Some Regions Are More Equal Than Others: Evidence on the Sources of Regional Income Differentials from the Canadian Labour Market Before 1930

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Some Regions are More Equal than Others:

Evidence on the Sources of Regional Income

Differentials from the Canadian Labour Market Before 1930

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The existence of income differentials across Canada's regions and provinces has been a persistent feature of the Canadian economy since at least 1890 (Green 1971). Further, the disparities in regional incomes have been unaffected by dramatic changes in market forces and government policy over the last century. Contrary to the convergence pattern observed for other developed nations, many Canadian studies examining various measures of per capita income find only weak convergence, or no convergence, or divergence in regional incomes characterizes the period 1910 to 1991 (Williamson 1965, Green 1967, 1971, McInnis 1968, Mansell 1975, Coulombe and Lee 1995, Afentoulis and Serletis 1999, Coulombe 1999). Tax and transfer policies for regional redistribution of income, and labour market policies such as unemployment insurance, may have contributed to some convergence in income levels (Coulombe and Lee 1995), or they may exacerbated regional inequality by impeding inter-regional labour mobility which perpetuates existing market imperfections and regional income differentials (Courchene 1981, Coulombe 1999).

An understanding of the reasons for the persistent differentials in regional incomes in Canada ultimately comes down to an understanding of the structure and operations of labour markets across Canada. To see this, one need look no further than the perceived importance of labour mobility in response to market forces in the development of Canadian policy. Struthers (1983) describes how Canadian governments before 1930 set up labour exchanges to facilitate the movement of under-employed workers to other provinces to find work. Courchene (1981) highlights the role of Canadian policies like unemployment insurance in reducing the degree of inter-regional labour mobility that has contributed to the persistence of regional income differentials.
Similarly, Coulombe (1999) argues that federal transfer payments, by enriching the levels of public goods and services in lower productivity Canadian regions, reduce the incentive for workers with high levels of human capital investment to move. D. Green (1994) points out Canadian policy recommendations for eliminating regional income differentials in Canada have focused on encouraging an expansion of the extents of Canada’s labour markets. Under a simple linear model of progressive labour market integration, government should identify and remove the main obstacles to arbitrage.

Given the existence of regional income differentials since at least 1890, an important contribution towards an understanding of the proximate reasons for the differentials would be to develop better information about the structure and operations of Canadian labour markets early in Canadian economic development. To that end, this paper develops real wage series for several occupations in 11 Canadian cities over the period 1901 to 1926 to determine the geographic extents of Canadian labour markets.

Did Canada have a national labour market? If it was not a national labour market, how integrated were the regional labour markets with one another, and what tendencies towards convergence in real wages are apparent?

Answering these questions provides vital information about the source of regional income disparities in Canada. If two labour markets are truly independent, then we should not be surprised to see a lack of convergence in incomes in the two markets. At the same time, if two markets are integrated, do observed regional income disparities reflect slow or impaired convergence processes? Or, do the regional income disparities reflect equilibrium income differentials that will not be eliminated through market forces? Do regional income disparities mean that Canadian workers do not exploit
arbitrage opportunities? Alternatively, are regional specializations in production and/or the early industrial leadership of Ontario the reasons that regional income disparities exist in equilibrium that will not be removed by market forces since they do not reflect an opportunity for arbitrage.

To date, our ability to answer these basic questions about Canada has been hampered by a lack of estimates of regional real wages over and above the problems with obtaining good estimates of nominal wages (MacKinnon 1996). Only Allen (1994) has produced the necessary inter-urban intertemporal price indexes to construct real wages for Canadian cities, but he has only done this exercise for Toronto and Vancouver as part of a larger study of how integrated Canada was in international labour markets. We build on Allen's (1994) work by constructing inter-urban inter-temporal price indexes to construct real wage series for 11 Canadian cities from a variety of nominal wage series for the period 1900 to 1926. To accomplish this task we follow Bertram and Percy (1979) who constructed, but did not publish, city specific price indexes to create their national price index.

Analyses of our real wage series suggest that before 1930 Canada may be best described as a collection of regional labour markets that were integrated but not to an extent to constitute a national labour market. The strength of integration between pairs of cities varied considerably, and often labour only flowed in one direction between the cities. Finally, our estimates reveal a "heartland-hinterland" structure to Canadian labour markets and that regional differences in real wages and per capita incomes reflect equilibrium differentials that will not removed by market forces.
1. Labour Mobility, Income Disparities and the Canadian Labour Market

Economic theory relating to adjustments in regional inequalities highlights inter-regional flows of people, goods or funds (Mansell 1975, 5). Heckscher-Ohlin theories of trade between nations, or regions, demonstrate that factor prices (wages paid to labour, and the return to capital) are equalized through commodity trade. Since per capita incomes that are often analysed in convergence studies reflect factor earnings, factor price equalization across regions would suggest that regional per capita incomes would also converge. If trade in commodities between regions is limited, but labour and capital move freely between regions, then we would expect labour and capital to migrate between regions until wages and the return to capital are equalized in both places. Barry (1996) points out that in traditional trade models, labour mobility between regions should equalize both GDP and GNP per head in both regions.

In the context of the convergence predictions of standard trade models, Mansell (1975) suggests that a puzzling aspect of the lack of convergence in income levels across Canada's provinces is that Canada has had a high degree of inter-regional factor mobility and essentially free inter-regional trade. Further, Mansell suggests that an important challenge is to explain how observed wage and income inequality in Canada could have been maintained over time when there have been large differences in rates of development and growth.

Inter-regional factor mobility and inter-regional trade in goods are unquestionable features of Canadian history. Consider the years 1896 to 1914, a key period in Canadian economic development. The Canadian prairies were settled, wheat was exported, and the Canadian economy grew rapidly. Under the traditional Wheat Boom story for this
period, prairie wheat exports "transformed the static and isolated regions (of Canada) into an integrated and expanding national economy." (Rowell-Sirois Book I, 93). While the term "national economy" is vague as it combines notions of goods market integration and factor market integration, the emergence of a national labour market is part of the story:

*The development of the West was a national achievement and the participation of all areas in a common effort fostered a new sense of nationhood. Sons and daughters of the Maritimes and Central Canada migrated to the plains and built up the West, thus forging innumerable links between older Canada and the new." (pp. 91-92)*

Another view on the existence of an integrated national economy, but which gives a central role to the National Policy, comes from Smiley (1975). Smiley suggests that before World War I, Canadian provinces were integrated on an east-west axis through the National Policy. ¹

A popular perception of the Canadian labour market at the turn of the century which suggests the existence of an integrated national labour market comes from Avery (1979, 8) where in February a labourer might find himself "a lumber worker in Iroquois Falls, Ontario; in June a railroad navvy along the National Transcontinental; in August a harvester in Grenfell, Saskatchewan; in November a coal miner in Fernie, British Columbia." In a similar vein, Voisey (1988) describes the high degree of mobility that was typical of the pioneers who settled Vulcan Alberta before 1910. One 31 year old Vulcan settler in 1905 left Ontario for Winnipeg; moved onto Calgary; laboured throughout British Columbia; panned for gold in the Klondike and soldiered in South Africa before moving to Alberta.

¹ After World War I, Canada is oriented to exporting raw materials to the US so continental integration, with trade on a north-south axis comes to the fore. This view is also found in the Rowell-Sirois Report Book I, pages 138-139.
The mobility of workers into Canada, and across Canada’s regions is not only implied by anecdotal evidence. Quantitative evidence shows that 1890 to 1910 was a period of massive population redistribution across Canada's regions. Green (1994, 156-157) relates the population movements to the integrating influence of the rise of prairie wheat exports:

_The western economy was the key factor in Canadian development between 1900 and 1930. At the turn of the century it was largely unsettled and was only weakly integrated into the Canadian economy as a whole. By 1930 this situation was completely reversed... At the center of this transformation was a large movement of people. The immigrants came not only from eastern regions in Canada but from Europe, especially Britain, and a significant number came from the United States... The rapidity of this transformation from uninhabited lands to a settled viable economy remains one of the central dynamic features of Canadian development during this three-decade period._

The coincidence of large immigration flows, significant population redistribution across regions and rapid economic growth is also suggestive of increasing market integration. As Williamson (1965, 7) points out:

_More generally, there may be a lack of inter-regional linkages in the early stages of national growth... Part of the national growth process is simply economic unification of regional markets. To the extent that such inter-regional linkages are slow in developing, national development is all the more likely to be regionalized in the earliest stages of growth._

Beyond the observed population and goods movements, there are other reasons to believe that Canada could have had a national labour market before 1930. Canada's rapid economic development before World War I coincided with what Williamson (1995,1996) characterizes as an emergence of a global economy with convergence of real wages across countries. By 1890, Canada had a transcontinental railway to link the prairie region with the East. Good information about economic opportunities on the prairies was
available. Struthers (1983) describes in detail how the Federal government created and
operated "labour exchanges" to aid the dissemination of information to enhance labour
flows in Canada. Further, immigrants responded to labour market conditions in deciding
where in Canada they would settle (Green and Green 1993).

While the "necessary conditions" for the existence of an integrated national
economy seem to have been met before 1930, some evidence would appear to be at odds
with the existence of an integrated national labour market. If regional economies are
integrated, one expects convergence in income levels, the opposite of what Green (1967,
1971) finds over the Wheat Boom period:

*The discovery of a growing dissimilarity between regions over time is
interesting in the light of our findings of the vast internal redistribution of
population and labour force that took place between 1890 and 1956... Also, of interest is the fact that the main shift towards divergence in
structure came in the period of greatest population growth and internal
migration (1890-1910). Thus, it appears ..., that the decades of vast
immigration and frontier expansion were not conducive to greater
structural similarity among provinces but, in fact, contributed to regional
specialization.* (Green 1971, 54)

Green (1971) suggests the divergence of provincial incomes could reflect a Kuznets
Curve description of Canadian economic development. In the early stages of
development, inequality of regional income distribution increases and over time
decreases as regional incomes converge. Williamson (1965) finds that with the exception
of Canada, this pattern has been typical for the history of developed nations. For Canada,
both Green (1971) and Williamson (1965) find that any convergence as part of the
Kuznets relationship was weak at best. McInnis (1968) argues that Canada did not
display any Kuznets effect making its development process an exception to the usual
development process.
Norrie and Owram (1996, 345) interpret movements of labour (and capital) over Canada's history as evidence that factor flows necessary for factor price equalization across regions were taking place. They pose the question that remains; why were these flows insufficient to remove regional income differences? One possibility is that World War I, World War II and the Depression interrupted the convergence of regional incomes in Canada as Williamson (1995) suggests these events interrupted the development of the global labour market. If this is the case we have to address why the convergence process did not resume after World War II.

Another answer to Norrie's and Owram's question comes from the work of Borts (1960), McInnis (1968), Mansell (1975), Krugman (1991, 1998) and Kim (1999) all of which point out that diverging regional incomes are easily reconcilable with regional market integration. Contrary to expectations that factor mobility eliminates regional income disparities, equilibrium income disparities remain and possibly even grow because of labour and capital mobility.

McInnis (1968) finds constancy of regional income differentials over the period 1921 to 1961 leading him to conclude that Canada did not display the Kuznets effects over its growth as other developed countries had. McInnis does not challenge the notion that regional labour markets in Canada were integrated, but he does challenge the expectation that incomes across Canadian regions would be expected to converge even when the regional labour markets are integrated with each other:

The factor price equalization(Hecksher-Ohlin) theorem, when coupled with the equalizing influences of inter-regional factor mobility, has led many of us to expect convergence of regional income levels. However, the assumption that production functions and qualities of land and labour inputs are identical in all regions is not generally acceptable. Moreover, the static model of factor price equalization does not
accommodate differential changes in aggregate demand. When the stringent assumptions of the model are relaxed it is possible under quite realistic conditions, to generate divergent income trends among regions.

Borts (1960) shows that even with competitive markets and labour and capital mobile between regions, the returns to capital and labour may not be equalized across regions because of different production functions in the regions, or due to differences in demands for each region's exports. Mansell (1975) develops a dynamic model of the Canadian economy that motivates regional income differences as equilibrium outcomes. He shows that equilibrium relative wage differentials do not require costs of factor movement, regional differences in production functions, employment bases or natural rates of increase. Instead, Mansell shows that the size of the relative wage differential can reflect how elastic migration responses are to per capita income differentials between labour markets.

Kim (1999) points out that if regions differ in factor endowments, then regions will specialize in different industries. Thus, if regional factor endowments become more dissimilar over time, then aggregate incomes may diverge as regional industrial structures diverge. Kim (1999) suggests that between the mid-nineteenth and mid-twentieth centuries, the divergence and convergence of regional industrial structures can explain a significant part of the divergence and convergence of U.S. regional income per capita.

Krugman (1991, 1998) shows that if production has increasing returns to scale, then as transportation costs between a high income industrialized region and a lower income less industrialized region fall, the regions become more specialized in their production, population concentrates in the industrialized region and real wages in the regions may diverge, not converge as a Hecksher-Ohlin model would predict. Barry
(1996) points out that in a core-periphery economy, Krugman's work predicts a Kuznets relationship. As trade barriers and transport costs fall, increasing returns to scale industries migrate to the core region from the periphery region and real wages in the core region rise relative to those of the periphery region. As transport costs fall further, some industry migrates back to the periphery to take advantage of the lower real wages of labour in the periphery. Once transport costs are low, shipping to the demand center in the core costs little compared to the production cost savings resulting due to the lower wages on the periphery. Thus, the process of trade and market integration leads to divergence in regional incomes in the early stages of the process, followed by convergence in the later stages.

Consistent with the predictions of diverging industrial structures and diverging incomes, Green (1971, 63) finds that diverging provincial incomes over the period 1890 to 1910 reflected increasing regional specialization of production. The central provinces expanded their shares of total manufacturing output, a sector with above average productivity, while the prairie provinces increased their shares of agricultural output, a sector with below average productivity. At the same time, Green suggests that structural shifts in production cannot be the whole explanation. Green notes that although both Quebec and Ontario had similar shifts in structure to sectors with above average productivity, only Ontario gained from the shift.

Green (1967, 245) raises another complexity associated with labour markets that could explain why regional specialization in production could generate diverging incomes even though regional labour markets are integrated. Green points out the factors that would have influenced farm and non-farm migrants may have differed:
...it is possible that the motives for migration to British Columbia differed from those to the prairie provinces since the structure differed. Thus in the case of farmers migrating to the latter region, the incentive was twofold. First, the migrants were interested in net farm income to be earned in this region and, second, they were induced to settle on the basis of prospects of receiving capital gain from rising land values due to subsequent settlement and anticipated increases in commodity prices. However, in the case of non-farm migrants, who apparently dominated the movement of workers to British Columbia, the incentive to settle is more likely to have been the level of real wages in this area relative to those in the sending region and the availability of jobs...

In other words, divergence in provincial income levels could reflect that heterogeneous labour moved to one of several labour markets, rather than to one western labour market even though sectoral labour markets are integrated across regions.

Another and less explored possibility for the existence of regional income disparities is that despite the observed movement of labour and goods, Canada's regional economies were not integrated to a large enough extent. Struthers (1983) recognizes the existence of factor and commodity movements across Canada, but he sees the Canadian economy as somewhat less than a national market:

"Staples also helped to create an economy that was more regional than national. Until the development of the Canadian West as a major wheat-producing region between 1896 and 1930, few economic links existed to bind the diverse regions of Canada together. Trade was more often with an external metropolis than with another Canadian province. As a result, the economic fortunes of Canada's regions, particularly where secondary manufacturing was weak, could and did vary widely, depending on the health of the export staples. Unemployment rates east of the Ottawa River have traditionally been double those of Ontario and the West, and wage levels between regions have varied widely as well. Until the 1920s, labour markets in Canada flowed more frequently along a north-south than an east-west axis, with the United States providing a major focal point for the talented and the jobless...To the extent that a 'national' labour market did exist, it revolved around western wheat which, in the words of the Rowell-Sirois report, 'transformed the static and isolated regions into an integrated and expanding national economy.'" (page 5)
Boyer and Hatton (1994, 84) point out that there is no necessary link between migration and the extent of market integration; "analyses of the pattern and extent of migration movements shed little light on the issue of integration. Markets could be perfectly integrated but exhibit little migration or they could exhibit high rates of migration but be poorly integrated." Boyer and Hatton suggest that patterns of labour market integration resulting from economic development reflect the existence of established channels of migration between different regions. Rosenbloom (1996) emphasizes similar notions with his discussion of labour market institutions that influenced migration patterns such as chain migration where current migrants follow the same paths as their predecessors.

Unlike a convergence in per capita incomes across regions, a lack of convergence in wages paid for labour despite large migrations would not be unique to Canadian history. Boyer and Hatton (1994, 84) find that in Victorian Britain, during a time of "considerable migration opportunities for arbitrage were not fully exploited." Similarly, Rosenbloom (1990, 98) finds that the persistence of large regional real wage differentials in the US after the Civil War suggests that "significant variations in the relative scarcity of labor persisted over more than three decades and that potential opportunities for arbitrage went unexploited." Allen (1994, 125) finds that "despite massive migration both ways across the border with the United States, Canada preserved a distinctive wage structure." In contrast to Williamson's (1995) view of integrated international labour markets, Allen (1994) feels that the persistence of distinctive wage structures despite massive migrations makes it impossible to believe that labour markets were well
integrated internationally. A. Green (1994) similarly finds that rural-urban wage ratios for
the Canadian prairies moved quite differently from rural-urban wage ratios for the United
States. Both Allen and A. Green suggest that the development and operation of national
labour markets are crucial for understanding trends in global labour markets.
Rosenbloom (1996) goes further suggesting that the appropriate level of analysis is
neither purely local, nor purely national.

If Canada could remain non-integrated with international labour markets, in
particular that of the US, and it is the national level of analysis rather than the
international level, then would it not follow that that regions within Canada were not
integrated, and that the regional level of analysis rather than the national level would be
appropriate. D. Green (1994, 32) poses the obvious question for Canada that arises from
Allen's work. "If a different wage structure can develop in Canada relative to the United
States in spite of massive migration, why cannot a different structure develop in the
Atlantic region relative to the rest of Canada, again in spite of a massive migration?"

If Canada's regions developed different wage structures, we also need to know
why they did. Are the wage differentials transitory but the rates of convergence are
slow? Are the wage differentials equilibrium differentials resulting from the regional
structure of the Canadian economy? Or are the differentials resulting from non-
integration of regional labour markets?

2. Labour Market Integration: Concepts and Measures

An economist's notion of integration of geographically distinct markets is based
upon the notion of the law of one price. In the absence of transportation costs, if buyers
and sellers of a homogeneous good have complete information of the price of that good
in the two markets, then in equilibrium the equilibrium price for the good is the same in both markets (Stigler and Sherwin 1985). If demand for the good rises in market A, then the price of the good will rise at A triggering additional supply into A from market B. Equilibrium is restored once the expansion of supply is large enough to restore the equality of the price in market A and B. This concept of one price can be generalized such that if there are transportation costs, or local amenities or disamenities associated with a given location, then prices can differ in equilibrium, but by no more than the amount of transportation costs or “compensating differentials”.

In applying this notion of market integration to labour market integration, Rosenbloom (1990) characterizes a completely integrated labour market as one where workers at every location are aware of all employment opportunities elsewhere and through migration can offer their services to employers elsewhere. If there are no site-specific amenities or disamenities, labour market equilibrium will have all workers of equal ability doing identical work receiving the same real wage. If workers are not indifferent to the location where they work, migration between locations will cease when real wages differ in equilibrium only to the extent that the individuals are indifferent between working in the two locations.

Labour market integration is most likely to be less than complete and determining the degree of labour market integration of two locations is primarily an empirical problem. Complete integration may be prevented by imperfect information about employment opportunities in distant locations; by institutional and financial constraints that impinge on a potential migrant’s ability to act on information as to employment opportunities in other places, and given that migrating is costly and potentially
irreversible, uncertainty as to the persistence of favorable labour market conditions in other markets may lead workers to delay or forego acting on information about employment opportunities.

For our purposes, we are interested in determining the degree of labour market integration across Canada's regions. A popular approach to this problem has been to calculate the correlation coefficient of wage changes in two labour markets (Stigler and Sherwin 1985). The higher the correlation coefficient, the more closely integrated two markets are assumed to be. Boyer and Hatton (1994) point out that an important shortcoming of this approach is that one cannot distinguish between a strong tendency for instantaneous arbitrage (market integration) and common shocks to labour demand and supply at each location (spurious correlation). A second approach is to search for trends over time in measures of wage dispersion (e.g. the coefficient of variation) across several markets. Diminishing dispersion of wage rates is interpreted as evidence of an increased degree of labour market integration. As with the correlation coefficient of wage changes across locations, the measure of dispersion approach has limitations for identifying labour market integration; an absence of a distinct trend in the measure of dispersion could reflect either very well integrated markets and very poorly integrated markets (Boyer and Hatton).

We follow the approach of Boyer and Hatton (1994) who apply an error-correction modeling approach that is based on a structural model of the forces that determine the relationship between wage rates in two locations.
Boyer and Hatton present a model where migration is the key force for wage convergence between two labour markets i and j. They express the net migration of labour from region j to region i at time t as:

\[ m_{ji} = c \cdot \left[ \log \left( \frac{W_{i,t-1}}{W_{j,t-1}} \right) - k \right] \]

c is a measure of the responsiveness of migration from j to i to a given wage differential between markets i and j at time t-1. The overall size of net migration from j to i depends upon the size of the wage differential and on the responsiveness of migration to the wage differential. c measures the degree of integration between labour markets j and i. As c approaches infinity, labour is perfectly mobile and the two markets are perfectly integrated. k represents a long run equilibrium wage ratio between i and j due to factors such as migration costs, differential labour productivity due to regional specialization in production or different production functions, or non-wage advantages of market j to market i.²

Migration influences the wage ratio for the two markets through the adjustment of labour supply in each market. Suppose that a positive labour demand shock affects market i so the W_i rises relative to W_j. If c>0, hence migration of labour links the two markets, then labour will flow from j to i until the equilibrium wage ratio is restored. For example, if \( \log(W_i/W_j) > k \), then labour moves from j to i which will tend to lower W_i and/or possibly raise W_j. The migration continues until \( \log(W_i/W_j) = k \). The speed at which the equilibrium is restored depends upon the magnitude of c. The closer c is to 0, the longer the time to convergence to the equilibrium wage ratio. As c tends to infinity, the difference in wages will be smaller.

²In the latter case, an example would be if market i is in a small isolated place, then workers may require higher wages to be indifferent between working in i as opposed to j. In equilibrium labour will only migrate from j to i if the wage in i is at least k percent higher than the wage at j.
adjustment is instantaneous and there is no meaningful sense in which a demand shock can affect i but not j since they are the same market. The long run tendency is towards the wage ratio $W_i/W_j = e^K$. If $k=0$, then the long run equilibrium wage ratio is $W_i/W_j = 1$; real wages are equal in equilibrium. If $k\neq 0$, then we would observe convergence to an equilibrium wage differential.

In terms of identifying the possible sources of regional income disparities in Canada that may result from labour market integration, we are interested in three possibilities. As D. Green (1994) points out, policy recommendations for eliminating regional income differentials in Canada focus on having the government identify and remove the main obstacles to arbitrage. There are two scenarios in the Boyer and Hatton framework that would justify this policy approach. First, if $c=0$, hence two labour markets are not integrated, possibly for reasons such as imperfect information or government intervention, then it is possible that real wage differentials reflect that arbitrage opportunities were not exploited. Second, if $c\neq 0$ and $k=0$, then markets are integrated and real wages are equal in the long run. Failure to observe convergence in real wages between markets could reflect that the rate of convergence is slow, and/or market disruptions hamper the convergence tendency. A third scenario is possible where government initiatives to encourage an expansion of the extents of Canada’s labour markets will do nothing to eliminate regional wage disparities. If $c\neq 0$ and $k\neq 0$, then labour markets are integrated but convergence is to a long run equilibrium differential. If $k\neq 0$, then we cannot expect market forces to eliminate regional wage disparities.

To generate an empirical model, Boyer and Hatton introduce a simple model of labour demand in two markets (which also allows for migration to and from third
markets) that allows them to express the relation between two labour markets in terms of
the wage alone. The model yields the following estimable relationship:

$$\Delta \log(W_i) = d_0 + d_1 \cdot \Delta \log(W_j) + d_2 \cdot \log \left( \frac{W_i}{W_j} \right) + v_t$$

d_1 reflects the degree to which common forces affect markets i and j. d_2 is a measure of
the degree of integration between the two markets and reflects the size of the unobserved
mobility parameter c. If c=0, then d_2=0. Thus, the sign and size of d_2 implies the
direction and strength of migration flow between the two markets. This type of model is
an error correction model. Boyer and Hatton highlight that the two wage rates are related
in changes but the error correction term d_2 log(W_i/W_j) prevents them from diverging over
time in levels if d_2 is negative.

This empirical specification also yields an estimate of the long run equilibrium
wage ratio for markets i and j. A long run stationary equilibrium is characterized by
$$\Delta \log(W_i) = \Delta \log(W_j) = v_t = 0.$$  In this long run equilibrium, \log(W_i/W_j) = -d_0/d_2, thus
$$-d_0/d_2$$ is an estimate of k. Finally, d_2 can be used to express the speed of adjustment of
the wage in region i to a shock to the equilibrium wage ratio holding W_j fixed. The
predicted lag between an initial shock and a return to equilibrium is:

$$T_s = \frac{1-|d_2|}{|d_2|}$$

This measure reveals that if d_2=-1, then markets are perfectly integrated since the return to
equilibrium is instantaneous.
3. Wage Data and an Inter-Urban Intertemporal Price Index

To estimate the error correction model introduced in the previous section of the paper, we need observations on real wages for different labour markets in Canada. This requires two types of data; nominal wage data, and an inter-urban intertemporal price index as constructed by Allen (1994).

For data on nominal wages in Canada there are two sources. The first source, that almost all of our analysis is based upon, is the Department of Labour supplement to the Labour Gazette. From this source we obtained nominal hourly wage rates for carpenters and builders' labourers for 11 cities in Canada for the period 1900 to 1926. The cities are: St. John, Halifax, Quebec City, Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Regina, Edmonton and Vancouver. A second source of data is MacKinnon (1996) who developed nominal wage series for fitters and machinists, helpers and labourers with the Canadian Pacific Railway. This data provides wages for only four cities in Canada; Montreal, Toronto, Winnipeg and Vancouver.

Despite MacKinnon's (1996) concerns over the usefulness of the Department of Labour wage data, we chose to focus our analysis on them for several reasons. First, the Department of Labour data provides us with a larger set of cities than the CPR wage data set. Second, the CPR wage data are primarily useful for general wage trends before 1918. After 1918, institutional factors specific to the determination of railway wages become important. Finally, our analyses of the MacKinnon CPR data suggested that we

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MacKinnon (1996) cautions that builders' labourers should not be confused with unskilled common labourers. She finds that builders' labourers weekly wages were substantially higher than weekly wages for CPR labourers. In contrast, CPR fitters and machinists wages are to levels of wages reported for building trades in the Department of Labour data. Generally, MacKinnon raises concerns about using the Department of Labour wage data since up to 1913 the data was collected by Fair Wage Officers who produced schedules of 'fair' minimum rates for contractors. These minimum rates were essentially the union's view of the appropriate minimum, and according to MacKinnon, were rarely observed.
may be observing a wage policy of a large firm that may or may not be representative of
the broader labour market. Our impression is that the CPR understood regional cost of
living differences quite well. Combined with the analyses of the Department of Labour
wage data, it would appear that the CPR took advantage of the relative lack of mobility of
Montreal workers by paying lower wages, and paid higher wages to Vancouver workers
as “compensating differentials”.

Our next task was to convert the nominal wage series into real wage series. To do
this, we have developed city specific price indexes using the price data and budget
weights cited and reported in Bertram and Percy (1979). There are essentially three
components to the price index; food and beverage prices, fuel and light prices and rental
costs for housing. The index is built by constructing “price relatives” by dividing the
price of each commodity m in city j at time t by commodity m’s price in city j in the base
year. These price relatives are then aggregated by the budget expenditure weights.
Bertram and Percy create a price index for each of the 11 cities we are studying but they
averaged the 11 indexes to report a national price index.

Figure 1 shows the own city price indexes for the 11 cities. For the years between
1900 and 1905 and between 1905 and 1909 we have used linear interpolation to get the
price index values. These indexes are useful if we are interested in price changes over
time but they are inappropriate for any exercise involving relative price levels across
cities. Note that in the base year 1913, the index equals 100 for all cities. If we use these
indexes to compare prices across cities then we are imposing that all cities had the
identical price level in the base year. As we show below, this assumption is a poor
description of cost of living differences across Canadian cities.
For our purposes we need an inter-urban price index as constructed by Allen (1994). This index yields real wages in the sense that they reflect the purchasing power of the wage in city j at time t in terms goods in the base city (Toronto) in the base year (1913). This intertemporal inter-urban index is obtained by dividing the price of commodity m in city j at time t by the price of commodity m in Toronto in 1913 to create the price relatives that are then aggregated together using the budget expenditure weights. Again, for the years between 1900 and 1905 and between 1905 and 1909 we have used linear interpolation to get the price index values.

Figure 2 shows the inter-urban price indexes. Before 1914 there are clear differences in price levels between cities west of the Lakehead and east of the Lakehead. The higher price levels prevailing in the western cities reflect that food prices were somewhat higher than food prices in the east, but rental costs for housing were substantially higher. High rents for housing and high food costs were a characteristic of the Canadian prairies in the frontier stages according to Voisey (1988). Through World War I, prices in all cities increased dramatically. After World War I, price levels fell and stabilized across Canada and the western/eastern division in cost of living had disappeared somewhat.

Figures 3 and 4 present the hourly wages of builders' labourers and carpenters from 1901 to 1926. Both figures show that before World War I nominal wages for these occupations were highest in Vancouver, and generally higher in the prairie and Ontario

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4 Voisey p. 64 – "When building commenced at the Champion and Vulcan townsites, they too instantly acquired hundreds of new residents. Still there remained a shortage of workers and an even greater shortage of accommodations. Labourers and merchants huddled in tents and shacks and packed the new hotels and boarding-houses. The Carmangay hotel reported fat profits, and the first houses completed rented at fantastic prices."
cities than they were in Quebec and the maritime cities. Nominal wages increased substantially through the war, fell and then stabilized after the war. By 1926, there is a clear split in the levels of wages East of Ottawa and west of Montreal for carpenters. A similar divergence also holds for builders' labourers although the difference is not as pronounced for carpenters. MacKinnon’s CPR wage data shows a similar division in the levels of nominal wages between the prairies and BC and Ontario and Quebec, at least until after World War I at which time uniform wage rates by occupation were the norm for the CPR. As with the Historical Statistics wage data, nominal wages increased dramatically during World War I, fell and stabilized after 1920.

While nominal wages in the west of Canada were higher than in the east, it was well known that the cost of living was higher in the west, and the early conditions of life in the west made it a less desirable place to settle than the east. For example, Voisey (1988, 179) observes that “Even though rural schoolboards offered higher wages than might be obtained back east, the teachers seldom gained, for they also faced proportionately higher living costs. Many did not wish to work in an isolated frontier schoolhouse in any event. And even in prosperous times school-boards did not always pay on time and in full.” Thus an interesting issue is how real wages compare across Canadian cities over this period.

Figures 5 and 6 show the nominal wage series for Carpenters and builders’ labourers deflated by the interurban price index. Real wages were highest in Vancouver, Hamilton and Toronto. Despite high nominal wages in prairie cities, real wages on the prairies before World War I are as low as real wages in Quebec and the maritime cities. For the labourers, real wages in the prairie cities (with the exception of Edmonton)
remain below those of Vancouver and the Ontario cities. For carpenters, the story is somewhat different as the real wages in the prairie cities rise to similar levels as Vancouver and the Ontario cities after 1907. For both the labourer and carpenter occupations, clear regional divisions in real wage levels are apparent by 1926. The maritime and Quebec cities have the lowest real wages while Vancouver and the Ontario heartland cities have the highest real wages.

MacKinnon’s CPR wage data provides a slightly different picture than the Department of Labour wage data. Figure 7 shows that real wages were lowest for Quebec, and highest for BC. Real wages in Ontario and the prairies were roughly equal and lay in between the Quebec and Vancouver levels. There is still a clear regional structure to real wage levels (at least before 1918) but the disadvantage of the prairie work location relative to Ontario is not apparent. For CPR labourers, real wages for Ontario based workers are higher than Prairie based workers until 1907. For the CPR fitters and machinists, there is no systematic difference in the wage levels between regions.

Figures 5 and 6 provide some insight into recent research on Canadian economic development and immigration to Canada. First, the real wage levels of the prairie cities and Ontario cities are consistent with Marvin McInnis’s arguments that the wheat boom is a post 1907 phenomenon. Second, the higher real wages found for Ontario workers can explain the immigration patterns found by Green and Green (1993). Their study of where in Canada immigrants chose to locate provides a more complex depiction of the Canadian labour markets than the standard Staples story of Canadian development implies. The "traditional" wheat boom story focuses too much on the wheat export
region and ignores the regionally and sectorally balanced nature of long term Canadian growth. Green and Green find that immigrants entering Canada before World War I did not just go to farm on the prairies. All provinces received immigrants and all sectors received immigrants. Given the desire of the Canadian government to settle the prairies and provide low wage labour to the region, the government became more focused and selective in its immigration policy to steer immigrants towards farming in the west after World War I. Finally, the low real wages of prairie cities, particularly before 1907, could explain the remarkable mobility of the frontier population noted by Voisey (1988).

Figures 5, 6 and 7 all suggest the existence of regional differences in real wage levels early on in Canadian economic development. The remaining task is to determine whether these differentials were disappearing over time.

*The Error Correction Estimates*

The error correction model for wage changes in two labour markets was estimated for each of 110 city pairs for the wage data from the Department of Labour sources. The results discussed are for the estimations carried out for the real wage data for carpenters and builders' labourers and nominal wage data for builders' labourers. The detailed regression output has not been included in this draft due to the volume of numbers to report. Instead, the statistics relating to the degree of market integration between city pairs and the implied equilibrium wage ratios are discussed exclusively.5

Figures 8, 9 and 10 are matrices of labour flows from one city to another implied by the estimate of $d_2$ in the error correction specification. The cities in the rows of the

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5 The detailed regression results are available upon request. The error correction models were also estimated using the CPR wage data. These results will be commented upon in the text of the paper, although not directly reported. A time trend variable is also included in the model specification.
matrices are the cities receiving labour, while the cities in the columns are the cities 
sending labour. A cell that has dark shading with a “2” in the box indicates that the flow 
of labour between the pair of cities was a two way flow as implied by d2 being 
statistically different from zero in both regressions for the city pair. A lighter shaded cell 
with “1” in it indicates that only a one way labour flow was implied by d2 being 
significant in only one of the two regressions for the city pair. Finally, a cell with no 
shading indicates that there is no significant migration response as real wages diverge. 
The negative number reported in each cell is the point estimate of d2 for the error 
correction term in the regression.

Figures 8, 9 and 10 all suggest that Canada had far less than an integrated national 
labour market. The degrees of integration between cities were less than perfect, far from 
uniform and often asymmetric between the cities. Cities in the same regions tended to 
be integrated with one another as suggested by two-way flows of labour. Cities in eastern 
Canada and western Canada were integrated with Ontario cities but not directly with each 
other. As such, a heartland-hinterland (or core-periphery) structure of the Canadian 
labour market is apparent well before 1930. The matrices also reveal that as one would 
expect, prairie cities were net recipients of migration, and maritime cities were net 
senders of labour. Perhaps most interesting is the weak, if not lack of, integration that 
Montreal shows with other Canadian cities in the real wage estimations. Montreal did 
receive labour from other cities, but apparently Montrealers tended not to leave for other 
destinations.6

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6 It is also possible that Montreal workers did migrate to other regions but migration of labour from the rest of Quebec to Montreal generates the appearance in this empirical framework that labour in Montreal was immobile.
Where city pairs are integrated, the estimates of $d_2$ imply that it would take between 2 to 6 years for the equilibrium wage ratio to be restored following a demand shock in one of the cities. Even where city pairs were not significantly integrated, the equilibrium wage ratio would be restored within a decade following a shock to one market. This suggests that convergence in real wages across Canada's regions was a tendency of the labour markets before 1930. The remaining issue is whether convergence was to equal real wages across regions.

Figure 11 presents the equilibrium real wage ratios for Canada implied by $e^{-d_0/d_2}$ from the estimations using carpenters and builders' labourers real wages. The ratio is expressed with Toronto real wages in the denominator. The heartland-hinterland structure of the Canadian labour market is readily apparent for both the labourers and carpenters. For labourers, real wages in Toronto, Ottawa and Montreal should be equal in the long run. Vancouver and Hamilton real wages are higher than Toronto in the long run. Real wages in the prairie cities, in Quebec City, Halifax and St. John are 80 percent of Toronto's real wage in equilibrium. The profile for carpenters' real wages generally agrees with that for labourers with the exception that Ottawa and Montreal real wages are more similar to those of eastern cities than for Toronto. These equilibrium real wage ratios also agree with Woods and Ostry's (1962) description how Canada's regions had developed, and retained, distinctive wage structures. They observed that "(t)he Canadian labour market exhibits a marked and distinctive regional structure. The profile of wage levels across this country looks like an elongated 'S' lying on its side. From a high in British Columbia, average wage levels slope downward to the prairies, rise again in
Ontario, and then fall once more as one proceeds eastward through Quebec and the Atlantic provinces."

The estimations of the error correction models suggest that regional real wages were converging to equilibrium differentials. Further, the regional structure in real wages looks remarkably similar to the cross-Canada profile for per capita incomes. Figure 12 presents the equilibrium real wage ratios compared to regional per capita incomes that McInnis (1968, Table II) presents for the period's 1926-1929 and 1956-1962. Although McInnis's income numbers are based upon nominal income estimates, the general regional profiles of per capita incomes from 1926 to 1962 exhibit the structure of the equilibrium real wage ratios to which real wages have been converging to since 1900. If per capita income disparities do reflect underlying regional real wage structures for Canada, then we should recognize that market forces cannot be relied upon to eliminate regional income disparities. Government policies that disrupt labour mobility and the operations of labour markets in Canada will disrupt the process of real wage convergence, but they are not the reason why regional incomes have not equalized.

Conclusions

We have constructed real wages series for 11 Canadian cities for the period 1901 to 1926. Our analyses of these series reveal that labour market integration across Canada's regional labour markets was less than complete and not uniform. Real wages in Canada were converging, but not towards being equal across regions. By 1926 a clear regional structure to real wages in Canada was apparent and the regional structure in real wages looks remarkably similar to the regional profile of per capita incomes for the period 1926 to 1962.
It would appear that regional income disparities are an inherent trait of Canada's heartland-hinterland structure. Rather than a search for disruptions to labour mobility in Canada, or for explanations for the failed operations of the Canadian labour market, the results in this paper suggest that more attention should be paid to the nature of the long term development of the Canadian economy, particularly from the perspective of the impact of regional specialization.

References


Department of Labour, Canada *Labour Gazette*.

Department of Labour, Canada, *Wages and Hours of Labour in Canada*.


FIGURE 7: Real Wages by Region, CPR Fitters and Machinists and Labourers, 1900-1926
### FIGURE 8

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| No flow | One way flow | Two way flow |

Implied Directions of Labour Migration – Builder’s Labourers, Real Wages, 1901-1926

No flow indicates that the estimated coefficient on the error correction term is not significant at size 5%. One way flow reflects that in the two regressions for each pair of cities, only one of the estimated coefficients on the error correction term is significant at size 5%. Two way flow reflects that both estimated coefficients on the error correction terms for the two regressions for a city pair are significant at size 5%. Estimated coefficients for the error correction term are in the bottom of each cell.
### FIGURE 9

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**Implied Directions of Labour Migration – Carpenters, Real Wages 1901-1926**

No flow indicates that the estimated coefficient on the error correction term is not significant at size 5%. One way flow reflects that in the two regressions for each pair of cities, only one of the estimated coefficients on the error correction term is significant at size 5%. Two way flow reflects that both estimated coefficients on the error correction terms for the two regressions for a city pair are significant at size 5%. Estimated coefficients for the error correction term are in the bottom of each cell.
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