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IMMIGRATION FLOWS AND REGIONAL LABOUR MARKET DYNAMICS

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**IMMIGRATION FLOWS AND REGIONAL  
LABOUR MARKET DYNAMICS.**

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## **Abstract**

This paper analyses the ability of a regional market to absorb growing flows of immigrant workers with declining levels of skills in times of relatively high unemployment. The impact of the size of the flow as well as the skill characteristics of the immigrants are analysed. It is found that immigration is positively related to unemployment in the short-run and negatively related to the unemployment rate in the long-run. Higher average skill level among immigrants makes them more competitive in their job search in the short-run however some discrepancy between the skill distribution of immigrants and the existing workforce maintains unemployment lower.

**Keywords:** International Immigration, Labour Market Dynamics, Co-Integration.

**J.E.L. Classification:** E24, F22, J61, J31.

# **FLUX MIGRATOIRES ET DYNAMIQUE DANS UN MARCHÉ DU TRAVAIL REGIONAL**

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October 15, 1997

## **Résumé**

Ce papier analyse la capacité d'absorption de flux migratoires grossissants par un marché régional du travail en période de chômage élevé alors que les qualifications des travailleurs immigrés diminuent. Les effets de la taille des flux et de leurs composition en terme de qualifications sont analysés. Il est démontré que l'immigration est corrélée positivement avec le chômage dans le court terme et négativement dans le long terme. Un niveau de qualifications moyen plus élevé chez les immigrants les rend plus compétitifs dans la recherche de travail dans le court terme mais différentes qualifications que la main-d'oeuvre locale aussi maintient le chômage à un niveau plus bas.

**Mots clés:** Immigration internationale, dynamique du marché du travail, cointegration.

**Classification J.E.L.:** E24, F22, J61, J31.

## 1. Introduction

In recent years, growing immigration flows and persistently high unemployment have become common features of many Western economies (see Appleyard (1993)). As a consequence, concern about the ability of the labour markets to integrate the newcomers has risen and, in many countries, demands to curtail immigration levels have become more pressing. The most often heard arguments are: Immigrants steal jobs from native workers and, immigrants are unskilled and put too much pressure on the public purse because they do not find jobs. In both cases, they are held responsible for high unemployment.

Surprisingly, there are very few empirical studies concerned with the impact of newly arrived immigrants on the destination labour market and even fewer are done at the aggregate level.<sup>1</sup> Aggregate studies of the relationship between immigration flows and unemployment in the destination country, put much emphasis on identifying the direction of the causality between the two variables. While unemployment may be sensitive to immigration, the level of immigration is also expected to be influenced by unemployment in the destination region through the so-called pull-effect (see Ghartak et al. (1996)). Most studies do not find a significant causality from immigration to unemployment (see for examples, Marr and Syklos (1994, 1995), Pope and

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Most of the literature concentrates on the assimilation question, i.e. the relative performance of natives and immigrants in the destination country (see Borjas (1994) and Ghartak et al. (1996) for surveys).

Withers (1985)).

The main shortcoming of aggregate causality studies is that they are statistical exercises as there is no structural representation of the labour market. Very few studies, among which Junankar and Pope (1990) and Withers and Pope, (1993) model simultaneously labour market aggregates in the context of immigration. Moreover, all the aggregate studies are conducted at the country-level thereby implicitly assuming that immigrants settle randomly across the country. This clearly is not the case. In Canada in 1986, for example, more than 50% of immigrants lived in the 3 metropolitan areas, Montreal, Toronto, Vancouver, which represented less than 30% of the population (Canada Yearbook (1994)). Also, at the country-level, the level of immigration is very small compared to the population and any effect on aggregate unemployment is likely to be difficult to identify. Finally, the use of time-series data present estimation challenges since it is now recognized that, statistical properties of the data such as non-stationarity invalidate the results obtained by traditional estimation methods.

This paper is an investigation into the impact of immigrants on the dynamics of a regional labour market represented by a set of aggregate structural relationships for immigration, unemployment, real wage and labour force participation. Advantage is taken of recent econometric developments to investigate long-term as well as short-term effects of immigration flows and skill characteristics.

The empirical investigation uses recent developments in time-series econometrics which recognize explicitly the properties of the data such as non-stationarity as well as allow for simultaneous determination of aggregate variables. The two-step procedure developed in Johansen (1995) and Johansen and Juselius (1995) is used to identify the long-run as well as the short-run relationship between unemployment and immigration. In the first-step, unemployment,

real wage, labour force participation and immigration flows are considered to be simultaneously determined. The results can therefore be interpreted as the long-run response of the regional labour market to international immigration. The short-run dynamic response of unemployment, real wages and immigration flows is estimated in the second step, paying particular attention to the role of skill differentials between native and immigrant workers. The methodology can be viewed as an extension of the one used by Marr and Syklos (1994) in their study of Canada in the sense that it allows for the introduction of structural factors in the analysis.

By focusing on a region, the analysis benefits from the presence of a high concentration of immigrants in a relatively small labour market. The region under consideration is British Columbia. It is, among the three Canadian provinces with a major metropolitan area, the region with highest density of immigrants.<sup>2</sup> It is found that, the initial impact of larger immigration flows, is to raise unemployment and real wage in the short-run. In the long-run, however, the immigration rate is negatively correlated with unemployment. The average level as well as the distribution of skills of immigrants relative to native workers matter. In particular, a higher level of skills in immigrants reduces unemployment and real wage in the short-run. Hence, increased skill levels in immigrants allow them to be more competitive on the labour market. However, the distribution of skills should not match exactly that of employed native workers. Since immigrants' skill characteristics are directly related to the point evaluation system, the results suggest that market outcome can be altered by immigration policy.

The paper is organized as follows. The next Section presents some facts about immigration and unemployment in British Columbia. Section 3 sketches briefly the theoretical argument and sets up the empirical specification. In Section 4, the estimation results are

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<sup>2</sup>In 1986, immigrants represented 48% of the provincial population. In Quebec, the share was 45% and in Ontario, 38%.

discussed. Final comments are given in Section 5.

## **2. Immigration and the labour market.**

The rising public concern about the ability of the labour market to integrate new immigrants is based on two observations. First, in recent years, unemployment has been relatively high and immigration levels have risen thereby not following the usual cyclical pattern. Second, the ability of immigrants to match the need of the labour market appears to have deteriorated as their average skill level fell. This section reviews some of the evidence about these two statements for British Columbia (B.C. hereafter) between 1980 and 1995.

Throughout the 1980s, the pattern of immigration flows reflected the federal policy which linked the number of accepted immigrants to the state of the business cycle (see Green and Green (1996), for details). In B.C., the unemployment rate more than doubled between 1980 and 1985, rising from 6.8% to 14.2% and during that period, the number of new immigrants dropped by 50% from 24,500 to 12,319 (see Figure 1).

*[Insert Figure 1, about here]*

During the second part of the 1980s, unemployment receded slowly and the number of newcomers was increased steadily. By 1989, the flow of new immigrants was above the 1980-level (25,442) and the unemployment rate was just below the two-digit level (9.1%).

In the 1990s, the immigration policy stand changed and, for the first time in Canadian history, the number of accepted applicants became independent of the state of the economy. Hence, when the recession hit in the early 1990s, the flow of immigrants kept rising. In 1994, almost 50,000 new immigrants settled in B.C. and the unemployment rate was 9.4% (see Table 1).

*[Insert Table 1, about here]*

Moreover, a concurrent rise in the proportion of those who declared their intention to work upon arrival put further pressure on the B.C. labour supply (see Figure 2).

*[Insert Figure 2, about here]*

In effect, in the early 1980s, approximately 40% of the newcomers declared their intention to work upon arrival (called 'immigrant workers' hereafter). Ten years later, almost half of the immigrants to the region wanted to enter the labour market. As a result, immigrant workers were a driving factor in labour force growth as the ratio of new immigrants to the domestic labour force rose from 0.45% in the early 1980s to 1.11% in the early 1990s. The increase in labour force participation by new immigrants appears to be inconsistent with the observed rise in unemployment. In fact, despite its sluggishness, the B.C. labour market was performing well relative to the rest of the country in the 1990s as the unemployment rate was below the national average (Column 5, Table 1, middle panel). This suggests that immigration is endogenous at the regional level while it is not necessarily so at the national level with a policy based on quotas. In that case, the distribution of immigrants across the land is clearly not random.

This brief review validates the first public concern: Immigration to British Columbia did rise during the past 10 years with an even stronger increase in immigrant workers despite stubbornly high unemployment rates.

The second reason for concern about immigrants and the labour market is the deterioration of the skill level of newcomers which, in Canada, is often attributed to changes in the selection process. The selection process is based on a class system by motives of immigration (i.e. business, family reunion, independent, retirement). Depending on the class, candidates may be

subjected to a point evaluation.<sup>3</sup> The goal of the point evaluation is to assess the ability of the candidate to fit the demands of the Canadian economy. It covers characteristics such as education, skills, work experience and language ability for examples. Throughout the 1980s, various changes to the definition of classes decreased the share of assessed immigrant workers significantly (see Figure 2). From a maximum of 65.4% in 1980 it fell to a minimum of 28.6% in 1992 with most of the decline taking place in the late 1980s and early 1990s. Thus, as the economy slowed down, a growing number of immigrants wishing to enter the labour market had not been evaluated for their ability to fit in a rapidly changing economy and the second concern appears to be also supported by the facts.

The statistical evidence since the late 1980s clearly points toward an increase in the immigration flows combined with a fall in immigrants' average skill in spite of the sluggish labour market. It is therefore tempting to conclude that *larger* waves of *less skilled* immigrants are responsible for high unemployment. The remainder of this paper is a formal investigation into the validity of this argument.

### **3. The basic theoretical framework.**

The intent of this paper is not to develop a full theoretical model of the labour market in the presence of international immigration but rather to uncover its dynamic evolution with the support of economic theory. This section therefore, outlines the main expected features of the aggregate relationships between unemployment, real wage, the labour force and immigration.

Labour market models such as the ones developed in Layard et al. (1991), Pissarides

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For examples, the "family reunion class" is totally exempted from assessment through the point system. Members of the so-called "independent class" are accepted solely on the basis of the number of points they get. For other classes, an assessment by points as well as other criteria enter the decision to accept or reject the applicant. (see Green and Green (1995) for details).

(1991), Layard and Nickell (1986), provide a theoretical framework for the following set of equations,

Install Equation Editor and double-click here to view equation. where  $u$  is unemployment,  $w$  is the real wage,  $l$  is the labour

force and  $m$  is immigration. The letters  $z$ ,  $x$ ,  $y$ ,  $k$  represent vectors of exogenous factors. The novelty with respect to the model developed in the literature is the introduction of immigration variable independently of the labour force.

The effect of immigrants on unemployment in microeconomic studies is usually set-up within the framework of the production process, and aims at determining whether immigrants are substitute or complement to native workers in the production process. An often neglected aspect of immigration, in partial equilibrium studies, is the job-creation effect of immigrants through their demand for goods and services, an argument developed in Simon (1989) and in Altonji and Card (1991).<sup>4</sup> In a more general equilibrium framework, immigrants create jobs through their demand for goods and services independently of their participation to the labour market thereby benefitting local workers immediately. At constant wages, the effect on local unemployment depends, among other factors, on immigrants' spending on consumption goods relative to natives' and on the types of returns to scale in production. However, new immigrants, once they enter the labour market also have an adverse effect on the search efficiency of native workers. Depending on their relative ability to find jobs (for example, their skill likeness with residents), they may provide strong competition to native workers and increase their unemployment. The total impact of new immigrants on native unemployment can be simply illustrated using the definition of

aggregate unemployment,

Install Equation Editor and double-click here to view equation. where  $UB$  and  $UA$  are native unemployment before and after the

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One of the earlier paper developing the idea is Harrison (1983).

arrival of the immigrants and  $I_n$  and  $O_n$  are the unemployment inflow and outflow. In an aggregate search framework, the two effects described above resulting from the arrival of immigrants imply

that (1) is also,

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with  $tE=I_n$ , the native turnover rate (assuming that everybody experiences unemployment when changing jobs) times

employment ( $E$ ). The term  $dM$  is the demand-induced job creation by immigrants where  $d$  [with  $0 < d < 1$ ] is a function of the returns to scale in aggregate production and of the immigrant and resident relative consumption spending;  $M$  is the number of new immigrants. The sum  $(tE + dM)$  is therefore the number of new vacancies. The last term is the rate at which the vacancies are filled by native job searchers and takes into account the externality immigrants impose on the search by native workers. The effectiveness of immigrants in competing with other workers is measured by a factor representing their relative skills ( $a$ , with  $0 < a < 1$ ). For example, if immigrants have skills which are not in demand, i.e.  $a=0$ , all the job openings are filled by native workers and their unemployment falls due to the increased job creation following immigrants' arrival.

Some insight into the expected magnitude of the two key parameters  $d$  and  $a$  can be gained by using information from our dataset after deflating (2) by the labour force. Using the sample average unemployment rate of 10% and a turnover rate with respect to the labour force equal to 6%, it is assumed that immigrants are as effective as native workers in job search ( $a=1$ ); their spending pattern is identical to that of natives and there are constant returns to scale in production ( $d=1$ ). Then, if workers' immigration rate is 1% on an annual basis, native unemployment after immigration drops to 9.4%. If the relative consumption rate is 50% with constant returns to scale, there is still a small beneficial effect and natives' unemployment rate drops to 9.9%. Clearly if immigrants are not as effective as native workers in job search ( $0 < d < 1$ ),

the decrease in native workers' unemployment will be even larger in both cases. For total unemployment effect, the supply impact of immigrants must be added as they enter the labour market to search for jobs.

In (1), the immigration rate enters the wage-setting equation for the usual supply effect of new entrants on the labour market. Two distinct effects are expected for the labour force. First, international immigration may affect the participation decision of some local residents (see Borjas (1990)). Second, the local labour force may respond to international migration by moving to another region. Filer (1992), using correlation coefficients, finds there is substitution between international and internal immigration. In B.C. the opposite holds. The simple correlation between the immigration inflow from abroad and domestic net migration is positive, a result similar to Butcher and Card (1991)'s.

Finally, even though it is not the purpose of this study to model immigration decision, the endogeneity of the flows at the regional level cannot be ignored and the immigration rate is modelled independently from the labour force.

In this more general equilibrium framework where supply- and demand-side effects of immigrants as well as feedbacks from wage and the labour supply determine the final impact of immigration on the destination market, the empirical specification must be rich enough to account for simultaneity as well as statistical properties of the time-series. The next Section develops a strategy for identifying the dynamic adjustment of this market in the short- and in the long-run.

#### **4. Empirical implementation and results.**

The estimation of the 4-equation model depicted in (1) presents several challenges. First,

the specification and estimation procedure are determined by the statistical properties of the various series. In particular, the presence of unit-root (i.e. the series are integrated of order one, I[1]) requires differencing the data and thus, contemplating the possibility of cointegration between the levels. Second, while Granger-causality tests at the country levels support the hypothesis of exogenous immigration, this conclusion cannot be easily extended to regional markets. In section 2, observations on immigration rates and relative unemployment rates suggest that immigration respond to the state of regional labour market. Finally, the simultaneous determination of all four variables, wages, labour force, unemployment and immigration must be taken into account.

Starting with the statistical properties, two tests have been performed on the main series: The Durbin-Watson statistic (DW) and the Augmented Dickey-Fuller (ADF) tests. The results for the unemployment rate (LUR), the immigration rate (LIRQ), the real product wage (LW) and the youth participation rate (LYPAR) are given in Table 2.<sup>5</sup>

*[Insert Table 2, about here]*

The results of the ADF tests show that the hypothesis that all series except the unemployment rate are I[1] cannot be rejected at 10% significance. The values of the DW for unemployment is very small and not much different from that of the immigration rate for example. Since the ADF test lacks power in small samples<sup>6</sup>, we chose to consider that all the series are likely to be non-

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Detailed definitions of the variables are given in the Appendix. All the variables are in log.

Unit-root tests which only have asymptotic properties are considered to be less reliable in short samples (See Campbell and Perron (1991) and Davidson and MacKinnon (1993), chapter 20).

stationary and specify the model in first difference. Note, however, that if the series are cointegrated, a long-run relationship in levels between immigration, unemployment, real wage and labour force participation can still be identified.

In recent years, several methodologies have been developed to identify cointegration between variables and some of them deal with systems of equations (see Hargreaves (1994)). Our goal is to estimate efficiently the long-run relationship between the endogenous variables while also identifying the short-run structural parameters. We therefore adopt a two-step procedure. In the first step we use the methodology which identifies cointegration in systems developed in Johansen (1995).<sup>7</sup> It allows to define whether there exists a relationship between  $u$ ,  $w$ ,  $lf$  and  $m$  in the long-run when the variables are simultaneously determined. In the second step we estimate the short-run dynamics for unemployment, real wage and immigration flows with a specification in difference where the parameters of the cointegrating vectors from the first step are fixed and enter as an error-correction mechanism (*ecm*).

*First step: Identification of the long-run relationship.*

The procedure developed in Johansen (1995) for co-integration in systems is based on a  $p$ -

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dimensional VAR model in levels which is reparameterized as,

where  $\mu$  is a vector of deterministic variable (constant and seasonal dummies) and  $k$ , is the number of lags. Model (3) is a VAR in difference with an additional term in level ( $\Pi X_{t-k}$ ) which contains information about the long-run relationship between the variables. There is a matrix  $\alpha$

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See also Banerjee et al. (1993).

and a matrix  $\beta$  such that  $\Pi = \alpha\beta'$  and (3) becomes a system of equations in difference with an error-correction mechanism.<sup>8</sup> The maximal eigenvalue and the trace tests are the two tests, based on the rank of matrix  $\Pi$ , which identify the number of co-integrating vectors .

The difficulty with VAR specifications is the rapidly shrinking number of degrees of freedom. Moreover, the results of Johansen's procedure are valid only for well-behaved errors. Our strategy is therefore to design a parsimonious specification consistent with normality of residuals and with our theoretical framework as described by (1). Vector  $X$  contains the four variables which are endogenous in the long run: the unemployment rate (LUR), the real product wage (LW), youth participation rate (LYR) and the quarterly immigration flow rate (LIRQ). Finally, the number of lags is set to  $k=4$ , a vector with a constant and seasonal dummies is introduced and the observations are quarterly from 1980.1 until 1995.4.

The results of the two tests for identifying cointegrating vectors in Table 3 confirm the results of non-stationarity in levels obtained with the single variable ADF-tests.

*[Insert Table 3, about here]*

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If matrix  $\Pi$  has full rank, the vector process  $X_t$  is stationary. If  $\text{rank}(\Pi) = r < 4$ , equation (4) is a traditional differenced vector time-series.

Both tests, the trace test and the eigenvalue test, predict there are two valid co-integration vectors, and they are given by the first two rows of the standardized  $\beta'$  matrix (see Appendix II).

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Rewritten in the form of the long-run relationships, they are

We therefore conclude that unemployment, wage, youth participation and immigration rates are cointegrated. In both relationships, there is a negative relationship between unemployment and the flow of immigrants in the long run. This result is quite robust since it holds consistently across the vectors. Hence, in the long-run there is net job creation by immigrants. The second step of the estimation procedure identifies the short-run parameters for model (1).

*Second step: short-run dynamic of unemployment and immigration.*

Since there is a long-run relationship between unemployment, wage, youth participation and immigration in level, the short-run equations can be specified in difference with an error-

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correction term such that

where  $z$  is a vector of exogenous variables in the short-run and  $ecm$  is an error-correction term.

The latter is the first cointegrating vector from the first-step procedure with fixed parameters. In the case of multiple cointegration vectors there is no objective rule to choose one vector rather than the other except that the first one is more strongly correlated with the stationary portion of the processes (see Johansen (1992)). Thus, the valid cointegration relationship that we consider is the one given by the first relationship. The lags for the differences (3 lags) as well as for the  $ecm$

term (t-4) are dictated by the initial set-up of the VAR where  $k=4$  for levels.

In this second step, the endogenous variables ( $y$ ) are the unemployment rate (LUR) and the real wage (LW) and immigration rate (LIRQ). Weak exogeneity tests for the two labour force variables show that the youth participation rate is weakly exogenous while the immigration rate is endogenous.<sup>9</sup> Additional exogenous variables are aggregate demand (AD), a supply-side shock (PWOOD), a domestic structural shift measure (OCCUP) and, the cost of capital (RINT). In the wage equation, unexpected inflation (UEINF) and productivity (PTY) are also used.

Finally, the ability of immigrants to influence the regional labour market depends on their characteristics relative to native workers. Hence, two variables controlling for the skill characteristics of immigrant workers are used. First, Section 2 provides evidence that the share of immigrants assessed through the point system dropped sharply in the 1990s. Green and Green (1995) show that such a change has implication for the skill mix of immigrants as a change in the distribution of classes changes the occupational distribution in the inflow. In particular, a move away from the "family class" where applicants are not assessed increases the average skill level in the flow. Hence, the share of immigrant workers who have been evaluated through the point

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See Johansen (1992) for weak exogeneity test in systems. The F-value for the level term in the marginal equation is  $F(1,43)=.06$  for the labour force and  $F(1,43)=6.08$  for the immigration rate. Therefore the hypothesis of weak exogeneity cannot be rejected in the case of the youth labour force participation only.

system (PSH) controls for the average skill level of immigrants.

Second, the distribution of skills compared to that of native workers influences the efficiency of immigrants in their search for a job. We therefore use a match index for the skill distribution between native and immigrant workers. The index takes the value zero when the distribution of occupations within the immigration flow reflects exactly the distribution of employment in the region.<sup>10</sup> An increasing value of  $M$  indicates the discrepancy between the two distributions widens. The partial equilibrium implication of a growing inadequacy between the two skill distributions for unemployment is not clear. On the one hand, if immigrants are substitute for native workers, a better match improves their competitiveness in search for jobs. On the other hand, if they are complement, mismatch is expected.

The final specification for the short-run structural equations is obtained by following the general to specific strategy (see Granger (1997)) and is estimated by two-stage least-squares. The results are given in Table 4.

*[Insert Table 4, about here]*

Before commenting on the impact of immigration a few general comments about the dynamic structure of the equations are necessary. Both equations have normally distributed

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Vacancies are more appropriate than employment to measure how newcomers "match" vacant jobs. Note that it does not matter in the absence of structural changes. Moreover, there is no information on vacancies by occupation in Canada or any of the provinces.

residuals as indicated by the tests at the bottom of Table 4. The error-correction term is significant only in the unemployment equation. This implies that the unemployment rate after exogenous shocks adjusts toward an equilibrium value given by the co-integrating vector. Hence, exogenous shocks have only temporary effects. The absence of significance of the error-correction mechanism in the wage and immigration equations implies that all shocks have permanent effects. Moreover, excess supply of labour does not exert any pressure on real wages (i.e. in column 3, the effect of unemployment is not significant). These two features represent sluggishness in the adjustment of real wages and has important consequences for unemployment in our regional market.

The concerns about the relationship between immigrants and the regional labour market in B.C. is partly the consequence of the change of immigration policy in the 1990s. To get some insight whether the new policy has had an impact on labour market aggregates, within sample forecasts have been computed for the period 1992.1-1995.4. The results of the tests at the bottom of Table 4 indicate there is no significant shift in the parameters during the 1990s. Hence, the switch to an immigration policy independent of the business cycle did not affect significantly the short-run adjustment mechanisms of the labour market to immigration flows.

In the short-run, variations in the immigration rate are positively related to unemployment rate variations (Column 1, Table 4) and the effects last for two consecutive quarters. The size of the effect however is small. For example, on average, in 1990, the immigration rate rose by 4% per quarter. The direct impact (initial period only) of such an increase during one quarter is to raise the unemployment rate by 0.03 percentage points. The cumulative impact over the two quarters would increase unemployment from 8.6% in the initial quarter of 1990 to 8.65%, *ceteris paribus*. An increase in the immigration rate such as the one in the above example also puts

upward pressures on the wage which, a period later feeds back into unemployment and generates more unemployment. Thus, this computation provides a lower bound for the full short-run effect of the quarterly increase in immigration rate. Note also, that at the regional level, immigration is endogenous to the unemployment rate.<sup>11</sup>

Turning to the measures for immigrants' skill, the average skill level of immigrants matters for both unemployment and the wage. More screening through the point system improves the unemployment rate. Thus the adverse "quantity effect" from the flow rate can be partly offset by the "quality effect" through average skill level. Higher average skill also decreases the wage in the short-run. Hence, the direct effect of immigrant characteristics on unemployment is reinforced by the indirect effect through the wage-setting mechanism. The combined effects on unemployment and real wage confirm that a higher average skill level allows immigrants to be more effective in their job search. Simulations for 10% increase in the share of immigrant assessed during one year indicate that the long-run quantitative effect is small since the unemployment rate would fall only by 1.6%. Hence, the screening process does serve a purpose. It speeds the immigrant access to the job market and in the long-run, its impact through more competitiveness is negligible. Finally, a perfect match of skills with native workers is not desirable since a wider discrepancy between the two skill distributions lowers unemployment. Taken together, the results for the skill variables indicate that the main role for higher average skills as well as imperfect matching with the local

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The result of the causality test clearly show that immigration Granger-causes unemployment as the  $F(4,51)=4.1$  with a p-value of .006.

labour force is to ease immigrants' transition into employment.

Throughout the analysis, the immigration measure (LIRQ) is the quarterly flow of immigrant workers as a proportion of the regional labour force. The use of quarterly observations implies that immigrants are distinct from native born for up to the number of lags in the specification. Clearly, this may be a restrictive assumption about the speed of adjustment of newcomers to the local labour market demands. Hence, a second measure has also been used. It is the ratio of the cumulative flow of immigrant workers during the past 12 months (LIRY) and the regional labour force. In that case, immigrants are distinct from native workers for up to 4 years after their arrival. The point assessment variable is modified accordingly and the two-step procedure is computed. The complete results of the first-step, the long-run, are given in Appendix II and the results for the second-step are given in Table 5.<sup>12</sup>

*[Insert Table 5, about here]*

When immigrant workers are allowed to be distinct from the native-born for a longer period, the results give some insight into the transition effect between the short- and long-term impacts. For the sake of comparison, the specification is constrained to be identical to that of quarterly immigration in Table 4. All immigrant-related variable, the rate and the skill measures, lose their significance in the unemployment equation suggesting that the additional difficulties encountered by newly arrived immigrants fade quite rapidly, i.e. after one year.

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The cointegration tests indicate there are two valid cointegration vectors again and the relationship between unemployment and immigration is negative in the long-run.

## **5. Conclusion.**

This paper addresses the growing public concern about the effect of large flows of unskilled immigrants into Western economies by offering some insights into the adjustment process of a regional labour market. Using British Columbia which is the region in Canada with the highest density of immigrants, we show that growing immigration flow have adverse unemployment effect in the short-run. In the longer run however, immigrants create more jobs than they occupy and unemployment is permanently lowered. The screening of immigrants matters for regional unemployment and wage dynamics in the sense that a higher rate of screening, by raising the average skill level, makes immigrants more competitive in the search for jobs. The aggregate impact in the long run however is likely to be very small.

A very short-sighted view of immigration policy would suggest that an improvement of the labour market can be achieved by cutting the immigration flow rates and increasing the average skill level of immigrant workers as well as not matching them perfectly with the existing workforce. However, a more general equilibrium approach identifies numerous feedback effects indicating in particular that the level of regional immigration is not directly controllable. Moreover, the long-term analysis shows that the immigration and unemployment rates are negatively correlated. Hence, decreasing admissions is not favourable in the long-run and it may not even be feasible at the regional level since better labour market conditions would attract more immigrants. Also, the screening process benefits immigrants by increasing their competitiveness in the job search. It cannot however be expected to be an effective tool to decrease regional unemployment significantly in the long-run.

## Appendix I: Data and Sources

Install Equation Editor and double-click here to view equation.

*AD* : Detrended Canadian real GDP. Estimated residuals from the regression, estimated over the period 1970.1-1995.4. (D10373).

*IRQ* : Ratio of the quarterly inflow of immigrants aged 15+ who have declared their intention to work minus the following categories: Entrepreneur, investor and self-employed over the relevant labour force in B.C.. (Ministry of Citizenship and Immigration; D769175, D769182).

*IRY* : Ratio of the cumulative inflow of immigrants over the current and past 3 quarters.

Install Equation Editor and double-click here to view equation.

*M* : Ratio of share of immigrants and employed in occupations such that, where  $I_i/I$  and  $N_i/N$  are the shares of occupation  $i$  in total immigration inflow and regional employment respectively. The occupations are, the same as for *OCCUP*, based on declarations by applicants. It is assumed that those who did not declare any occupation but intended to work follow the same distribution of occupations as those who did.

Install Equation Editor and double-click here to view equation.

*OCCUP* : Turbulence index calculated as, where  $N_i$  is employment in sub-category 'i' and  $N$  is total employment. The index captures the fraction of jobs that have changed sectors or occupations (see Layard et al., 1991, chapter 6, p. 298-300 for a description). The correlation coefficients between domestic aggregate demand and the indexes are 0.111 for sectors and 0.039 for occupations which suggest that the measure is independent from business cycle variations.

To indexes have been computed. One for 9 broadly-defined types of occupations: Managerial and administrative, clerical, sales, service, primary, processing, construction, transport and material handling and other crafts. One for 9 industries: Agriculture, other primary industries, manufacturing, construction, transport and power, trade, finance/insurance and real estate, community business and personal service, public administration (D770355, D771561, D771562, D771563, D771564, D771565, D771566, D771567, D771568; D771581, D771582, D771583, D771584, D771585, D771586, D771587, D771588, D771589).

*W* : Ratio of real hourly wage and production per employed. Real hourly wage is weekly earnings in industrial aggregate, divided by the weekly hours worked in manufacturing in B.C.. (D704316, L87280, D706892, L87996, P710000) deflated by the B.C. CPI. Production per employed is real B.C. GDP per employed aged 15 and more. The B.C. RGDP is expanded to generate a quarterly series with a seasonal pattern based on the national RGDP. (D45169,

D769176, D769183).

*RINT* : Ex-ante real yield on government bonds. Yield for 5-10 year federal bonds minus expected 12-month inflation measured by the IPPI in Canada (B14011, D693420).

*PWOOD* : IPPI for wood products divided by total IPPI, both for Canada. (D694055, D693420).

*UR* : Number of unemployed people in British Columbia aged 15+ as a proportion of the labour force aged 15+. (D769184, D769177, D769175, D769182).

*UEINF* : Actual 12-month inflation in B.C. minus one-period lagged 12-month inflation (P710000).

*YPR* : Labour force participation rate for youth aged 15 to 24 (D769216, D769217, D769223, D769224).

## Appendix II: Results of the Johansen's procedure.

### TESTS FOR I.I.D. RESIDUALS OF THE SYSTEM

<i>LUR, LW, LIR, LYPR are endogenous.</i>				
	Quarterly immigration rate		Annual immigration rate	
	$\chi^2(2)^{a/}$	$\chi^2(16)^{b/}$	$\chi^2(2)^{a/}$	$\chi^2(16)^{b/}$
LUR	0.286	22.453	0.834	14.950
LW	1.678	18.145	1.659	15.679
LIR	1.480	9.444	7.402	16.619
LYPR	2.029	18.418	1.516	13.539

<sup>a/</sup> Jarque-Bera (1980) test for normality.  $\chi^2 = [(T-m)/6] * [SK^2 + (1/4)EK^2]$  where m is the number of regressors, SK is skewness and EK is excess kurtosis.

$SK = E(x-\mu)^3/\sigma^3 = 0$  for a normal distribution.  $EK = [E(x-\mu)^4/\sigma^4] - 3 = 0$  for a normal distribution.

<sup>b/</sup> Box-Pierce (1970) test for serial correlation.  $\chi^2 = T \sum r_j^2$  for  $j=1,2,\dots, 16$ .

The critical values at 5% are 5.99 and 26.30 for 2 and 16 degrees of freedom respectively.

The critical values at 1% are 9.21 and 31.99.

### RESULTS OF THE COINTEGRATION ANALYSIS.

#### 1. Quarterly immigration rate.

##### Eigenvalues

0.001335      0.164521      0.297467      0.441699

##### Standardized $\beta'$ eigenvectors:

	LUR	LW	LIRQ	LYPR
LUR	1.00000	-2.05077	0.13066	4.20817
LW	0.26597	1.00000	0.25098	0.00965
LIRQ	0.31804	-0.01856	1.00000	12.18119
LYPR	0.10910	0.43195	0.04520	1.00000

##### Standardized $\alpha$ coefficients:

	LUR	LW	LIRQ	LYPR
LUR	-0.20401	-0.34456	0.00329	0.02072
LW	-0.01557	-0.07921	0.01445	-0.01473
LIRQ	0.29017	-1.26580	0.02202	0.07027
LYPR	-0.00403	-0.16741	-0.00813	-0.01004

## 2. Annual immigration rate.

*Co-integration tests:*

	Maximum eigenvalue <sup>a</sup>		Trace <sup>b</sup>	
	Critical value	LIRY	Critical value	LIRY
$r \leq 3$	6.69	0.001	6.69	0.001
$r \leq 2$	12.78	13.916	15.58	13.917
$r \leq 1$	18.96	28.518	28.44	42.435
$r = 0$	24.92	45.624	45.25	88.059

Eigenvalues

0.000025

0.216623

0.393656

0.550860

*Standardized  $\beta'$  eigenvectors:*

	LUR	LW	LIRY	LYPR
LUR	1.00000	-2.21762	0.09090	3.27911
LW	0.07510	1.00000	0.15900	-0.51391
LIRY	0.71038	-0.02441	1.00000	10.43239
LYPR	0.10102	0.51364	0.04892	1.00000

*Standardized  $\alpha$  coefficients:*

	LUR	LW	LIRY	LYPR
LUR	-0.37823	-0.27843	-0.00642	0.00255
LW	-0.05264	-0.09206	0.01048	-0.00235
LIRY	0.06670	-0.98183	0.01374	0.00294
LYPR	-0.01879	-0.14729	-0.02359	-0.00093

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