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Abstract

We analyze the impact of temporary foreign workers (TFWs) and permanent immigrants on interprovincial mobility in Canada. Particular attention is given to the Canadian program of TFWs that has intensified enormously over the last 30 years. Results of the empirical analysis are analyzed through the lens of a small theoretical model that incorporates a job-matching framework (Pissaridès, 1985, 2000) in a migration model à la Harris and Todaro (1970). We find that the inflow of TFWs into a given province tends to substantially decrease net interprovincial mobility. This is not the case, however, for the inflow of permanent immigrants selected through the Canadian point system. On average, each inflow of 100 TFWs is found to decrease net interprovincial migrants within the year by about 50, a number substantially higher than is present in existing literature. This number increases to 180 in the long run. The negative impact of TFWs is ascribed to the fact that TFWs are hired directly by employers, take vacant jobs, and display employment and participation rates of close to 100 per cent. Our paper suggests that, in general, the impact of immigration on labor market conditions depends critically on the way immigrants are selected.

JEL-Code: F220, J080, J290, J610.

Keywords: internal mobility, immigration, foreign workers, displacement effect.

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1. Introduction

In most developed countries, the control over immigration remains one of the clear signs of national sovereignty in this era of globalization. Country-specific contexts—such as political debates about illegal immigration and family reunification in the United States, skilled labor shortages in booming natural resource provinces in Canada, or a slow labor market recovery from the great recession in the United Kingdom—have put the question of immigration policy on the front stage of the policy scene. One of the most important preoccupations of interest groups and, consequently, of policy-makers deals with the effect of immigrants on domestic labor markets. In this respect, economic tools should be viewed as essential guides for policy design. Fortunately, the issue has been a major subject of investigation by economists for decades.

Following the work of Grossman (1982), Borjas (1987), and Card (1990), an extensive literature has concentrated on the effect of incoming foreign workers on the local wages of domestic workers in the immigrant settlement area. The general results of the "area-analysis" approach have suggested that the impact of international immigration on wages is either non-existent or quite modest. If an effect is discernible, the typical elasticity of wages with respect to inflows of immigrant workers is estimated to be around 0.1, which might indicate that the impact of immigration on labor markets should not be a major policy concern.

However, this approach and its results have been questioned by Borjas, Freeman, and Katz (1996, 1997) on the grounds that the range of effects of immigration on domestic labor markets goes beyond their mere impact on local wages.[1] As showed initially in Filer (1992) and Frey (1995), another possible effect might be that inflows of immigrants into a particular area might lead, because of competition, to outflows of natives or former immigrants to other locations within the country. A broad literature has analyzed the linkages between immigration and internal migration or, phrased differently, the displacement effect of natives by immigrants. The contribution of this paper is to show that the *way* in which international immigrants are selected might have a significant effect on the reaction of domestic workers in terms of internal mobility. We show that the main effect materializes in a decrease in the gross immigration of natives to the provinces that receive TFWs. This effect is stronger than the one leading to native outflows and therefore explains a greater share of the decrease of the net interregional immigration of natives.

One important aspect of our analysis is that we investigate the respective effects of two types of international immigrants. The two categories are subject to very different selection criteria. The first deals with permanent immigrants (landed immigrants) who are mostly selected through the Canadian point system of immigration. This point system tends to favor skilled migrants irrespective of regional and national imbalances between supply of and demand for specific skills in Canada. Candidates applying for immigration in Canada who have more than the minimum required points are

1 Subsequent studies of the influence of immigration on wages include Borjas (2003) and Ottaviano and Peri (2012). D'Amuri, Ottaviano, and Peri (2010) consider the impact of immigration in Germany on wages and employment rates. Recently, Braun and Mahmoud (2014) look specifically at the impact of forced immigration from Eastern Germany to post-war Western Germany on native employment.

automatically put on the waiting list. Immigration visas are awarded on a first-come, first-served basis to people on this list.[2]

The second category concerns TFWs. In contrast to permanent immigrants, TFWs are hired directly by employers through a variety of programs in which provincial authorities are more or less involved, in order to fill vacancies. These TFWs come for short periods of time (less than one year), have limited rights (for example, the possibility for family reunification or for social benefits), and display employment and participation rates that are virtually 100 per cent. The numbers of TFWs have increased massively nationwide since the end of the 1980s.[3] In this respect, the Canadian experience provides some kind of natural experiment to look at the role of immigration programs in shaping the labor market impact of immigrants.

In this paper, we take advantage of the good Canadian immigration data to analyze the reaction of interprovincial migration (both net and gross flows) to permanent immigrant and TFWs inflows. We pool annual data for the 10 provinces over the 1981–2011 period. We find compelling evidence that the inflow of TFWs into Canada leads to a significant and substantial decrease in the mobility of Canadians across provinces. We come to this conclusion by looking at TFWs' negative impact on job vacancies, which in turn lowers the expected income of potential internal migrants in the location where they plan to locate. The profiles of TFWs make them substitutes for native workers. The displacement effect holds across all segments of the relevant population under investigation. The effect also survives IV estimations dealing with several endogeneity concerns. Unsurprisingly, the effect is found to be stronger for young people than for older persons, and for males than females. In contrast, the effect of permanent migrants on interprovincial mobility is generally not significant. The differentiated impacts between the two immigration channels can be ascribed to the lower degree of matching permanent migrants with vacant jobs and to the potential positive externalities they might exert on the labor market.

The expansion of the TFW program was initially presented as a "win-win" policy in the context of the Canadian immigration policy. The eradication of labor shortages might be seen as a positive development for employers and has potentially positive externalities for other workers in the area of settlement. It is obvious that, in many Canadian regions, economic development would not be possible without the contribution of foreign workers. For the TFWs, the increase in wages is very substantial, sometimes more than a fivefold increase over the wage conditions prevailing in their countries of origin. Furthermore, Beine, Coulombe, and Vermeulen (2014) show that the inflows of TFWs (contrary to those of permanent migrants) could alleviate the potential Dutch disease at the regional level that is associated with the big resource boom between 2001 and 2008.

.2 Recent immigration reforms that should be implemented in 2014 put more emphasis on labor market demand.

3 While the number of TFWs in Canada was fewer than 90,000 in 2000, their total number in 2013 had risen to 290,000. This is more than a threefold increase in a period of fewer than 15 years.

Nevertheless, the inflows of TFWs have potential detrimental effects on the situation of native workers.[4] By reducing the number of vacant jobs, TFWs can decrease the prospects of employment for Canadian workers coming from other provinces and might reduce their incentives to move. In the same vein, TFWs might also lead to outflows of native workers from the region where the TFWs work.

The results of this paper suggest this is actually the case. Interprovincial mobility of native workers is a key mechanism in the context of the Canadian economy (Coulombe, 2006): first, interprovincial migration is a natural mechanism of adjustment in the presence of asymmetric disturbances between Canadian regions. It is especially important in a federal state that aims at equalizing standards of living among the various regions. Second, the resulting decrease in mobility across provinces might lead to persistent disparities in the unemployment rates across provinces. Gross and Schmitt (2012) conjecture, but do not empirically test, that the inflow of TFWs might be responsible for the absence of convergence in provincial unemployment rates.[5] Interprovincial migration also offers young individuals from depressed provinces the possibility of entering the labor market and accumulating some professional experience at the start of their professional life. Third, since Canada experiences a resource boom in specific provinces (Alberta, Saskatchewan, and Newfoundland and Labrador), interprovincial migration allows a sharing, at least partially, of the benefits of the commodity bonanza among Canadian people, irrespective of their region of birth. From an equity point of view, this matters since Canada is a highly decentralized federation where natural resource ownership and most of the resource revenues were granted to the provincial governments. Canadians might well have to move to booming provinces to benefit from good public health care and education at an affordable tax rate (Boadway, Coulombe, and Tremblay, 2014). Doing so would be restricted by the fact that job openings in booming provinces would be occupied by TFWs.

Our analysis is related to two major strands of the economic literature on immigration. If one follows the "Borjas critique," the emigration of local workers might well be the most important consequence of the arrival of international migrants in terms of labor market adjustments. The existing literature exhibits very differing results in that respect.[6] The Canadian experience in terms of TFWs provides an interesting natural experiment for the econometrician to identify the potential effects of TFWs on internal mobility. There are many reasons for this. The first are related to the minimization of measurement errors of the key variables. Second, interprovincial mobility of natives is measured precisely in Canada. The annual tax returns filed by residents allows the capture of the internal mobility of workers on an annual frequency, in a very precise and consistent

4 Note that, very recently, concerns about several negative effects of the TFW program in Canada have appeared in the press and in policy circles. These arose well after this paper was started. For a recent coverage, see Gross (2014) and many articles in the *Globe and Mail* newspaper cover this broad issue. See, among many others, http://www.theglobeandmail.com/globe-debate/editorials/temporary-foreign-workers-canada-needs-fewer-guests-and-more-citizens/article18732350/.

5 It is indeed difficult to argue in favor of convergence in unemployment rates in face of the joint observation of rates close to the natural rate in some regions (e.g., Alberta with 3.5 per cent in 2007) and around 15 per cent in other regions (such as Newfoundland and Labrador, also in 2007).

6 Overall, evidence of the impact on native outflows is very mixed. A large number of papers find significant effects of immigration on natives' outmigration; see Filer (1992), Frey (1995), and Borjas (2006) in the case of the U.S., among others. See Cortes and Pan (2013) on the specific case of native-born nurses in the U.S. See also Hatton and Tani (2005) for the U.K. In contrast, other papers find very little evidence of native displacement. See Card (2001), Card and Di Nardo (2000), and Kritz and Gurak (2001) among others.

way. Third, given the immigration policy governing the inflow of TFWs and their allocation to vacant jobs in the economy, TFWs have by definition a maximum impact on the local labor market. This contrasts with inflows of the permanent immigrants who might display employment rates or participation rates well below 100 per cent. Fourth, the size of the TFW program is significantly heterogeneous across the provinces. British Columbia and Alberta each year attract more than 1.2 per cent of their total population in the form of TFWs, while some provinces such as Nova Scotia attract less than 0.3 per cent each year. Also, while some provinces have experienced a major increase in the intensity of the flows (Newfoundland has experienced a fourfold increase in the inflow rate of TFWs since 1987), other provinces such as Nova Scotia and New Brunswick have kept the rate quite constant. In short, there is significant cross-sectional and time-series variation in the inflow of TFWs that might facilitate the identification of the effect on interprovincial mobility.

Our paper is also related to the second major strand of literature that deals with the determinants of internal mobility of natives. An extensive literature, mainly concerned with the U.S. situation, has looked at identifying the factors that explain the long-run decrease in the internal rates of mobility of natives.[7] Interestingly, the same pattern in the interprovincial mobility of residents has also been observed in Canada over the last 35 years. Our analysis suggests that inflows of a particular kind of international immigrant, such as the TFWs, can help to explain a significant part of the declining trend that has been observed. This had not been considered in this specific strand of the literature.

The paper is organized as follows. Section 2 presents a small theoretical model that clarifies the mechanism(s) underlying the relationship between international immigration and internal mobility of natives. The econometric specification, the variables, and the data are presented in Section 3 with the features of the Canadian immigration systems receiving a special focus. Section 4 presents the econometric approach and the results, including some robustness checks. Section 5 concludes.

2. Theoretical Background

In this section, we develop a small theoretical model aimed at explaining the expected impact of both types of immigrants on the internal migration of domestic agents. The model reflects the expected differential impacts that the two types of international migrants can exert on the state of local labor markets and, in particular, their respective impacts in terms of job vacancies and unemployment.

The model builds on earlier contributions to the theory of economic migration and labor economics. In the spirit of the seminal work of Todaro (1969) and Harris and Todaro (1970), we assume a two-region world in which agents in each region assess the utility expected from migrating to the other region. To keep things simple, we assume that

7 See Molloy, Smith, and Wozniak (2011) for a recent review. The investigated factors are numerous and related, for instance, to demographic trends (aging), variation in unemployment rates, and housing factors such as home ownership. These factors also include technological progress that allows people to work at a distance. Kaplan and Schulhofer-Wohl (2013) argue that the fall in internal migration in the U.S. is due to a decline in the geographic specificity of returns to occupation as well as a reduction in information costs about alternative locations.

agents look forward only to the next period and do not optimize over their full living horizon.[8]

Two kinds of impact caused by international immigration can be considered. First, one can investigate the impact of international immigration into region *j* on immigration to region *j* from region *i*, in other words, the impact on *internal immigration*. Alternatively, we can look at the impact of international immigration into region *i* on internal emigration from *i* to *j*. This the impact on *internal emigration,* the effect that has received the most attention in the literature devoted to the influence of international immigration on the domestic labor markets (Borjas, 2006; Card, 2001; Card and Di Nardo, 2000; Filer, 1992; Frey, 1995; Hatton and Tani, 2005, among many others).

Let us first consider the impact of international immigrants on internal immigration into region *j*. We look at two types of international immigrants, namely, TFWs and permanent immigrants. The total number of TFWs and permanent immigrants landing in province *j* is denoted by T_j and I_j respectively. The impact of both types differs in two respects. First, TFWs have a stronger effect in terms of reducing the number of total vacant jobs in region *j,* due to the way they are selected by immigration authorities and allocated to the local labor market. Second, while the TFWs have no impact on the total number of unemployed agents in region *j* (TFWs' participation and employment rates are, by definition, 100 per cent), the impact of permanent immigrants is subject to discussion. This net impact is uncertain because some permanent immigrants can increase unemployment. This can occur, for example, because they do not find a job in the short run due to a skills mismatch. Other permanent immigrants, however, can decrease unemployment through positive externalities (when immigrants are investors or entrepreneurs, or simply through an increase in the demand for services such as schooling and health care).

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2.1 Impact of international immigration on internal immigration

Each individual k of category c living in region i makes a decision about migrating or not to region *j*. In the spirit of Todaro (1969), each individual migrates to j ($m_{ij}^{k,c} = 1$) if the expected utility associated to migration is positive. This expected utility is denoted by $E\left(\Delta_{ij}^{k,c}\right)$. Hence, we have:

$$m_{ij}^{k,c} = 1 \; if \; E\left(\Delta_{ij}^{k,c}\right) > 0, \; m_{ij}^{k,c} = 0 \text{ otherwise.} \qquad (1)$$

The utility Δ induced by migration takes the form:

$$\Delta_{ij}^{k,c} = E\left(y_j^{k,c}\right) - E\left(y_i^{k,c}\right) + A_j^{k,c} - A_i^{k,c} - C_{ij}^{k,c} + \epsilon_{ij}^{k,c} \qquad (2)$$

where $E(y_l^{k,c})$ denotes the expected income of this individual in location l (l=i,j), $A_l^{k,c}$ captures the role of amenities in location l on utility, and $C_{ij}^{k,c}$ capture the cost of moving

8 This assumption is in line with most traditional models of income maximization with a set of alternative migration destinations. See, for example, Grogger and Hanson (2011) and Beine, Docquier, and Özden (2011). This framework has been recently extended within an intertemporal set-up with optimal sequences of location decisions by Kennan and Walker (2011) and applied to international migration by Bertoli et al. (2013).

from *i* to *j*. $\epsilon_{ij}^{k,c}$ is a random shock that is identically distributed but uncorrelated across individuals *k*, with $E(\epsilon_{ij}^{k,c}) = 0$ and $E(\epsilon_{ij}^{k,c^2}) = \sigma_{ij}^2$.

We assume that income consists only of wage revenues and that the wage in each location l $w_l^{k,c}$ is known by individual *k*. We assume no outside option and no replacement income such as access to family resources. Expected income at location *l* is given by the wage level that is conditional upon being employed:

$$E\left(y_l^{k,c}\right) = P_l^{k,c}\ w_l^{k,c} \tag{3}$$

where $P_l^{k,c}$ denotes the probability of being employed.

The extensive and insightful literature on job matching (Pissaridès, 1985, 2000) turns out to be useful in linking the individual probability of finding a job to the state of the labor market. This literature specifies not only matching functions but also relates the probability of finding a job to the number of vacant jobs (V_l) and unemployed people (U_l) in location *l* that is consistent with the job-matching process and the Beveridge curve.

Consistent with the literature on the job-matching function (Petrongolo and Pissaridès, 2001), the probability of finding a job at the individual level (or the job-finding rate at the aggregate level) is positively related to the vacancy rate–unemployment rate ratio (also called the tightness ratio) at location l (V_l/U_l) where V_l and U_l denote respectively

the number of vacancies and the number of unemployed workers. The job-finding probability is given by

$$P_l^{k,c} = \beta(V_l/U_l) \tag{4}$$

with $\partial\beta \Big/ \partial(V_l/U_l) > 0$. The exact form of the $\beta()$ function is, of course, unknown. Shimer

(2007) shows that, in a mismatch model, the implied relationship between the job-finding rate and the tightness ratio takes a concave form. This form might be captured—for any value of the *V*-*U* ratio—by the following probability function:

$$P_l^{k,c} = 1 - e^{-(V_l/U_l)}. \tag{5}$$

This function is increasing in the *V*-*U* ratio, takes a concave form, and is bounded between 0 and 1, which ensures the consistency with the concept of probability.[9]

9 There is a direct connection between equation (5) and the matching function. See Petrongolo and Pissaridès (2001) for details. Indeed, if one denotes n the number of job matches and defines the matching function n = n(U,V), the n/U ratio can be seen as the probability of finding a job for unemployed workers. n/U is characterized by equation (5) if one assumes that (a) each employer sends one job vacancy randomly to one single unemployed worker; (b) all unemployed workers are all the same; (c) the degree of matching is perfect; and (d) U is large enough with respect to V. The equivalence might be checked through a Taylor expansion.

The dynamics of the job vacancy rate and the unemployment rate in region l are both driven by changes in the labor supply as well as by aggregate factors unrelated to the labor supply X_l, such as the economic cycles and the resource booms. Hatton and Tani (2005) show that accounting explicitly for the status of the regional economies is important for capturing the displacement effect of international immigration. The changes in the labor supply are driven by the inflows of international immigrants that are known by the prospective internal migrant. The flow of TFWs and permanent immigrants into province l is denoted respectively by T_l and I_l. Their respective impact on V_l and U_l is captured by the V and U functions with different sensitivities between the two flows. The other factors are denoted by X_l and include those related to the business cycle in region l. Their impact on the number of vacant jobs and unemployed agents is captured by the $\delta()$ and the $\theta()$ functions respectively. We have:

$$V_l = V(T_l, I_l) + \delta(X_l) \quad (6)$$

$$U_l = U(T_l, I_l) + \theta(X_l). \quad (7)$$

Given the design of immigration policies involving TFWs and permanent immigrants, the impact of TFWs on the vacancy rate is higher in absolute terms than the impact of permanent migrants. Denoting $\partial V_l/\partial T_l = \alpha_T$ and $\partial V_l/\partial I_l = \alpha_I$, we have $\alpha_T < \alpha_I < 0$.[10] The impact on the unemployment rate also differs between the two categories of international migrants. For TFWs, since their visas are subject to the TFWs' allocation to a vacant job and give no rights in terms of family reunification, there is no impact on unemployment, i.e., $\partial U_l/\partial T_l = \gamma_T = 0$. For permanent immigrants, in contrast, the net total impact is ambiguous, at least on a theoretical level. On the one hand, some permanent migrants can be unemployed if there is some mismatch between their skills and the ones required in the local labor market. Furthermore, even if they find a job, some of their accompanying family members might be unemployed. On the other hand, permanent migrants can exert positive externalities on the aggregate unemployment rate. Indeed, given their skill level (the point system positively selects those with respect to their education level) and/or their profiles (permanent immigrants include special classes of investors and entrepreneurs), these permanent immigrants can create jobs and hence decrease unemployment. Furthermore, the inflow of family members such as the children can increase the demand for services such as education and health. The global impact is therefore the net impact of the direct effect on unemployment and the effect of these positive externalities and is a priori unknown. Hence, $\partial U_l/\partial I_l = \gamma_I$ might be negative, positive, or close to zero if both effects offset each other.

At the individual level, the impact of an increase of TFWs in region j on interprovincial migration into region i is captured by the effect on the probability of a positive differential expected utility $E(U_{ij}^{k,c})$:

$$\frac{\partial Prob(m_{ij}^{k,c}=1)}{\partial T_j} = \frac{\partial Prob(E(\Delta_{ij}^{k,c})>0)}{\partial P_j} \frac{\partial P_j}{\partial V_j} \frac{\partial V_j}{\partial T_j}. \quad (8)$$

If we denote the first term of the RHS of expression (8) by $\mu_j^{k,c}$, and assuming a functional form such as (5) for the job-finding rate, we have:

10 Given the design of the immigration policy regarding TFWs, α_T should be close to -1.

$$\frac{\partial Prob(m_{ij}^{k,c}=1)}{\partial T_j} = \mu_j^{k,c}\alpha_T \frac{e^{(U_j/V_j)}}{U_j}. \quad (9)$$

This impact is unambiguously negative as $\alpha_T < 0$. Its magnitude depends positively on the impact of the probability of job finding and on the impact on the expected differential utility of migration that is, for instance, a positive function of wages at destination , $w_j^{k,c}$. It also depends on the size of the negative impact on the job vacancy rate α_t , which should be proportional to the inverse of the size of the working force in region *j*. It also depends on the status of the provincial labor market, as reflected by the last term in (9).

The impact of permanent immigrants is given by:

$$\frac{\partial Prob(m_{ij}^{k,c}=1)}{\partial I_j} = \mu_j^{k,c}\left[\frac{\alpha_I}{V_j} - \frac{\gamma_I}{U_j}\right] e^{(U_j/V_j)} \frac{V_j}{U_j}. \quad (10)$$

The sign of this expression is ambiguous. Three cases might be considered at the theoretical level.

First, if $\gamma_I = 0$, i.e., if the positive externalities of permanent immigrants perfectly offset the direct negative effect on unemployment, then we have an expression that is similar to (8) for TFWs . $\frac{\partial Prob(m_{ij}^{k,c}=1)}{\partial I_j}$ is in this case unambiguously negative and the impact in absolute value of TFWs is higher than the one of permanent immigrants since $|\alpha_I| < |\alpha_T|$. Both types of immigrants tend to bring about a decrease in the individual immigration probability of prospective interprovincial immigrants because they decrease the V-U ratio and the expected probability of finding a job.

Second, in the case where $\gamma_I > 0$, i.e., if permanent migrants tend to increase unemployment on the whole, then the total impact on the probability of migration is unambiguously negative since the impact on unemployment reinforces the one on vacant jobs. In this case, it is unclear how the global magnitude of the effect compares between TFWs and permanent migrants.

Finally, if $\gamma_I < 0$, i.e., if positive externalities of permanent migrants dominate, then the direction of their impact on internal migration is unclear. If the impact on unemployment more than offsets the negative impact on the vacancy rate, then there is a possibility that the inflow of permanent migrants will foster rather than to deter internal migration. In this case, TFWs have unambiguously a more negative effect on internal migration than permanent migrants.

As usual, the impact of each inflow of international migrants can be computed by summing up (8) and (9) over the total number of internal migrants belonging to category *c*, i.e., by summing up over *k*.

2.2 Impact of international immigration on internal outflows

In order to consider the impact of international immigration on internal emigration, we can first make the assumption of symmetry. If we assume than equation (5) is similar for region *i* and *j*, then everything above applies in a similar way to m_{ji}. A given inflow of TFWs in region *j* tends to lower the probability of employment for the natives of region *j*, which increases the incentive to migrate out of region *j*. Thus the extent of the impact of international immigration on internal emigration is similar to the impact on internal immigration, but with the opposite sign. The impact of international immigration on the local labor market and the potential emigration of natives is typically the one that is investigated in the literature. The implication of the symmetry assumption is that we can investigate the impact on net interregional balances (i.e., on the difference between internal immigration and internal emigration). The global impact of international immigration is assumed to be the result of the two effects that are of similar magnitude.

However, this assumption of symmetry might be rejected in practice. In the real world, there are at least three deviations from the basic assumptions of our model. First, while the impact on internal immigration might operate mainly through the expectation channel as outlined in the model, the impact in terms of internal outflows can also go through a pure substitution effect if the TFW program has some flaws.[11] Second, at home, in face of a reduction of V_i due to incoming international migrants in region *i*, the reduction in terms of expected utility $E(U_{ij})$ might be lower. Reduction of expected income might be compensated for by access to alternative sources of income such as family resources. This is especially relevant for young workers at the start of their professional lives. If this is the case, we should expect that a given inflow of international migrants, particularly TFWs, into a given province will increase interprovincial emigration out of that province but to a lesser extent than it reduces interprovincial immigration from the other provinces.

Third, there might be a difference in the uncertainty with which incomes at the individual level in both locations are known. Kennan and Walker (2011) for instance assume that individuals know their wage in their current location but need to move to another location to determine their exact prospective wage there. This asymmetry can be important if individuals are risk-adverse. If the inflow of international immigrants also reduces wages—something not considered in our framework—the impact of these international immigrants on internal immigration and internal emigration might differ. At the empirical level, the existence of such asymmetries suggests that we should investigate these two effects separately and that gross flows should be analyzed in addition to the dynamics of net balances of interregional flows. In the econometric investigation, we will look first at the impact on net immigration flows and will then consider the effect on gross flows to allow for the existence of asymmetries.

2.3 Variation across categories of internal migrants

11 There have been recent concerns in Canada that, despite the design of the TFW program and particularly despite the LMO test in place, some native workers have been replaced by TFWs. For instance, in a recent series of scandals, a McDonald's franchisor in Victoria was accused of pushing aside Canadians for lower-paid workers; and a Weyburn, Saskatchewan, pizzeria was accused of letting go veteran servers for foreign workers. See also Gross (2014) on the various flaws of the TFW program leading to crowding-out effects.

The main result associated with equation (9), i.e., the negative impact of TFWs on net internal migration, is likely to vary across categories of individuals. One important distinctive feature is definitely age. Two situations might explain why the expected impact of TFWs on net immigration is much greater for young residents than older ones. The first is associated with the level of migration costs $C_{ij}^{k,c}$. This might be expected to be higher for older people than for younger; for example, home ownership is a major impediment to migration. Family ties and the expected adaptation of dependents are also important elements of the costs of migration. However, a given decrease in the probability of expected employment in the destination province, due to the inflow of TFWs, will lead more young potential migrants to switch from expected utility gains to expected losses associated with emigration. Similarly, an inflow of TFWs into the province of origin of young potential migrants will lead more young natives to leave the province; this might relate to the size of $\mu_j^{k,c}$. It is possible, although difficult to assess, that a reduction in the perceived probability of employment, triggered by the decrease in the number of vacant jobs, might be higher for young workers. Young workers are less experienced and, for individuals under 25, it is often their first job prospect. Therefore, they might take the macroeconomic information associated with variations in the tightness ratio more into account. In contrast, experienced workers tend to be specialized in one sector, if not one specific occupation, and might look for prospects in some specific sectors. If true, both effects go in the same direction and lead to a greater reduction in net internal migration of young prospective migrants.

A second important dimension is gender. Both effects, although to a lesser extent than across ages, might also be relevant to explain differences between males and females. First, migration costs might be higher for females. Migration costs include psychic costs that are related to risk aversion. Some literature suggests that women might be more risk-averse with respect to risky projects such as migration. They might also value family ties more. The second effect related to the macroeconomic information associated with variations in the *V-U* ratio is more speculative. If TFWs take vacant jobs more in sectors that typically hire more male (primary and secondary sectors) than female (tertiary), then the effect in terms of reduction of employment probability would be higher for males. Unfortunately, the available data do not allow us to assess the validity of this conjecture. However, we know that there has been massive hiring of TFWs in the primary sectors such as agriculture and resource extraction. By itself, the seasonal agricultural worker program attracted 12 per cent of all TFWs in 2012. Conversely, the Live-in Caregiver program, which should attract more female workers than male, attracted only 3 per cent of the TFWs in 2012. All in all, this might suggest than men might be more affected in terms of mobility than women. The highly detailed interprovincial migration data by demographic groups will allow us to test whether these conjectures are verified by the data.

3. Econometric analysis

3.1 Benchmark econometric specification

The theoretical model in the previous section is a useful guide for defining the relevant econometric specification and capturing the impact of international immigration flows on internal mobility. The benchmark specification relates to the analysis of net

interprovincial immigration. It will be extended below to the analysis of gross migration flows (see Section 4).

The key determinants of internal migration predicted by theory are related to the expected income that, in turn, is a function of the probability of employment and the wages (respectively P_j and W_j in Section 2). The probability of employment is related to the V/U ratio, which depends on the inflows of international migrants, the provincial business cycle, and provincial terms of trade (resource boom). One should emphasize that it is important to have the variables affecting the labor demand defined at the regional level.[12] Finally, the model identifies some roles for amenities as well as the bilateral migration costs.

The benchmark econometric specification for net immigration in province j at time t is given by:

$$m_{j,t}^{k} = \gamma_j^k + t_t^k + \rho^k m_{j,t-1}^{k} + \beta_1^k T_{j,t} + \beta_2^k I_{j,t} + \beta_3^k yc_{j,t} + \beta_4^k u_{j,t} + \beta_5^k R_{j,t} + \beta_6^k A_{j,t} + \varepsilon_{j,t}^k \qquad (11)$$

where m_j^k captures the rate of net interprovincial immigration in the province of agents of category k at time j.

In equation (11), T_j and I_j represent the total number of TFWs and landed permanent immigrants, respectively, coming into province j at time t. $yc_{j,t}$ and $u_{j,t}$ represent, respectively, the economic cycle and the unemployment rate of province j at time t. $R_{j,t}$ is a measure of the provincial terms of trade that is supposed to capture variations in wages at the aggregate level. We capture amenities $A_{j,t}$ through public expenditures and/or taxes as a share of provincial GDP at time t. $\varepsilon_{j,t}^k$ is an error term and γ_j^k and t_t^k are fixed effects capturing unobserved factors that are specific to province j (like natural amenities) and specific to time t (like the national business cycle). Since our approach is monadic in nature, the time-invariant migration costs such as the ones related to geography, remoteness, or different languages C_{ij}^k in expression (2) are fully captured by the provincial fixed effects γ_j^k. These provincial fixed effects also capture the role of province-specific, time-invariant factors such as differences in institutions. The time dummies t_t^k capture the overall variation in costs such as the general decrease in transport costs.

The regression model is a dynamic panel data model that allows us to capture short- and long-run effects of international migration channels. The introduction of dynamics in the econometric specification represents a deviation from the theoretical model presented in Section 2 but it is needed to capture the mechanisms at stake in the real world. There are two main reasons for this. First, interprovincial mobility is highly persistent over time at the macroeconomic level. Failure to account for such persistence would lead to some omitted-variable bias to the extent that past internal migration is correlated with some covariates of (11) such as unemployment U or the provincial terms of trade. Second, the model features migration decisions that are driven by variations in expected

12 In this respect, in an econometric model capturing the impact of immigration on domestic wages and internal migration, Hatton and Tani (2005) insist on the need to explicitly include regional proxies of labor demand shocks instead of nationwide ones. Omitting these variables is indeed likely to generate significant biases in the estimation of coefficients of an equation like ours, since they are obviously correlated with the key covariates $T_{j,t}$ and $I_{j,t}$.

probability of employment in a static way. The real world is more complex. In the short run, some prospective internal migrants might be deterred from migrating simply because the vacant jobs they were targeting have been filled up by international migrants. In the medium run, other potential internal migrants may just stop searching for vacant jobs in provinces with large numbers of TFWs. Another dynamic mechanism at work comes from the fact that first-time migrants tend to move alone at first but, in the long run, they can attract their partner, some relatives, or some friends. In this perspective, we can expect the short-run effect to be smaller (in absolute value) than in the long run. Potentially, the long-run displacement effect could even be larger than 1. In the framework of equation (11), the long-run effect of $T_{j,t}$ is $\beta_1^k / (1-\rho^k)$.

3.2 Definition of variables and data sources

3.2.1 Interprovincial migration data

The interprovincial data for a variety of age groups and by gender $m_{j,t}^k$ are available on a yearly basis from 1971 to 2011 from Statistics Canada CANSIM database Table 510012 on a net basis (in-migration minus out-migration) and on a gross one. In the benchmark specifications, the interprovincial migration variables for any demographic group in province *j* during year *t* are measured as the ratio of net interprovincial migration (*j, t*) divided by the corresponding population stock in the same demographic group at (*j, t*). Gross migration flows are also used for some specifications. Population estimates are taken from CANSIM Table 510001 and pertain to the population of the demographic subgroup living in the province on July 1st of the given year.

In contrast to some earlier proxies used in the existing literature—such as variations in the resident population—the interprovincial net migration data refer directly to the net flows of interprovincial immigrants (in-migration minus out-migration) in a given province during year *t*.[13] These data are derived by Statistics Canada from income tax data. Every year, Canadian households that earn income have to submit a federal income tax return in which the number of dependents and the province from where the last income tax return was submitted are stated. A person residing in a province on December 31st has to fill out the income tax return for that province. Consequently, the data on interprovincial migration flows for year *t* pertain to the movement of population on December 31st between year *t* and *t-1*.

The interprovincial migration flows are available for different age brackets. We use migrants between the ages of 18 and 65 as a measure of working-age migrants. Other subcategories involve migrants between 18 and 25, between 25 and 45, and between 45 and 65. The data are also available by gender for each subcategory.

13 Hatton and Tani (2005) emphasize the benefits of such an analysis using direct measures of internal migration as opposed to proxies derived, for instance, from the variations in the population stocks. Hatton and Tani's measure of flows derived from the records of the British National Health Services is definitely a valuable step toward a better measurement of internal migration. An additional feature of the Canadian regional case is that, given the size of provinces, the share of interprovincial commuters is negligible, which minimizes the case of a systematic downward bias in the measurement of mobility.

3.2.2 International immigration

As noted before, international migrants involve two different categories: TFWs ($T_{j,t}$)) and permanent immigrants ($I_{j,t}$). Both variables refer to the flows of immigrants coming into a province during a given year, divided by the population of the province. The international immigrant data that come from special tabulation data (computed at our request by the government department, Citizenship and Immigration Canada) for both the TFWs and the permanent immigrants refer to the total flow of new immigrants entering province *i* during year *t*. At our request, the data were also broken down by country of origin and by destination province on a yearly basis from 1980 to 2012.[14]

Temporary foreign worker program: The TFWs come into Canada under a variety of programs that were set up mainly by the federal government to reduce labor shortages in the Canadian economy. Under these programs, employers need to contact the immigration authorities to be allowed to hire an international worker on a temporary basis to fill a vacant occupation. In some cases, immigration authorities require a labor market opinion test to be conducted to ensure that this particular position cannot be filled by a Canadian worker. According to Worswick (2013), TFW entries with labor market opinion accounted for 38 per cent of the total number of TFWs admitted in 2012. Employers also need to pay some fees to cover part of administrative costs.[15] The TFW is assigned to a specific job and comes to Canada on a temporary basis with limited rights compared with permanent immigrants, particularly with respect to social security benefits and possibilities of family reunification. Thorough descriptions of that program and its evolution over time can be found in Gross and Schmitt (2011) and Worswick (2013). The design of the program is such that the incoming TFWs are characterized by employment rates and participation rates of 100 per cent.

A point that will prove important in our analysis of endogeneity is the respective roles of the federal and the provincial authorities in the admission of TFWs. In general, the institutional organization of immigration policies regarding TFWs gives limited powers to provincial authorities. In principle, the institutional procedures to bring in TFWs apply to all provinces. Nevertheless, Citizenship and Immigration Canada has agreements with provinces and territories on how they share responsibility for immigration. Some provinces have signed particular agreements regarding TFWs that are gathered in appendixes" to the TFW agreement.[16] These agreements might facilitate and speed up the immigration of TFWs in some provinces that are particularly in need of labor in certain occupations. For instance, they might give exemptions for labor market opinion tests to bring TFWs more quickly. Five provinces currently have such agreements. Nevertheless, in all cases (except Quebec), they are very recent. Most have been signed after 2006 and implemented after 2007 and were therefore not operational during the major part of the investigation period.[17]

14 In the benchmark analysis, we do not use the dyadic dimension of the migration data. The time-varying pair, country of origin, and province of destination, are nevertheless used later on for TFWs in the instrumental variable analysis.

15 The current fee level is CAD$275. See Gross (2014) for details.

16 See www.cic.gc.ca/english/department/laws-policy/agreements/index.asp.

17 The dates of signature of these agreements are 1991 for Quebec, 2007 for Nova Scotia, 2008 for Ontario, 2009 for Alberta, and 2010 for British Columbia.

Permanent immigrant program: The design of the permanent immigrant program is totally different from the one governing TFWs. Permanent immigrants arrive in Canada through three different channels. First, economic immigrants are selected under the Canadian immigration point system. Permanent immigrants also arrive in Canada under the family reunification program and as refugees. For the main part of the analysis, we will consider only the first category, i.e., economic migrants. This system gives preferential access to applicants who fall into a specific age bracket and who have high levels of education. When selected, these permanent immigrants receive an immigration visa allowing them in general to settle in their desired location place. These permanent immigrants come with rights of family reunification that allow the immigrants to bring their close relatives (children and spouses or husbands) with them. In contrast to TFWs, the main purpose of the incoming permanent immigrants is to favor the long-run development of the Canadian economy rather than decrease the extent of the labor shortages. Green and Green (2004) provide an historical account of the permanent immigrant system in Canada.

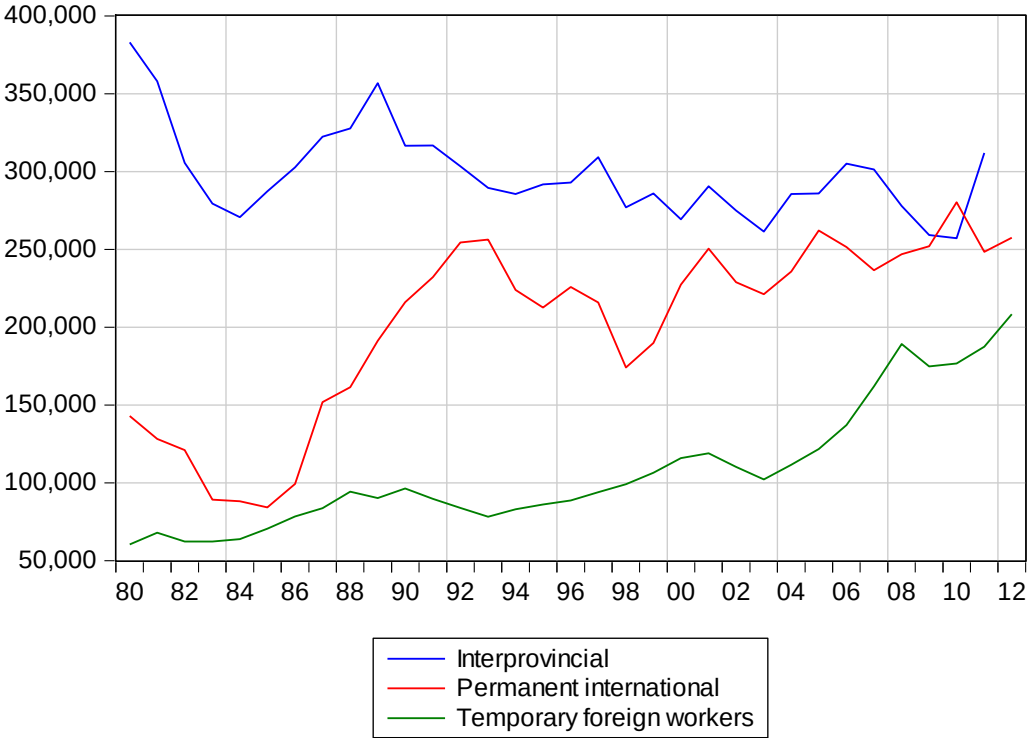
While permanent immigrants are positively selected in terms of education levels, there is some prevalence of mismatches between their skills and what is needed in the short run in the Canadian provincial economies. For example, as of January 2013, data from the Labor Force Survey indicate that the participation rates of permanent immigrants across provinces vary between 55.9 per cent in Newfoundland and Labrador and 70.6 per cent in Alberta. Comparable numbers for the Canadian-born vary between 60.9 per cent and 73.1 per cent.

The relatively low participation rate of permanent immigrants is due to at least two main factors. First, permanent immigrants are known to concentrate in the big Canadian cities where they can benefit from the various externalities of their diaspora (see Beine, Docquier, and Özden, 2011). One might also assume that they have some preference for urban environments. This means that their migration location choice is guided not only by the highest probability of employment (or, equivalently, by the highest level of the V/U ratio) but by other considerations. Second, over our investigation period, the point system was designed to favor prospective candidates with the highest education level. This means that vacant occupations requiring specific skills but no university degree—such as carpentry and plumbing—can hardly be filled with immigrants using the point system. Furthermore, there is also a presumption that education levels are not comparable across origin countries and need to be adjusted with respect to the Canadian counterparts. For example, based on skill data from the International Adult Literacy Survey performed in Canada, Coulombe and Tremblay (2009) found that, on average, international immigrants to Canada have more years of schooling but a lower skill level than the Canadian-born population. Measured at the mean skill level of the immigrant population, the skill deficiency (skill-schooling gap) of the foreign-born population corresponds to three years of formal education in Canada. Part of the gap (one year of it) comes from weak knowledge of English or French. According to Coulombe and Tremblay (2009), the remaining two years of the skill-schooling gap could be attributed to a lower quality of education for immigrants in source countries that have a lower level of development (Hanushek and Kimko, 2000). Consequently, even for jobs requiring university education, permanent immigrants to Canada might have problems getting their credentials recognized in the Canadian labor markets.

The above characteristics of the point system have shed some doubts on its ability to select the most productive immigrants for the Canadian economy, at least in the short run. This has led to some recent reforms of the system. In 2012, the federal government announced substantial changes to the permanent immigrant point system, to take effect in 2014. More weight will be given to English and French proficiency. The points awarded for foreign education would now reflect the foreign credentials' factual value in Canada.[18] Finally, employers would be allowed to hire applicants more rapidly when specific needs are demonstrated in the Canadian labor market. Changes in this direction were also announced by the Quebec government in February 2014.

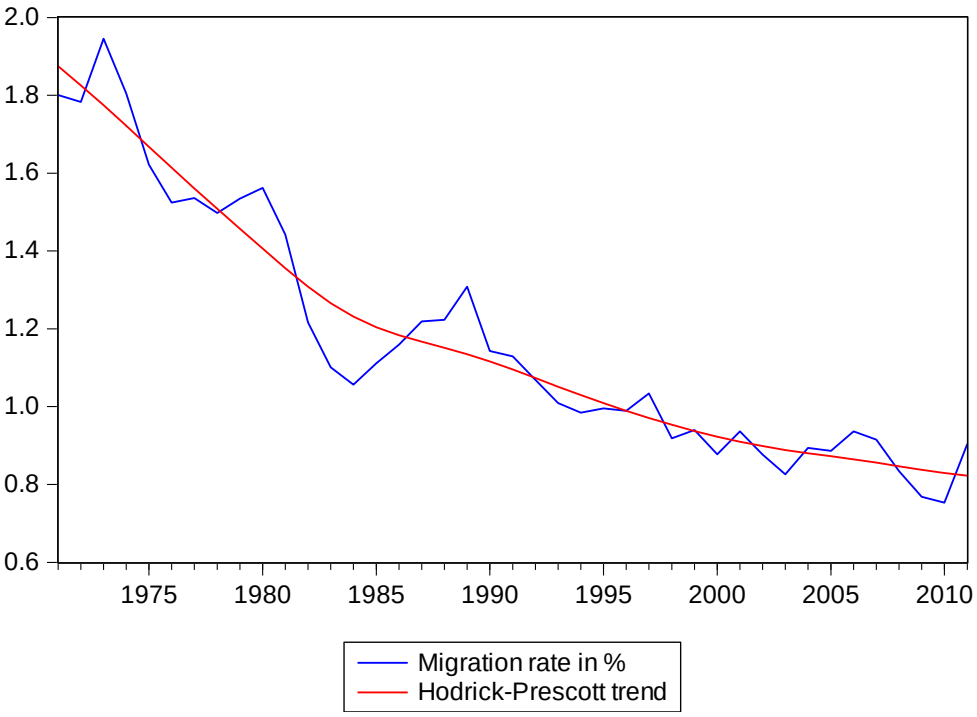
3.3 Evolution over time

Figure 1: Three immigration flows into Canada: 1980-2012



18 The details for this policy shift have not yet been announced.

Figure 2: Interprovincial migration rate: 1971-2011



The annual numbers for the three immigration flows for Canada as a whole (interprovincial in-migrants, permanent immigrants, and TFWs) are depicted in Figure 1 for the 1980–2012 period. In 1980, the interprovincial migrant flow was much larger than the two international channels combined. The situation is reversed in 2012. The permanent immigrant flow rose sharply between 1985 and 1993 and varied around 250,000 people per year thereafter. The flow of TFWs shows an upward trend during the whole period but accelerated after 2003, a period that coincides with the resource boom. The rate of TFWs (ratio to population) varies considerably across provinces and over time. In 2012, the TFW rate in relative terms was the largest in British Columbia (1.3 per cent) and Alberta (1.2 per cent) and the lowest at 0.3 per cent in New Brunswick and Nova Scotia. In Alberta during the peak of the resource boom between 2003 and 2007, the TFW rate increased from 0.37 per cent to 1.37 per cent of the Albertan population.

The interprovincial migration rate and its decreasing trend between 1971 and 2011 are depicted in Figure 2. The decreasing strength of interprovincial migration in the last decades corresponds to the stylized facts observed by Molloy, Smith, and Wozniak (2011) for interstate migration in the United States over the last decades.

3.4 Other data

The model developed in Section 2 is a useful guide for selecting the controls. Basically, we need to capture three types of variables: (i) the variables affecting the probability of employment; (ii) the variables acting as proxies for the different wages across provinces; and (iii) the variables related to time-varying amenities at destination.

Probability of employment variables: We consider two variables affecting the probability of employment. One is the cyclical component of provincial output, i.e., the provincial output gap. The annual output gap of the 10 Canadian provinces is constructed in two steps. First, we use the Hodrick and Prescott filter on the logarithm of quarterly real GDP estimates (we thank The Conference Board of Canada for supplying these). The output gap data were annualized in the second step and are available from 1981 to 2012. The other variable is the provincial unemployment rate. Unemployment rate data were downloaded from the Labor Force Survey of CANSIM Table 2820055; the data are available from 1987 to 2012.

Variation in wages: Labor productivity, the ratio between real GDP and employment (from the Labor Force Survey), is used as a proxy for wages. Terms-of-trade changes might also drive substantial migration across provinces. Endowments of natural resources vary substantially across provinces. Large and sustained increases in the price of oil, for example, can encourage many Canadians to migrate to oil-rich provinces such as Alberta. We use a recent measure of the provincial terms of trade developed by Coulombe (2011) and used by Beine, Coulombe, and Vermeulen (2014) for Canada. Terms-of-trade changes are derived under the standard assumption that they could be approximated by the difference between the changes in the GDP deflator and the consumer price index. In order to approximate provincial terms-of-trade changes, the provincial GDP deflators are derived from the growth of nominal and real GDP of the Canadian provinces using the Conference Board data. We then subtract the growth in national CPI (computed from CANSIM Series V41693271) from the growth in provincial GDP deflator. Considered together, variations in labor productivity and terms-of-trade measures capture the differences in the change in national income across provinces.

Time-varying amenities at destination: The proxies for these variables are the relative shares of government expenditures and taxes. Provincial government expenditures and taxes are taken from Statistics Canada's provincial economic accounts in CANSIM Table number 3840004. We use all provincial government expenditures and all autonomous revenues. We use nominal data divided by nominal GDP.

4. Econometric results

The results of our benchmark specification are presented in tables 1 to 4. The analysis illustrates the impact of the two international migration channels on the interprovincial net immigration flows. The effect varies substantially across age groups and, to a lesser extent, by gender. Table 5 summarizes the quantitative effects of TFWs on the interprovincial migration flows of various demographic groups. The results of alternative specifications and robustness analysis, including IV specifications, are presented in tables 6 through 12.

4.1 General direction of results

Given the amount of econometric evidence that we report in the tables, four main results emerge consistently from the estimation of the benchmark regressions involving different age profiles and genders. These main results are also confirmed in most of the alternative specifications and in the robustness analysis.

First, the effect of the TFW variable on the net interprovincial immigration is always negative, substantial, and highly significant. The decrease in net immigration is driven by both a decrease in gross immigration and an increase in gross emigration. Nevertheless, the former effect tends to dominate the latter, from both a quantitative and a statistical point of view. While the decrease in gross immigration is always highly significant at the 1 per cent level, the impact on gross emigration is less obvious and depends on the profiles of the interprovincial migrants.

Second, the direction of the effect of permanent immigrants on interprovincial flows is more uncertain than the one concerning the TFWs. In general, we find a negative impact of permanent immigrants on net immigration. This impact is not always significantly different from zero and its statistical significance depends on the age profile of interprovincial immigrants. It is noteworthy that the magnitude of the impact of permanent immigrants, when negatively significant, is always much lower in absolute terms than the one for TFWs. This important result is in line with the theoretical story of a lower degree of skill matching of permanent immigrants. We find very limited evidence of a positive and significant impact by permanent immigrants in the case of booming provinces. This suggests that positive externalities, while existing, are in general not large enough to counteract the negative impact in terms of job vacancies.

Third, the impact of TFWs and, to a lesser extent, of permanent immigrants on internal mobility displays some significant variability across the profiles of the interprovincial migrants. Unsurprisingly, the impact of international immigration, particularly by TFWs, is higher for young prospective internal migrants with slightly more male migrants than female affected.

Finally, the traditional controls in the regressions generally appear with the expected sign, with the exception of fiscal variables. Provincial unemployment rates and economic cycles that affect the expected probability of employment have the expected sign but display significance levels that vary with the age profiles. Direct proxies of provincial wages based on GDP do not perform as well. In contrast, proxies of provincial windfalls based on provincial terms of trade turn out to be powerful control variables and ensure that our results rely on well-specified frameworks.

4.2 Benchmark results

Tables 1 to 4 report the benchmark regression results based on specification (10) for the impact of international immigration flows on net interprovincial immigration flows for various demographic groups. Table 1 shows the results for all interprovincial migrants (both genders and all ages) and all interprovincial migrants in the working-age group (18 to 64 years old). We generally start with a more general specification and then use a parsimonious specification that can be estimated over a longer period; this is done because some covariates are unavailable.

Two points have to be taken into consideration regarding the interpretation of the estimated effects of the two international immigration channels. First, the model estimated for the benchmark regressions is a dynamic model. Therefore, strictly speaking, point estimates cannot be compared in a straightforward manner across the various specifications since the estimated coefficient of the lagged dependent variable

turns out to vary.[19] In order to compare the effect of TFWs on interprovincial migration of various demographic groups, one can compute the estimated long-run effect. This long-run effect of TFW is given by $\beta_1^k / (1 - \rho^k)$ and its implicit *t*-ratio is the same as the one associated with the point estimate of TFWs β_1^k.

Second, the various interprovincial flows are measured as a ratio to the population of the receiving province of the specific demographic group. The two international immigration flows are measured as the ratio of these flows to the overall population. Consequently, if one wants to know the estimated effect on the interprovincial flows of an increase of one TFW, the point estimates reported for the TFW have to be adjusted by the relative size of the population subgroup to the total population. Long-run effects and adjusted effects are reported in Table 5 for the impact of TFW for the key specifications that include the terms-of-trade variable.

4.2.1 Effect(s) of TFWs

The main result that emerges from tables 1 to 5 refers to the relative impact of TFWs on interprovincial migration across different demographic groups. As mentioned in Section 4.1, the various point estimates are always significant (at the 1 per cent level) and display the expected negative sign.

However, the point estimates vary considerably across age groups and sexes. The key results from a quantitative point of view for the TFWs are summarized in Table 5. The point estimates of the TFWs are displayed in column (1) of Table 5 and represent the short-run effects. These are directly comparable to estimates of displacement effects in existing studies such as Hatton and Tani (2005).[20] A larger point estimate (as found for the 18 to 24 year olds) indicates that the short-run impact of an increase in TFWs is *proportionally* more important for this subgroup than for the other demographic groups. The short-run effect is the smallest for the all-migrant variable, indicating that the substitution effect of TFWs is less for the non-working population (children and seniors). The (unadjusted) long-run effects displayed in column (3) of Table 5 are larger since the impact of TFWs on interprovincial flows operates through a dynamic channel. The long-run effect of TFWs on interprovincial net migration flows is proportionally 40 per cent larger[21] and 103 per cent larger for the 18 to 24 age group than for the 25 to 44 and 45 to 64 age groups, respectively. The effect varies also by gender; the effect on young male interprovincial migrants is proportionally 29 per cent larger than for young females.

The short-run adjusted effects of TFWs depicted in column (2) of Table 5 measure the effect of an increase of one TFW on the number of interprovincial immigrants of the subgroup. An increase in one TFW translates into a decrease of 0.53 interprovincial migrant of all ages in the short run. For the working-age population, the short-run reduction is 0.36 interprovincial migrants. These numbers are directly comparable to previous estimates of the literature. Hatton and Tani (2005) obtain an insignificant

19 Note, however, since estimates of ρ^k are fairly similar across regressions, the ranking of short-run effects and long-run effects across categories of natives is similar.

20 In particular, our estimates compare with the effects reported in their Table 7.

21 In all cases, the comparison between long-run elasticities is based on the difference in percentage between the absolute values.

coefficient of 0.30 for the full sample, and a significant effect of 0.444 for a restricted sample of Southern British regions. In general, our estimates of the displacement effect of TFWs are always more substantial and more significant. We ascribe that partly to the specific profile of Canadian TFWs.

The long-run adjusted effects are displayed in column (4). For the overall population, an increase of one TFW decreases interprovincial migrants of all ages by 1.82 persons in the long run. It might be surprising at first glance that the effect is larger than 1. However, one has to consider the fact that, contrary to TFWs, interprovincial migrants tend to move with spouses and children, especially for the long term. A worker can move to a province for a short while, and then family might follow when the job is secure and the spouse can also find a work in the same province. Furthermore, an increase of one TFW translates into a decrease in interprovincial mobility of 1.23 people in the working-age population. Children are now excluded but one can speculate that the number exceeds one because of the spouse effect.

Those results suggest that the TFWs are close substitutes for prospective interprovincial migrants and the effect is proportionally stronger for the young, especially the young male. This result is important because the TFW program was designed from the start to avoid such substitution effects. Firms willing to hire TFWs have to demonstrate that the new workers will not take the place of native workers. Our empirical evidence suggests, while this might be the case in the local area, the implementation of the program exerts additional substitution effects on other native workers. These effects are demonstrated in a decrease of interprovincial mobility of potential workers, spouses, and children.

4.2.2 Effect of other controls

Across tables 1 to 4, the impact of permanent immigrants on net interprovincial flows is always negative, sometime significant at 5 per cent but the results are far from robust. When negative and significant, the impact of permanent immigrants on the interprovincial flows is always much smaller, in absolute values, than the impact of TFWs. This result is consistent with the theoretical framework allowing for a lower degree of skill matching of permanent immigrants ($|\alpha_T| < |\alpha_I|$). It is also consistent with a sufficient level of positive externalities that offset the direct positive effect on unemployment.

The impact of terms-of-trade changes on interprovincial flows in tables 1 to 4 is always positive and significant at the 1 per cent level. Furthermore, when the terms-of-trade effect is introduced into the specifications, the impact of some other controls becomes less or non-significant. This point is illustrated in particular through the specifications for the male interprovincial flows in Table 3. For all age groups, the t-ratio of the business cycle variable decreases substantially when the terms-of-trade variable is added to the list of controls. The unemployment rate and the business cycle variables generally have the expected sign but the magnitude and the significance of their influence depends on the age profile. In general, they turn out to be significant mainly for the young prospective migrants. In this framework, changes in terms of trade might be viewed as more permanent factors compared with provincial business cycles. The rather weak and non-robust impact of public expenditures does not survive the introduction of the terms-of-trade variable. This suggests that the measured impact of public expenditures in some regressions might result from an omitted variable bias. The effect of taxes is generally not significant.

**** Insert Table 1, Table 2 Tables 3, 4, and 5 around here ****

4.3 Alternative specifications

In this section, we provide further evidence of our main results in alternative frameworks. We first disentangle the impacts on net immigration: the impact on gross *emigration* and on gross *immigration*. We then include non-economic permanent migrants.

4.3.1 In- and out-migration

As explained in Section 2, the impact on interprovincial immigration that has been documented so far can be seen as the combined influence of two different channels. The first channel is the impact on the outflow of native workers; the second one is the effect on provincial immigration. While the theoretical framework sketched out in Section 2 does not allow for asymmetric effects of that kind, there are still good reasons to believe the impact might not be purely symmetric in the real world. We therefore conduct separate analyses of the impact of TFWs and permanent immigrants on interprovincial emigration and immigration. Table 6 looks at the impact on gross emigration. This is the type of effect that has been mainly investigated in the existing literature. Table 7 looks at the impact on gross immigration, which has been considered much less in previous studies.

**** Insert Tables 6 and 7 around here ****

Basically, the results of tables 6 and 7 lead us to two important conclusions. First, both channels of international immigration contribute to a decrease in net interprovincial immigration. In other terms, there is evidence that TFWs lead to moderate native outflows to other provinces and tend to deter the arrival of natives from other provinces. Second, there is strong evidence of a significant difference in the magnitude of both channels. While the impact on native outflows is moderate, especially for older migrants, there is a strong impact in terms of decreasing provincial immigration. In other terms, the effect in terms of net immigration is driven more by a decrease in immigration of natives from other Canadian provinces. This is an important finding, for at least two reasons. First, the traditional way of thinking about interprovincial mobility refers to native outflows, not inflows. Second, unlike the effect on outflows, the decrease in gross inflows is less directly observable and is best identified through econometric estimations.

Evidence of TFWs' asymmetric impact can be explained by a set of deviations from the assumptions used in the small theoretical framework of Section 2. For instance, the existence of outside options for prospective interprovincial emigrants in their native province might explain this asymmetry. For example, if young workers have access to family resources in case of unemployment, that might explain why the impact on emigration is less significant in terms of size. Uncertainty about the exact wage in alternative locations, combined with risk aversion of agents, can also rationalize the documented asymmetry.

4.3.2 Accounting for all permanent immigrants

**** Insert Table 8 around here ****

An additional robustness check concerns the definition of the permanent international immigrants who are included in the analysis. So far, we have included just economic migrants, i.e., those granted a permanent visa on the basis of their prospective economic impact, who enter Canada mainly through the point system. Other classes of permanent migrants—which we will call non-economic migrants for the sake of brevity—encompass mainly those who arrived in Canada for family reunification purposes or for humanitarian reasons (refugees). In any case, non-economic permanent migrants form quite a heterogeneous group with respect to their impact on the local labor market.

Compared with economic migrants, the expected impact of non-economic migrants is unclear. On the one hand, they should be less educated. They also generate what we called positive externalities in terms of vacant jobs though an increase in demand for specific services. On the other hand, it is not obvious that their degree of job matching with vacant jobs is lower than that of economic migrants. For instance, vacant jobs in some unskilled occupations such as waiters will not be filled by economic migrants selected through the point system but may well be taken by non-economic migrants looking for a job. Therefore, the global impact on the internal mobility of natives is more an empirical issue. In this robustness check, we include the non-economic migrants and assess the robustness of our results with that inclusion. Results are reported in Table 8.

The results of Table 8 yield basically two main messages. First, the inclusion of non-economic permanent migrants does not change the pattern of TFWs' impact on the internal mobility of natives in Canada. Elasticities of TFWs are very similar to the corresponding ones in tables 1 and 2. Second, non-economic permanent migrants do not appear to affect internal mobility significantly. While the impact of non-economic migrants is negative and higher in absolute terms compared with economic migrants, it is insignificant. The high level of uncertainty around the estimated elasticities might reflect the great diversity of profiles of these non-economic migrants.

4.4 Dealing with possible endogeneity concerns

The theoretical framework developed in Section 2 as well as the econometric investigation conducted so far have assumed that the provincial inflow of TFWs is either exogenous with respect to the interprovincial mobility of workers or at least uncorrelated with the error term in specification (10). This assumption might be questioned on several grounds but deviation from that assumption can result in inconsistent fixed-effect estimates of the coefficients of equation (10). In particular, the endogenous nature of TFWs can lead to biased estimates of their impact on interprovincial migration.

Before addressing this issue with econometric solutions, it is important to discuss the potential sources of endogeneity of TFWs and the implied direction of the bias, should that variable be endogenous. Endogeneity of TFWs in model (10) can, in principle, result either from possible reverse causality or from the fact that TFWs are correlated with unobserved factors affecting interprovincial migration. Identifying the particular source is important, both for the expected sign of the bias and for the solution to implemented.

4.4.1 Reverse causality

Reverse causality from interprovincial migration to the inflows of TFWs could be expected, for instance, if provinces with insufficient inflows of interprovincial migrants (or excessive outflows of their residents) expand the TFW program to offset the negative impact on the labor supply. If this is the case, reverse causality implies a negative correlation between the TFWs and the error term, which in turn implies that the estimated coefficients of equation (10) by FGLS would *underestimate* the true impact of TFWs on interprovincial immigration. It is important to emphasize that, for this to be the case, provincial authorities would need to have the necessary powers to fine-tune the immigration policy regarding the TFWs. In other words, a significant part of the decision to bring in TFWs must be controlled by the provincial governments. As seen in the data Section 3.2, provincial governments, the Quebec government since 1991, and five other provinces since 2007 exert proactive decision-making to some extent regarding TFW entries. This suggests that, while there is a case for reverse causality, the magnitude of the possible bias should be rather modest.

***Insert Table 9 around here ***

To address the issue of reverse causality, two separate econometric investigations have been carried out. The first is to re-estimate model (10) over a different subsample. In particular, we exclude Quebec and consider the period before 2009. In other terms, we re-estimate model (10) using a sample of provinces and a period of time over which institutional features make the occurrence of reverse causality less likely. The results of this exercise, reported in Table 9, are quite similar to the ones presented in Table 1 and point to a larger (in absolute value) impact of TFWs on interprovincial net immigration.[22]

***Insert Tables 10 and 11 around here ***

A second strategy is to lag flows of international migrants in the estimation. If provincial immigration authorities react to the contemporaneous situation of interprovincial migration, and if shocks to interprovincial immigration are not too persistent over time, this simple procedure takes care of the endogeneity induced by reverse causality. Tables 10 and 11 report the estimation results with one-period lagged TFWs and permanent immigrants. Table 10 reports the estimation results using the panel FGLS estimates of specification (10). Table 11 reports the estimation results using a first-difference estimator. This estimation method is nevertheless quite "brutal" in the way it deals with unobserved heterogeneity and the results are reported here only for the sake of robustness. All in all, these additional estimations show that our estimates are robust to endogeneity issues that result from reverse causality between TFWs and internal migration.

4.3.2 Instrumentation

The occurrence of reverse causality between TFWs and internal migration is not the only concern in estimating equation (10). Omitted factors of internal migration that are

22 Reading the agreement between Quebec and CIC in 1991, it is nevertheless unclear whether this gives significant preferential treatment to Quebec regarding the TFWs. Therefore, it is unclear that one needs to exclude Quebec. Excluding post-2008 period but including Quebec gives estimates that are quite similar to those in Table 1 and Table 9. These are available upon request.

correlated with TFWs can also generate endogeneity issues. Suppose, for instance, that in a given province, there is a particular positive shock affecting the labor demand for specific skills. A good example is provided by the expansion of oil extraction from the tar sands in Alberta. Suppose that, since this activity is quite new, there is a great shortage of skills in Alberta for that particular occupation. In this case, the expansion of such an activity can create an increase in demand for these workers who can be found both in other Canadian provinces and in the rest of the world. Indeed, taking the example of the oil sands, Alberta attracted a lot of drillers from Newfoundland and organized weekly flights between St. John's (Newfoundland and Labrador) and Fort McMurray (Alberta) to facilitate the flow of labor. But, in spite of significant interprovincial immigration, drillers are still at the top of the list of labor shortages in Alberta and foreign workers with that type of skill are more than welcome in Alberta.

**** Insert Table 12*

All in all, such a situation illustrates that omitted factors can result in a positive correlation between TFWs and the error term of equation (10). In that case, the estimation by FGLS might result in an underestimation of the absolute effect. Furthermore, since these omitted factors or shocks are likely to be persistent over time (e.g., labor shortages for that type of skills might persist for years), the lagging procedure used before might be ineffective in coping with this endogeneity issue. In other words, the type of endogeneity is important when choosing the subset of eligible instruments. This source of endogeneity requires the use of external instruments, i.e., variables not correlated with the omitted factors but with the observed TFWs. Specification (10) makes clear that such an instrument needs to be defined at the provincial level and needs to vary over time.

To that end, we use an approach that has appeared extensively in the literature of international trade (see the original contribution of Frankel and Romer, 1999) but also in some recent papers dealing with international migration. Recent illustrations are provided by Spilimbergo (2009) and by Beine, Docquier, and Schiff (2013) among others. We generate an instrument, taking advantage of the disaggregation of TFWs coming into each province by country of origin. The computation of that instrument is done into two steps. First, we estimate a gravity model that explains the magnitude of the flow of TFWs from each origin country of the world to each province for each year. The covariates of that gravity model include exogenous variables and fixed effects.

The fixed effects are country of origin, province, and time. These fixed effects are useful in capturing the role of time-invariant factors specific to the origin (e.g., geographic factors, such as its being an island), specific to the destination (e.g., geographic factors, such as airports and climate), and time-specific (e.g., the general Canadian immigration policy). These are supposed to be uncorrelated to the unobserved provincial shocks of equation (11).

The exogenous time-invariant bilateral variables are the bilateral distance between each province and each country of origin as well as dummy variables capturing whether the destination and the origin share the same language (English or French). We create two dummies, one for English and one for French (to deal with the cases of Quebec and New Brunswick). Based on the estimated gravity model, we recover the predicted flows for each country–province–year triplet.

We also include two additional sets of important factors to predict the magnitude of TFWs. A first set includes income shocks in the origin countries. We use two functional forms to capture the role of these shocks, proxy by GDP per head estimates from the Penn World Tables (see details in Appendix A). Income shocks in origin countries are obviously uncorrelated to the provincial shocks to the extent that Canadian provinces are (very) small economies at the world level. Finally, we also capture some kind of network effect in the migration of TFWs. Employers, having hired TFWs from a specific origin country, get some useful information about those workers' productivity and commitment to the job. If satisfied, Canadian employers subsequently tend to hire the same TFWs or TFWs of the same origin. Much anecdotal evidence suggests it is an important factor in explaining the magnitude of bilateral flows of TFWs. We capture that by using the cumulated flows over the five previous years. These cumulated flows are supposed to be exogenous to the contemporaneous provincial shocks if these shocks are not too persistent over time. Appendix A gives the details and results of the first step of our instrumentation strategy.

Based on the estimation of the gravity model, we sum up the predicted flows across origin countries to get a total predicted flow of TFWs by year and province. This total predicted value can therefore be used as an instrument of the observed TFWs in specification (10).

One key issue for that instrumentation procedure is whether the predicted flow is a strong instrument of the observed one. The quality of the fit of the gravity model is a necessary but insufficient condition for that. Indeed, one needs to have a good prediction not only at the country–province–year level but also at the aggregate provincial level. The first condition might be checked, looking at the R^2 of the gravity model. The second condition can be evaluated looking at the F-stat of the first stage of the final IV estimation.

Table A1 in Appendix A provides the estimation results of the gravity equation. These results suggest that the gravity model does a good job in fitting the data. The R^2 amounts to more than 80 per cent, showing that the prediction at the disaggregated level is quite good. Unsurprisingly, distance and common languages are good predictors of the magnitude of the flows. The same holds for the network effect. Income at origin displays a more ambiguous effect, certainly because of non-linear effects.

Table 12 provides the final IV estimation results using the aggregate predicted flows of TFWs as an instrument of the observed TFWs. Table 12 replicates the estimations of Table 1 with the IV procedure instead of the FGLS estimation.[23] Two main comments are in order. First, the negative impact of TFWs on net mobility that is obtained with FGLS survives the IV correction. The coefficients of TFWs are negative and significant for all specifications. Importantly, the decrease in the significance level is associated with an increase in the standard error of the coefficient, a well-known consequence of instrumentation, and is not due to a decrease in the point estimates. On the contrary, all

23 The instrument used in Table 12 is based on the gravity model whose results are reported in column (5) of Table A1. The specific gravity regression involves all the bilateral flows of TFWs (including the zeroes and transforming the missing data into zeroes) and allows for a linear effect of the income shocks at origin. The results of the IV estimation are qualitatively and quantitatively similar across the alternative instruments, i.e., those generated by other specifications (as reported in columns (1), (2), (3), (4), and (6) of Table A1). Results with these alternative instruments are available upon request.

the IV estimations tend to yield more negative effects with respect to FGLS estimates. Focusing on our preferred specification (see columns (3) and (6) of Table 12), the size of this adjustment amounts to 25 per cent and 62 per cent for the all-migrants case and the 18–65 age case respectively. The direction of this adjustment is fully consistent with a situation in which unobservable shocks to internal immigration are positively correlated with the flows of TFWs. In other terms, it is fully in line with a story like the oil sands in Alberta. All in all, while the amplitude of the IV estimates should be taken with caution given that the instruments are generated, all the procedures dealing with possible concerns of endogeneity issues in the estimation of equation (10) confirm that the TFWs exert a negative impact on net mobility of natives.

5. Conclusion

This paper revisits the impact of international migration on the internal mobility of domestic workers. For that purpose, we rely on Canadian data that allow us to examine the effect of two very different immigrants' channels: the TFWs, and the workers and permanent immigrants selected through the immigration point system. Our main contribution is to show that the profile of these immigrants is key when identifying their impact on the propensity of Canadian residents to move to another province. TFWs tend to decrease the net interprovincial migration rate of the province in which they settle. In contrast, permanent immigrants do not affect the mobility of natives in a systematic way. Our interpretation of this contrast lies in the way both channels affect the job vacancy rate/unemployment rate ratio. TFWs come into Canada to fill vacancies, whereas the effect of permanent immigrants on the vacancy/unemployment ratio is unclear, given the way they are selected. This vacancy/unemployment ratio is likely to affect the perceived probability of employment of prospective internal migrants and, hence, the expected gains from moving. In general, our results shows how important immigration policies are in shaping the labor market impact of international immigration.

Our findings show that, in the short run (within the year), 10 additional TFWs arriving in one given province tend to displace about 6 native workers, a number that is higher than the ones found in previous similar studies. The results also indicate that, in the long run, 1 additional TFW tends to decrease net interprovincial migration of the province the TFW lands in by about 2 internal working-age migrants. These general results vary significantly across the characteristics of the internal migrants. It is higher for young workers and for males. Also, the impact of TFWs on net immigration is driven by the effect on gross emigration and immigration. We show that, while both effects exist, the decrease in gross immigration is more significant than the increase in resident outflows. The respective contribution is roughly 60 per cent and 40 per cent of the total impact. To the best of our knowledge, this result has not been documented before in the existing literature and is noteworthy because the dominant impact on immigration is more obvious.

From the perspective of Canadian economic policy, the results also have important implications. The expansion of the TFW program was initially presented as a win-win policy move by Canadian authorities. It cannot be contested that this program yields obvious benefits in many cases, such as an increase of economic activity, a decrease in

labor shortages, and mitigation effects on Dutch disease. Nevertheless, we show that the TFW program, given its design, shows significant costs. The mobility of Canadian workers between regions is a powerful natural mechanism of adjustment in a federal country hit by asymmetric shocks. Internal migration allows young people from depressed regions to enter the labor market in more prosperous regions. It also allows provinces with different endowments of natural resources to share the recent commodity bonanzas concentrated in some locations. The decrease in labor mobility brought about by the expansion of the TFW program means that more pressure will be put on non-market adjustment schemes such as the existing Canadian equalization system.

Our results imply that policy options should be taken by Canadian authorities to cope with these potentially detrimental effects. The evaluation of such policy options is clearly beyond the scope of this paper. Nevertheless, one can list possible measures that could be undertaken by authorities. The list is far from being exhaustive of course. The first set of options pertain to the exact design of the LMO tests associated to the TFW program. Immigration authorities should clearly increase the control on employers to make sure that the search for a Canadian worker on the local labour market has been correctly carried out. In the last decade, as reported by Gross (2014), the immigration authorities have regularly relaxed the conditions of applications of LMO tests. Expedited LMO tests have even been implemented in some provinces between 2007 and 2010 to speed up the arrival of TFWs in some areas. These developments should be reversed to make LMO tests more efficient and binding. Second, the area that is subject to these LMO tests should be extended and should involve non-immigrant workers from other provinces. Also, the number and types of TFWs subject to these tests should be increased. Only less than 40% are currently subject to these tests, a proportion that is obviously too low. Finally, the relative cost of bringing a TFW rather than a native worker should be increased. One possibility would be to increase the fee paid by employers.

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Appendix 1: Two-step Instrumentation strategy: Procedure and detailed results

In this appendix, we detail the procedure and results of the instrumentation strategy used in Section 4.3.2 to cope with the potential occurrence of unobservable province-specific shocks. If these unobservable shocks are correlated with the inflows of the TFWs, then the FGLS estimates of the structural model to be estimated (see equation 11) can be biased.

The IV procedure basically requires us to use an instrument that is correlated with the observed inflows of TFWs but uncorrelated with the error term and hence with the unobservable shocks. We need to emphasize that these shocks and the instrument are time- and province-specific. Our IV procedure builds on the previous strategies implemented in the literature of growth, trade, and migration. See Frankel and Romer (1999) for an application to the impact of trade on growth. It has also been used in the literature on international migration (see Spilimbergo [2009]; Beine, Docquier, and Schiff [2013], among others). The present strategy extends the previous contributions in the sense that we use a panel dimension while the previous papers dealt only with cross-sectional data.

The procedure involves two main separate steps. For the sake of clarity, the first step can be broken down further into separate substeps.

A.1.1 First step: Gravity model and aggregate predicted inflows of TFWs by province

In this first step, we use a gravity model applied to the bilateral flows of TFWs between each country of origin of the world and each province in each year. The model is used to generate predicted bilateral flows for each triplet (origin country–destination province–time) that are afterwards aggregated across countries of origin to generate our instrument. This instrument is the time-varying, province-specific aggregate predicted inflows of TFWs. The prediction is supposed to be generated by exogenous factors, i.e., covariates of the gravity model that are uncorrelated with the unobservable shocks (and the error term) of equation (11).

We first estimate the following benchmark gravity model:

$$\ln(1 + m_{ij,t}) = \alpha_i + \alpha_j + \alpha_t + \beta_1 \ln(d_{ij}) + \beta_2\, l_{ij} + \beta_3\, M_{ij,t-1+}\gamma' f(y_{it}) + \varepsilon_{ij,t} \quad \text{(A1)}.$$

The gravity model involves a log-log specification explaining the log of the number of TFWs $m_{ij,t}$ each year t between country of origin i and province j. This specification can be more or less justified on the basis of microfoundations with optimizing agents (see Beine, Bertoli, and Fernandez-Huerta-Moraga [2014] for a survey).

Since there are many pairs with zero bilateral flows or even missing bilateral flows, the use of $\ln(m_{ij,t})$ would generate estimations that are subject to a significant selection bias. We can indeed expect that countries that do not send any TFWs to a given province do not share the same observed and unobserved features as those of the countries sending TFWs. The same line of reasoning can apply to missing data about the flows. To

avoid that, we use the usual "trick" of taking $\ln(1 + m_{ij,t})$ (the so-called scaled estimation procedure) to include the zeroes in the estimation. Further to that, we also have to deal with the missing data. Looking at the database (kindly provided by Citizenship and Immigration Canada [CIC]), we notice that most of the missing data was found for triplets for which zero flows were observed during other years. If this is correct, we can transform the missing data into zeroes, which would involve even more observations. We follow both procedures and check that the results are qualitatively and quantitatively similar.

Model (A1) involves either covariates or fixed effects. With respect to fixed effects, we include country of origin fixed effects α_i that capture the time-invariant characteristics of origin countries such as geographical location. We also include the destination province fixed effects α_j that capture the time-invariant characteristics of receiving provinces such as geographical location or language. Finally, we include time fixed effects that capture the general factors affecting the migration of TFWs. These include important factors such as the Canada-wide immigration policy regarding these TFWs.

We use two time-invariant factors affecting the relative attraction between each country of origin and each province. First, we use geographic distance d_{ij} between each origin country and each province, using the respective capitals as references. Second, we use linguistic proximity measures denoted by l_{ij}. Note that Canada is mainly an English-speaking country with the exceptions of Quebec, which is French-speaking, and New Brunswick in which both languages are spoken. l_{ij} is broken down further into two variables, one for French, one for English. The two variables are dummy ones taking 1 if the origin and the destination share the same language, 0 otherwise. The l_{ij} and d_{ij} variables are exogenous with respect to unobserved shocks.

We also capture in model (A1) some network effect regarding the TFWs. The migration of workers has been shown to depend a lot on migrants' networks at the macroeconomic level (see Beine, Bertoli, and Fernandez-Huerta-Moraga [2014]). These networks are related to the stock of previous migrants in the destination province who came from the same origin. For TFWs, however, this concept is not directly applicable since these are temporary migrants who have to return to their country at the end of the year. Still, some network effect definitely exists in the process of hiring TFWs. In hiring TFWs from a specific origin, Canadian employers obtain some information about productivity, efficiency, and so on of that origin's workers from previously hired TFWs from the origin. But these important revelations can be asymmetric. Furthermore, if employers are satisfied with the previous TFWs, employers can hire the same workers provided they return to their origin and reapply to the program. Anecdotal evidence of farmers in Quebec repeatedly hiring agricultural workers from Honduras as TFWs is a good illustration of that phenomenon. We capture this particular network effect by summing up the flows of previous TFWs over the last five years. This variable is denoted by $M_{ij,t-1}$. If unobserved shocks to the province are not too persistent over time, this variable is also exogenous with respect to unobserved shocks.

Finally, we include origin-specific income shocks y_{it}. We use GDP per head data from the Penn World Tables (version 8.0)[24] in several functional forms. In a first one, we simply

24 Actually, the database of bilateral flows to each province transmitted by CIC includes up to 251 origins (the maximum number is for Ontario). While most of these origins are countries, a subset includes regions of

use the log of GDP per head, i.e., $\gamma' f(y_{it}) = \beta_4 \ln(y_{it})$. This could capture the role of the wage differential between the origin and Canada, and we should expect a negative coefficient if this mechanism is prevailing. Nevertheless, the literature on migration shows that income at origin can have a non-linear effect. See Mayda (2010 and Beine, Bertoli, and Fernandez-Huerta-Moraga (2014) on that. Low income levels can be associated with little emigration because liquidity constraints are operating. As income increases, this releases these constraints and leads to more migration. After some threshold, when constraints are no longer operating, further increases lead to a reduction in the wage differential and therefore deter emigration. In that case, one should expect a concave relationship. In this functional form, we have $\gamma' f(y_{it}) = \beta_4 y_{it} + \beta_5 {y_{it}}^2$. Income shocks at origin y_{it} are obviously uncorrelated with province-specific shocks and can be therefore considered as exogenous factors.

Table A1 presents the results of the estimation of equation (A1) with different variants.

The results of the gravity regressions are more or less in line with the expectations. Flows of TFWs to a given province from a given origin increase with linguistic similarity, decrease with distance, increase with the size of the previous flows of the TFWs. The role of origin-specific GDP shocks receives less support from the data. While the signs of the coefficients are consistent with the expectations, they are mostly insignificant. This might due to the fact that what matters for migration decisions is the wage at origin. GDP per head might be a poor proxy for the wages in a lot of cases. This issue has already been identified in the existing literature on gravity models applied to international migration (see Beine, Bertoli and Fernadez-Huerta-Moraga [2014[among others).

The different specifications (1) to (6) give fairly similar results. The R^2 vary between 0.83 and 0.90, which suggests that the prediction should be quite good, at least at the bilateral level. The fact that missing data are transformed into zero values leads to a slightly less-good fit; this is understandable since, in some cases, this might be too strong an assumption. One should be aware that each model will give rise to a different instrument, so a choice has to be made for the subsequent instrumentation procedure. In Section 4.3.2, we use the instrument generated by model (6). Nevertheless, the results of the final IV estimation do not depend in general on that choice since the results are qualitatively and quantitatively similar across the six possible instruments. [25]

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some countries. (The remaining origins are aggregates of countries like East Africa and are omitted.) A good example is provided by the four overseas departments of France (Guyana, Guadeloupe, Martinique, and La Réunion) for which the flows are distinct from the ones coming from Metropolitan France. Aggregating the flows with those coming from Metropolitan France would include some bias since these departments differ significantly from the Metropole, especially in terms of distance to Canada but also in terms of income levels. It is still interesting to include these regions since they send many migrants to Canada and especially to French-speaking Quebec. For these entities, we calculated our own GDP per head data since they are not available in the Penn World Tables (version 8.0). We use data of Insee (Institut National de la Statistique et des Études Économiques) for 2009, 2010, and 2011. For the rest of the sample period, we applied the ratio department/metropole to the French data to get GDP per head estimates of these origins.

25 All the results are available upon request from Michel Beine.

Table A1. First-stage regressions: Explaining flows of TFWs

	Dependent variable : ln(1+Temporary Foreign Workers)					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.444***	1.588***	1.510***	1.162***	1.358***	1.228***
	(10.373)	(8.988)	(10.762)	(9.342)	(8.793)	(9.736)
Log (distance)	-0.567***	-0.562***	-0.562***	-0.402***	-0.399***	-0.399***
	(-9.779)	(-9.750)	(-9.737)	(-7.653)	(-7.578)	(-7.577)
Common English	0.222***	0.245***	0.245***	0.234***	0.245***	0.245***
	(7.970)	(8.708)	(8.688)	(8.206)	(8.468)	(8.466)
Common French	0.381***	0.398***	0.398***	0.162***	0.165***	0.165***
	(15.736)	(16.272)	(16.251)	(7.470)	(7.547)	(7.545)
Past TFWS last 5 years	0.529***	0.520***	0.520***	0.561***	0.557***	0.557***
	(97.011)	(93.047)	(93.138)	(130.512)	(127.069)	(127.145)
GDP per head			-0.000*			-0.000
			(-1.815)			(-1.053)
GDP per head squared			0.000			0.000
			(1.385)			(0.914)
Log (GDP per head)		-0.011			-0.017	
		(-0.818)			(-1.553)	
Observations	35,088	33,310	33,310	50,712	48,502	48,502
R-squared	0.898	0.898	0.898	0.833	0.832	0.832
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust t-statistics in parentheses. *** p<0.01; ** p<0.05; * p<0.1. Specifications (1) to (3): Missing data not included for the TFWs. Specifications (4) to (6): Missing data transformed in zeroes for the TFWs.

A.1.2 Prediction of bilateral flows of TFWs

Once model (A1) has been estimated, one can recover the estimates of the fixed effects and the coefficients to predict each bilateral flow of TFWs between each origin and each province of destination at each point of time. Let us denote by α' the vector of the estimated fixed effects, and denote θ' as the vector containing the estimated slope coefficients $(\widehat{\beta_1}, \widehat{\beta_2}, \widehat{\beta_3}, \widehat{\beta_4}, \widehat{\beta_5})$ from model (A1). Finally, let us collapse in vector X'_{ijt} the covariates used in each regression. Then we have:

$$\left(1 + \widehat{m_{\iota J,t}}\right) = \exp(\alpha' + \theta' X'_{ijt}). \qquad \text{(A2)}$$

A.1.3 Prediction of inflows of TFWs by province and by year

We then can use the predicted $\widehat{m_{\iota J,t}}$ at the dyadic level to produce a predicted aggregate value for each province at each point of time. This is obtained simply by summing up across origins for each province in each year:

$$\widehat{m_{J,t}} = \sum_{i=1}^{N} m_{ij,t} \, . \qquad \text{(A3)}$$

The predicted $\widehat{m_{J,t}}$ can be used subsequently as an instrument for the observed values of TFWs by province and time period.

The validity of these instruments has to fulfill the usual two conditions. First, the instruments must be strong predictors of the observed TFWs. The estimates of Table A1, in particular the values of the R^2, suggest that this is the case at the bilateral level. Furthermore, at the aggregate level, i.e., after summing up across origins, this can be evaluated by the F-stat of the first stage of the final IV procedure. The values of the F-stats reported in Table 12 in the core of the text are far beyond the usual threshold of 10.

The second condition is that the instrument must be uncorrelated with the error term of the final regression. In this case, the error term contains the influence of unobserved provincial shocks on the net interprovincial immigration flows of native workers. The covariates used for the prediction of $\widehat{m_{J,t}}$ and $\widehat{m_{J,t}}$ are obviously uncorrelated with the contemporaneous shocks. The exclusion restriction can be questioned only for our measure of the network effect $M_{ij,t-1}$ if these shocks are highly persistent over time. Nevertheless, instruments generated without the inclusion of $M_{ij,t-1}$ give qualitatively similar results.[27]

[27] Once again, these results are available upon request from Michel Beine.

Appendix B: Tables to be included in the text

Table 1. Impact of international immigration on net internal migration: Benchmark results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	All migrants			18–64 years old		
Lagged migr.	0.618***	0.635***	0.710***	0.630***	0.645***	0.717***
	(9.4)	(11.8)	(13.5)	(9.8)	(12.3)	(13.6)
Public exp.	-3.223*	-3.923***		-3.453	-4.345***	
	(-1.7)	(-4.4)		(-1.6)	(-4.3)	
Taxes	-0.661			-0.304		
	(-0.2)			(-0.1)		
Log(wage)	0.132			0.201		
	(0.3)			(0.3)		
Unempl. rate	-0.034			-0.036		
	(-1.5)			(-1.4)		
Econ. cycle	1.795	2.505*		2.961*	3.648**	
	(1.2)	(1.9)		(1.8)	(2.4)	
TFWs	-0.828***	-0.650***	-0.531***	-0.909***	-0.724***	-0.590***
	(-4.1)	(-3.9)	(-3.4)	(-3.8)	(-3.6)	(-3.1)
Perm. immig.	-0.110	-0.099	-0.163*	-0.130	-0.118	-0.186*
	(-0.9)	(-1.1)	(-1.9)	(-1.0)	(-1.2)	(-1.9)
Terms of trade			0.025***			0.029***
			(3.5)			(3.4)
Observations	230	270	270	230	270	270
R-squared	0.840	0.808	0.816	0.851	0.819	0.825
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–3): all interprovincial migrants; columns (4–6): interprovincial migrants aged between 18 and 64. Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1, for the impact of TFWs.

Table 2. Impact of international immigration on net internal migration by age profile: Benchmark results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		18–25 years old			25–44 years old		45–64 years old
Lagged migr.	0.647***	0.668***	0.679***	0.629***	0.704***	0.640***	0.719***
	(10.3)	(12.4)	(13.3)	(10.2)	(13.6)	(9.6)	(11.9)
Public exp.	-2.617			-4.410		-2.145**	
	(-0.6)			(-1.6)		(-2.4)	
Taxes	4.035			-1.488		-0.298	
	(0.6)			(-0.4)		(-0.2)	
Log(wage)	1.328			-0.002		-0.074	
	(1.1)			(-0.0)		(-0.3)	
Unempl. rate	-0.090*	-0.093**	-0.070*	-0.039	-0.018	-0.005	0.001
	(-1.8)	(-2.2)	(-1.7)	(-1.2)	(-0.7)	(-0.4)	(0.1)
Econ. cycle	7.668**	9.946***	6.215*	3.217	1.847	1.008	0.705
	(2.305)	(3.168)	(1.839)	(1.621)	(0.890)	(1.422)	(0.929)
TFWs	-1.548***	-1.219***	-1.125***	-0.962***	-0.696***	-0.480***	-0.350***
	(-3.3)	(-3.0)	(-2.8)	(-3.5)	(-3.1)	(-3.1)	(-3.0)
Perm. immig.	-0.235	-0.332	-0.330	-0.162	-0.230*	-0.048	-0.104**
	(-0.7)	(-1.4)	(-1.5)	(-1.1)	(-1.8)	(-0.8)	(-2.3)
Terms of trade			0.043***		0.029***		0.010***
			(2.8)		(3.1)		(2.7)
Observations	230	270	270	230	270	230	270
R-squared	0.915	0.898	0.907	0.797	0.773	0.881	0.861
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–3): interprovincial migrants aged between 18 and 25; columns (4–5): interprovincial migrants aged between 25 and 44; interprovincial migrants aged between 45 and 64.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1. For the impact of TFWs, the second figure within the bracket reports the long-run impact.

Table 3. Impact of international immigration on net internal migration by age profile, males: Benchmark results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**18–64**		**18–25**		**25–44**		**45–64**	
Lagged migr.	0.611***	0.675***	0.639***	0.663***	0.614***	0.688***	0.611***	0.712***
	(10.1)	(12.0)	(10.4)	(12.0)	(10.0)	(12.3)	(9.8)	(12.0)
Public exp.	-3.213		-1.574		-4.256		-2.169**	
	(-1.3)		(-0.3)		(-1.4)		(-2.1)	
Log(wage)	0.314		1.208		0.137		0.007	
	(0.5)		(0.9)		(0.2)		(0.0)	
Unempl. rate	-0.030	-0.026	-0.085	-0.072	-0.027	-0.020	-0.001	-0.002
	(-1.1)	(-1.1)	(-1.4)	(-1.4)	(-0.8)	(-0.7)	(-0.1)	(-0.2)
Econ. cycle	3.815**	2.534	9.797**	7.489*	4.193*	2.320	1.198	0.643
	(2.0)	(1.2)	(2.6)	(1.9)	(1.9)	(1.0)	(1.5)	(0.7)
TFWs	-0.909***	-0.740***	-1.701***	-1.328***	-0.880***	-0.728***	-0.497***	-0.400***
	(-0.4)	(-3.2)	(-3.4)	(-2.9)	(-2.9)	(-2.7)	(-3.5)	(-3.3)
Perm. immig.	-0.130	-0.233**	-0.216	-0.343	-0.129	-0.233	-0.086	-0.139**
	(-1.3)	(-2.1)	(-0.8)	(-1.3)	(-1.3)	(-1.6)	(-1.4)	(-2.4)
Terms of trade		0.030***		0.052***		0.034***		0.012***
		(3.1)		(2.9)		(3.0)		(3.0)
Observations	240	270	240	270	240	270	240	270
R-squared	0.827	0.811	0.901	0.896	0.768	0.752	0.855	0.839
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–2): interprovincial male migrants aged between 18 and 64; columns (3–4): interprovincial male migrants aged between 18 and 25; columns (5–6): interprovincial male migrants aged between 25 and 44; columns (7–8): interprovincial male migrants aged between 45 and 64.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Impact of international immigration on net internal migration by age profile, females: Benchmark results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**18–64**		**18–25**		**25–44**		**45–64**	
Lagged migr.	0.619***	0.692***	0.598***	0.638***	0.604***	0.697***	0.601***	0.690***
	(10.2)	(12.6)	(10.4)	(12.3)	(10.1)	(13.4)	(9.0)	(10.7)
Public exp.	-4.253**		-4.125		-5.464**		-2.482***	
	(-2.5)		(-1.1		(-2.5)		(-3.0)	
Log(wage)	-0.049		0.617		-0.150		-0.188	
	(-0.1)		(0.7)		(-0.3)		(-1.0)	
Unempl. rate	-0.031	-0.022	-0.112**	-0.088**	-0.031	-0.020	-0.004	0.002
	(-1.4)	(-1.1)	(-2.4)	(-2.2)	(-1.1)	(-0.8)	(-0.4	(0.2)
Econ. cycle	2.088	1.767	5.650*	5.096	2.128	1.426	0.835	0.794
	(1.5)	(1.1)	(1.8)	(1.6)	(1.2)	(0.7)	(1.3)	(1.1)
TFWs	-0.757***	-0.589***	-1.252***	-0.935**	-0.831***	-0.664***	-0.425***	-0.319***
	(-4.1)	(-3.5)	(-3.5)	(-2.5)	(-4.0)	(-3.5)	(-3.1)	(-2.8)
Perm. immig.	-12.068	-19.508*	-25.107	-34.141	-16.110	-23.762*	-3.562	-7.220
	(-1.4)	(-1.9)	(-1.2)	(-1.5)	(-1.4)	(-1.8)	(-0.9)	(-1.6)
Terms of trade		0.021***		0.034**		0.025***		0.007**
		(2.9)		(2.4)		(3.2)		(2.3)
Observations	240	270	240	270	240	270	240	270
R-squared	0.859	0.831	0.903	0.891	0.800	0.771	0.880	0.859
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–2): interprovincial female migrants aged between 18 and 64; columns (3–4): interprovincial female migrants aged between 18 and 25; columns (5–6): interprovincial female migrants aged between 25 and 44; columns (7–8): interprovincial female migrants aged between 45 and 64.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Quantitative effects of TFWs on various interprovincial migration flows

	(Table/Column)	(1) Short-run	(2) Short-run adjusted	(3) Long-run	(4) Long-run adjusted
All migrants	(1/3)	-0.53	-0.53	-1.82	-1.82
18–64 both sexes	(1/6)	-0.59	-0.36	-2.00	-1.23
18–24 both sexes	(2/3)	-1.12	-0.13	-3.49	-0.40
25–44 both sexes	(2/5)	-0.70	-0.20	-2.33	-0.67
45–64 both sexes	(2/7)	-0.35	-0.07	-1.25	-0.26
18–24 males	(3/4)	-1.33	-0.08	-3.44	-0.19
18–24 females	(4/4)	-0.93	-0.05	-2.57	-0.14

The short-run impact (column 1) is the point estimate of TFWs reported in various columns (always with the terms-of-trade control) of tables 1 through 4. The long-run effect (column 3) is computed directly from the short-run, using the coefficient of the lagged dependent variable as explained in Section 4.2.

Table 6. Impact of international immigration on gross interprovincial emigration

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	18–25 years old			18–65 years old		
Lagged migr.	0.706***	0.716***	0.712***	0.702***	0.711***	0.735***
	(15.8)	(16.1)	(15.6)	(15.6)	(15.7)	(16.1)
Public exp.	4.171***	3.582**	4.311***	1.720***	1.152	
	(2.813)	(2.026)	(2.885)	(2.932)	(1.609)	
Econ. cycle	-5.419**	-4.747**	-5.672**	-2.005**	-1.344	
	(-2.5)	(-2.1)	(-26)	(-2.0)	(-1.2)	
Unempl. rate	0.021	0.018		0.008	0.006	0.011
	(0.8)	(0.7)		(0.7)	(0.5)	(0.9)
Terms of trade		-0.010			-0.010*	-0.013***
		(-1.0)			(-1.9)	(-2.7)
TFWS	0.475*	0.451*	0.451*	0.285**	0.260**	0.225*
	(1.8)	(1.7)	(1.8)	(2.3)	(2.1)	(1.8)
Perm. immig.	-0.032	-0.017	-0.047	0.072	0.084	0.105
	(-0.2)	(-0.1)	(-0.3)	(0.8)	(1.0)	(1.2)
Observations	270	270	270	270	270	270
R-squared	0.970	0.970	0.970	0.963	0.964	0.963
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–3): interprovincial emigrants aged between 18 and 25; columns (4–6): interprovincial emigrants aged between 18 and 65.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Impact of international immigration on gross interprovincial immigration

Variables	(1)	(2)	(3)	(4)	(5)	(6)
		18–25 years old			18–65 years old	
Lagged migr.	0.677***	0.673***	0.674***	0.647***	0.651***	0.705***
	(11.9)	(13.1)	(13.0)	(10.7)	(11.5)	(13.0)
Public exp.	-1.398	0.224		-2.223***	-1.519***	
	(-1.4)	(0.2)		(-3.9)	(-2.7)	
Econ. cycle	2.990*	0.986		1.336*	0.493	
	(1.9)	(0.6)		(1.7)	(0.6)	
Unempl. rate	-0.043*	-0.038	-0.039*	-0.014	-0.011	-0.012
	(-1.7)	(-1.6)	(-1.7)	(-1.1)	(-0.9)	(-1.0)
Terms of trade		0.029***	0.029***		0.012***	0.015***
		(3.4)	(3.8)		(2.9)	(3.6)
TFWS	-0.771***	-0.703***	-0.691***	-0.458***	-0.428***	-0.400***
	(-3.1)	(-3.1)	(-3.0)	(-3.5)	(-3.5)	(-3.2)
Perm. immig.	-0.253**	-0.290***	-0.284***	-0.068	-0.082	-0.099*
	(-2.5)	(-3.3)	(-3.1)	(-1.2)	(-1.6)	(-1.8)
Observations	270	270	270	270	270	270
R-squared	0.948	0.954	0.954	0.957	0.961	0.959
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–3): interprovincial immigrants aged between 18 and 25; columns (4–6): interprovincial immigrants aged between 18 and 65.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 8. The impact of international immigration on net internal migration (including permanent economic and non-economic immigrants)

	(1)	(2)	(3)	(4)
Variables	**18–65**		**18–25**	
Lagged immig.	0.690***	0.716***	0.678***	0.684***
	(12.6)	(13.4)	(13.2)	(12.9)
Econo. cycle	2.157		6.260*	
	(1.2)		(1.8)	
Unempl. rate	-0.022		-0.069*	-0.083**
	(-1.1)		(-1.7)	(-2.0)
Terms of trade	0.026***	0.028***	0.043***	0.050***
	(3.0)	(3.4)	(2.8)	(3.3)
TFWS	-0.671***	-0.597***	-1.135***	-1.046**
	(-3.4)	(-3.1)	(-2.8)	(-2.6)
Perm. econ. migrants	-0.176*	-0.151	-0.272	-0.266
	(-1.0)	(-1.5)	(-1.2)	(-1.1)
Perm. non-econ.migr.	-35.487	-35.393	-57.063	-54.480
	(-1.5)	(-1.5)	(-1.1)	(-1.1)
Observations	270	270	270	270
R-squared	0.829	0.826	0.907	0.905
Prov FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Sample period: 1981–2010. OLS estimation. Columns (1–2): migrants aged between 18 and 65; columns (3–4): migrants aged between 18 and 65.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 9. The impact of international immigration on net internal migration: Subsample results

	(1)	(2)	(3)	(4)
Variables	**All**		**18–64**	
Lagged immig.	0.641***	0.671***	0.647***	0.677***
	(10.9)	(13.0)	(11.3)	(13.0)
Pub exp.	-4.342***		-4.744***	
	(-4.0)		(-4.0)	
Econ. cycle	2.338		3.656**	
	(1.5)		(2.0)	
TFWs	-0.716***	-0.672***	-0.774***	-0.710***
	(-3.5)	(-3.3)	(-3.2)	(-2.9)
Perm. immig.	-0.161	-0.354***	-0.170	-0.382***
	(-1.4)	(-2.8)	(-1.3)	(-2.6)
Terms of trade		0.033***		0.038***
		(4.0)		(4.1)
Observations	216	216	216	216
R-squared	0.825	0.839	0.836	0.848
Prov FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Sample period: 1981–2008 and excluding Quebec. OLS estimation. Columns (1–2): all migrants; columns (3–4): migrants aged between 18 and 65.
Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 10. The impact of international immigration on net immigration — lagged international immigration

Variables	(1)	(2)	(3)	(4)
	18–64		18–25	
Lagged immig.	0.707***	0.725***	0.695***	0.703***
	(13.0)	(14.0)	(13.5)	(13.4)
Econ. cycle	1.567		4.976	
	(0.8)		(1.5)	
Unempl. rate	-0.013		-0.054	-0.068
	(-0.5)		(-1.2)	(-1.5)
Terms of trade	0.024***	0.026***	0.041***	0.046***
	(3.0)	(3.3)	(2.8)	(3.2)
TFWs (lagged)	-0.687***	-0.661***	-1.482***	-1.450***
	(-3.8)	(-3.7)	(-3.7)	(-3.7)
Perm. immig. (lagged)	-0.320***	-0.302***	-0.472*	-0.462*
	(-2.9)	(-2.7)	(-1.8)	(-1.8)
Observations	260	260	260	260
R-squared	0.834	0.832	0.910	0.909
Prov FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Sample period: 1981–20012. OLS estimation. Columns (1–2): all migrants ; columns (3–4): migrants aged between 18 and 65.

Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

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Table 11: Impact of international immigration on net immigration, first differences: 1981–2012

Variables	(1)	(2)	(3)	(4)	(5)	(6)
		18–65			18–25	
Public exp.	-1.467			-0.789		
	(-0.6)			(-0.1)		
Log(wage)	0.708			2.336		
	(0.9)			(1.4)		
Unempl. rate	-0.146***	-0.146***	-0.144***	-0.258***	-0.256***	-0.254***
	(-4.6)	(-4.5)	(-4.5)	(-3.7)	(-3.5)	(-3.5)
Econ. cycles	2.109	3.290**	3.628***	4.728	7.635***	7.969***
	(1.3)	(2.4)	(2.9)	(1.5)	(2.8)	(3.1)
Lagged TFWs	-0.870**	-0.781*	-0.825**	-1.514*	-1.514*	-1.558**
	(-2.4)	(-1.9)	(-2.1)	(-1.9)	(-1.8)	(-2.0)
Lagged perm. imm.	-0.097	-0.308	-0.310	0.350	-0.134	-0.136
	(-0.4)	(-1.1)	(-1.1)	(0.7)	(-0.2)	(-0.2)
Terms of trade		0.003			0.003	
		(0.6)			(0.3)	
Observations	230	250	250	230	250	250
R-squared	0.293	0.280	0.279	0.311	0.294	0.294
Prov FE	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–20012. First-difference estimator. Columns (1–3): migrants aged between 18 and 25; columns (4–6): migrants aged between 18 and 65.

Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 12. Impact of international immigration on net internal migration: IV regressions with external instrument

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	All migrants			18–64 years of age		
Lagged mig.	0.619***	0.721***	0.709***	0.643***	0.728***	0.717***
	(9.282)	(14.919)	(19.770)	(10.489)	(15.359)	(14.840)
Public exp.	-3.421	-4.834***		-4.136	-5.830***	
	(-1.106)	(-2.725)		(-1.163)	(-2.817)	
Log(wage)	0.625			0.652		
	(1.518)			(1.370)		
Unempl. rate	-0.053**			-0.059**		
	(-2.093)			(-2.227)		
Econ. cycle	2.483*	3.610***		3.826**	5.159***	
	(1.813)	(2.788)		(2.353)	(3.370)	
TFWs	-1.836**	-1.231*	-0.666*	-2.267***	-1.694**	-0.957*
	(-2.405)	(-1.854)	(-1.685)	(-2.827)	(-2.291)	(-1.790)
Perm. immig.	-0.146	-0.115	-0.162*	-0.162	-0.123	-0.183*
	(-1.048)	(-0.935)	(-1.880)	(-1.033)	(-0.849)	(-1.927)
Terms of trade			0.025***			0.029***
			(7.124)			(3.728)
F-stat first stage	17.65	24.05	40.66	22.24	26.66	36.63
Observations	230	250	270	230	250	270
R-squared	0.816	0.799	0.815	0.822	0.806	0.822
Prov FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Sample period: 1981–2012. IV estimation, robust standard errors. Columns (1–3): all interprovincial migrants; columns (4–6): interprovincial migrants aged between 18 and 64. Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
For the impact of TFWs: TFWs are instrumented using total predicted inflows of TFWs by province computed from the sum (across countries of origin) of bilateral flows predicted by gravity model (Column 5 of Table A1).