INEQUALITY OF OUTCOMES VS. INEQUALITY OF OPPORTUNITIES IN A DEVELOPING COUNTRY. AN EXPLORATORY ANALYSIS FOR CHILE[1]

DESIGUALDAD DE RESULTADOS VS. DESIGUALDAD DE OPORTUNIDADES EN UN PAÍS EN VÍAS DE DESARROLLO. UN ANÁLISIS EXPLORATORIO PARA CHILE

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Abstract

We apply a variation of Bourguignon, Meléndez and Ferreira (2005) methodology to examine the extent to which income inequality is associated with the inequality of observed exogenous circumstances of origin that determine individuals' "opportunities" to pursue their chosen life plans. We find that equalizing a set of observed circumstances of origin across individuals such as parents' schooling, parents's stability of employment, father's age, household size and growing in a single vs a bi-parental household reduces income inequality, but in a small margin, in the range of 8 to 13 points of the Gini coefficient, about a 15-20 per cent drop. These results are similar to those obtained by Bourguignon et al. *(2005) for Brazil, although the dataset and the set of observed circumstances are partially different. These results suggest that a significant part of income inequality may be associated with unobserved heterogeneity across individuals unrelated to circumstances of origin, such as preferences, effort and sheer luck, transitory shocks and measurement errors in income. However, assessing the relative importance of these factors vs. the role of unobserved circumstances remains as future research.*

Key words: *income inequality, equality of opportunities.*

Resumen

Aplicamos una variación de la metodología de Bourguignon, Meléndez y Ferreira (2005) para examinar en qué medida la desigualdad de ingresos está relacionada con la desigualdad de circunstancias observadas de origen, exógenas a los individuos, que determinan las "oportunidades" de éste para realizar sus

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planes de vida elegidos. Encontramos que, al igualar un conjunto de circunstancias observadas de origen, como escolaridad y estabilidad de empleo de los padres, edad del padre, tamaño del hogar y crecer en un hogar conformado por un solo padre vs. uno con ambos padres, reduce la desigualdad de ingreso, aunque en un margen pequeño, en un rango de 8 a 13 puntos del coeficiente Gini, aproximadamente una baja de 15-20 por ciento. Estos resultados son similares a los encontrados por Bourguignon et al. *(2005) para Brasil, aunque la base de datos y el conjunto de circunstancias observadas son parcialmente distintas. Estos resultados sugieren que una gran parte de la desigualdad de ingresos podría estar asociada con heterogeneidad no observada entre individuos, no relacionada con las circunstancias de origen, como preferencias, esfuerzo y suerte, shocks transitorios y errores de medición en el ingreso. Sin embargo, evaluar la importancia relativa de estos factores vs. el rol de circunstancias no observadas queda como futura investigación.*

Palabras clave: *desigualdad de ingresos, igualdad de oportunidades.*

JEL Classification: *D31, D63.*

I. Introduction

There is an old debate among economist and philosophers about what is the kind of economic inequality that public policies should aim to reduce. While some authors have stressed the importance of addressing the inequality of "outcomes" (typically of income), others have instead proposed that public policies should promote some kind of "equality of opportunities" across individuals.[2] This latter concept rests on the notion that individuals should have similar opportunities to pursue their desired life plans, which in turn implies that those opportunities should not be determined by exogenous circumstances that individuals inherit without their choice or consent, such as, for example, parental and family background. Advocates of equal opportunities have argued that differences in economic outcomes partly reflect differences in aspects under the control of individuals, such as effort, responsibility, choices and so on. Accordingly, equality of opportunities advocates postulate that public policies should aim to equalize the exogenous "circumstances" that shape individuals' opportunities to pursue their chosen life plans, and then accept the resulting level of inequality of outcomes that would emerge from individuals' choices and preferences. With some variations, this has somewhat become the dominant view of the idea of equity that deserves public action, as suggested for example

[2] See for example Roemer (1996), (1998) and (2000) and Dworking (1981) for descriptions of the notions of equality of opportunities and of outcomes. Also, Amartya Sen's Capability approach has a resemblance with the notion of equality of opportunities, as described for example in Sen (1999) and Nussbaum and Sen (2000). See Roemer (1996) for a discussion of the main theories of distributive justice. See also Alessina, Di Tella and MacCulloch (2004) for a discussion on different attitudes between Europeans and Americans towards different notions of equality.

by the notion of equality explicit in the overview of The World Banks' 2005 Report on Equity and Development:

> "By equity we mean that individuals should have equal opportunities to pursue a life of their choosing and be spared from extreme deprivation in outcomes", (p. 2)[3]

However, little is known about the extent to which inequality of outcomes reflects individual choices and preferences vs. the exogenous circumstances that individuals inherit. This paper is an empirical attempt to contribute to the understanding of the relationship between the notions of equality of outcomes vs. opportunities. In particular, this paper follows and adapts the methodology developed by Bourguignon, Melendez and Ferreira (2005) in order to study the role that a set of important exogenous observed circumstances of origin play in explaining the observed income inequality in Chile.

Studying the relationship between "opportunities" and "outcomes" is relevant for various reasons. First, the practical implications of the philosophical distinction between "outcomes" and "opportunities" would be less significant if the two were closely associated. This would reinforce the idea of interpreting income distribution indicators not only as a measure of equality of outcomes, but also as a good representation of equality of opportunities. This would also suggest a more significant role for the exogenous circumstances in comparison with the role of individual choices and preferences in promoting both equality of outcomes and opportunities in the long run. On the contrary, if exogenous circumstances played a limited role in explaining inequality of outcomes, then this would have different implications depending on the chosen normative standpoint: equal opportunity advocates should expect a significant amount of income inequality to remain after equalizing opportunities, while advocates of equality of outcomes should realize that achieving this aim-even in the long run- would require more than policies intended to equalize some key circumstances such as access to quality education, and that some additional redistributive policies would be needed.

We follow Bourguignon *et al.* (2005) pioneering work, which attempts to establish the effect of circumstances of origin and individual "effort" in the determination of income inequality in Brazil.[4] In their work, circumstances play a double role: they have a direct impact on earnings, and an indirect effect on "effort", that they take to be the schooling level. They define the former

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[3] On page 3 of the overview this view is reinforced in these passages: "Three considerations are important at the outset. First, while more even playing fields are likely to lead to lower observed inequalities in educational attainment, health status and incomes, the policy aim is not equality in outcomes"... "Second a concern with equality of opportunities implies that public action should focus on the distributions of assets, economic opportunities, and political voice, rather than directly on inequality in incomes".

[4] Behrman (2006) and Ruiz-Tagle (2007) also examine the role of schooling on income inequality, although employing a framework different to that developed by Bourguignon *et al.*, which allows establishing and separating the direct and indirect effects of observed circumstances on income inequality. However, their results are similar to the results found in this work, in the sense that both studies suggest a limited role of schooling in reducing income inequality.

effect as the "partial effect" of observed circumstances on earnings, and the "total effect" to be the joint effect of the direct and indirect effects of observed circumstances on earnings. Apart from using a different dataset and set of circumstances, our work differs from theirs in two respects. The first is a matter of interpretation. Our aim is more modest in the sense that we only attempt to measure the effects of observed circumstances on earnings, and not to study the (more complex) issue of what part of the income distribution is associated with individual "effort". Hence, we prefer to refer to the indirect effect simply as the effect of observed circumstances on the level of schooling (not effort), and also interpret the unexplained part of the income distribution simply as an unknown combination of unobserved circumstances, individual effort, sheer luck and possibly income measurement errors. Second, we provide some additional exploratory circumstance-equalizing benchmarks in order to shed some light on the possible role of unobserved circumstances on the income distribution. In the first benchmark, we assume an extreme situation where everyone's schooling levels only reflect individuals circumstances- either observed or unobserved-, such that individual "merit" and "effort" play no role in the determination of schooling. This amounts to computing the income distribution after equalizing schooling levels across individuals. The second equalizing benchmark consists of guaranteeing everyone a minimum of 10 years of schooling (which are completed at about age 16) under the assumption that a simulated value of schooling lower than 10 would almost certainly reflect unobserved circumstances, but use the simulated level of schooling dictated by equalized circumstances whenever it is higher than 10, after which the relative role of unobserved circumstances vs. individual effort or other non-circumstance factors can be expected to be lower. Yet, we find that all four circumstance equalizing benchmarks yield a significant of income inequality.

The paper is structured as follows: The second section presents the basic model and the empirical identification strategy of the four observed circumstances-equalizing benchmarks. The third section describes the data and the set of circumstances employed. The fourth section presents and discusses the results and compares them to those obtained in Bourguignon *et al.* (2005), and finally section five concludes.

II. The model

a. Bourguignon *et al.* (2005) Model

Following Bourguignon *et al.* (2005), among the many determinants of an individual's earnings, it is possible to distinguish two different groups: those determinants that result from actions that people carry out along their lives, which allow them to increase their productivity, and those that obey to circumstances out of people's control. Bourguignon *et al.* (2005) call the first set of determinants "effort variables" and the second, "circumstance variables". The relationship between incomes, efforts and circumstances can be described as $W_i = f(C_i, E_i)$, where circumstances C typically includes a series of variables of the individuals' socioeconomic origin and effort E is thought of as human capital variables.

In order to estimate the model empirically, this relationship can be expressed as a linearized model, as follows:

$$Ln(W_i) = \alpha \cdot C_i + \beta \cdot E_i + U_i \quad (1)$$

where α and β are coefficient vectors and U_i is the residual that includes the unobserved circumstance and effort variables, measurement error and variations of the individuals' measured income from their corresponding permanent income level. All these factors are supposed to be independent from the included variables in C_i and E_i, to have zero mean and that to be identically and independently distributed across individuals.

This formulation however is fairy restrictive and debatable, as it assumes a complete additive separability between circumstances and efforts. For example, it seems reasonable to expect that the circumstances that surrounded an individual during his childhood, as well as the characteristics of his household and his parents' human capital must have had an influence on his own human capital accumulation. Accordingly, Bourguignon *et al.* (2005) propose the following relationship where "effort" is partly a function of circumstances:

$$E_i = B \cdot C_i + V_i \quad (2)$$

where B is a coefficient matrix and V_i represents a non-observable effort determinant vector. As usual, V_i it is supposed to have mean zero and to be i.i.d. across individuals.

Introducing equation (2) in (1) yields,

$$Ln(W_i) = (\alpha + \beta \cdot B) \cdot C_i + \beta \cdot V_i + U_i \quad (3)$$

The model displayed in (3) is more general than model (1) since it allows the circumstance variables to affect people's incomes directly, as well as indirectly through its effects on the effort variables. In particular, in model (1) the marginal effect of circumstances on earnings amounts only to α. Bourguignon *et al.* (2005) call this effect the "Partial Effect" of observed circumstances on earnings. On the other hand, in model (3) the effect of observed circumstances on earnings is $\alpha + \beta \cdot B$. This corresponds to the "Total Effect" of observed circumstances on earnings. Note that this effect includes the partial effect of circumstances on earnings, α, but also de indirect effect of circumstances on earnings through "effort", βB. The total effect of observed circumstances on earnings is larger than the partial effect if βB>0, as expected.

b. Effort vs. Schooling

In practice, Bourguignon *et al.* (2005) employ schooling as their measure of "effort" E_i. However, as discussed in the introduction we believe it is both controversial and misleading to refer to schooling as an "effort" variable, at least in a country with known inequality of opportunities such as Chile. Accordingly,

we have preferred to replace effort E_i simply by individual schooling level S_i. Given this new interpretation, equation (1) would simply indicate that wages are a function of human capital (i.e. schooling), circumstances of origin, as well as term U_i, which captures unobserved circumstances, sheer luck, "effort" at work, deviations from permanent income, and possibly income measurement errors. In addition, parameter β would be more directly interpreted simply as the return to schooling, while parameter B would reflect the effect of observed circumstances of origin on the accumulation of schooling. For example, parameter B can capture parents' resources to invest in tertiary education for their son, the role of cognitive and non-cognitive abilities acquired during infancy and adolescence on the chances of gaining access to tertiary education. In addition, parameter α would be interpreted as the direct effect of circumstances on earnings, given a schooling level, or alternatively, as the effect of circumstances on the return of a given amount of schooling. For example, parameter α can capture the effect of the *quality* of education (likely to be associated with circumstances), the role of abilities acquired in the household of origin on labor productivity and earnings, access to social networks and even the possibility of "class discrimination" in the labor market.[5] In conclusion, this interpretation treats "effort" as a non observable variable, which would be captured in term V_i in equation (2).

c. The "Partial" and "Total" effects of observed Circumstances on income inequality

The estimation of parameters α, β and B through an OLS estimation of equations (1) and (2) allows performing two types of simulations of the distribution of income after equalizing exogenous observed circumstances C. Let W^P denote the simulated income distribution associated with the "Partial Effect" described above, obtained after equalizing all the circumstance variables across individuals in equation (1). Accordingly, the resulting income distribution would reflect individual differences in schooling and in the residue U_i. More formally, the hypothetical distribution W^P would be derived from the simulation of the individual incomes W_i^P using the following equation, and after estimating equation (1) by OLS:

$$Ln(W_i^P) = \hat{\alpha} \cdot \bar{C} + \hat{\beta} \cdot S_i + \hat{U}_i \tag{4}$$

where $\bar{C}$ is the vector of population means of the circumstance variables.

An alternative hypothetical wage distribution W^T associated with the "Total effect" of observed circumstances on earnings can be obtained by equalizing all the observed circumstance variables across individuals in equation (3), after estimating equation (1) and (2) by OLS. The income distribution W^T would thus be obtained from:

[5] See for example Núñez and Gutiérrez (2004).

$$Ln(W_i^T) = (\hat{\alpha} + \hat{\beta} \cdot \hat{B}) \cdot \bar{C} + \hat{\beta} \cdot \hat{V}_i + \hat{U} \quad (5)$$

where again $\bar{C}$ stands for the population means of the circumstance variables and the coefficients are obtained from OLS estimations of equations (1) and (2).

The comparison between the actual (observed) distribution W and distribution W^P reflects the partial effect of observed circumstances on the distribution of income, while the comparison between W and W^T provides the effect of the total effect of observed circumstances on earnings, i.e. including the effect of observed circumstances on the accumulation of schooling. Both measures of income inequality allows distinguishing the part of income inequality associated with the direct influence of observed circumstances on earnings, from the part that comes from the indirect effect of the observed circumstances on the accumulation of schooling.

d. Two additional circumstance-equalizing benchmarks

However, a limitation of the methodology described above is that part of the income inequality obtained after equalizing observed circumstances may still be caused by differences in unobserved circumstances. In particular, it can be argued that unobserved circumstances can explain part of the diversity in schooling that is not associated with observed circumstances, βV_i. In this context, in addition to the circumstance-equalizing propositions of Bourguignon *et al.* (2005) described above, namely the partial and total effects, we perform two additional equalizing benchmarks of the effect of circumstances on income distribution to explore the possible role of unobserved circumstances. First, assume an extreme situation where all schooling acquired by an individual were fully determined by his circumstances of origin, either observed or unobserved. Or to phrase it more simply, assume that there is no role for "effort" or "merit" in the accumulation of schooling. This situation would be equivalent to setting the term $V_i = 0$ (which includes unobserved effort) for all individuals. In this context, schooling would vary across individuals only due to the effect of circumstances, not effort. This is equivalent to simulating individuals' income by replacing C_i by the population mean circumstances $\bar{C}$ and $V_i = 0$ in equation (3), or equivalently, replacing C_i and S_i by $\bar{C}$ and the population mean schooling $\bar{S}$ in equation (1), respectively.[6] More formally, the simulated income distribution after equalizing observed circumstances and schooling, W^{ES}, would be derived from the simulated individual earnings from:

$$Ln(W_i^{ES}) = (\hat{\alpha} + \hat{\beta} \cdot \hat{B}) \cdot \bar{C} + \hat{U}_i \quad (6)$$

Hence, in this case the only source of variation in the simulated income distribution would arise from term U_i in equation (1).[7-8]

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6 Note that estimating equation (2) by OLS yields $\bar{K} = B\bar{C}$.

7 Note however, that term U_i can include the direct effect of unobserved circumstances on earnings.

8 However, in the earnings regressions we include potential experience as an independent variable, which adds another source of variation in the simulated incomes.

The second additional exploratory equalizing benchmark that we carry out arises from the observation that individuals cannot be made responsible for their human capital accumulation in the early years of the life cycle, but they can arguably be made partly responsible for it later in their life cycle, after some age threshold. Let $S_i^{'} = \hat{B}\bar{C} + \hat{V}_i$ denote the simulated schooling of individual I after equalizing observed circumstances in equation (2). In this context, a low level of simulated schooling level $S_i^{'}$, say dropping out of school at an early age, can be interpreted not as lack of "effort", but as the result of unobserved circumstances contained in $\hat{V}_i$. However, after some age threshold, the value of simulated schooling $S_i^{'}$ will presumably reflect a combination of effort and unobserved circumstances. Although it may seem absurd to fix a specific age threshold after which individuals can be made partly responsible for their accumulation of schooling, it must be remembered that this happens *de facto* in other spheres such as penal responsibility, and in the gain of rights such as voting and driving, during the teen years. For simulation purposes, we implement this benchmark by guaranteeing everyone 10 years of schooling (achieved at about age 16), and employ the simulated value of schooling $S_i^{'}$ whenever it is greater than 10. More formally, the simulated income distribution after guaranteeing 10 years of schooling, W_i^{GS}, is derived from:

$$(7) \qquad Ln(W_i^{GS}) = \hat{\alpha}\bar{C} + \hat{\beta}S_i^{"} + \hat{U}_i$$

where,

$$(8)\ S_i^{"} = 10 \text{ if } S_i^{'} = \hat{\beta}\bar{C} + \hat{V} \leq 10 \text{ , and } S_i^{"} = S_i^{'} = \hat{\beta}\bar{C} + \hat{V}_i \text{ if } S_i^{'} = \hat{\beta}\bar{C} + \hat{V} > 10.$$

Although this threshold is admittedly arbitrary, we claim that it partly addresses the shortcoming implicit in the indirect effect, namely that infants and young teenagers are assumed to be partly responsible for their schooling.[9]

Finally, let ψ be an operator that computes an income inequality coefficient from a given distribution of income W. In particular, in this paper we compute the Gini and the Theil coefficients. Then, given the differences in the sources of variation in the observed and the simulated individual incomes under each of the four circumstance-equalizing benchmarks, it can be expected that $\psi(W) > \psi(W^P) > \psi(W^T) > \psi(W^{GS}) > \psi(W^{ES})$.

III. Data

This work employs data from the Survey of Employment and Unemployment in Greater Santiago, undertaken in June of 2004 by the Department of Economics of the University of Chile. In addition to the regular economic and labor market questions, various questions were added to the survey in order to obtain measures of the individuals' circumstance of origin. These include household characteristics during infancy such as household size, if they grew in a single

[9] Using alternative age thresholds in the range of 14 to 18 years of age yielded only marginally different results than those reported below for age threshold 16.

vs. a bi-parental household, father's and mother's schooling, parents' age and birth date, father and mother's participation in the labor market, frequency of father's and mother's employment, as reported by the sons. The sample has a total of 11.007 observations, corresponding to 3.060 interviewed homes. The selected sample is a representative cross-section of the population of Greater Santiago, which holds about a third of the country's population.

In order to avoid selectivity issues associated with participation of women in the labor market, in this work we focus only on sons. The sample of sons was delimited to ages in the range from 15 and above. The earnings regressions employ sons of 15 years of age and above, but the schooling regressions employ sons of 23 years of age and above. This is established in order to avoid possible selectivity problems, as some individuals younger than 23 are in tertiary education and not fully inserted in the labor market, and also because younger sons may not have achieved their long-run amount of schooling. The observations of unemployed individuals or those who did not report positive incomes were eliminated, as well as those who did not report sufficient information about the characteristics of their parents. Finally, we considered individuals working between 30 and 72 hours per week.

IV. Results

a. Schooling and earnings regressions

Table 1 reports OLS regressions of the schooling determinants, as in equation (2) of the model.[10] Table 1 indicates that various observed circumstances of origin have a significant effect on the accumulation of schooling. In particular, parental schooling has a large and statistically significant effect on the son's accumulation of schooling, close to 0.28 years of schooling per additional year in the mean parental schooling.[11] However, this effect is stronger for older sons, as the interactive variable of parental schooling and son's age indicates.[12] This may be a consequence of increasing educational mobility throughout time. Table 1 also indicates that the father's age also has an effect on the son's schooling, although this effect is concave.[13] This would be consistent with how father's experience has a concave effect on father's earnings, which in turn may limit the resources to invest in the son's education and well-being. Finally, Table 1 also indicates that household size and being raised in a single parent household

[10] We performed regressions with robust standard errors for both the schooling and earnings regressions, but yielded similar result to the ones reported here.

[11] We employ mean parental schooling to avoid a colinearity problem associated with including father's and mother's schooling separately in the regressions. In the few cases where schooling was reported for one parent only, we employed this figure as the mean parental schooling, under the assumption that this was the parent most likely to have raised the son.

[12] However, this is consistent with the evidence of higher intergenerational educational mobility in younger cohorts in Chile reported in Núñez and Miranda (2007).

[13] We employ father's age even though in some cases he could have been absent from home because he could still have contributed resources to the household.

TABLE 1
SCHOOLING DETERMINANTS[1)]

Variable	Specifications[2)]	
	1	2[3)]
Age	–0.0688111***	–0.0737303***
	[0.0174026]	[0.0156892]
Parental Schooling		
Mean parental schooling	0.2949843***	0.2685192***
	[0.0811011]	[0.0748456]
Mother/father schooling difference	–0.0517466	
	[0.043312]	
Mean parental schooling * son's age	0.0037926**	0.0042125***
	[0.001713]	[0.0015728]
Father's Life Cycle Variables		
Father's age when the son was 15	0.0331722**	0.0268721**
	[0.0150761]	[0.0139196]
Father's age when the son was 15 - squared	–0.0000371**	–0.0000289**
	[0.0000153]	[0.0000139]
Childhood Household Characteristics		
Household size	–0.0879002*	–0.094932**
	[0.0471903]	[0.0427122]
Bi-parental household dummy	0.9095529**	0.6558078**
	[0.3780006]	[0.3145342]
Parental employment instability dummy	–0.8409475	–0.9744392**
	[0.5414537]	[0.4819123]
Constant	9.871226***	10.48943***
	[1.193715]	[1.071267]
Sample Size	773	867
R-squared	0.370	0.3757
Adjusted R-squared	0.3626	0.3699

1) Dependent variable is years of schooling.
2) OLS estimates standard errors in brackets; *= significant at the 10% prob. level; **= significant at the 5% prob. level; ***= significant at the 1% prob. level.
3) Specification used in simulations.

TABLE 2
EARNINGS EQUATIONS[1)]

Variable	Specifications[2)]		
	1	2	3[3)]
Schooling Return			
Primary Education	0.0197612	0.0339435	
	[0.0281318]	[0.0236105]	
Secundary Education	0.0676964*	0.0502285	
	[0.0389149]	[0.0347507]	
Primary and Secundary Education			0.063888***
			[0.0113342]
Tertiary Education	0.1182382***	0.1238904***	0.1475077***
	[0.0255809]	[0.0242499]	[0.0179333]
Experience Variables			
Potential Experience	0.0161548*	0.0245867***	0.0231317***
	[0.0083877]	[0.0055474]	[0.0054598]
Potential Experience - squared	-0.0001197	-0.0001951**	-0.0001668*
	[0.0001127]	[0.0000995]	[0.0000976]
Parental Schooling			
Mean parental schooling	0.0013671	0.029537***	0.0295607***
	[0.0203902]	[0.0061033]	[0.0061083]
Mean parental schooling* son's age	0.000685		
	[0.0004757]		
Father's Life Cycle Variables			
Father's age when the son was 15	0.0037693		
	[0.0027396]		
Father's age when the son was 15 - squared	-0.0000037		
	[0.00000272]		
Childhood Household Characteristics			
Household size	-0.0057045		
	[0.009183]		
Biparental household dummy	-0.0547253		
	[0.066334]		
Parental employment instability dummy	-0.1085018		
	[0.0986114]		
Constant	11.21416***	11.03948***	10.87809***
	[0.3191213]	[0.1822356]	[0.1441385]
Sample Size	595	667	667
R-squared	0.5577	0.5321	0.5306
Adjusted R-squared	0.5486	0.5279	0.5271

1) Dependent variable is log of earnings.
2) OLS estimates standard errors in brackets; *= significant at the 10% prob. level; **= significant at the 5% prob. level; ***= significant at the 1% prob. level.
3) Specification used in simulations.

decrease son's schooling, as well as having parents with unstable employment. In particular, growing in a single-headed household decreases schooling in almost a year, and having parents with unstable employment has a similar effect.[14] In conclusion, Table 1 indicates that observed circumstances of origin in Chile have a significant effect in reproducing inequality through their impacts on the accumulation of human capital. We employ specification 2 of Table 1 to carry out the income simulations associated with the circumstance-equalizing benchmarks described above.

Table 2 shows the results of OLS regressions for the sons' earnings. All specifications show the standard effects of schooling and potential experience on earnings. In addition, Table 2 indicates that mean parental schooling is the only circumstance variable that has a robust statistically significant effect on earnings. This suggests that the remaining circumstance variables employed in this work do not seem to affect earnings directly, although they do so through their indirect effect on the accumulation of schooling, as shown in Table 1. Table 2 indicates that tertiary education in Chile is the one that has the highest pecuniary return, in the range of 20 per cent per year. In addition, Table 2 shows that an extra year of mean parental schooling raises earnings in about 3 per cent.[15] We employ specification 3 for simulating individual incomes based on the four circumstance-equalizing benchmarks.

b. Simulated income distribution coefficients

Using specification 2 of Table 1 and specification 3 of Table 2, we perform the four circumstance-equalizing benchmarks described above in order to compute the resulting simulated income distribution coefficients. Table 3 reports all of them for the Gini and the Theil coefficients. We also show results for the ratio of top to bottom quintiles. All inequality indicators are reported for all ages, as well as for three 14 year cohorts.

Table 3 reports a Gini coefficient for the actual (observed) inequality (0.5) that is somewhat lower than the Gini coefficients for Greater Santiago and nationwide, which are around 0.52-0.55.[16] This is possibly a result of having only employed individuals of age 23 and above. However, as the focus of this work is to establish the role of observed circumstances on the income distribution, this small divergence is not a matter for concern. Table 1 also indicates that the Gini coefficient for the younger cohorts is lower, which may be a consequence of having more similar earnings profiles early in the life cycle.

Table 3 indicates that the Partial and Total Effects of observed circumstances on income inequality explain only about 7 to 12 points of the Gini coefficient, depending on the age cohorts, and yield a drop in this coefficient of about 15

[14] This variable is a dummy variable equal to one if either both parents had unstable employment, or in the case of a single parent household, the household head had an unstable employment.

[15] This is consistent with the finding reported by Bravo, Contreras and Medrano (1999), who report statistically significant coefficients of about 0.02 and 0.01 for the father's and the mother's schooling on their sons' earnings, respectively.

[16] See for example Ferranti, Perry, Ferreira and Walton (2003).

TABLE 3
EFFECTS OF EQUALIZING CIRCUMSTANCES ON LABOR INCOME INEQUALITY
GREATER SANTIAGO, CHILE
Gini and Theil coefficients, and Top-bottom Quintile Ratios

A. Gini Coefficients	Ages 23-36	Ages 37-50	Ages 51-65	Ages 23-65
Observed Inequality (W)	0,454	0,518	0,527	0,503
Simulated Inequality				
Partial Effect (W^P)	0,395	0,464	0,410	0,433
Total Effect (W^T)	0,343	0,428	0,408	0,420
10 years schooling guaranteed (W^{SG})	0,335	0,419	0,397	0,412
Equalized Schooling (W^{ES})	0,274	0,320	0,307	0,314

B. Theil Coefficients	Ages 23-36	Ages 37-50	Ages 51-65	Ages 23-65
Observed Inequality (W)	0,387	0,502	0,512	0,477
Simulated Inequality				
Partial Effect (W^P)	0,278	0,375	0,293	0,331
Total Effect (W^T)	0,206	0,308	0,287	0,307
10 years schooling guaranteed (W^{SG})	0,197	0,296	0,270	0,295
Equalized Schooling (W^{ES})	0,131	0,180	0,158	0,171

C. Q5/Q1 Ratios	Ages 23-36	Ages 37-50	Ages 51-65	Ages 23-65
Observed Inequality (W)	8,386	13,273	14,002	11,465
Simulated Inequality				
Partial Effect (W^P)	6,513	9,933	7,766	8,133
Total Effect (W^T)	5,271	8,421	7,509	7,830
10 years schooling guaranteed (W^{SG})	5,023	8,053	7,361	7,548
Equalized Schooling (W^{ES})	3,951	5,070	4,625	4,796

to 25 per cent. The simulations for the Theil coefficient show a similar pattern, although more accentuated. This indicates that part of the observed income inequality in Chile is associated with inequalities associated with the set of circumstances of origin employed in this work. However, these results also suggest that even after equalizing the set of observed circumstances employed in this work, a significant amount of income inequality remains. Another significant feature of the results in Table 1 is that the Partial and the Total effects of observed circumstances yield similar income inequality, although a few points

lower in the case of the Gini coefficient for the Total effect, as expected. This would indicate that, at least in Chile, the role of observed circumstances on the accumulation of *years* of schooling has a significant but limited effect on the income distribution.[17] Note also that a large part of the Total effect is associated only with the Partial effect, that is, the direct effect of observed circumstances on earnings. This suggest that variables such as the *quality* of education, and the acquisition of abilities associated with family background and parental human capital in particular (as suggested in the earnings regressions in Table 2) seem to play an important role in shaping income inequality in Chile.

Regarding the additional circumstance-equalizing benchmarks described above, Table 3 indicates that guaranteeing 10 years of schooling yield similar income inequality to the Total effect. Finally, the extreme situation of equalizing schooling (at the population mean schooling level) decrease the Gini coefficient an extra 10 points from the Gini associated with the Total effect. Even though this equalizing exercise may seem extreme, it reinforces the idea that still a significant amount of income inequality would persist even under these circumstances.

It is important to note that the results reported in Table 3 are similar to the results obtained by Bourguignon *et al.* (2005), although they employ a different (and much larger) dataset and a partially different set of circumstances (although parental schooling is also employed). In their study, the Partial and Total effects yield fairly similar absolute and proportional drops in the Gini and Theil coefficients to the ones reported above. This fact reinforces the general idea of this section, namely that, although income inequality is to an extent associated with inequality of a set of observed circumstances, equalizing these circumstances of origin has a rather limited effect in reducing income distribution. This in turn suggest that the remaining income distribution is associated with as combination of unobserved circumstances, individual "effort" and preferences, transitory shocks in income, sheer luck, as well as measurement errors in the income variable.

It would be interesting to assess the role played by unobserved circumstances in determining the unexplained part of the income distribution after equalizing observed circumstances. Although this task is beyond the purpose of this work, we provide some comments on this issue. First, using data from twins, Behrman and Rosenzweig (2004) suggest that the role of unobserved circumstances (fixed family background) on the offspring's performance can be large in comparison with the role of standard observed circumstances such as parental schooling. This would indicate that a substantial part of the income inequality obtained after equalizing observed circumstances may indeed be associated with unobserved circumstances. However, in an earlier related study, Behrman and Rosenzweig (2002) also suggest that maternal schooling seems to proxy some important unobserved factors associated with family background. This evidence would suggest that the observed circumstances employed in this work are likely to capture the effect of important unobserved circumstances associated with family

[17] This is consistent with the high average level of years of schooling and low relative inequalities in schooling that Chile exhibits in comparison with the rest of the region. See for example Ferranti, Perry, Ferreira and Walton (2003).

background. In order to explore this possibility, we make use of additional data of observed circumstances that was gathered in 2006 for 400 sons sampled from the sons employed in this work. In this survey we asked them to report information about additional observed circumstances, in particular their parents' interest in their progress at school, attendance to a private vs. a public school, access to tap water during infancy, parents' reading and writing skills, growing in an urban vs. a rural environment, parents' ethnicity (amerindian vs. non-amerindian background), and access to pre-school education during infancy. We do not employ these additional circumstance variables in this work because the sample size is reduced. However, Appendix 1 reports results on the statistical association of these additional circumstance variables to the mean parental schooling, which is the main circumstance variable employed in this work. The evidence in Appendix 1 indicates that mean parental schooling is associated with each one of these additional circumstance variables. This suggests that this variable is likely to capture a variety of different relevant circumstances of origin of the individuals in the sample.

V. Conclusions

This paper has applied a variation of the methodology developed in the pioneering work by Bourguignon *et al.* (2005) to analyze the extent to which income inequality in Chile is associated with a set of significant inequalities of exogenous observed circumstances of origin, namely parental schooling, vulnerability of the household head's occupation, fathers' age, family size and being raised in a single vs. a bi-parental household. The methodology allows to examine the direct effect of these observed circumstances on earnings conditional on schooling (the "partial effect"), as well as the additional role that these circumstances play in determining individuals' schoolings levels, which jointly yield the "total effect" of observed circumstances on earnings. We find that after equalizing individual observed circumstances to the mean values of the population, the resulting standard income distribution indicators become more egalitarian, indicating that a part of income inequality reflects inequalities of circumstances. However a large amount of income inequality is not associated with inequality in these circumstances. In particular, after equalizing observed circumstances, the Gini coefficient decreases in 7 to 12 points and 8 to 13 points under the Partial and the Total effects, respectively, representing approximately a drop of 10-20 and 15-20 per cent in each case. These results are similar to those obtained by Bourguignon *et al.* (2005) for Brazil, although they employ a partially different set of circumstance variables and a larger dataset.

We explore the possible role of unobserved circumstances by developing two additional benchmarks to those in Bourguignon *et al.* (2005). Equalizing individuals' schooling to the population mean to reflect an extreme situation where all schooling is assumed to depend on circumstances, either observed or unobserved further decrease income inequality, but still a significant amount persists. In addition, guaranteeing all individuals 10 years of schooling (achieved at about 16 years of age) under the argument that having less schooling may reflect adverse unobserved circumstances yield similar results to the Total effect.

The results of this work suggest that, if the exercise of equalizing circumstances is a close approximation of the notion of "equality of opportunities", then income inequality indicators may not adequately reflect the degree of equality of opportunities, as income inequality may also reflect other aspects such as individual "effort", preferences, choices, sheer luck and possibly transitory shocks in income and income measurement errors.

These results also suggest some implications for public policy, which depend on the chosen moral standpoint in the equality-of-outcomes vs. equality-of-opportunities debate. If income inequality matters, then the results suggest that achieving this aim-even in the long run-would require more than just equalizing circumstances such as access to educational opportunities, and in consequence additional redistributive policies are likely to be needed. On the other hand, advocates of equality of opportunities must be ready to accept that establishing "equal opportunities" is likely to coexist with a significant amount of income inequality. However, although these results seem suggestive, more research is needed to obtain more conclusive results. In particular, it seems necessary to examine the effect of having a larger set of observed circumstances that those employed in this work.

VI. References

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APPENDIX 1

MEAN DIFFERENCE T-TEST FOR MEAN PARENTAL SCHOOLING, BY VARIOUS CIRCUMSTANCE VARIABLES

Parents' interest in progress at school	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
High	8.78	4.20	−5.19	1.00
Medium & Low	6.48	3.99		
School Type	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
Private (Particular Pagado)	9.97	4.05	−6.63	1.00
Public (Municipal & Part. Subvencionado)	6.72	3.90		
Access to tap water during infancy	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
Yes	7.94	4.14	−4.40	1.00
No	4.98	4.08		
Rural vs. Urban Environment	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
Urban	7.89	4.17	−3.59	0.998
Rural	5.43	4.15		
Parents reading & writing skills	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
Without difficulty	8.32	3.98	−7.83	1.00
With difficulty	3.67	3.46		
Parents' ethnicity	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
At least one parent Amerindian	5.29	3.97	2.48	0.007
None of Amerindian Background	7.74	4.21		
Access to pre-school education	Mean Parental Schooling	Std. Dev.	t	Pr(T > t)
Yes	9.15	4.14	−5.02	1.00
No	6.79	4.09		