Intergenerational Mobility After Expanding Educational Opportunities: A Quasi Experiment

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Intergenerational mobility may be affected by a plethora of factors; however, much recent literature has focused on the impact of the neighborhood environment (Chetty, Hendren, and Katz 2016; Chetty et al. 2014). Given the focus on the U.S. case, that work is unable to distinguish the effect of neighborhoods from that of the schools that are located in them, since US students are usually tied to neighborhood schools. Distinguishing the impact of neighborhoods and schools is crucial for policy debates bearing on school choice and housing policy. I rely on a quasi-experiment in Chile to measure the impact of education outside of the neighborhood of origin. In Chile, a country with a voucher school system where parents can choose schools from any neighborhood, a new subway line in Santiago provided access to educational opportunities for low-income students by reducing their transport time to schools outside of their neighborhood and promoting pupils ability to switch schools (Asahi, 2014). Using an enormous, novel, student-level data set, this paper shows that the expansion of educational opportunities promoted intergenerational income mobility.

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I. Introduction

The puzzle

How important are educational interventions as opposed to neighborhood environments for social mobility? Intergenerational mobility could be affected by factors beyond the neighborhood of residence, such as, educational opportunities. In the US environment students are tied to school neighborhoods, therefore it is not easy to disentangle the effect of neighborhoods and education on intergenerational mobility. As such, much recent research fails to disaggregate more general effects of neighborhoods environments from the effects of educational opportunities (Ananat, Gassman-Pines, and Gibson-Davis, 2011; Chetty and Hendren, 2018a; Chetty, Hedren, Kline, and Saez, 2014). Nonetheless, there is no doubt that education is an important factor impacting intergenerational mobility, as more years of education has shown increases in intergenerational mobility (Maurin and McNally, 2008; Oreopoulos, Page, and Stevens, 2006; Pekkarinen, Uusitalo, and Kerr, 2009) and it is arguable that students who attend better schools present additional positive social mobility outcomes. Therefore, there is an important interest to determine if students increase their intergenerational mobility by attending "better" schools which may be located beyond their neighborhood of residence[1].

Argument

The effect of school quality versus neighborhoods on intergenerational mobility is important since it generates different policy solutions to promote social mobility. While some authors propose the creation of housing subsidies or vouchers, the educational experts have long promoted school vouchers. If the objective is to generate intergenerational mobility, instead of moving the family to live in a different neighborhood, students could be allowed to attend a school in a different neighborhood. The school choice literature in the US and Chile has found that there is an endogenous problem with school choice, as

1 In this phrase, "better" schools is a broad expression than englobes traditional measures of educational quality and also better role models, peers, teachers, expectations, educational environments, and other factors that are valued by the students' families.

parents tend to choose schools considering quality, distance, and other characteristics, such as religious orientation and discipline practices (Blagg et al. 2018; Blagg, Rosenboom, and Chingos 2018; Chumacero, Gómez, and Paredes 2011; Valenzuela, Bellei, and Ríos 2014). A quasi-experiment could help determine the relative importance of neighborhoods versus education on intergenerational mobility.

Design Test

Chile is a country with a voucher school system, where parents can choose schools from any neighborhood and no school in the country selects students considering a student's neighborhood of residence. The Chilean context allows students to attend schools far from home (Canals et al., 2015). A new subway line in Santiago, the capital of Chile, generated an external shock in 2005, allowing for increased educational opportunities for students by reducing their transport time to schools beyond their neighborhoods, promoting school switches (Asahi, 2014). The new subway line is used as a quasi-experiment to evaluate the impact of reduced transport cost and the subsequent increment of educational opportunities. A difference-in-difference (DID) approach and a nearest neighbor matching (NNM) are used in conjunction to a new subway line to evaluate the impact of increased educational opportunities. The NNM and DID methodology measure the Intent to Treat Effect (ITT) of the subway on the intergenerational income mobility of student. Students in the areas affected by the subway[2] are compared to control students that were later affected by another subway expansion. A novel dataset of educational trajectories, family information, and wages is used to estimate intergenerational income mobility using a rank-rank specification (see Chetty et al., 2014) as the outcome variable. This dataset was created by merging educational datasets of the Ministry of Education and Labor, analyzing one national cohort of 8th graders in 2004. These 250 thousand students are followed for over thirteen years, with detailed educational, residential, and labor market trajectories.

2 The areas of influence of the new subway stations have been studied in the Chilean literature and the origin-destination (OD) surveys (Asahi 2014; Metro 2017).

Findings

Both methodologies find that affected individuals that were in middle schools that finished in eight grade – forcing them to switch to a high school- in the presence of the new subway line, present a higher intergenerational mobility in moving 2 percental points above their parental income ranking. The exploration of several channels of impact, points into the direction of higher education graduation and different areas of study, could explain the higher income mobility. This paper contributes to the intergenerational mobility literature as analyzed the causes of mobility in the developing world, using a quasi-experiment. Moreover, this paper adds to the school choice discussion as it finds a positive effect for allowing low-income students to choose schools beyond their neighborhood.

This paper is organized as follows, Section 2 reviews the theoretical and empirical literature of social mobility, school choice, and the characteristics of the quasi-experiment. Section 3 describes the data sets used. Section 4 describes the methodology proposed. Section 5 shows he preliminary results and Section 6 lists the next steps.

II. Neighborhoods, Education and Social Mobility

While the work on social mobility analyzes intergenerational effects, and particularly the effect of neighborhoods, the school choice literature describes the factors that influence parents to choose different educational institutions. The motivations of parents' school choice selections are important, as they reflect- in part- parental concern for the long-term benefits of their children. This section briefly reviews the theoretical and empirical research on social mobility and school choice relevant for this research and contributing to the intergeneration mobility literature. This section also reviews a quasi-experiment, the inauguration of the new subway in Santiago and the population impacted by this new transport system that promoted students to switch to schools beyond their neighborhoods.

Low social mobility is important as it affects the capacity of individuals to live up to their full potential; moreover, low social mobility is inefficient, as it reduces the capacity of the economy to obtain maximum productivity from individuals. The idea of the "American dream" – rooted in the idea that a citizen can succeed regardless of the economic circumstances in which one was born is a reason why some citizens may accept inequalities in democratic countries (Corak, 2013). However, recent estimates of social mobility in the developed world have shown that it is lower than previously estimated (Chetty and Hendren, 2018b; Corak, 2013; Landersø and Heckman, 2017). The literature of social mobility has investigated causes that affect social mobility, including education, geography, neighborhoods, and parental education, among others (Chetty and Hendren, 2018b; Chetty et al. ,2014; Torche, 2015).

In their seminal work, Becker and Tomes developed a theory of intergenerational mobility that has served as the base of the analysis of social mobility and the cornerstone of further improvements (Solon, 2004). In this model, parents influence the outcomes of their children through several channels: genetics and human capital investment, as well as social reputation and connections (Becker & Tomes, 1979). Parents invest in their children and then these investments interact with the market and generate revenues. The recent availability of large administrative datasets from tax records and surveys has benefited the empirical literature of social mobility, allowing detailed estimations if Intergenerational Elasticity (IGE) (Palomino et al., 2018)[3].

Moreover, the empirical literature has shown that social mobility is affected by aspects such as ethnicity, early education, neighborhood, family characteristics, college education and social class (Chetty and Hendren, 2018a; Heckman, 2006; Streib, 2011; Torche, 2011; 2015; Zimmerman, 2019). There is a long history in the literature regarding the analysis of the effect of education on wages and social mobility. One of the problems in this analysis

3 For the United States, initial estimations of social mobility were close to 0.2 (Becker & Tomes, 1986), while more recent estimates are higher (Chetty et al., 2014; Connolly, Corak, and Haeck 2017; Mazumder 2005).

is that education is endogenous to family characteristics, as parents affect their offspring's educational attainment (Björklund and Jäntti, 2009). Several approaches have been used to assess the causal effects of education on social mobility. In particular, policy expansion of education and quasi-experiments have been useful tools to identify the effect of family background and education (Black, Devereux, and Salvanes, 2005; Carneiro, Meghir, and Parey, 2007; Chevalier, 2004; Machin, 2007; Magnuson, 2007; Maurin and McNally, 2008; Oreopoulos, Page, and Stevens, 2006; Pekkarinen, Uusitalo, and Kerr, 2009). Most of this research has posited the importance of education, supporting the role of educational public policies to promote social mobility (Björklund and Jäntti, 2009).

Previous literature has shown the relative high importance of the family over other background factors, like neighborhoods (Björklund and Jäntti, 2009). However, recent research has revitalized the idea that neighborhoods of residence are important to promote social mobility (Ananat, Gassman-Pines, and Gibson-Davis, 2011; Chetty et al., 2014). And new evidence, using randomized residential voucher programs in the US have shown the importance of neighborhoods on wages and social mobility (Bergman et al., 2019; Chetty, Hendren, and Katz 2016). However, these new research done in the US linked not only to geographical environments, but also to the educational opportunities, bundling several factors into their "neighborhood" definition. In the US school districts define the schools that students can attend; therefore, this literature detects two factors: the social environment in neighborhoods and educational opportunities and quality. Consequently, there is a limit to how much it's possible to learn from empirical experiences in the US. This dilemma – neighborhoods environments versus education– is important as it entails different public policies to promote social mobility. While some authors propose the creation of housing subsidies or vouchers, others policy experts propose school vouchers; instead of moving the family to a different neighborhood, it could be possible to allow students to attend schools in different neighborhoods. The school choice solution would allow the families to maintain their social networks within their communities allowing for the student to have better educational opportunities. Moreover, the school voucher solution

is less expensive than the housing voucher subsidy. These two possible policy solutions that promote social mobility demand for further research in this arena before large scale policy programs are implemented.

In particular, other countries have educational systems that do not bound educational opportunities to the neighbourhood of residence. Therefore, there is an opportunity for international evidence to contribute to the current literature and test the importance of the neighbourhood versus education on social mobility. However, there are challenges to measure the impact of education on intergenerational mobility, as school choice is endogenous to family characteristics, and direct estimations of educational quality on mobility will be biased. A quasi experiment in an educational system with school choice will help to answer this question.

III. Schooling in Chile

There are multiple mechanisms in the world by which students are assigned to schools, ranging from models that regulate school zones to systems of free choice. The latter are known as school choice systems. School choice schemes rely on the assumption that maximizing the rational and informed-choice of the families could promote optimal competition in the educational market (Friedman, 1955)[4] and increase social welfare.

The promoters of school choice system argue that these systems increase efficiency, competition, quality, and opportunities for students (Sapelli and Vial, 2002; Brighouse, 2000; Hoxby, 2000; Cohen-Zada, 2009). The detractors argue that school choice systems increase inequality and segregation (Valenzuela, Bellei, and de los Ríos, 2014; Elacqua, 2012; Ladd and Fiske, 2003; McEwan and Carnoy, 2000). Market failures could prevent school choice systems from achieving conditions of optimum competition (Mizala and Romaguera, 2000; Carnoy 1998). Thus, there is no consensus regarding the effect of school

4 Although there are many variations of school choice systems, they all share the ideas of competition, freedom of choice, and decentralization (Chubb and Moe, 1990).

choice systems on educational quality, given that most results are contradictory, small, or insignificant (Mizala and Romaguera, 2000; Ramos, 2002; Bustos, Contreras, and Sepulveda, 2007).

There are few countries in the world with as extensive a school choice system as Chile (OECD, 2017; McEwan et al., 2008) where over 90% of students are educated under this system. Furthermore, the school system in Chile has two characteristic that are useful for this study: high stratification and segregation in a school choice environment. In the Organization for Economic Cooperation and Development (OECD) countries, a high proportion of the variance of education is explained by the socioeconomic status of families (OECD, 2018). This stratification has consequences, higher quality schools tend to be located in higher income neighbourhoods, therefore resulting in low-income students usually having limited educational opportunities (Elacqua, 2012).

The school choice literature in Chile has shown the effects of school selection, finding that parents tend to choose schools considering quality, distance, safety, and other characteristics, like religious orientation and discipline (Chumacero, Gómez, and Paredes, 2011; Urzua et al., 2010; Valenzuela, Bellei, and de los Ríos, 2014)[5]. While high income parents can choose their neighbourhood of residence, lower income parents have less possibilities to choose where to live. The Chilean educational system has a second distinction. While in countries like the US, students attend schools in their school districts, the educational system in Chile is not bound by geographical markers and the availability of a school choice system allows parents to choose schools far from home. In this scenario, policies that reduce transportation costs will promote school switches, allowing low income students to attend higher "quality" schools.

5 Besides such characteristics, like quality or cost of education, there could be other factors, invisible to the researchers, that influence parents choose schools far from their places of residence. These unobservable characteristics could be important for the future of students. As an example, parent may want to isolate their child from what they consider bad company or other problems in their neighborhood schools.

Authors such as Chetty et al. (2014) analyse the local geography or neighbourhood impact on social mobility, but the schools in their study are linked to their neighbourhoods. It is, therefore, not possible to independently identify the impact of neighbourhood and schools. However, this could be evaluated in a country where school choice are not bound by district rules.

In Chile, no school selects students according to their neighborhood of origin; therefore. Therefore, it is possible to decouple the neighborhood from the school effect on social mobility. Moreover, schools have incentives to accept students, as students bring vouchers or governmental subsidies[6]. In this environment, 93% of schools are financed under a voucher program, and 7% of schools are private. Public schools in Chile are organized according to educational cycles: separating students from kindergarten to 8th grade and high schools, from 9th to 12th grade. On the contrary, private voucher schools tend to have a scheme from kindergarten to 12th grade. In the system it's possible to see a re-shuffling of students after eighth grade, as there is an important proportion of students moving to different schools (Canals et al., 2015).

In this school environment, we use a new subway line as a quasi-experiment. This subway line promoted a safe, inexpensive, and fast way for students to attend schools in different neighborhoods. Other authors have used this subway shock to detect the change in schooling opportunities (Asahi, 2014) and property price increases (Agostini and Palmucci, 2008).

6 Although no school in the country selects students according to their neighborhood of residence, private paid schools and private vouchers schools do, in practice, select students considering such variables as academic performance, religious affiliation and socioeconomic status

Private paid schools represent 7% of schools in country and students pay tuition, private voucher schools represent over 50% of schools in the country and are funded mainly using the governmental voucher. These schools are also able to charge tuition, reducing the real "choice" that families have for schools that would accept their children that they can afford, whereas public schools accept all students that apply.

III. Methods

A. New Subway Line

The scenario of a spatially segregated city, with stratified educational opportunities was affected by key event. During the mid-200s an important expansion in the subway system was inaugurated, in the context of great inequality in Santiago and a lack of transport services for the lower income groups (Asahi, 2014). This expansion in the subway system increased the proximity of more than 50% of households to the subway network, affecting mainly low and middle income groups (Asahi, 2014). The inauguration in 2005 of subway Lines 4 and 4A, in Santiago, the capital of Chile (See Figure 1A) connected some of the most populated municipalities in the city to the subway network, increasing the educational opportunities of students, Table 1.

The Santiago subway has notable characteristics: it is clean, fast, safe, and inexpensive for students. The impact of the subway networks has been analyzed by different authors in Chile. In terms of real state, it has been documented that housing prices increase at a distance of 1000 meters from the subway stations (Agostini and Palmucci, 2008). Similarly, the effect of school switches for new subway line has also been found to have a maximum impact around 1000 meters from the subway stations (Asahi, 2014). Figure 1.B shows the example of a middle school in Puente Alto in 2004. It is possible to see that the same students in 12_{th} grade move to schools all around Santiago, probably using the subway.

The surveys of origin-destination trajectories of the Santiago Subway Metro S.A, have discovered that that 80% of travelers walk 300 meters or less to and from the subway stations, and that 98% of travelers walk 600 meters or less to and from the subway stations, Figure 1(B). In 2007, The Lines 4 and 4a of the subway registered over 470,000 starting trips per day (in Appendix I, Metro, 2007)

TABLE 1— AFFECTED POPULATION BY NEW SUBWAY LINE 4 AND 4A

	Population
Puente Alto	491,222
Peñalolen	216,040
La Florida	364,602
Macul	111,914
Nuñoa	162,481
San Ramon	94,906
La Granja	132, 520
Providencia	117,020
Total	1,690,705

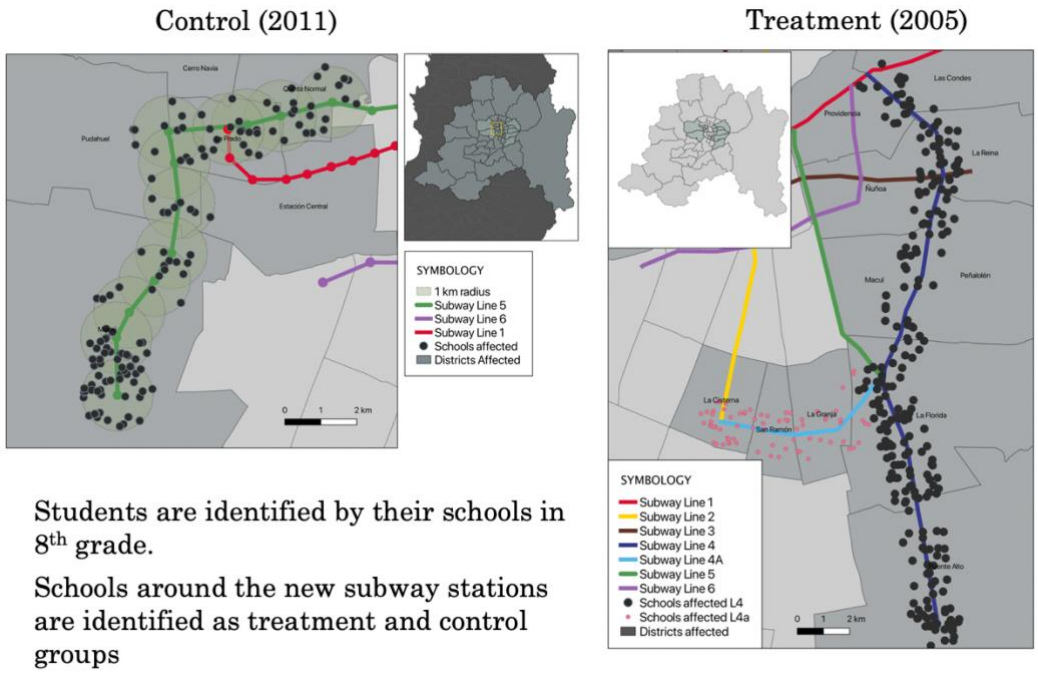
Source: Chilean Census 2002.

Beside the new subway line, a subway expansion occurred in Santiago in 2011. Students affected by the 2011 subway expansion will be the control group. This later subway expansion occurred in a different part of Santiago, connecting individuals with similar income level to the subway network. However, this expansion occurred when the analyzed cohort of students had already left high school, therefore did not promote school switches, but it did have an impact in many other relevant factors as labor markets, land value, college selection etc.

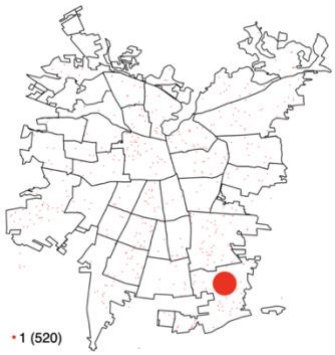
The treated students will be defined as the students enrolled in 8th grade in the middle schools around the catchment areas of the new subway lines 4 and 4A. The control group will be the students in 8th grade in middle schools around the catchment areas of the Line 5 expansion. This method to define the treatment and control group assumes that if students were able to walk to their middle school, they would also be able to walk to the new subway stations. The selected middle schools are shown in Figure 1A.

FIGURE 1. SUBWAY LINES AND STUDENTS

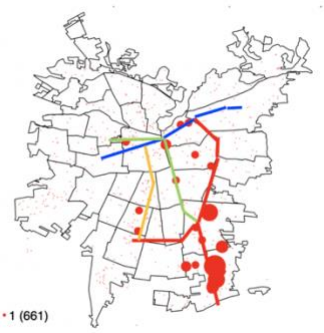
A. New Subway lines



B. Example Middle School in 8th grade



C. Destination of Students in 12th grade



B. Data Sets

To analyze social mobility and wages of students, a panel data set is created following students from age 14 to age 27. These data sets come from the Ministry of Education of Chile and the Chile's Ministry of Labor which were merged by the Ministry of Labor and all individual identifiers erased. The initial data set documents the results of a national mandatory test administered to students in the 8th grade – the SIMCE – followed by the college selection tests administered in the 12th grade. There is also information regarding college entrance and college graduation, as well the wages of students in the private sector.

The SIMCE (the System of Quality Measurement in Education, abbreviated as SIMCE by its initials in Spanish) test is a government-provided, national, mandatory test taken by eighth and 8th graders in Chile. The SIMCE tests include parental and teacher questionnaires that provide self-reported information for parents' socio-demographic factors such as maternal education, family income level, and type of school attended, among other factors. The family income and parental education in these questioners are used in this paper to estimate the baseline of family position.

The Ministry of Labor has provided information detailing the wages of the students' families between 2015 and 2018 in the private sector. These wages come from the unemployment insurance systems, that follows the wages workers, and cover the majority of the population in the country. This data set does not have information regarding workers in the informal sector.

The outcome variables of this paper constitute the rank-rank intergenerational mobility of students in Chile in which parents and students are both ranked using the full national cohorts of students. Parental income was obtained from the 2004 SIMCE survey and the

income of the adult child is obtained from their wages in 2017. Appendix 2 shows a detailed explanation of the calculations. The students in the treatment and control groups correspond to students in the school in the surrounding areas of the subway lines and amount to 13,802 students.

TABLE 2— STUDENTS USED IN THE STUDY

	Population
Initial Cohort	249,733
Monthly Wages 2017	182,000
Treated and Control	13,802

Source: Authors' own work

The variables of interest of this study are test scores, parental income, education, and wages as described in Table 3. Table 3 presents the statistics of the main variables of the students and their families. It is possible to see that there are available incomes for only 10,437 of the sample of students, out of 13,802, as not all young people work in the country.

TABLE 3—VARIABLES OF INTEREST AND SAMPLE SIZE

Variable	Obs	Mean	Std. Dev.	Min	Max
Income Rank Child	10,437	0.538	0.2833812	0.0003022	1
Income Rank Parents	13,802	0.575	0.2566679	0.0001003	1
SIMCE Test Score	13,802	255	45.54781	121.245	388.115
Maternal Education (level)	7,855	4.9	2.262401	0	13
Students Forced to Switch	13,802	.5049993	0.4999931	0	1

Source: Author calculations using data sets from the Ministry of Education and Labor.

C. Methodologies

This paper will use two methodologies to estimate the ITT effect of the subway and the increase in school choice. The exposed group is defined as students that attend middle schools in the catchment areas of the subway. The control group are students that were affected by a second subway expansion in 2011 (Figure 1A). Therefore, these individuals

had a similar positive effect of the increase in connectivity, but did not have it when they had the opportunity to choose a different high school.

The initial formulation follow the literature of intergenerational mobility that uses administrative data sets (Chetty et al., 2014). Where y_{i0} is the rank of the family in 2004, and $y_{i1}$the rank of the child in 2017 and the variable $Exposure_{it} = 1$ indicates the students affected by the subway expansion. Equation 1 is the traditional formulation to estimate intergenerational mobility. Then β_1 is the intergenerational transmission coefficient, in this case, the rank-rank coefficient. X_i are other covariates, such as academic performance, maternal education etc. that will later be included. Regressions on equation 1 would capture the extent of the movement of intergenerational mobility and the effect of the exposure to the subway expansion. Using a NNM approach regressions are perform on equation (1).

1. $y_{i1} = \beta_0 + \beta_1 y_{i0} + \beta_2 Exposure_i + \beta_3 X_i + \varepsilon_i$

DID approach:

To run the regressions using a DID approach, the data is transformed into a panel data set. A time measurement variable is created, where the period is *t,* and the initial period (t=0) is 2004, and the following period (t=1) is 2017. T_{it} is a dummy variable that indicates the year 2017. The interaction term $T_{it}Exposure_{it}$ will allow the measurement of the shock, and β_3 will be the DID estimate. Equation (2) shows the equation for the DID estimation.

$$y_{it} = \beta_0 + \beta_1 Exposure_{it} + \beta_2 T_{it} + \beta_3 T_{it} Exposure_{it} + \varepsilon_{it}$$

This regression then calculates how much of the change in rank is associated to the subway expansion. However, this estimation does allow for the calculation of the intergenerational transmission coefficient, but only the ITT of the subway.

To further refine the argument, the paper will divide the sample and estimate the ITT. The two groups are the students that were in middle schools that ended in 8th grade (aprox. 50% of the sample), and therefore forced them to choose a new high school (Figure 1, D), and students that were in schools that did continue towards high school. The analysis will estimate the ITT results of these students and students that where not forced to choose a new high school. Moreover, different co-founding variables (maternal ranking, SIMCE test scores, Income) are included in the analysis to check the robustness of the estimations. The comparison of the analysis of students that were forced to switch schools, versus the wants that were not, will provide a useful comparison to understand the nature of the changes and causes of social mobility. Table 4 provides a summary of students treated and students forced to switch schools.

TABLE 4— TREATED STUDENTS AND SWITCHED STUDENTS

	Treated		
Forced To Switch	No	Yes	Total
No	2,357	4,475	6,832
Yes	2,323	4,647	6,970
	4,680	9,122	13,802

Source: Authors' own work

The main hypothesis of this paper is that the increase in school options will increase intergenerational mobility. Nevertheless, the channels that could promote social mobility are varied. The first direct channel of transmission could be increases in educational quality measured in standardized tests. This perspective could also be related to increases in the college selection tests scores, better college applications and therefore increases in their future income (Hastings et al., 2013). Better quality of education can also be related to increases in higher education enrolment and higher education graduation rates (Pearson, 2012).

There are two other channels of transmission that are related to peers and role models. Peer and role models may affect the students' decision to actually enroll in higher education or to enroll in different areas of study, that could have different labor market outcomes. This paper also evaluates the enrolment rates, graduations rates, and areas of study to analyze these possible channels of transmission.

IV. Results

The results of the DID estimation with and without covariates are included in Table 4. The results show that the students in the affected areas had an increase in intergenerational mobility of two percentage points with respect to their parents, while controlling for parental income, maternal education and SIMCE test scores. The results show that students that were in middle schools that did not finished present no intergenerational mobility effect, while all of the effect is presented by students that were in middle schools that forced them to choose a new high school. Table 5 shows the results for the NNM. Although the results in both methodologies (Table 4 and 5) obtain different estimates, the results point out in the same direction, that students that were forced to switch schools present intergenerational income mobility due to the subway effect.

TABLE 4—DID REGRESSION RESULTS ON INTERGENERATIONAL INCOME MOBILITY

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
DID Estimator Covariates*	0.020 ***	0.007	0.033***
Observations	7466	4242	3224
DID Estimator No Cov.	0.007	-0.008	0.019*
Observations	24239	11877	12362

Source: Author calculations using diff command in Stata:

* Parental Income, Maternal educational level and SIMCE test scores as controls

[a] Schools that closed in eight grade:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 5—NNM REGRESSION RESULTS ON INTERGENERATIONAL INCOME MOBILITY

	NNM All Students	NNM Not forced to Switch	NNM Forced to Switch [a]
NNM Estimator	0.021	0.025*	0.022*
Observations	6512	2973	3541

Source: Author calculations using Stata

[a] Schools that closed in eight grade

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 6 and 7 show the results for the proportion of students that graduate from higher education. The DID results show that the affected students have a higher education graduation. However, the students that were forced to switch school do not present changes in their higher education graduation rates. On the other hand, the NNM estimations do not show significant results.

TABLE 6—DID REGRESSION RESULTS ON HIGHER EDUCATION GRADUATION

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
. DID Estimator Cov.	0.028 ***	0.048***	0.016
Observations	8446	4822	3624

Source: Author calculations using diff command in Stata: Parental Income, Maternal educational level and SIMCE test scores as controls

[a] Schools that closed in eight grades:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 7—NNM REGRESSION RESULTS ON HIGHER EDUCATION GRADUATION

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
NNM Estimator	.0027	-0.0048	0.009
Observations	8558	3995	4563

Source: Author calculations using diff command in Stata: Parental Income, Maternal educational level and SIMCE test scores as controls

[a] Schools that closed in eight grades:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

V. Channel of transmission

The first possible channel that could explain the higher intergenerational mobility is educational quality. To test this possible explanation this paper looks at the SIMCE test scores of students in 8th grade is compared to the SIMCE test scores of students in 10th grade. The results show negative overall results, driven mainly by students that were forced to switch schools. There are several possible explanations regarding why there are negative results. The first one could be attrition in the sample, or the socio-emotional costs of switching schools. An although these results are aligned with the literature (Asahi, 2014) they do not explain the higher intergenerational mobility or graduation rates.

TABLE 8—DID REGRESSION RESULTS SIMCE IN 10TH AND 8TH GRADE

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
DID Estimator	-2.561**	-1.085	-4.312***
Observations	7876	4542	3334

Source: Author calculations using diff command in Stata: Parental Income, and SIMCE test scores as controls. Outlier with over 2 SD of difference in tests were excluded.

[a] Schools that closed in eight grades:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

It's possible that the intergenerational mobility of students is not only affected by educational quality, but by changes in the professional paths of the students. In Chile, students choose the field of study before entering college, and while higher education is

very profitable, some degrees generate higher economic rents than others. In particular, engineering and sciences generate higher rents compared to social sciences, humanities or art, particularly for low income students (SIES 2015). Two students with the same college selection test scores and grades, could have completely different earning paths if they decided to study different professions.

The analysis is closer related to the literature of role models and peers that influence the expectations and desires of the students (Hastings et al., 2013). It could be possible that parents know what is better for their child and due to the subway, are able to choose schools environments that are a good fit for their offspring, and although the schools may not provide higher test scores, they provide guidance and professional interests that are valuable in the long term.

After reviewing all the areas of knowledge differentiated by the OECD, this paper found that treated students study engineering in a small, but higher proportion, as described by table 8. As a counterpart, results in Table 9 show a reduction in the proportion of treated students that study social sciences, business, law, humanities and arts, degrees that are less profitable. This result is particularly relevant for students that were forced to switch schools.

The results in this subsection showed that there is a negative "quality" effect measured my the SIMCE tests, but there are changes in the areas of study of the students. These results generates new research questions, making it relevant to ask if the test scores are the adequate measure that parents looking for when analyzing schools, and if researchers should be relying heavily on these scores.

TABLE 8—DID REGRESSION RESULTS ON ENGINEERING

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
DID Estimator	0.011*	0.017**	0.007
Observations	19656	9216	10602

Source: Author calculations using diff command in Stata: Parental Income, and SIMCE test scores as controls

[a] Schools that closed in eight grades:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

TABLE 8—DID REGRESSION RESULTS ON SOCIAL SCIENCES, HUMANITIES AND ARTS

	DID All Students	DID Not forced to Switch	DID Forced to Switch [a]
DID Estimator	-0.012*	-0.005	-0.016**
Observations	18818	9216	10602

Source: Author calculations using diff command in Stata: Parental Income, and SIMCE test scores as controls

[a] Schools that closed in eight grades:

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

VI. Discussion

Increasing inequality and low intergenerational mobility in developed and developing nations warrants for in-depth scrutiny of the variables causing intergenerational mobility, and particularly the factors that could be modified by policy solutions.

While neighborhoods have been used as an explanatory factor in the intergenerational mobility literature, they tend to englobe several variables, including educational opportunities. In the context of the high valuation of the neighborhood environment in the current intergenerational mobility debate, this paper proposes the analysis of education outside of the neighborhood of residence as a possible policy solution to allow students to have access to better education and promote intergenerational income mobility.

A new subway in Santiago, Chile provides a quasi-experiment which helps analyze students that attend schools in different neighborhoods by reducing their transport costs.

This paper builds upon previous research that examined how students used the subway line to travel to high schools beyond their neighborhood (Asahi, 2014)

Using DID and NNM techniques, this paper's results show that the subway expansion in the context of a school choice policy increased the intergenerational mobility position of students by two points above their parents ranking. Moreover, this overall positive effect is mainly driven by students switching schools as their middle school ended. The results indicate that intergenerational mobility increases when low-income students can choose and attend schools beyond their neighborhoods of residence; this opens spaces for further debate in this arena, and different policy solutions to increase intergenerational mobility.

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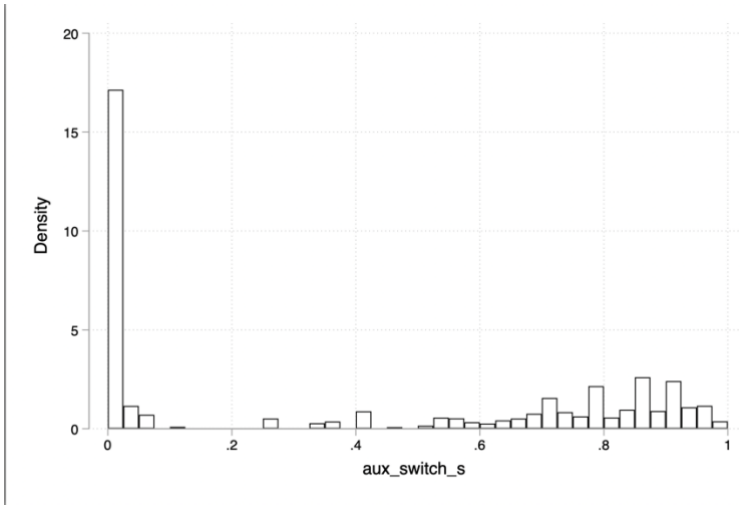
Appendix I : Metro Surveys

Appendix II: Wage Ranking Calculations

Appendix III : Proportion of students that continue in the same School

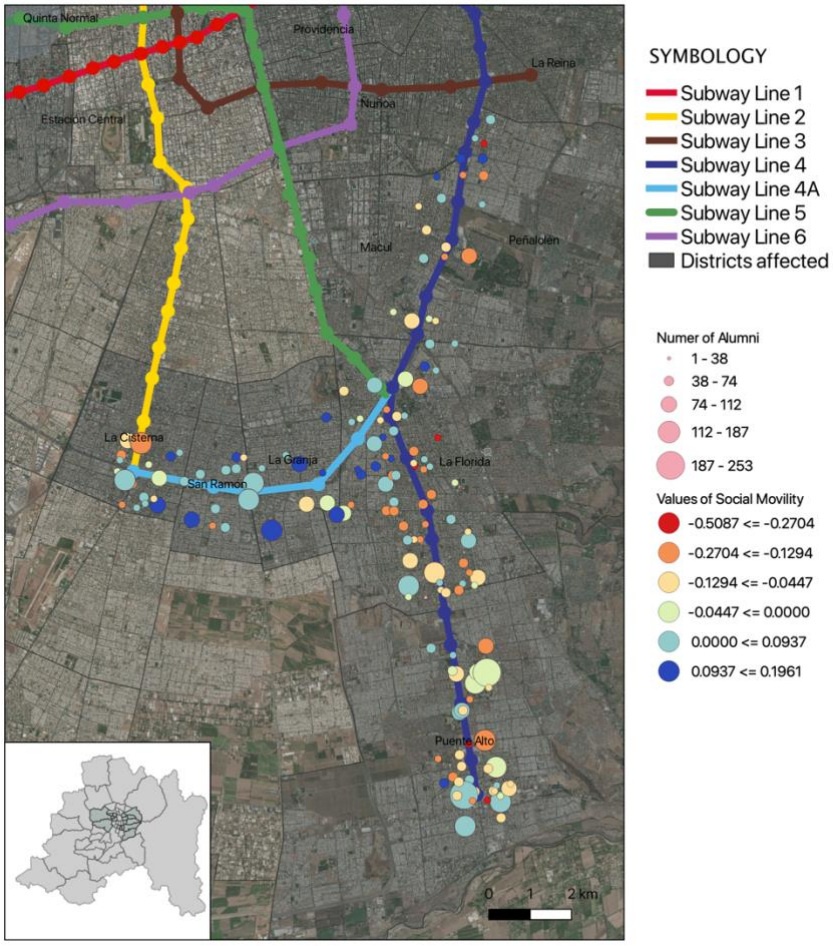


Appendix IV : School Switching

Appendix V : Effect Per Middle School

After estimating positive effects of the treated students, it is of interest to see which students are pushing the positive intergenerational mobility results. Figure 2 shows the average intergenerational income mobility (rank child – rank parents). It is possible to see that the positive intergenerational mobility results are driven mainly by students in the municipalities of San Ramon, La Granja, while there are mixed results in la Cisterna, la Florida and Puente Alto, and more negative results in Macul and Peñalolen.

FIGURE 2. INTERGENERATIONAL INCOME MOBILITY PER MIDDLE SCHOOL [A]



Source: Author calculations estimating child income rank – parental income rank

A Average results per middle school