of parents with higher education levels, or (iii) an increase in coverage due only to an increase in parents' education, but with the probability of coverage unchanged once one controls for parents education.

VII.2. Coverage according to parents' attainment

Coverage of incomplete primary increases for children of parents with all education levels, converging to 100% for all groups. Hence we can say that the probability of having at least one year of education is independent of family background. We also observe a strong tendency to both increase and converge for coverage of incomplete secondary, independent of parent's education. The convergence is complete for children of parents with 7-11, 12 and 13+ years of education. However, even though convergence is strong for children of parents with 1-6 years of education for the cohort born in 1978 there still is a large gap in coverage. In numbers, the level of coverage for the children of parents with the three higher levels of education (7+ years of education) converges to 98%. For the children of parents with 1-6 years of education the level of coverage reached for the cohort born in 1978 is 84%[34]. The evolution of the coverage of incomplete primary and incomplete secondary are shown in figures 6 and 7 respectively.

For the evolution of the coverage of complete secondary we start seeing noticeable differences in how coverage evolves for children with different parental educational levels. In particular, we can see a lack of convergence (see figure 6). In figure 5 we see that coverage grows, though when we look at it conditional on parental education (figure 8)

[34] The group of parents with 1-6 years of education substantially decreases in numbers throughout the period under analysis. Hence the children in this situation are a small percentage of the total.

then coverage for the four groups rises almost in parallel. However, there is some convergence before 1957. Coverage grows at rates of 4.6%, 3%, 1.2% and 1.5% (for the four educational levels, ordered from less to more education) showing a negative relationship between coverage growth and parental education that justifies the existence of convergence. In the second stage, for cohorts born between 1958 and 1978, the coverage differences by parental education tend to persist (or to close the gap much more slowly). Coverage grows at rates of 1.8%, 0.3%, 1.1% and 0.2%.

Finally, we analyze coverage in incomplete tertiary education. This is possibly the most interesting of all the tendencies we have analyzed and confirm the results from the previous section. In figure 9 we do not see convergence but divergence (or stability followed by divergence). Coverage for children of parents with 1-6 years of education grows very slowly during the whole period, from 5% to 10%. Coverage for children of parents with 7-11 years of education grows form 14% to 33% and for those children of parents with 12 years it grows from 7% to 51%. The first two coverage rates double but the third triples. For children with parents with 13+ years of education the rate also more than doubles, from 37% to 81%. But possibly the most interesting difference does not occur from start to finish of the period under study, but in the second stage we have identified (i.e. cohorts born after 1957). In this second stage the rate of growth of coverage for the four levels of parental education are: 0.0%, 1.2%, 2.6% and 1.0%, showing divergence. The growth of coverage during the first stage had been of 3.1%, 2.7%, 2.0% and 2.3%, showing a small degree of convergence.

If one compares these rates of change, one thing stands out: the relatively large increase in tertiary coverage for the children of parents with complete secondary. That is a key ingredient in the divergence between this group and the children of parents with lower than complete secondary. The stagnation of tertiary education supply is probably at fault here. If rationing of vacancies occurs according to the results of the academic aptitude test, which in turn is correlated to education quality and permanent income, then the reduction in enrollment hurts children of less educated parents more, a phenomena that is reflected in the relative divergence in tertiary education coverage for different groups in figure 9.

In sum, two main conclusions about the relationship between intergenerational mobility and educational attainment can be drawn. First, when mobility increased for cohorts born between 1930 and 1957 there was a large expansion in the share of each cohort that completed primary and secondary education, which can be seen in the evolution of the first three groups we previously defined (figures 6 to 8). This was not the case for coverage of tertiary education (figure 9), which was relatively stagnant throughout our sample. Second, when mobility stagnated for cohorts born in 1958 onwards educational coverage still grew. The stagnation in mobility was due to differences in the evolution of coverage for children of parents with different educational levels. Children of less educated parents were not able to achieve higher levels of education, while children from more educated parents did achieve those levels.

VIII. Conclusions

Economic and social development in Chile during the twentieth century brought advances in a broad range of institutions, including education. While cohorts born in 1930 had (on average) 6 years of schooling, those born in the late seventies reached almost complete secondary education (12 years). This improvement was accompanied by an increase in the intergenerational mobility of education, measured by the correlation between the educational level reached by a child and the one achieved by his parent.

Intergenerational mobility greatly improved in Chile for cohorts born during the first half of the century. The correlation between parents and children education declined from 0.67 for those born in 1930 (a level comparable with other relatively immobile Latin American countries) to 0.41 for the cohort born in 1957 (which is comparable to that of some developed countries). But starting with the generation born in 1958 mobility faced a sudden stop and stagnated. It barely changed from this generation to those born in 1978, where the correlation was still 0.41.

We find that both the demand and the supply of education played a major role in the evolution of mobility. On the one side long-run credit constraints began to be relevant for cohorts born after 1956. On the other, after the change of government in 1973 the supply of

vacancies in tertiary education was sharply reduced and then frozen, preventing many teenagers of achieving higher educational levels. If one assumes that the entrance to university is ordered according to ability (this means that the more skilled group enter first, then the second, third, etc.), again, the children of less educated parents are the most hurt. Hence following long-run credit constraints, which handicapped them on their early childhood, they were faced with supply constraints.

The combination of credit constraints and stagnated supply are bad for mobility. However, if we had access to newer data (cohorts born after 1978) we expect to see that these factors have been attenuated or removed. On the one hand economic growth has increased permanent incomes for new families, thus we should observe a lower percentage of children with binding credit constraints. On the other hand, as can be seen in figure 3, in 1990 the university supply of vacancies began to grow sharply again. Hence those that were teenagers in the nineties had more possibilities to access tertiary education than their parents. Moreover there are institutions offering vacancies that do not ration according to the aptitude test, hence making entrance less conditional on previous restrictions. We expect these developments will result in an improvement in intergenerational mobility.

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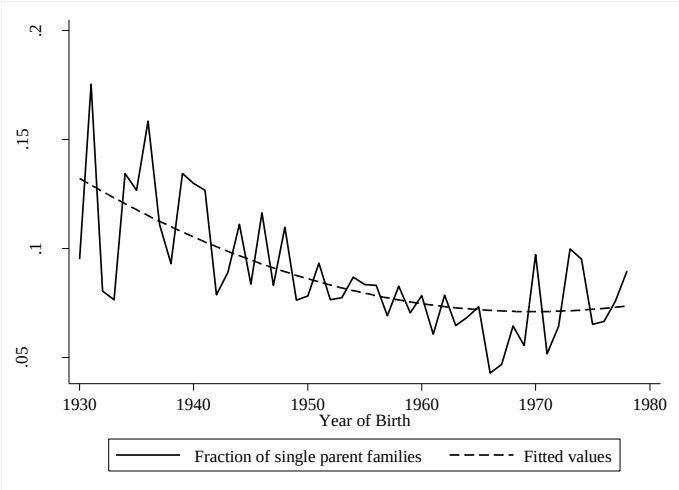
Appendix 1. Alternative explanations

A1.1. Family structure

A hypothesis that is related to long term credit constraints argues that family structure; specifically single-parent families (SPF) affect human capital accumulation by children. Recent work has found that (for the US) SPF are associated with higher levels of high school drop-out rates and teenage pregnancy, and have lower results in standardized test scores (see McLanahan and Sandefur (1994), Deleire and Kalil (2002)). Figure A1 plots the fraction of SPF by cohort in our sample. The pattern is highly similar to the evolution of intergenerational mobility (figure 2), and shows that for older cohorts the fraction of SPF is relatively high, though it falls sharply for cohorts born during the forties and fifties from a value of 17.5% for the cohort born in 1931 to 6.9% for those born in 1957, implying an average reduction of 2.16% per year[35]. After the cohort born in 1957 the fraction of SPF stagnates, which can be seen in figure 2, where for cohorts born between 1958 and 1978 the value raises an average of 0.003 per year (0.3%) which can be thought as a sign of stagnation (at least relative to the high reduction seen in the first period). Thus we have that the fraction of single parent families shows an evolution very similar to intergenerational mobility, and other empirical evidence tell us that SPF are associated with lower educational achievement. To test this, table A1 shows the results of a regression of the correlation of child and parent educational levels and the fraction of SPF, and also includes the other hypotheses. SPF presents a statistically significant coefficient, implying that as the number of SPF fell, the coefficient of correlation also fell, hence the reduction in SPF contributed to the increase in mobility. But, as it can be seen in tables A2 and A3, if we estimate this regressions separately for families whose parents have 0 to 6 years of education and for families whose parents have 7 to 11 (there aren´t SPF whose parents have more than 11 years of education), the SPF hypothesis only is statistically significant in the second group of families, which for almost all the cohorts the number of SPF is 0 (the total percentage of SPF comes almost exclusively from the first group), indicating that SPF has no explicative power over intergenerational mobility and rejecting family structure hypothesis.

Figure A1: Fraction of single parent families for each cohort



[35] Although the values are highly unstable the dashed line in figure 9 shows the (quadratic) fitted values of the fraction of single parent families, which shows a sustained reduction in spite of the high variation of point values for a particular cohort.

Table A1: The effect of Single-parent Families on intergenerational mobility

	(1)	(2)	(3)	(4)	(5)	(6)
SFP	1.838***	1.337***	0.680**	0.652**	0.631**	0.664**
	[0.214]	[0.252]	[0.265]	[0.257]	[0.249]	[0.253]
Universities				-0.000935***	-0.000811***	-0.000928***
				[0.000155]	[0.000154]	[0.000236]
Income at birth		-0.00288***	-0.000137		-0.00103***	-0.00132**
		[0.000625]	[0.000591]		[0.000325]	[0.000531]
Income at age 18			-0.00268***			0.000548
			[0.000557]			[0.000791]
Observations	49	49	49	49	49	49
R-squared	0.390	0.574	0.707	0.756	0.773	0.774

Notes: Notes: OLS regressions, the dependent variable is intergenerational mobility of education by cohort (results from table 2). Columns 1 tests the SPF hypothesis alone; columns 2 to 6 add the credit constraints and supply hypotheses combined using universities supply. All incomes in 1996 thousand of Chilean pesos. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table A2: The effect of Single-parent families on intergenerational mobility in families with parents with 0 to 6 years education

	(1)	(2)	(3)	(4)	(5)	(6)
SFP 0a6	0.589	0.630**	0.284	0.255	0.377	0.479*
	[0.477]	[0.278]	[0.272]	[0.269]	[0.231]	[0.258]
Income at birth		-0.00656***	-0.00245		-0.00345***	-0.00462**
		[0.000981]	[0.00156]		[0.000962]	[0.00173]
Income at age 18			-0.00335***			0.00205
			[0.00101]			[0.00216]
universidades				-0.00149***	-0.00104***	-0.00149***
				[0.000173]	[0.000196]	[0.000450]
Observations	49	49	49	49	49	49
R-squared	0.037	0.523	0.633	0.615	0.698	0.706

Notes: OLS regressions, the dependent variable is intergenerational mobility of education by cohort for families with parents with 0 to 6 years of education. Column 1 test de SPF hypothesis alone; columns 2 to 6 add the credit constrains and supply hypotheses combined using university supply. All incomes in 1996 thousand of Chilean pesos.
Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table A3: The effect of Single-parent families on intergenerational mobility in families with parents with 7 to 11 years education

	(1)	(2)	(3)	(4)	(5)	(6)
SFP 7a11	-3.582***	-3.241**	-2.966**	-2.894**	-2.884**	-2.884**
	[1.160]	[1.208]	[1.219]	[1.242]	[1.261]	[1.278]
Income at birth		0.00422	-5.57e-05		0.00119	0.00138
		[0.00270]	[0.00303]		[0.00210]	[0.00411]
Income at age 18			0.00356			-0.000350
			[0.00251]			[0.00524]
universidades				0.00120*	0.00105	0.00113
				[0.000683]	[0.000669]	[0.00141]
Observations	49	49	49	49	49	49
R-squared	0.080	0.120	0.147	0.154	0.156	0.156

Notes: OLS regressions, the dependent variable is intergenerational mobility of education by cohort for families with parents with 7 to 11 years of education. Column 1 test de SPF hypothesis alone; columns 2 to 6 add the credit constrains and supply hypotheses combined using university supply. All incomes in 1996 thousand of Chilean pesos.
Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

A1.2. Mandatory schooling laws

Four laws increasing the level of mandatory education have been approved in the relevant period (i.e. affecting the cohorts we examine). The laws were approved in 1920 (imposing a 4 year minimum), 1929 (6 year minimum) and 1965 (8 year minimum)[36]. To analyze the effect of these four laws on the evolution of mobility we concentrate on whether they have had an impact on the coverage percentages by cohort. We look at this through two different tests.

First, we look at the percentage of coverage for each cohort that should abide by the mandatory minimum. Then we do a regression of this coverage and see whether the approval of the law significantly changes the evolution of coverage. We do this analysis to test the effect of the 1965 law since this is the law we have more data for.

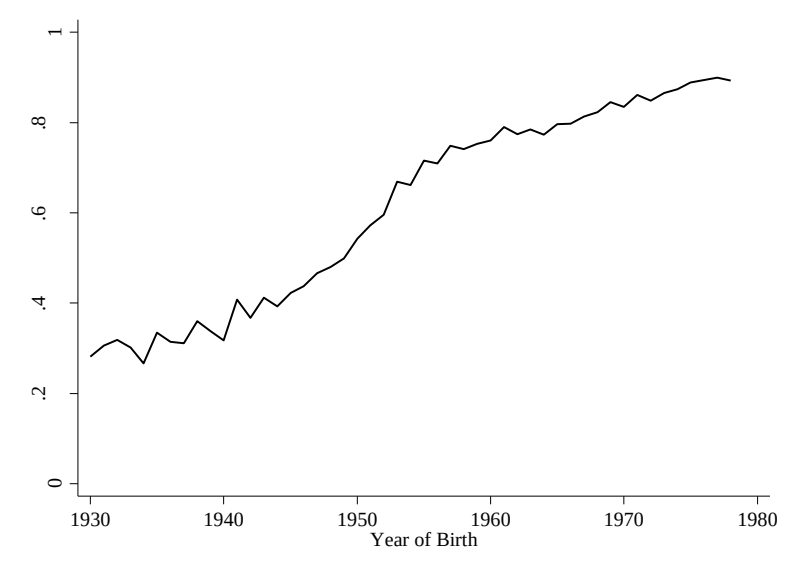
Before we proceed with the analyses, it is useful to briefly discuss which cohort will be considered affected by the laws. The laws affect the children in the level immediately preceding the level that becomes mandatory. For example, the law that mandates a minimum of 6 years of schooling affects those that are in the fifth year of primary school, who would not be able to choose whether to continue or not the next year. Since this law was approved in 1929, it affected those that were in fifth year of primary school at the time. That is, it affects those that where 11 years old in 1929, hence those born in 1918. To generalize, a law approved the year X that mandates level S of schooling will affect those that are 6+(S-1) years old; therefore the first cohort affected is that born in year Y, where year Y is estimated as X - (S-1) – 6, or X - S – 5. The number six introduced in the formula comes from the age of entry to primary school. This formula tells us then that the 1920 year law with a 4 year minimum affected all cohorts that where born from 1911 onwards; the 1929 law, those born from 1918 on and the 1965 law those born from 1952 on.

Percentage of each cohort that abides by the mandatory minimum

We concentrate on the effects of the 8 year minimum imposed on the 1952 cohort. The evolution of the percentage of individuals of each cohort that meet the minimum imposed regulation is shown in figure A2. There is acceleration in the percentage that abides by the minimum, but that precedes rather than follows the approval of the law. The graph illustrates a situation that we are able to test empirically with a regression. We will do it only for the 1965 law that imposes an 8 year minimum, since it is the law for which we have the most observations and the only one for which we have observations both for cohorts not affected and cohorts affected by the law.

[36] In 2003 a law imposing 12 years of minimum mandatory education was approved, but our data does not allow us to study its effects, since the cohorts that were affected by it begin with those born in 1986 and our data ends with the cohort of 1978.

Figure A2: Percentage of individuals the meet the minimum schooling, by moment of promulgation of the law



Regression analysis

We test for changes in trend for the 1952 cohort and after. The results are shown in table A3. We can see that the change in the trend of coverage after the law is in fact negative (column 1), which tells us that the rate of growth falls after the 1952 cohort. A second empirical work looks for all structural breaks and the analysis of the time series finds three structural breaks: for the cohorts born in 1944, 1953 and 1957. Columns 2 through 4 in table A2 show the results. Again the trend found after the imposition of the law (for columns 3 and 4) has a lower rate of growth than the trend from before that cohort. In turn, in column 2 we propose a structural break before the imposition of mandatory primary schooling, when the rate of growth was higher (see figure A2) and find that the trend increased *before* the law was imposed (this last case serves as a falsification exercise).

Table A3: The effect of mandatory primary school law on the rate of growth of coverage

	(1) 1952	(2) 1944	(3) 1953	(4) 1957
Trend	0.0125***	0.00816***	0.0132***	0.0165***
	[0.00117]	[0.00165]	[0.00120]	[0.00133]
TrendxReform	-0.00296**	0.00606***	-0.00438***	-0.00860***
	[0.00138]	[0.00189]	[0.00128]	[0.00136]
Dummy Reform	0.210***	-0.00419	0.244***	0.310***
	[0.0327]	[0.0358]	[0.0241]	[0.0235]
Observations	49	49	49	49
R-squared	0.987	0.962	0.988	0.976

Notes: OLS regressions, the dependent variable is intergenerational mobility of education by cohort (results from table 2). All columns test for a structural break in the evolution of intergenerational mobility. Column 1 tests it in 1952, column 2 in 1944, column 3 in 1953 and column 4 in 1957. The independent variables are a constant, a time trend, a dummy that takes the value 1 after the respective year, and the interaction of the trend and the dummy. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

What these results tell us is that a policy that was supposed to improve mobility does not. We could have expected that the law would have forced children from less educated parents to achieve a higher level of education than they would have otherwise reached, improving levels of mobility. Instead we see the reverse effect. However the conclusion should be that the law has no effect. The results we find must not be taken as a causal effect, we do not expect that mandatory educational laws reduce the growth of coverage.

Event study

We use a second methodology to study whether the laws has an effect on the trend of coverage, that is, event studies. This methodology is used in finance to study the impact of news, for example, on the value of a stock (McKinlay (1997)). Here we use the method to study the impact of the law on the time series of eight year coverage by cohort. We fit a trend to the trajectory of the variable before the event and test whether the true trajectory after the event deviates from the projection of the time trend followed before the event. Since the percentage of persons with at least eight years of schooling in a cohort is bound by 0 and 100 we fit a lognormal, transforming the dependent variable through a logistic function $Y = \ln\left({X}/{(1 - X)}\right)$. This transformation guarantees that the estimated trajectory will converge to 100%. Thought, we are testing whether the law accelerated the convergence with respect to the trend followed before the approval of the law.

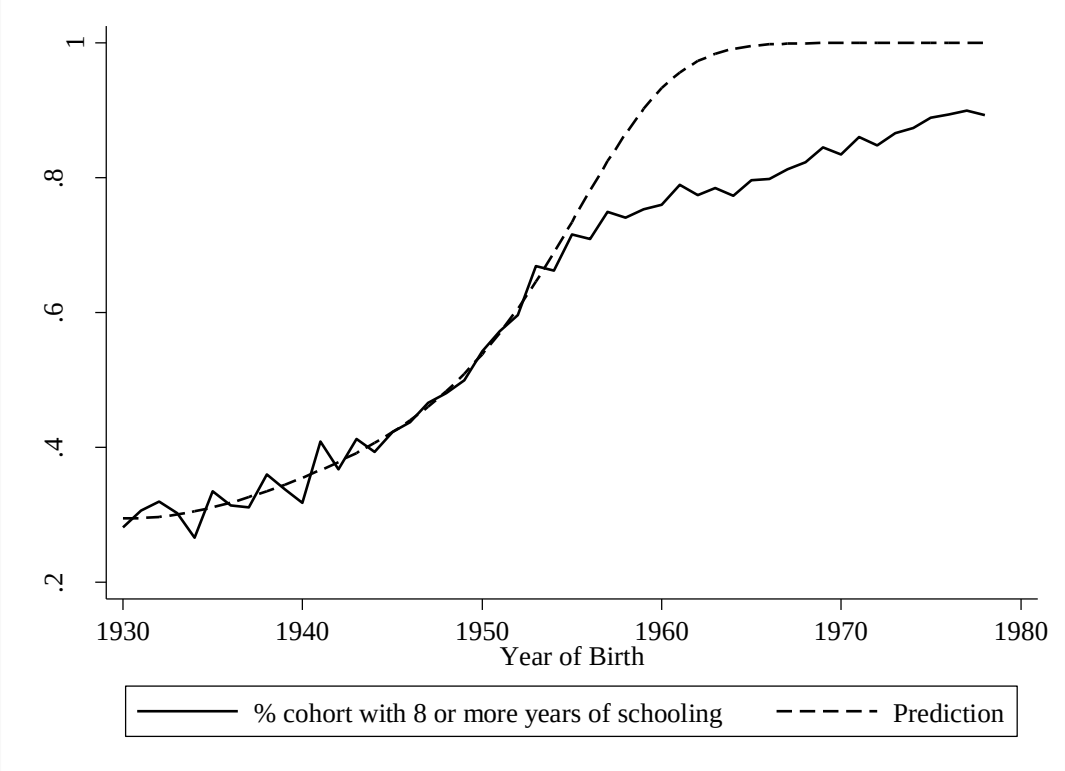
We estimate the log normal function $\ln\left({X}/{(1 - X)}\right) = s + bT + cT^2 + dT^3 + eT^4$. Where X is the percentage of individuals in a cohort that have at least eight years of education, and T is simply a trend. We estimate this function for cohorts born between 1930 and 1951 (before the event) so as not to contaminate the trend with the event (this is standard practice). With this estimate we predict the percentage of coverage for the rest of the period 1952- 1978. We then estimate the prediction error for each cohort (the difference between the prediction and the realization). We test then whether the accumulation of errors is significantly different from zero. The results can be seen in table A4 and figure A3.

After the cohort born in 1956 there is a significant deviation from the projected trend but it is not because the realized trend accelerated; the trend actually decelerated after the law. Hence we reject that the laws had any effect in the acceleration of intergenerational mobility, and so the lack of new laws does not explain the stagnation of mobility in the most recent cohorts.

Table A4 Event Study: Impact of mandatory primary education law over the percentage of individuals with 8 or more years of schooling

Cohort	Distance from the Event	ohort with 8+ years of schooling	Prediction	Error	Cumulate Error	Test
1930	-22	28.10%	29.48%	-1.38%	-1.38%	
1931	-21	30.60%	29.47%	1.13%	-0.24%	
1932	-20	31.90%	29.65%	2.25%	2.01%	
1933	-19	30.20%	29.99%	0.21%	2.22%	
1934	-18	26.60%	30.48%	-3.88%	-1.66%	
1935	-17	33.50%	31.08%	2.42%	0.76%	
1936	-16	31.40%	31.79%	-0.39%	0.37%	
1937	-15	31.10%	32.59%	-1.49%	-1.12%	
1938	-14	36.00%	33.47%	2.53%	1.41%	
1939	-13	33.80%	34.43%	-0.63%	0.78%	
1940	-12	31.70%	35.47%	-3.77%	-2.99%	
1941	-11	40.80%	36.60%	4.20%	1.21%	
1942	-10	36.70%	37.82%	-1.12%	0.08%	
1943	-9	41.20%	39.15%	2.05%	2.13%	
1944	-8	39.30%	40.61%	-1.31%	0.82%	
1945	-7	42.30%	42.23%	0.07%	0.89%	
1946	-6	43.70%	44.02%	-0.32%	0.57%	
1947	-5	46.60%	46.04%	0.56%	1.13%	
1948	-4	48.00%	48.31%	-0.31%	0.82%	
1949	-3	49.90%	50.87%	-0.97%	-0.15%	
1950	-2	54.30%	53.77%	0.53%	0.38%	
1951	-1	57.20%	57.02%	0.18%	0.56%	
1952	0	59.60%	60.64%	-1.04%	-0.48%	-0.469
1953	1	66.90%	64.63%	2.27%	1.79%	0.391
1954	2	66.20%	68.92%	-2.72%	-0.93%	-0.386
1955	3	71.60%	73.43%	-1.83%	-2.75%	-0.744
1956	4	70.90%	78.00%	-7.10%	-9.86%	-2.094
1957	5	74.90%	82.47%	-7.57%	-17.43%	-3.301
1958	6	74.10%	86.62%	-12.52%	-29.95%	-5.183
1959	7	75.30%	90.27%	-14.97%	-44.91%	-7.227
1960	8	76.00%	93.29%	-17.29%	-62.20%	-9.404
1961	9	79.00%	95.62%	-16.62%	-78.82%	-11.284
1962	10	77.40%	97.31%	-19.91%	-98.74%	-13.458
1963	11	78.50%	98.45%	-19.95%	-118.69%	-15.474
1964	12	77.30%	99.17%	-21.87%	-140.56%	-17.593
1965	13	79.60%	99.58%	-19.98%	-160.54%	-19.354
1966	14	79.80%	99.81%	-20.01%	-180.55%	-21.020
1967	15	81.30%	99.92%	-18.62%	-199.16%	-22.444
1968	16	82.30%	99.97%	-17.67%	-216.83%	-23.700
1969	17	84.50%	99.99%	-15.49%	-232.32%	-24.673
1970	18	83.50%	100.00%	-16.50%	-248.81%	-25.717
1971	19	86.10%	100.00%	-13.90%	-262.71%	-26.462
1972	20	84.80%	100.00%	-15.20%	-277.91%	-27.316
1973	21	86.60%	100.00%	-13.40%	-291.31%	-27.972
1974	22	87.40%	100.00%	-12.60%	-303.91%	-28.538
1975	23	88.90%	100.00%	-11.10%	-315.01%	-28.956
1976	24	89.40%	100.00%	-10.60%	-325.61%	-29.324
1977	25	90.00%	100.00%	-10.00%	-335.61%	-29.636
1978	26	89.30%	100.00%	-10.70%	-346.31%	-30.007

Figure A3: Event Study: Impact of mandatory primary education law over the percentage of individuals with 8 or more years of schooling



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Tables

Table 1: Summary statistics for available data by cohort (year of birth)

Cohort	N	Child Mean Schooling	Father's Mean Schooling
1930	427	6.04	4.50
1931	304	6.08	4.68
1932	527	6.30	4.62
1933	321	6.11	4.40
1934	564	5.84	4.19
1935	460	6.48	4.55
1936	513	6.29	4.51
1937	687	6.28	4.29
1938	580	6.63	4.42
1939	692	6.55	4.39
1940	805	6.49	4.08
1941	588	7.13	4.70
1942	1,119	6.98	4.67
1943	725	7.18	4.97
1944	1,19	7.20	4.78
1945	879	7.31	4.73
1946	1,063	7.54	4.79
1947	1,141	7.83	4.89
1948	1,233	7.89	4.99
1949	1,087	8.15	4.94
1950	1,572	8.44	5.21
1951	1,112	8.71	5.41
1952	1,927	8.82	5.15
1953	1,352	9.31	5.44
1954	2,110	9.15	5.21
1955	1,596	9.60	5.65
1956	1,912	9.42	5.36
1957	2,114	9.88	5.74
1958	1,932	9.76	5.65
1959	2,030	9.70	5.54
1960	2,444	9.79	5.69
1961	1,899	10.19	6.09
1962	2,883	9.93	5.72
1963	2,288	10.13	6.04
1964	2,825	10.04	5.81
1965	2,332	10.12	5.99
1966	2,459	10.26	6.12
1967	2,364	10.37	6.09
1968	2,123	10.51	6.28
1969	2,098	10.82	6.54
1970	2,255	10.72	6.58
1971	1,814	11.05	6.97
1972	2,471	10.94	6.97
1973	1,976	11.32	7.25
1974	2,135	11.29	7.30
1975	1,892	11.47	7.58
1976	1,804	11.55	7.75
1977	1,691	11.71	8.04
1978	1,605	11.57	8.20
Total	73,920		

Data was obtained using the 2002 and 2004 versions of the EPS. The column cohort refers to the year of birth of the child. Child's Mean schooling refers to the average years of education of the corresponding cohort, while Parent's mean schooling refers to the average years of education of the fathers of each cohort, those parents may have been born in different years, we do not separate them.

Table 2: Correlation between child and parent education (in levels)

Father's education × cohort		Father's education × cohort	
F.E.×1930	0.668***	F.E.×1955	0.438***
F.E.×1931	0.619***	F.E.×1956	0.476***
F.E.×1932	0.615***	F.E.×1957	0.407***
F.E.×1933	0.651***	F.E.×1958	0.443***
F.E.×1934	0.551***	F.E.×1959	0.423***
F.E.×1935	0.557***	F.E.×1960	0.426***
F.E.×1936	0.564***	F.E.×1961	0.407***
F.E.×1937	0.558***	F.E.×1962	0.435***
F.E.×1938	0.609***	F.E.×1963	0.402***
F.E.×1939	0.598***	F.E.×1964	0.413***
F.E.×1940	0.645***	F.E.×1965	0.404***
F.E.×1941	0.533***	F.E.×1966	0.426***
F.E.×1942	0.539***	F.E.×1967	0.420***
F.E.×1943	0.518***	F.E.×1968	0.407***
F.E.×1944	0.534***	F.E.×1969	0.409***
F.E.×1945	0.502***	F.E.×1970	0.408***
F.E.×1946	0.494***	F.E.×1971	0.396***
F.E.×1947	0.491***	F.E.×1972	0.411***
F.E.×1948	0.508***	F.E.×1973	0.430***
F.E.×1949	0.536***	F.E.×1974	0.402***
F.E.×1950	0.521***	F.E.×1975	0.357***
F.E.×1951	0.481***	F.E.×1976	0.397***
F.E.×1952	0.502***	F.E.×1977	0.401***
F.E.×1953	0.483***	F.E.×1978	0.406***
F.E.×1954	0.495***		
Observations		63,445	
R-squared		0.3406	

Notes: The table shows the coefficient of a regression of child education on parent education, by cohorts (see equation (12)). The regression includes a constant a full set of dummies by cohort. Robust standard errors, clustered by cohort not reported. All coefficients are significant at the 1% level.

Table 3: Correlation between child and parent education (in logs)

Father's education × cohort		Father's education × cohort	
LN(F.E.)×1930	0.641***	LN(F.E.)×1955	0.245***
LN(F.E.)×1931	0.514***	LN(F.E.)×1956	0.272***
LN(F.E.)×1932	0.532***	LN(F.E.)×1957	0.238***
LN(F.E.)×1933	0.549***	LN(F.E.)×1958	0.288***
LN(F.E.)×1934	0.500***	LN(F.E.)×1959	0.254***
LN(F.E.)×1935	0.527***	LN(F.E.)×1960	0.255***
LN(F.E.)×1936	0.533***	LN(F.E.)×1961	0.221***
LN(F.E.)×1937	0.407***	LN(F.E.)×1962	0.260***
LN(F.E.)×1938	0.448***	LN(F.E.)×1963	0.250***
LN(F.E.)×1939	0.444***	LN(F.E.)×1964	0.255***
LN(F.E.)×1940	0.486***	LN(F.E.)×1965	0.236***
LN(F.E.)×1941	0.445***	LN(F.E.)×1966	0.262***
LN(F.E.)×1942	0.410***	LN(F.E.)×1967	0.223***
LN(F.E.)×1943	0.458***	LN(F.E.)×1968	0.232***
LN(F.E.)×1944	0.415***	LN(F.E.)×1969	0.238***
LN(F.E.)×1945	0.386***	LN(F.E.)×1970	0.226***
LN(F.E.)×1946	0.367***	LN(F.E.)×1971	0.231***
LN(F.E.)×1947	0.336***	LN(F.E.)×1972	0.250***
LN(F.E.)×1948	0.364***	LN(F.E.)×1973	0.245***
LN(F.E.)×1949	0.361***	LN(F.E.)×1974	0.251***
LN(F.E.)×1950	0.359***	LN(F.E.)×1975	0.234***
LN(F.E.)×1951	0.325***	LN(F.E.)×1976	0.248***
LN(F.E.)×1952	0.368***	LN(F.E.)×1977	0.247***
LN(F.E.)×1953	0.292***	LN(F.E.)×1978	0.252***
LN(F.E.)×1954	0.287***		
Observations		51,963	
R-squared		0.2618	

Notes: The table shows the coefficient of a regression of (log) child education on (log) parent education, by cohorts (see equation (12)). The regression includes a constant a full set of dummies by cohort. Robust standard errors, clustered by cohort not reported. All coefficients are significant at the 1% level.

Table 4: The separate effect of credit constraints and tertiary education on intergenerational mobility of education			
	(1)	(2)	(3)
Panel A: Credit Constraints Hypothesis			
Income at birth	-0.00393***		0.000154
	[0.000574]		[0.000664]
Income at age 18		-0.00327***	-0.00335***
		[0.000302]	[0.000503]
Observations	49	49	49
R-squared	0.395	0.672	0.672
Panel B: Stagnated Supply Hypothesis			
Universities	-0.00109***		-0.00105***
	[0.000128]		[0.000134]
Total Supply		-0.000657***	
		[7.22e-05]	
IP			0.00162
			[0.00243]
TFC			-0.00101
			[0.00127]
Observations	49	49	46
R-squared	0.722	0.683	0.734

Notes: OLS regressions, in both panels the dependent variable is intergenerational mobility of education by cohort (results from table 2). Panel A tests the credit constraints hypothesis. The independent variables are a constant, low-skilled workers income at the moment of birth (col. 1), at age 18 (col. 2) and both (col. 3). All incomes in 1996 thousand of Chilean pesos. Panel B tests the stagnated supply hypothesis. Column 1 uses the universities supply (in thousands), column 2 total tertiary education supply, and column 3 uses a disaggregated measure of total supply, which is separated in the three different segments of the market (universities, IPs and TFCs). Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 5: The separate effect of credit constraints and tertiary education on intergenerational mobility of education						
	(1)	(2)	(3)	(4)	(5)	(6)
Income at birth	-0.00109***		-0.00105*	0.00121		0.00111
	[0.000394]		[0.000607]	[0.000761]		[0.000760]
Income at age 18		-0.00100	-7.38e-05		-0.00141*	-0.00129
		[0.000611]	[0.000881]		[0.000746]	[0.000801]
Universities	-0.000956***	-0.000796***	-0.000939***			
	[0.000141]	[0.000239]	[0.000265]			
Total Supply				-0.000786***	-0.000390**	-0.000531**
				[0.000136]	[0.000157]	[0.000223]
Observations	49	49	49	49	49	49
R-squared	0.741	0.732	0.741	0.694	0.694	0.704

Notes: OLS regressions, the dependent variable is intergenerational mobility of education by cohort (results from table 2). Columns 1 to 3 test the credit constraints and supply hypotheses combined using universities supply. The independent variables are a constant, low-skilled workers income at the moment of birth (col. 1), at age 18 (col. 2) and both (col. 3). All incomes in 1996 thousand of Chilean pesos. Columns 4 to 6 test the credit constraints and stagnated supply hypotheses using total tertiary education. Column 4 uses low-skilled workers income at the moment of birth, column 5 income at age 18, and column 6 uses both. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 8: percentage of parents on each educational group				
Cohort	Parents with 0-6 years	Parents with 7-11 years	Parents with 12 years	Parents with 13 years or more
1930	0.79	0.08	0.11	0.02
1931	0.77	0.11	0.10	0.03
1932	0.78	0.07	0.12	0.03
1933	0.81	0.06	0.09	0.04
1934	0.79	0.07	0.12	0.02
1935	0.81	0.06	0.09	0.04
1936	0.79	0.07	0.12	0.03
1937	0.81	0.08	0.09	0.02
1938	0.81	0.07	0.09	0.03
1939	0.79	0.09	0.09	0.03
1940	0.83	0.07	0.08	0.02
1941	0.77	0.09	0.11	0.03
1942	0.78	0.10	0.09	0.03
1943	0.77	0.09	0.09	0.04
1944	0.77	0.12	0.09	0.03
1945	0.77	0.11	0.09	0.03
1946	0.76	0.10	0.10	0.03
1947	0.75	0.12	0.10	0.03
1948	0.75	0.11	0.10	0.04
1949	0.76	0.11	0.11	0.02
1950	0.74	0.12	0.10	0.04
1951	0.72	0.13	0.11	0.04
1952	0.73	0.12	0.11	0.04
1953	0.72	0.13	0.12	0.04
1954	0.73	0.13	0.11	0.03
1955	0.71	0.13	0.12	0.04
1956	0.72	0.14	0.11	0.03
1957	0.69	0.15	0.13	0.04
1958	0.70	0.15	0.12	0.04
1959	0.71	0.14	0.11	0.04
1960	0.70	0.14	0.12	0.04
1961	0.66	0.16	0.14	0.05
1962	0.69	0.15	0.13	0.04
1963	0.66	0.16	0.13	0.05
1964	0.68	0.15	0.13	0.04
1965	0.67	0.16	0.13	0.05
1966	0.65	0.17	0.13	0.05
1967	0.65	0.18	0.12	0.05
1968	0.63	0.19	0.12	0.06
1969	0.60	0.21	0.14	0.06
1970	0.60	0.20	0.13	0.06
1971	0.57	0.20	0.15	0.08
1972	0.57	0.20	0.16	0.08
1973	0.53	0.23	0.15	0.09
1974	0.53	0.23	0.17	0.08
1975	0.49	0.24	0.18	0.10
1976	0.46	0.27	0.17	0.10
1977	0.44	0.28	0.17	0.11
1978	0.42	0.28	0.19	0.11

Table 9: Robustness check using logs in dependent and independent variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var. in levels			Dep. Var. in logs		
Ln(Income at birth)	-0.255***		-0.0221	-0.326***		0.0389
	[0.0362]		[0.0396]	[0.0536]		[0.0427]
Ln(Income at age 18)		-0.241***	-0.229***		-0.337***	-0.358***
		[0.0204]	[0.0318]		[0.0295]	[0.0364]
Observations	49	49	49	49	49	49
R-squared	0.419	0.709	0.710	0.354	0.720	0.722

Notes: OLS regressions of intergenerational mobility of education on credit constraints. In columns 1 to 3 the dependent variable is the regression coefficient of parents' years of education on children's years of education (results from table 2); in columns 4 to 6 the dependent variable is the intergenerational mobility, defined as the regression coefficient of log parent years of education on log child years of education (results from table 3). Columns 1 and 4 use permanent income at birth, columns 2 and 5 use permanent income at age 18, columns 3 and 6 use both. Permanent income is defined as a 10 lagged years average of low-skilled wage from XXX. All incomes in 1996 thousand of Chilean pesos. Robust standard error in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Robustness check using alternative permanent incomes, and logs in dependent and independent variables

	(1)	(2)	(3)
	Panel A: Levels-Levels		
Income at birth	-0.00250***		-0.000929***
	[0.000451]		[0.000294]
Income at age 18		-0.00240***	-0.00212***
		[0.000327]	[0.000325]
Observations	49	49	49
R-squared	0.231	0.532	0.557
	Panel B: Levels-Logs		
Ln(Income at birth)	-0.173***		-0.0553**
	[0.0328]		[0.0242]
Ln(Income at age 18)		-0.180***	-0.161***
		[0.0241]	[0.0247]
Observations	49	49	49
R-squared	0.241	0.555	0.573
	Panel C: Logs-Logs		
Ln(Income at birth)	-0.232***		-0.0665**
	[0.0485]		[0.0315]
Ln(Income at age 18)		-0.249***	-0.226***
		[0.0332]	[0.0312]
Observations	49	49	49
R-squared	0.223	0.546	0.560

Notes: OLS regressions of intergenerational mobility of education on credit constraints. Panel A tests the credit constraints hypothesis using a level-level approach. The dependent variable is the regression coefficient of parents' years of education on children's years of education (results from table 2); independent variables are measured in levels. Panel B also uses the results from table 2 as dependent variable, though incomes are measured in logs. Panel C uses a level-logs approach, the dependent variable is the intergenerational mobility, defined as the regression coefficient of log parent years of education on log child years of education (results from table 3). It also uses incomes in logs. Columns 1 uses permanent income at birth, columns 2 uses permanent income at age 18, columns 3 uses both. Permanent income is defined as a 5 lagged years average of low-skilled wage from XXX. All incomes in 1996 thousand of Chilean pesos. Robust standard error in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Robustness check using dependent variable and supply measured in logs				
	(1)	(2)	(3)	(4)
	Dep. Var. in levels		Dep. Var. in logs	
Ln(Universities)	-0.0743***		-0.107***	
	[0.00485]		[0.00594]	
Ln(Total Supply)		-0.0651***		-0.0923***
		[0.00394]		[0.00542]
Observations	49	49	49	49
R-squared	0.846	0.869	0.910	0.903

Notes: OLS regressions, columns 1 and 2 use the regression coefficient of parents' years of education on children's years of education (results from table 2) as dependent variable, columns 3 and 4 use the regression coefficient of log parent years of education on log child years of education (results from table 3) as dependent variable. Columns 1 and 3 use the log universities supply (in thousands), column 2 and 4 use log total tertiary education supply as independent variable. Robust standard error in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Robustness check for combined estimations						
	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var. in levels			Dep. Var. in logs		
Panel A: 10 lags						
Universities	-0.0667***	-0.0729***	-0.0825***	-0.104***	-0.120***	-0.128***
	[0.00593]	[0.0115]	[0.0126]	[0.00626]	[0.0131]	[0.0135]
Income at birth	-0.0629***		-0.0953***	-0.0259		-0.0744**
	[0.0207]		[0.0330]	[0.0215]		[0.0312]
Income at age 18		-0.00539	0.0764		0.0505	0.114*
		[0.0399]	[0.0582]		[0.0453]	[0.0574]
Observations	49	49	49	49	49	49
R-squared	0.863	0.846	0.871	0.912	0.913	0.921
Panel B: 5 lags						
Universities	-0.0691***	-0.0703***	-0.0712***	-0.101***	-0.109***	-0.110***
	[0.00499]	[0.00637]	[0.00613]	[0.00575]	[0.00802]	[0.00741]
Income at birth	-0.0612***		-0.0643***	-0.0672***		-0.0805***
	[0.0128]		[0.0154]	[0.0132]		[0.0148]
Income at age 18		-0.0153	0.00870		0.00725	0.0373*
		[0.0190]	[0.0208]		[0.0221]	[0.0214]
Observations	49	49	49	49	49	49
R-squared	0.872	0.848	0.873	0.927	0.911	0.931

Notes: OLS regressions, columns 1 to 3 use the regression coefficient of parent's years of education on children's years of education (results from table 2) as dependent variable, columns 4 to 6 use the regression coefficient of log parent years of education on log child years of education (results from table 3) as dependent variable. Panel A uses permanent incomes defined as the average of 10 years of incomes at birth and at 18. Panel B uses permanent incomes defined as the average of 10 years of incomes at birth and at 18. Robust standard error in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Figures

Figure 1: Average years of schooling by cohorts

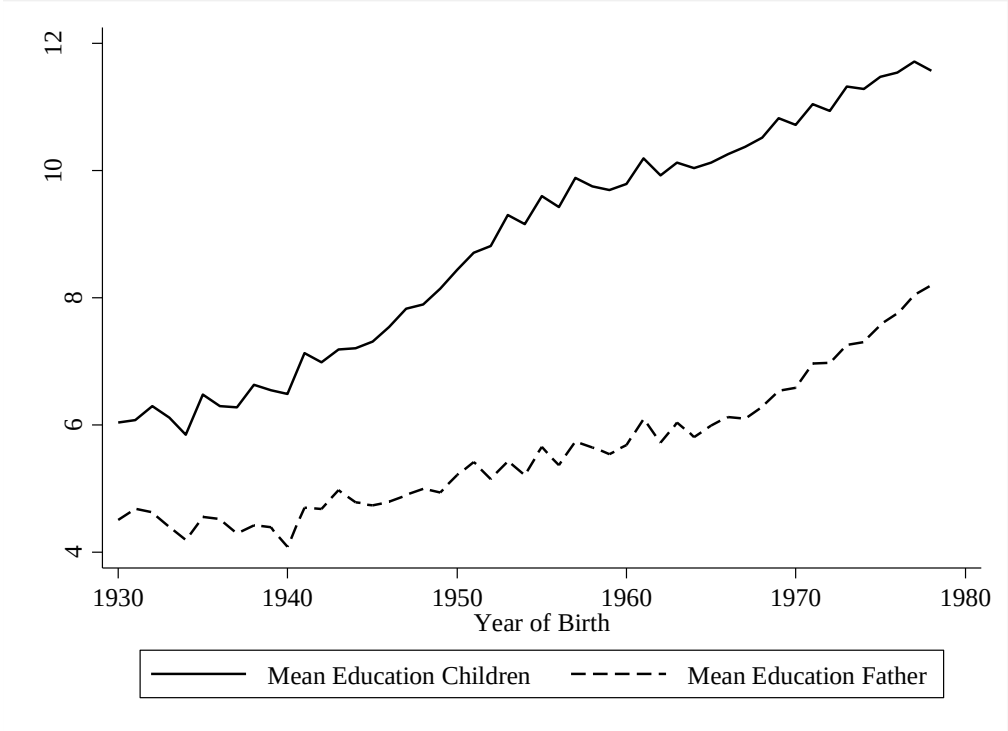

Figure 2: Intergenerational correlation of educational levels

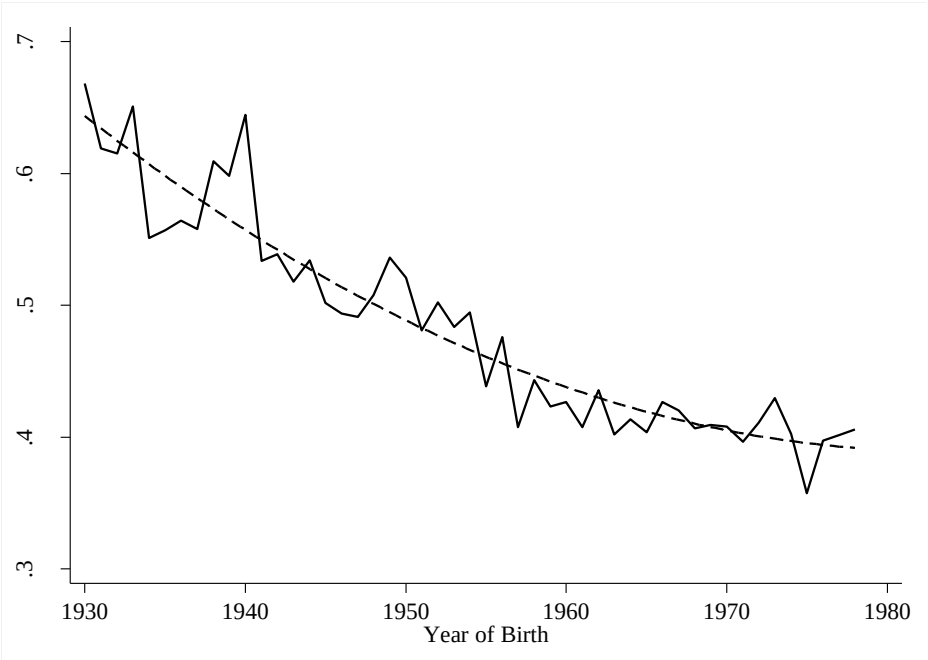

Figure 3: Permanent income at birth and age 18.

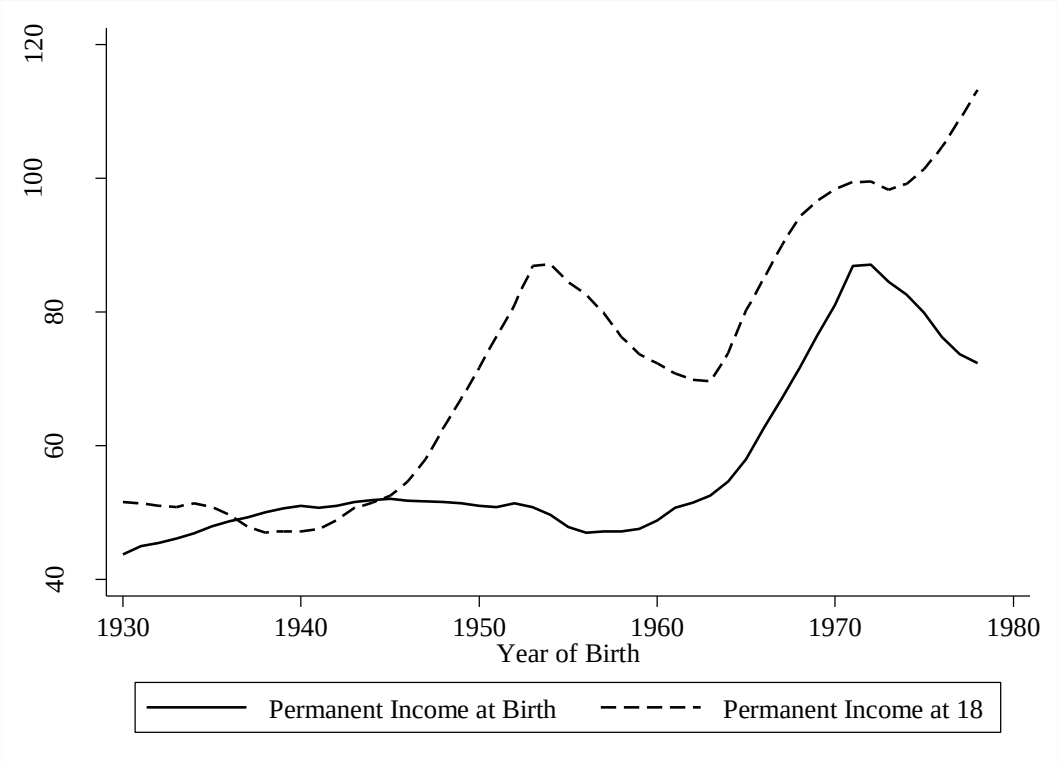

Figure 4: Total tertiary education supply

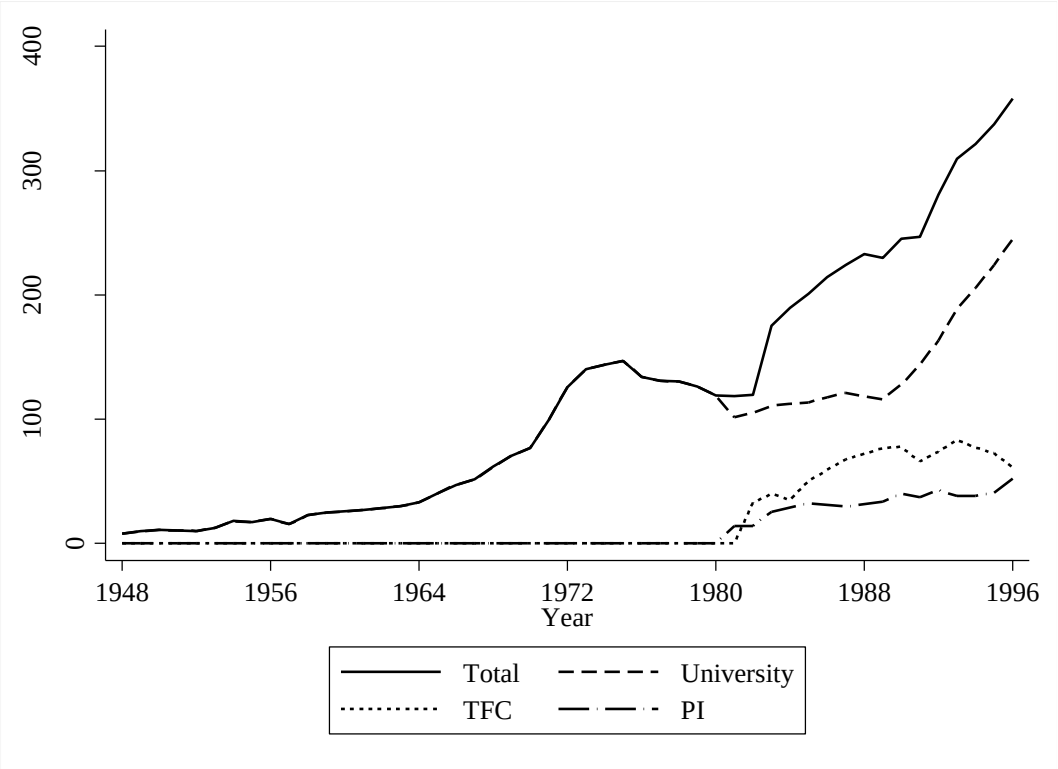

Figure 5: Absolute coverage for different educational levels

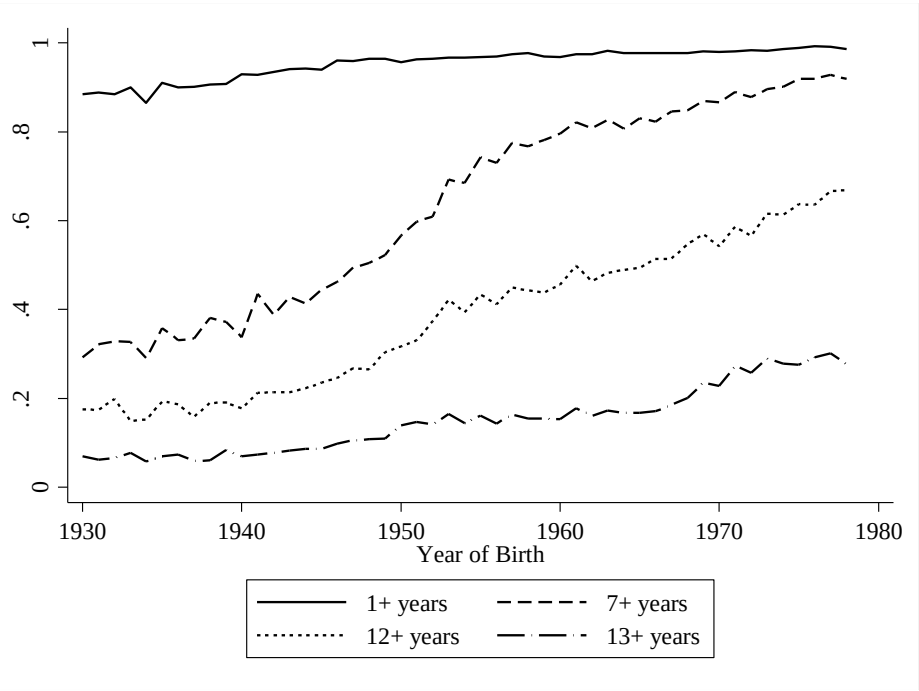

Figure 6: Coverage of incomplete primary according to parent's educational level

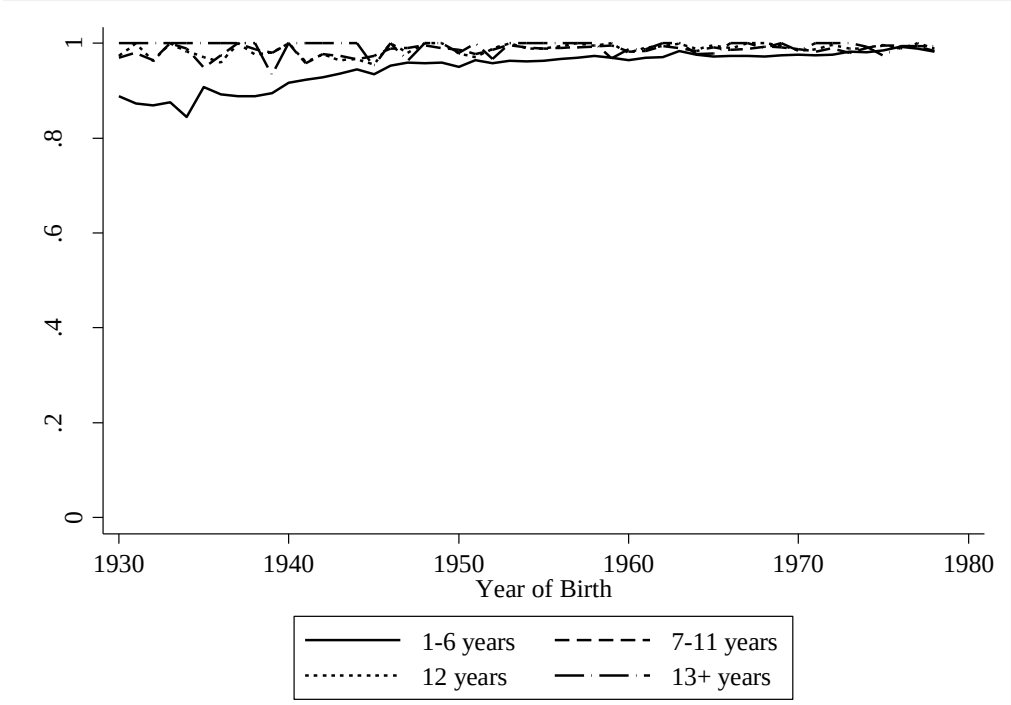

Figure 7: Coverage of incomplete secondary according to parent's educational level

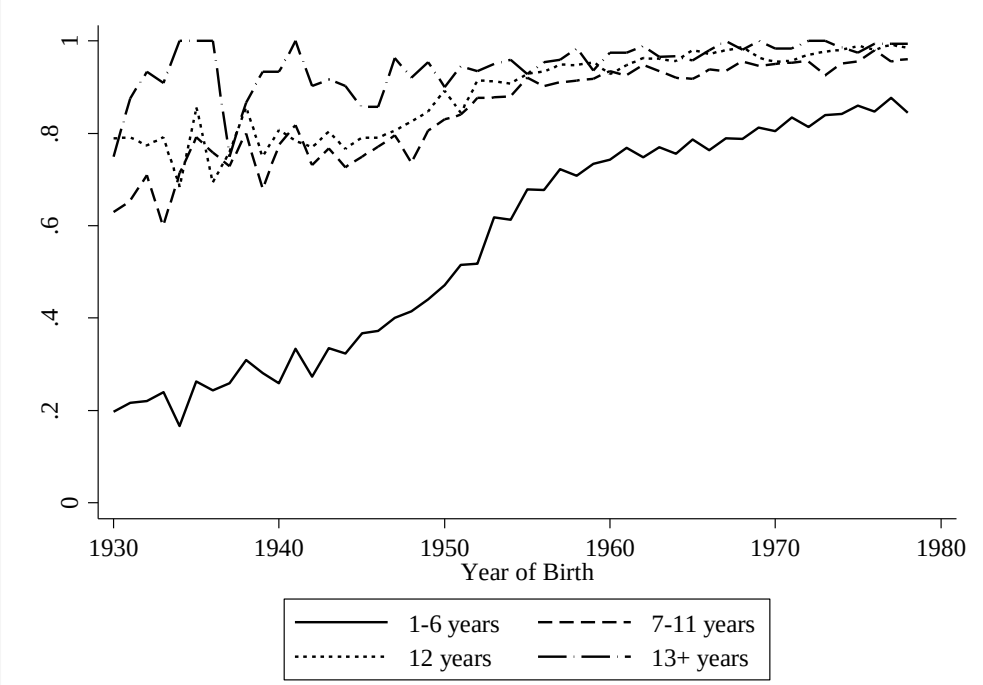

Figure 8: Coverage of complete secondary according to parent's educational level

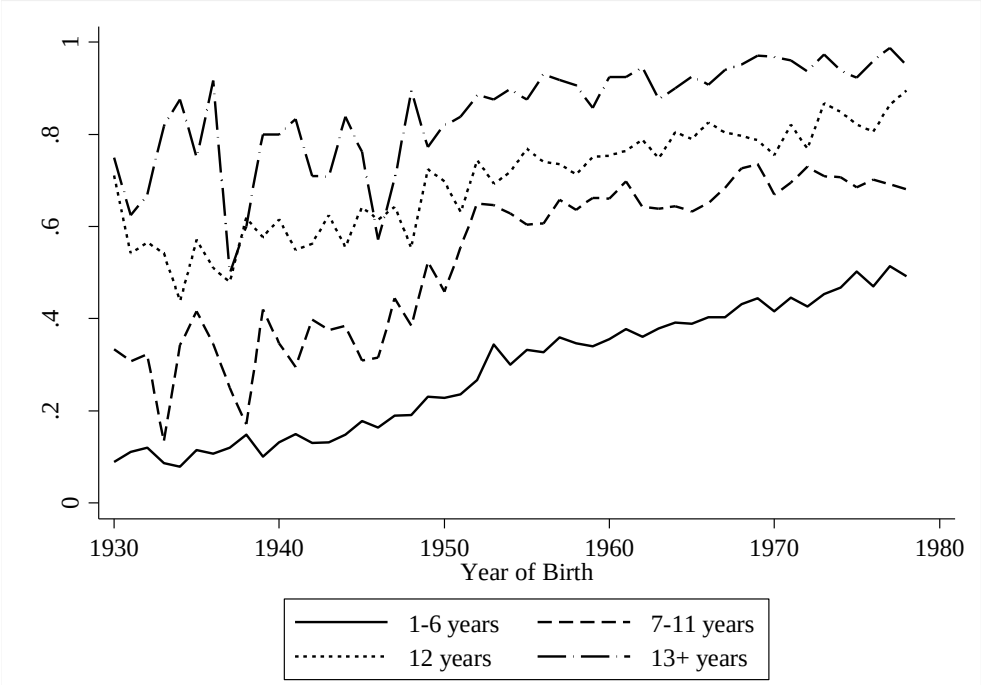

Figure 9: Coverage of incomplete tertiary according to parent's educational level