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SOCIAL ORIGIN EFFECTS ON EDUCATIONAL MOBILITY AND LABOR MARKET OUTCOMES: A CLOSER LOOK AT TECHNICAL EDUCATIONAL ENROLLMENT IN MEXICO

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For my mom.

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Abstract

Educational decisions may have a distinctive social origin pattern when an educational system offers parallel branches of study, a phenomenon termed as class inequality in educational attainment. In Mexico, the educational system allows students to choose between obtaining technical or academic degrees at both lower and upper secondary educational levels. The present study aims at analyzing 1) the effect of the social origin on educational track choice and 2) the relationship between type of educational attainment and labor market outcomes in Mexico. A two-part multinomial logit model is used to identify the effect of social origin on educational track decisions. Our results show that the social origin does have an effect on the type of education students opt for. Individuals with more favorable social origin characteristics are less likely to pursue technical educational programs; evidence confirming the presence of class inequality in educational enrollment in Mexico. An OLS regression was then used to analyze the effect of type of educational attainment on labor market outcomes. Once we control for the non-random allocation process by including as additional regressors the predicted probabilities of the multinomial stages we find that there's no statistically significant effect of technical educational track selection on hourly income nor labor market participation; suggesting that although the Mexican educational system generates class inequality in educational attainment, no real labor market advantage is gained or lost from obtaining a distinct type of education.

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Chapter 1

Introduction

As in many other countries, Mexico has introduced alternative educational track options to the traditional academic education. Today, Mexican lower and upper secondary students may choose between obtaining a general or technical education, the latter being focused towards developing practical labor skills. These branches are qualitatively different and may or may not converge with the traditional educational system at a later stage (Breen, 2000). According to ENILEMS (2012), a significant proportion of Mexican high school graduates (35.8%) between 18-20 years old obtained their high school degrees from vocational/technical schools, data attesting to the popularity of technical programs in the country.

In a school system with different educational paths available, social origin characteristics may influence an individuals' educational decisions and consequently his educational attainment. According to Breen (2000), "in a school system based on parallel branches of study, educational decisions may have a distinctive social-origin pattern, and changes in the institutional design of the school system may lead to changes in what is often termed class inequality in educational attainment". The present study aims to assess whether class inequality in educational attainment is present in Mexico and whether this inequality fosters further inequality of opportunities by granting a particular labor market advantage to those

who opt for a distinct educational track. In order to do so the study focuses mainly on two areas: a) measuring the effect of the social origin on educational track choice and b) assessing the link between this educational track choice and labor market outcomes in Mexico.

Inequality of opportunities as an economic concept was first introduced by Roemer in 1998. According to Roemer (2009), a society reaches equality of opportunities, a socially desirable outcome, when individual outcomes are determined solely by each individual's effort; if two individuals were to invest the same amount of effort, under equality of opportunities, both should obtain the same outcome. Similarly, Breen (2005) argues that equality of opportunities is achieved when a person's chances to "get ahead (attain an education, get a good job) are uncorrelated with social origin characteristics such as race, sex, or class". Educational attainment plays a substantial role in equalizing opportunities mainly due to its long lasting effects on labor market opportunities. Investing the same amount of educational resources per child is not enough to equalize opportunities. With the same resources, certain children are more efficient than others. Equalizing educational opportunities would therefore imply that no social origin characteristics or circumstances can influence a child's ability to process educational resources or the amount of individual effort he or she invests. In order to generate equal educational opportunities one would have to compensate individuals for their different social circumstances, without compensating for their individual effort (Roemer, 2009). Under equal educational opportunities, the social origin shouldn't play a roll in determining the type of education obtained. Additionally, individuals who employ the same effort, despite choosing different educational tracks, should achieve the same labor market outcomes.

On the effects of social origin characteristics on educational enrollment much research has been conducted. Breen and Jonsson (2000) utilized data from a large Swedish longitudinal data set and a multinomial model of educational career (that takes into account previous educational decisions) to study the class-origin effects at educational transition points. Their

results support their hypothesis that "origin effects are strongest at more indirect and unusual (educational) pathways" (Breen, 2000). The authors also discover that with regards to the social origin characteristics of students who drop out, students who opted for a technical educational alternative show less differences than those who opted for a traditional academic alternative. Similarly, Falter and Chávez Juárez (2016) studied the effect of the professional matura (vocational/technical degree) in Switzerland on educational mobility. The authors test whether or not the professional matura can reduce the link between social origin characteristics and education generated earlier in the educational system. Using a two-part econometric model their results do not allow them to conclude that the professional matura promotes equality of opportunity (Falter and Chávez Juárez, 2016). Karlson (2010) employs a multinomial transition model with unobserved heterogeneity for modeling the effects of family background characteristics on the probability of making two educational transitions (primary to secondary education and secondary to tertiary education) when multiple educational pathways are available at each transition point. With data from a longitudinal survey from a cohort born in 1954 in Denmark, Karlson shows that at the first transition, social class effects are larger for the academic track than for the vocational/technical track. Similar studies use multinomial models to study educational transitions in the Netherlands, Germany, Norway, Czech Republic, Taiwan, Israel and Denmark (Karlson, 2010).

For Mexico, the effects of the social origins on educational transitions have been analyzed by Solís (2013). The author, using data from the *Encuesta ESRU de Movilidad Social en México 2011* (National Survey on Social Mobility), employs a binomial logit model to identify the effects of social origin characteristics on the probability of making educational transitions. In order to identify the effect of social origin characteristics on selecting an educational pathway the author uses a multinomial logit model. Solís's econometric approach for dealing with multiple educational pathways is limited to analyzing only those individuals who have achieved each level of education, it does not contemplate an individual's previous

educational track. With regards to technical educational alternatives, the author finds that individuals with more favorable social origin characteristics are less likely to attend vocational/technical schools. Similarly, individuals who attend vocational/technical high-schools have a lower probability of pursuing a university career than those who attend an academic high school (Solís, 2013).

Solís's results indicate that the social origin does influence the educational career choices and hence educational attainment, but does this really mean that inequality of opportunities prevails in Mexico? As explained by Roemer, inequality of educational opportunities would exist when social origin plays a role in determining educational enrollment and an advantage is gained by to those who obtain a certain type of education. If two individuals with different social origin characteristics and who therefore opt for different types of education but employ the same amount of effort achieve the same outcome then no such *advantage* would exist. In such a case, social origin would have an effect on an individuals educational track choice, and hence class inequality in educational attainment would be present, but no particular advantage would be gained from the educational track choice. Under such a scenario, one could not prove that the educational systems design promotes inequality of opportunities.

An advantage of a certain educational path over another can be observed in labor market outcomes. The effect of class inequality in educational attainment on labor market outcomes for Mexico has yet to be studied, specifically on those individuals who obtain at some point of their educational career a technical education. At most, FLACSO (2012) analyzed results from a 2011 survey on labor market insertion applied to 2,036 Mexican graduates from technical public high schools (CONALEP) one year after graduating. In an executive report published in 2012, FLACSO identifies the socio-demographic profile of CONALEP graduates, uncovering interesting descriptive statistics but without providing causal relationships between social origin, technical educational attainment, and labor market outcomes (FLACSO, 2012).

Upon confirming the presence of class inequality in educational attainment, our study attempts to explore the effect of this inequality on two particular labor market outcomes: hourly income and labor market participation. In order to do so, the present study proceeds to introduce the Mexican educational system, describe the available data, explain our econometric model specification, and present our main findings.

1.1 Context of the study: Mexican Educational System

The Mexican educational system is designed and regulated by the Ministry of Education (Secretaría de Educación Pública- SEP). The SEP is responsible for the content of the national curriculum, which is followed in both private and public schools. Since 2004, mandatory schooling in Mexico covers a one-year preschool education, a six-year primary education (grades 1-6), and a three-year lower secondary education (grades 7-9). Once primary education has been completed, students can transition to lower secondary education which can follow either an academic track or a vocational/technical track. At a lower secondary education level, a technical educational program prepares students for transitioning to upper secondary education (grades 10-12) as well as incorporating them into the labor market. Technical lower secondary schools teach industrial and commercial technical skills and general curricula (SEP, n.a.).

Upper secondary education follows after three years of lower secondary education. Admission to upper secondary schools tends to be conditioned on finalizing lower secondary education and standardized examinations. Upper secondary education can follow one of two tracks: an academic university-preparatory or a vocational/technical education (Clark, 2013). A vocational/technical education can be obtained at public schools (CONALEP's) or at private institutions. In 2012, 94.4% of 18-20 year-olds who completed a technical high school education attended a public technical school (ENILEMS, 2012). Technical high school pro-

grams incorporate general high school curricula (mathematics, sciences, English, etc) in addition to professional classes and an apprenticeship in one of eight fields of specialization: electronics, maintenance and installations, production processes, chemical processes, informational technologies, accounting, tourism, and health (FLACSO, 2012).

Students graduating from technical upper secondary education or an academic upper secondary education can transition to higher education. Admission to higher education institutions varies greatly depending on the type of institution a student wishes to attend. Selection procedures usually involve entrance examinations and upper secondary schooling academic performance reviews. Higher education can conclude in four types of degrees: technical university degree, professional university degree, normal degree (education major) or a postgraduate degree (master or doctorate degree).

Chapter 2

Data

The data for this study comes from the National Survey on Social Mobility: EMOVI-2011. The EMOVI-2011 was designed and collected by the *Centro de Estudios Espinosa Yglesias*, a nongovernmental organization whose main objective is to generate and promote specific knowledge on social mobility and socioeconomic welfare in Mexico (CEEY, 2016). With 11,001 observations, the EMOVI-2011 is statistically representative of women and men between 25-64 years old from both urban and rural backgrounds. A particular attribute of this survey is that it collects data on social origin, educational pathways, current welfare, and labor market behavior. With regards to the research at hand, a particular interest is set on those individuals who have followed a general/academic or technical educational track. Table 2.1 displays an overview of the amount of observations available in the EMOVI 2011 corresponding to each possible educational track of interest.

Table 2.1: Observations per educational track of interest

	General/Academic Upper Secondary School	Technical Upper Secondary School	No Upper Secondary School (Dropped out after lower secondary school)
General/Academic Lower Secondary School	2113	321	2476
Technical Lower Secondary School	252	457	981

As Table 2.1 shows, opting for an educational pathway that combines technical and aca-

demic educational programs is less common than pursuing a strictly academic educational track. The number of observations available for the technical middle school combined with general high school (TMS-GHS) and general middle school combined with technical high school (GMS-THS) tracks is relatively small. Nevertheless, the EMOVI is the only database available for Mexico that recollects data on social origin, educational transitions, and labor market outcomes and thus it shall be used in a first approach at observing the effects of social origin characteristics on educational attainment and labor market outcomes.

Table 2.2 presents a complete overview of the variables used in the model. For educational attainment at the lower secondary level (middle school) a multinomial variable is employed based on whether the individual stated he attended a general school, a technical school, or whether he dropped out; no distinction is made between public an private schools. Similarly, multinomial variables are used for upper secondary (high school) educational attainment.

As labor market outcomes this study considers hourly income (ln) and labor market participation. The effect of lower and upper secondary educational track choice on the probability of pursuing an educational degree after high school is also analyzed, along with individual perception of wealth and self-fulfillment.

With regards to social origin variables, a factorial analysis is employed to construct a social origin index based on having particular home appliances when young. The social origin index is then normalized by age using a Nadaraya-Watson estimate to remove the effect that time plays on the probability of having the home appliances of interest.

Control variables for this study include gender and city size at age fourteen.

Descriptive statistics for the main variables used in this study can be observed in Table 2.3. The average age of the individuals in the sample, which contains a total of 9,811 observations, is 37.87 years. Certain trends can be observed from comparing means across those

Table 2.2: Variable Description

Variable	Measured Concept
Dependent Variables	
Educational Track	
MS Track	Multinomial variable indicating if the student chose to attend an academic middle school (=2), a technical middle school (=1), or dropped out after elementary school (=0)
HS Track	Multinomial variable indicating if the student attended an academic high school (=2), a technical high school (=1) or dropped out after middle school(=0)
Labor Market Outcome Variables	
Earnings per hour	Self reported monthly income (>0) divided by self reported monthly hours worked (natural log)
Labor market participation	Dummy variable for having worked at least an hour in the last week.
Post High School Education	Dummy variable for having pursued any type of education after finishing high school.
Perception of wealth	Ordinal variable for personal perception of wealth ranging from 0 (poor) to 10 (rich).
Perception on self-fulfillment	Ordinal variable for how much an individual feels he has accomplished on his own, ranging from 0 to 10.
Social Origin Characteristics	
NSO	Social origin index constructed through factorial analysis based on having the following home appliances at 14 years old: stove, washer, refrigerator, TV, water heater, vacuum, tap water, indoor bathroom, electricity and a land-line.
Paternal schooling years	Total amount of schooling years obtained by the father
Maternal schooling years	Total amount of schooling years obtained by the mother
Control Variables	
Gender	Dummy variable for being male
Age	Individual age
City Size	Categorical variable indicating the population density for the city in which the individual grew up. The categories are: rural, small city, medium city, large city or metropolis.
HC Beneficiary	Dummy variable for being a public health care beneficiary

who studied different educational tracks. One can observe that paternal years of schooling is greater for those who opted for a strictly academic educational track (6.51 years) than any other track choice. Regarding our variable of interest, social origin characteristics (NSO), one can observe that individuals who dropped out after elementary school have the lowest social origin index (-0.411), meaning they faced greater home deficiencies growing up. As expected, those who obtained a strictly academic educational track have the highest social origin index (0.535), meaning they faced the most favorable upbringing.

For labor market outcomes, those who opted for pursuing technical middle school and a general high school education have the highest average monthly income ($5,411.08 MXN), highest earnings per hour worked ($38.65 MXN), and highest employment rate (73.81%). When comparing those with a strictly academic track to those with a strictly technical track one can note that those with an academic track have a greater employment rate and monthly income but earn less per hour worked than those with a technical track.

Table 2.3: Descriptive Statistics

	Dropouts ES	Dropouts GMS	Dropouts TMS	GMS GHS	GMS-THS	TMS-GHS	TMS-THS	All	P-Value for GMS-GHS different from GMS-THS	P-Value for GMS-GHS different from TMS-THS	P-Value for DGMS different from DTMS
N	3211	2476	981	2113	321	252	457	9811			
Average age	43.98	35.63	36.24	33.85	34.67	35.03	33	37.87	0.168	0.1*	0.112
Percentage male	50.73%	52.99%	53.11%	63.46%	58.26%	62.70%	60.83%	55.31%	0.0721*	0.291	0.949
Average income	$3,122.43	$3,907.09	$3,513.43	$5,355.41	$5,249.32	$5,411.08	$5,086.01	$4,101.55	0.791	0.449	0.0916*
Average earnings/hr	$22.33	$26.01	$23.45	$34.13	$34.17	$38.65	$35.45	$27.54	0.991	0.681	0.239
Percentage employed	60.13%	65.91%	68.37%	69.18%	72.59%	73.81%	64.77%	65.34%	0.216	0.0663*	0.146
Average years of work experience	15.36	10.00	10.86	9.31	9.27	10.42	8.18	11.36	0.957	0.0399**	0.0375**
Average paternal schooling years	1.73	3.71	3.59	6.51	5.82	6.17	6.29	3.90	0.0221**	0.415	0.341
Average maternal schooling years	1.61	3.73	3.75	6.24	5.84	5.83	6.48	3.83	0.142	0.308	0.881
Percentage of individuals with post high school studies	0%	0%	0%	39.12%	32.50%	33.20%	33.99%	13.7%	0.0232**	0.0411**	-
Percentage who grew up in a rural area	52.76%	35.57%	37.78%	25.72%	23.82%	26.19%	19.69%	37.86%	0.470	0.0068***	0.224
Average perception of wealth(0-poor,10-rich)	5.05	5.77	5.63	6.57	6.39	6.31	5.79	5.73	0.0841*	0***	0.0520*
NSO	-0.411	0.016	-0.069	0.535	0.471	0.511	0.232	0.017	0.289	0***	0.0142**

Interesting results arise when we compare means across our different groups of interest by conducting *t-tests*. When we compare those who attended an academic middle school and an academic high school (GMS-GHS) with those who attended an academic middle school and a technical high school (GMS-THS) we find that these groups are statistically different in gender composition (GMS-GHS has a statistically significant higher percentage of men) and average paternal years of schooling (GMS-GHS has a higher average). Consistent with Solís (2013) results, the proportion of students who pursued further studies amongst completing high school is significantly less for those who have a technical high school diploma than those with a general high school diploma. We do not find a significant difference for the social origin index between both groups.

When we compare across more extreme groups of interest, for example those who obtained a purely technical education (TMS-THS) and those who obtained a purely academic education (GMS-GHS), the differences are even larger. These groups are statistically different in age, employment, work experience, post-high school studies, rural upbringing, perception of wealth and social origin. A closer look into our descriptive statistics also reveals that those who obtained a technical education are younger (average age=33) than those who obtained an academic education (average age=33.85). This difference makes sense considering the rise in popularity of technical programs in recent years. Clearly, those with a purely academic education have a greater social origin index (0.511) than those with a technical education (0.232); evidence that suggests a relationship between the social origin and educational enrollment.

Data availability also allows us to compare between those who dropped out after a technical and academic middle school. When comparing these two groups we find statistically significant differences in income, work experience, perception of wealth and social origin. Those who dropped out after obtaining an academic middle school diploma have a higher social origin index than those dropping out after technical middle schools. Our data also

shows that those who obtained only an academic middle school diploma also earn more (on average) than those with only an technical middle school diploma, this difference in income is significant at a 10% level.

From Table 2.3 we can conclude that our groups of interest are in fact different. In all three comparisons more than 10% of the variables included show statistically significant differences. According to our data, those who pursue more unusual educational pathways faced a less privileged social origin background. This does not necessarily reflect class inequality in educational attainment since no formal evidence has been shown to bind social origin characteristics to a particular type of educational attainment, let alone prove that this attainment translates into a distinct advantage.

Chapter 3

The Model

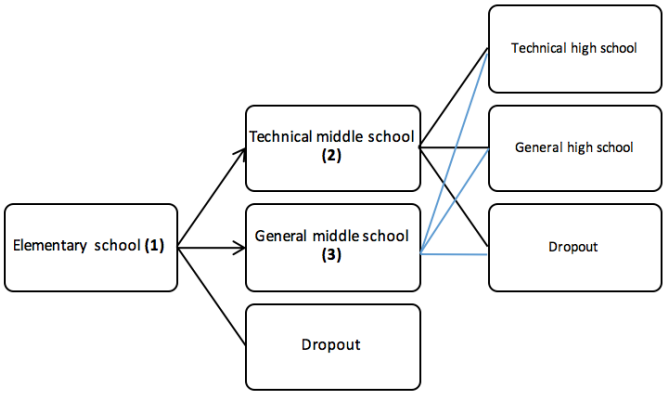
We now attempt to confirm and measure the effect of the social origin on educational enrollment and labor market outcomes. Our model can be broken down into two main estimation schemes; one attempting to measure the effect of the social origin on educational track choice and another focusing on the relationship between educational track choice and labor market outcomes. We will proceed to explaining and justifying our chosen methodology for each scheme.

3.1 Social Origin and Educational Track Choice

As mentioned previously, the Mexican educational system presents students with several educational choices along their educational career. Upon completing elementary school, students can choose to pursue studies in a general lower secondary school, a technical lower secondary school or to drop out of the educational system. A second transition then takes place, when students who completed lower secondary school must now choose between a general upper secondary school, a technical upper secondary school or dropping out. An important feature for the Mexican educational system is that all students completing a lower

secondary school diploma may pursue any type of upper secondary education. This is, students from a technical lower secondary school can choose between both general and technical upper secondary school. The same logic applies to students that finish general lower secondary school. This feature makes the choice after primary school less decisive, as students can change the track later in their educational career. Figure 3.1 displays these choices schematically.

Figure 3.1: Estimation scheme



Based on the institutional design of the Mexican educational system and in order to analyze how both lower and upper-secondary educational choice depend on the social origin, the present study follows common practice by employing a multinominal logit model. Multinominal logit models are frequently used in educational transitions research due to the "unordered" nature of the choices available to the individual at a particular decision point in their educational track; we cannot say a priori which type of schooling is preferable.

Considering the two critical transition points prior to high school education attainment in the Mexican educational system a repeated multinomial logit model (two-part model) seems appropriate. The first estimation deals with the selection of various tracks from elementary to lower secondary education. The second part of the model deals with the selection amongst the various educational tracks available in the transition from lower secondary to

upper secondary educational attainment. Therefore the following multinomial logit models are estimated:

$$Prob(MSTrack_i = j|x_i) = \frac{e^{\beta_j' x_i}}{\sum_{j=0}^{J} e^{\beta_j' x_i}}$$

$$Prob(HSTrack_i = k|x_i, MSTrack_i = 1, 2)$$

For the first model, middle school track ($MSTrack$) could take one of three possible values ($j = 0, 1, 2$): 0 if the student drops out prior to pursuing a middle school degree, 1 if the student chooses to attend a technical middle school or 2 if the student attend a general/academic middle school. The model also controls for individual attributes and social origin characteristics (x_i). The second stage multinomial logit model conditions the probability of deciding on a particular high school track on the previous middle school track decision and x_i. At this stage the individual faces three distinct choices ($k = 0, 1, 2$): drop out after middle school ($k = 0$), pursue a technical high school diploma ($k = 1$) or pursue a general/academic high school diploma ($k = 2$). In this setting, the two-part multinomial logit model estimates the probability of electing a particular high school track taking into account the previous educational track choice.

Alternatively we could use more advanced models aiming at estimating both choices simultaneously. We opt for the repeated use of a simpler model for at least two reasons. First, models such as the nested multinomial logit model generally assume different options in the second transition depending on the choice in the first transition. In our case, this would imply that students from general secondary middle school choose a different general high school than students who graduated from technical middle school and choose a general high school. This, however, is not what the Mexican education system looks like since all students graduating from middle school can access the same technical or general high schools. A second argument for the simpler model is that it allows for us to focus on each transition

individually. For instance, we can focus much better on the high school decision taken by graduates of technical secondary schools who were actually faced with choosing between the different high school educational tracks, as compared to a model that simultaneously estimates both decisions.

3.2 Educational Track Choice and Labor Market Outcomes

Having analyzed the effects of the social origin on educational enrollment through a two-stage multinomial logit model, it is important to further explore the effect of the educational track choice on labor market outcomes. If indeed class inequality in educational attainment exists in the Mexican educational system, further inequality of opportunities could be generated if choosing a particular educational tracks generates a competitive advantage.

In order to observe this effect, in our simplest model we regress our labor market outcome of interest on the educational track selected by the individual. As previously mentioned, for this study labor market outcomes of interest, y_i, are hourly income (ln) and labor market participation. Our coefficient results then capture how changes in educational track choice affect our labor market outcomes of interest.

We then add additional controls to reduce the risk of an omitted variable bias:

$$y_i = \beta_0 + \beta_1 TTrack_i + \beta_2 Age_i + \beta_3 Gender_i + \beta_4 HCBeneficiary_i + \epsilon_i$$

By adding controls we should expect our coefficients to tend to zero since we are now removing the effect that other variables, correlated with educational attainment, such as gender and whether the individual is a health care beneficiary (an indicator for formal employment in Mexico), $HCBeneficiary$, have on labor market outcomes.

In our OLS specification, $TTrack$ indicates the educational track choice selected by the individual. The seven possible tracks described on Table 2.3 are available. In order to compare labor market outcomes across educational tracks, we set as a baseline (omitted group) those who opted for a strictly academic track (GMS-GHS). Evidence in favor of inequality of opportunities would be found if those with more unusual educational tracks (TMS-THS, TMS-GHS, GMS-THS) were to have significant β_1 coefficients.

This simple model estimates labor market outcomes for the individuals who actually chose each particular educational track. These groups may not be directly comparable mostly due to class inequality in educational attainment. A corrected version of this model, based on Dahl (2002), would then try to estimate what would happen to the labor market outcome for the general individual if he were in each possible educational track. By including as additional regressors the predicted probabilities of the two-stage multinomial logit model, we would correct for the non-random allocation process. One must note though that due to the lack of available control variables, our correction may still suffer from omitted variable bias. Under our specification, our results would be comparing similar individuals whose only difference would be the educational track choice. Inequality of opportunities would once again be confirmed if the coefficients for $TTrack$ were to be significant.

3.3 Sample Size Delimitation

Prior to presenting our results a specification of the sample delimitation seems appropriate. Table 3.1 summarizes the sample size for each model specification. As for the first part of the model described in section 3.1, a total of 9,708 out of the 11,001 observations in the EMOVI 2011 are used. In the model, 1,100 observations are lost when incorporating middle school track decisions taken by the individuals, this is mostly due to losing those individuals who don't even have an elementary education. Similarly so, in computing the second stage

multinomial logit model (middle school to high school) a total of 3,186 observations are lost, corresponding to those individuals who dropped out after middle school.

Table 3.1: Sample Size Delimitation per Model

Variable		**No. of Available Observations**
Model 3.1		
Whole sample		11,001
Gender		11,001
+ City size at 14		10,855
+ Parental education (both maternal and paternal)		10,855
+ Normalized Social Origin (*NSO*)		10,808
+ Middle School Track Choice (*MSTrack*)		**9,708**
+ High School Track Choice (*HSTrack*)		**6,522**
Model 3.2		
Whole sample		11,001
Gender		11,001
Age		11,001
+ City size at 14		10,855
+ Paternal education (both maternal and paternal)		10,855
+ NSO		10,808
+ Predicted probabilities (Model 3.1)		10,808
+ Educational track choice (*TTrack*)		9,657
	Hourly Income (OLS)	
	+ Employed with income>0	4,175
	+ Hours worked weekly	4,066
	+ Earnings per hour ($ln(income/hours)$)	3,915
	+ Health Care beneficiary	**3,910**
	Labor Market Participation (Probit)	
	+ Worked during the past week	**9,652**
	Post High School education (Probit)	
	+ Last completed grade	**9,635**
	Perceptions on wealth (OLS)	
	+ Perception on home	9,600
	+ Health Care beneficiary	**6,211**
	Perceptions on self fulfillment (OLS)	
	+ Perception on success	9,574
	+ Health Care beneficiary	**6,194**

For the model described in section 3.2 the sample size varies according to the outcome of interest. For all outcomes, once we include control variables, 9,657 observations are available. As expected, not all individuals are employed and/or earn a positive income. Once we exclude those who are unemployed, don't get paid for their work, or decided not to report their income a total of 4,175 observations remain. Since the outcome of interest is earnings per hour, once we exclude those who omitted reporting the amount of hours worked per week we are left with 4,066 observations. Adding as a control whether the individual has

health care coverage by his employer, an indicator for formal employment in Mexico, our total amount of observations available for this model declines to 3,910, representing 36% of the total sample.

For labor market participation as an outcome of interest 9,652 observations are available. For this model, the biggest loss of observations comes from adding as a variable the total educational track choice the individual completed. A similar amount of observations (9,635) are available when the outcome of interest is pursuing further studies after high school graduation. Losses under such an outcome are also due to lack of information regarding the individuals' educational track choice.

When analyzing individual perceptions of wealth and self fulfillment as an outcome of interest, a significant amount of observations are lost when one includes whether the individual receives health care coverage by the employer as a control variable (around 3,000 observations are lost). Such a control variable is needed since it limits the sample to individuals who hold a formal job. Without such a control, the results would take into account perceptions of those who are unemployed, and hence may have a significantly lower perception of wealth and self fulfillment.

Sample size is of particular importance for the research at hand mostly due to the limited amount of observations available in each educational track of interest. With such a low proportion of the sample available to analyze certain labor market outcomes such as hourly income, it is crucial not to overrate the corresponding results.

Chapter 4

Results

4.1 Social Origin and Technical Educational Attainment Results

As explained in section 3.1, the first stage of our multinomial logit model deals with transition from elementary school to middle school. Students faced three alternatives: dropping out, attending a technical middle school or attending a general/academic middle school. Since multinomial logit coefficients are difficult to interpret, average marginal effects (AME) are calculated.

From our first stage AME on Table 4.1, one can observe that parental education, particularly the mother's educational achievement, plays a key role in determining the odds with which an individual attends middle school. An additional educational year for the mother increases the probability of obtaining a technical degree by 1 percentage point and the probability of obtaining an academic degree by 1.9 percentage points. One can also observe, that a standard deviation in NSO (associated with better home characteristics) decreases the probability of attending a technical middle school. This average marginal effect is statisti-

Table 4.1: First Stage (ES-MS) Average Marginal Effects

	Dropouts	Technical MS	General MS
NSO	-0.061***	-0.008*	0.069***
Male	-0.029***	0.001	0.027***
Paternal years of schooling	-0.018***	0.003**	0.015***
Maternal years of schooling	-0.029***	0.010***	0.019***
Population density			
Reference group: Rural upbringing (0-2,500)			
Small Sized City (2,500-15,000)	-0.080***	0.010	0.070***
Medium Sized City (15,000-100,000)	-0.088***	0.070***	0.018
Large Sized City (100,000-500,000)	-0.091***	0.027**	0.064***
Metropolis (greater than 500,000)	-0.091***	0.045***	0.046**
Observations	9708	9708	9708

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Pseudo R^2 MLogit= 0.1156

cally significant at a 10% level; evidence in favor of a social origin effect on educational track decisions. One can also notice that city size may help explain individuals educational choice. Those individuals coming from a city with a population between 15,000-100,000 are 7 percentage points more likely to choose a technical middle school than those who faced a rural upbringing.

Average marginal effects based on dropping out are all negative and significant. Being male decreases in 2.9 percentage points the probability of dropping out with respect to being a woman. Having better home characteristics (NSO) and parents with greater education (paternal and maternal) also decreases the probability of dropping out after elementary school. As city size increases the probability of dropping out after elementary school decreases with respects to those who grew up in a rural setting. Coming from a small sized city decreases the probability of dropping out by 8 percentage points. This probability only increases as city size increases; those coming from metropolis are 9.1 percentage points less likely to drop out after elementary school than those who come from a rural setting.

For the second stage in our model, we control for the previous middle school educational track choice and once again include the same variables. Individuals face three alternatives:

dropping out, attending a technical high school, or attending a general/academic high school. Average marginal effects are computed once again and presented on Table 4.2.

Table 4.2: Second Stage (MS-HS) Average Marginal Effects

	Dropouts	Technical HS	General HS
Previous MS Track Choice			
Reference group: Technical MS			
General MS	-0.058***	-0.211***	0.269***
NSO	-0.064***	0.002	0.062***
Male	-0.072***	0.007	0.065***
Paternal years of schooling	-0.016***	0.003**	0.013***
Maternal years of schooling	-0.015***	0.006***	0.009***
Population density			
Reference group: Rural upbringing (0-2,500)			
Small Sized City (2,500-15,000)	-0.030*	0.044***	-0.014
Medium Sized City (15,000-100,000)	-0.054***	0.051***	0.003
Large Sized City (100,000-500,000)	-0.056***	0.023**	0.034*
Metropolis (greater than 500,000)	-0.034	0.022	0.012
Observations	6522	6522	6522

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Pseudo R^2 MLogit=0.1297

For the second stage transition (MS-HS), parental schooling appears to have a significant effect on the odds of attending high school, greater odds being associated with greater parental schooling. In contrast with the first stage average marginal effects, home characteristics (NSO) do not have a significant effect on attending technical high school. Previous middle school educational track choice does contribute to explaining high school track choice. Having gone to a general middle school decreases by 21.1 percentage points the probability of attending a technical high school with compared to those that graduated from a technical middle school. Similarly so, those individuals who grew up in cities with a population between 2,500-500,000 have greater odds of obtaining a technical education than those who grew up in a rural setting.

Average marginal effects based on dropping out as an outcome show similar trends as those for dropping out after elementary school. A standard deviation from NSO (better

home characteristics) decrease the probability of dropping out after middle school by 6.4 percentage points. Being male also decreases the probability of dropping out prior to high school; men are 7.2 percentage points less likely to drop out than women. Parental education is also of great importance since lower parental education increases the odds of dropping out after middle school. Having obtained a general middle school decreases the probability of dropping out before high school by 5.8 percentage points when compared to those who obtained a technical middle school.

From our two-stage multinomial logit model we can conclude the following.

1. Social origin characteristics have a statistically significant effect on middle school track choice.
    - A higher social origin index is associated with a lower probability of dropping out after elementary school, a lower probability of attending a technical middle school, and a greater probability of attending a general middle school.
    - Having highly educated parents decreases the probability of dropping out after middle school and hence, increases the probability of obtaining a middle school education. Greater parental schooling increases the odds of attending a general middle school by a greater magnitude than the odds of attending a technical middle school.
2. Conditional on the family background, having obtained a general middle school education decreases the probability of obtaining a technical high school education when compared to those who achieved a technical middle school.
3. Social origin characteristics lose part of their significance when choosing a technical high school track.
    - Better off social origin characteristics decrease the probability of dropping out

after middle school and increase the odds of attending a general high school.

- Higher parental education is associated with greater odds of attending high school, with the amount of years of parental schooling having a stronger effect on choosing a general high school than a technical high school.

Having shown that social origin characteristics have an effect on lower secondary education track choice and that this decision strongly influences the type of upper secondary education an individual opts for, we can confirm the presence of class inequality in educational attainment in Mexico. We will now proceed to observe the effects of the complete educational track choice over our labor market outcomes of interest in order to assess whether a particular advantage is gained upon obtaining a distinct type of education.

In our simplest model, explained in section 3.2, we regress hourly income (ln) on educational track choice. Under such a model, those who drop out after elementary school earn 47.1% less than those who graduate from a general high school after receiving a general middle school education. We then include as control variables health care beneficiary and gender to correct our estimates. By doing so, we control for formal employment and gender wage differentials. This correction decreases all our coefficients. Those who dropped out after elementary school, under this model, now earn only 39.3% less than those who obtained a general high school diploma. In our most sophisticated model we include as additional regressors the expected probabilities with which each individual selects each academic track. In doing so, we aim at controlling for non-random selection bias. Intuitively, by controlling for non-random selection we are then comparing results for identical individuals whose only difference is their educational track choice. Our correction may not remove all non-random selection bias since we may have observed and unobserved variables that influence an individuals education decision which we don't control for in previous stages due to our data limitations. Nevertheless, by including these predicted probabilities our significant coefficients decrease, showing a partial correction of the model. Significant results can

only be observed with regards to those who dropped out of the educational system: individuals who drop out after elementary school earn 20.5% less than those who completed a strictly academic educational track (GMS-GHS) after partially controlling for non-random selection bias. In all three model specifications, as seen on Table 4.3, obtaining a technical lower secondary or upper secondary education does not create a significant difference in hourly income with respect to obtaining a general education; empirical evidence suggesting that technical educational enrollment does not generate an advantage nor disadvantage in the labor market.

Table 4.3: OLS Coefficient Results for Hourly Income (ln)

	OLS w/Selection Process Correction	OLS w/Controls	OLS without without Controls
Reference group: GMS-GHS			
Dropout ES	-0.205***	-0.393***	-0.471***
Dropout after TMS	-0.254***	-0.364***	-0.406***
Dropout after GMS	-0.124***	-0.218***	-0.276***
TMS-THS	0.040	0.024	0.010
TMS-GHS	0.066	0.032	0.038
GMS-THS	0.023	0.019	0.034
Selection Process Correction			
Reference group: Pr(D-ES)			
Pr(GMS-GHS)	0.492		
Pr(GMS-THS)	2.907*		
Pr(TMS-GHS)	5.435***		
Pr(TMS-THS)	1.114**		
Pr(GMS-D)	1.967***		
Pr(TMS-D)	-3.917***		
Control Variables			
Health Care Beneficiary	0.249***	0.316***	
Male	0.019	0.062**	
Constant	2.436***	2.911***	3.231***
Observations	3910	3910	3910
R^2	0.1405	0.0970	0.0588

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

As a second labor market outcome we analyze labor market participation, measured as being employed or not. Since labor market participation is a binary variable, we employ a

probit model and interpret its average marginal effects. These effects can be seen on the last two columns on Table 4.4. Dropping out after elementary school reduces the probability of being employed by 6.4 percentage points with respect to those who obtained a general educational track up to high school. Without partially correcting for non-random selection bias but including control variables, we find a significant difference in labor market participation between those who obtained a strictly technical educational track and those with a strictly general track. Those with a technical track are 3.9 percentage points less likely to have a job than those with a general track. Once we correct for our selection bias, which would then correct for individual characteristics other than track choice that influence their labor market participation, this effect looses its significance, but remains negative and in similar magnitude (3.4 percentage points). From these results we are unable to conclude that educational track choice has an effect on labor market participation.

We then run the same probit model but dividing our sample according to gender. Average marginal effects can be observed in Appendix 1. For men, we find no statistically significant results except for those who dropped out after attending a general middle school, who are 2.5 percentage points more likely to be employed than those who additionally completed a general high school program. It is important to note that this particular model does not control for any job characteristics.

For women we find the same statistically significant coefficients as for the whole sample but these are now much larger. According to our results, a women who dropped out after elementary school is 16.9 percentage points more likely to be unemployed than a woman who obtained a general middle school and high school diploma. Similarly so, dropping out after a general middle school decreases a woman's odds of being employed by 9.7 percentage points with respect to a woman who additionally obtained a high school diploma. With regards to technical educational attainment we find no statistically significant difference in labor market participation between women who opted for this type of education and women

who opted for a general/academic educational track.

Our results for both hourly income and labor market participation suggest that technical educational attainment does not generate a labor market advantage nor disadvantage. Hence, no evidence is found for educational track choice playing a significant role on fostering inequality of opportunities in Mexico.

Table 4.4: Probit AME Results for Achieving Higher Education and Labor Market Participation

	Higher Education w/SPC	Higher Education	Labor Market w/SPC	Labor Market
Reference group: GMS-GHS				
Dropout ES	-0.344***	-0.415***	-0.064***	-0.054***
Dropout after TMS	-0.263***	-0.338***	-0.002	0.005
Dropout after GMS	-0.304***	-0.378***	-0.023*	-0.015
TMS-THS	-0.019	-0.046*	-0.034	-0.039*
TMS-GHS	-0.052*	-0.069**	0.033	0.034
GMS-THS	-0.053**	-0.073**	0.033	0.037
Selection Process Correction				
Reference group: Pr(D-ES)				
Pr(GMS-GHS)	0.251***		-0.178*	
Pr(GMS-THS)	0.454		1.124*	
Pr(TMS-GHS)	-0.261		0.289	
Pr(TMS-THS)	-0.220**		-0.350*	
Pr(GMS-D)	-0.416***		0.099	
Pr(TMS-D)	0.147		-0.194	
Male	-0.033***	-0.010*	0.379***	0.371***
Observations	9635	9635	9652	9652

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Significant differences between obtaining a technical and general education are observed when analyzing the probability with which the individual pursues higher levels of education. Individuals with a general middle school and technical high school are 7.3 percentage points less likely to pursue higher education. This coefficient decreases to 5.3 percentage points once we control for selection bias. All different education paths from a strictly general educational track decrease the probability with which one pursues higher education.

These results are consistent with Solís (2013) findings; those with technical upper secondary education are less likely to go on to college.

When we once again divide our sample according to gender, we find that only those men who dropped out from the educational system prior to high school face a statistically significant lower probability of pursuing higher educational programs. Results are available in Appendix 1. From these results we may infer that men's probability of pursuing studies after high school is the same regardless of his high school educational track choice.

The results are dramatically different when we focus on analyzing only the women in the sample. Woman who opted for a technical high school are 8.5 percentage points less likely to pursue further education than woman who completed a general high school program (compared with a 5.3 percentage point effect for the whole sample). Women who obtained a technical middle school and academic high school are also less likely to pursue higher education (8 percentage points) than those with a strictly academic track. From these results we may infer that women who chose a technical education at some point of their educational track faced less odds of pursuing further education than men with the same unconventional track choice, when comparing to those individuals within the same gender and a strict academic educational track.

Interesting results arise from comparing perceptions on wealth and personal fulfillment across educational track choices. Table 4.5 presents coefficient results. On wealth perception, the EMOVI-2011 asks individuals to rank their homes on a scale from 0-10, where 0 represents the poorest homes in the country and 10 the richest. Even though no differences on hourly income were disclosed between educational tracks, those who obtain a strictly technical education perceive their homes as worse off (0.45 points less) than those with a strictly academic education. When contrasting only amongst those with a technical high school (GMS-THS) and a general high school (GMS-GHS), no such significant difference exists. The EMOVI-2011 also asks on individuals to rank from a scale of 0-10 how much

they feel they've achieved on their own. When regressing against this self-fulfillment proxy, we can observe that those with a strictly technical education feel they've achieved less (0.54 points less) on their own than those with a strictly academic high school. When comparing between those who have a general middle school but differ in their high school track choice, no statistically significant difference in perceptions is confirmed. Finally, those who dropped out at any stage feel they've achieved less than those who achieved a general high school diploma; evidencing a relationship between self-fulfillment and educational attainment.

From our results on the effect of educational track choice on labor market outcomes we can conclude the following:

- A significant difference in hourly income or on the probability of being employed does not exist between those who obtained a technical education at any stage of their educational career and those who opted for a strictly academic track.
  - No formal empirical evidence was found in favor of a labor market advantage being gained from the educational track choice. Hence our results suggest that the type of education one receives in Mexico does not contribute to fostering inequality of opportunities. One must consider the limited sample size and possible presence of omitted variable bias when externalizing this result.
- Those with unusual educational pathways face a lower probability of pursuing higher education than those who opted for a traditional academic track.
- Although no particular labor market advantage of an academic education was confirmed, those with a strictly technical educational track perceive themselves as worse off than those with a strictly academic educational track. When comparing only those with a technical or general high school, no difference in individual perceptions is observed.

Table 4.5: OLS Coefficient Results for Perceptions

	Wealth OLS w/SPC	Wealth OLS	Fulfillment OLS w/SPC	Fulfillment OLS
Reference group: GMS-GHS				
Dropout ES	-0.927***	-1.532***	-0.783***	-1.194***
Dropout after TMS	-0.599***	-0.959***	-0.729***	-0.966***
Dropout after GMS	-0.455***	-0.775***	-0.369***	-0.572***
TMS-THS	-0.453***	-0.552***	-0.541***	-0.645***
TMS-GHS	-0.270*	-0.289*	-0.173	-0.205
GMS-THS	-0.128	-0.156	0.138	0.128
Selection Process Correction				
Reference group: Pr(D-ES)				
Pr(GMS-GHS)	1.190**		2.450***	
Pr(GMS-THS)	4.784		5.306	
Pr(TMS-GHS)	16.544***		-0.431	
Pr(TMS-THS)	0.427		-3.794***	
Pr(GMS-D)	3.704***		2.539***	
Pr(TMS-D)	-8.110***		-2.285	
Male	-0.327***	-0.171***	-0.199***	-0.122**
Health Care Beneficiary	0.135**	0.326***	0.215***	0.338***
Constant	5.520***	6.674***	6.131***	7.222***
Observations	6211	6211	6194	6194
R^2	0.1626	0.1026	0.0964	0.0679

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 5

Conclusions

In this study we seek to analyze the effect of the social origin on educational track choice and whether this choice has an effect on labor market outcomes in Mexico. Particularly, the study focuses on the decisions Mexican students face when deciding upon a technical or academic education at a lower and upper secondary education level.

Using a two stage multinomial logit model and data from the EMOVI 2011 we are able to confirm that the social origin has an effect on educational track choice. Better social origin characteristics are associated with pursuing the traditional academic educational path. Worst social origin characteristics are associated with an increase in the probability of pursuing a technical lower secondary school and dropping out after elementary school. These results are consistent with Solís's findings with regards to educational attainment in Mexico and results from other authors, such as Breen (2005), that confirm larger social origin effects for unusual educational tracks. Since evidence was found in favor of the social origin playing a significant role in educational track choice we were able to confirm the presence of class inequality in educational attainment in the country.

To confirm whether this class inequality was promoting further inequality of opportu-

nities amongst Mexican individuals we proceeded to test for the presence of a labor market advantage gained from obtaining a distinct type of education. From our OLS results we were able to conclude that no significant difference in hourly income or labor market participation exist between those who achieve a strictly academic education and those who achieve a strictly technical one. Differences between these groups were indeed identified with regards to pursuing higher education and individual success perceptions. Those with a strictly technical education are less likely to pursue higher education programs and perceive themselves as worse off than those with an academic education. Our results, although severely influenced by our limited sample size and possible omitted variable bias, guide us to conclude that although the social origin has an effect on educational track choice, no real inequality of opportunities is promoted or discouraged by educational type. Based on these results, technical education attainment in Mexico has a positive effect on social mobility; allowing students from less privileged backgrounds to achieve equivalent labor market outcomes as students with traditional academic educational tracks who possess better social origin characteristics.

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Appendices

Appendix 1

Model 3.2 Probit Regressions by Gender

Table 1: Probit AME for Higher Education and Labor Market Participation- **MEN**

	Higher Education w/SPC	Higher Education	Labor Market w/SPC	Labor Market
Reference group: GMS-GHS				
Dropout ES	-0.341***	-0.401***	0.006	0.017
Dropout after TMS	-0.277***	-0.344***	0.022	0.028
Dropout after GMS	-0.307***	-0.372***	0.025*	0.032**
TMS-THS	-0.022	-0.046	-0.034	-0.042
TMS-GHS	-0.034	-0.038	0.043	0.044
GMS-THS	-0.028	-0.044	0.039	0.040
Selection Process Correction				
Reference group: Pr(D-ES)				
Pr(GMS-GHS)	0.178**		-0.011	
Pr(GMS-THS)	0.656		-0.154	
Pr(TMS-GHS)	-0.428		0.289	
Pr(TMS-THS)	-0.268*		-0.398**	
Pr(GMS-D)	-0.564***		0.102	
Pr(TMS-D)	-0.018		-0.164	
Observations	5342	5342	5349	5349

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Probit AME for Higher Education and Labor Market Participation- **WOMEN**

	Higher Education w/SPC	Higher Education	Labor Market w/SPC	Labor Market
Reference group: GMS-GHS				
Dropout ES	-0.347***	-0.433***	-0.169***	-0.165***
Dropout after TMS	-0.248***	-0.331***	-0.051*	-0.048
Dropout after GMS	-0.301***	-0.386***	-0.097***	-0.095***
TMS-THS	-0.022	-0.051	-0.030	-0.032
TMS-GHS	-0.080*	-0.122**	0.009	0.010
GMS-THS	-0.085**	-0.110**	0.002	0.007
Selection Process Correction				
Reference group: Pr(D-ES)				
Pr(GMS-GHS)	0.320***		-0.253	
Pr(GMS-THS)	0.159		1.736*	
Pr(TMS-GHS)	-0.042		-0.148	
Pr(TMS-THS)	-0.199		-0.103	
Pr(GMS-D)	-0.311***		0.011	
Pr(TMS-D)	0.341		-0.301	
Observations	4293	4293	4303	4303

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$