Internal Migration and its Impact on Reducing Inter-communal Disparities in Chile

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Abstract

Based on the affirmation that internal migration in Chile has become increasingly less important as an equalizing mechanism for regional disparities, this paper aims to look at the causes of such immobility. This study finds that the productivity differential is the leading factor explaining migration. Unfortunately, the initial disadvantage due to a precarious family background determines that the one who faces attractive potential wage differentials is at the same time constrained (retained) by its household. The conclusion is that household-related migration costs are a source of inefficiency in labour allocation. The estimation procedure allows for obtaining a non-endogenous potential wage differential which controls for the selectivity process involved in the migration decision (based on observed and unobserved characteristics). Consequently, supporting the infrastructure in the rural economy is not the only way to achieve convergence across the territory. Subsidies aimed to reduce migration costs should be also considered in a framework oriented towards encouraging functional migration flows.

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1 Introduction

Inter-communal migration movements are relatively minor in Chile. From April 2002 to 2006, the Chilean socio-economic household survey (CASEN 2006) reports a flow of 130,197 individuals from communes with less than 40,000 inhabitants to communes with more than 40,000 inhabitants reaching almost 4% of the population at origin.[1] In spite of the dynamic growth experienced in Chile during the past two decades, there is a consensus that the improvement of the standards of living has not been equally distributed across regions or communes. In a context where it is expected that internal migration may work as a mechanism to equalize relative resource scarcities over regions, Soto and Torche (2004) show evidence that migration has become increasingly less important as an equalizing mechanism for regional disparities.[2]

Based on this evidence, this paper focuses on the determinants of inter-communal movements of workers aiming to understand how the selection process of the migrant population works.[3] It considers observed and unobserved characteristics, productivity differentials and initial conditions allowing to asses which factors are currently discouraging migration and thus hampering the equalization of living standards.

In general, individuals are assumed to move if the returns (expected) to migration are greater than the sum of all opportunity costs and the moving costs (Borjas, 1987 and Mincer, 1978). Given this benefit-cost analysis, only a determined group of individuals and households will have an economic incentive to migrate.[4]

There have been many theories trying to explain the migration phenomena at different scales. For instance, the Neoclassical Economic Theory regards migration as a consequence of regional differences on demand and labour supply, which result in wage gaps. Pull factors at destination and push factor at origin are the underlying determinants of migration.[5] The micro-economic version considers migration as a result of a rational decision-making process of individuals in which cost-benefit analysis is essential.[6] Todaro (1976) considers that migration is triggered by wage

[1] Individuals moving in the opposite direction reached 128,915; equivalent to 1.1% of the population at origin.

[2] Busso (2006) argues, based on evidence by Cuervo González (2003) and Aroca (2004), that migration can also increase regional disparities in Chile.

[3] In this paper, rural-urban and urban-rural migration patterns are considered. In 2006, Chile was divided into 13 regions, which are further divided into provinces. Finally, each province is divided into communes. In 2010, Chile consisted of 54 provinces and 346 communes.

[4] In this context, positive selection means that, relative to the home-region population, movers are of above-average quality. While common wisdom maintains that movers are the most motivated individuals of the home-region population, it may be possible that persons from the bottom tail of the quality distribution have the economic incentive to migrate.

[5] Well known pull factors at destination are job opportunities, high incomes, amenities, etc. Push factors are usually criminality, poverty, pollution and unemployment amongst others.

[6] This micro-economic approach is based on an expected positive net return due to migration (Sjaastad, 1962; Todaro, 1976).

differentials and equilibrium is only reached when the wage differentials tend to be nonexistent. Similarly, Sjaastad (1962) and Becker (1962) propose that migration is an investment decision.

Under the New Economics of Labour Migration (NELM) Theory, migration is a joint decision by household members and not an individual decision (Stark and Bloom, 1985). Following this line of thought, minimizing risk plays a key role in determining migration. In addition, other factors such as capital, credit and insurance market availability also play a role; however, wage differentials are not considered as a necessary condition for migration. The NELM theory considers migration as a household strategy to enhance the income sources. Therefore, remittances play an important role here and migration will thus occur only when the structure and characteristics of the household allow for net gains in welfare.[7]

The Social Network Theory is based on the idea that the flow of information is extremely relevant for potential migrants and their households. It is assumed that family and friends contribute to obtain pertinent information about possible destinations. These networks reduce cost and migration-related risks for newcomers (Tilly and Brown, 1967 and Lomnitz, 1977). Thus, former migrants and non-migrants share information in origin and at destination reducing the risk associated to migration. This is complemented by the theory of cumulative causation, which states that migration reinforces itself by encouraging new migration flows (Massey 1990).

As Tsegai (2007) states, the various theories of migration, though with different policy implications, are not necessarily contradictory to each other. This paper supports the main conclusions of the Neoclassical Economic Theory considering migration as the leading factor explaining migration (triggered by regional differences on demand and labour supply).[8] This paper additionally shows that migration not only depends on individual characteristics, but strongly relies on household education.[9]Unfortunately, this evidence indicates that it is highly possible that the migrant is not necessarily the one who may benefit from higher labour earnings at the destination (contributing to equalize outputs across regions), but the one who is not constrained by its household. Contrary to this, the one who probably could take advantage from labour market differentials, but belongs to a household with low levels of education, would probably be forced to stay.

This paper also supports the following ideas by the NELM Theory (Stark and Bloom, 1985):

> *"it does not view the family as an entity that is split apart as its independence seeking younger members move away in an attempt to dissociate themselves from familial and traditional bondage, regardless of the negative externalities thereby imposed upon their families."*
>
> *"...this approach shifts the focus of migration theory from individual independence (optimization against nature) to mutual interdependence (optimization against one another), that*

[7]Net gains in welfare can be understood, for example, as declining risk and increasing expected incomes.
[8]See Borjas (1987), Mincer (1978), Sjaastad (1962), Todaro (1969 and 1976).
[9]The household education refers to the average education in years, excluding the potential migrant.

is, it views migration as a "calculated strategy" and not as an act of desperation or boundless optimism."

The empirical approach of this paper consists of a switching regression model presented by Goldfeld and Quandt (1973) with endogenous switching (Maddala, 1983) which can be properly used as a counterpart from an extended Roy model in the migration context. This methodology contributes through the provision of a structural form for internal migration, which is derived from a powerful theoretical framework. This paper shows that controlling for the selectivity process involved in the migration decision appears to be indispensable. Ignoring the self-selection of the migrant and non-migrant working population yields to an important underestimation of the potential wage differential. Thus, the estimation of an unbiased potential wage differential for those at origin allows the estimation of a parsimonious structural probability model. This equation has the advantage of accounting for the distribution of unobservables allowing to consistently assess the role of productivity differentials on the migration decision.

The main conclusion is that household matters not only regarding its composition, but also regarding relevant characteristics such as its educational level. The household education captures many underlying migration determinants such as the importance of the loss of income, the access to better information and networks and their use to reduce migration costs. It might also proxy for the ease of letting go and some demographic components. However, this study is devoted to test the idea that the potential migrant is household-dependent. The mechanisms through which this dependence takes place go beyond the scope of this study.

This study also reveals an interesting conclusion regarding how women (relative to men) are intrinsically motivated to move towards rural communes or remain there (in the case of those already residing in rural communes). At the same time, due to labour market differentials, women are more likely to move towards urban areas or remain there. Such decomposition of the gender-related effects shows the advantages of using a structural model approach.

Accepting the role of migration costs and amenities in discouraging migration, this paper recognizes that the way to ensure a long-run regional convergence in welfare should be based precisely on lowering migration costs and on the improvement of the rural infrastructure. Such interventions will lead migration to be an effective mechanism in ensuring an efficient allocation of labour between rural and urban communes.

This paper is broken down as follows: Section 2 reveals the data and the population of interest. Section 3 offers a brief characterization of the migrants and non-migrant groups. The theoretical framework based on the extended Roy model is presented in Section 4. Section 5 presents the results of the reduced and structural forms for the probability to move as the selectivity adjusted wage equations, while Section 6 concludes this study.

2 The Data

For this study, the official data was provided by the *Ministerio de Planificación del Gobierno de Chile* (MIDEPLAN), and in particular the *Encuesta de Caracterización Socioeconómica Nacional 2006* (CASEN 2006) was used.[10] According to MIDEPLAN, the size of CASEN 2006 reaches 73,720 households, with representativeness at country, urban, rural, regional and provincial levels and 301 communes of the country.

This study defines rural communes as those with less than 40,000 inhabitants. For the purpose of robustness, another relevant threshold for this paper was set at 20,000 inhabitants and different specifications regarding the selection of explanatory variables are considered.[11] This paper agrees with Coeymans (1983) and Raczynsky (1980) and uses the aforementioned rural-urban definition based on the idea that moving towards another commune implies a radical lifestyle change, the adoption of housing and job searching decisions, amongst other consequences. This study focuses on the rural-to-urban and urban-to-rural migration patterns. According to this, four categories of individuals can be defined. *Rural* and *Urban Movers* are the individuals who move from rural and urban areas towards urban and rural areas anytime within the last four years, respectively. *Rural* and *Urban Stayers* are the individuals who remain at origin.

The nature of the data makes it impossible to define a migrant as an individual who has moved to a different commune within the last few years (recent migrant). Consequently, workers who have migrated and later returned to their communes of origin during this period are not considered as migrants. Therefore, the estimates on self-selectivity could be potentially biased towards positive selection regarding the ability distribution.

In this study, the population of interest is restricted to non-enrolled workers aged 25 years and older reporting monthly labour earnings in 2006. In order to prevent the endogeneity of the schooling decisions and migration, this study excludes currently enrolled individuals and those who could be enrolled in 2002.

[10] Some variables at origin were obtained from CASEN 2003 by MIDEPLAN.

[11] This definition is similar to the one used by Coeymans (1982) and Raczynsky (1980). Both studies considered as rural those communes without cities with more than 20,000 inhabitants. The definition in this paper is somewhat different because it instead considers the total communal population. However, the definition adopted in this study considers as urban communes a slightly larger number of communes than those in Coeymans (1983), which is consistent with the urbanization pattern during the last two decades. See Pinto da Cunha (2002). Moreover, following World Population Prospects (2000), the urban population increased from 85.67% to 87.15% between 2000 and 2006, respectively. CASEN 2006 reports that 79% of the population lives within communes of more than 40,000 inhabitants.

2.1 Ex-post characteristics of inter-communal migrant workers

Table 3.1 shows descriptive information for stayers and movers originating from rural and urban communes.[12] As a matter of fact, movers are younger than and not as experienced as stayers. Rural movers have on average 10.91 years of education, in comparison with the 7.99 years of education for non-migrants originating from rural communes. Looking at the average household education in years, rural movers belong to households with 8.16 years of education per capita, while the figure for rural stayers reaches only 6.55 years.[13] These figures indicate a positive correlation between education levels and migration from rural to urban communes. Within those originating from rural communes, movers have more children, consist of a slightly larger proportion of women and receive higher monthly earnings than stayers.

Table 1: Descriptive statistics for workers in 2006, by groups

	Rural origin		Urban origin	
Variables	Stayers	Movers	Stayers	Movers
Age (in years)	46.52	38.56	44.55	39.56
Potential experience (in years)	32.53	21.66	28.25	22.47
Education (in years)	7.99	10.91	10.31	11.09
Average Household Education (in years)	6.55	8.16	8.17	8.09
Children per Household	1.63	1.67	1.73	1.40
Aboriginal Origin (Mapuche) (%)	9.54	7.64	5.89	6.15
Bi-Parental Household (%)	67.42	71.18	67.16	75.14
Female (%)	32.70	34.71	38.73	32.70
Adjusted monthly wage (in Current US$*)	234.60	388.91	380.80	385.04

Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
*Average US$ in 2006 equals 524.48 Chilean Pesos.
Source: own elaboration, based CASEN on 2003 CASEN 2006 and Banco Central de Chile.

Regarding those originating from urban communes, the selection of movers seems to be slightly positive in terms of the years of education, but on average, migrants belong to less-educated households. They are also younger, not as experienced, with fewer children and earn slightly more than their non-migrant counterparts.

3 Theoretical framework

Borjas (1987) used the Roy (1951) model to derive an economic selection model based on unobserved characteristics. In this model, migrants are negative selected if they have below-average labour earnings and productivities given their observable characteristics. Inversely, positive selected immigrants have above-average earnings and productivities. Borjas shows that there is

[12]The information presented here was collected at destination in 2006. To restrict the sample to those older than 24 years, not being enrolled contributes to approximate the figures to those actually observed at origin (ex-ante).
[13]The calculation of the average household education (in years) excludes the potential migrant.

no relationship between the selection process generated by unobserved characteristics, and the selection process generated by observed characteristics, such as education. In concordance with the kernel of the Harris-Todaro (1970) model, well-educated individuals are more able to access good-quality information on the labour market in potential destinations and therefore, highly educated people are more likely to get a job than unskilled workers if the correlation between labour markets in both regions is strong enough. However, as Borjas (1988) states, "it is completely possible for the most educated persons to migrate to the U.S. (i.e. positive selection in education), but for these persons to be the least productive persons in the population of highly educated persons (i.e. negative selection in unobserved characteristics)." There are consequently, two dimensions of "quality", therefore, generalizations based only on observed characteristics are misleading, because much more than half of the variance in wage rates or weekly earnings are explained by unobserved characteristics.

The standard Roy model predicts that migrants will be negative selected if the inequality in the distribution of incomes is lower at destination than at origin and if the correlation between labour earnings in both regions is strong enough. Nevertheless, a generalization of the Roy model that relaxes the assumption of constant moving costs by allowing correlation between non-observed abilities and moving costs shows that the type of selection may change in either direction (Borjas, 1987).[14]

3.1 Extended Roy model

This model, presented by Borjas (1988), considers random mobility costs. The log labour earnings at home area are described by:

$$lnW_1 = u_1 + e_1 \tag{1}$$

Where u_1 is the average log wage at the home area and e_1 is the zero mean disturbance with variance σ_1^2. In the same way, the log labour earnings at host area are defined such that:

$$lnW_2 = u_2 + e_2 \tag{2}$$

Both wage distributions have a joint normal distribution, where e_1 and e_2 can be interpreted as unobservable abilities of individuals.

[14]The standard Roy model does not consider any switching costs. As a consequence of this, important information is not taken into account if the costs of moving are inversely related to the amounts of human capital. If this is the case, it is plausible that individuals on the top of the income distribution at home (origin) decide to move to a host area with a more equal wage distribution (positive selection).One of the conclusions of this study shows that, in fact, the costs of moving are inversely related to the amount of human capital.

Assuming that C represents the migration costs which, in this extension of the standard Roy model, are not fixed but rather a proportion of the monetary and non-monetary cost of migration as a proportion of home income. Migration occurs if $\frac{W_2-W_1}{W_1} > C$, which is approximately $lnW_2 - lnW_1 > C$.

$$C = \gamma + \varepsilon \tag{3}$$

The extended version of the standard Roy model assumes that C is normally distributed with mean γ and error $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. With this information, an individual moves if the index function $I^* = (u_2 - u_1 - \gamma + e_2 - e_1 - \varepsilon) > 0$ and stays if $I \leq 0$. Assuming the normality conditions and defining $\sigma^v = \sqrt{Var(e_2 - e_1 - \varepsilon)}$, $z = -\frac{u_2-u_1-\gamma}{\sigma^v}$ and $\eta = \frac{e_2-e_1-\varepsilon}{\sigma^v}$, the probability to move is given by:

$$Pr(\eta > z) = 1 - \Phi(z) \tag{4}$$

Where $\Phi()$ is the cumulative distribution of the standard normal and following Heckman (1979), the unobserved wage of a mover in the region of origin is given by:

$$E(lnW_1 | I^* > 0) = u_1 + \frac{\sigma_1 \sigma_2}{\sigma^v} \left[(\rho_{1,2} - \frac{\sigma_1}{\sigma_2}) - \rho_{1,\varepsilon} \frac{\sigma_\varepsilon}{\sigma_2} \right] \lambda \tag{5}$$

and the observed labour earnings at destination as:

$$E(lnW_2 | I^* > 0) = u_2 + \frac{\sigma_1 \sigma_2}{\sigma^v} \left[(\frac{\sigma_2}{\sigma_1} - \rho_{1,2}) - \rho_{2,\varepsilon} \frac{\sigma_\varepsilon}{\sigma_1} \right] \lambda \tag{6}$$

Where $\rho_{1,2}$ represents the correlation coefficient between the disturbances e_1 and e_2. $\rho_{1,\varepsilon}$ and $\rho_{2,\varepsilon}$ are the correlation coefficients between e_1 and the error of the moving cost ε and between e_2 and ε respectively. $\lambda(z) = \frac{\phi(z)}{1-\Phi(z)}$ is the inverse of Mill´s ratio where $\phi()$ is the standard normal density function.

Brücker and Trübswetter (2007) decompose the second terms in (5) and (6) in order to identify composition and scale effects.[15] It reveals important implications about the selection biases in terms of unobserved and observed characteristics. Borjas (1988) shows that positive selection in observed characteristics (i.e. schooling) occurs if the labour market in the host region attaches a higher return in comparison to the home region.The estimation strategy presented in the next sec-

[15]The composition effect measures how a change in the ability mix of a constant-sized immigrant pool affects the selection bias, holding the size of the flow constant. The scale effect captures what happens to the selection bias as the size of the flow is increased for any given mix of abilities.

tion achieves the assessment of a structural probability model for internal migration, controlling for observed characteristics as well as for the impact of unobservables.

3.2 Estimation

The extended Roy model presented in this paper finds a suitable counterpart in a switching regression model, presented by Goldfeld and Quandt (1973) with endogenous switching (Maddala and Nelson, 1975; Maddala, 1983).[16]

Let's define the migration index function for the *ith* individual as

$$I_i = \delta(lnW_{2i} - lnW_{1i}) - Z_i\psi - \varepsilon_i \tag{7}$$

Where equation (1) and (2) can be rewritten as:

$$lnW_{1i} = X_{1i}\beta_1 + \mu_{1i} \tag{8}$$

$$lnW_{2i} = X_{2i}\beta_2 + \mu_{2i} \tag{9}$$

Where X_i is a vector of personal and household characteristics determining labour earnings . As standard in the literature, it contains educational levels and the potential experience (and its square). It additionally includes the average years of education for the other household members. Controls for those belonging to the Mapuche ethnic group, gender, wealthy communes, rural areas, occupations, economic sectors, the public sector and dummies for the region of residence (at destination) are also considered.

However, the index function cannot be estimated in a structural form because $lnW_{2i} - lnW_{1i}$ is endogenous. To solve this endogeneity problem, Lee (1978) and Willis and Rosen (1979) propose a three step strategy.

In the first step, a reduced form of the migration index function is estimated by using a probit Maximum Likelihood estimator where $I_i = 1$ if $I^*> 0$ and $I_i = 0$ otherwise. This index function is based on the migration cost identity $Z_i\psi + \varepsilon_i = C$ (counterpart of (3)), which depends on personal and household characteristics in Z_i and unobservable ε_i.

[16] Using the same notation, endogenous switching satisfies that $(\mu_{1i}, \mu_{2i}, \varepsilon_i) \sim N(0, \Sigma)$, where $\Sigma = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{1\varepsilon} \\ \sigma_{12} & \sigma_{22} & \sigma_{2\varepsilon} \\ \sigma_{1\varepsilon} & \sigma_{2\varepsilon} & 1 \end{bmatrix}$ is the Covariance Matrix.

Vector Z_i consists of the level of education of the potential migrant. Here, a positive association is expected owing to the relevance of education in the migration decision. Education allows individuals to reduce risk and improves their employment probabilities abroad.[17] Following Stark and Bloom (1985), the degree in which the remaining members of the household can generate income is important information for the potential migrant. So this paper includes the average household education (excluding the potential migrant) in the model. Other variables usually considered in the literature and included in this study are: the potential experience and its square, gender, the number of children in the household, a control indicating bi-parental households, indigenous status (as above), and controls for the regions at origin. All these variables are expected to be proxies of the characteristics of interest at origin (ex-ante). Additionally, the communal unemployment rates at origin are included to reflect the held notion that unemployment (and the subsequent poverty and lack of opportunities) encourages migration. The log-population at origin aims to control for the availability of public goods, as two indicators accounting for changes in the relative communal connectivity are expected to control the fact that migration flows are not homogeneously distributed across the territory. The inclusion of interaction terms between these indexes and the household education are expected to additionally show the relevance of the human capital accumulation within the household in shaping the observed migration patterns (see below).

In a second step, the ML function uses the estimated parameters from the reduced form probit model as starting values for the estimation of the Heckman corrected wage equations.[18] In order to identify this system, at least one variable in Z_i must be not included in X_i.[19]

$$I_i^* = \delta(X_{2i}\beta_2 - X_{1i}\beta_1) - Z_i\psi + \delta(\mu_{2i} - \mu_{1i}) - \varepsilon_i = Z_i^*\psi^* + \varepsilon_i^* \tag{10}$$

Now, the parameter vector $\hat{\psi}^*$ in (10) can be suitably estimated and therefore, the inverse Mills' ratio for stayers and migrants can be calculated. Equations (11) and (12) can be estimated for each worker, so that, the potential differential wage can be calculated. For stayers:

$$lnW_i = X_i\beta_1 - \sigma_{e1\eta}\frac{\phi(Z_i^*\hat{\psi}^*)}{\Phi(Z_i^*\hat{\psi}^*)} + \mu_{1i} \tag{11}$$

and for movers:

[17] Greenwood (1975) argues also that education may reduce the psychological costs of migration.

[18] This paper uses the Heckman Maximum Likelihood estimator for survey data, which also takes into account the correlation between primary sample units avoiding the underestimation of standard errors and consequently, avoiding the overestimation of sample selection bias or possible self-selectivity of migrants. The maximum likelihood method has been shown to produce consistent estimates under a few plausible conditions. Maximum likelihood estimates have the further advantage of being normal and efficient if sample sizes are large enough (Gujarati, 2003: 113).

[19] This identification problem was solved using the marital status and the indexes of changes in connectivity as exclusion variables in (11) and (12) to identify (10).

$$lnW_i = X_i\beta_2 - \sigma_{e2\eta}\frac{\phi(Z_i^*\hat{\psi}^*)}{1-\Phi(Z_i^*\hat{\psi}^*)} + \mu_{2i} \tag{12}$$

Both wage equations (for stayers and movers) allow the estimation of a potential wage differential for each worker without selection bias. The potential wage differential (in logs) and its square (allowing for nonlinearities) are then included in the third step to estimate structurally the index function for the migration probability (10). Besides the potential wage differential, the structural equation includes as explanatory variables the communal unemployment rates at origin and the provision the public goods proxied by the population at origin (in logs). Additionally, in order to control for the life cycle of the potential migrant, the age is included.[20] In order to test the hypothesis that migration is a household-dependent decision which is also affected by channels unrelated to the labour market, the average household education is included in the structural model specifications. Finally, other relevant characteristics are also considered i.e. the average household education, the bi-parental household condition, the number of children in household, indigenous status (Mapuche) dummies for the regions of origin, interaction terms and connectivity indexes as well.

3.3 Accounting for the geographic connectivity - Adjacency at the communal level

This paper uses a social network method to understand the role of the "connectivity" in determining migration. The migration literature has extensively depicted the role of the distance affecting the decision to migrate (Greenwood 1995).[21] However, distance itself is not a migration determinant, but it can be seen as an inverse function of the connection between origin and destination. Consequently, how connected are communes at origin and destination can be considered as a proper proxy for underlying migration determinants such as information flows, transport cost, psychological and opportunity costs (Schwartz 1973 and Greenwood 1995). To capture the impact of changes in connectivity, an index is elaborated following Boots and Kanaroglou (1988). The index relies on the principal eigenvector of the connectivity matrix.[22] Each element of the principal eigenvector e is a measure of the location relative to the "centre".

Due to the peculiar geographical distribution of the Chilean communes, two connectivity index variables are needed. $Comm_{ij}$ is expected to control for changes in the relative connectivity at the regional level and Reg_{ab} at the country level based on migration flows between regions. These variables can complement the evidence found decades ago by Herrick (1965) and Elizaga (1970)

[20] Following Greenwood (1993), the propensity to migrate decreases with age.

[21] See also Beaudreau (1990).

[22] This squared matrix is also known as the adjacency matrix. In this matrix, adjacent communes (regions) are denoted by the unity, while the diagonal of the matrix and non-adjacent communes (regions) have only zeros.

showing that migration in Chile follows a "stair-shaped" process, where individuals migrate initially from small towns towards intermediate cities and thereafter towards metropolitan areas.

The index of the relative location change between communes is obtained as follows:

$$Comm_{ij,ab} = \left[\frac{e_{j,b} - e_{i,a}}{e_{j,b} + e_{i,a}}\right] \tag{13}$$

where e represents the elements of the principal eigenvector of the connectivity matrix and subscripts i and a denote the commune and region of origin respectively. In the same way, subscripts j and b represent the commune and region of destination. Communes j and i may or may not belong to the same region. In the same way:

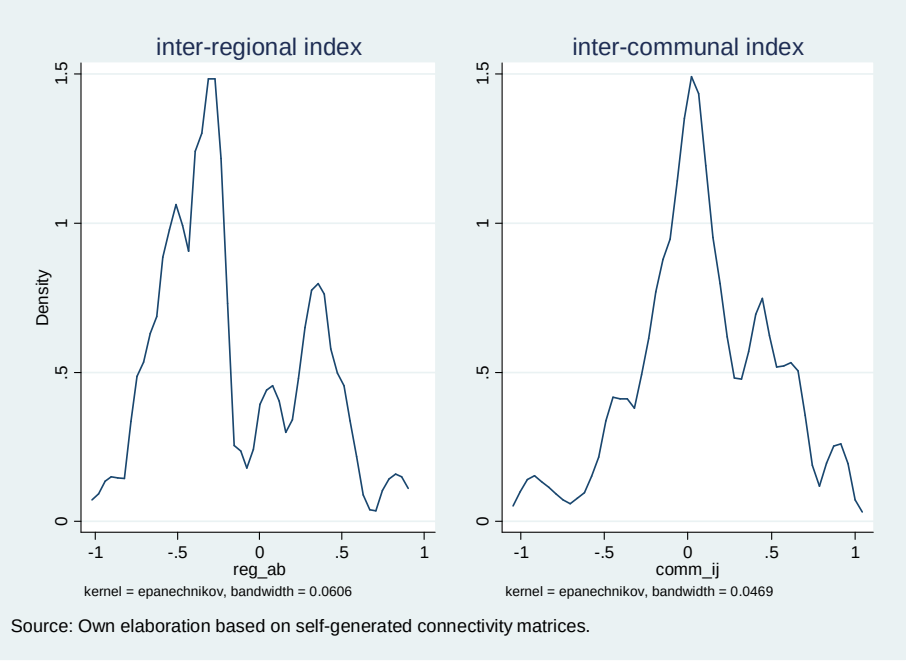
$$Reg_{ab} = \left[\frac{e_b - e_a}{e_b + e_a}\right] \tag{14}$$

where subscripts a and b denote the region at origen and destination respectively and $a \neq b$.

Both indexes take values between -1 and 1 including the zero, which mean no change in the relative location by region and/or commune. Therefore, using a single multiplicative index is unsuitable. Values close to 1 indicate a location change from an extreme peripheral commune (region) towards a central commune (region). Values close to -1 indicate the opposite.

Figure 3.1 shows the distribution of the mentioned indexes described above. Regarding migration flows between different regions R_{ab}, migrants tend to move towards relatively more peripheral regions. An unconditional view of the data shows that, except for *Puente Alto* (Region Metropolitana), the most preferred destinations for inter-regional migrants are placed in relatively non-central regions such as*:* IV *(La Serena)*, IX *(Temuco)*, II *(Antofagasta)* and I (*Iquique)*. When considering inter-communal migration at a regional level, the opposite occurs. Migrants move more frequently from peripheral communes towards those with a higher connectivity index. Note that in this study, the impact of changes in the index of connectivity is predetermined by the migration pattern. However, this control is needed in order to obtain consistent estimates of the other determinants of migration. Additionally, interaction terms relating the household education to the connectivity indexes are also considered (*Interaction 1* = average household education$\times Comm_{ij}$ and *Interaction 2 = average household education*$\times R_{ab}$). The interaction terms aim to test whether the decision to move towards a more connected/unconnected region or commune depends on the household education. It is expected to find an significant coefficient for these interactions, at least for those coming from rural areas. This would be an indication that migration flows consist of, in a major part, for those who belong to households with relatively high levels of education. The evidence in CASEN 2006 is quite clear regarding this issue. Two-thirds of the migrant population

Figure 1: Distribution of the connectivity change indexes (all flows), Chile, 2002-2006



Source: Own elaboration based on self-generated connectivity matrices.

comes from relatively well educated households (above average).[23]

3.4 Household education

As Stark and Bloom (1985) state, the degree to which the remaining members of the household can generate income is important information for the potential migrant. It is not risky to believe that the household income generation capacity is correlated with the stock of education in the household.[24] Thus, less-educated households are more dependent on the monetary and non-monetary contribution of each member. The cost in case of migration will be somewhat proportional to the household welfare dependence on any household member and therefore, an individual would be able to move, given other conditions, if he or she knows that in the case of migration, the household will not suffer a considerable reduction in welfare.

This variable is also highly correlated with the dependency ratio, but conditional on the stock of education within the household. Poor levels of household education would reflect high levels of dependency, which translate into a high opportunity cost in the form of higher reservation wages for potential migration (discouraging migration). Contrary to this, high levels of average

[23] See also Table 3.1.

[24] This variable was generated excluding the years of education of the potential migrant. More important than to avoid the endogeneity problems, it is possible to figure out what the potential migrant is observing in its own household in terms of education.

household education would be associated with lower dependency ratios, lower reservation wages and better mobility prospects.

In summary, the household education captures many underlying migration determinants such as the importance of the loss of income (opportunity costs in terms of household income at origin), but also the access to better information and networks and their use to reduce migration costs. It might represent the ease of letting go (more educated parents may find it easier to let their children leave the household) and some demographic components (younger siblings will typically have higher educational levels than their parents). This paper aims to assess whether the theoretical reasons briefly depicted above find some empirical support and can easily help to characterize the initial constraints that potential migrants might face. However, the mechanism through which this dependence takes place goes beyond the scope of this study.

It would appear that this variable has rarely been used in empirical studies. For instance, and for a variety of micro and macro model specifications to test for self-selection of migrants, Yashiv (2004), Brücker and Jahn (2008), Cobb and Clark (1993), Cohen and Haberfeld (2007), Brücker and Defoort (2007), Parrado and Cerrutti (2003) and Abramitzky (2008) used only individual education variables in their models. Fafchamps and Shilpi (2008) additionally use the father's education level in the migration selection equation. Tsegai (2007) uses the average years of education of the adult household members.[25]

4 Estimation Results

As mentioned earlier, the three-step strategy aims to obtain consistent estimates of the individual probability to migrate. In the first step, the probit model for migration serves as the starting point for the estimation of a wage equation allowing to independently evaluate wage determinants for migrants and stayers accounting for the role of unobservables and their self-selection (second step). Finally, in the third step, the structural probability model explores, amongst other determinants, the role of the non-endogenous potential wage differential in the migration probability.

[25] Tsegai (2007) finds a probit-coefficient for average education years for adults in the household equals 0.126 at the 1% significance level in the probability model of the migration decision equation at the household level in the Volta Basin of Ghana.

Table 2: Reduced form of the index function, probit ML, Threshold set at 40,000 inhabitants. Chile 2002-2006 (first step)

Dependent variable: migrant status.						
	Rural-urban			Urban-rural		
Model / Variables	M1	M2	M3	M1	M2	M3
Basic education	0.352***	0.229**	0.209**	-0.0122	0.0685*	0.0686*
Secondary education	0.601***	0.394***	0.333***	-0.0386	0.0978**	0.0980**
Tertiary education	0.723***	0.383**	0.335**	-0.0488	0.169***	0.169***
Potetial experience >5 <11	-0.328	-0.247	-0.199	0.0210	-0.0283	-0.0282
Potetial experience >10 <16	-0.577**	-0.487*	-0.436*	-0.0637	-0.138*	-0.138*
Potetial experience >15	-0.891***	-0.856***	-0.843***	-0.388***	-0.416***	-0.416***
Average household education	-	0.0534***	0.0581***	-	-0.0320***	-0.0318***
$Comm_{ij}$	-2.788***	-2.826***	-4.727***	-	-	-
R_{ab}	1.973***	1.925***	0.745	-3.001***	-2.987***	-3.052***
Interaction 1	-	-	0.210	-	-	-
Interaction 2	-	-	0.139	-	-	0.00789
Bi-parental household	0.274***	0.299***	0.317***	0.238***	0.220***	0.220***
Number of children in household	-0.0104	0.0171	0.0275	-0.0998***	-0.123***	-0.124***
Mapuche	-0.0721	-0.0590	-0.0596	-0.0350	-0.0535	-0.0541
Female	0.0272	0.0338	0.0371	-0.0866***	-0.0908***	-0.0907***
Unemployment rates at origin	0.0878***	0.0869***	0.0898***	-0.0430***	-0.0447***	-0.0447***
Log of population at origin	-0.172**	-0.192**	-0.185**	0.0308	0.0392	0.0391
Constant	-0.577	-0.760	-0.926	-2.170***	-2.011***	-2.011***
Regional controls		Yes			Yes	
Observations		51,278			47,452	
Non-migrant Population		1,006,382			3,990,350	
Migrant Population		41,501			47,592	
Population Size		1,047,883			4,037,942	
F	12.04	12.11	11.56	20.76	23.34	22.49
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.

4.1 Probit - reduced form (first step)

Rural-urban migration

Table 3.2 shows the reduced forms of the migration probability equations.[26] The probit regression indicates a positive relationship between education and the probability to move. This effect is stronger for individuals with higher levels of education. Bi-parental households are significantly associated with the probability to migrate. The number of children per household does not have any significant impact on the probability to move. As expected, average household education positively affects the probability to move, while having an indigenous background does not affect the probability to move.

The potential experience discourages the migration. As expected, higher communal unemployment rate at origin increases the migration probability towards urban areas. The statistical significance of the connectivity change indexes shows that the geographical network structure should be

[26]Table 1 in Appendix shows the same models using the alternative threshold (set at 20,000 inhabitants).

taken into account in a conditional framework. At the regional level, the net migration flow goes from the centre towards communes placed in the periphery. However, many important cities are located in peripheral areas within a region. At the country level, the net migration flow originating from rural communes goes from "isolated" regions towards regions in the "centre".[27] Finally, the significant coefficient on the log-population variable indicates that the provision of public goods works as a pull factor discouraging migration. Interaction terms appear to be insignificant.

Urban-rural migration

Here, the probability of migrating is statistically significantly dependent on the level of education. The idea that education allows individuals to reduce risks, improving their employment probabilities abroad appear to be confirmed. Education encourages migration independently of the flow direction. As expected (due to the nature of the flow), index of relative connectivity change indicate migration flowing towards regions in the periphery.[28] The number of children and the labour experience are significantly associated to lower probabilities of moving. Finally, women are less likely to migrate, while the indigenous background appears to be uncorrelated with the probability to move.

4.2 Selectivity adjusted wage equations and the potential wage differential

Accounting for the selection process involved in the migration decision, Table 3.3 shows the monthly wage equations for movers and non-migrant workers (threshold set at 40,000 inhabitants).[29]Although unbiased wage estimates are needed to consistently obtain the migration probabilities, they also deserve attention. With independence of the threshold being used, wage equations for movers and stayers show the expected influence of the standard determinants on labour earnings .[30] However, some interesting results can be found in these equations. For example, consistent with the fact that women are relatively over-represented in the sample of rural movers and under-represented in the sample of urban movers (relative to their stayer counterparts, see Table 3.1), women's earnings appear to be "less-penalized" for movers than for stayers originating from rural communes. Contrary to this, women originating from urban communes are expected to earn less in the case of migration. It is important to keep in mind the fact that women movers perform differently than their stayer counterparts. This can help to explain the findings in the structural

[27]This finding cannot be interpreted as contrary to the conclusions by Herrick (1965) and Elizaga (1970).

[28]The coefficient of the index at the communal level could not be calculated due to the insufficient number of observations with positive output.

[29]Table 2 in Appendix shows the wage equations using the alternative threshold set at 20,000 inhabitants.

[30]For robustness purposes, we estimate the adjusted wage equations using the best reduced form model (M2), and the alternative threshold set at 20,000 inhabitants.

model.[31]

Table 3: Wage equations adjusted for self-selection. Movers and stayers. Threshold set at 40,000 inhabitants using M2 (second step)

Dependent variable: monthly labour earnings (threshold set at 40,000 inhabitants)				
	Rural Origin		Urban Origin	
Variables / Migrant status	Movers	Stayers	Movers	Stayers
Basic education	0.164	0.107***	0.168**	0.135***
Secondary education	0.208	0.294***	0.380***	0.317***
Tertiary education	0.853***	0.637***	0.756***	0.685***
Potetial experience >5 <11	0.788***	0.175***	0.0811	0.219***
Potetial experience >10 <16	0.626**	0.310***	0.194	0.355***
Potetial experience >15	0.757***	0.383***	0.197	0.425***
Average household education	0.00442	0.0364***	0.0501***	0.0364***
Number of children in household	-0.00859	0.0269***	0.0759***	0.0360***
Mapuche	-0.122	0.0226	0.0421	-0.0220
Female	-0.342***	-0.500***	-0.552***	-0.415***
Public sector	0.0230	0.0532***	0.0147	-0.0275
Rich commune	0.543***	-	0.0724	0.263***
Rural sector	-0.00436	0.0923***	0.0321	-0.124***
Inverse Mill's ratio (lambda)	-0.0767	0.292***	0.0102	0.0499
Constant	9.105***	9.105***	9.276***	9.276***
Occupational controls	Yes	Yes	Yes	Yes
Sectorial controls	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes
Observations	51278	51278	32234	32234
Population size	1047883	1047883	4037942	4037942
Censored population	1006382	41501	3990350	47592
F	155.9	401.60	29.73	242.20
Prob > F	0.0000	0.0000	0.0000	0.0000

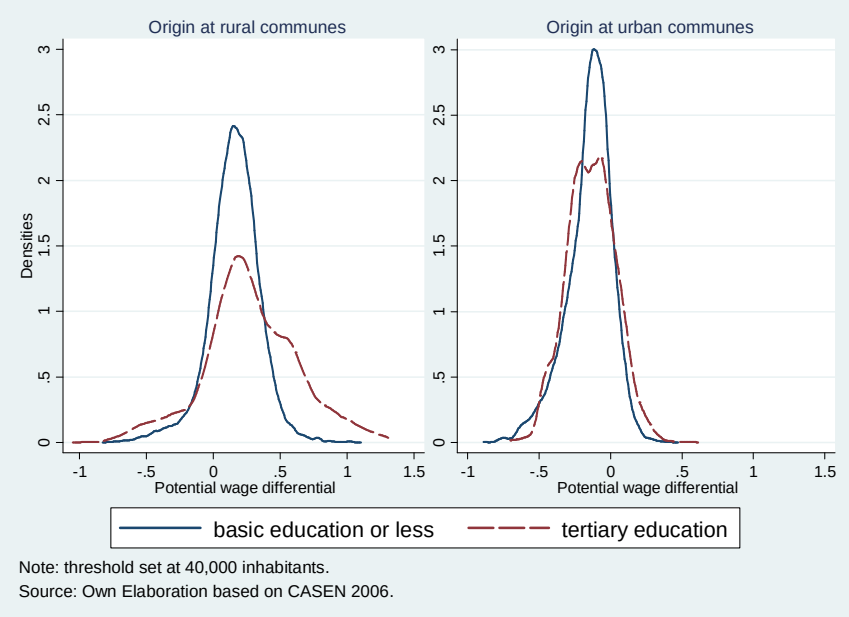
Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.

The same tables show that returns to education are higher for movers than for stayers. This finding points out that the observed positive selection in education is related to the observed outputs in the labour markets. However, the earning distribution is not only dependent on the relative returns to education and its distribution, but also on the distribution of unobservables and its returns. The results indicate for movers that, in terms of unobserved ability, they can be considered a random sample of the population at origin.[32] Contrary to this, for stayers originating from rural communes, the inverse Mill's ratio (λ) turns out to have a significant and positive impact on labour earnings . This indicates that the self-selection process involves only those who decide to stay at origin. Equations (11) and (12) show that the total impact of self-selection on expected incomes can be calculated by the difference between the coefficients associated to inverse Mill's ratio for

[31]The structural effect of being women on migration excludes the consequences of being women working through the labour market (affecting the labour earnings at origin and destination).

[32]Note that the reduced-form shows that migration depends on the household education. As migrants come, on average, from well-educated households, and assuming, as Belzil and Hansen (2002) do, that the distribution of unobserved ability is orthogonal to parents' background, it is possible to argue that every migration model has to control for the correlation between household education or parents' background and the migration status. Ignoring this would yield to underestimate the impact of unobservables on migration.

Figure 2: Distribution potential wage differential, tertiary versus basic education or less. (threshold: 40,000 inhabitants) Chile, 2002-2006



Note: threshold set at 40,000 inhabitants.
Source: Own Elaboration based on CASEN 2006.

movers and stayers.[33] On average, the effect of self-selection on expected incomes is about 36% and 4% for those originating from rural and urban communes, respectively.[34] Therefore, to ignore this issue would strongly underestimate of the potential wage differential for those originating from rural communes.

The potential wage differential and education

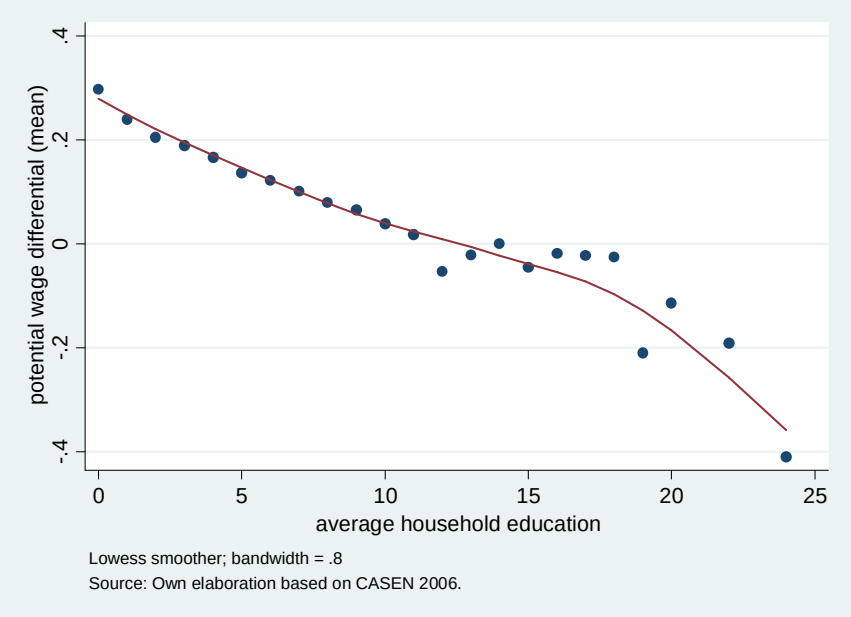
Now, after controlling for the selectivity of the migration decision (to stay or to move), it is possible to analyze the relationship between the potential wage differential conditional on the education of the potential migrant and on the average education of its household. Figure 3.2 shows the distribution of the potential wage differential for the bottom and upper tails of the educational distribution. The left panel shows that a significant portion of those with tertiary education "observe" a potential wage differential larger than 0.5 log-points.

Now, linking the potential wage differential to the migration status, Table 3.4 shows that migration is not a rare event for workers at origin facing potential wage differentials larger than 0.5

[33]The total impact of self-selection on expected incomes corresponds to the coefficient of the inverse Mill's ratio from the stayer wage equation minus the coefficient of the same variable from the wage equation for movers. See also Nakosteen and Zimmer (1980).

[34]Tsegai (2007) finds a combined effect of self-selection on expected incomes of about 30% in his study on migration in Volta Basin of Ghana.

Figure 3: The potential wage differential and the average household education. (threshold: 40,000 inhabitants) Chile, 2002-2006



log-points (mostly tertiary educated). Contrary to this, migration is significantly less frequent for those with potential wage gaps smaller than 0.5 log-points. Following the idea that migration is an investment decision (Becker, 1962 and Sjaastad, 1962), migration is more likely to occur when the potential wage differential reaches magnitudes of approximately 0.5 log-points or greater. At this point, all moving costs appear to be significantly overcome by the expected wage at destination. Figure 3.3 shows the relationship between the household education and the potential wage differential. For those originating from rural areas, lower levels of household education are associated with large productivity differentials. On average, only those belonging to households with less than 10 years of education actually observe positive potential wage gaps. This finding is crucial in the interpretation of the structural probability model.

Table 4: Migration incidence by groups

	Wage gap < 0.5 log points		Wage gap > 0.5 log points	
Migration status	Frequency	Percent	Frequency	Percent
Movers	29,015	2.69	12,486	17.94
Stayers	1,050,752	97.31	57,103	82.06

Source: own elaboration based on CASEN 2006.

Table 5: Structural form of the index function, probit ML, Chile 2002-2006. Threshold set at 40,000 inhabitants using M2 (third step)

Dependent variable: migrant status.						
	Rural-urban			Urban-rural		
Threshold / Variables	M1	M2	M3	M1	M2	M3
Log Potential wage differential	0.758***	1.213***	1.275***	3.159***	3.585***	3.585***
Log Potential wage differential - squared	1.145***	0.687***	0.624**	4.837***	4.889***	4.889***
Age	-0.0225***	-0.0220***	-0.0228***	-0.00902***	-0.00784***	-0.00784***
Average household education	-	0.107***	0.104***	-	-0.0518***	-0.0517***
$Comm_{ij}$	-2.634***	-2.618***	-	-	-	-
R_{ab}	2.152***	2.030***	-	-2.916***	-2.885***	-2.912***
Interaction 1	-	-	-0.222***	-	-	-
Interaction 2	-	-	0.238***	-	-	0.00317
Bi-parental household	0.282***	0.332***	0.338***	0.334***	0.304***	0.304***
Number of children in household	-0.0213	0.0386	0.0439	-0.223***	-0.275***	-0.275***
Mapuche	-0.0290	0.0994	0.0915	-0.209***	-0.298***	-0.298***
Female	-0.123*	-0.200***	-0.200***	0.230***	0.301***	0.301***
Unemployment rates at origin	0.0885***	0.0875***	0.0882***	-0.0566***	-0.0614***	-0.0614***
Log of population at origin	-0.162**	-0.234***	-0.231***	0.0636*	0.0999***	0.0998***
Constant	-0.319	-0.664	-0.693	-2.241***	-2.119***	-2.120***
Regional controls		Yes			Yes	
Observations		51,278			47,452	
Non-migrant Population		1,006,382			3,990,350	
Migrant Population		41,501			47,592	
Population Size		1,047,883			4,037,942	
F	15.70	16.16	17.98	43.20	40.94	39.28
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.

4.3 Probit, structural form (third step)

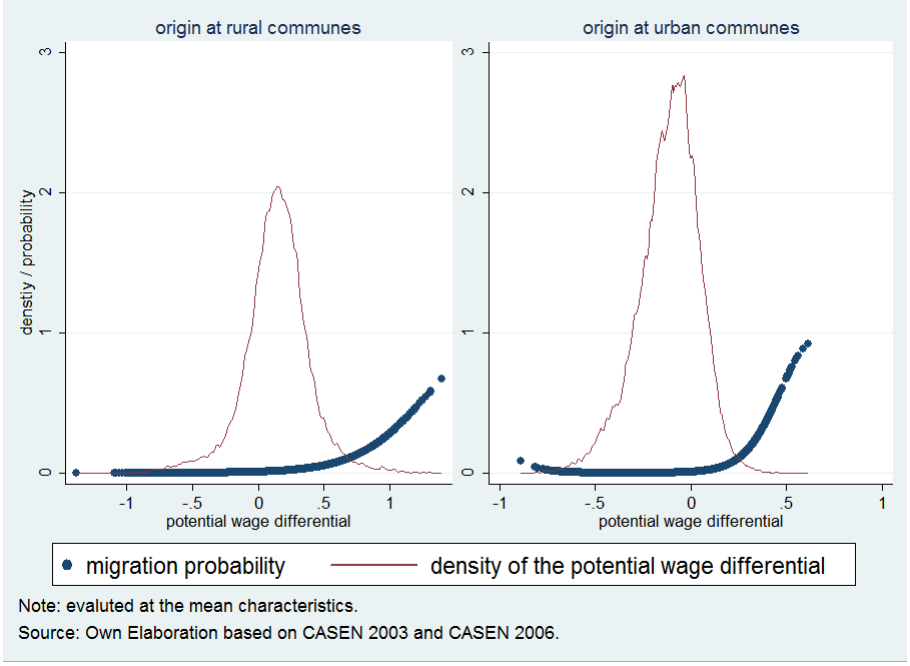
Table 3.5 confirms that there is a significant causal relationship between the potential wage differential and the migration decision.[35] This relationship is depicted in Figure 3.3. Interestingly, when the potential wage differential is smaller than a certain threshold, the probability to move is almost uncorrelated with this variable. However, beyond the threshold, the migration probability increases exponentially.[36]

Household education

The average household education appears to be highly significant in all specifications for reduced and structural forms of the probability models. Figure 3.4 shows for a worker with average characteristics originating from a rural commune, how the migration probability grows with additional years of household education.

[35]Table 3 in Appendix shows the results of the structural form using the alternative threshold set at 20,000 inhabitants.
[36]The mentioned threshold can be understood as the cost term in an indirect utility function, and consequently, the bigger the threshold, the higher the migration costs.

Figure 4: Potential wage differential and migration probabilities (at the mean characteristics), Chile, 2002-2006



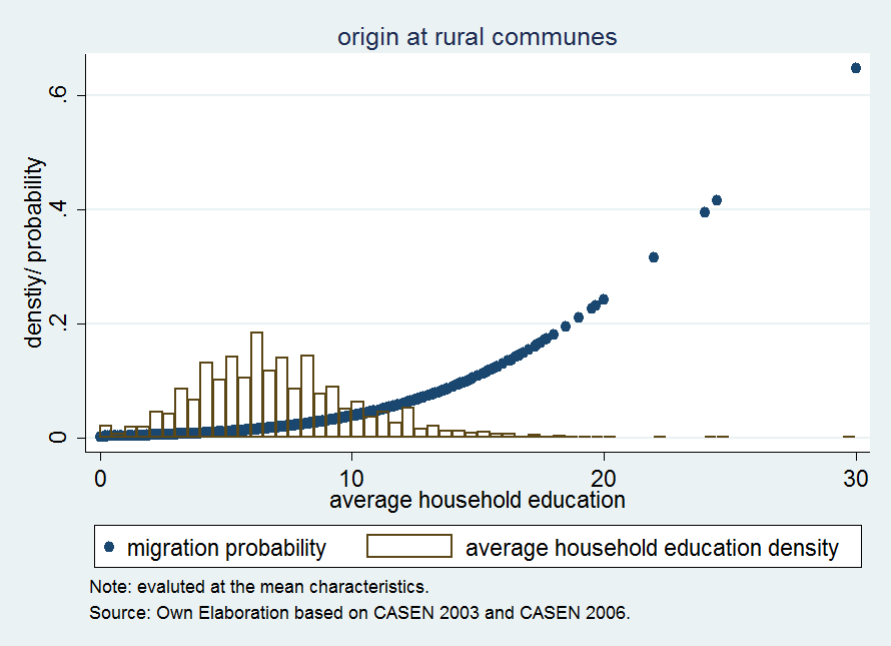
Note: evaluted at the mean characteristics.
Source: Own Elaboration based on CASEN 2003 and CASEN 2006.

The relevance of the household education on migration can be driven from an example based on the results of the structural probability model. According to these results, the "average" worker originating from rural areas has 8 years of education (being non-tertiary educated), 6.6 years of household education and faces a potential wage differential of 0.125 log-points. Looking at the figure 3.4, it is possible to realize that this average worker has an extremely low probability of moving. Now, imagine that the same worker belongs to a household with an average of 20 or 25 years of education. In this case, this worker would have a migration probability of about 24% and 43%, respectively (extraordinarily high in the context of migration). This example points out the fact that migration is not an individual decision, and it depends largely on the household education.

The structural probability model allows to decompose the impact of the household education into a labour and non-labour market effects. The effect working through the labour market discourages migration. Potential migrants belonging to well-educated household faces lower productivity differentials than those having families with low levels of human capital and therefore, are less likely to migrate. Contrary to this, the structural impact, which is not related to the labor market, encourages migration.[37] The distribution of the potential wage differential conditional to the household education is then relevnat

[37]Such decomposition arises by comparing structural and reduced form estimates.

Figure 5: Distribution of the household education and migration probability from rural to urban communes (at mean characteristics). Chile 2002-2006



Regarding the urban-rural pattern of migration, the household education reduces the migration probability. However, the impact is small and can be interpreted as a pull factor as a result of larger returns of this variable in more populated areas. As migration here is not positively dependent on the household education and the distribution of the potential wage differential is similar across educational levels (right panel in Figure 3.2), it can be argued that potential movers are not being constrained by their initial conditions and therefore, migration is probably working efficiently in equalizing outputs across regions.

The correlation between the potential wage differential and the household education is statistically significant for all patterns and all specifications in this study. Thus, to ignore the household education yields to obtain biased estimates of the productivity differentials on migration probability.[38]

The gender issue

Looking at Tables 3.2, 3.3 and 3.5, it is possible to draw some conclusions based on a gender perspective. The structural model shows that there are two channels in which being a woman affects the migration probability. The first one is related to the labour markets, in particular, the

[38] As a consequence of this, the role of education on the migration probability would be overestimated in reduced form equations.

potential wage differential which captures the fact that women movers are "less penalized" in terms of monthly earnings than their stayer counterparts as they originate from rural areas (Table 3.2). The second channel is related to the women's preferences which are non-related to the labour markets. As a result, reduced form estimates show the (confounded) combined effect of these two forces working in opposite directions. Thus, the gender issue is not irrelevant in designing and implementing migration-related policies.

The same reasoning follows for those originating from urban areas. The structural form actually shows that females are more likely to migrate than males towards rural communes. However, because women are worst-off regarding earnings in case of migration (and this discourages migration relative to males), the aggregate effect is significantly negative. Thus, women (relative to men) are intrinsically motivated to move/stay towards (or stay in) rural communes while, labour market differentials push and pull women towards urban areas.

Other determinants

To be part of a bi-parental household increases the migration probability. This result should be carefully interpreted because it might reflect the notion that migration can be a sequential process. Therefore, this variable eventually contains information related to migration experience and is consequently not only capturing the restriction imposed by the structure of the household. The number of children per household appears to be not correlated with the migration probability for those originating from rural communes. However, for those with origin in urban areas, the decomposition of the effect indicates that children appear to increase the potential wage differential (this is based on the idea that workers with children behave differently than those without children in terms of productivity). Contrary to this and as expected, the direct impact of the number of children in the household discourages migration.

Regarding the ethnic background (Mapuche), the structural model helps to disentangle its impact for those originating from urban areas. Here, labour markets appear to push "mapuches" towards rural areas, while other factors non-related to the labour market appear to work in the opposite direction. Hence, the global impact appears to be insignificant (showed in the reduced form). For those originating in rural areas, the ethnic background does not play any significant role.

Regarding the life cycle variable (age), this shows as expected a negative association with the studied probability. Looking at the interaction terms, they are only significant towards urban areas keeping the direction of the original indexes. This means a significant relationship between the connectivity change and the household education. Thus the migration pattern appears to be also influenced (shaped) by the household education.

The initial disadvantage

The fact that migration has become increasingly less important as an equalizing mechanism for regional disparities (Soto and Torche, 2004) can be explained by the fact that the effect of productivity differentials on migration decision, which are supposed to guide the migration process, is being annulated by initial disadvantages related to the family background of the potential migrant. The fact that relatively highly educated individuals belonging to poorly educated households observe attractive potential wage gaps means that rural-urban migration has the potential to benefit rural households and movers by allowing to increase their expected labour earnings and, in this way, to reduce regional disparities. However, the structural impact of the household education on the migration probability predicts that those individuals, even when facing attractive potential wage differentials, will have extremely reduced migration probabilities in case of having the initial disadvantage of belonging to a poor educated household. Unfortunately, the initial disadvantages related to the household background determines that the one who is migrating is not always the one who could profit more from labour market differentials, but the one who is not constrained by its household. The big issue is that both circumstances, on the one hand, to observe high-potential wage differentials and on the other, to be constrained by the low level of education of its households, come together. Thus, the only way to promote an equalizing rural-urban flow is by reducing the household dependence of the potential migrant.

Unemployment and probability models

Ignoring unemployment in the analysis may bias the estimates if unemployment affects movers and stayers unequally after controlling for observed and unobserved characteristics. The inclusion of unemployment would additionally introduce a second selectivity process. However, given the overall low rates of unemployment for the underlying population in 2006, it is safe to conclude that unemployment does not affect the fundamental findings of this study.[39] In order to prove the validity of this assumption, Table 4 in Appendix shows results of the structural models, including and excluding unemployed potential migrants. The evidence shows that ignoring unemployment is not a big issue, and it is therefore possible to extend with some precaution the main findings of this study to the labour-market participants at origin.

5 Conclusions

Based on the idea that migration is an investment decision (Becker, 1962 and Sjaastad, 1962), this paper uses an endogenous switching regression model to determine whether migrant workers

[39] Unemployment ranges from 3.5% to 7.7%.

are somehow selected according to their observed and unobserved characteristics. The estimation procedure allows obtaining a non-endogenous potential wage differential between origin and destination for each worker with control for the selectivity process involved in the migration decision (to stay or to move). On average, the effect of self-selection on expected incomes is about 36% and 4% for workers originating from rural and urban communes respectively. Thus, ignoring the selection process involved in the migration decision would strongly underestimate the potential wage differential for those originating from rural communes. As a consequence, the effect of productivity differentials on migration would be miscalculated. Moreover, the results are robust across thresholds and model specifications.

Evidence has been found that the potential wage differential strongly determines the probability to move, but only when the differential reaches some determined threshold for individuals with mean characteristics (about 0.5 and 0.3 log-points for workers originating from rural and urban communes respectively). This evidence supports the Neoclassical Economic Theory approach in the sense that potential wage differentials determine migration and can be seen as an investment decision. However, the potential wage differential for most individuals is relatively small compared to the migration costs. This explains why migration is a rare phenomenon being unable to reduce regional disparities.

This paper simultaneously uses the main idea of the New Economics of Labour Migration Theory, considering migration as a household decision (Stark and Bloom, 1985 and Stark 1993). Furthermore, it shows that migration not only depends on individual characteristics, but strongly relies on the household education. In this sense, households matter not only for their composition itself, but also for their intrinsic capacity to generate welfare.

The fact that migration has become increasingly less important as an equalizing mechanism for regional disparities (Soto and Torche, 2004) can be explained by the fact that the effect of productivity differentials on migration decision, which are supposed to guide the migration process, is being annulled by initial disadvantages related to the family background of the potential migrant. The fact that relatively highly educated individuals belonging to poorly educated households observe attractive potential wage gaps means that rural-urban migration has the potential to benefit rural households and movers by allowing an increase in their expected labour earnings and, in this way, to reduce vulnerability. However, the structural impact of the household education on the migration probability predicts that those individuals, even when facing attractive potential wage differentials, will have extremely reduced migration probabilities in the case of having the initial disadvantage of belonging to a poorly educated household. Unfortunately, the initial disadvantages related to the household background determines that the migrant is not always the one who could profit most from labour market differentials, but rather the one who is not constrained by its household. The big issue is that both circumstances, on the one hand, observe high-potential wage differentials and on the other, to be constrained by the low level of education of its households,

come together. Thus, the only way to promote an equalizing rural-urban flow is by reducing the household dependence of the potential migrant.

This study also reveals an interesting conclusion regarding how women (relative to men) are intrinsically motivated to move towards rural communes or stay there. At the same time, due to labour market differentials, women are more likely to move into urban areas or remain there. Such decomposition of the gender-related effects shows the advantages of using a structural model approach.

Finally, this study suggests that supporting the supply side in the rural economy is not the only way to achieve convergence across the territory. Subsidies aimed to reduce migration costs can be also considered under a framework oriented to encourage migration as an effective mechanism to reallocate labour between communes.

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6 Appendix

Table 1: Reduced form of the index function, probit ML, Threshold set at 20,000 inhabitants. Chile 2002-2006 (first step)

Dependent variable: migrant status.						
	Rural-urban			Urban-rural		
Model / Variables	M1	M2	M3	M1	M2	M3
Basic education	0.356***	0.304***	0.296***	0.0104	0.0769**	0.0757**
Secondary education	0.458***	0.372***	0.317**	-0.0504	0.0630	0.0629
Tertiary education	0.573***	0.424**	0.338**	-0.0838*	0.0962*	0.0967*
Potetial experience >5 <11	0.0970	0.121	-0.0502	-0.0428	-0.0834	-0.0833
Potetial experience >10 <16	-0.168	-0.135	-0.327	-0.0755	-0.136*	-0.136*
Potetial experience >15	-0.354	-0.342	-0.551**	-0.325***	-0.349***	-0.348***
Average household education	-	0.0236	0.0236	-	-0.0269***	-0.0262***
Commij	-2.997***	-3.018***	-5.058***	-	-	-
Rab	1.903***	1.877***	-0.350	-2.653***	-2.637***	-2.966***
Interaction 1	-	-	0.237	-	-	-
Interaction 2	-	-	0.303**	-	-	0.0413
Bi-parental household	0.185**	0.190**	0.225**	0.183***	0.172***	0.171***
Number of children in household	0.0128	0.0222	0.0294	-0.0859***	-0.102***	-0.103***
Mapuche	-0.0105	-0.00395	0.0164	0.00260	-0.0121	-0.0148
Female	-0.0104	-0.00918	-0.0122	-0.100***	-0.102***	-0.103***
Unemployment rates at origin	0.0922***	0.0920***	0.0975***	-0.0270***	-0.0277***	-0.0277***
Log of population at origin	-0.271***	-0.278***	-0.288***	0.0122	0.0201	0.0192
Constant	0.136	0.0477	0.245	-2.344***	-2.234***	-2.229***
Regional controls		Yes			Yes	
Observations		36,115			47,452	
Non-migrant Population		509,549			4,515,090	
Migrant Population		27,285			27,749	
Population Size		536,834			4,542,839	
F	7.524	7.738	7.342	17.74	18.00	17.97
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.

Table 2: Wage equations adjusted for self-selection. Movers and stayers. Threshold set at 20,000 inhabitants using M2 (second step)

Dependent variable: monthly labour earnings (threshold set at 20,000 inhabitants)				
	Rural Origin		Urban Origin	
Variables / Migrant status	Movers	Stayers	Movers	Stayers
Basic education	0.274	0.110***	0.241***	0.138***
Secondary education	0.332	0.268***	0.331***	0.322***
Tertiary education	0.890***	0.537***	0.714***	0.680***
Potetial experience >5 <11	0.607**	0.153***	0.0203	0.215***
Potetial experience >10 <16	0.526*	0.259***	-0.00290	0.363***
Potetial experience >15	0.523**	0.328***	0.118	0.447***
Average household education	-0.0146	0.0382***	0.0420***	0.0374***
Number of children in household	-0.0173	0.0238***	0.0459*	0.0403***
Mapuche	-0.201*	0.0395	0.0963	-0.0180
Female	-0.387**	-0.490***	-0.543***	-0.432***
Public sector	-0.0695	0.0583***	0.0474	-0.0225
Rich commune	0.280	-	0.0818	0.271***
Rural sector	0.0130	0.0970***	0.0867	-0.0706***
Inverse Mill's ratio (lambda)	-0.0375	0.285***	-0.0181	0.234***
Constant	9.188***	9.188***	9.417***	10.16***
Occupational controls	Yes	Yes	Yes	Yes
Sectorial controls	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes
Observations	36115	36115	47452	87304
Population size	536834	536834	4542839	5523250
Censored population	509549	27285	4515090	473621
F	13.71	293.00	26.07	419.50
Prob > F	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Source: Own calculations based on CASEN 2003 and CASEN 2006.

Table 3: Structural form of the index function, probit ML, Chile 2002-2006. Threshold set at 20,000 inhabitants using M2 (third step)

Dependent variable: migrant status.						
	Rural-urban			Urban-rural		
Threshold / Variables	M1	M2	M3	M1	M2	M3
Log Potential wage differential	3.758***	4.505***	4.592***	3.529***	3.537***	3.537***
Log Potential wage differential - squared	-0.128	-0.974**	-1.002**	4.480***	4.594***	4.594***
Age	-0.00591*	0.00289	0.00266	-0.00794***	-0.00811***	-0.00808***
Average household education	-	0.151***	0.138***	-	-0.0198***	-0.0191***
Commij	-2.053***	-2.036***	-	-	-	-
Rab	2.126***	1.795***	-	-2.514***	-2.501***	-2.795***
Interaction 1	-	-	-0.185***	-	-	-
Interaction 2	-	-	0.245***	-	-	0.0366
Bi-parental household	0.233**	0.245**	0.261**	0.247***	0.235***	0.235***
Number of children in household	0.0781	0.156***	0.167***	-0.154***	-0.166***	-0.166***
Mapuche	0.821***	1.121***	1.113***	-0.501***	-0.526***	-0.529***
Female	-0.449***	-0.554***	-0.545***	0.238***	0.244***	0.244***
Unemployment rates at origin	0.0815***	0.0793***	0.0846***	-0.0380***	-0.0384***	-0.0383***
Log of population at origin	-0.376***	-0.477***	-0.480***	0.0851***	0.0980***	0.0972***
Constant	1.432	0.829	0.839	-2.896***	-2.852***	-2.849***
Regional controls		Yes			Yes	
Observations		36,115			47,452	
Non-migrant Population		509,549			4,515,090	
Migrant Population		27,285			27,749	
Population Size		536,834			4,542,839	
F	21.15	30.59	29.41	54.53	51.70	50.30
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.

Table 4: Structural form of the index function, probit ML, Chile 2002-2006. Threshold set at 40,000 inhabitants using M2 and allowing unemployment (third step)

Dependent variable: migrant status.						
	Rural-urban			Urban-rural		
Threshold / Variables	M1	M2	M3	M1	M2	M3
Log Potential wage differential	0.725***	1.210***	1.265***	3.380***	3.792***	3.792***
Log Potential wage differential - squared	1.237***	0.769***	0.715***	3.988***	4.119***	4.119***
Age	-0.0219***	-0.0212***	-0.0223***	-0.0126***	-0.0119***	-0.0119***
Average household education	-	0.109***	0.106***	-	-0.0487***	-0.0480***
Commij	-2.656***	-2.608***	-	-	-	-
Rab	2.159***	2.000***	-	-2.948***	-2.917***	-3.117***
Interaction 1	-	-	-0.229***	-	-	-
Interaction 2	-	-	0.240***	-	-	0.0241
Bi-parental household	0.298***	0.344***	0.356***	0.282***	0.253***	0.252***
Number of children in household	-0.0263	0.0327	0.0386	-0.207***	-0.255***	-0.256***
Mapuche	0.0117	0.146	0.134	-0.199***	-0.285***	-0.287***
Female	-0.131**	-0.213***	-0.210***	0.233***	0.305***	0.306***
Unemployment rates at origin	0.0893***	0.0880***	0.0883***	-0.0562***	-0.0607***	-0.0606***
Log of population at origin	-0.160**	-0.231***	-0.230***	0.0566	0.0896**	0.0890**
Constant	-0.377	-0.737	-0.748	-1.801***	-1.635***	-1.635***
Regional controls		Yes			Yes	
Observations		53,005			33,818	
Non-migrant Population		1,044,193			4,236,425	
Migrant Population		45,008			50,028	
Population Size		1,089,201			4,286,453	
F	16.56	17.30	18.91	42.20	40.38	38.78
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Note: Based on non-enrolled workers 25 years old and older reporting monthly labour earnings in 2006.
Source: Own calculations based on CASEN 2003 and CASEN 2006.