Erasmus University Rotterdam

Master Thesis

MSc International Economics

Is the Grass Really Fairer on the Other Side? Migration and Inequality in Canada

Author:
Erik Merkus

Supervisor:
Dr. Laura Hering

February 25, 2015

Abstract:

This paper examines inequality within Canadian provinces and its effect on bilateral migration flows between 1981 and 2012. Through the availability of a large amount of data, a fixed-effect OLS model is applied to isolate this effect. Inequality in the province of origin is a significant driver of outward migration, once standards of living and labour market conditions are controlled for (through the inclusion of GDP per Capita or HDI and the unemployment rate). Relative inequality between provinces appears to be an insignificant determinant of net migration flows. The configurations of fixed effects also effectively deal with possible problems in the form of multilateral resistance to migration.

1 Introduction

Internal migration is the most important mechanism through which scarce labour resources are shifted from one place to the other as a consequence of changes in the structure of the domestic economy. However, the majority of migration research over the last few decades has focused on international rather than internal migration flows (Ellis, 2012). The study of migration flows within the same country is nevertheless of vital importance for public policy, as many infrastructure investment decisions are taken on the basis of forecasted population growth or decline. One could also approach internal migration in light of the development prospects of a region. If it is the talented, young people that migrate to other parts of the country, the region of origin may face economic stagnation. A large inflow of migrants, on the other hand, may lead to higher levels of unemployment of the local residents as these migrants may have lower salary demands.

Molloy et al. (2011) identify three main mechanisms through which changes in certain factors can influence internal migration rates. The first is based on individual characteristics, which affect the net benefits of migrating on a case-by-case basis. One can think of age and home-ownership status that fall within this category. The second mechanism is based on factors that only influence particular groups in society. Here lies the main addition of this paper, as we will focus on the effect of inequality within each province. As we will demonstrate in more detail later, the income distribution determines what specific type of worker will want to migrate. The third mechanism affects everyone, such as the position in the business cycle.

The theoretical relationship between inequality and migration follows from Borjas (1987). If the income distribution in the origin province is more equal than in the province of destination, people on the upper part of the skill distribution will have an incentive to migrate. Their relative position in society can be improved by doing so. Likewise, if the origin province is more unequal than the destination, we expect the migrants to predominantly come from the lower segments of the skill distribution. Those with lower skills enjoy a relatively better position in the more equal destination province. This gives rise to a non-linear relationship between inequality and internal migration. While inequality is not a direct policy tool in and by itself, it may add to the national debate by providing additional insights in the causes of migration and the skill level of the migrants more specifically.

US President Obama put the issue of inequality back at the centre of public debate in a speech when he proclaimed that inequality is the defining issue of our time (The White House, 2013). It is therefore worthwhile to see how people respond to (perceived) inequality. According to the Economist, the recent economic downturn has exaggerated the disparities between regions in the same country, more so than differences between countries. Moreover, as for the near future, central government spending cuts may disproportionally hurt the poorer regions that rely on social transfers to a larger degree, increasing the inequality between the regions as well as within them (The Economist, 2011). It is therefore worthwhile to look at the possible effects of inequality on migration flows as it might contain useful information for future policy analysis.

The country in focus in this paper is Canada. Canada is the second largest country in the world in terms of area size and spans from the Atlantic Ocean in the east to the Pacific Ocean in the west. Its regions have experienced different growth paths over the course of history. Long (1991) points out that some developed countries, most notably the US, Canada and Australia, are nations of immigrants. These historical roots may facilitate the decision of migrants to move other parts of the country, as they or their ancestors have made such moves before.

What makes Canada a suitable country of analysis is the fact that its statistical office provides provincial level data from the early 1970s onwards. Moreover, with the exemption of Quebec and its French heritage, Canada is also relatively homogeneous in terms of culture and institutions (some lingering interprovincial barriers for regulated professions are gradually abolished, see Gauthier (2011)). In terms of its economic structure, the manufacturing and services sectors are predominantly located in the south of Quebec and Ontario, as well as the metropolitan area around Vancouver. The other regions tend to rely more on agriculture and natural resources. Lastly, federal states such as Canada tend to be characterized by larger regional inequalities than unitary ones (Cameron & Hofferbert, 1974).

This paper is the first to look at the effect of inequality on migration flows between Canadian provinces. This contribution to the literature can easily be applied to internal migration flows of other developed countries, which has not been done before either. However, due to the rich amount of data available at the Canadian provincial level we constrain ourselves to Canada at this point. By including two different measures of inequality (the Gini coefficient and the Palma ratio) in a fixed-effects panel model, we attempt to isolate the effect of inequality by controlling for standard of living, labour market conditions amongst others. The statistical office for Canada, Statistics Canada, provides aggregated bilateral provincial flows between 1981 and 2012 which allows us to look at the long-run relationship between inequality and internal migration.

We find that the effect of inequality on internal migration flows is non-linear. Up to a point, an increase in inequality in the origin province leads to larger outward migration flows. Increased inequality beyond a certain threshold will slow these flows down. Similarly, migrants seem to prefer either relatively equal or relatively unequal destination provinces. These findings are relatively robust for different specifications, though if we look at net migration flows, relative inequality seems not to play a significant role.

The rest of this paper is organized as follows. Section 2 provides a literature review, which starts with a discussion of the theoretical perspectives one can have on migration. For this paper, we include variables from both perspectives. The literature review continues with an extensive analysis of the existing literature that deals with the interplay between inequality and migration (predominantly focused at the international migration flows) and concludes with empirical findings. The model, which builds on theoretical microfoundations, is introduced in section 3. The next section, section 4, describes the Canadian provincial data and provides a first insight in the migration patterns. Section 5 provides the results and section 6 concludes.

2 Literature Review

In two seminal papers on internal migration in the nineteenth century, Ernst Georg Ravenstein (1885, 1889) developed his 'Laws of Migration'. His 1885 paper solely focused on the United Kingdom, but his 1889 paper included 20 countries in the analysis, which made his argument more compelling. In the latter paper, he established dominance of economic motives behind migration. The prime reason for people to migrate, Ravenstein stated, was the desire to create a better economic future for themselves and their family. All internal migration models used for developed countries are based on the assumption that migration is a voluntary act, which is likely to hold in the case of Canadian migrants. The Canadian government is unlikely to force people to move for political reasons.

2.1 Theoretical Perspectives on Migration

Greenwood (1985) discusses two possible theoretical perspectives behind migration. Early internal migration research focused on a disequilibrium system, whereas later research also included equilibrium systems. In this section, we will provide an insight into these two strands of theory. Disequilibrium theory relies only on income-related variables (wages, unemployment rates and non-labour income) that adjust slowly to exogenous shocks and may or may not be in equilibrium across regions. Equilibrium theory, on the other hand, focuses mostly on changes in demand for regional-specific amenities and non-tradable goods due to systematic long-term forces or different stages of the life cycle of migrants.

2.1.1 Disequilibrium Theory

Disequilibrium theory builds on the human capital approach, which was developed by the Nobel laureates Schultz (1961) and Becker (1962). However, it was Sjaastad (1962) who first linked migration decisions to human capital investments. The disequilibrium theory is based on the existence of spatial differences in wages that can be exploited; migration is thus an arbitrage opportunity. Utility can be increased if one moves to the 'higher-wage' region. Basic demand and supply behaviour will narrow this wage differential once enough people decide to migrate, which will in turn decrease this specific migration flow again.

A worker will supply his labour in the regional market that rewards him with the highest net benefits, i.e. the highest net present value after having controlled for the probability of getting a job. Following Sjaastad (1962), where $E_{i,t}$ ($C_{i,t}$) are the earnings (costs) in region i in year t we get:

$$PV_{earnings} = \sum (E_{j,t} - E_{i,t})/(1+r)^t$$

$$PV_{costs} = \sum (C_{j,t} - C_{i,t})/(1+r)^t$$

which, if combined, gives us the present value of the investment in migration from i to j (denoted by m_{ij}):

$$PV_{m_{ij}} = \sum \frac{1}{(1+r)^t}[(E_{j,t} - C_{j,t}) - (E_{i,t} - C_{i,t})]$$

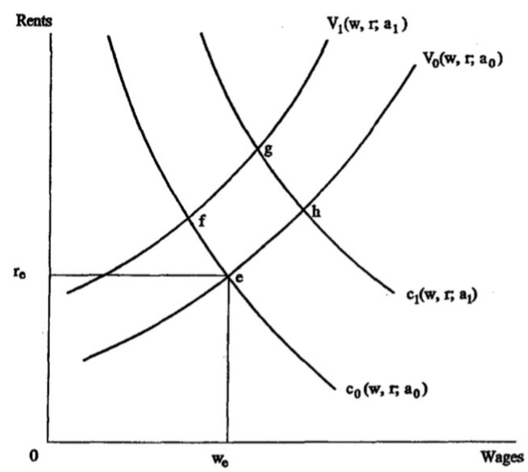
The migrant will move towards the region j that provides him with the largest value for PV, which could also be his current region i. The link between net present value maximizing behaviour and the disequilibrium theory is clear, as migration is a forward-looking decision. Migration is driven by residual differences in earnings between regions, after having accounted for the ('money' and 'non-money') costs. We take away from this theory to include income and unemployment rates in the model.

2.1.2 Equilibrium Theory

Equilibrium theory, on the other hand, requires the separation of goods in two segments, tradable and non-tradable goods (Graves & Linneman, 1979). Migration is the only way in which changes in demand for the latter category can be met. An (exogenous) increase in household income may increase the demand for non-tradable goods such as 'good quality education' or 'personal safety'. Migration is then necessary to enjoy these goods.

The underlying assumption of the equilibrium theory is that wages and real estate prices are compensating for the regional level of amenities. This can be seen in figure 1, if the level of amenities in the region is at level a_0, we identify the wage and rent levels that give the households the same indirect utility (V). If there is one region with 'better' consumer amenities or non-tradable goods (say at level a_1), the wages in that region are lower and the local prices of the real estate are higher.

Figure 1: Equilibrium Theory as in Greenwood (1997, p. 675)



Different stages in one's life cycle lead to different levels of demand for certain non-tradable goods and amenities. This will trigger migration in equilibrium models, until the point that these differences in amenities are offset by a decrease in wages or an increase in local prices. Proponents of the equilibrium model therefore stress the inclusion of region-specific amenities in migration models. For this paper, we assume inequality levels to be such an amenity, to be included in the model.

However, some region-specific amenities may, by their very nature, be difficult to construct objectively. Climate is an example of region-specific amenities that cannot be objectively measured. Some people prefer hot summers and very cold winters (as one will find in Quebec & Ontario), while others may rather live in a more moderate climate year-round (to be found in the Atlantic provinces & BC).

2.2 Internal Migration and 'Within-Region' Inequality

This section builds on the relative deprivation theory of Stark (1984), which is derived from the Stark's observation (in least developed countries - LDCs) that the proportionally largest outward migration flows are to be found in the most unequal regions, as opposed to the poorest ones. While Canada is not a LDC, this relative deprivation approach may still be relevant for a developed country, as is found in Borjas (1987) for the US.

The relative deprivation theory can be illustrated through a simple example, based on Stark & Taylor (1991). Imagine that everyone in a village earns an hourly wage of CAD$ 6, whereas the inhabitants of a nearby city earn CAD$ 10 per hour. If people expect to find a job in the city, they will move to improve their absolute position. On the other hand, in a world with only relative comparisons nobody will migrate, as there is no relative deprivation in the village (e.g. everyone in their peer group is equally rich). If, due to a policy change, either by the government or by a firm, the employment opportunities in the village improve so that half the population now earns CAD$ 8, both approaches have opposing effects. The absolute difference between the village and the city has declined, so there is less room for improvement in absolute terms. However, half of the population now feels relatively deprived, because they now earn less compared to their peers. This latter effect may increase migration flows.

As this paper uses aggregated data, we will use both the Gini coefficient and the Palma ratio as a proxy for the relative deprivation (see Stark (2006) for a formal and mathematical proof that Gini and relative deprivation are strongly and positively correlated). The Palma ratio is the income share of the top 10% divided by the share of the bottom 40%. Palma (2011) argues that the share of the middle 50% is hardly affected by contemporary changes in the income distribution and that Gini coefficient fails to account for changes at the margins. This alternative measure of inequality, or income distribution more generally, may be more intuitive to understand for policy makers and non-economists (Cobham & Sumner, 2014).

Clark et al. (2007) provide a mathematical model which we can use to relate the wage distribution to the abovementioned measures of inequality. The wage distribution is given by:

$$w_{origin,it} = \alpha_{origin,t} + \beta_{origin} s_i$$

$$w_{dest,it} = \alpha_{dest,t} + \beta_{dest} s_i$$

where wages for individual i are distributed as $w_{x,it} \sim N\left(\mu_x, \sigma_x^2\right)$. $\alpha_{x,t}$ is the wage if the individual i is unskilled and β_x is the skill premium. σ_x^2 is a measure of variation (e.g. inequality) in the wages.

Figure 2: Inequality of the wage distribution

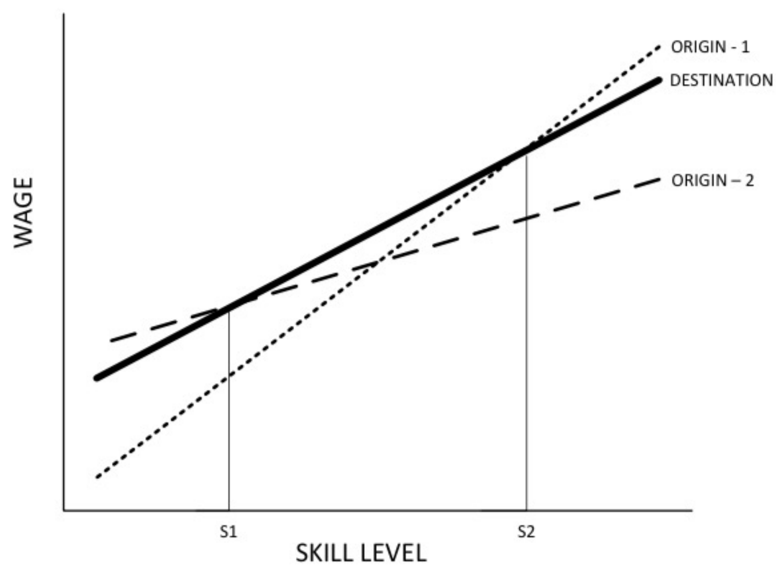


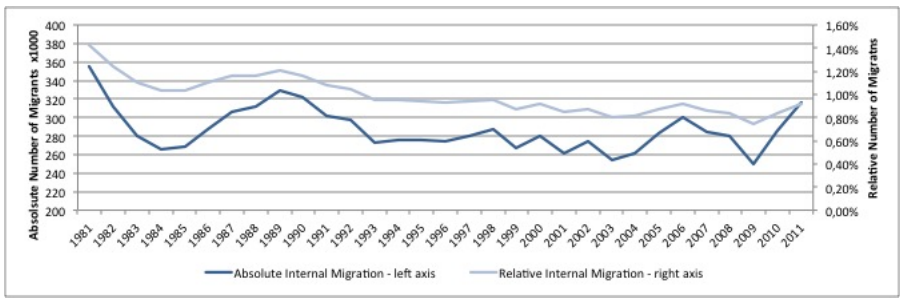
Figure 2, based on Clark et al. (2007), displays two wage distributions in the region of origin. If $\sigma^2_{origin} > \sigma^2_{dest}$, the wage distribution in the region of origin is more unequal than that of the region of destination. This will be an incentive for the less skilled workers to move to a more equal region, as they can improve their relative position by doing so. In other words, workers with a skill level lower than S2 have an incentive to migrate.

If, on the other hand, the region of origin is more equal than the region of destination (e.g. $\sigma^2_{origin} < \sigma^2_{dest}$), then it will be the highly skilled portion who would want to move, as their position can be relatively improved in the more unequal destination region. Indeed, only people with skill levels higher than S1 can improve their relative position. Several authors (e.g. Mayda (2010) and Clark et al (2007)) test this non-linear, inverted-U relationship by including the Gini coefficient both in linear and quadratic terms.

2.3 Empirical Findings

Since the 1980s, internal migration flows have declined in the developed world (Basher & Fachin, 2008); Canada included (especially in relative terms, see figure 3). This decline may be caused by changes in the composition of the household (e.g. more working female members) and less relevant and rewarding vacancies for outside workers (Molloy et al., 2014). Changes in internal migration volumes and patterns have macroeconomic and social implications. Smaller migration flows may lead to larger labour market frictions, whereas more migration may erode social ties (although Molloy et al. (2011) argue that this causality can go either way).

Figure 3: Absolute and relative internal migration rates, 1981-2012



2.3.1 Canadian Internal Migration

Bendiner (2013) finds that internal migration in Canada is pro-cyclical. The net benefits of moving in an economic boom are arguably higher than in a recession, when finding a job is harder. On the other hand, migrating to another region may be a more important mechanism to find a job in an economic downturn. It should be noted that Coulombe (2006) finds that Canadians tend not to react to business cycle shocks as much as they do to long-run/structural shocks to the labour market structure (e.g. tar sand exploration in Alberta) and hence make decisions based on a relatively long time-horizon. Moreover, Gauthier (2011) observes that Canadian internal migrants tend to come from both the low- and high-income classes.

Amirault et al. (2013) show that due to the sheer size of the country and the small and open nature of its economy, shocks to the terms-of-trade often display asymmetric effects to the economic performances of the provinces. This has also been found by Leung & Cao (2009), who argue that the appreciation of the Canadian dollar in the first decade of the 21st century hurt the labour markets of the exports-producing regions disproportionally hard as their products became more expensive for foreign buyers. Similarly, as Day & Winter (2006) show, the 1992 closure of the cod fishing industry in Atlantic Canada had a large impact on the regional economy in those provinces as well. This asymmetry will be exploited in this paper.

Bernard (2011) uses Canadian data at a more disaggregated level. His analysis showed that only shocks to personal income have a significant impact on the decision to migrate, while regional shocks do not. Beckstead & Brown (2003) postulate that the job markets in Canadian cities are relatively diversified, regardless of their size. Hence, even smaller Canadian cities are attractive for highly specialized, educated workers, so that selection bias in destinations is less likely to be present. This has been confirmed by Amirault et al. (2013) in that smaller cities are equally attractive for migrants.

2.3.2 Inequality and Migration

In general, most previous studies find a positive or inverted-U relationship between migration and income distribution in the origin region. It should be noted that, as mentioned before, the vast majority of these studies deal with international migration flows. In case these studies include an indicator of inequality (usually the Gini coefficient) only in linear terms, they find that the inequality in the source/origin region is positively related to the size of the bilateral migration flow. Examples include Leibig & Sousa-Poza (2004) - data from 23 predominantly developed countries, Brucker & Defoort (2009) - flows from 143 source countries to six major OECD destinations, Belot & Hatton (2012) - flows between 70 source countries and 21 OECD destination countries and Czaika & de Haas (2012) - through the examination of their own relative deprivation variable and bilateral stock data for 144 countries.

If the indicator of inequality is included both in linear and quadratic terms, most of the literature arrives at the inverted-U relationship as predicted from the theory in section 2.2. Mayda (2013), whose paper comes closest to this one, examines the bilateral migration flows between 79 source countries towards 14 destinations over a 16-year timeframe. While her model is not consistent regarding the functional form (e.g. it includes both seperate variables and ratios), the inequality indicator enters the model both linearly and quadratically. The signs of these variables, positive for the linear term and negative for the quadratic term, confirm the expected inverted-U nature of the relationship between migration flows and inequality. Similarly, Clark et al. (2007) found that higher inequality in the home country increased migration flows towards the US at lower levels of inequality, but this effect is inversed beyond a tipping point.

3 Model

Most previous studies used a gravity model to analyze migration flows. The backbone behind the migration gravity models is indeed Newton's famous law of universal gravitation, which was applied to physics first. For a good theoretical background on the use of gravity models in economics, see Tinbergen (1962) and Anderson (1979). In the context of migration, the key of the gravity model is the relationship between the size of the migration flows, which is inversely related to the distance between the two regions (as a proxy for the costs incurred by migration) and positively related to the population size of both. Modified versions of this migration gravity model include control variables that denote characteristics of one or both of the regions (Greenwood, 2005).

3.1 Theoretical Microfoundations

Based on a claim made by Anderson (2011), that the gravity model lacked a clear connection with (micro-)economic theory in the field of migration, this paper will apply a model that does indeed have microfoundations. We therefore rely predominantly on a paper by Beine, Bertoli & Fernandez-Huertas Moraga (2013, BBFHM hereafter), as they elaborate on the microfoundations of their random utility model that is derived from the gravity model.

The bilateral migration flow is defined as:

$$m_{ij,t} = p_{ij,t} s_{i,t} \tag{1}$$

where $m_{ij,t}$ is the number of individuals that move from region i to region j in year t. Hence, the migration flow is the multiplication of the proportion ($p_{ij,t}$) of the population ($s_{i,t}$) of region i that moves to region j in year t. For obvious reasons, $p \in [0,1]$.

The basic random utility model (RUM) takes the following form:

$$U_{kij,t} = W_{ij,t} + a_{ij} - c_{ij,t} + \epsilon_{kij,t} \tag{2}$$

where $U_{kij,t}$ is the utility that individual k derives from migrating from region i to region j in year t. The deterministic component of utility is represented by $W_{ij,t}$. Location specific amenities are included in the second term a_{ij}. The cost component c covers the time-specific costs of moving, while $\epsilon_{kij,t}$ is the individual stochastic element of utility with a i.i.d. Type I extreme value distribution (standard assumption, see Grogger & Hanson (2011) and Bertoli & Fernandez-Huertas Moraga (2013)).

A utility-maximizing individual will hence choose to move to region j due to the assumptions made about the individual stochastic element, as it will be distributed in such a way that the migrant always chooses the region that will provide the highest utility. Due to this assumption, we can write the expected migration flow from region i to region j as:

$$E(m_{ij,t}) = \frac{e^{W_{ij,t}+a_{ij}-c_{ij,t}}}{\Sigma_{d \in D} e^{W_{id,t}+a_{ij}-c_{id,t}}} s_{i,t} \tag{3}$$

where d denotes the possible regions out of the set of location choices D; the 10 Canadian provinces. We can rewrite (3) so as to facilitate the interpretation of this theoretical RUM. Moreover, we also follow the assumption that BBFHM make regarding the $W_{ij,t}$ term in that this deterministic component of utility does not vary with the origin region i. Hence, it only depends on the destination region j. This leads to:

$$E(m_{ij,t}) = \phi_{ij,t} \frac{V_{j,t}}{\Omega_{i,t}} s_{i,t} \tag{4}$$

where the expected migration flow will depend on the costs of migrating ($\phi_{ij,t} = e^{-c^{ij,t}}$), where $\phi \leq 1$, the attractiveness of the destination region ($V_{j,t} = e^{W_{j,t}+a_j}$), the number of possible migrants $s_{i,t}$ and it will depend inversely on the foregone utility ($\Omega_{i,t}$) of not moving to any other province (e.g. the denominator in (3)).

In order to arrive at a migration rate that can be used for testing, we followed standard literature and divided the number of migrants, $m_{ij,t}$, by the number of stayers, $m_{ii,t}$. After some rewriting, we get that:

$$E\left(\frac{m_{ij,t}}{m_{ii,t}}\right) = \phi_{ij,t} \frac{V_{j,t}}{V_{i,t}} \tag{5}$$

where we made the obvious assumption that $\phi_{ii,t} = 1$, as there are no migratory costs involved in not moving ($c = 0$). Here, we can see the effect of the independence of irrelevant alternatives, in that changes in the attractiveness of alternative destinations will not affect the migration rate $m_{ij,t}/m_{ii,t}$.

Multilateral Resistance to Migration

While this abstraction from reality provides us with an easy model, changes in the attractiveness of alternative destinations (especially close substitutes) evidently have an effect on the decision-making at the individual level (as Bertoli et al. (2013) show for Ecuadorian migrants to Spain and the US). Hence, the Ω term that captures the attractiveness of the other regions should depend on j as well. Based on the terminology of Anderson & van Wincoop (2003), this is called multilateral resistance to migration. Secondly, in this model we will relax the i.i.d. assumption of the ϵ stochastic component of utility in (2). Following BBFHM, we let $\tau \in (0,1]$ denote the inverse of the correlation in the ϵ term across regions. Bertoli & Fernandez-Huertas Moraga (2013) define τ as the dissimilarity parameter for nests, which are groups of provinces that share unobservable degrees of attractiveness for individuals. Hence, we get the migration flow:

$$E(m_{ij,t}) = \phi_{ij,t}^{1/\tau} \frac{V_{j,t}^{1/\tau}}{\Omega_{ij,t}} s_{i,t} \tag{6}$$

and of course expressed as migration rate:

$$E\left(\frac{m_{ij,t}}{m_{ii,t}}\right) = \phi_{ij,t}^{1/\tau} \frac{V_{j,t}^{1/\tau}}{V_{i,t}} \frac{\Omega_{ii,t}}{\Omega_{ij,t}} \tag{7}$$

The important term in (7) is $\Omega_{ij,t}$ in that it eliminates the upward bias in the estimates, which are present if this multilateral resistance to migration property is neglected. Indeed, the V term will pick up both its own effect and the changes in the attractiveness of alternative destinations if Ω is ignored.

Previous literature has come up with different strategies how to deal with this issue. If the dataset is large enough in terms of its bilateral and time observations, BBFHM argue that the common correlated effects (CCE) estimator of Pesaran (2006) fits perfectly to address this issue properly. Ortega & Peri (2013) attempt to account for this bias by including origin-year fixed effects. This approach is much less demanding in terms of data. Similarly, Beine & Parsons (2012) use destination-year fixed effects to address this issue. This paper will use the latter two options in one specific configuration of the model.

There are several tools at our disposal to check whether multilateral resistance to migration is properly accounted for. Pesaran (2004) proposes a simple test, which examines the existence of any lingering correlation across destinations for the 10 origin provinces. The null hypothesis of this test is that of cross-sectional independence and the p-value of this test will be provided in each specification. A second tool, proposed by Grogger & Hanson (2011) is that we examine the stability of the coefficients of interest each time we drop a possible destination province. The results of this process can be found in the appendix.

3.2 Bilateral Out-Migration

We will now turn to the actual regression model. The section above dealt with bilateral flows, the number of migrants from one region to another. In our dataset we therefore have 90 bilateral, unidirectional, flows (all 10 provinces to the other 9) for each of the 32 years between 1981 and 2012. Most of the current literature, with Mayda (2010) as a notable exception, takes logarithmic values of the dependent variable (e.g. Clark et al. (2007), Ortega & Peri (2013) and Hering & Paillacar (2014)). Hence, we get:

$$ln\left(\frac{m_{ij,t}}{m_{ii,t}}\right) = \alpha + \beta_1 Ineq_{i,t-1}\beta_2 Ineq^2_{i,t-1} + +\beta_3 Ineq_{j,t-1} + \beta_4 Ineq^2_{j,t-1}$$
$$+\gamma_1 X_{i,t-1} + \gamma_2 X_{j,t-1} + \delta_{ij} + \delta_t + \epsilon_{ij,t} \quad (8)$$

where $m_{ij,t}$ is the migration flow from origin i to destination j, $m_{ii,t}$ the population size and *Ineq* can either be the Gini coefficient or the Palma ratio. X denotes the control variables; a measure for the standard of living (proxied by either the GDP per capita level or HDI); the unemployment rate (in %); provincial tax level (in %); the inflation rate (in %) and the share of young people (under 25, in %). All independent variables are lagged one period.

Following standard literature (e.g. Cheng & Wall (2005) and Fidrmuc (2009)), a variety of fixed effects is included this model. In order to account for time-invariant differences between two provinces, we include bilateral, or province-pair, fixed effects δ_{ij}. This will capture the effect of migration costs due to distance and cultural barriers (e.g. French language in Quebec and New Brunswick). These time-invariant fixed effects may be different for each direction of the migration flow (so $\delta_{ij} \neq \delta_{ji}$). Time fixed effects will be included to account for the trend-stationarity issue in the HDI and GDP per capita variables, as is discussed in the appendix. Moreover, these fixed effects will capture common trends that may affect migration, such as the economic crisis.

As discussed in the previous section, other fixed effects specifications may be required to address multilateral resistance to migration. Therefore, equation 8 will also be estimated with origin-time fixed effects ($\delta_{i,t}$) and destination-time fixed effects ($\delta_{j,t}$). The inclusion of this type of fixed effects allows us to account for time-varying differences across the provinces. Here, we can refer back to section 2.1.2, where amenities were discussed. While we are now able to account for prices of provincial residential estate and non-tradable goods, this comes at a cost. Indeed, with origin-time (dest.-time) fixed effects all variables measured at the origin (dest.) province drop out. Lastly, in this model we assume that the error term is bilaterally pairwise uncorrelated (standard errors are clustered by province pair to account for possible heteroskedasticity) and has the usual $iid\left(0,\sigma^2\right)$ distribution.

3.3 Net Migration

Another way to analyse regional disparities is to look at net migration flows, although this method is less informative (less observations and variation). The benefit of net migration rates is that it allows us to identify to what extent relative differences between provinces spur or deter migration. However, this specification will solely serve illustrative purposes. For the dataset of Canadian provinces, there are 45 net migration flows (each province pair only gives one observation here), measured over 31 years. These are calculated, following Mitchell et al. (2011), as the inflow of migrants from a certain province ('foreign' or j) towards a certain province ('home' or i) minus the accompanying reverse flow (outflow). These net flows are then divided by either the population size of the 'home' province, or by the sum of both provinces. This leads to:

$$ln\left[\frac{m_{ji,t}-m_{ij,t}}{m_{ii,t}}\right] = \alpha + \beta_1\left[\frac{Ineq_i}{Ineq_j}\right]_{t-1} + \beta_2\left[\frac{Ineq_i}{Ineq_j}\right]^2_{t-1} + \gamma\left[\frac{X_i}{X_j}\right]_{t-1} + \delta_{ij} + \delta_t + \epsilon_{ij,t} \tag{9}$$

where the variables are defined the same as in equation 8 above, and the same assumptions apply. We also provide results if the denominator of the dependent variable is the sum of the population size of both provinces.

Table 1: Expected Signs of the Variables

	Std of Living	U-rate	Ineq	$Ineq^2$	Prov. Tax	Inflation	Under 25
Origin	-	+	+	-	+	+	+
Dest.	+	-	-	+	-	-	-
Net Mig.	+	-	-	+	-	-	-

Notes: Std of Living can be either the GDP per capita or the HDI, Ineq (and $Ineq^2$) are proxied by the Gini coefficient or Palma ratio.

3.4 Expectations and Hypotheses

The first two rows of table 1 provide the expected signs of the variables of the bilateral model. A higher standard of living in the origin region is expected to lead to a lower bilateral outflow. Indeed, the gains to be had from migrating are lower if origin standard of living is high to begin with. Reversely, if the unemployment rate is high in the origin region, labour market opportunities are bleak and people may look for better luck elsewhere. Higher provincial taxes and inflation will also push people away, whereas a larger share of (assumed to be mobile) youth may also boost migration.

For the main variables of interest, inequality and its square form, the expected sign for the origin region is that higher inequality will increase the outflow of migrants due to the relative deprivation effect (see section 2.2). This effect lasts up to a point, however. If the inequality becomes too high, the people at the bottom of the income distribution may no longer be able to afford to migrate, whereas those at the top cannot improve their relative position by migrating either. As for the destination region, the inverse of the above is the expectation.

Due to the way the net migration dependent variable is constructed, we expect to see the same signs as for the bilateral destination province. Hence, if the standard of living in the origin increases more than that of the destination province, the inflow should increase more than the outflow. This then leads to a positive effect on the net migration flow. For all other control variables, higher rates at home will have the opposite effect in that it will push outward flows while reducing inward ones. As for inequality, a larger increase at the origin vis-a-vis the destination will cause a larger outflow. Much like the bilateral model, people are expected to move towards regions with lower inequality, albeit at a diminishing rate.

Figure 4: Map of Canada

4 Data

This section will briefly introduce the data used in this paper. All data come from Statistics Canada, the statistical office of Canada. The use of a sole source of information diminishes the risk of different definitions. While Statistics Canada provides a large dataset of yearly observations at the provincial level, much of the data for the three northern territories (Yukon, Northwest Territory and Nunavut, see figure 4) is missing. Therefore, this study will only focus on the 10 provinces between 1981-2012, which together account for 99.7% of the population and 99.5% of Canada's GDP. In short, there are 90 annual flows, for 32 years.

Table 2 shows the summary statistics of the data. The annual number of migrants that move from one province to the other ranges from a mere 4 migrants (between Prince Edward Island and Manitoba in 2006) to over 37.000 (between Ontario and Alberta in 1981). On average, each annual bilateral flow is roughly 3200. The average value for our dependent variable, defined in section 3.2, is -7.23. As for the income indicator, all GDP per capita figures are expressed in 2007 constant CAD$. Per capita income in Prince Edward Island in 1981 was a little under CAD$ 20.000 while it almost hit CAD$ 75.000 just before the economic crisis of 2007 in Alberta. Unemployment rates reach their peak in the early 1990s, when for example in Newfoundland over one in five workers was unemployed.

Table 2: Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Migration Flow	2880	3.199	5.229	4	37.624
Population	2880	2.955.681	3.449.328	123.551	13.411.994
$\ln(m_{ij,t}/m_{ii,t})$	2880	-7,23	1,49	-12,04	-4,12
GDP per Capita (CAD$)	2880	37.625	11.105	18.631	74.890
ln(GDP per Capita)	2880	10,50	0,28	9,83	11,22
Unemployment Rate (%)	2880	9,81	3,73	3,40	20,20
HDI	2880	0,881	0,032	0,804	0,945
Gini Coefficient	2790	39,70	2,11	34,70	44,60
Palma Ratio	2790	4,97	0,48	3,91	6,43
Provincial Tax Rate (%)	2790	16,52	1,88	10,90	21,60
Inflation Rate (%)	2790	2,94	1,97	0,08	11,55
Young Population (%)	2880	15,22	2,37	11,91	23,25

The exact construction of the HDI is explained in the appendix, section 8.1.3, but this index follows the GDP per capita trend. Hence, the lower HDI scores were in the 1980s and early 1990s, whereas the highest values were achieved in recent years. The Gini coefficient (x100) tends to increase over time. We have used the total income figure of the Gini coefficient, for economic families (according to the Statistics Canada definition). While this coefficient is relatively stable over time, there is a slight increasing trend observable. Similarly, the Palma rate tends to increase over time, but does not fluctuate much on a year-to-year basis per province.

As for the control variables, the provincial income tax tends to be highest in the 1990s, when the Canadian economy was not performing so well. Inflation shows a decreasing trend, some recent years had inflation rates very close to zero. The share of the population that is younger than 25 varies widely between the provinces, though as in all developed countries, the share decreases over time. In this panel dataset, the most recent years in Atlantic provinces displayed the lowest share, whereas in Alberta and Quebec in the early 1980s more than one in five was below 25 years old.

When it comes to the issue of inequality, Canada is no exception to other developed countries. There is a growing share of economic growth that flows to the economic elite. The left-leaning Canadian Centre for Policy Alternatives has calculated that the top 1% took one third of the economic growth in the decade preceding 2007 (Yalnizyan, 2010). It should be noted that this increasing inequality in Canada has not occurred solely at the very top of the income distribution; across the board the differences between the top and bottom have increased.

Table 3: Size Indicators of Migration Flows

		Out-Mig (#)	Out-Mig (%)	In-Mig (#)	In-Mig (%)	Net-Mig (#)
Atlantic	Newfoundland & Labrador (Nfld)	362,687	2.06	260,148	1.48	-102,539
	Prince Edward Island (PEI)	91,642	2.14	89,325	2.08	-2317
	Nova Scotia (NS)	554,366	1.89	524,702	1.79	-29,664
	New Brunswick (NB)	407,529	1.72	375,059	1.58	-32,470
	Quebec (Que)	1,054,918	0.45	738,566	0.32	-316,352
	Ontario (Ont)	2,222,953	0.62	2,327,568	0.65	104,615
Prairies	Manitoba (Man)	613,400	1.69	476,294	1.31	-137,106
	Saskatchewan (Sas)	679,200	2.09	536,975	1.65	-142,225
	Alberta (Alb)	1,788,010	1.91	2,116,475	2.26	328,465
	British Columbia (BC)	1,438,158	1.20	1,767,751	1.48	329,593
	Total	9,212,863		9,212,863		0

Notes: This table shows descriptive statistics regarding the migration flows for each province for both inward and outward migration. The columns denoted by (#) represent the total flow for 32 years (1981 - 2012) and the columns denoted by (%) represent the average yearly flow as percentage of population.

Table 4: Outward Migration by Destination Province in % of Total 1981-2012

	Nfld	PEI	NS	NB	Que	Ont	Man	Sas	Alb	BC	Total
Nfld	-	1.5	14.7	5.3	2.3	**40.1**	2.1	1.2	25.9	6.8	100
PEI	4.6	-	22.6	14.8	4.0	**27.7**	1.6	1.5	16.4	7.0	100
NS	6.8	3.7	-	14.1	5.4	**37.3**	2.6	1.6	17.9	10.6	100
NB	3.4	3.3	19.6	-	15.7	**31.8**	2.5	1.3	16.0	6.4	100
Que	0.8	0.4	3.0	6.0	-	**65.9**	1.8	1.1	10.7	10.3	100
Ont	5.2	1.2	8.6	5.3	20.8	-	6.7	3.6	24.0	**24.6**	100
Man	1.1	0.3	2.4	1.5	3.1	**28.7**	-	13.5	27.3	22.1	100
Sas	0.5	0.2	1.3	0.8	1.6	12.6	12.0	-	**51.5**	19.5	100
Alb	3.0	0.6	4.0	2.5	3.9	24.9	6.3	13.9	-	**40.8**	100
BC	1.1	0.4	3.6	1.6	4.9	29	5.6	6.6	**47.3**	-	100

Notes: This table shows the shares of total migration during 1981 - 2012 towards each destination province. Bold figures display the destination province with the highest share of migrants from each origin province (left-hand column). Rounding errors may occur.

Several patterns can be discovered in the data. Table 3, for example, shows the total number of migrants over the period under consideration as well as the annual share of the population that moves to another province. In absolute terms, Ontario is the largest sender and receiver of migrants, though in relative terms, only Quebec has smaller flows. Over the 31 years of data in this analysis, only Ontario, Alberta and BC have experienced a net inflow of migrants. While the Atlantic provinces in the east are known for their outflow, there is also a substantial number of people who migrate to these eastern provinces. It may well be that the outflow mainly consists of young people, while the opposite flow is characterized by retired Canadians looking for a quiet place to live (Newbold & Bell, 2001).

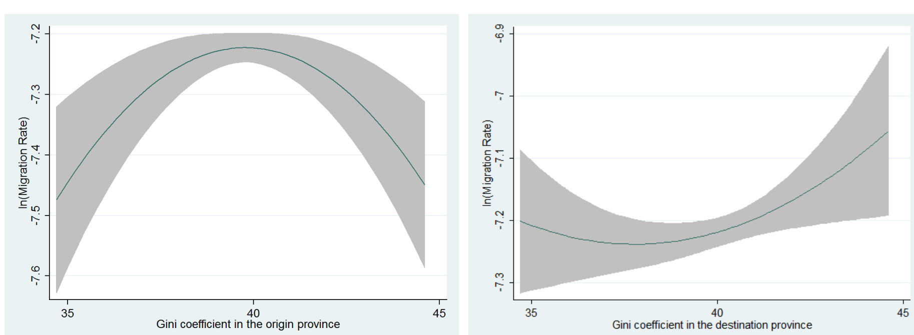
Table 4 provides a more detailed insight in the migration flows, as it shows the destination province of all 10 provinces. Of the 5 most eastern provinces and Manitoba, the largest share of migrants moves to Ontario. Ontarians themselves choose BC most often, as do people from Alberta. In the two neighbouring provinces of Alberta, Saskatchewan and BC, migrants most often choose Alberta as destination. For the people from Quebec, Ontario too is the most preferred destination, as almost two-thirds moves there, while the reverse flow (e.g. Ontario $\rightarrow$ Quebec) comes in third place for Ontarians.

5 Results

The results of the bilateral migration model, equation 8, can be found in table 5. In the first column, only GDP per capita, the unemployment rate and the Gini coefficient are included. The second column then shows the results with the three additional control variables; provincial taxes, inflation and the population share under 25 years old. Both include bilateral fixed effects and year fixed effects. The third and fourth column use destination-year fixed effects and origin-year fixed effects instead. In none of the four configurations can we reject Pesaran (2004) CD test's null hypothesis of cross-sectional independence, hence multilateral resistance to migration is properly dealt with in all configurations.

GDP per capita in the origin province is never significant. Higher average income in the destination, on the other hand, is significant in all three cases. As both the migration rate and GDP per capita are in log-form, results show that a 1% increase in GDP per capita in the destination province will boost migration by 1.1% in our preferred model, column 2. All three coefficients in columns 1, 2 and 4 are not significantly different from unity. Similarly to the GDP per capita, the unemployment rate is not significant in the origin province, whereas it does show significant results in the destination region. A one percent increase in the unemployment rate in the destination, reduces the bilateral flow by approximately 6%.

Figure 5: Marginal effects of inequality



(a) Origin Province (b) Destination Province

Table 5: Main Results

	Dependent Variable $ln(m_{ij,t}/m_{ii,t})$			
	Main Small	Main Full	Origin Only	Dest Only
ln(GDP p.C. Origin)	0.115	0.171	0.167	
	(0.319)	(0.355)	(0.235)	
ln(GDP p.C. Dest)	0.866***	1.097***		1.178***
	(0.242)	(0.255)		(0.226)
U-rate Origin	0.002	-0.005	-0.003	
	(0.009)	(0.009)	(0.008)	
U-rate Dest	-0.060***	-0.058***		-0.061***
	(0.011)	(0.010)		(0.008)
Gini Origin	0.768***	0.792***	0.804***	
	(0.159)	(0.165)	(0.147)	
$(\text{Gini Origin})^2$	-0.010***	-0.010***	-0.010***	
	(0.002)	(0.002)	(0.002)	
Gini Dest	-0.297	-0.295*		-0.325**
	(0.189)	(0.174)		(0.160)
$(\text{Gini Dest})^2$	0.004	0.004*		0.004**
	(0.002)	(0.002)		(0.002)
Constant	-25.880***	-32.202***	-24.789***	-13.126***
	(5.219)	(5.975)	(3.870)	(3.143)
Additional controls	no	yes	yes	yes
Fixed Effects				
Bilateral FE	yes	yes	no	no
Year FE	yes	yes	no	no
Origin-year FE	no	no	no	yes
Destination-year FE	no	no	yes	no
CD p-value	0.199	0.905	0.060	0.171
Observations	2790	2700	2700	2700
R-squared	0.234	0.253	0.490	0.393

Notes: This table shows the results of the bilateral migration model, equation 8, for the years 1981-2012. Clustered standard errors in parentheses. ***, **, * denote significance levels of 1%, 5% and 10% respectively. The CD p-value is based on the CD test by Pesaran (2004). Additional controls are provincial taxes, inflation and the population share under 25 years.

When we look at the variable of interest, inequality, we see the expected results for the prefered model ('Main Full'). Higher inequality in the origin region is positively related to the number of out-migrants. We also identify the inversed-U pattern, as expected. Inequality in the destination shows the exact opposite pattern, such that higher inequality at first deters people from moving, but after a certain threshold this reverses.

The marginal effects of these two variables can be found in figure 5. Panel (a) displays the effect of origin province inequality for a variety of Gini coefficients. From the results in table 5 and figure 5, we can infer that inequality has a positive effect on migration rates until the Gini coefficient reaches 39.8, after which it will reduce migration rates.[1] Similarly, we can calculate the turning point in the destination, see panel (b). Higher inequality in the destination province decreases bilateral migration flows until a Gini coefficient of 37.8. For Gini coefficients higher than 37.8, bilateral migration flows start to increase again.

Section 3.1 discussed an additional tool to investigate whether multilateral resistance to migration has been properly dealt with. Following Grogger & Hanson (2011), we re-estimate the prefered model ('Main Full') 10 times, each time leaving out one destination province. The results of this exercise can be found in the appendix, table 11. As it seems, the coefficients do not change that much (e.g. most are within one standard error of the coefficient in column 2, table 5). The only exception is if Alberta is left out, then the origin Gini coefficient is more than one standard error away from the coefficient in table 5. However, the turning point, as calculated by footnote 1, remains very close (Gini coefficient of 39.6)

Next to very similar results for the GDP per capita and unemployment rate results discussed above, the third and fourth column also comparable results for the Gini coefficient. This shows that the findings are robust if we follow suggested specifications on how to deal with multilateral resistance to migration through fixed effects (origin-year and destination-year) dummies.

As for the additional control variables, the exact coefficients are available upon request. Provincial taxes and inflation are insignificant drivers of bilateral migration in both the origin and destination provinces. Provinces with a larger share of young people indeed see a larger outflow of migrants,

[1]The quadratic formula ($ax^2 + bx + c$) changes signs at -b/2a.

but these migrants then also select provinces with a relatively large group of people below 25 years old as destination region, as both variables have positive and significant coefficients.

Robustness Checks

Both the GDP per capita and the Gini coefficient may suffer from certain drawbacks. The former may be a too simplistic measure of standard of living, whereas the latter does not respond well to changes at the margin of the income distribution. As a first robustness check, we therefore replaced them by the HDI and Palma ratio (introduced in section 2.2), respectively.

The results of this robustness check are reported in table 6. While we cannot easily compare the coefficients of these variables with table 5 due to different scales, the levels of significance are rather robust. A 0.01 point increase in the destination HDI index will increase bilateral migration by approximately 1%. Similarly, we still find the GDP per capita coefficient close to unity in the third column, not far from the findings in table 5. As for the unemployment rate, these coefficients can be compared with the ones in table 5, as the scale did not change. A 1 percent increase in the destination unemployment rate still reduces bilateral migration by 6%. Pesaran's CD p-value informs us that multilateral resistance to migration is properly dealt with in this robustness check as well.

For the inequality measures, the Gini coefficient in the first column and the Palma ratio in the second and third column, plots of the marginal effects for the origin province are very similar to the one in figure 5(a). Hence, inequality at home has a non-linear effect on bilateral migration. In the destination province, the effect of inequality is insignificant in all three configurations, in contrast to the results of table 5.

As an additional check, the dataset was split up in three periods[2]. These periods were not of equal size, but rather depict the business cycles of the Canadian economy. Each period was from the lowest point of the recession, to the last period before the lowest point of the next recession (with the exception of 1981 and 2012, the first and last years in the dataset).[3]

[2]The three periods are: 1981 - 1991, 1992 - 2008 and 2009 - 2012

[3]These recessions are based on Cross & Bergevin (2012). Note that the Canadian economy was not in recession in the early 2000s (the dotcom bubble). The economy only contracted for one quarter, hence in official terminology it was not a recession.

Table 6: Alternative Configurations

	Dependent Variable $ln(m_{ij,t}/m_{ii,t})$		
	HDI - Gini	HDI - Palma	GDP - Palma
Standard of Living Origin	8.283	8.117	0.168
	(5.447)	(5.416)	(0.356)
Standard of Living Dest	10.597***	10.161***	1.088***
	(3.475)	(3.592)	(0.263)
U-rate Origin	-0.004	-0.005	-0.006
	(0.009)	(0.009)	(0.009)
U-rate Dest	-0.060***	-0.059***	-0.057***
	(0.010)	(0.010)	(0.010)
Inequality Origin:	0.757***	1.418***	1.523***
	(0.171)	(0.474)	(0.456)
(Inequality Origin)^2	-0.009***	-0.137***	-0.149***
	(0.002)	(0.045)	(0.044)
Inequality Dest	-0.196	-0.183	-0.470
	(0.166)	(0.458)	(0.481)
(Inequality Dest)^2	0.003	0.024	0.051
	(0.002)	(0.045)	(0.047)
Constant	-36.982***	-28.284***	-24.767***
	(7.292)	(6.155)	(5.274)
Additional controls	yes	yes	yes
Fixed Effects			
Bilateral FE	yes	yes	yes
Year FE	yes	yes	yes
CD p-value	0.393	0.354	0.789
Observations	2700	2700	2700
R-squared	0.239	0.230	0.244

Notes: This table shows the results of the bilateral migration model, equation 8, for the years 1981-2012. Clustered standard errors in parentheses. ***, **, * denote significance levels of 1%, 5% and 10% respectively. The CD p-value is based on the CD test by Pesaran (2004). Additional controls are provincial taxes, inflation and the population share under 25 years.

Table 7: Split Sample

	Dependent Variable $ln(m_{ij,t}/m_{ii,t})$		
	1981-1991	1992 - 2008	2009 - 2012
ln(GDP p.C. Origin)	0.529	0.200	0.398
	(0.349)	(0.342)	(0.923)
ln(GDP p.C. Dest)	0.135	1.681***	1.830
	(0.398)	(0.344)	(1.418)
U-rate Origin	0.024**	-0.006	-0.048
	(0.011)	(0.016)	(0.036)
U-rate Dest	-0.063***	-0.054***	0.001
	(0.011)	(0.017)	(0.028)
Gini Origin:	0.280	0.455***	1.001***
	(0.218)	(0.151)	(0.354)
$(\text{Gini Origin})^2$	-0.004	-0.006***	-0.013***
	(0.003)	(0.002)	(0.004)
Gini Dest	-0.363	0.351**	-1.079**
	(0.274)	(0.165)	(0.500)
$(\text{Gini Dest})^2$	0.004	-0.004**	0.013**
	(0.004)	(0.002)	(0.006)
Constant	-14.348	-44.671***	-31.068
	(9.564)	(6.790)	(26.669)
Additional controls	yes	yes	yes
Fixed Effects			
Bilateral FE	yes	yes	yes
Year FE	yes	yes	yes
CD p-value	0.120	0.949	0.603
Observations	810	1530	360
R-squared	0.349	0.167	0.343

Notes: This table shows the results of the bilateral migration model, equation 8, for the years 1981-2012. Clustered standard errors in parentheses. ***, **, * denote significance levels of 1%, 5% and 10% respectively. The CD p-value is based on the CD test by Pesaran (2004). Additional controls are provincial taxes, inflation and the population share under 25 years.

While it may be difficult to compare the three periods, particularly due to the different lengths, there are enough observations in each period to comment on the results. For the first business cycle (begin dataset - 1991), the results contain insignificant coefficients for GDP per capita. In this period, the unemployment rates in the origin and destination provinces are a significant driver of bilateral migration flows, at a 5% and 1% significance level, respectively. Some provinces in the east (Atlantic) suffered from unemployment rates around 20% in the 1980s. As the provincial unemployment rates converged afterwards, this may be an explanation why we identify a significant effect here. No other independent variables have any explanatory power in this time period.

The second, and largest, period (between 1992 and 2008) displays results that are very similar to those found in table 5 for the entire period. For the four years starting in 2009, inequality is the sole driver of migration flows. Both in linear and quadratic terms do we see the expected signs.

Net Migration Results

The results of the net migration model, equation 9, can be found in table 8. Each column differs from the others either through a different dependent variable or a different measure of inequality. The first two colums have the population size of both the 'home' and 'foreign' provinces in the denominator of the dependent variable, as opposed the last two columns, where the net migration flow is divided through the population size of the 'home' province alone (following Mitchell et al. (2011)). The first and third column contain the Gini coefficient as inequality indicator, in the second and fourth column we used the Palma ratio. All four specifications include origin-year and bilateral fixed effects.

The only (weakly) significant variable in the net migration model is the GDP per capita ratio (though only at the 10% significance level). In the last three columns, a 0.01 point increase in the ratio will lead to an approximately 0.3% larger net migration flow. The ratio of inequality between the origin and destination is not significant in any specification. This is not in line with the expectation, or with literature that deals with international migration flows and inequality, such as Mitchell et al. (2011). A possible explanation could be that economic and social differences (in inequality) between countries is larger than between Canadian provinces and that the variation in the dataset is therefore limited.

Table 8: Net Migration

Dep. Variable:	$ln[(m_{ji,t} - m_{ij,t})/(m_{ii,t} + m_{jj,t})]$		$ln[(m_{ji,t} - m_{ij,t})/(m_{ii,t})]$	
	Gini Coef.	Palma Ratio	Gini Coef.	Palma Ratio
GDP ratio	0.279	0.298*	0.294*	0.314*
	(0.167)	(0.162)	(0.168)	(0.163)
U-Rate ratio	0.072	0.085	0.066	0.081
	(0.100)	(0.104)	(0.101)	(0.105)
Gini ratio	-27.435		-31.183	
	(21.561)		(21.663)	
(Gini ratio)^2	13.729		15.553	
	(10.732)		(10.782)	
Palma ratio		-8.580		-10.000
		(6.221)		(6.194)
(Palma ratio)^2		4.164		4.837
		(3.056)		(3.043)
Constant	6.157	-3.197	8.448	-2.081
	(10.828)	(3.268)	(10.883)	(3.263)
Additional Controls	yes	yes	yes	yes
Fixed Effects				
Bilateral FE	yes	yes	yes	yes
Origin-Year FE	yes	yes	yes	yes
Observations	1,350	1,350	1,350	1,350
R-squared	0.433	0.433	0.596	0.596

Notes: This table shows the results of the net migration model, equation 9, for the years 1981-2012. Clustered standard errors in parentheses. ***, **, * denote significance levels of 1%, 5% and 10% respectively. Additional controls are provincial taxes, inflation and the population share under 25 years.

6 Conclusion

This paper looked at the relationship between inequality within Canada's provinces and its effect on interprovincial migration flows between 1981 and 2012. Existing literature that looked at this link focused predominantly on international migration data, and usually stocks rather than flows. Hence, applying this theory on internal migration flows is relatively novel and can yield important insights for the public policy debate.

The availability of a large number of variables at the provincial level enabled us to investigate bilateral flows, most of this paper focused on this particular type of migration. We found, as was predicted, the standard of living in the destination province to be an important variable in the decision-making process of migrants. Higher average GDP per capita (or HDI score) lead to a larger bilateral flow. Similarly, the unemployment rate of the destination is negatively related to bilateral migration flows.

Inequality in the origin province also shows the predicted signs. If inequality is relatively low to begin with, an increase will boost the outward migration flow. If, however, inequality passes a certain threshold (a Gini coefficient of 39.8 in the prefered model), this effect becomes negative and will reduce migration. This finding is robust for many specifications. Inequality in the destination province is less often statistically significant.

To conclude, as previous literature on this specific topic does not yet exist, we cannot confirm our findings with earlier studies. However, these results are in line with Mayda (2010) and Clark et al. (2007), whose research on international flows comes closest to ours. Multilateral resistance to migration, the effect of changes in provinces that are close-substitutes, is properly dealt with.

Future research may try to find sufficient micro-data to further develop explanations as to how migrants make their migration decisions. At this point, our findings may simply reveal information on the skill level of the majority of the migrants, as provinces with an unequal distribution are likely to see an outflow of low-skilled workers. However, aggregate data as used in this paper has its limitations (e.g. personal characteristics are not accounted for, so the actual reason to migrate remains speculative). All we can claim at this point is that inequality has a significant, non-linear impact on migration, which is useful for policy debates.

7 Bibliography

Amirault, D., de Munnik, D., & Miller, S. (2013). Explaining Canada's regional Migration Patterns. *Bank of Canada Review* (Spring), 16-28.

Anderson, J. (1979). A Theoretical Foundation for the Gravity Equation. *American Economic Review*, 69 (1), 106-116.

Anderson, J. (2011). The Gravity Model. *Annual Review of Economics*, 3(1), 133-160.

Anderson, J., & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93 (1), 170–192.

Basher, S., & Fachin, S. (2008). The Long-Term Decline of Internal Migration in Canada: Ontario as a Case Study. *Letters in Spatial and Resource Sciences*, 1, 171-181.

Becker, G. (1962). Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, 70, 9-49.

Beckstead, D., & Brown, M. (2003). From Labrador City to Toronto: The Industrial Diversity of Canadian Cities, 1992-2002 . *Insights on the Canadian Economy.* Toronto: Statistics Canada.

Beine, M., Bertoli, S., & Fernández-Huertas Moraga, J. (2014). A Practitioners' Guide to Gravity Models of International Migration. *FEDEA Working Papers 2014-03.*

Beine, M., & Parsons, C. (2012). Climatic factors as determinants of International Migration. *CESifo Working Paper* 3747, Munich, Germany.

Belot, M. & Hatton, T. (2012). Immigrant Selection in the OECD. *Scandinavian Journal of Economics*, 114 (4), 1105-1128.

Bendiner, J. (2013). Interprovincial Migration Shifts in Canada. *Toronto-Dominion Bank, TD Economics Observation.* Toronto: TD Economics.

Bernard, A. (2011). Regional Economic Shocks and Migration. *Perspectives on Labour and Income* . Ottawa: Statistics Canada.

Bertoli, S., & Fernández-Huertas Moraga, J. (2013). Multilateral Resistance to Migration. *Journal of Development Economics*, 102, 79-100.

Bertoli, S., Fernández-Huertas Moraga, J., & Ortega, F. (2013). Crossing the Border: Self-Selection, Earnings and Individual Migration Decisions. *Journal of Development Economics*, 101 (C), 75-91.

Borjas, G. (1987). Self-Selection and the Earnings of Immigrants. *American Economic Review*, 77 (4), 531-553.

Brucker, H. & Defoort, C. (2009). Inequality and the Self Selection of International Migrants: Theory and New Evidence. *International Journal of Manpower*, 30 (7), 742-764.

Cameron, D., & Hofferbert, R. (1974). The Impact of Federalism on Education Finance: A Comparative Analysis. *European Journal of Political Research*, 2 (3), 225-258.

Cheng, H., & Wall, H. (2005). Controlling for Heterogeneity in Gravity Models of Trade and Integration. *Federal Reserve Bank of St. Louis Review*, 87 (1), 49-63.

Clark, X., Hatton, T., & Williamson, J. (2007). Explaining US Immigration 1971-1998. *The Review of Economics and Statistics*, 89 (2), 359–373 .

Clemens, M. (2014). Does Development Reduce Migration? *CGD Working Paper* 359.

Cobham, A., & Sumner, A. (2014). Is Inequality all About the Tails?: The Palma Measure of Income Inequality. *Significance*, 11 (1), 10-13.

Coulombe, S. (2006). Internal Migration, Asymmetric Shocks, and Interprovincial Economic Adjustments in Canada. *International Regional Science Review*, 29 (2), 199-223.

Cross, P., & Bergevin, P. (2012). Turning Points: Business Cycles in Canada since 1926. *C.D. Howe Institute Commentary No. 366*. Toronto, Ont.: C.D. Howe Institute .

Czaika, M. & de Haas, H. The Role of Internal and International Relative Deprivation in Global Migration. *Oxford Development Studies*, 40 (4), 423-442.

Day, K., & Winer, S. (2006). Policy-induced Internal Migration: An Empirical Investigation of the Canadian Case . *International Tax and Public Finance*, 13 (5), 535-564.

Ellis, M. (2012). Reinventing US Internal Migration Studies in the Age of International Migration. *Population, Space and Place*, 18, 196-208.

Fidrmuc, J. (2009). Gravity Models in Integrated Panels. *Empirical Economics*, 37, 435-446.

Gauthier, P. (2011). Interprovincial Migration: Where are Canadians Headed? *Toronto-Dominion Bank, TD Economics Special Report.* Toronto: TD Economics.

Graves, P., & Linneman, P. (1979). Household Migration: Theoretical and Empirical Results. *Journal of Urban Economics*, 6, 383-404.

Greenwood, M. (1985). Human Migration: Theory, Models and Empirical Studies. *Journal of Regional Science*, 25 (4), 521-544.

Greenwood, M. (1997). Internal Migration in Developed Countries. In M. Rozenzweig, & O. Stark, *Handbook of Population and Family Economics* (pp. 647-720). Elsevier.

Greenwood, M. (2005). Modeling Migration. *In Encyclopaedia of Social Measurement* (pp. 725-734). Elsevier.

Grogger, J., & Hanson, G. (2011). Income Maximization and the Selection and Sorting of International Migrants. *Journal of Development Economics*, 95, 42-57.

Hazell, E., Gee, K.F., & Sharpe, A. (2012). The Human Development Index in Canada. *CSLS Research Report 2012-02.*

Hering, L., & Paillacar, R. (2014). Does Access to Foreign Markets Shape Internal Migration? Evidence from Brazil. *TI Discussion Paper 14-084.*

Im, K., Pesaran, H., & Shin, Y. (2003). Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 115, 53-74.

Leung, D., & Cao, S. (2009). The Changing Pace of Labour Reallocation in Canada: Causes and Consequences. *Bank of Canada Review* (Summer), 31-41.

Liebig, T., & Sousa-Poza, A. (2004). Migration, Self-Selection and Income Inequality: An International Analysis. *Kyklos*, 57, 125-146.

Long, L. (1991). Residential Mobility Differences among Developed Countries. *International Regional Science Review*, 14 (2), 133-147.

Mayda, A. (2010). International Migration: A Panel Data Analysis of the Determinants of Bilateral Flows. *Journal of Population Economics*, 23, 1249-1274.

Mitchell, J., Pain, N. & Riley, R. (2011). The Drivers of International Migration to the UK: A Panel-Based Bayesian Model Averaging Approach. *The Economic Journal*, 121, 1398-1444.

Molloy, R., Smith, C., & Wozniak, A. (2014). Declining Migration within the US: The Role of the Labor Market. *NBER Working Paper 20065*.

Molloy, R., Smith, C., & Wozniak, A. (2011). Internal Migration in the United States. *Journal of Economic Perspectives*, 25 (3), 173-196.

Newbold, B., & Bell, M. (2001). Return and Onwards Migration in Canada and Australia: Evidence from Fixed Internal Data. *International Migration Review*, 35 (4), 1157-1184.

Ortega, F. & Peri, G. (2013). The Effect of Income and Immigration Policies on International Migration. *Migration Studies*, 1 (1), 47–74.

Palma, J. (2011). Homogeneous Middles vs. Heterogeneous Tails, and the End of the 'Inverted-U': the Share of the Rich is What It's All About. *Cambridge Working Papers in Economics 1111*.

Pesaran, H. (2004). General Diagnostic Tests for Cross-Section Dependence in Panels. *CES-Ifo Working Paper No. 1229.*

Pesaran, H. (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, 74 (4), 967–1012 .

Ravenstein, E. (1885). The Laws of Migration. *Journal of the Statistical Society of London*, 48 (2), 167-235.

Ravenstein, E. (1889). The Laws of Migration. *Journal of the Statistical Society of London*, 52 (2), 241-305.

Schultz, T. (1961). Investment in Human Capital. *American Economic Review*, 51, 1-17.

Sjaastad, L. (1962). The Cost and Returns of Human Migration. *Journal of Political Economy*, 70, 80-89.

Stark, O. (2006). Inequality and Migration: A Behavioral Link. *Economic Letters*, 91, 146-152.

Stark, O. (1984). Rural-to-Urban Migration in LDCs: A Relative Deprivation Approach. *Economic Development and Cultural Change*, 32 (3), 475-486.

Stark, O., & Taylor, E. (1991). Migration Incentives, Migration Types: The Role of Relative Deprivation. *The Economic Journal*, 101, 1163-1178.

The Economist. (2011, March 10). *Regional Inequality, Internal Affairs.*

The White House. (2013). *Remarks by the President on Economic Mobility.* http://www.
whitehouse.gov/the-press-office/2013/12/04/remarks-president-economic-mobility

Tinbergen, J. (1962). *An Analysis of World Trade Flows.* In J. Tinbergen, Shaping the World Economy. New York: Twentieth Century Fund.

UNDP. (2013) *United Nations Human Development Report 2013.*

Yalnizyan, A. (2010). *The Rise of Canada's Richest 1%.* Canadian Centre for Policy Alternatives, Ottawa, Ont.

8 Appendix

8.1 Data Appendix

8.1.1 Data Sources

Table 9: Variable Sources

Variable	Source
Migration	BC Stats (British Columbia)
Population	CANSIM 051-0001
GDP per Capita	CANSIM 384-0037
Unemployment Rate	CANSIM 282-0087
Gini Coefficient	CANSIM 202-0705
Palma Ratio	CANSIM 202-0703
Prov. Income Tax	CANSIM 202-0501
Inflation Rate	CANSIM 326-0021
Share Young Population	CANSIM 051-0001
Life Expectancy	CANSIM 102-0512
Educational Attainment	CANSIM 109-0006

Notes: This table shows the sources of the variables used in this paper.

The migration data for Canada is provided by Statistics Canada, but published as provincial migration flows from 1971 through 2012 by BC Stats, the statistical agency of the province British Columbia. All other variables directly come from the Canadian statistical office, Statistics Canada. The sole use of statistics provided by the federal government limits the possibility of differences in measurement and definitions. The exact sources of these variables can be found in Table 9.

8.1.2 Stationarity

Only few papers that deal with migration issues pay attention to the econometric issues of stationarity and cointegration of the panel variables (Fidrmuc, 2009). Basher & Fachin (2008) even claim to be the first ones to apply it to internal migration research. This paper will use the IPS panel unit root test to determine the stationarity of the variables (Im et al., 2003). The choice for this test follows from the assumption that the possible unit roots need not be equal for all panels; they can be individual unit root processes. Table 10 shows the results of the IPS test for all variables used in this analysis. As can be seen from the test-statistics, all variables are I(0), though some need a trend to achieve this result. This allows for testing with the variables in levels, and the inclusion of year fixed effects will solve the issue of trend-stationarity.

Table 10: IPS Unit Root Test

Variable	IPS test-statistic
$\log(m_{ij,t}/m_{ii,t})$	-2.76
log(GDP per capita)	$-2.68^{\dagger}$
HDI	$-3.21^{\dagger}$
Unemployment Rate	-2.15
Gini Coefficient	-3.11
Palma Coefficient	-3.09
Share Population < 25	-1.68
Inflation	-4.43
Provincial Taxes	-2.13

Notes: The 5-percent critical value is -1.67 (T=30/N=100). † denotes that a linear time trend is included, for these variables the relevant critical level is -2.31. (Source: Im et al. 2003)

8.1.3 Data Transformation

For the calculation of the Human Development Index (HDI), we have applied the 2011- method as discussed in the United Nations Human Development Report (2013). HDI consists of three separate dimensions: Long and Healthy Life, Knowledge and a Decent Standard of Living. The first is proxied by the life expectancy, the second is denoted by the average educational attainment of the population whereas GDP per capita indicates the standard of living dimension.

The final HDI score is calculated as the geometric mean of these three dimensions, or:

$$HDI = \sqrt[3]{LEI * EI * INI}$$

where LEI is the life expectancy index, EI is the education index and INI is the income index. These indices are calculated as follows:

$$LEI = \frac{LifeExpectancy - 20}{85 - 20}$$

where we have data available until 2011 at a provincial level and we make the assumption that life expectancy did not change in 2012.

$$EI = \frac{\frac{MeanYearsofSchooling}{15} + \frac{ExpectedYearsofSchooling}{18}}{2}$$

where we use the expected years of schooling for the whole of Canada of 16 years between 1990 and 2012 and we reduce this by 0.2 years in the decade before 1990. This is in line with Hazell et al. (2012). It should be noted that the average educational attainment is not available at a provincial level for any year but 1996 (Census data). We have therefore decided to proxy this by taking the share of population with no high school degree and attach 8 years to this group, attach 12 years to the share with only a high school degree, add 2 more years in case of a college degree and attach 16 years to those with a university degree. The correlation with our measure and the sole data point of 1996 was 0.864.

$$INI = \frac{ln(GDPperCapita) - ln(100)}{ln(85000) - ln(100)}$$

which requires no further discussion.

As was used in robustness checks, the official Palma ratio is the share of income of the richest 10% divided by the share of income of the poorest 40%. Due to limited data availability at the provincial level, this paper slightly adjusts the Palma ratio:

$$PalmaRatio_{i,t} = \frac{ShareIncomeTop20\%_{i,t}}{ShareIncomeBottom40\%_{i,t}}$$

8.2 Additional Robustness Results

Table 11: Robustness Check IIA

	Dependent Variable $ln(m_{ij,t}/m_{ii,t})$				
Left Out	Gini Origin	(Gini Origin)^2	Gini Dest	(Gini Dest)^2	Obs
Nfld	0.867***	-0.011***	-0.413**	0.006**	2430
PEI	0.751***	-0.009***	-0.403*	0.005*	2430
NS	0.836***	-0.011***	-0.282	0.004*	2430
NB	0.830***	-0.010***	-0.235	0.003	2430
Que	0.863***	-0.011***	-0.314*	0.004*	2430
Ont	0.799***	-0.010***	-0.332	0.004	2430
Man	0.804***	-0.010***	-0.244	0.003	2430
Sas	0.738***	-0.009***	-0.290	0.004	2430
Alb	0.666***	-0.008***	0.072	-0.001	2430
BC	0.767***	-0.010***	-0.485**	0.006**	2430

Notes: This table shows the results of the bilateral migration model, equation 8, for the years 1981-2012. Here, the 'Main Full' model of table 5 is re-estimated, each time leaving out one destination province to test for the issue of multilateral resistance to migration. The province that is left out can be found in the first column.