

**Immigration and Canada's Wage Structure  
in the First Half of the Twentieth Century**

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In an earlier paper, (Green and Green (2007)), we presented evidence using Census data on movements in the Canadian wage structure between 1911 and 1941. That evidence pointed to a substantial widening in the Canadian wage structure in the early twentieth century. More specifically, between 1911 and 1921 real wages fell at both the top and bottom ends of the wage distribution while in the following decade the wages at the bottom stayed relatively constant while the wages at the top end increased dramatically. Finally, during the 1930s, the spread of the wage distribution remained relatively constant. This broadening of the distribution is in striking contrast to the description of substantial compression in the US wage distribution over this same period presented in Goldin and Katz(2001). In particular, the two countries had substantially different experiences in terms of movements in their wage structure in the 1920s, with dispersion expanding substantially for Canada but not for the US. Understanding what forces drove these very different wage trends is potentially useful as an input into a better understanding of differences in technological choices in the two countries and, thus, of the different paths of economic growth in each.

We argue in our earlier paper that the difference in immigration experiences between Canada and the US in this era provides a reasonable potential explanation for the diverging wage structure trends in the two countries. In particular, while Canada continued to be a substantial immigrant receiving country in the 1920s (though at lower levels than the very high inflows in the first decade of the Twentieth Century), the US had relatively little immigration in that decade. The US data is not strong enough to support a direct investigation of the role of immigration in diverging wage trends in the two countries. However, by matching wage data with immigrant stock data from the 1911, 1921, 1931 and 1941 Canadian Censuses, we can investigate the relationship between immigration and wages across occupations in Canada to see whether there is any evidence that immigration was related to movements in the wage structure in this era. Our goal in this paper is to carry out that investigation and assess the evidence on that relationship.

We use data on average weekly earnings and the number of Canadian and foreign born employees in each of 117 occupations for which we have consistent definitions across the 1911 to 1941 Censuses. Our central empirical exercise involves examining the relationship between decadal changes in average wages and the proportion of employment accounted for by immigrants within occupations using this data. We find a substantial and statistically significant negative relationship with a increase of 0.1 in the proportion of workers in an occupation who are immigrants being associated with between a 3% and 6% decline in real wages in that occupation. These effects are larger in trades occupations (where there may be limited substitutability for other types of labour) and smaller in the professions (where immigration generally played a small role in this era). We address issues of aggregation and attempt to address endogeneity concerns. In the end, our conclusion is that wages and immigration were relatively strongly related in Canada in the first half of the Twentieth Century. To the extent this relationship is causal (although, we do not claim to have established that at this point), this may imply that the widening of Canada's wage structure in the 1920s was partly related to wages in low skilled occupations being kept low due to immigration, which was disproportionately low skilled. This would fit with arguments in Wylie(1989) and Keay(2000) that Canadian firms used a more labour intensive technology than their American counterparts in the early 20<sup>th</sup> century. Thus, differences in immigration levels may have set the stage for the two neighbours to follow different technological paths. Our work adds an extra dimension to these considerations since the earlier work does not differentiate labour by skill level.

This paper proceeds in 5 sections. In section 1), we recap our evidence on movements in the wage structure in Canada with some comparisons to the US. We also argue that differences in skill development through education in the two countries (a force which Goldin and Katz(2001) played an important role in determining US wages in this era) are unlikely to provide an explanation for differences in wage patterns because both countries had similar experiences in terms of education changes. In section 2), we discuss major changes in Canada's immigration experience in the first half of the Twentieth Century as a means of establishing the hypothesis we

investigate. The third section contains a description of the data. In the fourth section, we present the results from our empirical exercise and the fifth section contains conclusions.

## **1) Movements in Canada's Wage Structure in the First Half of the Twentieth Century**

### **1.1) Wage Structure Changes**

We begin with a summary of the results on movements in Canada's wage structure from Green and Green(2007). The wage data comes from tabulations in the 1911, 1921, 1931 and 1941 Censuses and is described in more detail in section 3). At this point, we will just note that the data correspond to weekly wages for males in a set of consistently defined occupations in the 11 most populous Canadian cities. Thus, these are wages for occupations in an urban setting. It is worth keeping in mind that these are average wages by occupation and thus the data do not include individual variation within occupations. In this sense, the data provide a depiction of the wage structure rather than of the whole wage distribution.

Figure 1 contains a depiction of changes in the real weekly wage distribution over time. The solid line in this figure corresponds to the difference between the log weekly wage in 1921 and the log weekly wage in 1911 at each percentile, and thus roughly shows the percentage differences in the distributions at each percentile. The line with squares shows the same difference between 1931 and 1911. The horizontal dashed line corresponds to zero change between the years. In this type of figure, a line sloping up to the right reflects an increase in inequality between the pair of years since it indicates that increases at the top of the distribution are greater than at the bottom (or decreases are less). Looking at the line capturing the difference between 1911 and 1921, there is clear evidence of an increase in inequality below the median, and especially below about the 35<sup>th</sup> percentile. Between the median and the 85<sup>th</sup> percentile there is evidence of a decrease in inequality as the higher percentiles decline more than the lower. Finally, there are mixed movements in the top decile.

The comparison of the 1911 and 1931 distributions indicates similar sized real declines below the 5<sup>th</sup> percentile to those between 1911 and 1921. That is, there is only limited

improvement from the low point reached in 1921 for those at the bottom end. However, between about the 15<sup>th</sup> and 45<sup>th</sup> percentiles there is generally little difference between the 1911 and 1931 distributions, corresponding to a gain relative to 1921 through much of this range. Above the 45<sup>th</sup> percentile, the 1931 distribution is dramatically superior to both earlier distributions, with the extent of its advantage generally increasing across the upper half of the distribution.

These patterns are also reflected in the summary statistics in Table 1. The standard deviation of the wage distribution first declines between 1911 and 1921 and then increases dramatically between 1921 and 1931. The squared coefficient of variation (a measure of inequality that is most sensitive to movements at the top of the distribution) yields similar conclusions. Both the variance and the coefficient of variation are susceptible to being strongly influenced by outliers. The log 90-10 ratio provides an alternative measure that does not suffer from these difficulties. According to that measure, inequality rose slightly from 1911 to 1921 and then rose dramatically between 1921 and 1931. The 50-10 and 90-50 ratios break this movement down into lower and upper tail components. These measures support what is evident from Figure 2: inequality rises in the lower tail of the distribution between 1911 and 1921 as the median stays the same but the lower tail experiences substantial declines. As we discussed earlier, the right tail of the distribution also shifts left in this period and this implies a decrease in inequality in the upper tail of the distribution. The result, as the previous lines in the table show, is conflicting results about the change in inequality from different summary measures of inequality. From 1921 to 1931, though, the movements are less equivocal. There is a slight increase in inequality in the left side of the distribution due to small changes in lower end wages but there is a massive increase in inequality in the right tail of the distribution. Thus, we observe a large increase in inequality from the 1911 to the 1931 distribution that occurs in two steps. In the first, the bottom tail drops substantially and in the second, the very lowest tail of the distribution roughly stays at its new, lower level while the upper tail rises substantially.

The data underlying Figure 1 and Table 1 contain variation by age, city and occupation. The 1941 data also incorporates city and occupation variation but the Census tabulations on

which it is built do not include age variation. In addition, the list of occupations is somewhat restricted relative to earlier years. For this reason, comparisons with the earlier years requires placing restrictions on the data from those years. Figure 2 contains a re-plotting of the 1931-1911 distribution difference using the non-age varying data along with the 1941-1911 difference. The pattern evident in the 1931-1911 line is broadly consistent with that seen in Figure 1, where age variation is included. In particular, the non-age varying data again shows large increases in wage inequality between 1911 and 1931 at the top end of the distribution, substantial real declines at the very bottom and little change in much of the remainder of the bottom half of the distribution. The 1911-41 difference line is very similar to its 1911-31 counterpart, indicating that there were few substantial changes between 1931 and 1941. There were, nonetheless, some shifts in various parts of the range between the 20<sup>th</sup> and 60<sup>th</sup> percentiles and a substantial change above the 90<sup>th</sup> percentile where there were noticeable equalizing adjustments between 1931 and 1941. In the end, the picture that emerges is one of substantial increases in inequality between 1911 and 1941, driven partly by real wage declines at the very bottom of the distribution but mainly by increased inequality above the median.

## **1.2) Comparisons with the United States**

Examinations of movements in the wage structure has a long tradition in the United States (e.g., Ober(1952), Brown(1977), Williamson and Lindert(1980), Goldin and Margo(1992), Goldin and Katz(1998, 2001)). Unlike in Canada, the US Censuses do not contain information on earnings or wages before 1940 and so movements in wage differentials before WWII are mainly studied through comparisons of intermittent wage series for different occupations. In Table 2, we present wage ratios for skilled relative to unskilled blue collar workers for the United States from Goldin and Margo(1992) and compare them to ratios from Canadian Census data that are constructed to be as similar as possible to their US counterparts. The first panel in the table shows the ratio of hourly wages of machinists to those of labourers. The US series does not extend back before the early 1920s but the data from that point through to 1940 show a small

increase in the differential during the 1920s followed by a larger (though still not substantial) decline in the differential over the 1930s. For the same period, the same ratio from Canadian Census data shows a more substantial increase in the skill differential over the 1920s followed by a smaller decline in the 1930s. The net effect over the period from just before WWI to the start of WWII for Canada is essentially stability in the differential, albeit with some large swings within the period. The first column in the second panel contains data (also from Goldin and Margo(1992)) originally reported by Ober(1952) and shows the ratio of skilled to unskilled manufacturing sector hourly wages. The pattern between 1920 and 1940 is much like that for the machinists/labourers ratio in the first panel (as is the pattern in the National Industrial Conference Board data shown in the second column in the panel) . The pre-WWI observation also available in this data shows that there was a substantial compression in the skill differential between the pre and post WWI periods. The Canadian data also reveal a compression between 1910 and 1920, though to a much smaller extent than what is observed in the US series. Overall, as Goldin and Katz(2001) point out, the US series can be summarized as showing a major skill differential compression between about 1910 and the early 1920s followed by relative stability thereafter. In contrast, the Canadian series show much less compression across the whole period (or, possibly, none at all), generated as the result of compressions both in the 1910s and 1930s being offset by a substantial increase in the differential between 1910 and 1920.

Goldin and Katz(2001) argue that this same pattern of initial substantial compression in skill differentials followed by stability can be found in comparisons between white collar and less skilled blue collar workers and among white collar workers as well. In Green and Green(2001), we argue that the patterns involving white collar workers for the US are not quite as straightforward as this but that, in general, we witness the same pattern of substantial compression in US skill differentials relative to their Canadian counterparts in the first half of the last century. Moreover, the 1920s stand out as a decade of substantial expansion in differentials in Canada but this is only sometimes the case for the US. It is worth keeping in mind in these discussions that they are couched in terms of differentials between occupations that tend to be

found in the middle of the wage structure. Thus, labourers (who are often used to represent unskilled workers) have average wages that place them near the 25<sup>th</sup> percentile of the Canadian data and the trades workers compared to them tend to be located near the 75<sup>th</sup> percentile. Figures 1 and 2 indicate that much of the action in wage structure movements in this era are further out in the tails of the distribution. Thus, the numbers in Table 2 for Canada tend to understate the overall expansion in the wage structure. The key point, though, is that Canada and the US experienced quite different wage patterns, particularly after WWI.

### **1.3) Education as an Explanation for Diverging Patterns**

The evidence in the previous sub-section indicates that Canada and the US experienced contractions in their wage structure during the decade of WWI (as did Britain) but while Canada's wage structure expanded to the point of more than offsetting its contraction, the US structure did not. In a series of papers, Goldin and Katz argue that the expansion of public education in the US is the main reason why the skill differential compression was not reversed in that country (Goldin and Katz(1998, 2001)). They argue that the US experienced a major technological revolution in the inter-war period that made education more productive. Since, under the new technologies, both clerical workers and skilled blue collar workers made use of the types of skills taught in the expanding high school system, one would expect this to have led to an increase in wage differentials between clerical workers and unskilled labourers and between skilled blue collar workers and unskilled labourers - all else being equal. However, they argue, what they see as the unique position of the US in expanding public education generated a supply effect that more than offset the skill biased demand increase; ultimately leading to the maintenance of the skill differentials at the lower levels established during WWI.

Canadian data on education suggests a need to look at other factors as potential explanations. Canada went through an educational expansion that appears to be very similar to that in the US in this period. While we do not have evidence that matches the Goldin and Katz(2001) data exactly, a 1931 Census manuscript provides details on school attainment over



the previous decades for Canada (McClelland(1931)). Goldin and Katz report an increase in high school enrollment for 14 to 17 year olds from approximately 39% in 1921 to 55% in 1931. McClelland reports that 44% of 14 to 17 year olds were in school in Canada in 1921, increasing to 56% in 1931. Since these numbers likely include some students who are in a grade below high school (which started in grade 8 in Canada in this period), the level of Canadian secondary school attendance may not match its US counterpart as closely as these numbers suggest, but the growth rate is apparently of the same order of magnitude. Indeed, much of McClelland's discussion focuses on the substantial expansion of school attendance among older age teenagers in Canada in this period. The idea that Canada underwent a similar educational transformation to the US in this period is important for considering the source of the wage patterns presented here. Since Canada presumably had access to similar technologies, the fact that Canadian skill differentials expanded in the inter-war period indicates a need to look to factors beyond education to obtain a complete explanation for movements in the wage structure of both countries.

## **2) Immigration as a Potential Explanation**

Table 3 sets out the timing and source of immigration to Canada at five points of time; 1901, 1911, 1921, 1931 and 1941 and the change in flows between these dates. The selection of dates was chosen to coincide with the decennial censuses in Canada and so parallel the stock data drawn from these census reports. This data allows us to link the flow of immigrants to changes in the national wage structure that occurred during the first half of the last century. The four source areas shown in Table 3 cover both country flows, for example Britain which is the sum of British, Irish, Welsh and Scottish immigrants, and regional totals such as Asia which covers Japanese and Chinese immigrants and Europe which includes Northwest, Central, Eastern and Southern Europe. The United States appears separately. Unfortunately this creates a problem of double counting for immigration after 1925 when total immigration includes both Overseas and the United States. Hence one cannot estimate total immigration by summing these four categories. However the data we have allow us to observe the size, timing and source of

immigrants to Canada during our test period.

In order to get some perspective on the flow of immigrants to Canada Table 4 is included. This table shows changes in the stock of male immigrant workers from 1911 through 1941. These changes will reflect the net impact of immigration, emigration and deaths. We present them because they are the closest matches to our data. As the table shows the first half of the last century can be divided into two parts. From 1911 to 1931 Canada was a net absorber of labour while for the decade of the thirties it was a net loser of labour. The first decade of the century contained very substantial inflows with numbers on net immigration from the Canadian Historical Statistics indicating a net inflow of 715 thousand over the decade. The data in Table 4 indicate that net changes in the stock of foreign born workers were on a much more modest scale in both the 1911-1921 and 1921-1931 decades but were still quite substantial in the latter, with the inflow representing a 23% increase in the stock of immigrant workers between 1921 and 1931. It seems possible that this large inflow might help explain the diverging patterns in wage structures between Canada and the US, where the male immigrant stock of workers was virtually unchanged over the 1920s.

The large net inflow of the first decade of the last century was dominated by immigrants from Britain followed by the US, and finally Europe. Each source has its own story. The large inflow from Britain coincides with the slow down in economic growth in that country beginning in the late 19<sup>th</sup> century coupled with a vigorous advertising campaign by the Canadian government to attract immigrants to settle the west. European immigration had many of the same root causes as was the case for Britain, although for the Continent the goal was to attract agricultural labour. Finally, the northern flow from the US was driven by the hunger for settlement land which was still available in Canada but which had largely dried up by the 1890's in the US.

As Green and Green (1993) have shown, the settlement patterns desired by the government did not materialize. British immigrants were dispersed across the country and they chose to settle more in urban than in rural areas. The Europeans were more inclined to settle in

enclaves and were relatively more in the countryside than were British immigrants. Americans were destined to western farming. Hence, we get a more mixed pattern of settlement than the Canadian authorities had wanted, that is, new immigrants could be found in all sectors and in virtually all regions of the country by the time this large inflow had come to an end with the outbreak of WWI.

World War I proved to be a watershed in European migration to North America. Neither in Canada nor in the US did mass migration return to either country as it had existed up to 1914. The reasons for the lower rate of inflow were very different between these two countries. In the case of the US it followed a deliberate move by the US government to block the large inflows first by imposing a literacy test on would be immigrants in 1917 (Goldin, 1994), and then by the introduction of the Quota system in 1924. These regulations had the effect of dropping the annual level of immigration to the US from over a million migrants a year in the decade leading up to the war to less than a quarter of that number by the twenties. The regulations were also aimed at restricting the flow from non traditional sources such as those from southern and eastern Europe in favour of immigrants from northwestern Europe.

Canadian immigration policy after WWI exhibits some similarity to that adopted by the US. Canada imposed a literacy test in 1919 and formally introduced a discriminatory set of regulations in 1924 when the Immigration Act formally divided the world between preferred and non-preferred countries. Britain and the US were on the preferred list central and eastern Europe were not. We see the results of these policy changes in Table 3, although not to the extent we might have expected. During the war decade the inflow from all sources declined. The recovery during the twenties revealed a more mixed pattern of arrivals. Migration from Britain continued to fall during the twenties despite efforts to induce more migrants from this country. One reason was that during the twenties competition for immigrants from Britain intensified from other Commonwealth countries. By 1926 the number from Britain had fallen from 148,000 in 1911 to about 60,000 in 1926. The drop of arrivals from the US is what one might expect given that settlement lands were largely settled by this time.

It is the increase in numbers from Europe during the twenties that on the face of it seems contradictory to the establishment of a discriminatory policy in 1924. For example, by 1926 the numbers from Britain, as noted above were 60,000, while those from Europe had climbed to 69,000. Certainly economic conditions in Europe (hyper inflation, widespread unemployment, weak commodity markets etc), were conducive to widespread emigration. At the same time economic conditions in Canada were booming after 1925 as wheat exports had reached levels not seen earlier. As a result there was a cry from western farmers for labour to help with harvesting the crop. Searching for foreign labour from Continental Europe ran counter to current policy. Hence the two national railways were commissioned, under the Railway Act of 1925, to recruit immigrants from central and eastern Europe. They were extremely successful to the point that by the late twenties 70% of immigrants listed their destination as the Canadian west and approximately the same share listed themselves as destined to farming (Green, 1994).

The twenties also saw the expansion of the Canada manufacturing sector. This came in response to developments in the west and was characterized by production of goods linked to the “Second Industrial Revolution” ie automobiles, electrical goods, chemistry products etc. This in fact was the decade that saw productivity in this sector reach parity with comparable industries in the US (Keay). Foreign as well as domestic labour were drawn to jobs in the urban sector during this period as the manufacturing activity became increasingly concentrated in the central provinces.

The final decade in this review covers what are often called the “Disruptive Years” ie the decade of the Great Depression and the start of WWII (1931-1941). As Table 3 shows that immigration virtually came to a halt during these years. This occurred for two reasons. First, high levels of unemployment discouraged immigration and second the government amended its immigration policy to admit only close relatives of immigrants already in Canada, farmers with sufficient cash to start a farm, and female domestics. By the end of the period with the country at war immigration policy was further changed to prohibit the admission of enemy aliens ie potential migrants from Germany, Italy and Japan.

This sharply reduced inflow was coupled with a large outflow of migrants. Net emigration for the decade was 112,000. Since this net immigration estimate was obtained as a residual calculated from the population equation (identity), we know very little about who actually left Canada and where they went. Two hypotheses are suggested from the evidence of past immigration. Former British migrants, who were consistently the largest group moving to Canada, may have made up a significant share of those leaving both because of their numbers and because Britain performed better economically during the depression than did either Canada or the US. Second, the immigrants from central and eastern Europe who came in the twenties were largely gone by the early thirties according to the census. Where they went is a mystery - did they return home seeing themselves as temporary workers, or did they move on to third countries? Certainly the labour market of the thirties was very different from what it had been in the previous three decades.

Taken together, this discussion indicates that immigration inflows followed a highly variable pattern between 1911 and 1941, with variation occurring in total size of the inflows, occupational distributions, and regional sources. In the rest of the paper, we will take advantage of this variation to investigate whether the large shifts in immigration were correlated with changes in wages within occupations. We will also use the regional variation in source countries, and the fact that some of it was related to factors beyond Canada's borders (both in terms of competition for immigrants from other receiving countries and the supply-push nature of some of the European immigration) as the basis for an instrumental variable approach to dealing with potential endogeneity.

### **3) Data**

The first component of our data relates to weekly wage distributions in a set of 11 Canadian cities for males over the age of 15 for the years 1910/11, 1920/21 and 1930/31. The data come from Census tables showing number of persons, total number of weeks worked and total annual earnings in detailed occupations by age categories for each of a set of large cities.

We focus on the set of cities that had populations over 25,000 in 1911: Victoria, Vancouver, Calgary, Edmonton, Regina, Winnipeg, Toronto, Montreal, Quebec City, St. John, and Halifax. Together, the populations of these cities make up 20% of the total population in 1911, 21% in 1921, 23% in 1931 and 30% in 1941.<sup>1</sup> Over this same period, the proportion of the population that was urban as opposed to rural rose from 45% in 1911 to 56% in 1941. Thus, our sample corresponds to wages in larger urban centres which became a steadily more important component of Canada's overall population and of the urban population over this period.

The earnings and weeks worked in these tables refer to the twelve month period preceding June 1 of the Census year. Annual earnings refer to wage, salary, commission or piece rate earnings from all jobs in that period. Weeks worked are constructed by subtracting responses to questions about total weeks of work lost due to lay-off, illness, accident or strike from 52. The tables correspond to "wage-earners" which, in both the introductions to the 1921 and 1931 Censuses is defined as "a person who works for salary or wages, whether he be the general manager of a bank, railway or manufacturing establishment, or only a day labourer." This definition excludes the self-employed (both those who employ others and those who do not) and unpaid family workers (e.g., farmers sons). The 1910/11 data comes from an unpublished tabulation found in Mac Urquhart's papers in the Queen's University archives and were originally gathered as part of Urquhart's work on the Canadian Historical Statistics. The 1920/21 data is from Table 40 in Volume III of the 1921 Census. The 1930/31 data is from Tables 34 and 35 in Volume V of the 1931 Census. In each case we loaded all of the numbers recorded in the tables into spreadsheets.

The occupation dimension in these tables corresponds to the jobs held at the time of the Census, while earnings and weeks worked correspond to all jobs in the previous twelve months. Thus, when we construct the average weekly wage for an occupation group this is not, strictly speaking, the average weekly price of labour in that group. For example, if workers employed in

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<sup>1</sup> Ottawa and Hamilton also fit the definition of having over 25,000 inhabitants in 1911 but there is no 1911 data for these cities and so we drop them from all years for comparability.

a semi-skilled occupation at the time of the Census spend parts of their year working as common labourers then our calculated average weekly earnings would be lower than the rate firms paid to semi-skilled workers in that occupation for a week's work. As we will see, though, the weekly wages constructed for various occupations in this way correspond well to other wage data sources in this time period. Thus, this appears not to represent a major shortcoming of the data.

The occupation categories for each Census are quite detailed. The 1911 table includes earnings and weeks data for 325 occupations, the 1921 table has data for 442 occupations and the 1931 table has data for 353 occupations. In the age dimension, the 1911 table has three age groupings while the 1921 table has 5 age groupings and the 1931 table has 8 age groupings.<sup>2</sup> Our goal is to compare the weekly wage distribution across the three Census years. To do this, we need to use the same age and occupation groups in each year, otherwise we would likely observe greater variability in the weekly wage in years with more occupation and age categories. Thus, our examinations from this point forward will correspond to the three age groups that are evident in the 1911 Census and that can be constructed from the age categories in the other Censuses: 15-24, 25-64 and 65+. Matching occupation categories to create one consistent set of occupations across Censuses is obviously more difficult and subject to the interpretation of the individual researcher. We created a concordance in which we combined occupations into categories that could be compared across years. We provide a description of our main matching decisions along with a comparison of the distribution constructed from the complete set of data and that based on the concordance matched data in Green and Green(2007). There we show that the two distributions are, in fact, quite similar and argue that our main conclusions are unlikely to be affected by the fact that we are forced to switch to a restricted but consistent set of occupations. In creating these concordance categories, we were forced to drop some occupations in each Census year which we could not confidently place in a particular concordance occupation group. However, the number of people represented in the remaining occupations correspond to 90% of

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<sup>2</sup> Table 34 has data on 7 of the age groups (starting at age 20) plus the totals for all workers regardless of age. We use data from Table 35, which has the same data by occupation for various age groupings for 10 to 19 year olds, to construct the numbers for the 15 to 19 year old group.

all male wage earners in Montreal in the 1911 Census, 84% of those in the 1921 Census and 89% of those in the 1931 Census. Thus, we still capture the large majority of workers. When we use the 1911-1931 data, our concordance includes 158 occupations, implying that we have information on 158 occupations times 3 age groups times 11 cities or 5214 cells for each year. In fact, some of the cells are empty, so for 1911, 1921 and 1931 we are left with 452, 464 and 455 occupation-age groups with positive earnings, respectively.

The 1941 Census data imposes some extra restrictions because there is no age dimension to the 1941 tables. In addition, the set of reported occupations is smaller, leading to a cross-year concordance with only 117 occupations when we include 1941 data. We will present results both with and without the 1941 data throughout the paper so the reader can see what is lost by moving to descriptions without the age dimension and with fewer occupations.

We construct weekly wage distributions from this data by first dividing annual earnings by annual weeks worked within each occupation-age category.<sup>3</sup> We also know the number of wage earners in each occupation-age category. We create a dataset by assigning each of these people the average weekly wage associated with their category. Thus, we effectively weight the occupation-age wages according to the number of wage earners. This creates a dataset in which all of the variability arises across occupation-age groups and which necessarily misses within group variation. We convert all wages into 1913 Toronto equivalent dollars, using the cost of living indexes in Emery and Levitt(2002). Because our earnings data correspond to 12 month periods spanning half of two consecutive calendar years, we actually used the average of the listed 1910 and 1911 values for the first Census, and similar averages for the other Censuses. Unfortunately, this assumption is not completely innocuous. Because of rapid deflations in both 1921 and 1931, choosing to average in this way yields quite different results from just using one year's index value in each case. Thus, the actual index values we use for Montreal (compared to a 1913, Toronto base of 100) are 83 for 1911, 148 for 1921 and 127 for 1931. If, instead, we had

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<sup>3</sup> Note that these are essentially weeks weighted average wages. That is, the weekly wages of workers who work more weeks are weighted more heavily.



used the values for 1911, 1921 and 1931, the index values would have been 82, 136 and 116, respectively, thus affecting the 1911-1921 comparisons. However, we believe that the averaging approach is the most reasonable given the timing of the earnings reporting.

Our data on immigration are also from Census Tabulations. Each Census contains a table on number of persons gainfully occupied by nativity. The 1911, 1921 and 1931 tables all correspond to people 10 years of age and over while the 1941 table corresponds to people age 14 and over. The 1941 tabulations do not include those on active military service. We use only the data on males to match the wage data. Each table contains numbers of workers occupied in each of a list of occupations. Those occupation lists are a close match to the set of occupations in the tables we use for constructing the wage data. In order to make use of the 1941 data (and because the immigration data is not broken down by age), we work with the narrower concordance that establishes a set of common occupations across all four Censuses. This results in 117 occupations in each year. However, the matching between the two types of tables is not perfect and we drop a set of occupations for which we have a lower level of certainty about the match between the wage and immigrant data. This leaves us with 99 occupations for which we have the weekly wage, the number of gainfully occupied Canadian born workers and the number of gainfully occupied foreign born workers. For 1911, we have only numbers on Canadian and foreign born workers. For 1921, 1931 and 1941 we also have foreign born workers broken down by region of birth: Great Britain (and possessions), United States, Europe, Asia, and Other.

## **4) Results**

### **4.1) Tables and Figures**

We begin by characterizing the distribution of immigrants across occupations relative to the native born population. An initial question of interest is whether immigrants were disproportionately low skilled. One common measure of skill used in labour economics studies is the average wage in an occupation. In Figure 3, we plot the proportion of male workers in each occupation in 1911 who were immigrants against the wage in 1911 in the occupation along with

a fitted cubic in the wage showing the general relationship between immigrant proportion and wages.<sup>4</sup> Since immigrants comprised 33% of the Canadian labour force in 1911, all the points above 0.33 in the figure correspond to occupations with a disproportionate immigrant component. The fitted line has a negative slope, indicating that immigrants tend to be concentrated in lower wage jobs. Table 5 contains a listing of the 5 lowest and 5 highest immigrant concentration occupations in 1921 (a middle year in our data). The lowest concentration occupations tend to be professional, though that is not uniformly the case, and have concentrations as low as 10% immigrant. At the other extreme, high concentration occupations tend to be low skilled and associated with personal service and cleaning, with laundry workers being the highest concentration occupation at 79% immigrant. Together with the line in Figure 3, these basic patterns indicate that immigrants were disproportionately employed in low skilled jobs. The other point from Figure 3, though, is that the relationship between the proportion immigrant and the wage is not at all tight. There is plenty of variation in immigrant proportion across the wage range. It is this variation that we will exploit in our estimation of the impact of immigration on wage changes.

In Figure 4, we plot fitted cubics associated with the relationships between the proportion immigrant in each occupation in each Census year against the 1911 average wages, where we again view the latter as a summary measure of skill. We do not plot the individual concentration-wage points to reduce clutter in the figure. The 1921 line is shifted up from the 1911 line (redrawn from Figure 1) and reflects a somewhat flatter relationship between immigrant concentration and the wage at both the bottom and top of the range. The shift up corresponds to an increase in the proportion of the workforce who are immigrants to .35 in 1921.<sup>5</sup> Between 1921

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<sup>4</sup> The wages in this figure and throughout the paper are in 1913 Toronto dollars. We use only occupations with wages between the 10<sup>th</sup> and 90<sup>th</sup> percentiles of the 1911 wage distribution because using extreme occupations distracts attention from the pattern in the majority of occupations.

<sup>5</sup> This overall proportion does not form a mid-point for the 1921 line in Figure 2 because the line is fitted based only on occupations with wages between the 10<sup>th</sup> and 90<sup>th</sup> percentiles of

and 1931, the number of immigrants in the workforce grew by over 20% but so did the number of Canadian born workers, leaving the proportion of workers who were immigrants unchanged at .35. As a result, the concentration-wage profile for 1931 has the same height as the 1921 profile. In addition, it has much the same shape as the 1921 profile, though with a small twist toward having more immigrant concentration in the lowest wage occupations. Finally, between 1931 and 1941, the profile maintains a similar shape but shifts down substantially, reflecting a decade of net emigration. By 1941, immigrants made up only 26% of workers.

We also calculate the Duncan index of the dissimilarity between the immigrant and native born occupational distributions as a summary measure of the congruence between the immigrant and native born distributions and how they changed over time. This index is defined as,

$$D = \sum_{i=1}^I |n_i - m_i| / 2$$

where,  $i$  indexes occupation,  $I$  is the total number of occupations,  $n_i$  is the percentage of native born workers who are in occupation  $i$ , and  $m_i$  is the percentage of immigrant workers in the occupation. The index takes a value of 0 if the native born and immigrant occupational distributions are exactly equal and a value of 100 when there is complete segregation (i.e., when immigrant and native born workers do not share any occupations in common). The value of the index corresponds to the percentage of either native born or immigrant workers who would have to change occupations to generate complete equality in the occupational distributions. It takes values of 18, 11, 17 and 23 in 1911, 1921, 1931 and 1941, respectively. Thus, the occupational distributions for the two groups became much more similar between 1911 and 1921 but then diverged in the succeeding decades. Since we do not have information on when immigrants arrived (except in the 1941 Census) we cannot investigate whether these shifts reflect differences in occupations taken by new immigrants or changes in the occupational distribution of immigrants after arrival through either shifts across occupations or through emigration. As a

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the 1911 wage distribution.

point of comparison, in an earlier paper, we calculated that the index of dissimilarity between men and women of 64 in 1911. Thus, while nearly two-thirds of women would have to change their occupation to attain an overall female occupational distribution that was the same as the male distribution, less than a quarter of male immigrants would have to shift occupations to attain equality with male native born workers. Measured against this benchmark, the immigrant and native born distributions do not appear to have been substantially different in this era.

We turn, next, to a simple characterization of the relationship between immigration (or, more properly net migration) in a given decade and wage changes in that decade. In Figure 5, we plot the change in the real wage for an occupation (expressed as a ratio to the wage in the occupation at the start of the decade) against the change in the proportion immigrant in the occupation, pooling the points for all three decades. The line in the figure is a simple regression capturing the average relationship represented in the points. That line has a slope of  $-.35$  with a standard error of  $.13$ , indicating that an increase in the proportion immigrant in an occupation is associated with a substantial (and statistically significant) decline in the real wage in that occupation. There is no reason, at this point, to claim that this relationship represents anything causal but the association does indicate that there is reason to look more closely at the impact of immigration on the wage structure.

#### **4.2) Empirical Considerations in Estimating Immigration Impacts**

The approach of relating changes in immigrant proportion to wage changes within sub-groups in an economy has a relatively long pedigree in economics. In conceptual terms, consider a simple supply and demand model of a labour market. An increase in immigration into that market, holding all else constant, will effectively shift the labour supply curve out, generating a decline in wages for the workers who were there before the immigration. The slope of the labour demand curve then determines the extent of that decline and the ultimate impact of immigration on other workers. Several difficulties complicate obtaining estimates of that impact, however. First, we need to establish well-defined labour markets. What we would like is to observe a set of

independent labour markets so that we can obtain impact estimates by comparing wage and immigration changes across them. However, labour markets are typically defined using sub-groups defined either by geography (e.g., Card(1990)), skill groups (e.g., Borjas(2003)), or occupations (e.g., Card(2001)) within a single economy. Working within one economy has advantages in terms of making the “all else held constant” assumption mentioned earlier more credible. But it also has downsides in that the various groups may overlap in ways that suggest that the various observations are not truly independent. The way any such dependence is handled could have profound effects on estimates of the impacts of immigration.

The second difficulty is strongly related to the first and corresponds to supply responses among the native born workers (those who were there before the immigrants arrived). In particular, if immigrants enter in specific “markets” in the economy - putting downward pressure on wages - native born workers may respond by moving to other markets where immigrants are not entering. Of course, by doing so, they themselves have a depressing effect on wages in the receiving market, thereby effectively spreading the impact of immigration across the economy. To the extent this occurs, when we compare wage and immigration changes across markets we will see no effect: there is variation in immigration proportions across the markets but internal migration has resulted in there being no wage differences. The average wage in the economy will decline but this is not captured in any analysis that uses variation across cities. In most studies that include more than one period, the researchers include period fixed effects, implying that the impact on the overall average wage is not part of the estimates. Trade across markets can have the same effects of eliminating the wage differentials.

The argument that internal migration can lead to under-estimates of the effects of immigration on wages has been the focus of much of the debate over, for example, Card(1990)’s finding that the massive Mariel boatlift had only small effects on the Miami labour market. Card(2001) argues, though, that there is little evidence of internal migration by the native born in response to immigration into their local labour market. Borjas(2003), on the other hand, argues that there is real reason for concern about these effects and, as a consequence, turns to defining

labour markets based on education and experience groups at the national level. Working at the national level obviously gets around issues relating to internal geographic migration but does not necessarily avoid the second difficulty completely. In particular, native born workers may be able to move into “markets” formerly occupied by a different skill group. For example, if a large number of foreign engineers migrate to Canada and compete down engineer earnings, native born engineers may move to working as entrepreneurs or even into technician jobs formerly held by less educated workers. This, again, could dissipate the impact of immigration. Nonetheless, Borjas(2003) finds substantial negative impacts of immigration on native born wages. This contrasts with Card’s results using geography (Card(1990) and a combination of geography and occupation (Card(2001)).

The third difficulty is that the immigrant inflow may not be exogenous. If immigrants move to markets where the demand curve is shifting out, we will tend to see immigration positively correlated with wage changes. Thus, what we estimate is actually a reflection of both supply shifts (the immigration) and anticipated demand shifts. While the standard response to the second difficulty is to try to define larger (and clearer) labour markets, the response to the third difficulty is to use instrumental variables approaches. For example, Card(2001) forms an instrument in which immigrant geographic location is predicted based on the distribution across cities in the US of earlier generations of immigrants from the same source country. The argument is that this variation in immigrant location comes from tastes for associating with others from the same culture rather than from immigrants pursuing economic advantage and, as a result, that it constitutes an exogenous source of variation in immigrant location. The validity of this instrument rests on an assumption that whatever induced immigrants from a given source country to cluster in a particular location is not related to future innovations in economic activity. That is, this instrument would be invalid if immigrants from a given source country have common unobserved skills and they choose locations based on accurate predictions of growth in demand for those skills in that location. Card(2001) finds that this instrument performs well in the first stage. In contrast, Borjas(2003) does not attempt to address this form of endogeneity, arguing,

instead, that it will tend to bias (negative) estimates of own-price elasticities toward zero.

Finally, issues relating to the specification of the production function and implied restrictions on substitutability among different factors of production are central in establishing estimating equations and in interpreting results. The most common approach is to assume a CES production function with two inputs: capital (K) and labour (L). Labour is, in turn, expressed as an aggregate of specific sub-groups of labour. Thus, for example, Borjas(2003) assumes that groups of workers defined by experience and education level are combined using a CES aggregator into education specific labour amounts. These are then combined in another CES aggregator into L. As Borjas(2003) notes, this approach is quite restrictive, imposing restrictions that the elasticity of substitution is the same among all workers with the same education but different levels of experience. Similarly, there is only one elasticity of substitution among the various education groups. Card(2001), similarly, works with an initial production function with K and L as inputs, and with L expressed as an aggregate of labour employed by occupation; again, with one common elasticity of substitution across all occupation groups . The key point about such specifications is that they impose restrictions on the interactions among types of labour and between those labour types and capital. Those restrictions could be important for understanding the overall impact of immigration.

In what follows, we will attempt to address each of these issues. We will begin with an examination of the association between immigration inflows and wages within occupations and, later, discuss endogeneity issues.

### **4.3) Econometric Results**

We begin with an examination of the simple relationship between immigration and wages. We could investigate this using cross-sectional variation, finding the correlation between the proportion immigrant in an occupation and the wage paid in that occupation. However, we are concerned that occupations with low language requirements will tend to both pay low wages and attract immigrants (or, at least, those immigrants who do not have language skills). In this

case, one would find a negative correlation between immigrant share and the average wage but it would not be because immigrant inflows depress wages. To avoid this difficulty, we will work in first differences, eliminating occupation specific, time-invariant effects such as differences in required language skills across occupations. In all the estimations we present, we weight observations by the square root of the number of workers in a given year x occupation cell in 1911. We specifically do not use the number of workers in 1921 to weight 1931-1921 differences or 1931 numbers to weight 1931-1941 differences. This is because the number of workers in an occupation may, itself, be determined by the size of the immigration inflow into that occupation. In that case, using later year employment numbers as weights would mean we were weighting our estimation using an endogenous variable. Using the 1911 numbers in all years reduces this problem since the immigration inflows we study all occur after 1911.

The first column of Table 6 contains the estimates from a simple regression of changes in the log wage within each occupation on the change in the proportion immigrant in each occupation, with all three decades pooled together. This corresponds to the regression line shown in Figure 5. Because the specification does not include year dummy variables, it uses both variation within occupations over time and aggregate differences across decades. That is, the coefficient on the proportion immigrant variable partly reflects the fact that there was positive immigration in both the 1910s and 1920s but negative net immigration in the 1930s. The coefficient on the change in proportion immigrant is economically substantial and statistically significant at any standard significance level. In magnitude, it implies that a 0.1 increase in the proportion immigrant in an occupation is associated with a 3.5% decline in the average wage in that occupation. In the second column, we repeat the regression but include year effects in order to be sure we are not just picking up a spurious correlation between overall trends in immigration and the economy. With the inclusion of the year effects, the proportion immigrant effect falls but is still substantial and statistically significant. Its coefficient implies that a 0.1 increase in the proportion immigrant in an occupation is associated with a 2.6% decline in that occupation's average wage. Given our earlier discussion that immigration impacts may be distributed across



the economy through various adjustments, the overall year effects may contain some valid variation for identifying the effects of interest to us. In that sense, the specification that controls for the year effects should be seen as providing a conservative estimate of the association between immigration and wage changes.

We next turn to the first of the empirical challenges described in the previous section: that adjustments in the economy may imply that focusing on single occupations may under-estimate the true impacts of a given shift in immigration. Our first approach to this problem is to aggregate occupations which we view as potentially substitutable for one another. In particular, we assume that low skilled workers can move among low skilled occupations but that both specific trades and professions can be viewed as separate labour markets. We also leave managers, clerks and salesmen as their own categories.<sup>6</sup> The results from estimation using this somewhat aggregated set of occupations is given in the third column in Table 2. The estimated immigrant proportion effect is larger, as one would predict if the impact of immigration in some occupations was spilling over onto wages in other occupations. The immigrant coefficient is statistically significant at any conventional significance level and implies that a 0.1 decline in the proportion immigrant in an occupation (or aggregated group of occupations) is associated with a 6.0% drop in the occupation.

We also experimented with another approach to allowing for spill-overs of immigration across occupations. In the estimation up to this point, we have restricted the number of relevant

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<sup>6</sup> The low skilled workers we aggregate together into one category consist of all occupations with 1911 wages that place them below the 40<sup>th</sup> percentile of the 1911 weekly wage distribution (approximately \$16 per week). Just above this point in the distribution, we begin to find occupations which sound more like trades, such as, bakers and dyers. The list of occupations fitting this criterion is: agricultural labour, other (non-trade) construction workers, boot blacks, cooks, laundry workers, servants, shantymen, saw mill workers, labourers in mines, messengers, other drivers, longshoremen, telephone linemen, labourers (not in resource sector), char workers, janitors and sextons, hotel employees, boot and shoe workers, sailors. We also dropped a set of categories about which we were uncertain as to whether we could view them as their own market. This set included: theatre employees, clergy, telephone operators, other agents in trade, and a set of occupations which were of the form, “other workers” in various industries. The result is 69 included occupations, with one of them being the large, unskilled category.

immigrants in terms of impacting the wage in an occupation to the number in that occupation. As an alternative, we create a number of relevant immigrants as the sum of the immigrants in a given occupation plus the number in nearby occupations. We define “nearby” by putting declining weights on other occupations, with the weights formed using the 1911 wages and a normal density function. In particular, we take the difference between the 1911 wage for the occupation and the wage in all occupations. We divide this difference by a scaling factor (effectively the standard deviation in the normal density) and then evaluate a standard normal density function at that difference value. We divide all these density values by the value at zero (which corresponds to the occupation on which we are focusing) so that the occupation of interest has a weight of one and the other weights decline according to the normal density. We then multiply those weights by the immigration levels in each occupation and sum up. The result is a number of immigrants “near” the given occupation, with nearness defined by the 1911 wage in each occupation (which we take to be a measure of skill). We repeat this exercise for the number of Canadian born workers and then use the calculated number of relevant immigrants and Canadian born workers to form a proportion immigrant variable. By increasing the scaling factor, we increase the range of other occupations that get a positive weight and we can see whether broadening the comparison group in this way affects our estimates. This effectively allow us to see whether allowing for more spill-overs from immigration in neighbouring occupations onto the wage in a given occupation changes our measure of the impact of immigration.

In Table 7, we present estimates of the proportion immigrant coefficient obtained when the proportion immigrant variable is constructed using different values of the scaling factor. In particular, we set the scaling factor to values that correspond to putting positive weight on other occupations up to 25 cents on either side of each occupation, and up to 50 cents, 1 dollar, 2 dollars and 3 dollars on either side.<sup>7</sup> The estimates are again based on a first-differenced

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<sup>7</sup> For occupations near the top and bottom of the distribution, the weighting function is truncated at the highest or lowest wage occupation and, thus, is asymmetric.

specification using the square root of 1911 employment levels as weights and including period effects. We do not report the latter or the intercept since they do not vary substantially across the columns in Table 7. The results in the table indicate that we obtain estimated immigration associations that are similar in size to our basic results when putting weight on occupations up to 2 dollars on either side of a given occupation. The standard errors associated with these coefficients are larger than those in the basic regression and get larger as the spread of occupations with positive weight increases. This is because we are effectively smoothing the proportion immigrant variable, reducing its variation across occupations.<sup>8</sup> Nonetheless, even taking the resulting large standard errors into account, the results in this table suggest that our point estimates for the immigration effect are not sensitive to a substantial amount of variation in aggregation.

We are also interested in whether the estimated effects differ by occupational sub-group. In Table 8, we present separate estimates of the basic model (including period effects) for low skilled workers (defined as in our earlier aggregation exercise), low skilled blue collar workers, trades workers, and professionals. The results for the low skilled in the first column indicate an effect quite similar to our overall basic results in Table 2, though less well defined because of the smaller number of observations. The estimated impact for the blue collar low skilled occupations in column 2 is larger, implying that the white collar low skilled effect is not as large. In comparison, the effects for the trades is large (indicating that a .10 increase in the proportion immigrant in a trade occupation is associated with a 5.4% drop in the real wage in that occupation) and relatively well defined. This may fit with the trades actually being like separate labour markets with little spill-over among them. Finally, the results for professionals imply limited immigration impacts. In fact, the estimated immigration effect for professionals is positive and relatively sizeable but it is also very badly defined in spite of having as many

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<sup>8</sup> In the most extreme smoothing, we could set the scaling factor so that all occupations were given equal weight. In that case, there would be no variation in our proportion immigrant variable across occupations and its standard error would effectively be infinity.

occupations as the low skilled grouping. The implication is that immigrant proportion changes and wage changes are not strongly correlated among professionals. This fits with our earlier observation that immigrants in this era tended to be disproportionately lower skilled. Certainly, for the professional occupations listed in Table 5, competition from immigrants seems unlikely to have been a significant concern for Canadian born professionals.

Finally, we turn to addressing the issue of endogeneity of the immigration inflows - the third complicating issue described in the previous section. We approach this issue using a variant on an instrument used in other work on immigration (e.g., Card(2001)). In particular, we have data on occupations for immigrants broken down by region of birth (Britain and Possessions, US, Europe, and Asia) for 1921, 1931 and 1941. We construct predicted numbers of workers in each occupation from a given region at the end of a decade by multiplying the number in that region-occupation cell at the start of the decade by the overall growth rate in the number of immigrants from that region in the decade. Thus, for example, we construct a predicted number of British immigrants in a given occupation in 1931 by multiplying the number of British immigrants in that occupation in 1921 by the ratio of the total number of British immigrants in Canada in 1931 to the total number present in 1921. We do this for each region and then sum across regions to get an overall predicted number in each occupation in 1931. Finally, we use these predictions along with actual numbers of Canadian born in each occupation in 1931 to form a predicted proportion of immigrants in each occupation in 1931. Differencing this from the actual proportions in 1921 generates our instrumental variable for the actual change in proportions across the decade. Thus, the instrument uses variation that stems from the interaction of shifts in the regional composition of the inflow with regional differences in historical occupational composition. The underlying assumption behind this instrument is that the occupational distribution at the start of the decade partly reflects the skill distribution of potential immigrants from the given source region. The instrument then embodies immigration that reflects that skill distribution - leaving out any adjustments to actual changes in the fortune of various occupations in Canada in the decade. This would be plausible, for example, to the extent that some part of the

immigrant inflow is a response to broad external, push factors rather than immigrants responding to specific market conditions in Canada. We acknowledge that this assumption may be questionable. In our own earlier work, for example, we found evidence that immigrants had a strong information network reaching across the Atlantic that passed information on the relative performance of various regions in Canada. However, this is the only instrument possibility open to us and we view the assumption as being plausible enough to warrant examining estimates based upon it.

The IV estimates for the overall sample and occupational sub-groups are presented in Table 9. Recall that we do not have information on region of birth for 1911 and so can only use the 1921-31 and 1931-41 differences in this estimation. When we re-run the basic specification with OLS just using these differences the coefficient on the proportion immigrant variable is  $-.34$ , with a standard error of  $.14$ . Thus, using this sub-sample of years generates an estimated effect that is quite similar to what we obtained using all the data and is, again, statistically significant at conventional significance levels. The instrument performs well in the first stage with the coefficient on the instrument in a regression of the change in proportion immigrant on the instrument and a period dummy having an associated t-statistic of  $7.7$ . Nonetheless, the second stage estimates presented in the table are poorly defined. They suggest a near zero wage effect based on estimates from the overall sample but this turns out to stem from a balancing of negative effects for low skilled and trades workers against a positive effect for the professions, with the latter being particularly poorly defined. The proportion immigrant coefficient is only statistically significant for the trade group, for which it takes a large (possibly unbelievably large) negative value. In the end, the IV estimates provide some support for the rest of the findings in the paper but are too poorly defined to be truly useful. In future work, we plan on introducing a provincial dimension to the variation which should help in refining the instrument and, hopefully, as a result obtaining more useful IV results.

## 5) Conclusion

In this paper, we investigate the relationship between movements in the number of foreign born workers in an occupation and the wage in that occupation. Our interest in this relationship stems from our earlier work in which we showed that the Canadian wage distribution underwent a substantial widening in the first half of the Twentieth Century, and particularly in the 1920s. We argue that the contrast of this pattern with a pattern of compression in the wage structure in the US in the same period opens the possibility that differences in immigration between the two countries could help explain differences in the wage structures. There is no US data that will allow us to pursue this hypothesis directly and so we turn to the examination of wages and immigration across occupations in Canada. Using data from the 1911, 1921, 1931 and 1941 Canadian Censuses, we find that decadal changes in the average wage and the proportion of workers who are immigrants are significantly related. In particular, we find that a 0.1 increase in the proportion immigrant in an occupation is associated with an approximately 3% decline in the average wage in an occupation. These effects are present at various levels of aggregation of occupations. We find larger effects (on the order of a 5% decline in wages for a 0.1 increase in proportion immigrant) for trades occupations, which fits with fewer opportunities to substitute across these occupations. In contrast, the estimated effects for professionals are not well-defined and are not statistically significantly different from zero, fitting with the fact that immigrants made up a disproportionately small component of employment in these occupations.

Taken together, we believe that these results provide some support for the possibility that immigration played an important role in the depression of lower skilled wages and, hence, in the expansion of wage dispersion in Canada in the first part of the Twentieth Century. We are purposefully circumspect in our statement of this conclusion, however, since we do not view ourselves as having satisfactorily solved endogeneity issues at this point. We can say that immigration and wages are negatively correlated but we cannot conclude firmly that differences in immigration caused differential wage movements across occupations. To the extent that there is a relationship, though, it does support further research into the question of the role of

immigration in, for example, explaining differences in wage structures across countries in this era. In particular, these results may fit with Wylie(1989) and Keay(2000)'s findings that Canadian firms adopted more labour intensive production techniques than their American counterparts in the same industries. Their results are based on aggregate labour measures. Our results point to further differentiation between the two countries in relative skill price movements. Thus, it is possible that different immigration policies in the two countries in the first part of the last century had somewhat nuanced effects in placing them on different technological trajectories.

## References

- Borjas, G. (2003). "The Demand Curve Is Downward Sloping: Re-examining the Impact of Immigration on the Labor Market," Quarterly Journal of Economics, pp. 1335-1374.
- Card, D. (1990). "The Impact of the Mariel Boatlift on the Miami Labor Market," Industrial and Labor Relations Review, Vol. 43, pp. 245-257.
- Card, D. (2001). "Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration," Journal of Labor Economics, vol. 19, pp. 22-64.
- Emery, J.C.H and C. Levitt (2002). "Cost of Living, Real Wages, and Real Incomes in Thirteen Canadian Cities, 1900-1950." Canadian Journal of Economics, 35(1), February, pp. 115-137.
- Goldin, C. and L.F. Katz(1998). "The Origins of Technology-Skill Complementarity." Quarterly Journal of Economics, 113(3), August, pp. 693-732.
- Goldin, C. And L.F. Katz(2001). "Decreasing (and Then Increasing) Inequality in America," in F. Welch, ed., The Causes and Consequences of Increasing Inequality. Chicago: The University of Chicago Press, pp. 37-82.
- Goldin, C. and R. Margo (1992). "The Great Compression: The Wage Structure in the United States at Mid-Century," Quarterly Journal of Economics, 107, pp. 1-34.
- Goldin, Claudia, "The Political Economy of Immigration Restriction in the US from 1890 to 1921". In Claudi Goldin and Gary Libecap eds. The Regulated Economy: A Historical Approach to Political Economy (Chicago: The University of Chicago Press, 1994),
- Green, Alan, "International Migration and The Evolution of Prairie Labour Markets, 1900-1930" in T. J. Hatton and Jeffrey Williamson eds, Migration and the International Labour Market, 1850-1939, (London, Routledge), 156-174.
- Green, Alan and David Green, "Balanced Growth and the Geographical Distribution of European Arrivals in Canada, 1900-1912" in Explorations in Economic History, 30 (January, 1993), 31-39.
- Green, A.G. and D.A. Green (2007). "Canada's Wage Structure in the First Half of the Twentieth Century (with comparisons to the United States and Great Britain)." UBC, Department of Economics.
- Hicks, J. (1932). The Theory of Wages, London, 1932.
- Keay, I. (2000). "Scapegoats or Responsive Entrepreneurs: Canadian Manufacturers, 1907-1990," Explorations in Economic History, No. 37, pp. 217-40.
- Williamson, J. And P.H. Lindert (1980). American Inequality: A Macroeconomic History, New York: Academic Press.
- Mackinnon, Mary(1996). "New Evidence on Canadian Wage Rates, 1900-1930." Canadian Journal of Economics, 29(1), February, pp.114-131.
- McClean, M.C.(1931). "Extent and Direction of Changes in School Attendance During the Century." Chapter VII, Volume XII, Census of Canada, 1931, pp. 654-665.
- Ober, H. (1948). "Occupational Wage Differentials, 1907-47," Monthly Labor Review, August, pp. 27-134.
- Urquhart, M.C. and K.a.H. Buckley(1965). Historical Statistics of Canada. Toronto: Macmillan.
- Wylie, P. (1989). "Technological Adaptation in Canadian Manufacturing, 1900-1929," Journal of Economic History, Vol. 49, No. 3, pp. 569-91.



**Table 1**  
**Summary Statistics For Census Based Weekly Wage Distributions**  
**(1913 Dollars)**

<b>Statistic</b>	<b>1911 Census</b>	<b>1921 Census</b>	<b>1931 Census</b>
Mean	18.07	16.56	20.23
Standard Dev.	7.74	5.99	10.1
Percentile			
1	8.21	6.41	6.22
5	10.27	9.12	9.93
10	11.88	10.5	11.34
25	13.84	12.7	14.18
50	16.91	16.16	18.13
75	20.77	18.83	23.27
90	23.91	22.81	31.53
95	29.27	27.35	40.77
99	45.14	37.86	60
Squared Coef. Of Variation	0.183	0.131	0.249
log 90-10 Ratio	0.7	0.78	1.02
log 90-50 Ratio	0.35	0.34	0.55
log 50-10 Ratio	0.35	0.43	0.47

Based on Census tables described in text.

**Table 2**  
**Skilled/Unskilled Wage Differentials**  
**Blue Collar Workers, Canada and the United States**

Year	Machinists/ Labourers		Manuf Skilled/ Unskilled		
	US	Canada	US(1)	US(2)	Canada
1910/11	-	1.49	2.05	-	1.35
1920/21	2.03	1.41	1.75	1.41	1.24
1930/31	2.06	1.57	1.8	1.39	1.36
1940/41	1.92	1.52	1.65	1.35	1.25

Notes: The dates in the first column correspond to the years for the Canadian Census observations. US data correspond to the closest dates available, as listed below. The Machinists/Labourers ratio relate to hourly wages. The Canadian series is constructed as in Table 6 but for all of Canada rather than just Montreal. The US series is from Goldin and Margo(1992), Table 7, and corresponds to wages on Class I steam railroads. The actual years reflected are:1922, 1930/31, and 1940/41. The US(1) series is from Goldin and Margo(1992) Table 7 and are originally from Ober(1952). They correspond to hourly wages in various skilled and unskilled manufacturing occupations in urban areas and reflect data from: 1907, 1918, 1931 and 1938. The US(2) is also from Goldin and Margo(1992) and comes originally from National Industrial Conference Board data. It corresponds to the ratio hourly wages in skilled and semi-skilled manufacturing production occupations to those in unskilled manufacturing production occupations, with the actual years reported being 1922, 1930/31 and 1940/41. Both US series are compared to a ratio of weekly wages from Canadian Census data with the numerator consisting of all skilled and semi-skilled occupations in manufacturing and the denominator corresponding to all labourers (since we are unable to separate manufacturing labourers from other labourers in all Censuses).

**Table 3**  
**Immigration Inflows, Canada**

Source	1) Annual Inflow, 1901	2) Annual Inflow, 1911	Difference 2) - 1)	3) Annual Inflow, 1921	Difference 3) - 2)
Britain	11810	147760	135950	44367	-103393
Europe	15463	58144	42681	11148	-46996
USA	39940	112028	72078	23888	-88140
Asia	675	7999	7324	3463	-4536

Source	4) Annual Inflow, 1925	5) Annual Inflow, 1926	6) Annual Inflow, 1931	Difference 6) - 5)	7) Annual Inflow, 1941	Difference 7) - 6)
Britain	35358	59825	18061	-411764	6655	-11406
Europe	26430	69123	10106	-59017	2122	-7984
USA	17717	20394	13195	-7199	6594	-6601
Asia	805	846	1004	158	16	-988

Source: Historical Statistics of Canada, Series A316 - A326

(a) From 1901 to 1925 immigration covers overseas migrants only while the estimates for 1926 to 1941 includes Overseas and US immigrants

(b) The first figure for immigration from the US is 1904.

**Table 4**  
**Net Changes in Stocks of Male, Foreign Born Workers**

Decade	Net Change in Stock	Net Change as a Percentage of Stock at Start of Decade
1911 - 1921	137488	17.6%
1921 - 1931	211554	23.0%
1931 - 1941	-240716	-21.3%

Source: Census of Canada, 1911, 1921, 1931, 1941

**Table 5**  
**Highest and Lowest Five Occupations Based on Proportion Immigrant, 1921**

Five Lowest			Five Highest		
Occupation	Proportion Immigrant	Wage	Occupation	Proportion Immigrant	Wage
Physicians	0.1	23.69	Janitors	0.61	12.47
Dentists	0.13	21.7	Cooks	0.7	11.65
Undertakers	0.14	16.22	Boot Blacks	0.7	9.15
Veterinarians	0.18	25.47	Other Service	0.72	10.53
Boat and Canal Men	0.18	15.11	Laundry Workers	0.79	9.39

**Table 6**  
**Basic Regression Estimates**

Variable	Basic - No Year Effects	Basic - With Year Effects	Aggregated - With Year Effects
Constant	.0015 (.011)	-.12 (.014)***	-.11 (.016)***
Proportion Immigrant	-.35 (.13)***	-.26 (.11)**	-.60 (.16)***
1921-1931 Year Dummy	-	.31 (.020)***	.36 (.023)***
1931-1941 Year Dummy	-	.069 (.023)***	-.0019 (.028)
# of Observations	297	297	207
R <sup>2</sup>	0.022	0.51	0.6

Standard errors in parentheses. \*, \*\*, and \*\*\* corresponds to statistical significance at the 10%, 5% and 1% significance levels, respectively.

**Table 7**  
**Estimation With Varying Aggregation of Occupations**

	Positive Weight on Occupations with Wages Up To				
	25 Cents	50 Cents	1 Dollars	2 Dollars	3 Dollars
Proportion Immigrant Coefficient	-0.15 (.14)	-0.20 (.16)	-0.31 (.18)*	-0.19 (.24)	-0.026 (.34)
# of Obs.	297	297	297	297	297
R <sup>2</sup>	0.52	0.53	0.53	0.51	0.5

The columns correspond to different values for the scaling factor in the weighting scheme used to create the proportion immigrant variable as described in the text. Essentially, we put declining weight on occupations farther and farther away from a given occupation of interest, where distance is measured in terms of the 1911 average wage in each occupation. The columns reflect different ranges over which positive weights are applied to other occupations. Thus, in the first column, occupations with 1911 wages within 25 cents of a given occupation are used in creating the proportion immigrant measure. All estimations include period effects (not reported).

Standard errors in parentheses. \*, \*\*, and \*\*\* corresponds to statistical significance at the 10%, 5% and 1% significance levels, respectively.

**Table 8**  
**Basic Regression by Sub-Group**

Variables	Low Skilled	Blue Collar, Low Skilled	Trades	Professional
Constant	-0.077 (.028)***	-0.0023 (.037)	-0.10 (.017)***	-0.26 (.032)***
Proportion Immigrant	-0.32 (.19)*	-0.44 (.24)*	-0.54 (.16)***	.31 (.35)
1921-31 Dummy	.16 (.042)***	.071(.054)	.29 (.023)***	.69 (.047)***
1931-41 Dummy	.11 (.042)**	.071 (.054)	.030 (.030)	.14 (.053)**
# of Obs	57	24	87	60
R <sup>2</sup>	0.32	0.3	0.69	0.83

Standard errors in parentheses. \*, \*\*, and \*\*\* corresponds to statistical significance at the 10%, 5% and 1% significance levels, respectively.

**Table 9**  
**Instrumental Variables Estimates**

<b>Variables</b>	<b>All Occupations</b>	<b>Low Skilled</b>	<b>Blue Collar, Low Skilled</b>	<b>Trades</b>	<b>Professional</b>
Constant	.19 (.014)***	.085(.028)**	.064 (.038)*	.21 (.022)***	.48 (.042)***
Proportion Immigrant	.11 (.29)	-.18 (.34)	-.62 (.42)	-1.55 (.68)**	1.58 (.97)
1931-41 Dummy	-.21 (.03)***	-.054 (.036)	.001 (.050)	-.37(.078)***	-.52 (.052)
# of Obs	198	38	16	58	40

Standard errors in parentheses. \*, \*\*, and \*\*\* corresponds to statistical significance at the 10%, 5% and 1% significance levels, respectively.

Figure 1: Differences in Log Percentiles,  
Weekly Wages, 1921 versus 1911 and 1931 versus 1911

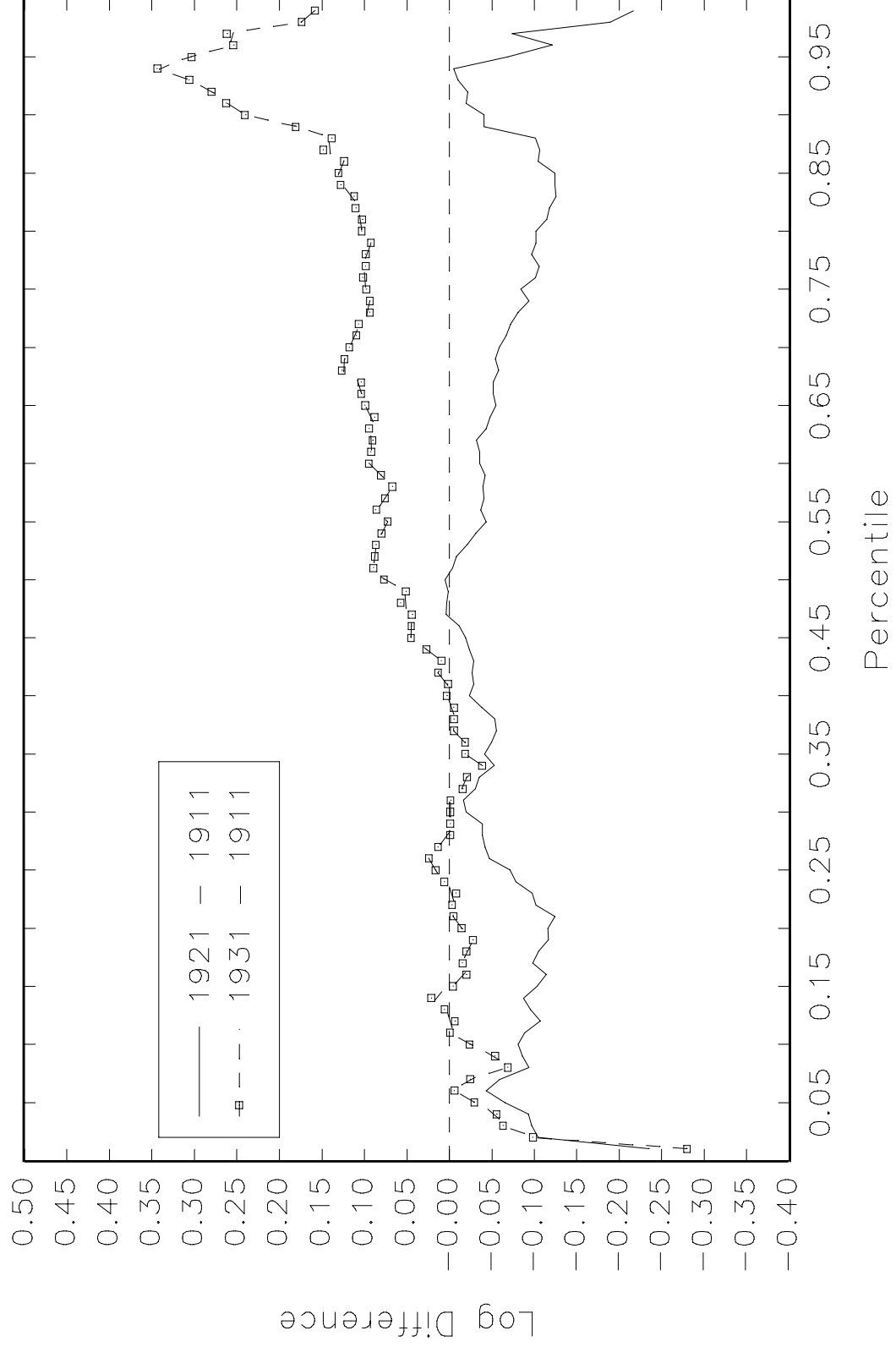


Figure 2: Differences in Log Percentiles,  
Weekly Wages, 1931 and 1941 versus 1911

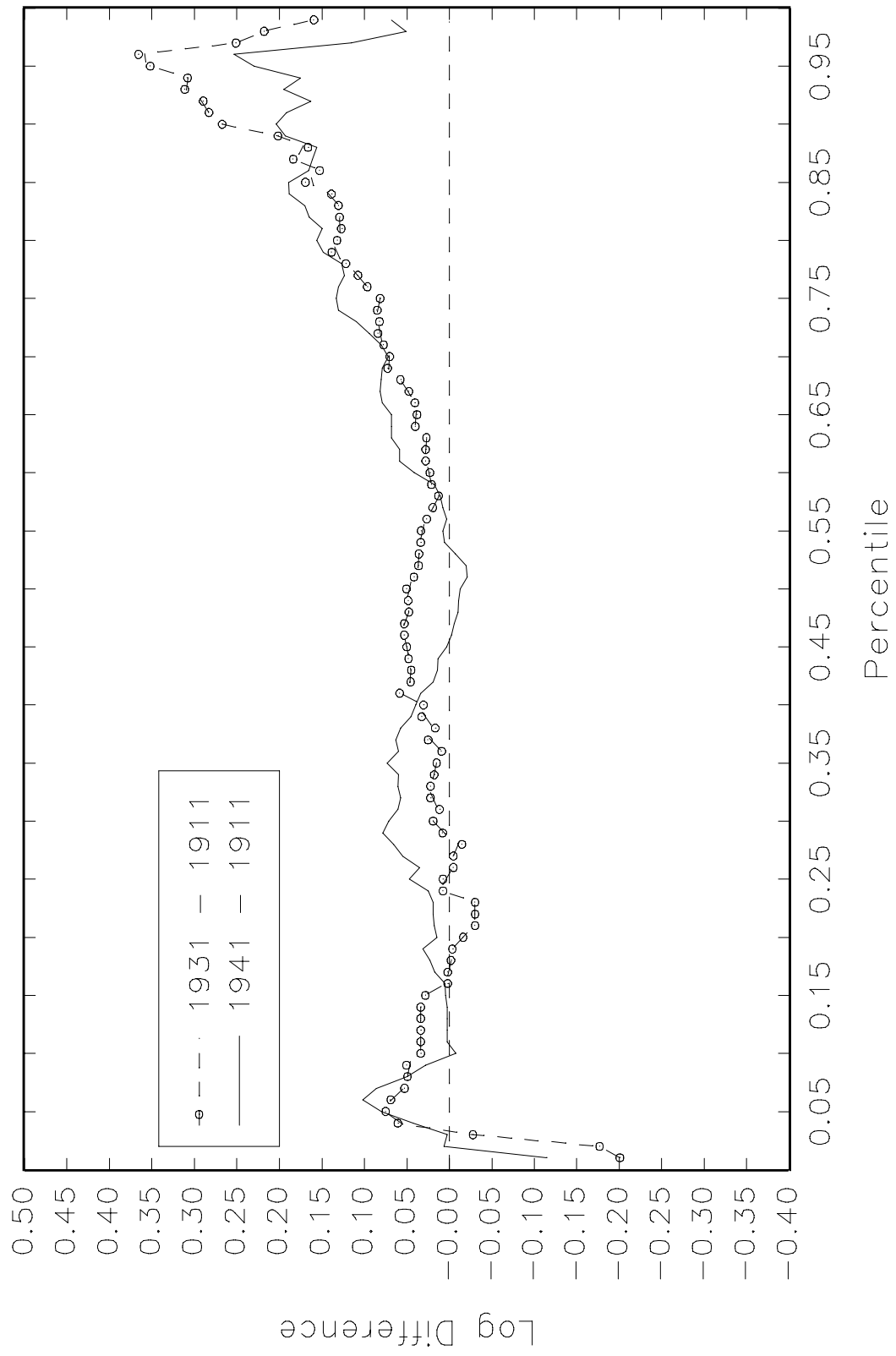




Figure 3:  
Plot of Immigrant Wage Share Against 1911 Wage  
by Occupation, 1911

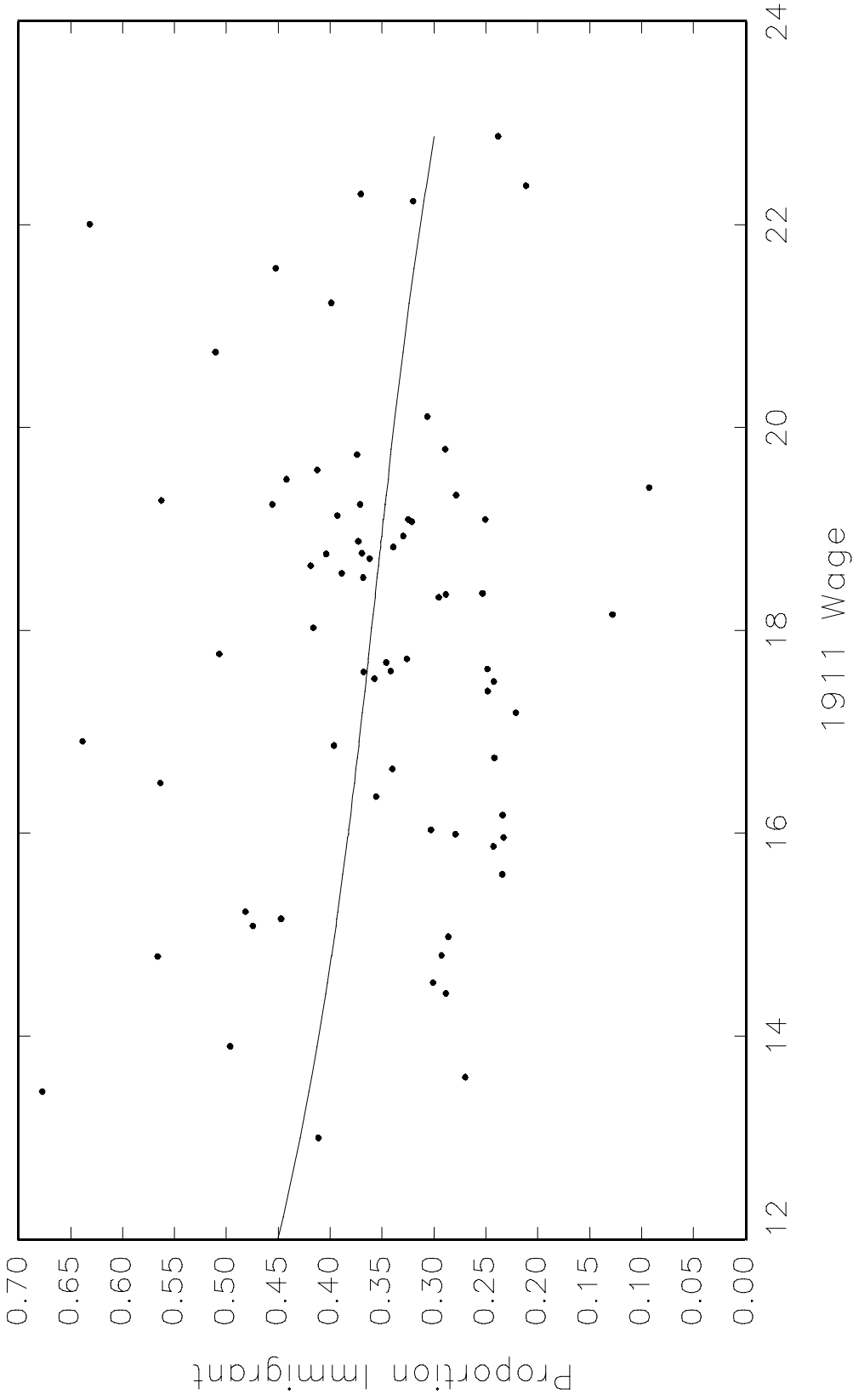


Figure 4:  
Plot of Fitted Immigrant Wage Share Against 1911 Wage  
by Occupation, 1911 – 1941

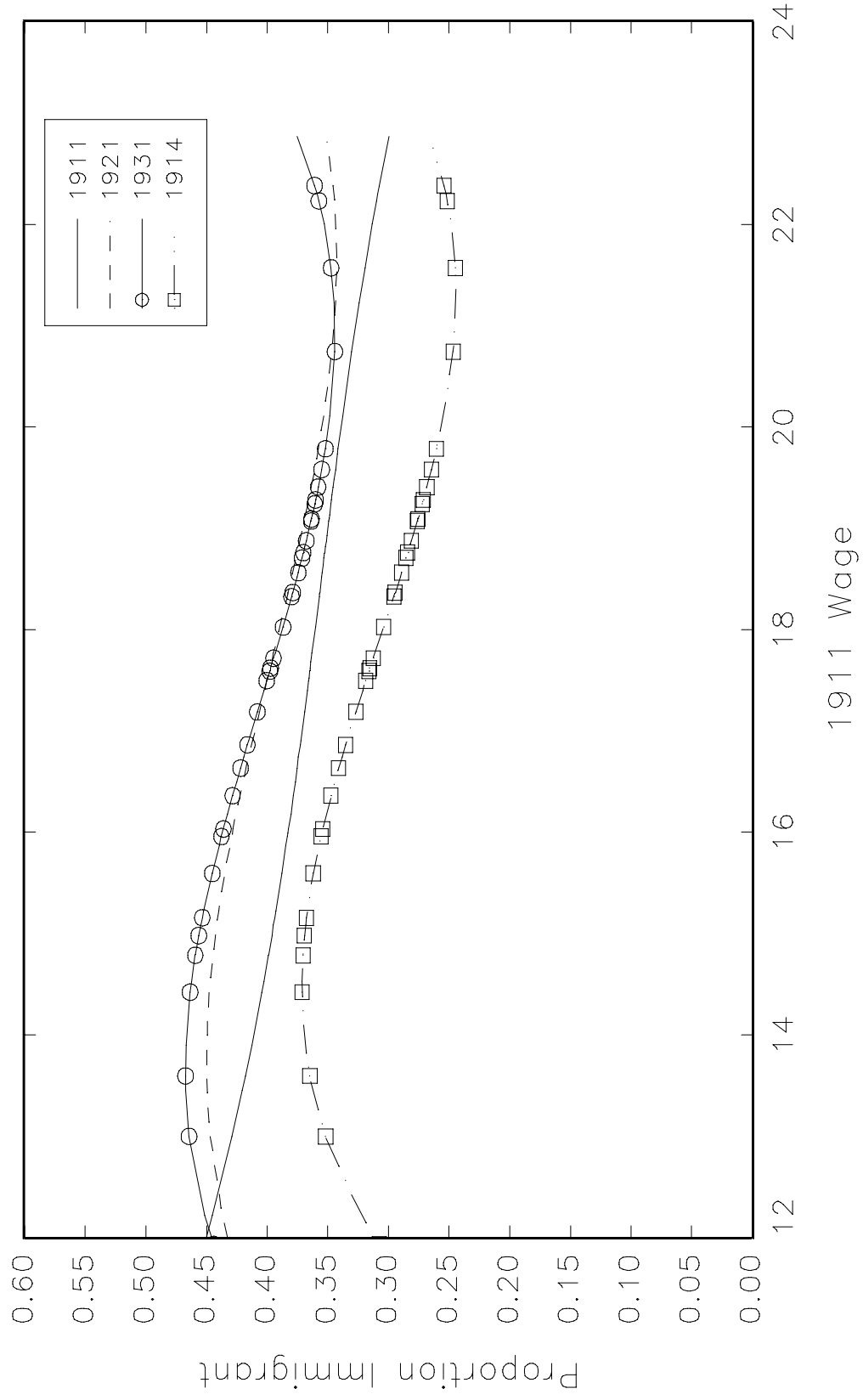


Figure 5:  
Plot of Wage Differences versus Immigration Changes  
by Occupation, Pooled

