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Working Paper No.41 2011
Série de documents de recherche 41-2011

July 2011

Centre Métropolis Atlantique
Atlantic Metropolis Centre

The Atlantic Metropolis Centre's Working Papers Series
Série de documents de recherche du Centre Métropolis Atlantique

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Effects of Immigration on Inter-regional Population Flows in Canada: An Economic Approach

Yigit Aydede[1]

Abstract: The purpose of this article is to investigate one possible mechanism by which Canadian labour markets adjust to immigration. Despite Canada's being one of the world's major immigrant-receiving countries, most studies that look across Canadian local markets have found immigration's effects to be weak. The well-known argument is that rising immigration levels in an area may result in the out-migration of its residents if the immigrants displace the local workers in employment, bid down wages, or cause housing prices to rise through increased demand for shelter. The present study is the first attempt to investigate this bias by estimating the mobility responses of local residents to immigrant inflows based on a spatial equilibrium model for 28 census metropolitan areas (CMA) from 2000-2007. The results show that immigration has a negative effect on net migration across these CMAs.

Keywords: Displacement, Immigration, Migration, Population Mobility
***JEL* Classification:** J6, J15, J61

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The purpose of this article is to investigate one possible mechanism by which Canadian labour markets adjust to immigration. The well-known argument is that rising immigration levels may result in the out-migration of an area's local residents if the immigrants displace the local workers in employment, bid down wages, or cause housing prices to rise through increased demand for shelter. Besides these economic reasons, the native born may also have some degree of social avoidance regarding immigrants.

Although the displacement effect of immigrants in major cities may be lifestyle driven, researchers increasingly agree that the lower-income and the less-educated in the local population are sensitive to immigrant inflows because this group most likely will be in direct competition with the new immigrants for the less-skilled and lower-paying jobs. Every year, Canada receives about 225,000 immigrants, and over the last two decades, more than three million immigrant workers entered local labour markets. Yet despite Canada's being one of the world's major immigrant- receiving countries, studies investigating the effects of immigration on local markets are scarce and have produced mixed results. For example, Akbari and Aydede (2010), Islam (2009), Akbari and DeVoretz (1992), and Roy (1987, 1997) concluded, using national data on industries and occupation, that there is an imperfect substitution between immigrant and native-born workers.[2] On the other hand, Aydemir and Borjas (2007) found a strong negative impact of immigrant inflows on labour market outcomes in Canada. Unlike some others, they questioned how much of the disparity in outcome for different skill groups among native-born workers can be attributed to immigration that shifts the relative demand and supply of these skills at the national level. In the immigration literature, this approach (*skill-cell approach*) is justified by the fact that if substantial native-born outflows are the response to +immigrant inflows, a "naïve" spatial empirical study that compares local market outcomes with different immigrant densities (*spatial correlations approach*) may actually find a positive impact of immigration on local market outcomes for the native born.

Hatton and Tani (2005) developed a model to illustrate how inter-regional mobility can mask the effects of immigration on wages and unemployment (summarized in the Appendix). Their proposed solution to this bias in immigrant impact estimates is to test directly the reactions of local populations to immigration. The present study investigates this issue by estimating the net inter-regional mobility responses of local residents to immigrant inflows by using a spatial equilibrium model for 28 census metropolitan areas (CMA) from 2000-2007, which receive more than 96 percent of new immigrants. The results showed that immigration has significant displacement effect across these CMAs. The rest of this paper proceeds as follows: Section 1 summarizes the literature. Section 2 reviews the data on trends in immigration and inter-regional migration. A spatial

[2] Two recent studies on housing markets (Akbari and Aydede, 2009; Ley and Tutchener, 2001) also indicate a weak negative linkage between immigration and local housing prices.

equilibrium framework is developed in Section 3, and Section 4 presents the estimation results. Section 5, the conclusion, interprets the results.

1 Literature

Many analysts have studied native-born mobility responses to immigration in the U.S. and obtained mixed evidence.[3] Frey (1994, 1995, 1996, 2002) found strong native-born mobility responses leading to the "demographic balkanisation" of U.S. cities. Further, Borjas et al. (1997) reported consistent evidence confirming the substantial out-migration of the native born in response to immigrant inflows on a national scale. However, Frey's displacement hypothesis was challenged by White and Imai (1994), Wright et al. (1997), and Harrison (2002), who found that net in-migration of the native born is either positively related or unrelated to immigration in metropolitan areas. In fact, their results indicate that the net loss of unskilled native-born workers from metropolitan areas is probably a function of those cities' population size and industrial restructuring rather than of immigrant inflows to them. Moreover, Card and DiNardo (2000) estimated the net impact of immigration inflows on the relative skill distribution of several cities in the U.S. and found that increases in the immigrant population in specific skill groups actually led to small increases in their settlement of native-born individuals of the same skill group. In a recent study, Borjas (2006) showed that the internal migration of the native born is a significant adjustment process that accounts for as much as 60 percent of the difference between wage effects of immigration estimated by skill-cell and spatial correlation approaches. Federman et al. (2006) tested for native-born responses to the arrival of Vietnamese immigrants in the manicurist occupation in California and concluded that the displacement effect was due not to the exit of native-born workers but to fewer new entries of native-born manicurists.

No Canadian study has reviewed native-born mobility responses to immigration on a national scale. Two recent studies (Hou and Bourne 2004; Ley, 2007) found that the growth in recent immigration co-varied with out-migration rates among the less-educated native born in Toronto and Vancouver, traditional immigrant destinations in Canada. While Ley compared Sydney (Australia) and Toronto by using time-series data between 1977 and 2002, Hou and Bourne calculated in- and out-migration rates by using multivariate logistic regression techniques on a sample of microdata drawn from five censuses from 1981 to 2001 for the working population aged 25-64 and living in three CMAs (Toronto, Montreal, and Vancouver). Hou and Bourne compared the effects of economic restructuring, housing market conditions, and immigrant in-inflows in a CMA with the trends in internal migration from and to that CMA. They found a significant correlation between growth in the recent immigrant population and the

[3] For an excellent literature review, see Hou and Bourne (2004).

increased out-migration rate among low-skilled Canadians born in Toronto and Vancouver. However, this association becomes insignificant across CMAs, which implies that immigration may not be the major source of out-migration of the native born in immigration-gateway cities.

This paper builds on the study conducted by Hatton and Tani (2005), which reviewed migration patterns across 11 regions of the U.K. using annual data for the period 1981-2000. They found a strong negative link between immigration flows and native-born mobility responses. More specifically, for all 11 regions, their results showed that a 1 percent increase in net immigration rate decreased net migration by 0.064 percent, implying that immigration will likely induce local residents to relocate to other regions.

2 Population flows in Canada

Table 1 sheds some light on the differences in provincial population growth rates between 1971 and 2006. It shows that although British Columbia, Ontario, and Quebec experienced large increases in their immigrant population relative to the increase in the native-born population, the opposite was true in Alberta, Manitoba, and Saskatchewan.

Table 1: Components of population growth (1971–2006) (%)

Provinces	Total	Native Born	Immigrants
Canada	44.85	35.66	87.74
Newfoundland and Labrador (NL)	-4.12	-4.35	-6.32
Prince Edward Island (PE)	20.21	19.66	29.15
Nova Scotia (NS)	14.47	13.66	21.51
New Brunswick (NB)	13.41	13.07	11.25
Quebec (QC)	23.36	17.57	81.60
Ontario (ON)	56.16	41.97	99.06
Manitoba (MB)	14.70	16.46	-0.01
Saskatchewan (SK)	2.98	10.49	-56.49
Alberta (AB)	100.04	100.82	86.72
British Columbia (BC)	86.50	72.06	125.35

Source: Authors' calculations based on the data.

Table 2 summarizes the components of population growth rates from 1981- 2006, inter-regional population flows, and the correlation between net migration and immigration inflows for each CMA from 1986-2007. The first observation is that Toronto, Montreal, and Vancouver receive 75 percent of all new immigrants in the 28 CMAs studied.

Table 2: Population growth and inter-regional migration

	Pop. Growth (%)			Population Flows (thousands)				
CMA	**Total**	**Native**	**Imm.**	**Inflow**	**Ouflow**	**Net**	**Imm.**	**Corr.**
St. John's (NL)	17.75	17.43	6.49	113	118	-5	7	0.35
Halifax (NS)	34.05	33.03	35.93	299	298	1	33	-0.53
Saint John (NB)	7.73	8.07	-14.01	83	93	-10	3	-0.04
Saguenay (QC)	11.28	10.88	48.10	78	100	-22	5	0.37
Québec (QC)	23.81	21.56	104.13	416	389	27	41	0.57
Sherbrooke (QC)	58.69	55.06	119.26	135	136	0	18	-0.40
Trois-Rivières (QC)	25.34	24.56	59.48	109	108	1	4	0.74
Montréal (QC)	28.52	19.94	63.48	1,580	1,872	-293	632	-0.52
Ottawa (ON/QC)	56.99	48.51	99.46	817	778	40	189	0.10
Oshawa (ON)	114.89	122.44	80.55	338	244	95	17	0.62
Toronto (ON)	70.51	45.23	104.90	2,042	2,535	-493	1,821	-0.07
Hamilton (ON)	27.13	28.75	18.64	448	431	17	83	-0.08
St. Catharines(ON)	27.75	32.59	5.85	200	184	17	28	0.28
Kitchener (ON)	56.70	52.92	63.26	332	294	38	69	-0.06
London (ON)	61.65	61.49	54.43	332	324	8	60	0.18
Windsor (ON)	31.77	26.78	43.18	143	142	1	58	0.60
Greater Sudbury(ON)	5.23	9.79	-34.87	118	123	-5	4	0.50
Thunder Bay (ON)	1.16	8.90	-37.99	81	92	-10	5	0.31
Winnipeg (MB)	18.60	19.85	8.14	384	459	-75	90	-0.32
Regina (SK)	18.56	21.72	-15.35	156	181	-25	14	0.03
Saskatoon (SK)	51.64	56.61	0.00	219	237	-18	17	0.42
Calgary (AB)	82.43	74.68	101.51	810	668	142	167	0.07
Edmonton (AB)	57.54	58.39	47.10	724	689	35	109	-0.31
Vancouver (BC)	67.82	39.75	123.44	1,091	1,100	-10	670	-0.32
Victoria (BC)	41.71	48.26	13.93	319	278	41	24	0.72

Notes: Population growth rates are taken from censuses for the period 1981-2006. Population flows are calculated from the data and cover 1986- 2007. Inflows and outflows include only in- and out-migrations. "Corr." represents the correlation coefficient between net migration and new immigrant flows from 1986- 2007.

It isn't the three gateway cities of Montreal, Toronto, and Vancouver that show persistent net outflows. Note that although each of those major cities experienced a high increase in their immigrant population compared to the increase in their native-born population, almost all CMAs neighbouring Calgary, Montreal, Toronto, and Vancouver had higher growth in their native-born, rather than in their immigrant, population. Moreover, the correlation between new immigration and net migration flows was mostly negative for cities with negative or near zero net migration. Yet although Tables 1 and 2 are instructive and reflect migration and immigration trends at the provincial and CMA levels, they are far from conclusive in showing possible crowding out patterns across metropolitan areas.

3 Spatial equilibrium framework

To identify the key channels by which immigration affects out-migration of nonimmigrant's, I introduce a simple spatial equilibrium model in which population flows are explained by regional housing and labour market conditions, the quality of local amenities, and the presence of social avoidance or self-selected ethnic segregations.[4] To understand how relocation decisions can be made by nonimmigrant individuals, we start with the following separable utility function:

$$U_{ir} = \left[\alpha \frac{h^{1-\theta} - 1}{1-\theta} - R_r h \right] + w_r(P_r) + A_{ir} - \lambda M_r . \qquad (1)$$

The term in brackets captures the net income effect of housing, where h is the value received from housing services that the nonimmigrant individual i consumes, and R represents the housing rent in region r so that the optimal housing can be expressed as $h_{ir} = (\alpha/R_r)^{1/\theta}$. The individual earns and consumes the current regional wage w_r, which is a function of the local population (P_r) – the sum of nonimmigrant (N_r) and immigrant (M_r) residents. Assuming that all individuals are in the labour force, the demand for labour can be expressed by $w_r = \bar{w}_r - \rho(N_r + \varepsilon M_r),$ where ρ measures the impact of the population growth on local wages and ε reflects the degree of substitutability between immigrant and nonimmigrant workers with $0 \le \varepsilon \le 1$.[5]

The value of regional amenities for the individual is represented by the term A, which is heterogeneous among established nonimmigrants and new immigrants. Hence, $A_{ir} = T_r - aN_r$ provides a linear approximation of the congestion effect, where T is the total capacity of local amenities and a is the individual share of amenities that each nonimmigrant consumes on average.

Finally, immigration has a direct negative impact on the well-being of nonimmigrants expressed by λM, where λ captures the degree of self-segregation or social avoidance. The native born and the established immigrants may want to live in communities with other households who have similar cultural and social values. This topic has been the subject of discussions particularly in the U.S. Frey used terms such as “demographic balkanisation” and “white flight” in his earlier papers investigating racial segregation across U.S. cities. Filer (1992) found that although white wages are affected less by low-skilled immigration than are black wages in the U.S., mobility responses were stronger among whites, which implies something other than direct labour market effects influencing migration of the native born.

At the steady state, for a spatial equilibrium to hold, U_{ir} must be equal to a reservation utility level denoted by $\underline{U}$. In other words, the marginal nonimmigrant

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[4] This model builds on the framework used by Saiz (2007) to identify the relationship between immigration and local housing markets in the U.S.

[5] It is assumed that $\rho > 0$.

will be indifferent between staying and leaving the region if $U_{ir} = \underline{U}$, where we normalize the utility level outside the region to $\underline{U}$.[6] From this spatial equilibrium condition, we can derive the supply of nonimmigrant residents in region r as follows:

$$N_r = \Phi - \frac{1}{a+\rho}\left((\underline{T} - T_r) + (\underline{\overline{w}} - \overline{w}_r) + \sigma(\underline{R}^{\frac{\theta-1}{\theta}} - R_r^{\frac{\theta-1}{\theta}}) \right) - \left(\frac{\varepsilon\rho + \lambda}{a+\rho} \right) M_r, \quad (2)$$

where $\Phi = (a+\rho)^{-1}(\varepsilon\rho+\lambda)\underline{M} + \underline{N}$ and $\sigma = \theta\alpha^{1/\theta}/(1-\theta)$. It is assumed that immigration to a region from abroad is exogenously determined by conditions in source countries and previous immigrant inflows.

A number of observations can be made about (2). First, unfavourable spatial differences (*e.g.*, in amenities, income levels, and housing costs) expressed in the first parenthesis has a negative effect on the number of nonimmigrant residents.[7] Second, the effect of immigration on nonimmigrant mobility is not independent of the parameter of ρ – the impact of immigration on local wages. For example, if ρ is "large" in the case of imperfect substitution, the effects of immigration on internal migration are diffuse even if the direct disutility from immigration is substantially larger than zero. Third, in this framework, the labour market is clear, and there is no unemployment. If wages do not adjust, inter-regional differences in unemployment rates will affect internal migration as well. Lastly, the coefficient on M is biased downward because the relationship between local housing rents and immigration is absent in the above setting.[8]

Note that by using (2), we can also express differences in the supply of nonimmigrant residents between region j and r as a function of spatial differences and the divergence in the size of immigrant populations as follows:

$$N_j - N_r = \frac{\Omega}{a+\rho} + \left(\frac{\varepsilon\rho+\lambda}{a+\rho} \right)(M_r - M_j), \quad (3)$$

[6] To incorporate moving costs, we can discount $\underline{U}$ by μ; hence, the equilibrium condition becomes $U_{ir} = \mu\underline{U}$, where $0 \leq \mu \leq 1$, depending on the distance. Although discounting does not change the fundamental results, it implies that spatial differences and immigration have weaker effects on relocation decisions as the distance increases.

[7] The list of spatial differences that may affect the supply of nonimmigrant residents should be longer than what we have in (2). For example, as Ley (2007) points out, in the last two decades, global cities have been experiencing significant shifts in their economic structure with new types of capital growth and polarized labour demand.. This ongoing economic restructuring has created new demand for managerial and professional occupations, with decreasing importance of primary jobs in some disappearing manufacturing and service industries. As a result, blue collar native-born workers have had to move to other places or upgrade their skills, whereas new immigrant worker are willing to work for lower wages (Sassen, 1995).

[8] From (2), it is obvious that an increase in R reduces N. It can also be shown that at any given level H (= h x P) and N, an increase in M raises R in the short run.

where Ω represents the term in the first parenthesis of (3).[9]

4 Results

Based on (3), our estimating framework[10] takes the following form:

$$n_{rj,t} = \beta(m_{r,t} - m_{j,t}) + \boldsymbol{\delta}(\mathbf{x}_{r,t} - \mathbf{x}_{j,t}) + \varepsilon_{rj,t}, \tag{4}$$

where the dependent variable is the inter-regional net migration ratio from region *j* to *r*, which is the number of in-migrants from region *r* to *j* minus the number of out-migrants from region *j* to *r* divided by half the combined regional populations. The first term on the right-hand side of (4) is the difference between inflows of new immigrants to region *r* and *j* divided by half the combined population with coefficient β. The second term is the difference in a vector of other variables between region *r* and *j* that affect net migration from *j* to *r* with the coefficient vector δ.

For the dependent variable, I use a dataset (CANSIM Table 1110030) provided by Statistics Canada at the CMA level. The table contains detailed information on inter-regional migration across CMAs over the period 2000-2007. The dimension of the series (28 CMAs and 8 years) gives a panel of 3024 observations (8 years x 378 CMA pairs). For example, the observation on the first pair (St. John's-Halifax) reflects the amount of net migration (in-migration from Halifax minus out-migration to Halifax) from St. John's to Halifax for each year over the period 2000 to 2007. The immigration series, which reflects the number of new immigrants, is taken from Table 1110029 for the same period and CMAs. The linkage between local market outcomes and population mobility is controlled by inter-regional differences in unemployment rates (CANSIM Table 2820053), wage rates (CANSIM Table 1110025), and housing price indices (CANSIM Table 3270005).

Note that this analysis investigates local population flows, including all people, not just labour flows. This is mainly because data on the mobility of local workers by skill groups or by labour force status are not available to the public at the CMA level and the cost of obtaining such data is too high. Although labour market effects on relocation decisions will be diffused in this setting, these data do have the advantage of including people who are not in the labour force but move to other localities due to housing market outcomes or self-segregation.[11] Moreover, inter-regional migration flows include not only nonimmigrant residents but all of the local population. An immigrant to one region who later moved to

[9] Note that (3) puts a constraint on the coefficient of (M_r–M_j) by assuming that the degree of substitutability (ε) and the disutility from immigration are identical across regions.

[10] This is similar to the framework applied by Hatton and Tani (2005).

[11] This is similar to Frey's models that cover all people.

another region will be included in net migration data. In this sense, estimation results may be interpreted as mobility responses of the local population to immigration, not as responses of the local nonimmigrant or native-born residents. Lastly, the data include population flows only across CMAs and but not information on the mobility of local residents between CMAs and non-CMA localities. Therefore, the present study questions whether the displacement of local residents from one CMA to other CMAs is a response to immigration.

To remove unobserved spatial differences, I apply a fixed-effect model that includes a full set of year dummies. To address a potential concern that immigrant inflows as well as other explanatory variables could be endogenous, I also use lagged values for the explanatory variables.[12] Moreover, unlike other area studies that use immigrant densities, this study uses flows of new immigrants that, as commonly accepted, choose their initial destination based not on local labour market opportunities but on their ethnic and cultural connections in the local population (Borjas et al., 1997; Saiz, 2007; Bodvarsson and Van den Berg , 2009).

To confirm the existence of displacement effects of immigration, the sign of the net immigration ratio should be positive. An example helps us see this relationship better: net migration between St. John's and Halifax (in-migration from Halifax to St. John's minus out-migration to Halifax from St. John's over half the combined population) is supposed to increase as the net new immigration ratio (the number of new immigrants to Halifax minus the number of new immigrants to St. John's divided by half the combined population) rises. This is also true for the net unemployment rate, which is the difference between unemployment rates (those of Halifax minus those of St. John's). Similarly, it is expected that an increase in the housing price index in Halifax relative to that in St. John's would positively impact net migration between St. John's and Halifax. A wage rate differential, on the other hand, should have a negative effect on the net migration rate. In other words, as relative local wage rates go up in Halifax, migration to St. Johns declines.

[12] I also used lagged values as instrumental variables (IV). The results are not substantially different from those obtained without an IV application.

Table 3: Estimates of bilateral net inter-regional migration rates (2000–2007)

	1	2	3	4
Net immigration ratio	-0.0026	0.0022	0.0033	0.0038
	-1.68	2.01	3.24	2.00
Net unemployment rate		1.50E-05	1.70E-05	9.70E-06
		4.02	0.68	1.97
Net wage earning		-7.7E-09	-5.2E-09	-1.20E-08
		-2.67	-3.45	-3.11
Housing price index difference				1.70E-06
				2.98
AR(1)–ρ			0.5593	
# of observations, (CMA pairs, Year)	2971 (378, 8)	2971 (378, 8)	2593 (378, 7)	1516 (190, 8)
F(df, N)	(8, 377) 2.86	(10, 377) 6.4	(9, 2206) 4.84	(11, 189) 6.87
R^2-within	0.015	0.054	0.019	0.078
corr(u_i, X)	-0.243	-0.036	0.074	-0.168
rho = var[u_i]/(var[u_i]+var[e_{it}])	0.707	0.682		0.557

Notes: (1) The dependent variable is net migration from *j* to *r* divided by half the combined population. (2) Net immigration ratio is the difference between the number of new immigrants to region *r* and *j* (region *r* minus region *j*) divided by half the combined population. Net unemployment rate is the difference between regional unemployment rates (*r* minus *j*). Net wage earning is the difference between regional average wage rates (*r* minus *j*). Housing price index difference is the difference between regional housing prices indices (*r* minus *j*). (3) 't' statistics are given under the coefficients calculated from robust standard errors adjusted by regional provincial clusters. (4) 'rho' indicates the fraction of the unexplained variance due to differences across CMA pairs. (5) Year and regional fixed effects are controlled in all regressions (not shown here).

Because of negligible differences, only the estimation results of (4) without lagged explanatory variables are reported in Table 3. The estimation in the first column includes only the variable of interest. The second and third columns include all variables, while the third column applies the AR(1) transformation and the last column adds the housing price index variable to the regression.[13] As expected, high *rho* values indicate that most of the explanatory power comes from unobserved fixed effects across CMA pairs. Except for the estimate in column (1), all coefficients have the expected signs. This implies that differences in local market outcomes are important and that without controlling them, the coefficient of the net new immigration ratio will be biased.

In columns (2), (3) and (4), the coefficients on net immigration are significant and suggest that a one percentage point increase in the difference of

[13] The housing price index is not available for all CMAs. Therefore, the number of observations decreases drastically when included in the regressions.

new immigration ratios between two CMAs *r* and *j* increases the net migration ratio from *j* to all other 27 CMAs about 0.003 (0.0022, 0.0033, 0.0038 in columns (2), (3), and (4)) percentage points on average. Because the displacement effect of immigration for each CMA spills over into 27 other CMAs, the size of the coefficient turns out to be small. However, a rough estimate of this displacement effect on a CMA can be approximated in an example: when CMA *j* receives 100 more new immigrants than *r*, the net new immigration ratio increases 1 percentage point (supposing that the average population is 100 thousand for *j* and *r*). The regression results indicate that this 1 percentage point increase in the immigration ratio should increase the net migration ratio by a 0.003 percentage point on average, which implies that for each 100 more new immigrants, CMA *j* loses its 8 residents to other CMAs,[14] which is consistent with what Hatton and Tani found for the U.K.[15] However, the present bilateral model cannot control a possible effect of the third CMA on CMA pairs. In other words, the effect of immigration on a CMA pair, say *j* and *r*, can be influenced by the relationship between CMA *r* and *i*, which may, in turn lead to an unpredictable bias in estimates.

Differential local market outcomes have also significant effects on net migration rates. In addition to the spillover effect explained above, there could be several other reasons for their insignificant magnitude. First, since the data include all local residents, labour market effects on relocation decisions will be dissipated. Second, by definition, (1) abstracts from income effects in housing consumption. Hence, a more sensible approach would be to consider income net of housing costs, not housing costs as measured by the housing price index. For example, consider two neighbouring regions with identical amenities, one of which has annual wages of $40,000 with annual housing costs of $10,000, whereas the other has annual wages of $60,000 and annual housing costs of $30,000. As seen in this example, even though the housing cost is higher in the second region, higher wages offset the difference, and in both regions, people earn the same income ($30,000 net of housing cost). This fact leads to a downward bias in the coefficients of the housing variables in our estimations.[16]

5 Concluding remarks

Despite Canada's being one of the major immigrant-receiving countries in the world, most studies that look across Canadian local markets have found immigration's effects to be weak. One hypothesis is that rising immigration flows into a region may lead to the out-migration of local residents. If this effect is

[14] 0.003% x 27 = 0.08%.

[15] Note that this study looks at effects of immigration on bilateral inter-regional population flows at the CMA level, which is different from what Hatton and Tani studied. Since they looked at 11 regions covering the entire country, the size of the coefficient in their study is bigger than those estimated here.

[16] See Glaeser (2008) for more details.

substantial, even if immigrants displace local workers in employment, bid down wages, or cause local housing cost to rise, the overall impact of immigration on local markets will be diffused.

This study, which builds on a model developed by Hatton and Tani (2005), investigates mobility responses of local residents to immigrant inflows across CMAs in Canada. First, I developed a spatial equilibrium framework by which the migration of local residents is determined. Based on this model, I estimated bilateral net inter-regional migration responses to differences in regional immigration inflows and local market outcomes by using data on migration and immigration, a panel of approximately 3000 observations, over the period 2000- 2007 at the CMA level.

The results indicate a positive correlation between immigration and out-migration across CMAs. For each 100 or more new immigrants, a CMA loses 8 residents to other CMAs on average, roughly equivalent to an 8 percent crowding out effect of immigration only across CMAs, which is consistent with the modest local labour and housing market effects of immigration found in most Canadian studies. However, this crowding out effect can be offset or magnified when all CMA and non-CMA regions are included. Moreover, displacement effects can occur across not only regions but also skill levels in a region, leaving the local labour market outcomes for a skill level unchanged. I will expand this study on these issues in future as data availabilities improve.

Appendix: Brief summary of the Hatton-Tani model

In their paper, Hatton and Tani (2005) formally show how inter-regional mobility of the nonimmigrant local labour force can diffuse the effect of immigration on regional wages or unemployment. In region *i*, the change in total employment at time t can be represented thus:

$$m_{i,t} + n_{i,t} = \Delta x_{i,t}^{d} - \alpha \Delta w_{i,t} + v_{i,t}, \qquad \text{(A1)}$$

where $m_{i,t} = \Delta M_{i,t} / (M+N)_{i,t-1}$ and $n_{i,t} = \Delta N_{i,t} / (M+N)_{i,t-1}$ are the population growth rate contributions of the native born (N) and immigrants (M) in region *i*, respectively. The first term on the right-hand side of A1 is the shift in labour demand; the second term is the growth rate of wage with the parameter α that captures the labour demand elasticity with respect to the wage; the last term is the random disturbance. The growth of immigrant and nonimmigrant labour supplies can also be defined as follows:

$$m_{i,t} = \beta_1 (w_{i,t} - w_t^{n}) + \beta_2 z_{i,t} + u_{i,t}, \qquad \text{(A2)}$$

$$n_{i,t} = \lambda_1 (w_{i,t} - w_t^n) - \lambda_2 m_{i,t} + e_{i,t}, \qquad \text{(A3)}$$

where w_t^n is the (log) national average wage and $z_{i,t}$ is a region-specific immigration shock. Hence, immigration inflow is determined by the region's relative wage and other factors, like conditions in source countries. On the other hand, nonimmigrant migration is affected by a direct negative impact of immigration presented by the second term in (A3). This term reflects a sum of all other channels – the housing market, congestion effects and social avoidance – that may affect the dislocation decision of the nonimmigrant.

Using (A1) and (A3), changes in the regional wage level can be obtained as a function of immigration and other variables:

$$w_{i,t} - w_{i,t-1} = \frac{\Delta x_{i,t}^d}{\alpha + \lambda_1} + \frac{\lambda_1 (w_t^n - w_{i,t-1})}{\alpha + \lambda_1} + \frac{v_{i,t} - e_{i,t}}{\alpha + \lambda_1} - \frac{(1-\lambda_2) m_{i,t}}{\alpha + \lambda_1}. \qquad \text{(A4)}$$

Area studies implicitly assume that internal immigration is unresponsive to the relative wage or to the direct displacement effect of immigration, that is, $\lambda_1 = \lambda_2 = 0$. (See Hatton and Tani, 2005, for more detail.)

References

Akbari, A. and Aydede, Y. (2009) "Effects of Immigration on Housing Prices in Canada." Working Paper 24-2009, Atlantic Metropolis Centre.

———. (2010) "Do the Educational Credentials of Immigrant and Nonimmigrant Workers make them Perfect Substitutes for Each Other in Canadian Labour Markets? A Production Function Analysis." Working Paper 29-2010, Atlantic Metropolis Centre.

Akbari, A. and DeVoretz, D. (1992) "The substitutability of foreign born labour in Canadian production: circa 1980." *Canadian Journal of Economics*, 25.

Aydemir, A. and Borjas, G. (2007) "Cross-Country Variation in the Impact of International Migration: Canada, Mexico, and the United States." *Journal of European Economic Association*, 5(4).

Bodvarsson and Van den Berg (2009) "Economics of Immigration" Springer, NYC

Borjas, G. (2006) "Native internal migration and labor market impact of immigration." *Journal of Human Resources*, 56: 221-258.

Borjas, G., Freeman, R. and Katz, L. (1997) "How Much Do Immigration and Trade Affect Labor Market Outcomes?" *Brookings Papers on Economic Activity* 1997(1): 1-90. Washington, D.C.: Brookings Institution.

*Card, D. (1997) "Immigrant Inflows, Native Outflows, and the Local Market Impacts of Higher Immigration." NBER Working Paper 5927.

Card, D. and DiNardo, J. (2000) "Do Immigrant Inflows Lead to Native Outflows?" *New Issues in Immigration*, 90(2).

Federman, M., Harrington, D. and Krynski, K. (2006) "Vietnamese manicurists: Are immigrants displacing natives or finding new nails to polish." *Industrial and Labor Relations Review*, 59: 302-318.

Filer, R. (1992) "The Effect of Immigrant Arrivals on Migratory Patterns of Native Workers." In Borjas and Freeman (Eds.), *Immigration and the Workforce: Economic Consequences for the United States and Source Areas* (pp. 245-269). Chicago: The University of Chicago Press.

Frey, W. (1994) "The New White Flight." *American Demographics*. 21: 123-45.

———. (1995) "Immigration and Internal Migration 'Flight' from US Metropolitan Areas: Towards a New Demographic Balkanisation." *Urban Studies*, 32(4-5): 744-757.

———. (1996) "Immigration, Domestic Migration, and Demographic Balkanisation in America: New Evidence for the 1990s." *Population and Development Review*, 22(4): 741-763.

———. (2002) "Three Americas: The Rise Significance of Regions." *Journal of the American Planning Association*, 68(4): 349-355.

Glaeser, L.E. (2008) "Cities, Agglomeration, and Spatial Equilibrium." New York: Oxford University Press Inc.

Harrison, R. (2002) "Moving Out when Minorities Move In." *American Demographics*, (June): 23-24.

Hatton, J.T. and Tani, M. (2005) "Immigration and Inter-Regional Mobility in the UK, 1982–2000." *The Economic Journal*, 115 (November): 342-358.

Hou, F. and Bourne, L.S. (2004) "Population Movement Into and Out of Canada's Immigrant Gateways Cities: A Comparative Study of Toronto, Montreal and Vancouver." Statistics Canada, Analytical Studies Branch research paper series, Catalogue no: 11F0019MIE—No: 229.

Islam, A (2009) "The substitutability of labor between immigrants and natives in the Canadian labor market: circa 1995." *Journal of Population Economics*, 22.

Ley, D. (2007) "Countervailing Immigration and Domestic Migration in Gateway Cities: Australian and Canadian Variations on an American Theme." *Economic Geography*, 83(3): 231-254.

Ley, D. and Tutchener, J. (2001) "Immigration, Globalisation and Housing Price Movements in Canada's Gateway Cities." *Housing Studies*, 16: 199-223.

Roy, A. (1987) "An Analysis of substitutability and complementarity of immigrants and the Canadian-born workforce." *Labour Market Bulletin*, 4.

———. (1997) "Job displacement effects of Canadian immigrants by country of origin and occupation." *International Migration Review* 31(1).

Saiz, A. (2007) "Immigration and Housing Rents in American Cities." *Journal of Urban Economics*, 61: 345-71.

Sassen, S. (1995) "Immigration and Local Labor Markets." In A. Portes (Ed.), *The economic sociology of immigration* (pp. 87-127). New York: Russell Sage Foundation.

Statistics Canada (2005) "Population Projections for Canada: Provinces and Territories, 2005-2031." Catalog Number: 91-520-XIE.

Walker, R., Ellis, M. and Barff, R. (1992) "Linked Migration Systems: Immigration and Internal Labour Flows in the United States." *Economic Geography*, 68(3): 234-248.

White, M. and Imai, Y. (1994) "The Impact of U.S. immigration upon internal Migration." *Population and Environment*, 15(3): 189-209.

Wright, R. A., Ellis, M., and Reibel, M. (1997) "The Linkage between Immigration and Internal Migration in Large Metropolitan Areas in the United States." *Economic Geography* 73(2): 234-254.