Essays on Labor and Banking

By

Yuanyuan Ning

A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Department of Economics

University of Alberta

Essays on Labor and Banking

Yuanyuan Ning

Abstract

The thesis is composed of two parts including three chapters. The first two chapters study the wage gap between immigrants and natives in Canada as well as wage structure of immigrants and natives. The third chapter is on the subject of the bank loan-deposit spreads and business cycles.

The first chapter explores the wage gap between immigrants and native-born full-time workers in Canada applying OLS regression, quantile regression, and decomposition method. There are three main findings. First, wage disadvantage relative to natives for the recent arrivals is larger than the earlier arrivals in the Canada. The presence of sizable "cohort effects" indicates that newly arrived with a much larger wage deficit is in contrast to earlier immigrant cohorts with premium wages. Second, the second generation of immigrants performs not only better than the first generation but also the third generation. Third, changing place of birth of the successive immigrants from US & Europe to Asia accounts for the notable expansion of the wage gap for immigrants. In addition, the wage gap at the bottom quantile is larger than at the top quantile. The decomposition of wage gap also indicates that the wage prices widen the wage gap.

The second chapter examines the wage structure of immigrants and natives in Canada through exploring the effect of immigration on the wage of native-born men as well as scrutinizing wage inequality. There are three findings. First, wage effect of immigrants on natives is diverse according to various groups. Increased immigration dwindles the wages of young workers and university group of native-born men. Moreover, immigrants have more discernible negative effects on the second generation than the third generation for the university group. Second, recent immigrants make the larger effect on earlier immigrants than natives, specifically, immigrants diminish the relative wage of the high school dropout of earlier immigrants, not that of natives.

Recent immigrants have substantially more negative effect on high school dropout of US & European earlier immigrants. Third, the counterfactual analysis highlights that the lower-tail 50/10 overall or residual wage inequality diminishes, whereas upper-tail 90/50 wage inequality expands for natives from 1990-1995 to 2000-2005. The upper tail overall or residual wage inequality expansion is larger than lower tail wage inequality for natives during whole period 1990 to 2005, which is converse to immigrants. Price effects are the principal factor to the increase in the upper tail and lower tail wage inequality, but labor force composition exerts a substantially paramount effect on the lower tail overall wage inequality if the labor force composition had remained the same as in 1990. Further, demand shift analysis confirms the findings of wage effect and wage inequality examination.

The third chapter studies the behavior across business cycles of representative bank loan-deposit spreads and their components for Canada, Italy, Germany, the Netherlands, Switzerland, the United Kingdom, and the United States. A main finding is that the loan rate (adjusted for movements in overall market interest rates) in most countries is countercyclical, consistent with "financial accelerator" theories of the business cycle. Another main finding is that historically in the continental European countries the spreads between savings-deposit and time-deposit rates and overall market interest rates were large and markedly counter-cyclical, and much more so than in the English-speaking countries. This is consistent with banks in these countries exploiting market power over "core deposits" systematically across business cycles, possibly to buffer cyclical shocks to banks' borrowers. However, the levels and cyclical properties of spreads across the two groups of countries have largely converged in the past two decades.

Acknowledgement

I would like to thank professors, classmates, friends and any other person who provide help to me in my life, their kindness and encouragement give me the confidence to solve the problems whenever I meet. I am extremely grateful to my supervisors who always bring me invaluable advice, guidance and priceless support, which plays a paramount role for me to finish this thesis. I am deeply indebted to my parents and my family, their unwavering love makes me have a passion for continuing my favorite research.

Contents

1 Wage gap between Immigrants and natives in Canada 1

1.1 Introduction 1

1.2 Data 3

1.3 Regression analysis 8

1.3.1 Regression analysis methods 8

1.3.2 Regression results 10

1.4 Decomposition of the wage gap 17

1.5 Conclusions 21

Tables and Figures 22

Appendix 37

2 Wage structure of immigrants and natives in Canada 59

2.1 Introduction 59

2.1.1 Literature review 60

2.1.2 Motivation 62

2.2 Data 64

2.3 The effects of immigration on wage structure of natives 64

2.3.1 Methodology 64

2.3.2 The effects of immigration on native wage 64

2.4 Wage inequality and demand measure shifts 69

2.4.1 Wage inequality: the role of composition and prices 69

2.4.2 Measured Demand Shifts 77

2.5 Conclusions 80

Tables and Figures 82

Appendix 106

3 Cyclical Behavior of Bank Loan and Deposit Spreads 138
3.1 Introduction 138
3.2 Interpreting Loan-Deposit Spreads 140
3.2.1. Discussion: Relationship versus Transactional Banking Systems 145
3.3 Data and Empirical Methodology 146
3.3.1 Data 146
3.3.2. Econometric Specification 147
3.3.3 Estimation 150
3.4 Results 151
3.4.1 Pre-1990 Sub-Samples 152
3.4.2 Post-1989 Sample 155
3.5 Interpretation of the Results and Concluding Remarks 156
Tables and Figures 159
Appendix 168
References 213

LIST OF TABLES

Table 1.1 Summary statistics of Immigrants according to the period of arrivals 22
Table 1.2 Summary statistics for different generations and place of birth 22
Table 1.3 Summary statistics according to the quartile wage distribution..... 23
Table 1.4 Estimates of immigrant-native wage gap according to arrival cohorts..... 24
Table 1.5 Wage gaps between different generations 25
Table 1.6 Wage gap between immigrants from Asia, Europe, others and Natives..... 25
Table 1.7 Decomposition of wage gap: human capital specification..... 26
Table 1.8 Decomposition of wage gap: full specification..... 27

Table 2.1 Estimates of the elasticity of substitution between immigrants and natives 82
Table 2.2 The effect of immigrants to natives (2nd generation of immigrants and 3rd generation) 83
Table 2.3 The effect of recent immigrants to natives and earlier immigrants 84
Table 2.4 The effect of recent immigrants to earlier immigrants according to different place of birth..... 85
Table 2.5 Male full-time employment share by education and age 86
Table 2.6 Within-group wage dispersion by education and age 87
Table 2.7 Observed and composition-constant overall and residual weekly wage inequality (Natives)... 88
Table 2.8 Observed and composition-constant overall and residual weekly wage inequality (Immigrants, 1990-2005) 89
Table 2.9 Within, between and overall demand shift measures..... 90

Table 3.1 Predictions of the Hypotheses..... 159
Table 3.2 Spread between Loan Rate and Savings Deposit Rate..... 159
Table 3.3 Spread between Loan Rate and Short-Term Money..... 161
Table 3.4 Spread between Saving Deposit Rate and Short-Term Money..... 162
Table 3.5 Spread between Loan Rate and Time Deposits 162
Table 3.6 Spread between Time Deposit Rate and Short-Term Money 163
Table 3.7 Spread between Loan Rate and Eurodeposits..... 164
Table 3.8 Spread between Eurodeposit Rate and Short-Term Money..... 165

LIST OF FIGURES

Figure 1-1 Immigrant share distribution by place of birth 28
Figure 1-2 Log weekly wage gap between immigrants and natives by place of birth 28
Figure 1-3 Immigrant share distribution and wage gap between immigrants and natives 29
Figure 1-4 Recent immigrant share and wage gap for different education groups 29
Figure 1-5 Earlier immigrant share and wage gap for different education groups 30
Figure 1-6 Wage gap between immigrants between immigrants and natives by year of arrival 31
Figure 1-7 Wage gap between different generations 32
Figure 1-8 Wage gap between immigrants and natives by place of birth 33
Figure 1-9 Wage gap between immigrants between immigrants and natives by year of arrival 34
Figure 1-10 Wage gap between different generations 35
Figure 1-11 Wage gap between immigrants and natives by place of birth 36

Figure 2-1 Average native weekly wage change and average immigrant share change 91
Figure 2-2 Relative immigrant wage change and average immigrant share change 91
Figure 2-3 Wage inequality for native and immigrants by year 92
Figure 2-4 Change in real Log weekly wage 94
Figure 2-5 Smoothed changes in wage relative to the median by wage percentile 95
Figure 2-6 Overall standard deviation and residual standard deviation 95
Figure 2-7 College-high school log wage gap by age groups and years 96
Figure 2-8 Immigrant weekly wage inequality by year 97
Figure 2-9 Actual and counterfactual weekly wage inequality for native, control for education and age 98
Figure 2-10 Actual and counterfactual weekly wage inequality for native, additional control for occupation and industry dummies 99
Figure 2-11 Actual and counterfactual weekly wage inequality for immigrant, control 1 100
Figure 2-12 Actual and counterfactual weekly wage inequality for immigrant, control 2 101
Figure 2-13 Actual and counterfactual weekly wage inequality for immigrant, control 3 102
Figure 2-14 Actual and Counterfactual wage change, 1990-2005 103
Figure 2-15 Actual and Counterfactual wage change, 1990-2005 103
Figure 2-16 Average immigrant share change and native wage change by occupation: 1990-2005 104
Figure 2-17 Average immigrant share change and native wage change by industry: 1990-2005 104
Figure 2-18 Occupational employment change within and between industries 105

Figure 3-1 Summary Statistics on Loan-Deposit Spreads 166
Figure 3-2 Summary Statistics on Loan-Deposit Spreads in Sub-Samples 166
Figure 3-3 Average cyclical coefficient 167
Figure 3-4 Standard deviation of average cyclical coefficient 167

Chapter 1

Wage gap between Immigrants and natives in Canada

This chapter examines the wage gap between immigrants and native-born workers in Canada employing OLS regression, quantile regression, and decomposition method. There are three main findings. First, wage disadvantage relative to natives for newly arrived immigrants is larger than the earlier arrivals in the Canada. The presence of sizable "cohort effects" indicates that newly arrived with a much larger wage deficit is the contrast to earlier immigrant cohorts with premium wages. Second, the second generation of immigrants performs not only better than the first generation but also the third generation. Third, changing places of birth of the successive immigrants from US & Europe to Asia accounts for the notable expansion of the wage gap for immigrants. In addition, the wage gap at the bottom quantile is larger than at the top quantile. The decomposition of wage gap also indicates that the wage prices widen the wage gap.

1.1 Introduction

What is the wage gap between different categories of immigrants and natives[1]? How about the wage gap at various wage distribution? Which causes the wage gap between immigrants and natives, labor supply or labor demand? These are interesting immigration-related topics for economists as well as governments. This chapter mainly analyzes these problems applying OLS regression, quantile regression, and decomposition method.

Most existing studies analyze the wage gap issue relevant to the US and UK. Such as immigrant-native gap (e.g., Chiswick (1978); Borjas (1985, 1995, 2015); Bell (1997); Trejo (1997); Butcher, and DiNardo (2002); Dustmann and Fabbri (2003); Card (2005); Smith (2006); Lubotsky (2007); Abramitzky, Boustan, and Eriksson (2014)), black-white gap (e.g. Card and

[1] A person is defined to be an immigrant if he was born abroad and is either a non-citizen or a naturalized citizen; all other persons are classified as natives.

Krueger(1992); Wolpin (1992); Bound and Freeman (1992); Neal and Johnson (1996); Neal (2004)), gender gap (e.g. Blau and Kahn (1997); Mulligan and Rubinstein (2008); Carrell, Page, and West. (2010); Goldin (2014); Card, Cardoso and Kline (2016)). Nevertheless, examination of Canadian data (e.g. Baker & Benjamin (1994); Aydemir, and Skuterud (2005); Antecol, Kuhn, and Trejo (2006); Boudarbat and Lemieux (2014)) is not as extensive as the US and UK data, and there are important differences between the Canadian and American or British immigration patterns which highlight the contribution of this study. There are several relevant problems this chapter will study to examine wage gap in a Canadian immigration context.

This study presents some novel perspectives for estimating the wage gap between immigrants and natives by measuring the Canadian Census data. First, it seems more likely that the wage gap will vary according to different wage distribution. Hence, the quantile regression analysis is applied to draw inference on the wage gap. The finding shows that the wage gap at the bottom quantile is larger than at the top quantile. Second, the Juhn, Murhpy, and Pierce (1993) (JMP) decomposition of wage gap also indicates that the wage prices widen the wage gap. Third, there is enough data information in this chapter to research from both the labor supply and demand perspectives. On the one hand, the supply side consists of education, age, and other relevant variables. On the other hand, this study takes the variable of occupation and industry for a demand side into consideration. The findings indicate that the laws of demand and supply have clear implications for how immigration should affect labor market conditions and influence the wage gap.

There are three main findings. The first finding is that wage disadvantage (relative to natives) for newly arrived immigrant cohorts in the Canada is larger than the earlier immigrant cohorts. Given that it is unlikely that the wage is impervious to the Canadian experience, the initial wage disadvantage may gradually narrow after they have worked in Canada for more than one or two decades. According to the rudimentary statistics and due to the presence of sizable “cohort effects”, earlier immigrant cohorts enter the labor market with similar wages as natives, while more recent cohorts enter the market with a much larger wage deficit.

The second finding is that the second generation immigrants earn more than the third or higher generation of natives, but contrarily, the first generation earns less than the third generation. This noteworthy finding on the catch-up phenomenon is provided by examining wage differences across generations. The initial results discussed below provide evidence that the second generation

of immigrants performs better than not only the first generation but also descendent of the natives. The analogous comparison among these three groups will provide insight into the wage gap topics.

The third finding is that changing national origins of the successive immigrants may account for the notable expansion of the wage gap. Before 1980, half of the immigrants originated from the US & Europe. From the early 1980's onward, the data document a steep climb for Asian immigrants and a sharp plummet for US & European immigrants during the same period. Wage premium associated with the US & European immigrants change to wage deficits associated with Asian immigrants. This result suggests that immigrants in a comparable environment with their home country adapt more easily, probably due to a similarity of language, culture, institutions or custom.

The remainder of the paper proceeds as follows. Data is laid out in Section 1.2. The regression model and results are introduced in Section 1.3. Wage decomposition is discussed in Section 1.4. Section 1.5 arrives the conclusion.

1.2 Data

The empirical analysis employs data drawn from 1991, 1995, 2001 and 2006 Public Use Microdata File (PUMF) of the Canadian censuses. Each census provides information corresponding to the preceding year. The 2006 census consists of 844,476 records, accounting for 2.7% of the Canadian population. Similarly, the 2001 census comprises data based on a 2.7% sample of the population enumerated in the census. The 1996 census and 1991 census respectively contain a 2.8% and a 3.0% sample of the Canadian population. This chapter employs the pooled four censuses data. Before proceeding to the formal analysis, given some differences in the variables in each census, it is instructive to make it intelligible about the variables which can efficiently capture wage differences. Summary statistics reported in this section is largely on the basis of "raw" statistics drawn directly from the four censuses. I begin by presenting some simple evidence on the nature of immigrant inflows into the Canada.

First, Table 1.1 is about the summary statistics according to the arrival cohorts of immigrants. Six arrival cohorts are grouped in term of immigrants' arrival period: before 1980, 1981-1985, 1989-1990, 1991-1995, 1996-2000, and 2001-2005 periods. (The natives are the excluded group in the regression estimation). Only in this way can this chapter compare wage advantage or disadvantage of recent and earlier immigrants relative to natives. The analysis implies that the

recent cohorts appear to have lower wage than earlier cohorts. In addition, education is an essential element to explore. Education of different categories indicates prominent human resources people own. According to the highest certificate, diploma or degree documented in four censuses, this chapter divides the education into four categories: High school dropout, High school, College, and University according to 1991, 1996 and 2000 census[2] and 2006 census[3]. As documented in Table 1.1, more than one-third of natives have the college degree which is substantially higher than other degree owned by natives. There is a strong upswing for immigrants with the university degree, especially for immigrants arriving after 1995. More specifically, the proportion of university was more than half for arrival cohort 1996-2000 and increased to approximately two-thirds in the subsequent period, substantially higher than natives with only one-fifth being the portion of the university degree. In addition, the share of dropout is lowest for the recent immigrants, declining by more than fifteen percentages than that of the earliest immigrant. This pattern is usually interpreted as evidence that either immigration policy has changed to attract more educated and skilled immigrants, or the new immigrants pay more attention to the education. Can high education lead to high wage level for recent cohorts? Not necessarily, the following regression analysis casts doubt on it.

The census provides adequate available data for comparisons from the perspective of labor demand such as occupation or industry. This chapter classifies 4 broad categories according to the

[2]I group education according to the census 2001, 1996, 1991 as follows. **High school dropout**: 1 No degree, certificate or diploma. **High school**: 2 High school graduation certificate. **College**: 3 Trades certificate or diploma 4 College certificate or diploma. **University**: 5 University certificate or diploma below bachelor level 6 Bachelor's degree 7 University certificate above bachelor level 8 Medical degree 9 Master's degree 10 Earned doctorate

[3] I group education according to the 2006 census as follows. **High school dropout**: 1 None. **High school**: 2 High school graduation certificate or equivalency certificate. **College**: 3 Other trades certificate or diploma 4 Registered apprenticeship certificate 5 College, CEGEP or other non-university certificate or diploma from a program of 3 months to less than 1 year 6 College, CEGEP or other non-university certificate or diploma from a program of 1 year to 2 years 7 College, CEGEP or other non-university certificate or diploma from a program of more than 2 years. **University**: 8 University certificate or diploma below bachelor level 9 Bachelor's degree 10 University certificate or diploma above bachelor level 11 Degree in medicine, dentistry, veterinary medicine or optometry 12 Master's degree 13 Earned doctorate degree

National Occupational Classification of census 1991, 1995, 2001[4] and census 2006[5]: high skilled workers, skilled workers, semi-skilled workers and unskilled workers. This chapter also divides the economy into 12 narrow occupations categories and 16 industries.

Table 1.1 denotes two-fifths of natives belong to high skilled workers. The share of high skilled workers in immigrants is a little different compared with corresponding natives, with a range of approximately 37% to 47% in different arrival cohorts. Specifically, the trend for high skilled workers went down over the decade of 1980, whereas it rose from 1996 onward, achieved to the highest level 47%, comparable to before 1980 arrivals. However, it drops conspicuously again to around 42% at the first five years of the new century. In contrast, the share of semi-skilled workers gradually increases until 1995. Somewhat unanticipated, increase rate of recent cohorts working at the unskilled occupation is larger compared to that of earlier cohorts (from 9% to 15%). This is more likely to due to change of the place of birth which will explain in the following paragraph. Further, the skilled immigrants occupied almost 14% before 1990, while this share shrunk considerably to less than one-fifth in the new century. The change may be attributable to the improvement of technology leading to the change of labor demand.

Second, place of birth is an important indicator to analyze the wage gap. To confirm that performance of immigrants born in different places is substantially distinguishable, it is useful to consider their place of birth. This study divides all the workers into 4 groups according to the place of birth: Asia, US and Europe, Others and Canada (natives). Table 1.1 reveals that transformation of immigrants from different birth places in the last three decades. Before 1980, more than sixty percent of immigrants came from the US and Europe, however, the situation is totally changed in the subsequent period, which fell to 31%, and continued to slip conspicuously to one-fifth in the new century. Conversely, the fraction of Asian immigrants increased rapidly from 22% before

[4] Occupation classification according to Census 2001, 1996, 1991: **High Skilled workers**: 1 senior managers 2 middle and other managers 3 professionals 4 semi-professionals and technicians 5 supervisors 6 supervisors: crafts and trades 7 administrative and senior clerical personnel. **Skilled workers**: 8 skilled sales and service personnel 9 skilled crafts and trades workers. **Semi-Skilled workers**: 10 clerical personnel 11 intermediate sales and service personnel 12 semi-skilled manual workers. **Unskilled workers**: 13 other sales and service personnel 14 other manual workers.

[5] Occupation classification according to Census 2006: **High Skilled workers**: 1 managers 2 professionals 3 semi-professionals and technicians 4 supervisors 5 administrative and senior clerical personnel. **Skilled workers**: 6 skilled sales and service personnel 7 skilled crafts and trades workers. **Semi-Skilled workers**: 8 clerical personnel 9 intermediate sales and service personnel 10 semi-skilled manual workers. **Unskilled workers**: 11 other sales and service personnel 12 other manual workers.

1980 to almost half in 1985, and achieved the high peak of over three-fifths at the last five years of the 20th century, with the increase rate being almost three times. It is also revealed that immigrants from Other places remain stable of around one fifth regardless of earlier and recent arrival cohorts. Given a great number of immigrants from Asia instead of the US and Europe, is measured wage gap affected by the change of origin of immigrants? Comparisons of the wage gap between the Asian immigrants and natives, as well as understanding to what extent the performance of US and Europe immigrants relative to natives, etc. may be thought of a new channel for wage differentials analysis. Figures 1.1 and 1.2 provide maps for immigrant share and raw wage gap distribution between immigrants and natives by 15 various places of birth[6]. Figures 1.3 through 1.5 divide the immigrants according to arrival cohorts and education groups and vividly show that change of immigrant share and wage gap according to their different places of birth. Information shown in these figures is the mirror of summary statistics and also is the basis of the regression analysis.

It is revealed in Table 1.2 that university degree and above in Asia immigrants takes up over forty-one percentage points. It is consistent with that more Asian arrive in Canada in recent years and at the same time, the recent arrivals have much higher education attainment as clearly indicated in Table 1.1. In contrast, only a slightly more than one-fifth of Canadian workers have the university degree. Canada has the lowest university proportion compared to any groups of immigrants and has the highest fraction of high school graduates and the college degree. The fraction of the college degree, more than one-third for Others' immigrants, is the highest in all the immigrant groups, although slightly less than natives. The fraction of the college degree for immigrants from the US and Europe is one-third. While the university fraction for the US and European immigrants, with around one-quarter, which is lower than Asian but higher than the other groups. For the occupation groups, immigrants from the US and Europe have the highest proportion for the high skilled occupation, while immigrants from Asia have the highest fraction for the unskilled occupation. The occupation distribution will provide the explanation for the finding of the decomposition of the wage gap in Section 1.4.

[6] I divide immigrants into 15 narrow groups according to their places of birth: United States of America; United Kingdom; Germany; Italy; Portugal; Poland; Other European; West, Central Asia and the Middle East; Southern Asia; People's Republic of China; Philippines; Other Eastern and South East Asia; Africa; Central America, Caribbean and Bermuda and South America; and Others.

Third, generation status is also taken into account in this chapter. From available information about the generation of status in the census 2001 and 2006, this chapter defines three generation categories. The First generation consists of immigrants in the census. The second generation of immigrants denotes at least one of parents is immigrant. The third or higher generation identifies Canadian natives whose parents are both born in Canada. It is helpful to consider remuneration of various generations to illuminate the wage differential and assimilation issues. This study compares the wage gap between the second generation of immigrants, first generation and third or higher generation ('the third generation' or 'THN' in this thesis indicate this group). Given that immigrants perhaps take a long period to adapt to the new language and cultural environment, immigrants might be expected to earn less than natives at the beginning of arrival period. In particular, it is possible that in their whole career life they are less likely to catch up with the natives. It may be expected that the descendant of immigrants not only perform better than their parents but also catch up with the descendant of natives and even earn higher wages. The educational and occupational distribution of different generations is clearly listed in Table 1.2. The first generation of immigrants has the highest fraction of the university degree, whereas the third or higher generation has the least fraction of the university degree. The situation is converse for the college and high school graduates, the third generation occupies the most in these education groups. The second generation of immigrants has the least fraction of high school dropout. According to the occupation distribution, the second generation has the highest fraction of high skilled occupation, the first generation has the highest fraction of semiskilled and unskilled occupation. And the largest skilled occupation fraction belongs to the third generation.

The summary statistics according to the age groups is documented in Table A1.1. The focus of this analysis is restricted to people aged 25-59 who are full-time workers in the census year. Full-time workers occupy around 87%, as shown in the last panel of the Table. Different age denotes various work experience to some extent. This study splits all the labor force into 7 age categories, which are 25-29 years old, 30-34, 35-39, 40-44, 45-49, 50-54 and 55-59. From year 1990 to 1995, immigrant share increases from young to old. However, 35-39 years old increases largely compared to other age groups for the recent two census years. As year 2005, 35-39 years old occupies around 24 percent, more than other age groups except for 55-59. It indicates that Canada absorbs more immigrants younger than 40 due to 35-39 age group is energetic and also has enough work experience to make more contribution to this country.

The last prominent variable introduced in this section is the wage. Wages and salaries in the Canadian census refer to "gross wages and salaries before deductions for such items as income tax, pensions and employment Insurance." Weekly wage of full-time workers in this study is calculated by dividing annual wage and salary earnings by weeks worked for individuals who worked full-time in the previous year between 25 and 59 years old. I use the Canadian CPI (Consumer Price Index) to deflate all wages to 2002 dollars. Individuals with the weekly wage below CAN $50 and above CAN $2000 are excluded. Summary statistics according to the quartile weekly wage distribution is indicated in table 1.3. Column 1 shows the fraction of each group in the bottom quartile wage distribution. Almost 30% of immigrants are at the bottom quartile distribution, compared with native, only 23%. It is also diverse for different generations, specifically, only 20% of the second generation at the bottom quarter group. Moreover, Immigrants from the US and Europe is 22%, whereas it is almost 37% for the immigrants from Asia. Besides, it is obvious that almost half of the immigrants arriving from 2001 to 2005 are at the bottom quarter of wage distribution, while it is only 22% for before 1980 arrivals. The age group panel indicates that the fraction for the age group 25-29 is highest, 35%, while age group 45-54 is lowest, around 21%. The situation for top quartile wage distribution indicated in column 4 is the mirror to the bottom quartile wage distribution. The basic summary statistics along the wage distribution in Table 1.3 provides the evidence for the finding of the quantile regression and decomposition of the wage gap in the following analysis.

1.3 Regression analysis

1.3.1 Regression analysis methods

1.3.1.1 OLS model

The comparison of wage gap between the immigrants and natives in this study largely is associated with previous cross-sectional analysis (e.g. Chiswick (1978); Borjas (1985, 1995 and 2015); Abramitzky, Platt, and Eriksson (2014)). The wage gap is mainly examined in the following model which is designed for the empirical application.

The model of the log of weekly wage gap is given by

$$y_{ipkt} = \mu_k + \theta_t + \alpha_j + \varphi_1 age_{it} + \varphi_2 age_{it}^2 + \omega_{ipkt}$$

In the first situation, Where i indicates the individual, p denotes the place of birth (or generation,etc.), k is the year of arrival in the Canada, t is the (census) year. The immigrant arrival cohort effects (μ_k) are given by indicators for immigrants who arrived in the six periods: before 1980, 1981-1985, 1989-1990, 1991-1995, 1996-2000 and 2001-2005 periods (the native-born are the excluded group). θ_t is year dummy, α_j is education, occupation and industry dummies, etc. Corresondingly, in another two situations, μ_k refers to as the indicators for generation and places of birth, the omitted groups respectively are third or higher generation of immigrants and people born in Canada.

1.3.1.2 Quantile regression model

There are many papers estimate the wage gap applying quantile regression (e.g. Gosling, Machin and Meghir (2000); Albrecht, Bjӧrklund and Vroman (2003); Eeckhout, Heywood, and Parent (2012); Pinheiro and Schmidheiny (2014); Boudarbat and Lemieux (2014); Gobillon, Meurs, and Roux (2015)). The wage gap between immigrants and natives may be diverse along the wage distribution. Thus, the quantile regression (QR) model is employed in this chapter. Figures 1.6 through 1.11 plotting the QR coefficients and 95% confidence intervals provide a better sketch for the wage gap analysis.

The quantile regression model (e.g., Koenker and Bassett (1978) or Buchinsky (1998)) can be written as:

$y_i = x_i'\gamma_\tau + \omega_{\tau i}$ with $Q_\tau(y_i|x_i) = x_i'\gamma_\tau \quad (i = 1, \dots, n)$

Where $Q_\tau(y_i|x_i)$ indicates the τth conditional quantile of y given x.

The quantile $\tau \in (0,1)$ represents that y divides the data into fractions τ below and $1-\tau$ above: $F(y_\tau) = \tau$ and $y_\tau = F^{-1}(\tau)$. It is known as the median regression if τ =0.5.

What is the difference between the quantile regression and OLS regression? Let ϵ_i indicate the prediction error. As we all know, OLS minimizes a sum of squared errors, $\sum_i \epsilon_i^2$. Median regression, which is also named as least absolute deviations (LAD) regression, minimizes a sum of absolute errors, $\sum_i |\epsilon_i|$. It is symmetric for ϵ_i^2 and $|\epsilon_i|$, and it is not relevant for the sign of ϵ_i. But there is an asymmetric penalty, if $\tau \neq 0.5$, with expanding asymmetry when τ moves toward 0 or 1. Quantile regression, as a result, minimizes a sum of $(1-\tau)|\epsilon_i|$ and $\tau|\epsilon_i|$, which represents asymmetric penalties for over-prediction and under-prediction respectively.

The quantile regression estimator for quantile τ minimizes the function

$$Q(\gamma_\tau) = \sum_{i:y_i \geq x_i'\gamma}^{N} \tau|y_i - x_i'\gamma_\tau| + \sum_{i:y_i < x_i'\gamma}^{N} (1-\tau)|y_i - x_i'\gamma_\tau|$$

Quantile regression results shown shortly provide a more comprehensive picture of illustrating the relationship at specific quantiles in the conditional distribution of the dependent variable, and also examine the extent to which the wage gap between immigrants and natives at different quantiles is expounded by a series of independent variables. For example, the quantile regressions allow me to compare the wage gap at the bottom, middle and top of the wage distribution and estimates the effects of age, education, occupation, and industry on the wage gap along the wage distribution. The quantiles estimated in this chapter are from the 5th quantile to the 95th quantile at 5-quantile intervals.

1.3.2 Regression results

1.3.2.1 OLS results analysis

This section mainly discusses the OLS results and part of quantile regression results. The specific quantile regression examination will be introduced in the next subsection. The finding indicated in Tables 1.4-1.6 is consistent with the discussion in the introduction. A thorough analysis of earning gap is shown in the regression analysis denoted in Tables 1.4-1.6 and Figures 1.6-1.11. The OLS regression and quantile regression provide the wage gap not only from the average perspective but also from different quantile regression perspective. The dependent variable is log weekly real wage and the estimates are based on pooled data of 1991, 1996, 2001 and 2006 census. All regressions include age, age squared, and year dummy as control variables. For OLS regression, the additional variables such as education levels, place of birth, occupation and industry dummies are successively added. The coefficients provide a straight measure of the average wage gap between immigrants of a particular cohort and natives. For quantile regression, the last three columns of the Tables 1.4-1.6 refers the wage gap along the Q25, median and Q75, which includes all the control variables. Figures 1.6-1.11 are drawn based on the results of quantile regression Q5, Q10, Q15…, Q90, and Q95. Additionally, 95% confidence intervals for coefficient at each quantile are also plotted in the gray area. The first three Figures 1.6-1.8 control age, age squared, education dummies, and year dummies, and the Figures 1.9-1.11 add other variables:

place of birth, occupation and industry dummies. In this way, this chapter can compare the difference of wage gap from different control variables.

The wage gap between immigrants from different arrivals and natives is shown in Table 1.4. First, I analyze the OLS regression results. The coefficients are positive before 1980 and are negative after 1980 period arrival indicating that every immigrant cohort earns squarely lower wages than natives for the after 1980 arrival cohort. As shown in the first row, the earliest immigrants arriving before 1980 earn 0.8 percent higher wages than natives. However, immigrants arriving after 1980 earn less than natives. Reading down the first column, the log wage gap becomes greater in size which has expanded to roughly thirty-three percent for recent immigrants arriving at 2001-2005. As pointed up by the second column, the inclusion of education dummies increases the gap by somewhat regardless of arrival cohort. In particular, it highlights earliest immigrants' wage advantage relative to natives become a disadvantage. In addition, the wage gap increased to the 43% for latest arrival. Compared with the first row, the second row indicates that education is an important element to decrease the wage gap. Adding the place of birth dummies, the wage disadvantages relative to natives is diminished largely. The earliest arrival cohort earns three percent higher wages than natives. Furthermore, considering the joint effects of occupation dummies, industry dummies and place of birth dummies and education dummies together, it turns out that the wage gap for the immigrant arrival before 1985 again earn higher than natives. The wage disadvantages for each subsequent arrival cohort relative to natives are much less compared to other columns. The last three columns refer to the quantile regression results. The wage gap for the first two arrival cohorts is positive for all three different regressions, indicating immigrants arriving before 1985 earn a higher wage than natives. Reading down the row, the size of the negative wage gap is expanded, which provides the explanation that the recent arrival cohort earns much less than earlier arrivals. Consequently, these results confirm what has been found in term of the wage of immigrants arriving different period (e.g. Aydemir and Skuterud (2005); Green and Worswick (2010); Boudarbat and Lemieux (2014)).

There are a lot of previous research about the generation of immigrants to tackle the wage gap issue (e.g. Borjas (1992, 1993, 1994); Aydemir, Chen, and Corak (2009)). The study next turns to explore the generation channels through which the immigrants move up the wage ladder. Coefficients in Table 1.5 provide a direct measure of the wage gap between the second generation, the first generation, and third and higher generation (THN), with standard error. Coefficients in

the first row seek to determine an explanation for the wage advantages of the second generation of immigrants relative to THN. Equivalently, the coefficients in the second row signify immigrants' wage disadvantages relative to THN. The results of log wage gap in column 1 denote that second generation average over nine percent higher wages than THN, whereas, the first generation of immigrants averages almost nine percent lower wages than THN. After inclusion of the education dummy, the wage gap for second generation gap drops to about six percent, while the wage gap for first immigrants is on the upswing, with almost twelve percent. In terms of adding the place of birth dummy, to some unanticipated, the first generation earn higher than natives, around 0.2 percent, although not significant. It is more likely to be interpreted as the lower wages of immigrants are relevant to their birth places. At the time of the occupation and industry dummy is included, the first generation of immigrants earn eight percent fewer wages again, while the wage advantages for second generation relative to THN slip to 5.7 percent. After combining all dummy variables together, the first generation of immigrants earns, on average one percent, higher than THN. The results in column 5 are generally invariant to that in column 4 of the second generation. The columns 6 to 8 indicate the quantile regression results. Specifically, the bottom quantile regression highlights that the negative wage gap of the first generation and THN is much higher, almost 11 percent. Compared with median and top quantile regression, the wage gap between the first generation and THN are 7 percent and 5 percent. The median and mean regression is comparable, 7.6 percent and 7.8 percent. The large wage gap for the first generation at the bottom quantile regression indicates that first generation of immigrants earns much less than THN at the lower wage distribution. Correspondingly, the first row of the last three columns is the result of the wage gap between the second generation of immigrants and THN. The Q25 and median wage gap are almost identical, 6.8 percent and 6.3 percent. The wage gap at the top Q75 is 5 percent. Overall, the finding regarding different generation is consistent with Aydemir, Chen, and Corak (2009).

Finally, Table 1.6 seeks to determine an explanation for the growing wage divergence in recent decades attributed to the changing national origins of the successive immigrants. In line with Butcher and DiNardo (2002) who find that ethnicity changes are linked to the expansion of wage gap. This study points up the wage convergence or divergence of Asian immigrants, US and European immigrants and Others immigrants wage relative to natives. The first, second and third row in Table 1.6 pick up the different performance of Others, US and Europe and Asian immigrants

relative to natives. It highlights that US and European immigrants earn higher than natives for the first column, Others immigrants earn, on average, thirteen percent less than natives. In contrast, as shown in the second row, the mean wage disadvantage for Asian relative to natives is significantly larger, of about twenty percent. When education dummy is added, all the immigrants' groups earn less than natives, the wage gap all increased. It is noteworthy to observe that US and European have a slightly lower wage, 1.1 percent than the natives. While obviously, the wage gap for Asian immigrants diverges extremely to twenty-three percent, that is, the wage differentials for this group rose by around five percent compared with that in column 1. Thus, the relative smaller wage disadvantages in the first column for Asian immigrants are possibly attributed to their higher education attainment. The inclusion of occupation & industry dummy dwindles the wage gap somewhat for all the Others and Asian immigration groups. In particular, Others and Asian immigrants continue to lessen by 3 and 7 percentage respectively compared to column 2, and US and Europe immigrants change to positive again, 0.1 percent, although it is insignificant. Quantile regressions in the last three rows provide some interesting different results from OLS results. First, the bottom quantile regression indicates that all the immigrants earn a lower wage than natives. It is emphasized that wage gap between the US& European immigrants and natives is negative, whereas the wage gap for this group is positive for the median and top quantile regression. Second, for Others and Asian immigrants, the wage gap relative to natives for these two groups dwindled along the wage distribution according to the finding of quantile regression, that is, the wage gap at the top quantile regression is smaller than median regression, while the wage gap at the bottom regression is larger than median regression. Third, the positive wage gap for US & European immigrants relative to natives is larger at the top quantile regression than median regression. Positive wage gap also highlights that US&European immigrants earn higher wages than natives at the median and top quantile. The following section will examine the quantile regression in detail to provide the new results to complement the wage gap finding.

1.3.2.2 Quantile regression result

This section analyzes the quantile regression estimation and compares two groups: Figures 1.6-1.8 and Figures 1.9-1.11. Specifically, the wage gap and the 95% confidence interval are plotted in these figures according to the estimation coefficients at the quantile regression Q5, Q10,

Q15, and so forth up to Q95. It is revealed that the most of the wage gap at the bottom quantile is larger than that at the top quantile.

First, the basic fix effects "age, education and year" are controlled in the Figures 1.6-1.8. Figure 1.6 represents wage gap together with their 95% confidence intervals between immigrants from different arrival periods and natives according to the quantile regression. The contrast for different arrival cohorts is striking associated with their various shapes in Figure 1.6. It is indicated that immigrants arriving before 1980 earn more than other immigrants for every quantile. As presented in the left top panel, the negative wage gap between immigrants arriving before 1980 and natives at the Q10 is substantially larger than other quantiles, then the negative wage gap gradually dwindles along the wage distribution. At the top quantile Q95, the wage gap is almost erased, approaching to 0. The right top panel suggests that for immigrants who arrived between 1981 and 1985, the negative wage gap is larger at around quantile Q25 than any other quantile. From quantile Q25 onward, the negative wage gap diminishes along the wage quantiles. The wage gap, as represented in the middle panel, is much larger for immigrant arrival cohorts 1986-1990 and 1991-1995 than earlier arrival cohorts. In addition, the shape of the graph is similar for the two arrival cohorts, that is, the negative wage gap for Q20 is largest, the size of negative wage gap for immigrants at the top wage quantile is smaller than any other wage quantiles. As indicated in the right bottom panel, the wage gap for recent immigrants arriving at 2000-2005 at the bottom quantiles is around -0.55, which is an obvious contrast comparing with the wage gap for earlier immigrants arriving before 1980, around -0.02. Similar to other arrival cohorts, the negative wage gap at the bottom quantile is larger than the top quantile for recent immigrants. The immigrants arriving at 1996-2000 shown in the left bottom panel, perform a little better than recent immigrants at each quantile, specifically, the negative wage gap is around 0.1 smaller in each quantile.

The wage gap based on quantile regression between different generations is plotted in Figure 1.7. The first generation of immigrants earns lower than the third generation at each wage quantile. In contrast, the second generation of immigrants earns higher than the third generation at each wage quantile. The connected line of the estimates from the regressions for each quantile in the left panel is roughly linear. In other words, the wage gap between the first generation and the third generation at the bottom wage quantile Q5 is around -0.18, the largest negative wage gap compared with any other wage quantiles. The wage gap gradually dwindles to around -0.05 at the top quantile Q95 for the first generation compared to the third generation. That is, the higher the wage quantile,

the smaller the negative wage gap. The right panel illustrates that the wage gap between the second generation and the third generation follows an inverted 'tick' shape. For instance, the wage gap for the bottom quantile Q5 is 0.05, and then steadily moves up to 0.08 at Q30, which is the largest wage gap. From Q40 onward, the wage gap drops strikingly to smaller than 0.03 at the top quantile. Overall, the shape of the two panels in Figure 1.7 provides an impressive comparison among various generations.

In addition to comparing the wage gap between different arrival cohorts and natives, as well as wage gap among various generations, Figure 1.8 illustrates the wage gap between immigrants from various places of birth and natives. As shown in the top and bottom panel, the Asian immigrants and Others immigrants earn less than natives for each quantile, the negative wage gap for bottom wage quantiles Q5 to Q20 is large, and it gradually dwindles from Q20 onward. For instance, the wage gap for Asia and Others is -0.3 and -0.17 respectively at the bottom wage quantile Q5, and the wage gap diminishes to -0.09 and -0.06 at the top quantile Q95 respectively. The middle panel represents immigrants from the US and Europe performs better than the other groups of immigrants. The wage gap between US & Europe immigrants and native is -0.04 at the bottom quantile Q5, and it gradually dwindles almost to 0 at the quantile Q60. From wage quantile Q65 onward, the wage gap becomes positive. In general, the results in term of various places of birth confirm what has been examined earlier in the literature regarding the wage of US & Europe immigrants or Asian immigrants (e.g. Boudarbat and Lemieux (2014); Borjas (2015)).

Put differently, the places of birth, occupation and industry dummies as additional control variables are added. Estimates from the quantile regressions for various quantiles are illustrated in Figures 1.9-1.11 together with the 95% confidence intervals. A comparison of Figures 1.9-1.11 and Figures 1.6-1.8 indicates that the size of the wage gap is various with different control variables. The wage gap between immigrants from the different period of arrivals and natives is presented in Figure 1.9. The top panels indicate an inverted U shape and inverted V shape respectively for the immigrants arriving before 1980 as well as immigrants arriving between 1981 and 1985. The wage gap is steady between Q20 and Q80 for earliest arrivals, which is around 0.07-0.08. For between 1981 to 1985 arrivals, the wage gap reaches the maximum, 0.30, at the 65th percentile. Compared with Figure 1.9 with Figure 1.6, the negative wage gap changes to positive for earliest arrivals, the wage gap for immigrants between 1981 and 1985 becomes positive from

Q20 to Q90, and the negative wage gap for other immigrant arrival cohorts becomes much smaller with more control variables.

Figure 1.10 reveals wage gap at the each quantile among different generations. Compared to Figure 1.7, when the additional control variables are added, Figure 1.10 indicates the size of negative wage gap for the first generation of immigrants and third generation is smaller except the bottom quantile Q5. In addition, the positive wage gap between the second generation of immigrants and third generation is slightly smaller except the last three top quantiles Q85 to Q95.

With regard to the wage gap between different places of birth, Figure 1.11 adds occupation and industry control variables to depict that the size of the negative wage gap between Asian immigrants and natives is smaller compared to Figure 1.8. Comparably, the wage gap between Others immigrants and natives is a little smaller except the bottom wage quantile Q5. As represented in the middle panel of Figure 1.11, the size of the negative wage gap between US & Europe immigrants and native is smaller for the first six bottom wage quantile from Q5 to Q30. However, from Q35 to Q60, there is a sizable positive wage gap compared to the negative gap in Figure 1.8, and the positive wage gap is pronounced from Q65 onward when the additional control variables are added. In other words, the wage gap is larger for the positive wage gap and smaller for the negative wage gap when more variables are controlled.

Consequently, there are four findings in the quantile regression analysis. First, immigrants arriving before 1980 earn more than other immigrants for every quantile. The negative wage gap at the bottom wage quantile is largest for immigrants arriving after 1985, and negative wage gap at the bottom quantile is larger than at the top quantile for recent immigrants. Second, the linear shape for the first generation indicates that the negative wage gap is larger at the bottom quantile than the top quantile. The inverted 'tick' shape for the second generation represents that wage gap at the Q30 achieves the maximum value, then it drops sharply and the positive wage gap for top quantile is very small compared to other quantiles. The second generation of immigrants earns a higher wage than the third generation for each wage quantile, which is contrary to the first generation. Third, Asian immigrants and Others immigrants earn less than natives for each quantile. The wage of US and Europe immigrants is higher than native at the top quantiles, from Q65 onward. Fourth, most of the positive wage gap becomes larger and the negative wage gap becomes smaller with more controlled variables when comparing Figures 1.9-1.11 with Figures 1.6-1.8.

The wage gap analysis in this section is based on the OLS and quantile regression results, why there will be so much difference between each group no matter mean regression or quantile regression? The following section will focus on the decomposition of wage gap to try to provide some evidence.

1.4 Decomposition of the wage gap

This section seeks to decompose the wage gap to understand how the observed quantities and wage prices and unobserved residual contribute to the wage gap. How does the diversity of education, age, and occupation & industry, etc. for the immigrant and natives explain the wage gap? To further explore the reason behind the wage gap, this chapter performs a decomposition using the methodology of Juhn, Murphy, and Pierce (1993) which scrutinizes the wage gap of the entire wage distribution. JMP decomposition is applied in a lot of inequality analysis (e.g., Aguiar and Hurst (2007); Blau and Kahn (1996); Goldin and Margo (1992)). Different from the inequality analysis, I employ JMP method to examine the wage gap in this section. The advantage of JMP decomposition compared with the Oaxaca decomposition is that it provides not only the decomposition of the mean wage gap but also decomposition of the different quantiles of the wage gap. (The Blinder-Oaxaca decomposition results are shown in the Appendix: Tables A1.2 and A1.3).

The rise in skill premia applies to both observable dimensions of skill (e.g., education, age, and occupation, etc.) and unobservable dimensions of skill (the residual). The framework for isolating these effects is to write a simple wage equation such as

$$Y_{ic} = X_{ic}\gamma_c + \omega_{ic}$$

where Y_{ic} is the log weekly wage for individual i in category c (native, immigrant, second generation, etc), X_{ic} is a vector of individual characteristics consists of education and age effects, and ω_{ic} is the component of wages explained by the unobservables. The residual has two parts, one is an individual's percentile in the residual distribution, τ_{ic}, The other is $F_c(\,)$, the distribution function of the wage equation residuals. Based on the cumulative distribution function,

$$\omega_{ic} = F_c^{-1}(\tau_{ic}|X_{ic})$$

$\overline{F}(.|X_{ic})$ is specified as the average cumulative distribution and $\overline{\gamma}$ as the average prices for observables. The level of inequality into corresponding components is decomposed as

$$Y_{ic} = X_{ic}\overline{\gamma} + \overline{F}^{-1}(\tau_{ic}|X_{ic}) + X_{ic}(\gamma_c - \gamma) + (F_c^{-1}(\tau_{ic}|X_{ic}) - \overline{F}^{-1}(\tau_{ic}|X_{ic}))$$

Furthermore, with a fixed residual distribution and observable prices, wages would be decided as

$$Y_{ic}^1 = X_{ic}\overline{\gamma} + \overline{F}^{-1}(\tau_{ic}|X_{ic})$$

If both observable prices and observable quantities are allowed to change through category c, then wages can be obtained by

$$Y_{ic}^2 = X_{ic}\gamma_c + \overline{F}^{-1}(\tau_{ic}|X_{ic}) = Y_{ic}^1 + X_{ic}(\gamma_c - \overline{\gamma})$$

At last, if observable prices and quantities and the distribution of residuals are permitted to vary through category c, then

$$Y_{ic}^3 = X_{ic}\gamma_c + F_c^{-1}(\tau_{ic}|X_{ic}) = X_{ic}\gamma_c + \omega_{ic} = Y_{ic}$$

In addition, the series $F_c^{-1}(\tau_{ic}|X_{ic}) - \overline{F}^{-1}(\tau_{ic}|X_{ic})$ indicates varies in the distribution of unobservables.

The decomposition results in Tables 1.7 and 1.8 display the contribution of observed quantities (education, age, place of birth, occupation, and industry), observed prices (wage coefficients), as well as the residual (unobservable quantities and prices) to the wage gap for different groups. Table 1.7 applies the "human capital specification" control variables including age, education, and Table 1.8 uses "full specification" control variables including age, education, and place of birth, occupation and industry dummy. There are 8 wage gap groups: immigrant and natives, recent immigrant (2001-2005 arrivals) and native, earlier immigrant (before 1980 arrivals), the first generation of immigrant and the third generation, the second generation of immigrant and the third generation, Others immigrant and native, Asian immigrant and native, US&Europe immigrant and native. The first column in Table 1.7 and Table 1.8 indicates the total log wage gap, the remaining columns break down the total log wage gap into three parts representing the effect of observed characteristics, the effect of returns to these characteristics, as well as the residual effect. Four panels in each table represent the decomposition for mean wage gap, together with the 25th, 50th and 75th percentile wage gap.

As demonstrated in column 3 of Table 1.7, observed prices appear to play an important role in explaining the mean wage gap, implying the return to the human capital is higher for natives than immigrants. Although immigrants have higher education level, which is already displayed in the summary statistics, immigrants have the disadvantage to compete with natives in wage earning

owing to unfamiliar language, culture (Lazear (1999)), environment, or discrimination etc. Similarly, it is the observed prices that increase the wage gap at the distribution Q25, median, and Q75. This situation is especially obvious in the two groups of the wage gap, one is the wage gap between the recent immigrants and natives, the other is the wage gap between Asian immigrants and natives. It is easier to understand in terms of what we mentioned in Section 1.2, recent immigrants and Asian immigrants have a higher level of education and better age advances, but the observed prices have much higher negative value as demonstrated in table. Additionally, with regard to the wage gap between the second generation and the third generation, the observed price is positive, which is the only positive value when comparing to any other groups in each panel. The return to human capital of the second generation is higher than the third generation, which attributes to that second generation has already adapted to the new environment, familiar with the language, culture, and policies, etc or gets less discrimination. Therefore, if they have the same education level, they will get the same and even higher wage than the third generation, which is totally different from the first generation of immigrants. Furthermore, the observed price for the US&Europe immigrants is negative, but it is very small, almost 0. As a result, it is the observed quantities, not the observed prices that contribute positive wage gap between the US&Europe immigrants and natives, which is comparable with the wage gap issue between earlier immigrants and natives. It is comprehensible in view of the fact that it is the US&Europe that consists of the main source countries for the earlier immigrants arriving before 1980.

The second column of Table 1.7 refers to the effect of observed quantities to the wage gap. As demonstrated in the mean, Q25, median, and Q75 wage gap, observed quantities have a substantially larger effect on the wage gap than observed prices and residuals for the two groups: earlier immigrants to natives and US&Europe to natives, which is comparable with the analysis for the third column.

The last column of Table 1.7 shows that the residual effect is 0 for mean wage gap in the first panel, but it contributes to the wage gap along the wage distribution in the remaining three panels. The residual effect is negative at the bottom quantile Q25, in contrast, it changes to positive at the top quantile Q75 except for the group between first generation and third generation. Therefore observed prices and residual effects both explain the negative wage gap at the bottom quantile Q25, but the contribution of observed prices for Q25 is less than Q75 to the wage gap. The unexplained quantities and prices diminish the negative wage gap groups for the top quantile and

expand the two positive wage gap groups (earlier immigrants and US&Europe), which is similar to the finding of Boudarbat and Lemieux (2014) who demonstrate that the unexplained gap at the top quantile is larger than bottom quantile.

The comparison of Table 1.8 and Table 1.7 highlights that the various effect on the wage gap between human capital specification and full specification. When the additional control variables are added, the decomposition indicates that the observed quantities widen the wage gap for the three groups including immigrant, Asian, and Others immigrant, but the observed prices effect for these three groups are substantially diminished compared to that in Table 1.7. In addition, for the US & Europe group, the observed prices change from negative to positive. It indicates that immigrant earning less than native is attributable to their unmatched occupation and industry if they have same human capital such as education and age (experience). It is possible that immigrants may not find the proper occupation or industry matched with their human capital if the culture or language of their home countries is totally different from Canada. As a result, the finding from the decomposition of the wage gap with the full specification is consistent with the summary statistics, OLS and quantile regression results scrutinized in Section 1.2 and 1.3, and the finding further quantitatively explains the effect of control variables 'occupation or industry' on the wage gap.

Overall, the results of decomposition of wage gap shed light on the various effect of observed quantities: age, education, places of birth, and occupation & industry, their observed prices as well as unobserved quantities and prices on the wage gap. This paragraph provides three findings for the decomposition to illustrate that the observed characteristics and their return to these measured characteristics have differently pronounced impact on the eight wage gap groups. First, the return to the human capital is higher for natives than immigrants (especially for recent immigrants and Asian immigrants). It is emphasized that the return to the human capital is higher for the second generation of immigrants than any other generations. In contrast, the observed quantities have a considerably larger effect on the wage gap for earlier immigrants and US&Europe. Second, observed prices contribute less to the wage gap at the bottom quantile than at the top quantile. The unobserved quantities and prices dwindle the negative wage gap for the top quantile and expand the two positive wage gap groups (earlier immigrants and US&Europe). Third, the comparison of findings of the full specification and human capital specification illustrates that lower wage of

immigrants relative to natives may attribute to their unmatched occupation and industry if they have the same human capital.

1.5 Conclusions

This chapter applies employing OLS regression, quantile regression, and decomposition method to examine the wage gap to arrive three main findings. First, wage disadvantage relative to natives for newly arrived immigrants is larger than the earlier arrivals in Canada. Attributable to the presence of sizable "cohort effects" in the examination, newly arrived with a much larger wage deficit is compared to earlier immigrant cohorts with premium wages relative to natives. Second, the second generation of immigrants performs better than not only the first generation but also third generation. The first generation earns least in all the generations owing to their lack of Canadian experience or language skill. Third, changing places of birth of the successive immigrants from US & Europe to Asia accounts for the notable expansion of the wage gap for immigrants. Specifically, the wage of Asian immigrants is less than US & Europe immigrants. In addition, the (JMP) decomposition methodology is applied to get how the observed quantities and wage prices explain the wage gap. It reveals that observed prices are important in explaining the wage gap. For example, the return to education is less for immigrants than for natives because some immigrants are not easier to adapt the new culture and environment to work in the relative occupation and industry matched with their education.

There are some points left for the future research. First, I can compare the wage gap of three generations according to their national origins because the second generation of some Asia origins earns a very higher wage although their first generation earns the almost lowest wage. Second, wage gap analysis by different education and age groups should provide a lot of interesting findings because the young or lower education groups are often influenced heavily by immigrants. Third, it is meaningful to consider the selection issue to examine the wage gap issue.

Tables and Figures

Table 1.1 Summary statistics of Immigrants according to the period of arrivals

	Immigrants: period of arrivals						Natives
	Before 1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	
Education (%)							
HS dropout	21.81	22.44	20.43	17.29	10.77	6.39	19.42
High School	20.02	20.72	21.27	21.49	15.33	13.17	24.18
College	31.91	28.82	28.15	25.44	17.77	14.27	34.75
University	26.25	28.01	30.14	35.79	56.13	66.17	21.65
Occupation (%)							
High Skilled	46.88	40.93	37.42	37.24	46.78	42.6	46.37
Skilled	13.71	13.06	13.37	11.38	9.42	9.25	13.69
Semiskilled	30.25	34.6	35.85	37.44	32.36	33.46	31.54
Unskilled	9.16	11.41	13.36	13.94	11.44	14.69	8.40
Place of birth (%)							
Others	17.53	22.8	24.25	21.92	17.13	21.44	
Asia	22.13	45.51	49.05	56.00	60.42	58.02	
US&Europe	60.34	31.69	26.7	22.08	22.46	20.54	

Table 1.2 Summary statistics for different generations and place of birth

	Generation			Place of birth			
	3rd generation	2nd generation	1st generation	Others	Asia	US&Europe	Canada
Education(%)							
HS dropout	16.31	10.29	15.04	23.48	18.84	21.24	18.95
High School	24.49	23.22	19.9	19.77	19.43	19.63	24.49
College	37.17	35.41	27.81	34.64	20.69	33.41	34.73
University	22.03	31.07	37.25	22.11	41.04	25.72	21.83
Occupation(%)							
High Skilled	46.37	54.4	45.86	39.96	41.14	47.69	46.68
skilled	14.08	11.94	11.98	13.29	11.43	14.85	13.6
Semiskilled	30.86	27.94	31.84	35.07	35.57	28.05	31.47
Unskilled	8.69	5.73	10.31	11.68	11.86	9.41	8.26

Table 1.3 Summary statistics according to the quartile wage distribution

	Weekly wage distribution			
	Bottom	Q2	Q3	Top
Immigrant status(%)				
Natives	23.85	25.02	25.37	25.75
Immigrants	29.44	24.91	22.19	23.46
Generation(%)				
3rd	24.44	24.67	24.57	26.32
2nd	19.68	22.99	26.35	30.98
1st generation	29.67	24.64	21.91	23.78
Place of birth(%)				
Others	31.64	27.06	22.73	18.57
Asia	36.73	25.36	19.59	18.33
US&Europe	22.56	23.3	24.62	29.53
Canada	23.45	24.97	25.45	26.13
Arrival cohorts (%)				
before 1980	22.53	23.86	24.66	28.94
1981-1985	31.5	26.81	21.57	20.12
1986-1990	36.62	26.9	20.35	16.14
1991-1995	41.78	26.18	17.84	14.2
1996-2000	39.37	24.89	17.47	18.27
2001-2005	47.76	25.33	14.65	12.26
Age (%)				
25-29	35.15	31.18	22.4	11.26
30-34	26.09	26.89	26.59	20.43
35-39	23.28	24.35	25.99	26.38
40-44	22.31	23.28	25.25	29.16
45-49	21.5	22.64	24.59	31.27
50-54	21.69	22.15	23.76	32.4
55-59	24.32	23.08	23.1	29.5

Table 1.4 Estimates of immigrant-native wage gap according to arrival cohorts

Arrival cohorts			OLS			Q25	Median	Q75
	1	2	3	4	5	6	7	8
before 1980	0.008***	-0.013***	0.030***	0.007***	0.068***	0.079***	0.08***	0.071***
	(0.002)	(0.002)	(0.004)	(0.002)	(0.004)	(0.005)	(0.003)	(0.003)
1981-1985	-0.104***	-0.118***	-0.035***	-0.070***	0.019***	0.01***	0.026***	0.022***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.006)	(0.005)	(0.005)
1986-1990	-0.175***	-0.194***	-0.104***	-0.135***	-0.041***	-0.051***	-0.037***	-0.02***
	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.006)	(0.004)	(0.004)
1991-1995	-0.241***	-0.269***	-0.171***	-0.195***	-0.095***	-0.112***	-0.094***	-0.074***
	(0.004)	(0.004)	(0.005)	(0.003)	(0.005)	(0.006)	(0.005)	(0.004)
1996-2000	-0.211***	-0.297***	-0.195***	-0.231***	-0.128***	-0.16***	-0.121***	-0.073***
	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.007)	(0.005)	(0.005)
2001-2005	-0.328***	-0.433***	-0.332***	-0.338***	-0.235***	-0.28***	-0.236***	-0.194***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.009)	(0.007)	(0.007)
Control variables								
Education	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Place of birth	No	No	Yes	No	Yes	Yes	Yes	Yes
Occupation&Industry	No	No	No	Yes	Yes	Yes	Yes	Yes
Observations	1000549	1000549	1000424	996434	996309	996434	996434	996434
R-square	0.032	0.095	0.098	0.218	0.221	0.149	0.167	0.165

Note: Standard errors are in parentheses. Models estimated on pooled sample of the Public Use Microdata Files of the Canadian censuses Surveys 1991, 1996, 2001 and 2006. Samples include full-time workers age 25–59 only. The dependent variable is log weekly wage and the wage is adjusted to 2002$. All regressions control for the age, age squared, and census year dummy. Regressions are weighted by census weight. * p<0.10, ** p<0.05, *** p<0.01

Table 1.5 Wage gaps between different generations

Generation			OLS			Q25	Median	Q75
	1	2	3	4	5	6	7	8
Second generation	0.092***	0.062***	0.061***	0.057***	0.057***	0.068***	0.063***	0.051***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
First generation	-0.078***	-0.118***	0.002	-0.078***	0.011***	-0.107***	-0.076***	-0.055***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.005)	(0.003)	(0.003)
Control variables								
Education	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Place of birth	No	No	Yes	No	Yes	Yes	Yes	Yes
Occupation&Industry	No	No	No	Yes	Yes	Yes	Yes	Yes
Observations	511560	511560	511560	507452	507452	507452	507452	507452
R-square	0.027	0.085	0.091	0.209	0.212	0.1406	0.1603	0.159

Note: See the note of Table 1.4

Table 1.6 Wage gap between immigrants from Asia, Europe, others and Natives

Places	OLS			Q25	Median	Q75
	1	2	3	4	5	6
Others	-0.131***	-0.135***	-0.111***	-0.129***	-0.110***	-0.090***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Asia	-0.181***	-0.225***	-0.159***	-0.196***	-0.149***	-0.110***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
US and Europe	0.008***	-0.011***	0.001	-0.009***	0.008***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Control Variables						
Education	No	Yes	Yes	Yes	Yes	Yes
Occupation&Industry	No	No	Yes	Yes	Yes	Yes
Observations	1000424	1000424	996309	996436	996436	996436
R-square	0.031	0.093	0.217	0.147	0.164	0.163

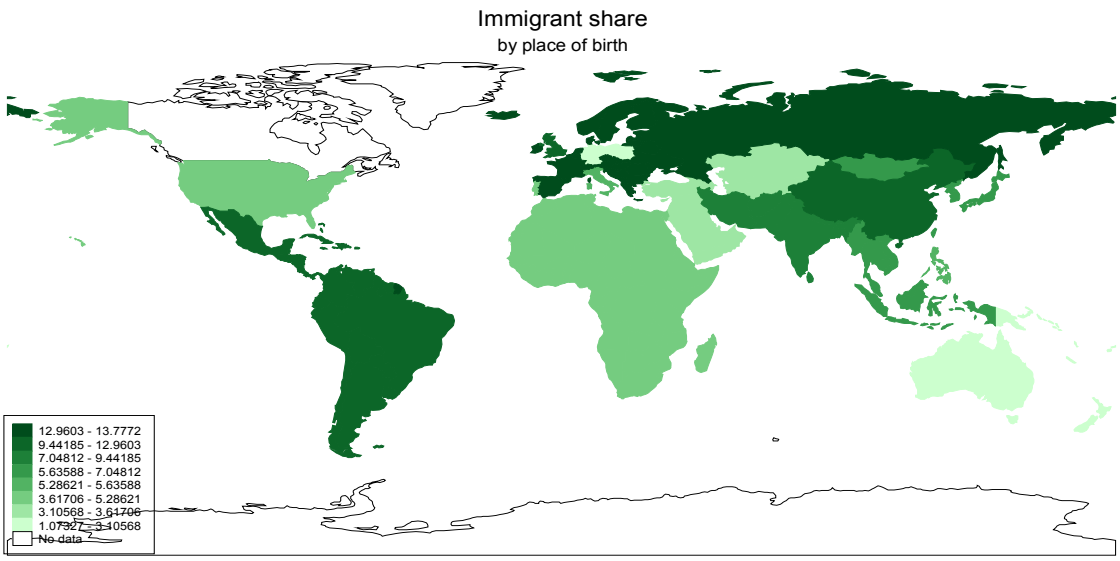
Note: See the note of Table 1.4

Table 1.7 Decomposition of wage gap: human capital specification

	Total change	Observed quantities	Observed prices	Unobservables
	Human Capital Specification			
	mean			
Immigrant-native	-0.067	0.040	-0.108	0.000
Recent imm-native	-0.321	0.102	-0.423	0.000
Earlier imm-native	0.035	0.045	-0.010	0.000
G1-G3	-0.068	0.039	-0.107	0.000
G2-G3	0.076	0.011	0.065	0.000
Others-native	-0.109	0.030	-0.139	0.000
Asia-native	-0.179	0.037	-0.216	0.000
USEU-native	0.039	0.045	-0.006	0.000
	Q25			
Immigrant-native	-0.115	0.026	-0.102	-0.039
Recent imm-native	-0.377	0.110	-0.408	-0.080
Earlier imm-native	0.029	0.040	-0.004	-0.006
G1-G3	-0.109	0.029	-0.095	-0.043
G2-G3	0.098	0.014	0.062	0.022
Others-native	-0.131	0.025	-0.137	-0.020
Asia-native	-0.243	0.021	-0.207	-0.057
USEU-native	0.029	0.044	-0.002	-0.012
	Median			
Immigrant-native	-0.077	0.027	-0.107	0.003
Recent imm-native	-0.367	0.086	-0.419	-0.035
Earlier imm-native	0.034	0.038	-0.010	0.007
G1-G3	-0.074	0.025	-0.105	0.006
G2-G3	0.076	-0.001	0.065	0.012
Others-native	-0.129	0.013	-0.139	-0.004
Asia-native	-0.201	0.023	-0.212	-0.012
USEU-native	0.041	0.037	-0.005	0.009
	Q75			
Immigrant-native	-0.038	0.034	-0.114	0.041
Recent imm-native	-0.311	0.082	-0.441	0.047
Earlier imm-native	0.045	0.044	-0.012	0.014
G1-G3	-0.034	0.034	-0.113	0.045
G2-G3	0.066	0.011	0.062	-0.007
Others-native	-0.108	0.018	-0.143	0.018
Asia-native	-0.146	0.029	-0.222	0.046
USEU-native	0.055	0.045	-0.009	0.020

Table 1.8 Decomposition of wage gap: full specification

	Total change	Observed quantities	Observed prices	Unobservables
	Full Specification			
	mean			
Immigrant-native	-0.068	-0.026	-0.042	0.000
Recent imm-native	-0.321	0.267	-0.588	0.000
Earlier imm-native	0.036	0.057	-0.022	0.000
G1-G3	-0.068	0.039	-0.107	0.000
G2-G3	0.076	0.011	0.065	0.000
Others-native	-0.110	-0.022	-0.088	0.000
Asia-native	-0.179	-0.038	-0.141	0.000
USEU-native	0.039	0.033	0.006	0.000
	Q25			
Immigrant-native	-0.115	-0.058	-0.035	-0.022
Recent imm-native	-0.377	0.245	-0.569	-0.053
Earlier imm-native	0.029	0.047	-0.016	-0.002
G1-G3	-0.109	0.029	-0.095	-0.043
G2-G3	0.098	0.014	0.062	0.022
Others-native	-0.131	-0.032	-0.081	-0.018
Asia-native	-0.243	-0.069	-0.136	-0.038
USEU-native	0.029	0.028	0.008	-0.007
	Median			
Immigrant-native	-0.078	-0.041	-0.041	0.004
Recent imm-native	-0.368	0.227	-0.589	-0.005
Earlier imm-native	0.035	0.051	-0.022	0.005
G1-G3	-0.074	0.025	-0.105	0.006
G2-G3	0.076	-0.001	0.065	0.012
Others-native	-0.131	-0.043	-0.088	0.000
Asia-native	-0.202	-0.065	-0.136	-0.001
USEU-native	0.040	0.027	0.007	0.006
	Q75			
Immigrant-native	-0.040	-0.019	-0.049	0.029
Recent imm-native	-0.311	0.259	-0.619	0.049
Earlier imm-native	0.045	0.060	-0.025	0.011
G1-G3	-0.034	0.034	-0.113	0.045
G2-G3	0.066	0.011	0.062	-0.007
Others-native	-0.110	-0.034	-0.099	0.024
Asia-native	-0.148	-0.036	-0.151	0.039
USEU-native	0.055	0.036	0.003	0.016



Note: The data is pooled sample of 1991, 1996, 2000, and 2006 Canada Censuses. The graph is based on full-time immigrants from the 15 different places of birth: United States of America; United Kingdom; Germany; Italy; Portugal; Poland; Other European; West, Central Asia and the Middle East, Southern Asia; People's Republic of China; Philippines; Other Eastern and South East Asia; Africa; Central America; Caribbean and Bermuda and South America; Others.

Figure 1-1 Immigrant share distribution by place of birth

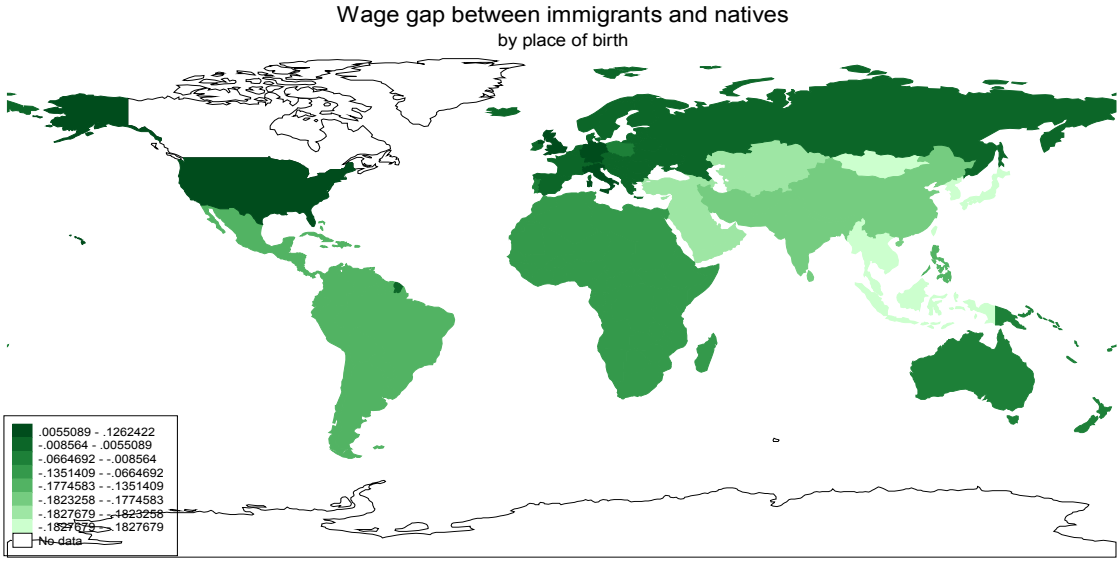


Figure 1-2 Log weekly wage gap between immigrants and natives by place of birth

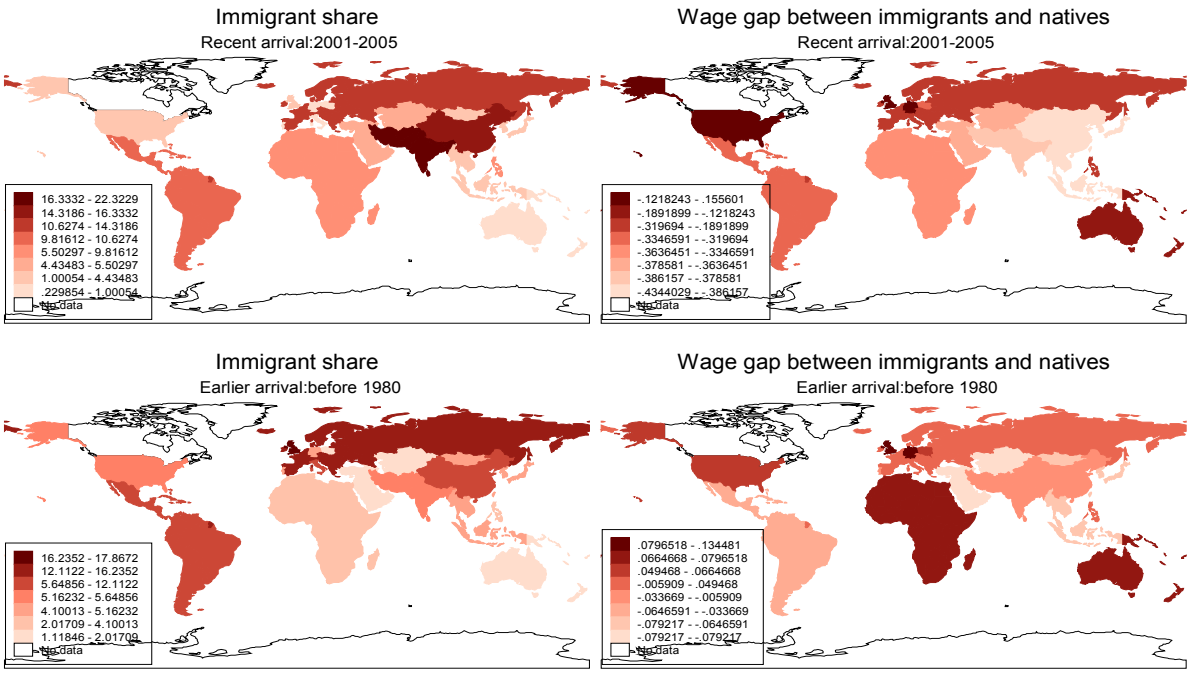


Figure 1-3 Immigrant share distribution and wage gap between immigrants and natives

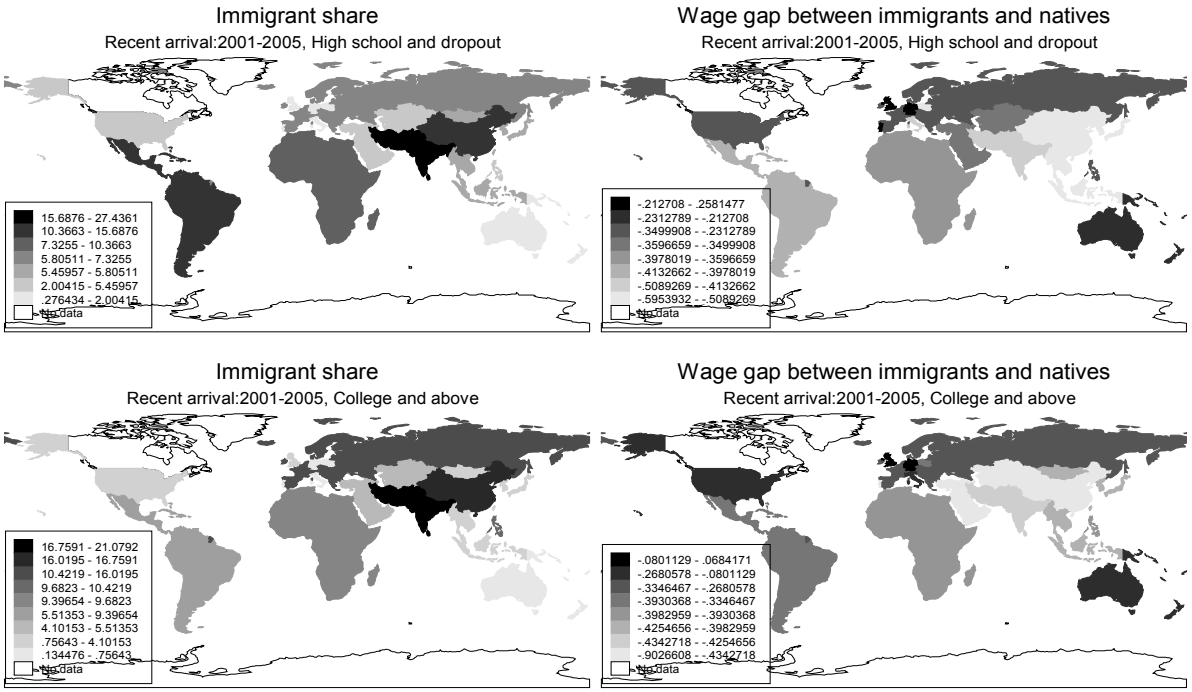


Figure 1-4 Recent immigrant share and wage gap for different education groups

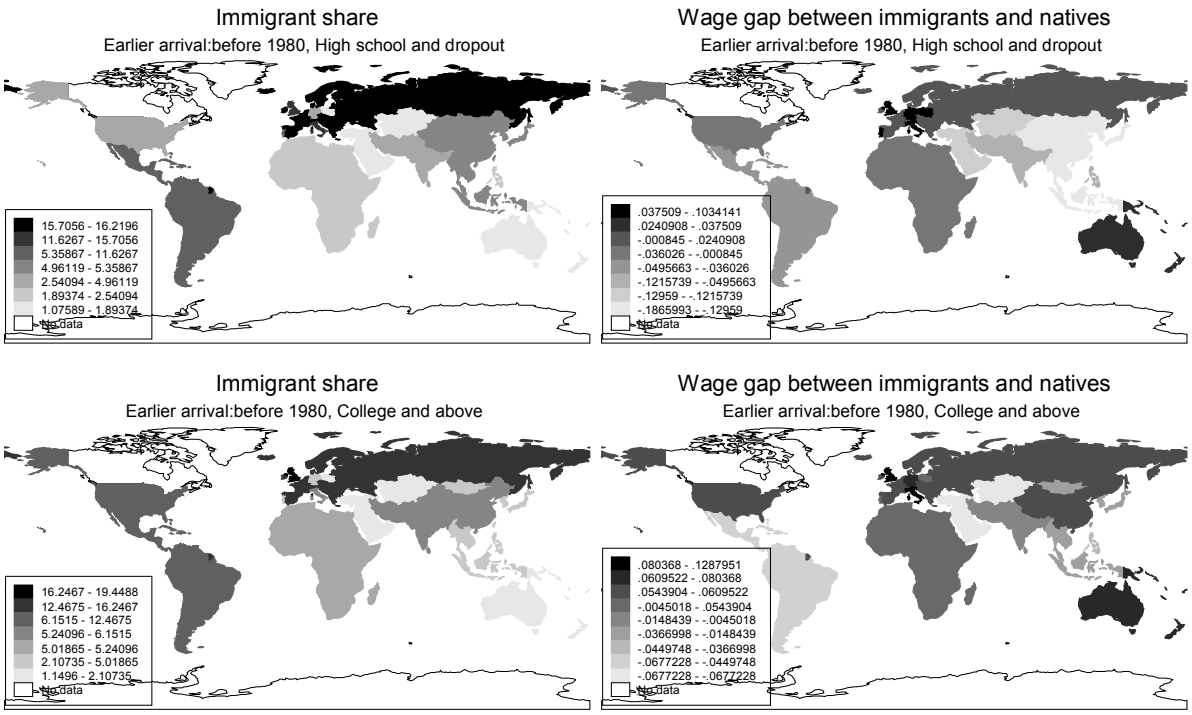
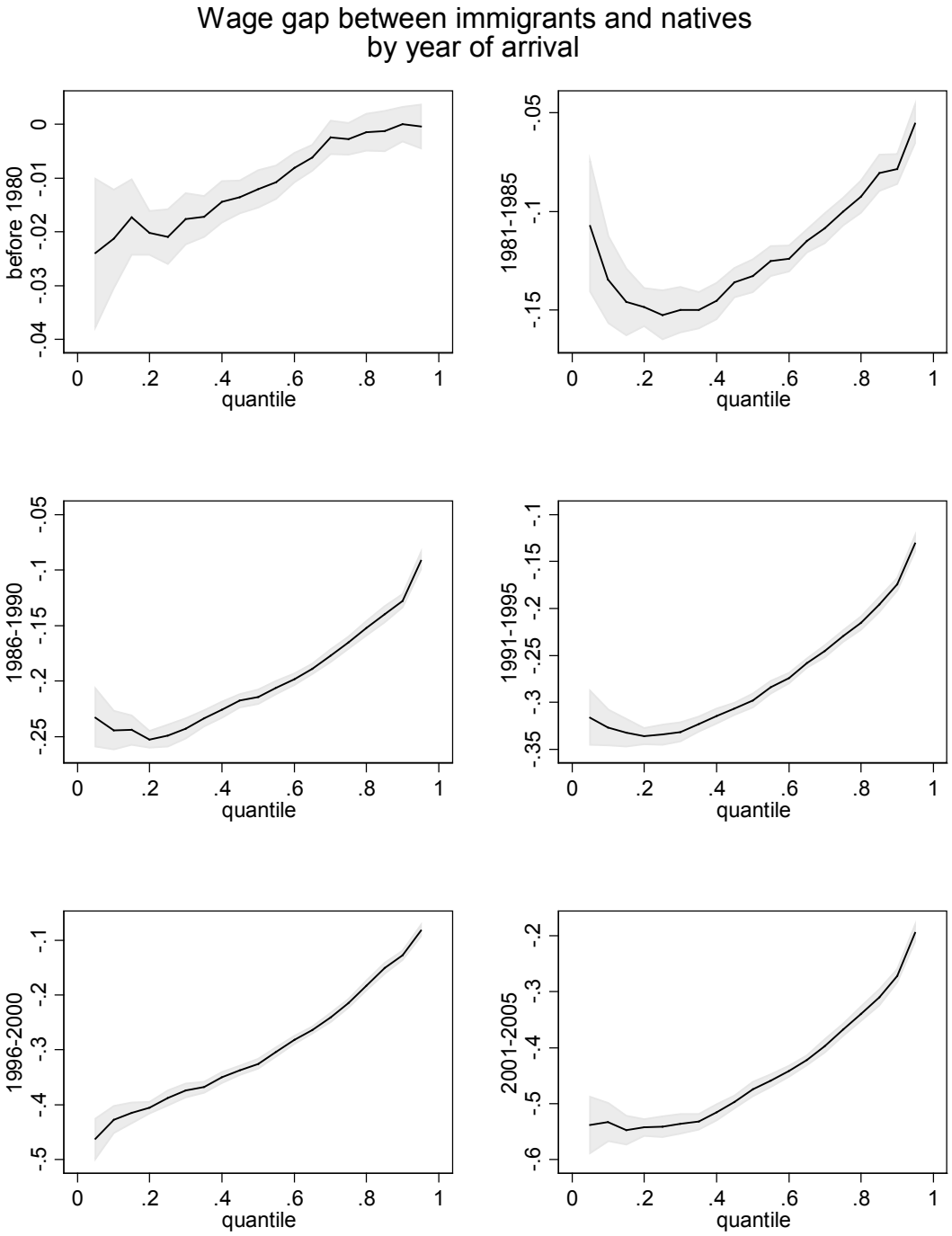


Figure 1-5 Earlier immigrant share and wage gap for different education groups



note:control variables include age, education and year

Figure 1-6 Wage gap between immigrants between immigrants and natives by year of arrival

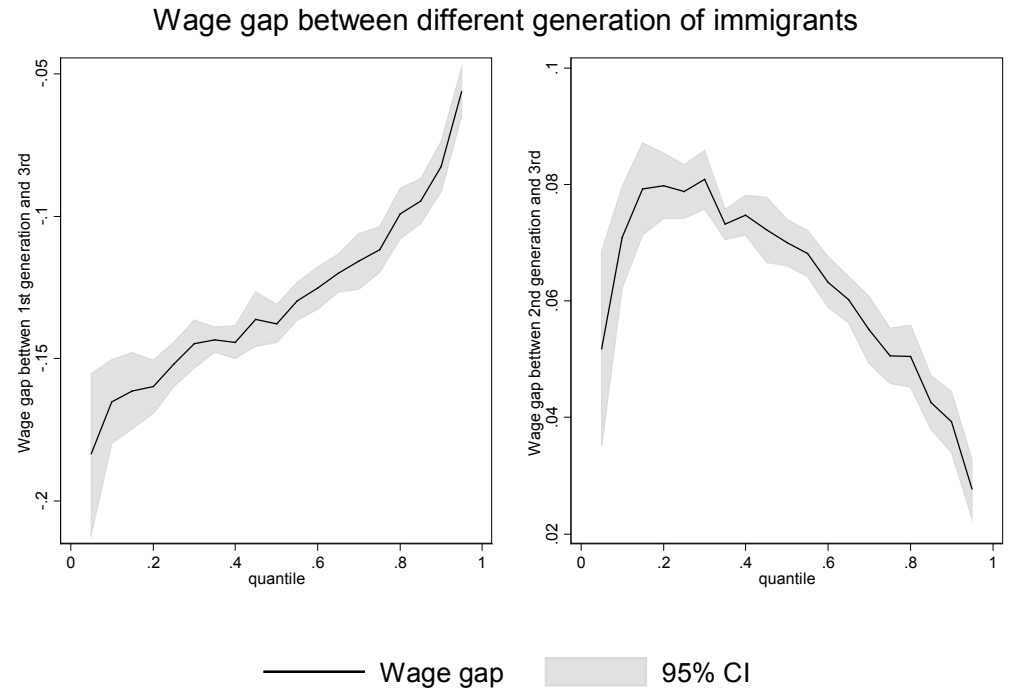


Figure 1-7 Wage gap between different generations

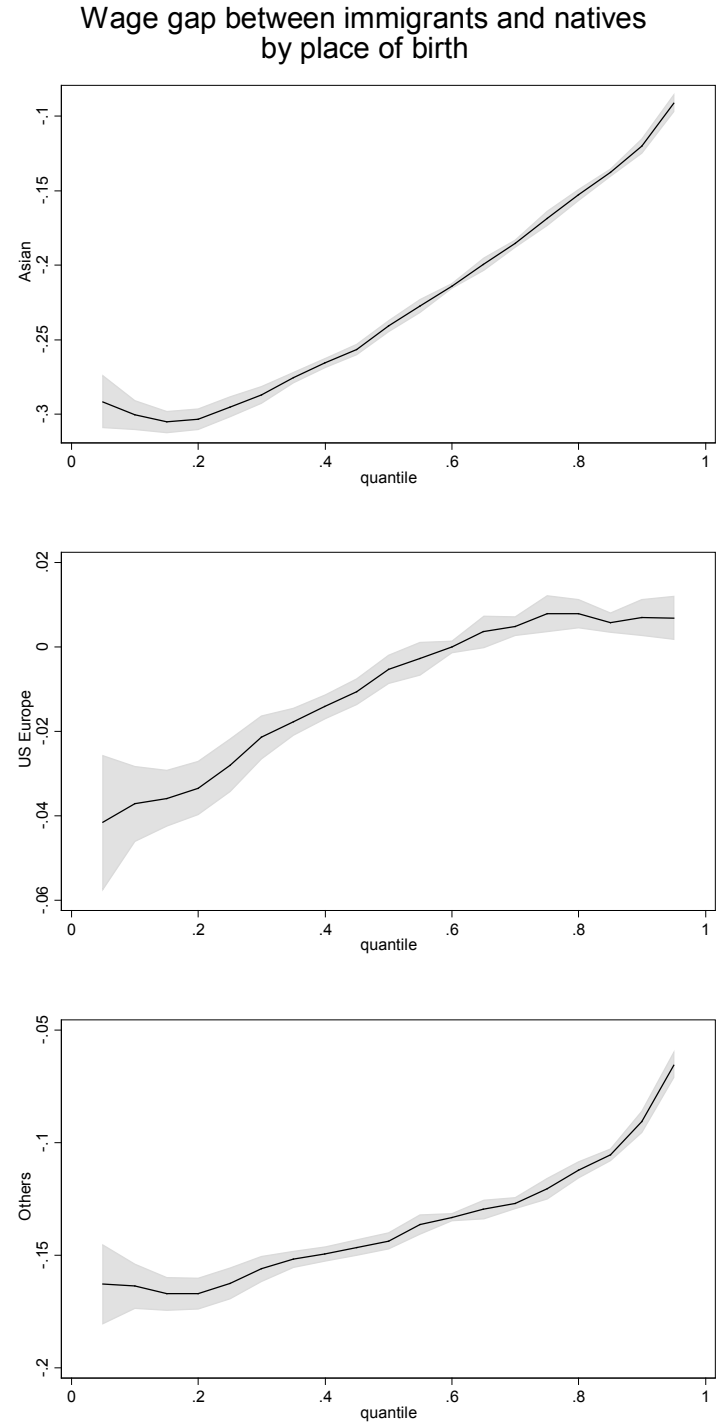


Figure 1-8 Wage gap between immigrants and natives by place of birth

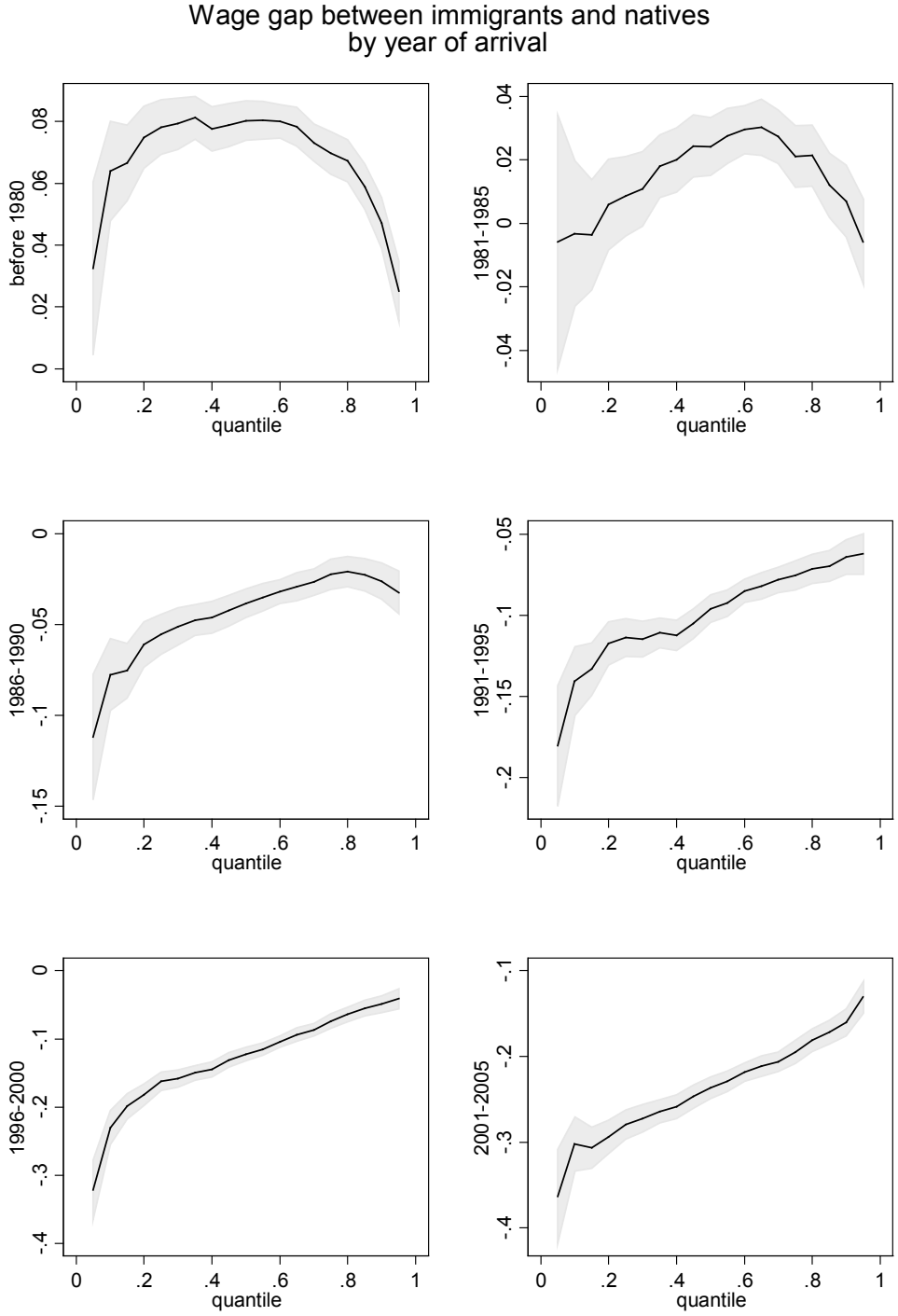


Figure 1-9 Wage gap between immigrants between immigrants and natives by year of arrival

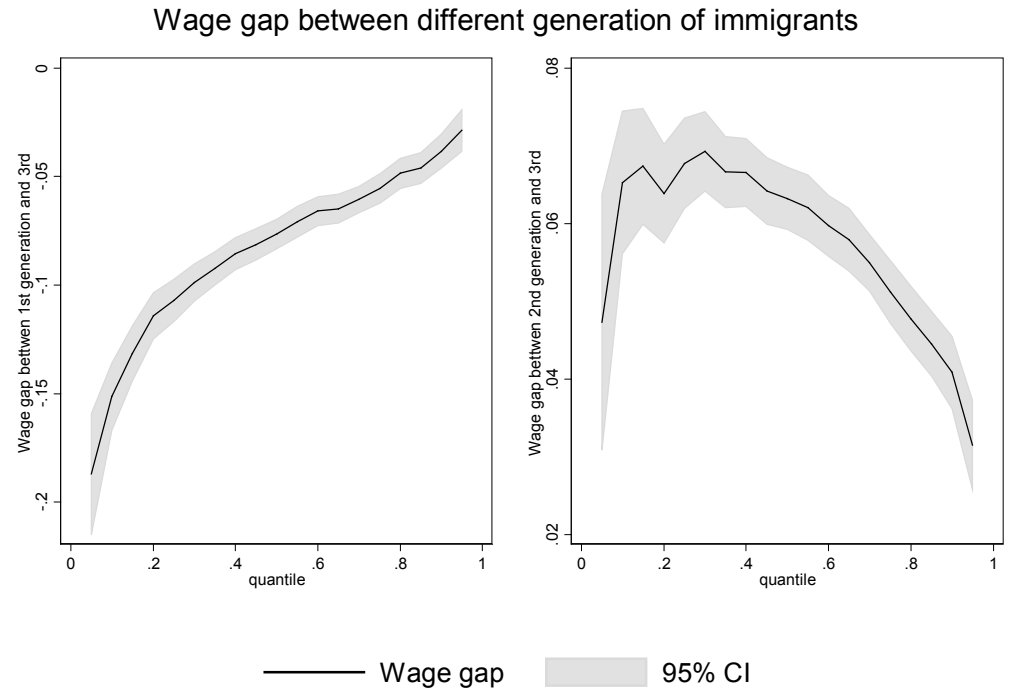
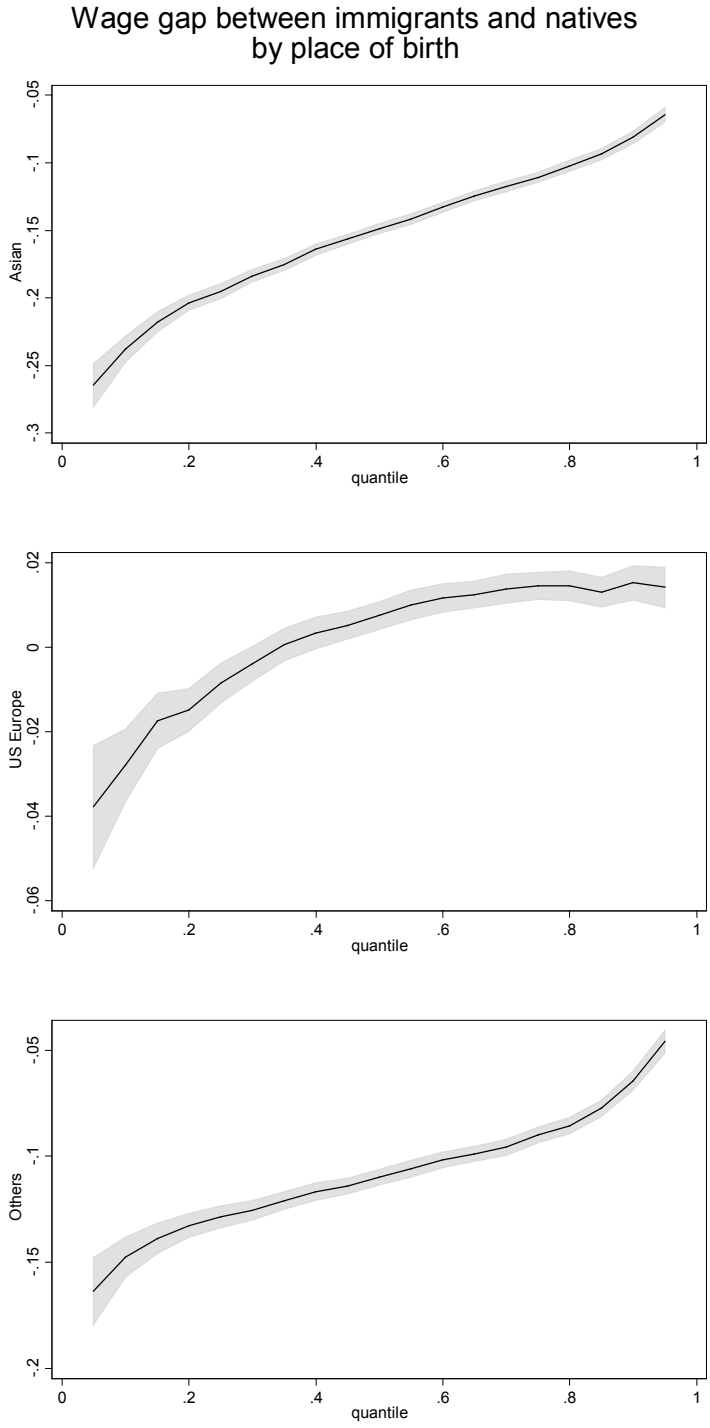


Figure 1-10 Wage gap between different generations



note:control variables include age, education and year, occupation and industry

Figure 1-11 Wage gap between immigrants and natives by place of birth

Appendix

Table A1.1: Summary statistics according to age groups

	Age							
	25-29	30-34	35-39	40-44	45-49	50-54	55-59	Total
Immigrant share (%)								
1990	13.38	14.75	17.92	23.32	25.07	26.84	29.03	19.76
1995	15.12	16.98	17.02	19.76	24.01	26	28.95	19.99
2000	14.77	19.87	20.33	19.36	21.23	25.25	28.86	20.78
2005	14.64	19.99	24.04	22.35	20.88	22.13	26.54	21.38
1990-2005	14.41	17.67	19.7	21.12	22.5	24.64	28.07	20.48
Education (%)								
HS dropout	14.9	16.34	17.87	18.89	20.61	24.14	30.46	19.49
High School	24.11	22.64	23.5	24.18	24.06	22.59	20.29	23.29
College	34.68	35.01	34.71	34.2	32.77	30.8	29.72	33.52
University	26.32	26.01	23.93	22.73	22.57	22.47	19.53	23.7
Occupation (%)								
High Skilled	42.47	45.97	46.3	46.92	47.62	47.21	43.33	45.85
skilled	13.55	13.76	13.94	13.49	13.2	12.88	13.75	13.52
Semiskilled	34.42	31.88	31.61	31.19	30.58	30.61	31.64	31.73
Unskilled	9.55	8.39	8.15	8.4	8.6	9.3	11.28	8.89
Generation (%)								
3rd	65.81	62.42	63.21	65.7	66.61	64.83	60.74	64.44
2nd	19.2	17.45	14.52	13.21	12.15	11.52	11.64	14.29
1st	14.98	20.13	22.27	21.09	21.23	23.65	27.62	21.27
Place of birth (%)								
Others	7.18	7.85	7.97	7.71	7.19	6.71	7.03	7.44
Asia	6.83	8.14	8.47	8.18	7.6	7.15	6.86	7.7
US&Europe	4.99	6.28	7.69	9.32	11.3	13.75	17.24	9.35
Canada	81	77.73	75.87	74.78	73.92	72.39	68.87	75.5
Arrival cohorts (%)								
natives	85.59	82.33	80.3	78.88	77.5	75.36	71.93	79.52
before 1980	5.11	6.63	8.56	11.29	14.54	18.46	23.18	11.42
1981-1985	1.55	1.82	1.91	1.96	1.7	1.35	1.21	1.69
1986-1990	2.94	3.25	3.26	3.03	2.53	2.02	1.58	2.78
1991-1995	2.5	2.79	2.91	2.51	2.05	1.6	1.24	2.35
1996-2000	1.48	1.97	1.96	1.56	1.19	0.89	0.63	1.47
2001-2005	0.83	1.21	1.1	0.76	0.49	0.33	0.23	0.77
Fulltime workers (%)								
Total	85.33	86.9	86.15	87.08	87.44	86.89	83.18	86.34
native	85.38	86.79	85.98	86.92	87.34	86.56	82.25	86.16
Immigrant	85.02	87.46	86.86	87.71	87.79	87.91	85.66	87.06

Table A1.2: Oaxaca Decomposition of wage gap

	Immigrant-native	'before 1980'-native	'2000-2005'-native
total log wage differential	-0.067	0.036	-0.321
	(0.002)	(0.002)	(0.007)
	Attributable to differences in average characteristics		
Education	0.011	0.004	0.045
	(0.000)	(0.000)	(0.006)
Age	0.018	0.030	-0.006
	(0.000)	(0.001)	(0.003)
Place of birth	-0.110	-0.062	-0.079
	(0.003)	(0.003)	(0.020)
Occupation	-0.010	0.002	-0.023
	(0.000)	(0.000)	(0.002)
Industry	-0.001	-0.001	-0.005
	(0.000)	(0.000)	(0.001)
subtotal	-0.093	-0.027	-0.068
	(0.003)	(0.003)	(0.022)
	Attributable to differences in coefficients		
Intercepts	0.003	0.071	-0.068
	(0.008)	(0.010)	(0.041)
Education	-0.075	-0.014	-0.138
	(0.004)	(0.005)	(0.020)
Age	-0.010	-0.045	-0.117
	(0.003)	(0.003)	(0.016)
Place of birth	0.113	0.041	0.037
	(0.005)	(0.007)	(0.031)
Occupation	-0.048	-0.011	-0.080
	(0.003)	(0.003)	(0.012)
Industry	0.041	0.020	0.113
	(0.003)	(0.003)	(0.013)
subtotal	0.026	0.063	-0.253
	(0.003)	(0.004)	(0.023)

Table A1.3: Oaxaca Decomposition of wage gap: generation and Places of birth

	G1-G3	G2-G3	Others-native	Asian-native	US&Euro-native
total wage differential	-0.069	0.076	-0.128	-0.177	0.034
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	Attributable to differences in average characteristics				
Education	0.016	0.023	-0.004	0.021	0.003
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Age	0.011	-0.016	0.001	0.002	0.031
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Occupation	-0.003	0.025	-0.026	-0.021	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry	-0.003	-0.008	0.000	-0.002	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
subtotal	0.020	0.024	-0.029	0.000	0.039
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	Attributable to differences in coefficients				
Intercepts	0.036	0.042	0.000	-0.072	0.075
	(0.011)	(0.012)	(0.011)	(0.011)	(0.010)
Education	-0.115	-0.032	-0.061	-0.056	-0.064
	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)
Age	-0.007	0.014	-0.004	-0.049	-0.015
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Occupation	-0.060	0.004	-0.050	-0.054	-0.020
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Industry	0.057	0.024	0.016	0.053	0.019
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
subtotal	-0.089	0.052	-0.099	-0.177	-0.005
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

Oaxaca decomposition of wage gap (Oaxaca and Ransom 1994) provides a technique for decomposing the wage gap into two parts: one is differences in average characteristics of the groups and the other is differences in labor market returns to these characteristics. Now this method is employed to analyze the wage gap between immigrants and natives. Based on the OLS regression in this chapter, the mean log wages of immigrants and natives as

$$\overline{y_i} = \hat{\alpha}_i + \overline{X_i}\hat{\beta}_i$$

And

$$\overline{y_n} = \hat{\alpha}_n + \overline{X_n}\hat{\beta}_n$$

where y is Log weekly wage, X refers to a vector consisting of the variables (experience, education, occupation, and industry) with group specific coefficients, and subscripts i and n indicate immigrants and natives respectively. Overbars is group-specific means, and hats above parameters represent least-squares estimates.

Therefore, the log wage gap between immigrants and natives is:

$$\overline{y_i} - \overline{y_n} = \underbrace{(\hat{\alpha}_i - \hat{\alpha}_n) + \overline{X_i}(\hat{\beta}_i - \hat{\beta}_n)}_{\text{differences in the wage structure}} + \underbrace{(\overline{X_i} - \overline{X_n})\hat{\beta}_n}_{\text{differences in human capital endowments}}$$

Table A1.4: Predicted percentage of occupation of full-time workers

	High Skilled	Skilled	Semiskilled	Unskilled
Natives	47.2	13.8	30.6	8.4
Immigrants	40.4	12.3	36.4	10.9
Female	50.3	4.9	36.2	8.6
Male	42.5	19.9	28.5	9.1
Education				
HS dropout	20.6	14.4	45.6	19.5
High School	34.3	11.6	42.8	11.3
College	44.2	20.5	29.4	5.9
University	80.7	4.1	13.2	2.1
Age				
25-29	40.1	14.0	35.5	10.4
30-34	44.3	13.8	32.9	9.0
35-39	46.0	13.8	31.8	8.3
40-44	47.2	13.5	30.8	8.4
45-49	48.3	13.3	30.0	8.4
50-54	48.8	12.8	29.8	8.6
55-59	47.5	12.9	30.0	9.6
Place of birth				
Canada	46.1	13.0	32.2	8.7
Asia	38.4	15.9	34.6	11.1
US&Europe	51.3	16.1	24.9	7.6
Others	43.3	13.7	32.6	10.3

Note: Predictions are based on a multinomial logit model applied to the full-time workers ages 25-59.

Table A1.5: Industry based demand shift measures, 1990-2005

	within	between	overall	within	between	overall
		1990-1995			1995-2000	
Natives						
HS Dropout	-5.015	-0.219	-5.234	-2.744	0.341	-2.403
High School	-0.352	-0.133	-0.485	-0.343	-0.077	-0.420
College	2.785	0.018	2.803	1.275	0.265	1.540
University	2.582	0.334	2.916	1.811	-0.529	1.283
Immigrants						
HS Dropout	-4.792	-0.201	-4.994	-3.749	0.576	-3.173
High School	-0.722	0.069	-0.652	-0.259	0.367	0.108
College	1.156	-0.025	1.131	-1.827	0.164	-1.663
University	4.357	0.158	4.515	5.835	-1.107	4.728
		2000-2005			1990-2005	
Natives						
HS Dropout	-7.055	-0.356	-7.411	-14.710	-0.338	-15.047
High School	1.461	0.086	1.547	0.855	-0.213	0.642
College	2.979	-0.245	2.734	6.805	0.273	7.078
University	2.614	0.515	3.129	7.050	0.278	7.328
Immigrants						
HS Dropout	-8.156	-0.411	-8.567	-16.585	-0.149	-16.734
High School	0.883	0.037	0.919	0.062	0.313	0.375
College	-1.947	0.048	-1.899	-2.576	0.145	-2.431
University	9.221	0.327	9.547	19.099	-0.309	18.791

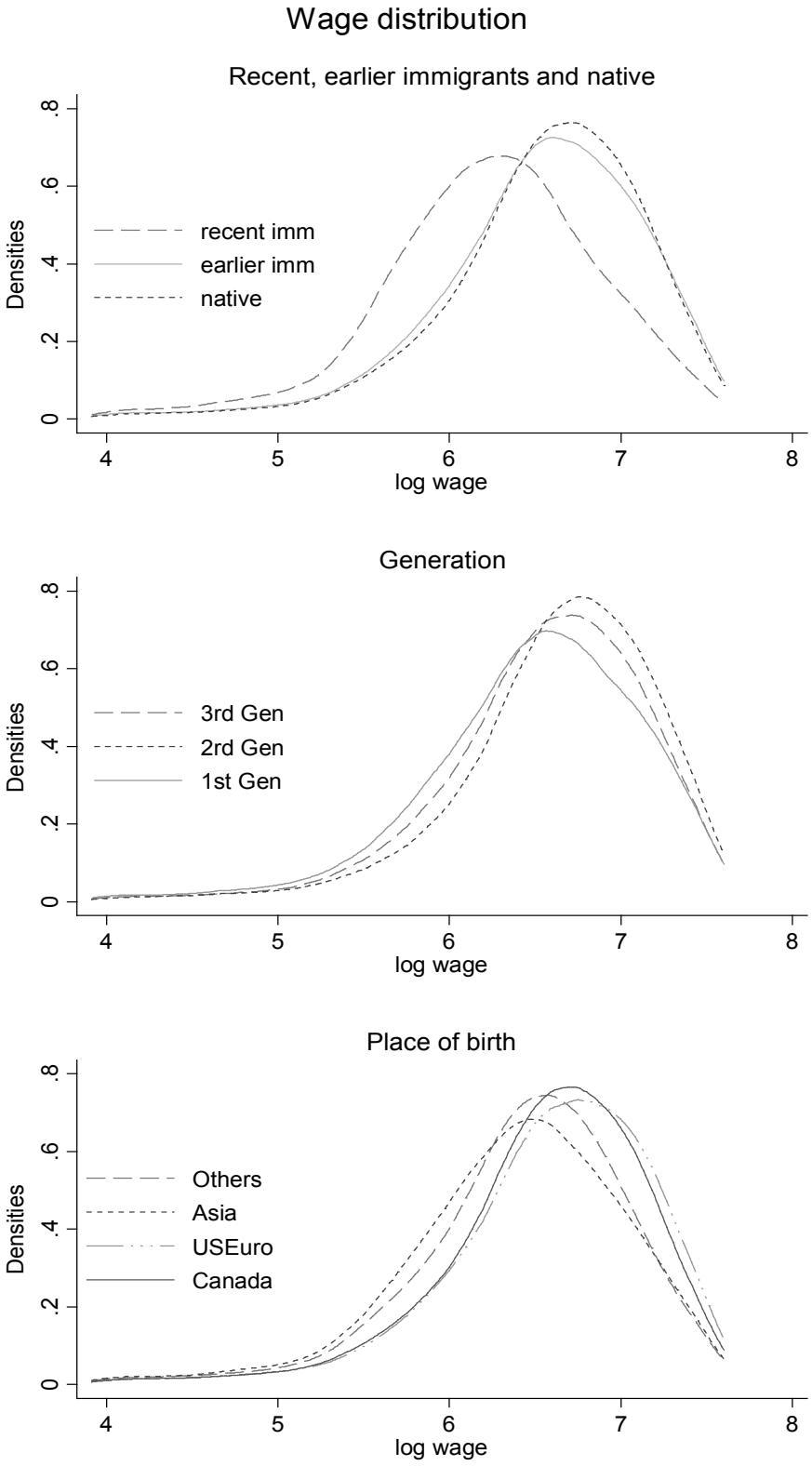


Figure A1-1: Wage distribution by different groups

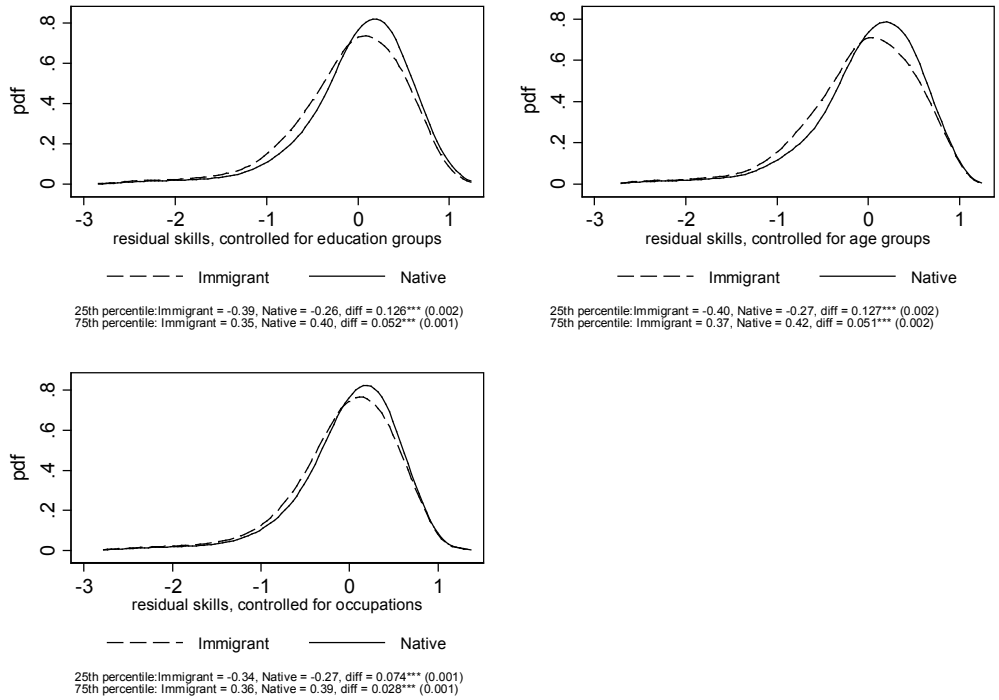


Figure A1-2: Residual density of immigrant and native

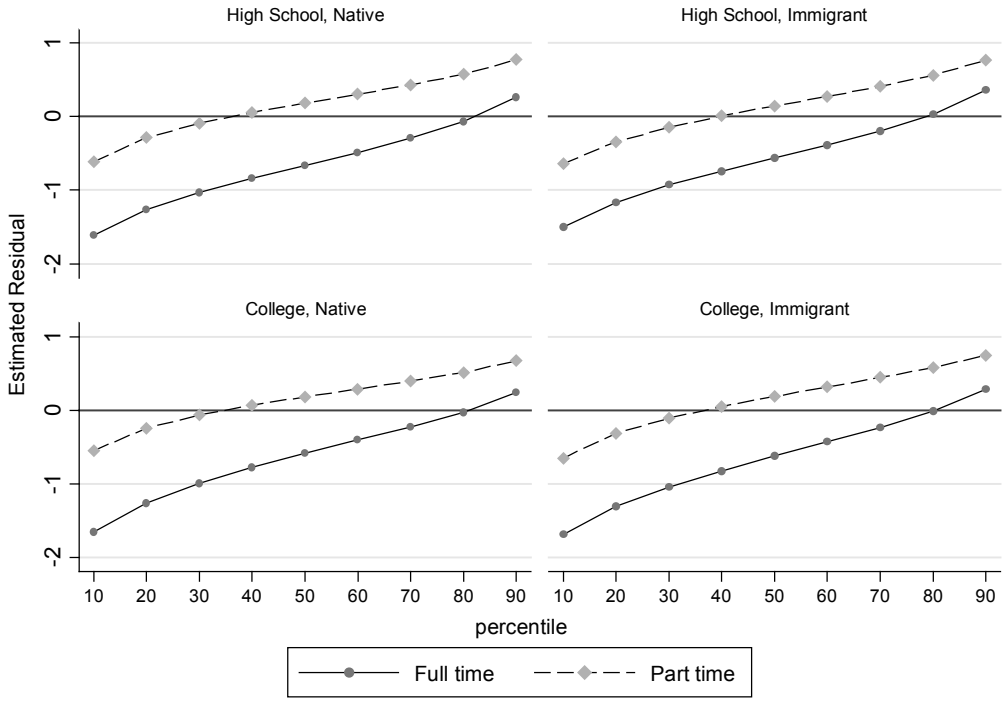


Figure A1-3: Estimated residual for full-time and part-time workers by education groups

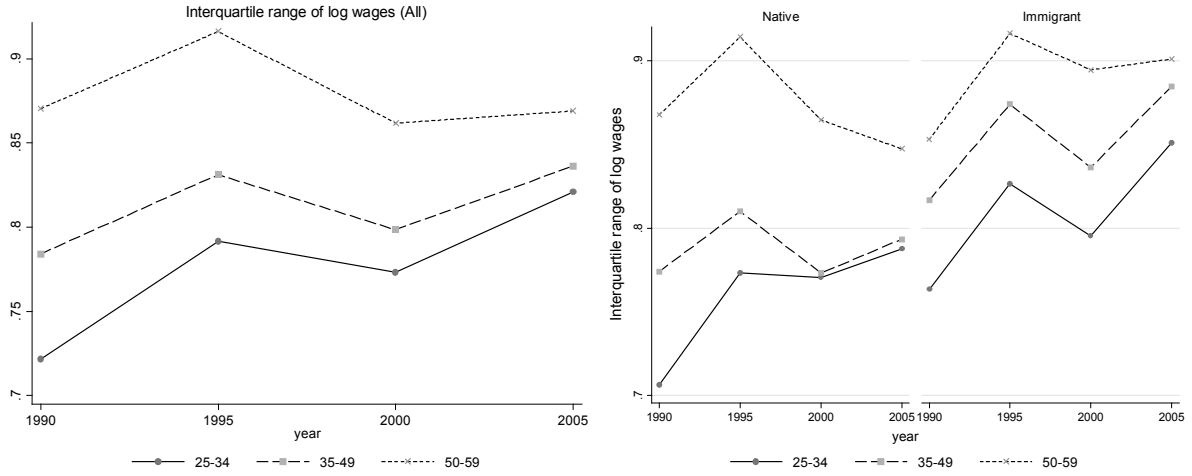
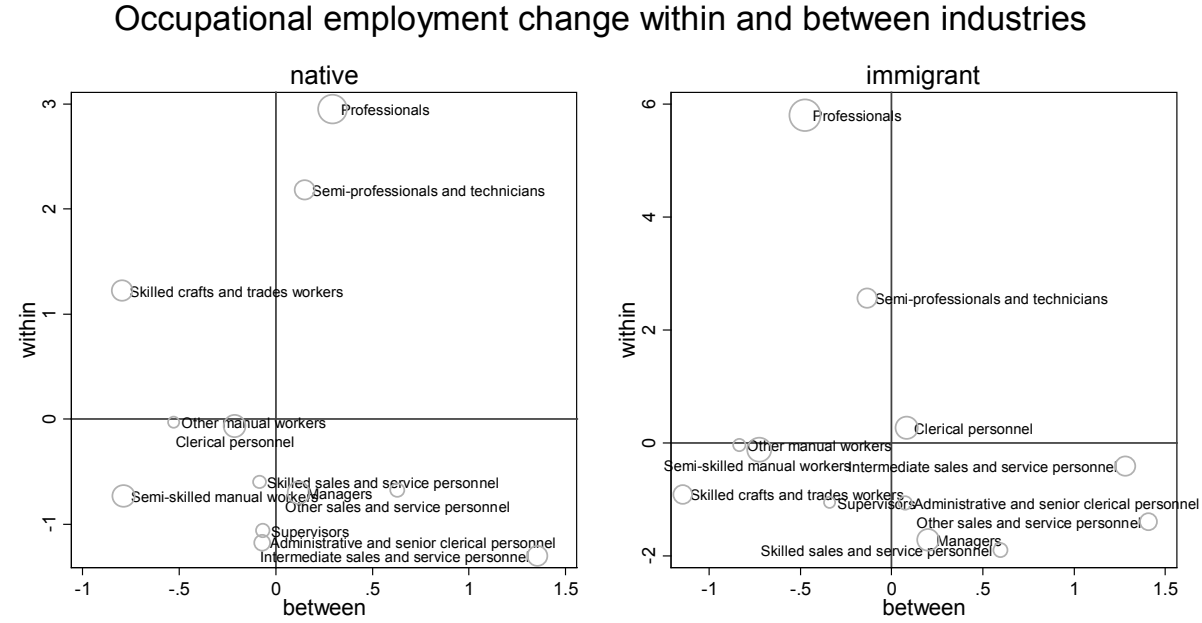


Figure A1-4: Interquartile range of log wages by age groups



Weight is employment share in 2005

Figure A1-5: Occupational employment change within and between industries

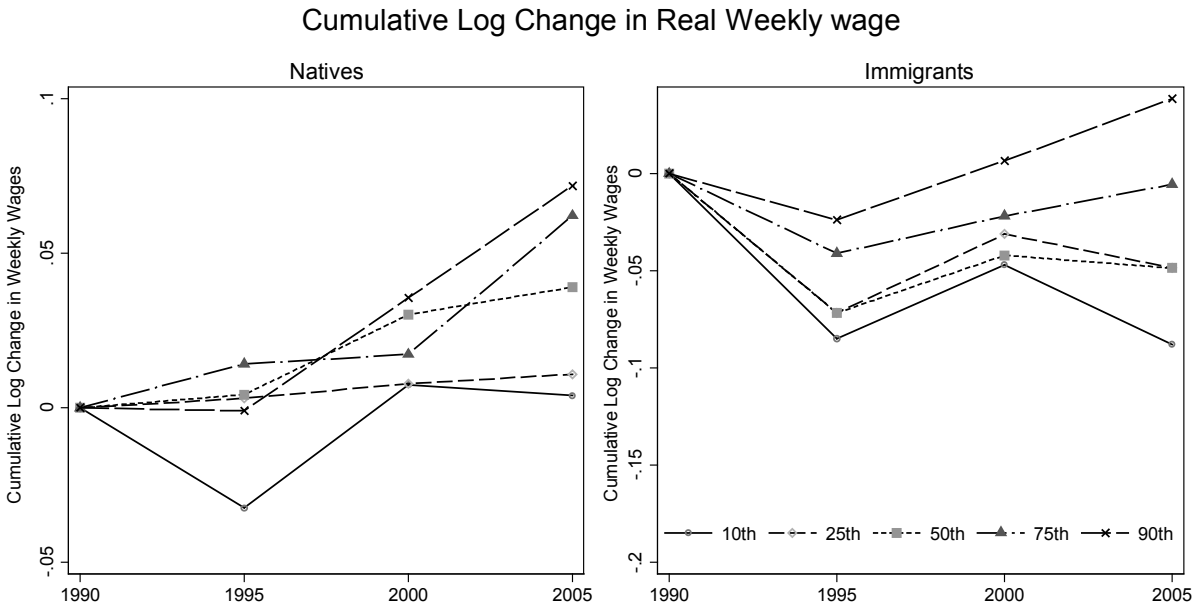


Figure A1-6: Cumulative change in Log real weekly wage

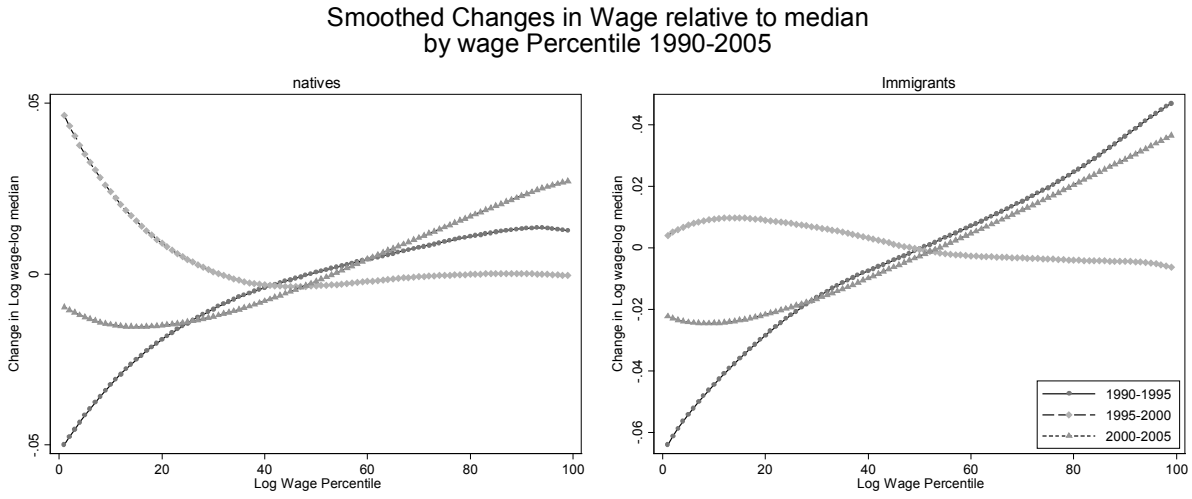


Figure A1-7: Smoothed changes in wage by wage percentile

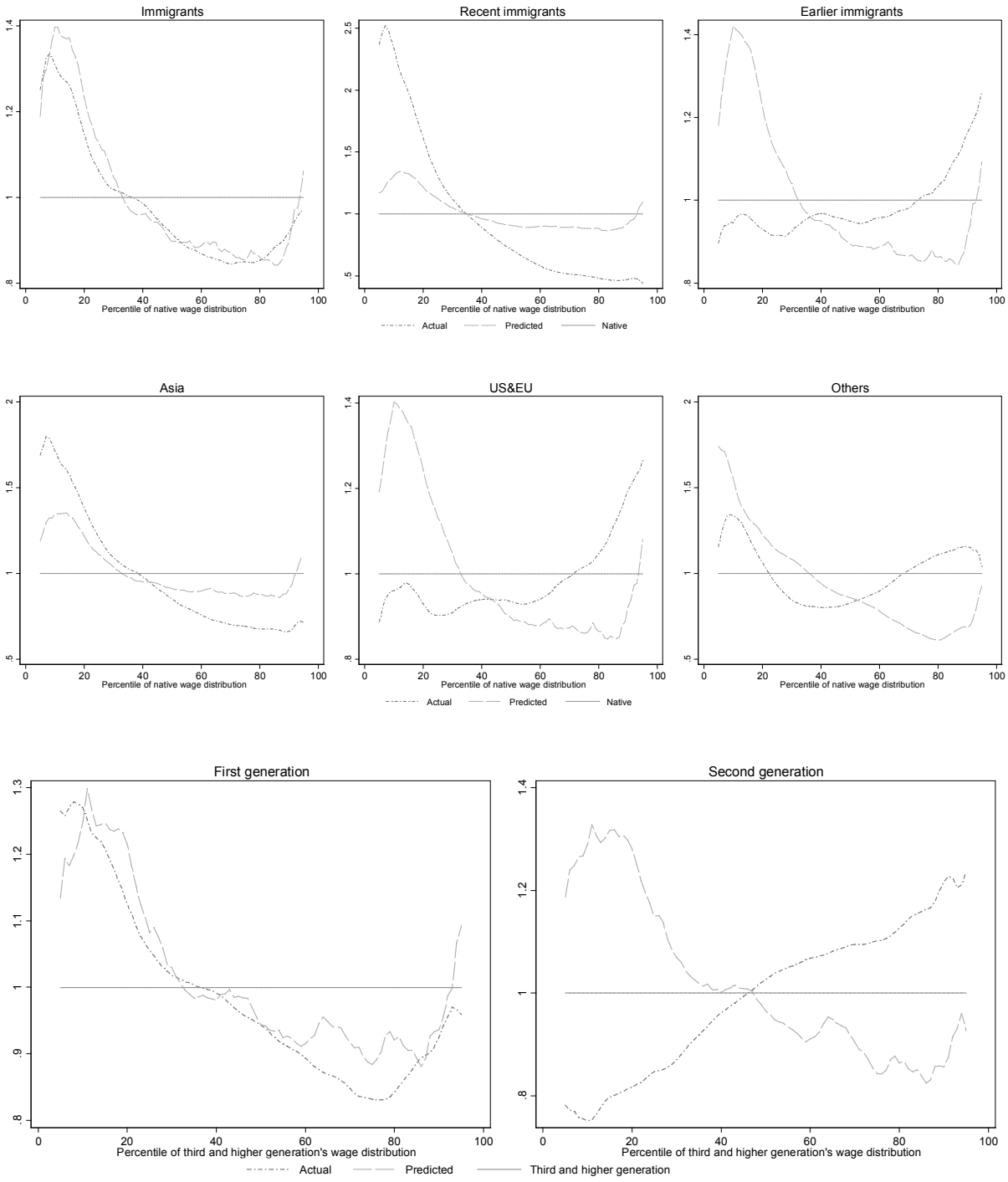
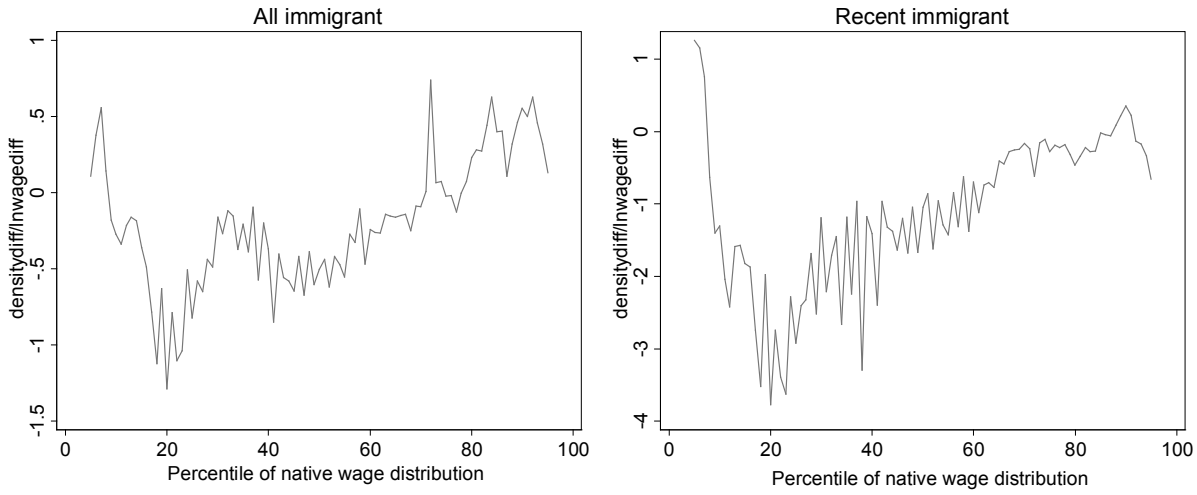


Figure A1-8: Predicted and actual position of immigration in wage distribution



Note: The figure reports for each percentile p of the native wage distribution the ratio of the difference between the density of immigrants(recent immigrants) at p and at p −1 and the difference in log wages at p and p −1.

Figure A1-9 the ratio of the difference between the density and the difference in log wages

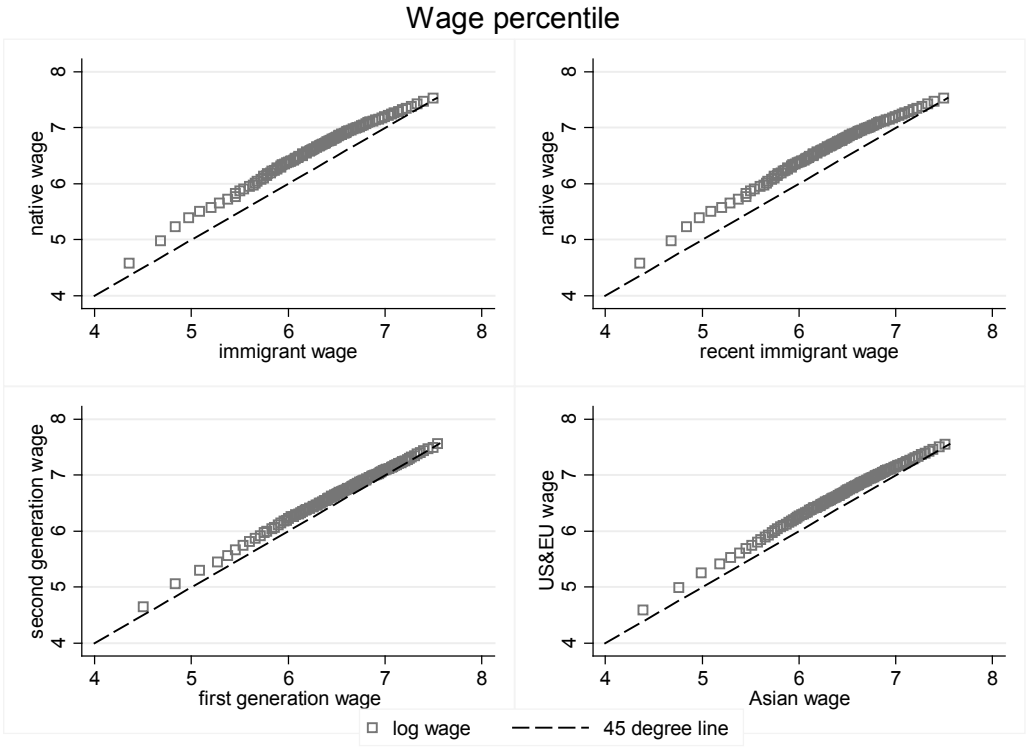


Figure A1-10: Natives and immigrants wage percentile

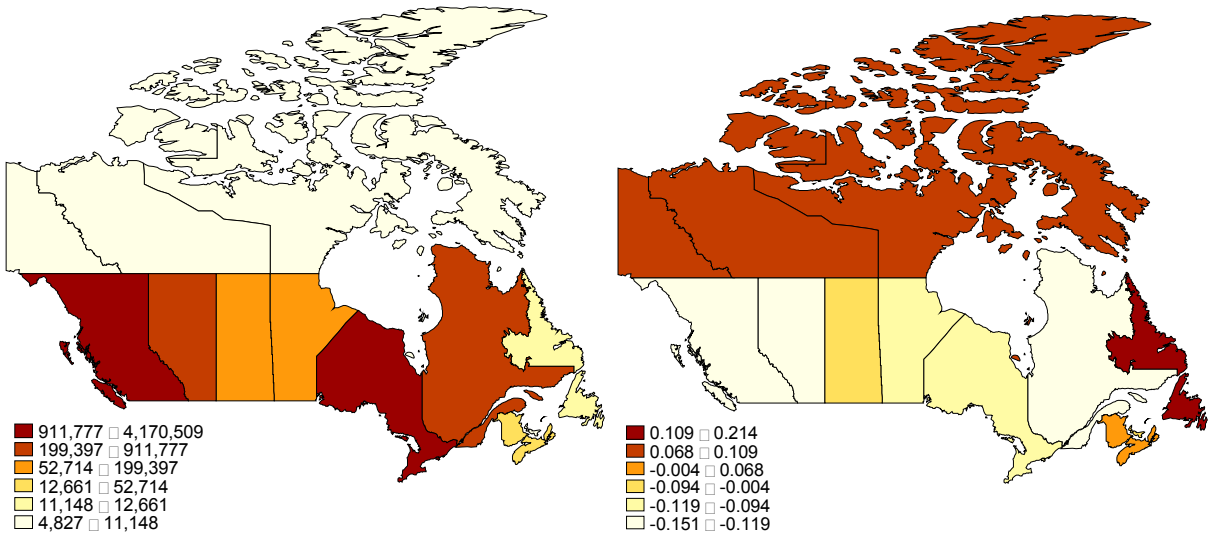


Figure A1-11: Immigrants distribution and log wage gap between immigrant and native by province.

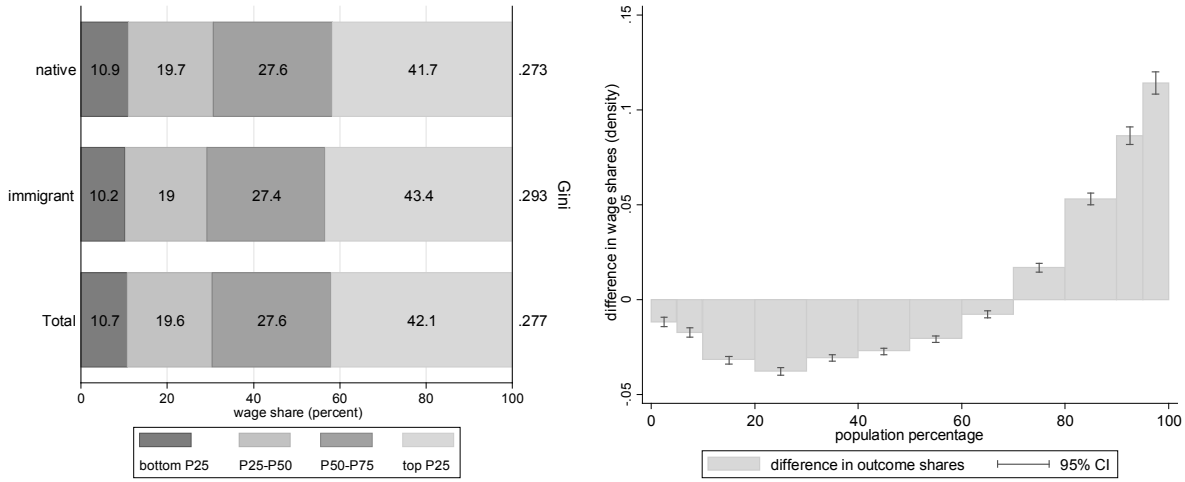


Figure A1-12: wage percentile share(left panel), wage gap between immigrants and natives (right panel)

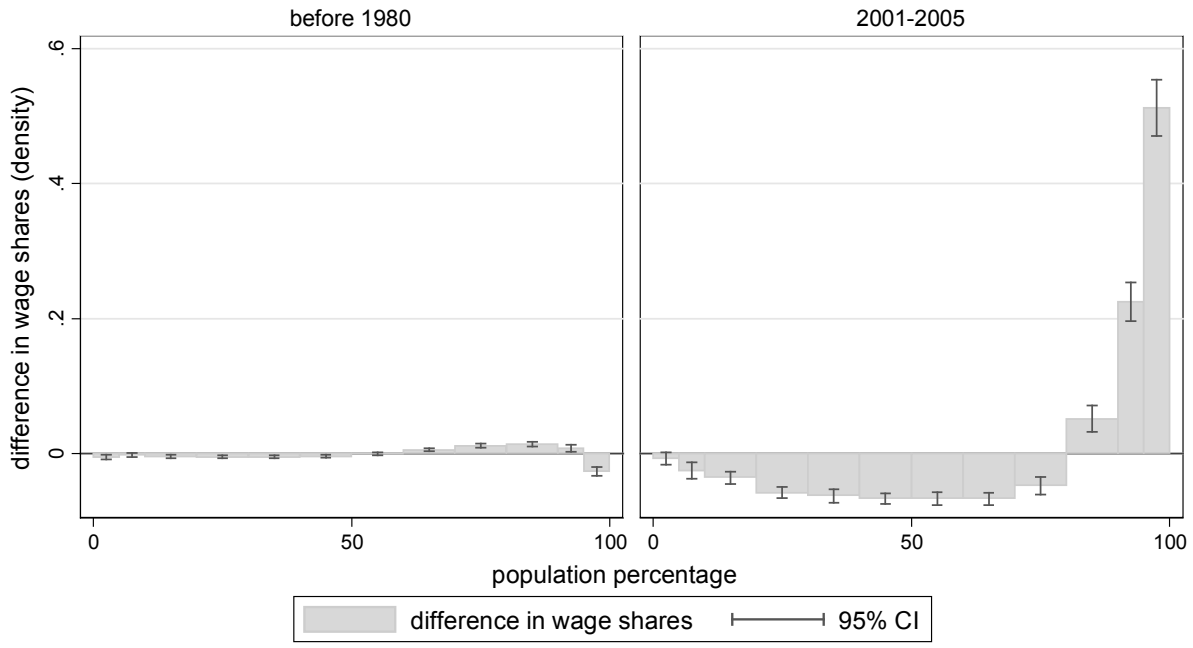


Figure A1-13: Wage gap between immigrants (earlier and recent) and natives

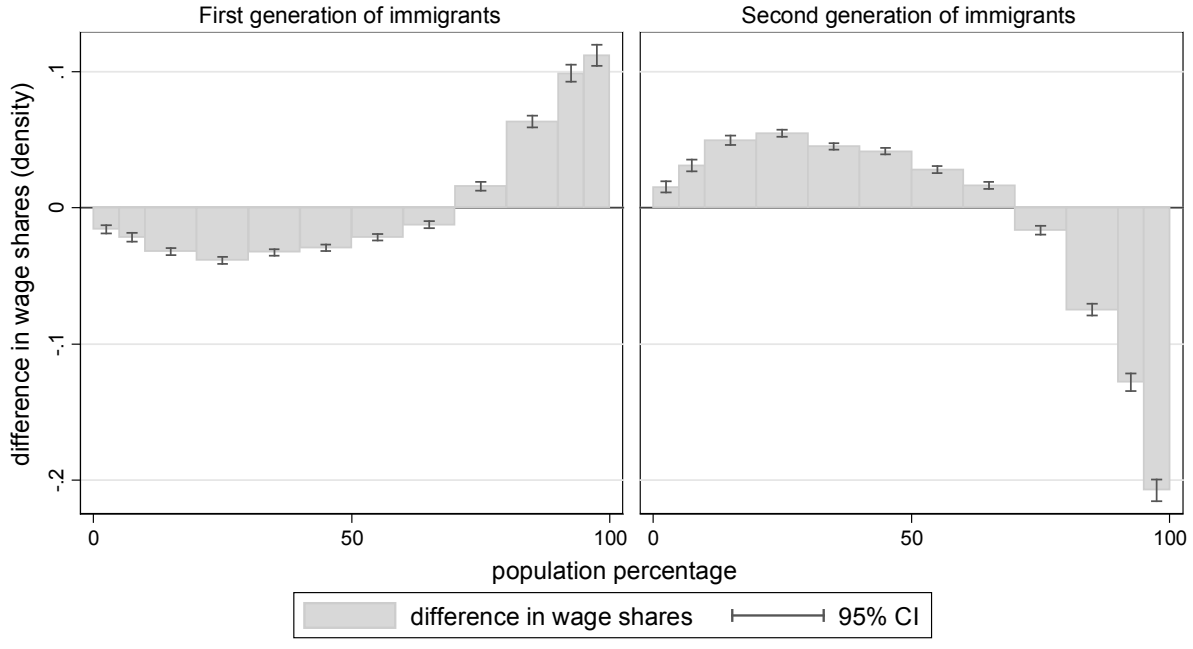


Figure A1-14: Wage gap between first, second generation and third generation

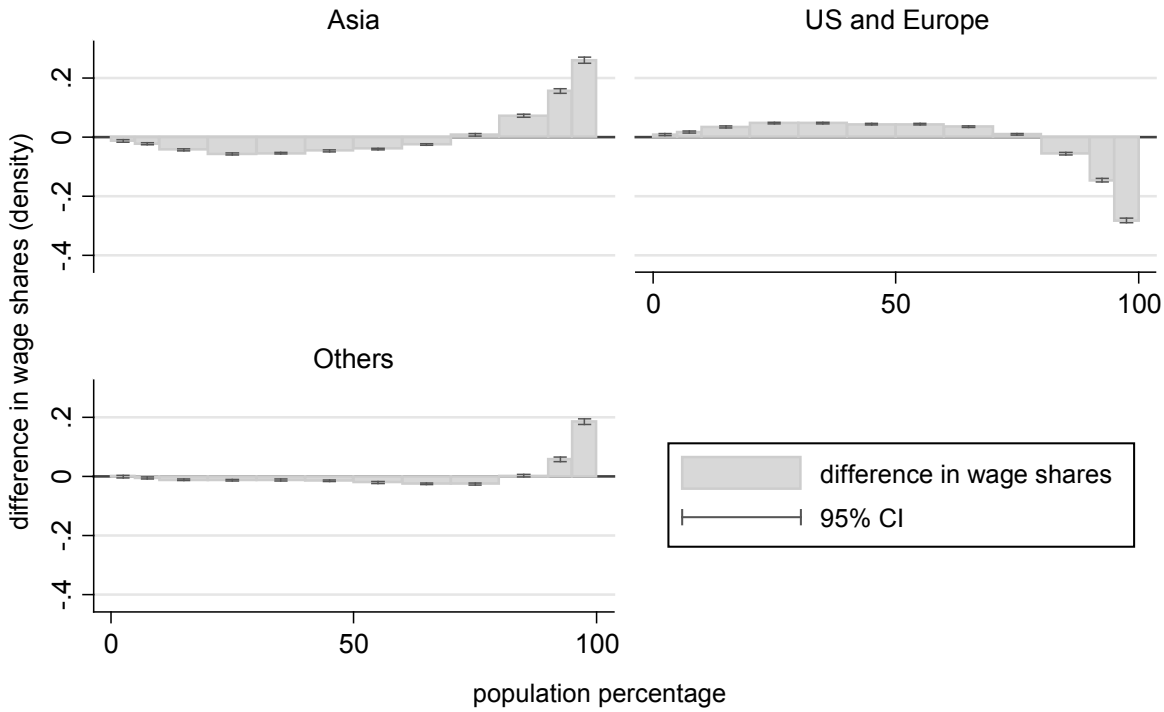
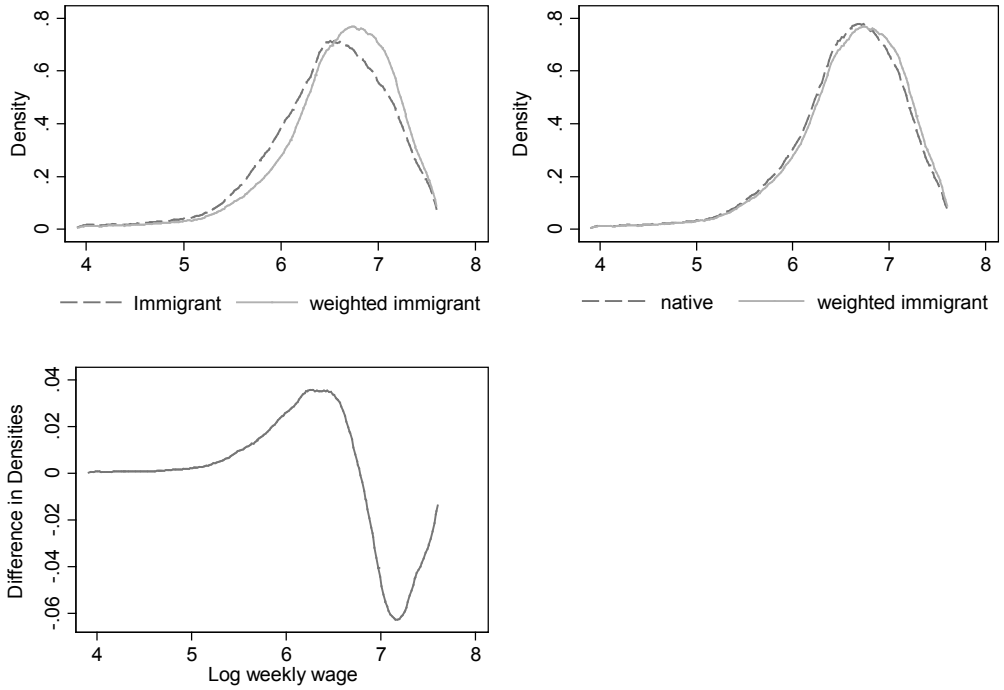


Figure A1-15: Wage gap between immigrants from different places of birth and natives



Note: Weighted immigrant wage density means that how immigrant distribution that would have prevailed if they had been paid like natives. (Control for age, age2, education)(DFL weight,DiNardo, Fortin, and Lemieux (1996))

Figure A1-16: Actual and counterfactual wage densities for immigrants and natives

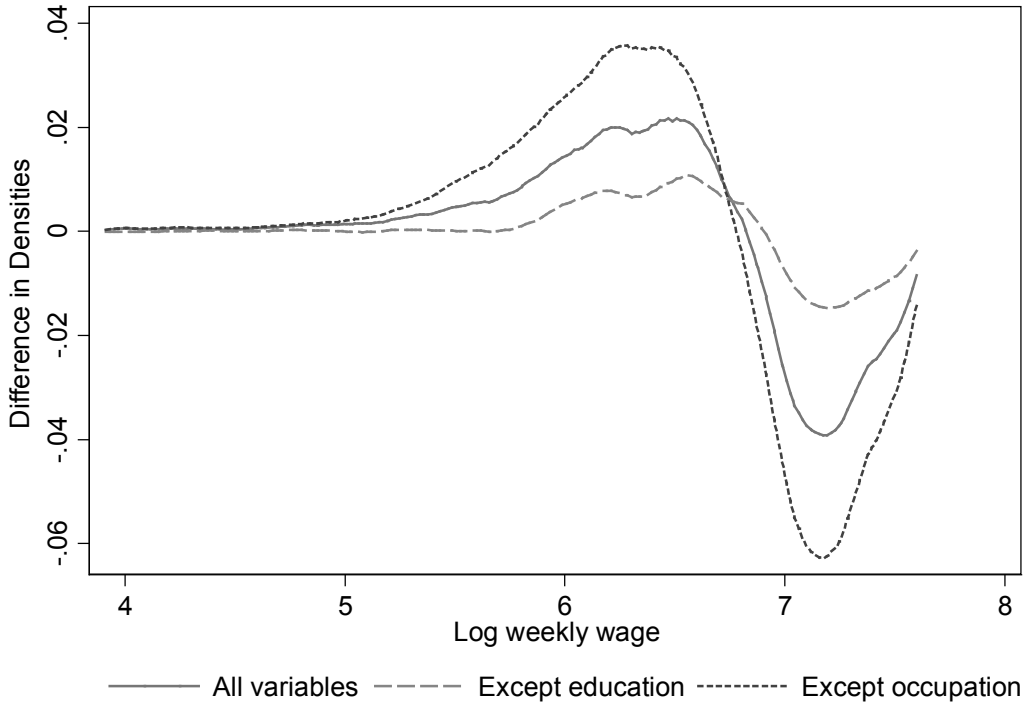


Figure A1-17: Actual native minus counterfactual immigrant wage densities

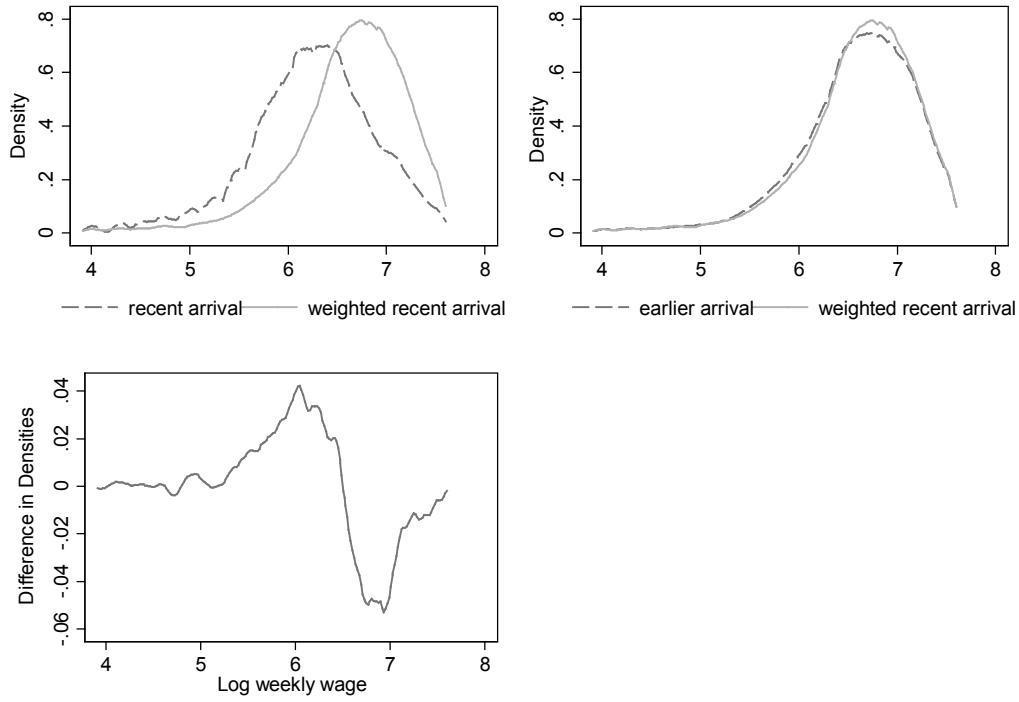


Figure A1-18: Actual and counterfactual wage densities for recent and earlier immigrants

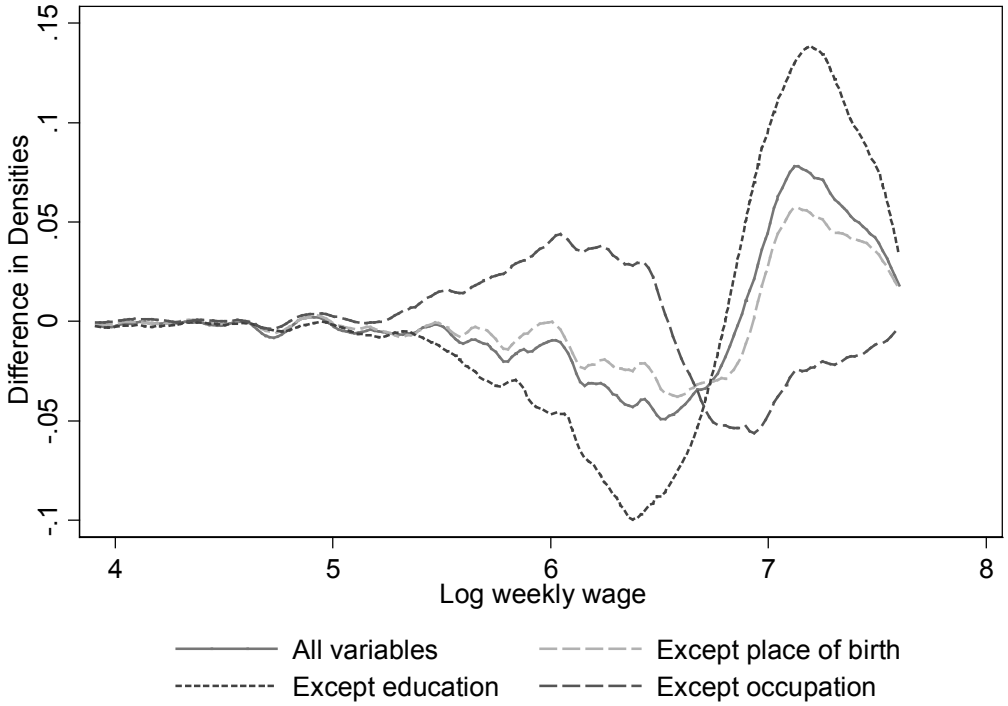


Figure A1-19: Actual earlier immigrant minus counterfactual recent immigrant wage densities

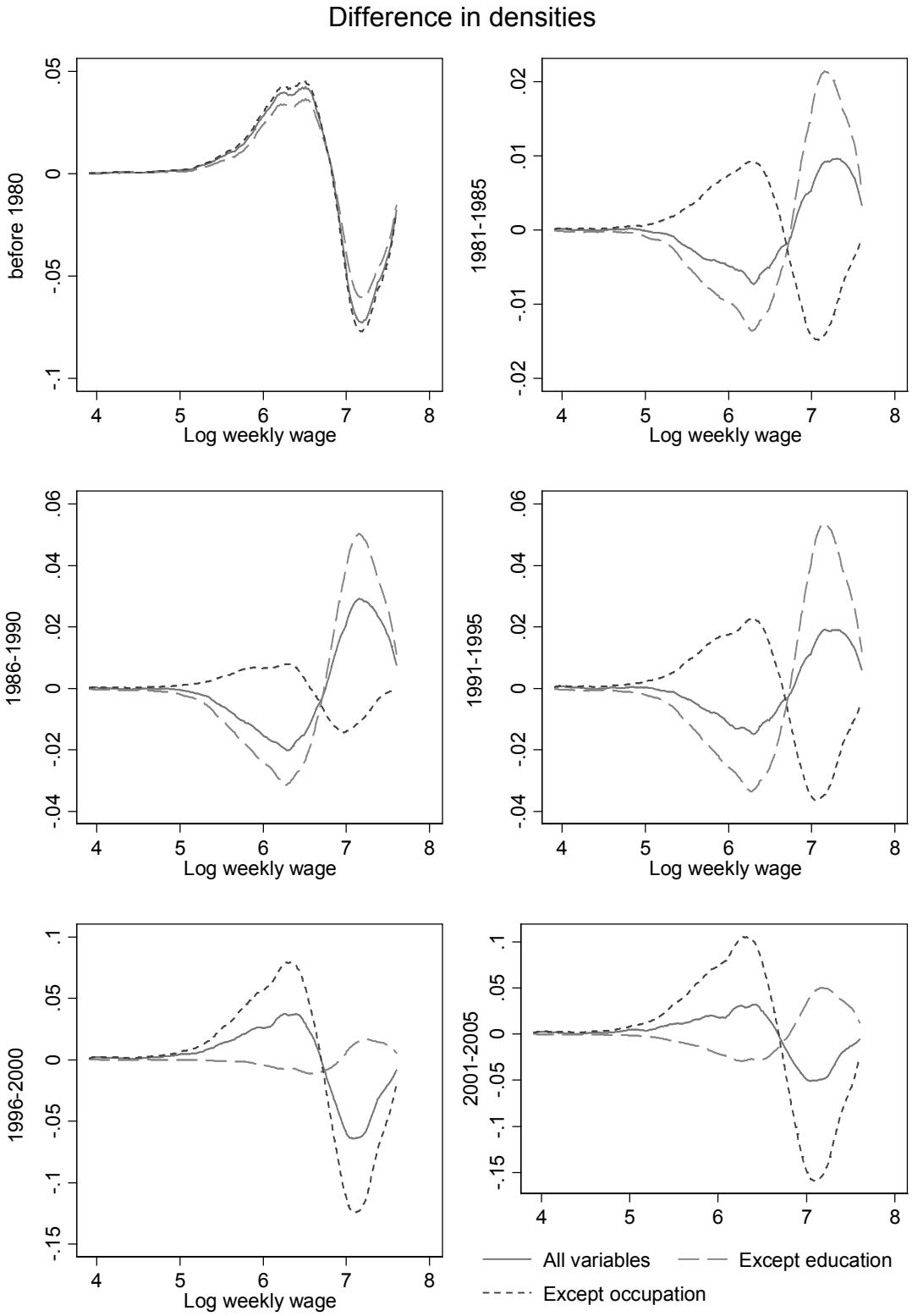
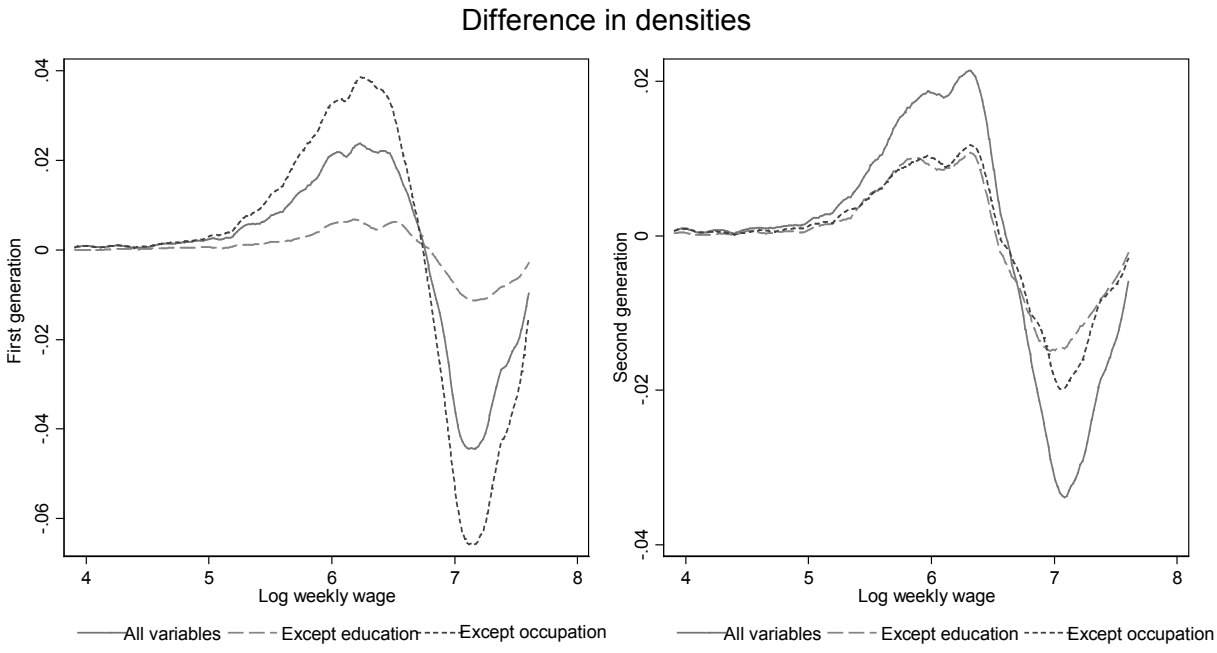
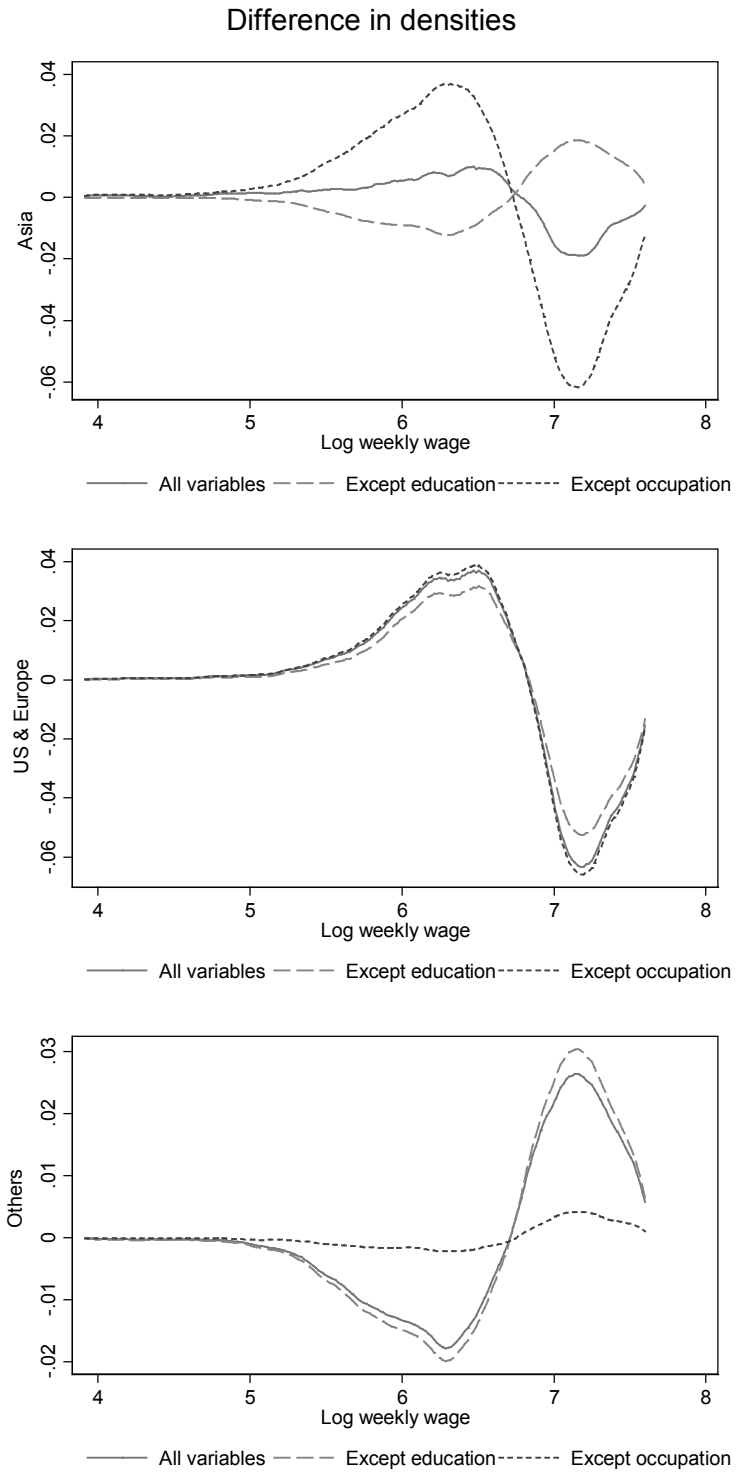


Figure A1-20: Actual minus counterfactual wage densities by year of arrival



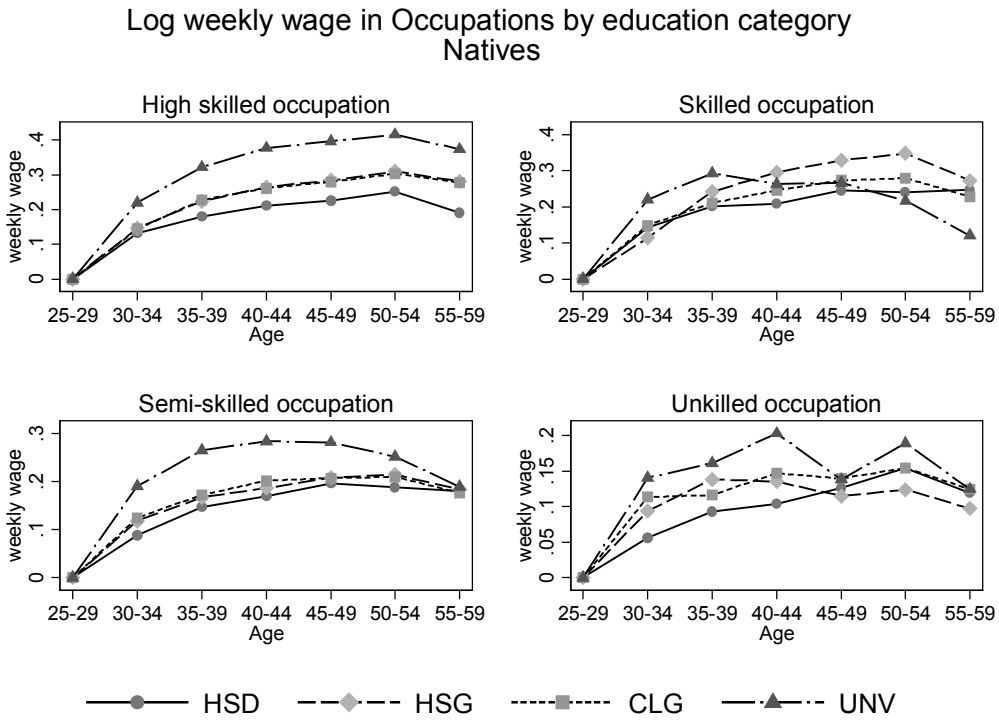
Note: Actual third generation minus counterfactual (first and second generation) wage densities.

Figure A1-21: Actual minus counterfactual wage densities by generation



Note: Actual native minus counterfactual (Asia, US&Europe, and Others) immigrant wage densities.

Figure A1-22: Actual minus counterfactual wage densities by place of birth



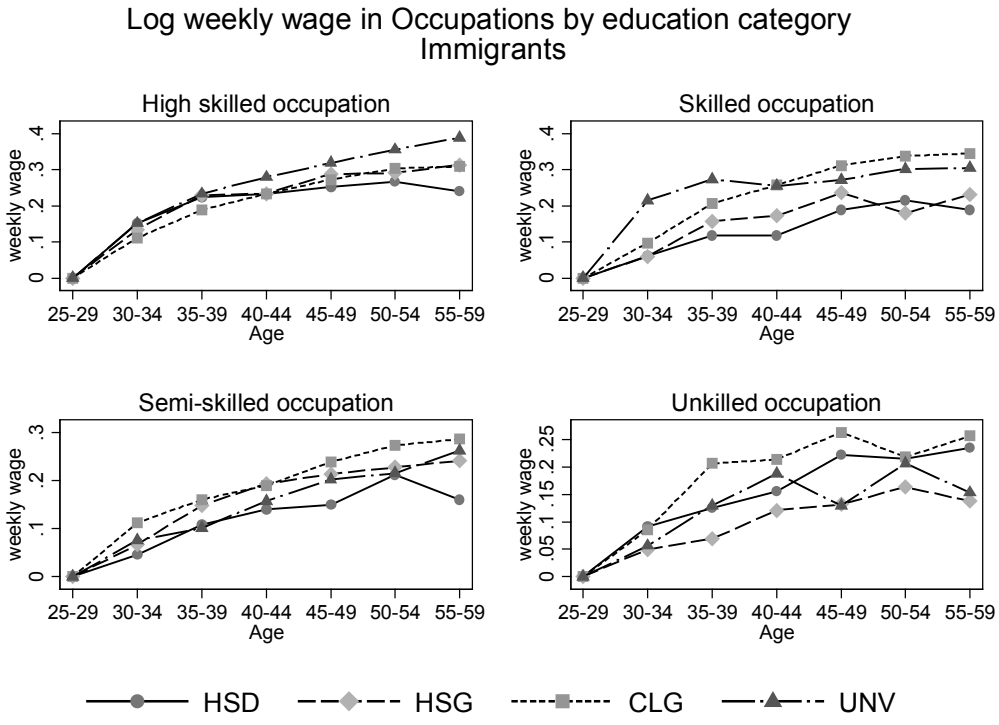
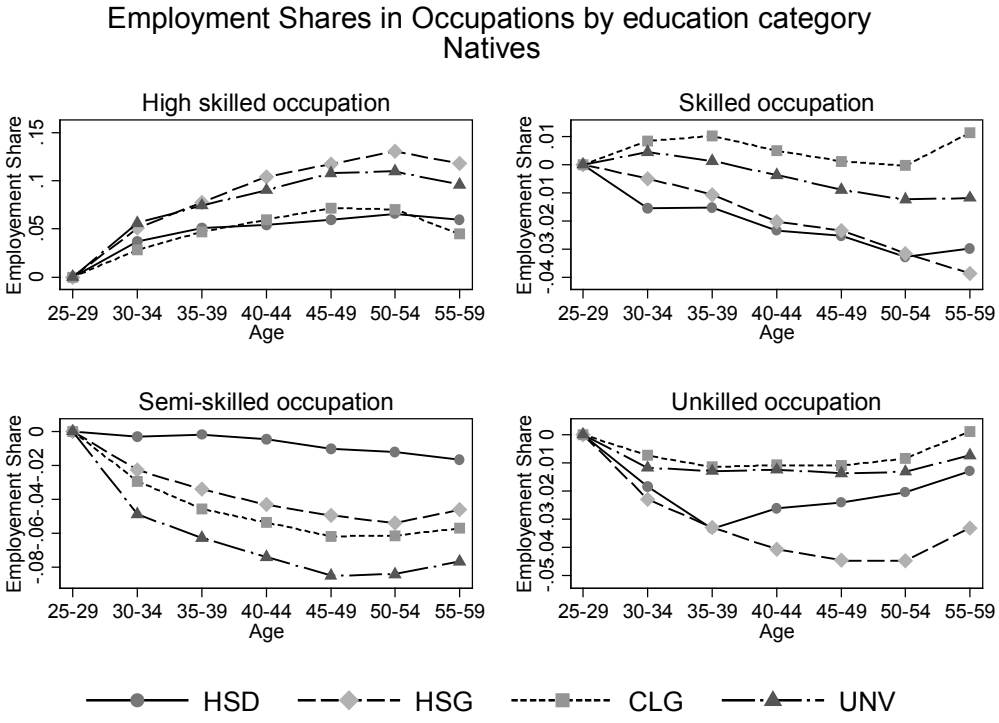


Figure A1-23 Log weekly wage in occupation by education



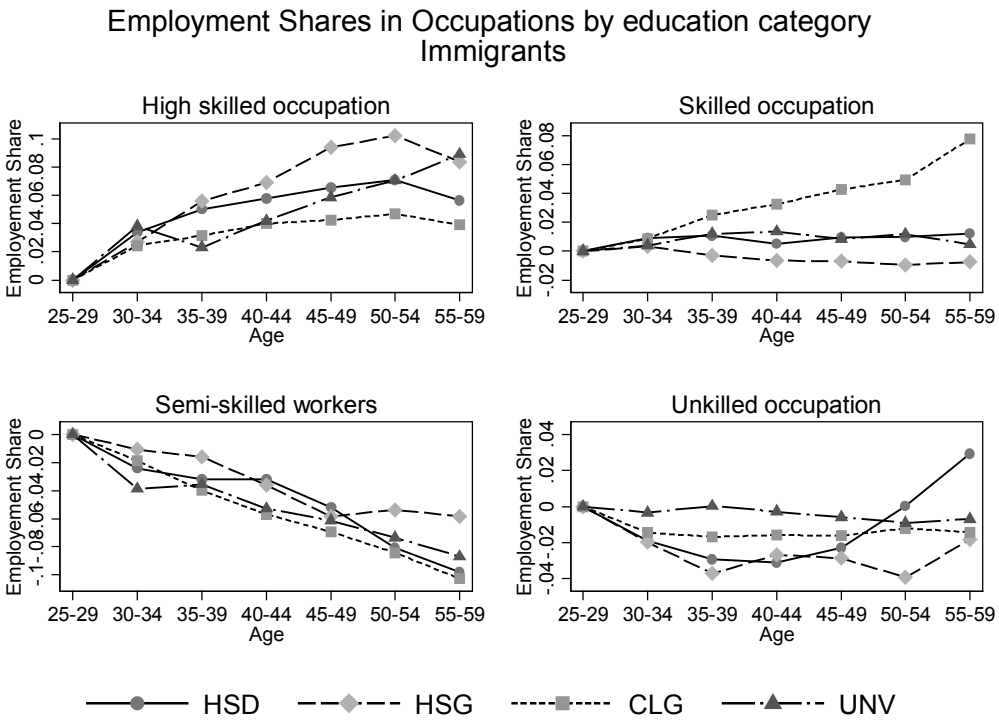


Figure A1-24 Employment shares in occupation by education

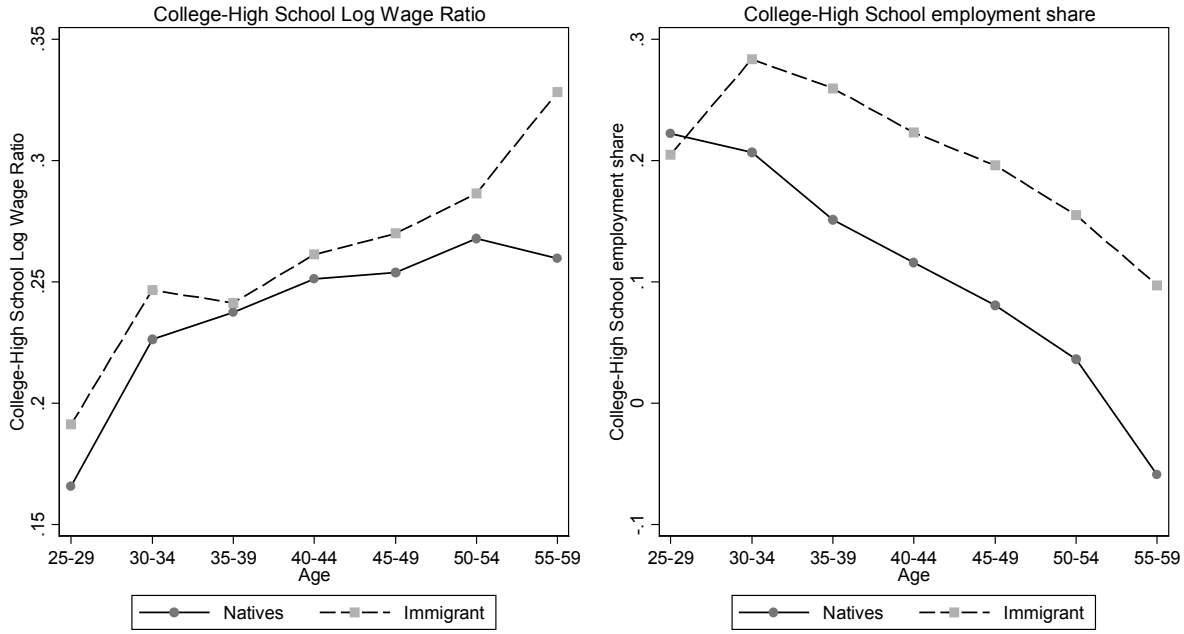


Figure A1-25 College-high School log wage ratio and employment share by age groups

Chapter 2

Wage structure of immigrants and natives in Canada

This chapter explores the wage structure of immigrants and natives in Canada through examining the effect of immigration on the wage of native-born men as well as scrutinizing wage inequality. There are three findings. The first finding is wage effect of immigrants on natives is diverse according to various groups. Increased immigration dwindles the wages of young workers and university group of native-born men. Furthermore, Immigrants have more discernible negative effects on the second generation than the third generation for the university group. The second finding is that recent immigrants make the larger effect on earlier immigrants than natives, specifically, immigrants diminish the relative wage of the high school dropout of earlier immigrants, not that of natives. Recent immigrants have substantially more negative effect on high school dropout of US & European earlier immigrants. The third finding is that through employing the counterfactual method, I conclude that the lower-tail 50/10 overall or residual wage inequality diminishes, but upper-tail 90/50 wage inequality expands for natives from 1990-1995 to 2000-2005. The upper tail overall or residual wage inequality expansion is larger than lower tail wage inequality for natives during whole period 1990 to 2005, which is converse to immigrants. Price effects are the principle factor to the increase in the upper tail and lower tail wage inequality, but labor force composition exerts a substantially paramount effect on the lower tail overall wage inequality if the labor force composition had remained the same as in 1990. In addition, demand shift analysis confirms the findings of wage effect and wage inequality analysis.

2.1 Introduction

It is well known that Canada absorbs more and more immigrants each year from all over the world. Immigration has ranged between 221,352 and 262,236 immigrants per year since 2001. As

recent as in 2008, crucial changes have been made by Citizenship and Immigration Canada to streamline the steady flow of immigrants. The number of immigrants even achieved to 280,688 in 2010, including male 137,002. There are also 258,953 immigrants in the recent year 2013. Undoubtedly, immigrants have a profound effect on the economic development of Canada and constitute a sizable and rapidly growing segment of the Canada labor force irrespective of low-skilled or high-skilled components. A great deal of examination of the effect of immigrants on the wage structure of natives has indicated that the expansion of the labor supply in some labor markets attributable to the increase of immigrants exerts negative effect on the wage of natives, especially for some groups, such as young or low skilled labors, attributable to the elasticity of substitution for immigrants and natives for these groups is high.

Does the large magnitude of immigrants lead to the transformation of wage structure of native-born workers? Does wage inequality for natives increase or decrease? How different about wage inequality for natives and immigrants in Canada? This chapter inquiries into these problems from several perspectives.

2.1.1 Literature review

A large amount of research about the effect on immigrants on wage structure is explored by economists in the past decades. Nevertheless, the studies have gotten various outcomes about the wage effects on the host country. It is a controversial issue among the economists. Borjas, Freeman and Katz (1996), Borjas (2003, 2006), Borjas and Katz (2007) and others argue that immigration has had a negative effect on natives' wages. Borjas (2003, 2006) assumes that immigrant and native labor force of different education and experience are only imperfect substitutes and concludes that immigration lowers the native workers' wages and opportunities. He shows that from 1960 to 2000, U.S. workers' wage fell approximately 3%, while about 9% for high school dropouts and about 5% for college graduates. In contrast, Butcher and Card (1991), Card (1990, 2001, 2005), Friedberg (2001), Lewis (2005) argue that immigration has no discernible effect on the native wages and they arrive a conclusion that immigration on the wages of low-skill workers is not harmed as much as shown by other research.

Cortes (2008) presents a conclusion implementing an instrumental variables strategy that wage effects are considerably smaller for low-skilled natives than for low-skilled immigrants, indicating that the two are imperfect substitutes. Manacorda, Manning, and Wadsworth (2012)

conclude that immigrants have little effect on native wage but have a substantial effect on the wage of previous immigrants especially the workers who have the university degree. Ottaviano and Peri (2012) highlight that owing to immigrants and natives are imperfect substitutes, immigrants have a somewhat positive effect on average native wages in particular of wages of natives with high school dropout, but have a pronounced negative impact on wages of earlier immigrants. Dustmann, Frattini, and Preston (2013) conclude that the impact of immigration on wage structure in the UK is various depending on the different wage distribution. Specifically, immigration increases the wage of natives slightly at the top of the wage distribution, but it diminishes the wage at the bottom of the wage distribution. At the same times, they also find that immigration has no discernible effect on the average native wages. Dustmann, Schönberg, and Stuhler (2017) employing the German data find that the wage impact of immigrants on younger natives is larger than other natives, but employment effect of immigrants on older natives are substantially pronounced. Card (2009) tackles the immigration and inequality using instrument variable method. He concludes that high school dropout and high school graduates are perfect substitutes, however, immigrants and natives are not perfect substitutes within education group. In addition, there are some papers inspect the effect of immigrants on natives in Canada (e.g. Aydemir and Borjas (2007); Aydemir and Borjas (2011)).

Wage inequality is a very hot and interesting issue attracting researchers to contribute the inequality analysis from various angles. Generally, most of the wage inequality research is scrutinized from three kinds of perspectives: supply, demand and institutional factor. Supply perspective consists of various immigrates, high or low skilled workers, etc. (e.g. Card (2009); Juhn and Murphy (1997)). Demand perspective contains computer application, technological transformation, globalization, and import competition, etc. (e.g. Autor, Katz, and Krueger (1998); Card and DiNardo. (2002); Autor, Levy and Murnane (2003); Autor, and Dorn (2013). David, Dorn, Hanson, and Song (2014)). An institutional factor perspective includes the minimum wage, unionization, etc. (e.g. Dinardo, Fortin and Lemieux (1996); Lee, David S. (1999); Autor, and Kearney (2008); Dustmann, Ludsteck, and Schonberg (2009)). In addition, there are other wage inequality analysis contributing to theoretical or empirical literature (e.g. Bound and Johnson (1992); Murphy and Welch (1992); Katz and Murphy (1992); Juhn, Murphy, and Pierce (1993); Borjas and Ramey (1995); Blau and Kahn (1996). Welch (1999); Pierce, Brooks (2001); Piketty and Saez (2003);Lemieux (2006a); Blundell, Gosling, Ichimura, and Meghir (2007); Lemieux,

Macleod and Parent (2009); Philippon and Reshef (2012); Young (2013); Card and Kline (2013); Chetty, Hendren, Kline, and Saez (2014)).

2.1.2 Motivation

The effect of immigration on the wage structure of natives has been scrutinized for the United States and the United Kingdom since last century by economists, in spite of the fact that literature about immigrant-native is considerably less compared to voluminous literature about black-white (e.g. Boustan (2010)) and female-male (e.g. Juhn and Murphy (1997); Juhn and Kim (1999); Autor, Acemoglu, and Lyle (2004); Mulligan and Rubinstein (2008)). The motivation for this study is threefold. The first motivation is that the measured impact of immigration on the Canadian wage structure is tackled substantially little despite an abundance of careful studies about wage structure of the US and UK. In addition, the existing evidence provides mixed results about the measured wage effect of immigration which fluctuates widely from study to study and there is no consistent conclusion yet. One of my goals is to identify that to what extent the wage structure of natives is influenced by immigrants or recent immigrants, and to what extent that of the previous immigrants are impacted by recent immigrants. As the Canadian census shows, Asians have become the main part of immigration source countries and almost two-thirds of Asian recent immigrants have the university degree. That is, education attainment for immigrants is higher than that around three decades ago. As a result, high-skilled immigrants arriving at Canada may generate a substantial effect on wage structure of Canadian labor force. Besides, it is a good point to examine the effect of the relative wage of native according to immigrants from the divergent place of birth. Furthermore, the first generation, the second generation of immigrants and the third or higher generation have distinct experience and environment when they grow up. The census 2001 and 2006 provide the detailed data of different generation, therefore the new perspective of analyzing wage structure by generation would contribute to the immigration study.

The second motivation is that immigrants will have a diverse effect on the wage of natives across subgroups such as different age groups, education groups, etc. Since youth labor market is notably negatively influenced by low skilled immigrants in the US (Smith (2012)), the exploration of how immigrants make an effect on the relative wage of Canadian across different age groups would provide some insightful suggestion to the policy makers. The preliminary results you shall

see indicate that increased immigration in Canada exerts a more substantially discernible impact on young natives than old natives.

The third motivation is that wage inequality is an important and essential part to examine the wage structure. The overall inequality and residual inequality based on the counterfactual methods would be a good angle to tackle the wage distribution of immigrants and natives. In addition, data about the occupation and industry is available, demand shift measures (within and between industries) are applied to draw inference on the wage structure of immigrants and natives.

There are three findings in this chapter as I scrutinize the effect of immigration on wage structure of native-born workers. The first is wage effect of immigrants on natives is various according to different groups. Increased immigration reduces the wages of young native-born workers and university education native-born workers. Additionally, immigrants have more discernible negative effects on the second generation than the third generation for the university group. The second is that recent immigrants influence earlier immigrants more than natives. Specifically, immigrants diminish the relative wage of the high school dropout of earlier immigrants, not that of natives. Recent immigrants have substantially more negative effect on high school dropout of US & European earlier immigrants. The third is that the lower-tail 50/10 overall or residual wage inequality dwindled, but upper-tail 90/50 wage inequality expanded for natives from the first subperiod 1990-1995 to the last subperiod 2000-2005. The upper tail overall or residual wage inequality rose more than lower tail wage inequality for natives during the whole period 1990 to 2005, which is contrary to immigrants. Price effects are the main factor to the expansion in the upper tail and lower tail wage inequality, but labor force composition effects play a considerably important role in the lower tail overall wage inequality if the labor force composition had remained the same as in 1990. Additionally, demand shift analysis confirms the results of the wage effect and wage inequality examined in this chapter.

The structure of the paper is as follows. Section 2.2 introduces the data. Section 2.3 tackles the effects of immigration on the wage of natives. Section 2.4 explores the wage inequality and demand shift analysis. Section 2.5 concludes.

2.2 Data

This chapter mainly examines the male full-time workers of natives and immigrants who were age 25–59 in the census year. The empirical analysis uses four census data 1991, 1996, 2000, and 2005. Definition of each variable is same as that in chapter 1.

When calculating the effects of immigration on wage structure of natives, for the purpose of keeping the analysis as consistent as possible with previous research, this study classifies individuals into year-age-education-immigrant cells. Hence, there are 224 cells (7 age groups by 4 years by 2 immigrant status groups by 4 education groups) to estimate the elasticity of substitution.

2.3 The effects of immigration on wage structure of natives

2.3.1 Methodology

This study implements similar idea and approach to the previous literature (e.g. Welch (1979); Card and Lemieux (2001); Borjas (2003); Aydemir and George (2007); Manacorda, Manning, and Wadsworth (2012); Ottaviano and Peri (2012); Bratsberg and Raaum (2012); Borjas, Grogger, and Hanson (2012); Dustmann, Frattini and Preston (2013); Dustmann, Schönberg and Stuhler (2017)) to examine the immigrants on the effect of the relative wage of natives and analyzes the elasticity of substitution of native and immigrants within each age–education group.

To estimates the elasticity of substitution between the immigrants and natives, I consider immigrants and natives as various production inputs within each age and education cell. The production function is assumed as a nested Constant Elasticity of Substitution (CES) form (Bowles, 1970; Card and Lemieux, 2001):

$$Y_t = \left[\sum_e \mu_{et} H_{et}^{\rho}\right]^{\frac{1}{\rho}} \qquad (2.1)$$

where $-\infty < \rho \leq 1$, $\rho = 1 - 1/\sigma_E$, with the elasticity of substitution σ_E between the four education groups. The marginal product of labor for a given age-education group in this situation relies on both the group's own supply of labor and the aggregate supply of labor in its education group.

Next, the skill-specific labor input H_{et} is modeled as a CES aggregation of a set of imperfect substitute age-specific labor inputs according to:

$$H_{et} = (\sum_a \gamma_{ea} H_{eat}^{\eta})^{(\frac{1}{\eta})}, \quad (2.2)$$

Where H_{eat} refers to the number of labors in education group e and age group a, and $\eta = 1 - \frac{1}{\sigma_A}$, with σ_A being the partial elasticity of substitution between different age groups within an education group $(-\infty < \eta \leq 1)$. γ_{ea} is the relative efficiency of different age inputs for each education group. Following Card and Lemieux in assuming no age-biased technical progress, α_{ea} is fixed over time, and $\sum_a \gamma_{ea} = 1$

As in Ottaviano and Peri (2012), this study assumes that each age-education specific input is a CES combination of native-born and immigrant workers:

$$H_{eat} = (N_{eat}^{\delta} + \theta_{eat} M_{eat}^{\delta})^{(\frac{1}{\delta})}. \quad (2.3)$$

Where M, N denote immigrants and natives respectively and θ is the native-immigration relative efficiency parameter. This chapter employs σ_I indicating the elasticity of substitution between immigrants and natives. In other words, $\sigma_I = 1/(1-\delta)$, where $(-\infty < \delta \leq 1)$. Immigrants and natives are not perfect substitutes if $\delta \neq 1$.

According to the assumption that the wage equals the value of marginal product in a competitive labor market, immigrant and native wage can be written as

$$W_{eat}^{M} = \frac{\partial Y_t}{\partial M_{eat}} = \frac{\partial Y_t}{\partial H_{et}} \times \frac{\partial H_{et}}{\partial H_{eat}} \times \frac{\partial H_{eat}}{\partial M_{eat}} = \mu_{et}\gamma_{ea}\theta_{eat} {Y_t}^{1-\rho} {H_{et}}^{\rho-\eta} {H_{eat}}^{\eta-\delta} {M_{eat}}^{\delta-1}$$

$$W_{eat}^{N} = \frac{\partial Y_t}{\partial N_{eat}} = \frac{\partial Y_t}{\partial H_{et}} \times \frac{\partial H_{et}}{\partial H_{eat}} \times \frac{\partial H_{eat}}{\partial N_{eat}} = \mu_{et}\gamma_{ea} {Y_t}^{1-\rho} {H_{et}}^{\rho-\eta} {H_{eat}}^{\eta-\delta} {N_{eat}}^{\delta-1}$$

Taking logarithm, the first-order condition for the immigrant and native wage becomes:

$$\log W_{eat}^{M} = log\mu_{et} + log\gamma_{ea} + log\theta_{eat} + (1-\rho)logY_t + (\rho-\eta)logH_{et} + (\eta-\delta)H_{eat} + (\delta-1)M_{eat}$$

$$\log W_{eat}^{N} = log\mu_{et} + log\gamma_{ea} + (1-\rho)logY_t + (\rho-\eta)logH_{et} + (\eta-\delta)H_{eat} + (\delta-1)N_{eat}$$

All in all, the native–immigrant wage differential in each cell:

$$ln\frac{W_{eat}^{N}}{W_{eat}^{M}} = -ln\theta_{eat} + \frac{1}{\sigma_I}(\frac{M_{eat}}{N_{eat}}) \quad (2.4)$$

The estimation of the elasticity of substitution between immigrants and natives is calculated by regressing the relative immigrant weekly wage on the relative immigrant share. Specifically, the relative wage is computed by weekly wage of native to that of immigrant; the relative share is computed by total hours worked ratio for immigrants and native.

$ln\theta_{eat}$ is various by education, age and times for both immigrants and natives, therefore, an estimate of $ln\theta_{eat}$ can be yielded by adding the coefficients on education, age and time dummies $D_e, D_a, and\ D_t$. That is:

$$-ln\theta_{eat} = D_e + D_a + D_t$$

The estimation σ_I for equation (2.4) can be given by

$$ln\frac{W_{eat}^N}{W_{eat}^M} = D_e + D_a + D_t + \frac{1}{\sigma_I}\left(\frac{M_{eat}}{N_{eat}}\right)$$

2.3.2 The effects of immigration on native wage

First, this section provides an overview of the immigrant share change, native and immigrants wage change from 1990 to 2005 in Figures 2.1 and 2.2. Figure 2.1 plots the average immigrant share change and native wage change from 1990 to 2005. There are 7 age groups from 25 to 59 and 4 education groups. i and j in age and education groups AE_{ij} are introduced as follows. i =1,2,3,4,5,6,7 indicates the age groups: 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, and 55-59, j =1,2,3,4 refers to the education groups: high school dropout, high school, college and university. As graphed in Figure 2.1, average immigrant share change for immigrants who are younger than 40 as well as have university degree increases much more than other groups. Immigrants share for 30-39 age groups expands more than other groups from 1990 to 2005, although immigrant share for this group is not high in 1990. Besides, the average immigrants share change for immigrants older than 40 depends on their education, that is, it rises if they have the university degree whereas it diminishes if they have the college degree. For other age education groups, the average immigrant share change is almost invariant. The reason is that on the one hand more and more Canadian have the college degree, on the other hand, the immigration policy attracts more university graduates and young immigrants. Additionally, native weekly wage change, on average, is negative for all groups. The negative wage change for native with the college degree as well as older than 45 years is smaller than other groups. Especially, the negative wage change for natives who are older than 55 and have the college degree is much smaller than any other groups. In contrast, natives who are younger than 35 and high school dropout have suffered a lot more than any other groups.

The left panel in Figure 2.2 illustrates that immigrant share for university groups is substantially greater than any other education groups in 2005. It also points up immigrant share

change for immigrants who are older than 40 years old and have the college degree is larger than -0.1, a sizable drop. As shown in the right panel of Figure 2.2, most of the relative wage change of immigrants is negative except low education groups. It is emphasized that immigrants who are 45-50 years old and own the university degree encounter the largest negative relative wage change, -0.2, although immigrant share change for this group experienced somewhat expansion.

The estimates of the elasticity of substitution of immigrants and natives for all full-time men are presented in Table 2.1. The findings for 4 education groups and 3 age groups are also reported. First of all, the relative wage of natives experiences a rise when relative immigrant share increases with fixed effects and weight, which demonstrates that immigrants and natives are imperfect substitutes. Nevertheless, the results of four education groups provide more meaningful information, which is consistent with previous literature (e.g. Dustmann, Schönberg, and Stuhler (2017), Smith (2012), etc.). One obvious reason for this is that more university immigrants moved to Canada during the last thirty years. The other reason is that the elasticity of substitution between university natives and university immigrants is substantially larger than that between low educated natives and low educated immigrants. In fact, there is a little discernible effect on low educated natives (HS dropout and HS graduates) due to low educated immigrants are imperfect substitutes of low educated natives. In other words, estimation coefficient for university group is significant and negative when the fixed effects and weight is added, which is divergent from other groups. In contrast, estimation coefficient for some college group is significant and positive. That is, the expansion of relative university immigrant share diminishes the relative wage of natives. While it has a positive effect on the wage of natives for the college group. Besides, the findings of three different age groups tell that wage of young natives below age 35 are negatively and significantly influenced by immigrants when we use weight 1 and weight 2 without fixed effects, as well as fixed effects without weight. Given that young natives have less experience, as well as the substitution for immigrants and natives for young is much higher than other groups, the immigrants especially low-skilled immigrants usually concentrated on jobs which are taken by young natives (Smith (2012)). Furthermore, the coefficient for middle groups between 35 and 49 is negative but insignificant without fixed effects, however, if the education and year fixed effects are controlled, the negative coefficient transitions to positive and significant. Overall, the results in columns 1 to 3 explore that the substitution between immigrants and natives is higher for the young group and university group. Columns 4 to 7 employ different weight to robust test the elasticity of substitution

for immigrants and natives. With the second and third weight, the results are almost invariant compared with the result of weight 1. The exception is that the negative coefficient for the young group becomes insignificant with the third weight, and the coefficient transitions to negative and insignificant for high school dropout with the third weight and fixed effects.

This section next turns to exploring how the relative immigrant share change affects the relative wage of different generations when the natives are divided by the second generation of immigrants and the third or higher generation. The second generation of immigrants may have both the characteristics of immigrants and natives, hence it is interesting to compare the effect on the second generation with the effect on the third generation. The coefficient in Table 2.2 for all workers is negative and insignificant for both the second and the third generation with no fixed effects, however, when the fixed effects are applied, the coefficients become positive and insignificant for both groups. Other rows summarize the findings of subgroups. Relative immigrants share expansion lessens the relative wage of university group of the second generation, but not the third generation. In contrast, immigrants make a positive effect on the college groups of both generations. Besides, with fixed effects and weight, expansion of relative immigrant share also declines the relative wage of the young group of both second generation and third generation, which indicates that elasticity substitution of immigrants to native for the young group is higher than middle and old groups. Further, without fixed effects, the middle age group 35-49 is also negative and significant, which indicates that the expansion of immigrant share dwindles the relative wage of middle age group. However, when the fixed effects are included, the coefficient for the middle age group become positive and insignificant, which indicating that the immigrant does not have much effect on the middle age group. What's more, for the high school dropout, the second generation shows a divergent result compared to the third generation, which provides an explanation that expansion of immigrants increases the relative wage of high school dropout of the third generation, but not the second generation. Overall, the substitution of elasticity between immigrants and the second generation is higher than that among immigrants and the third generation, especially for university workers.

Another relevant estimation is about the recent immigrants who live in Canada less than 5 years before the survey year. The main empirical finding in Table 2.3 is that the relative recent immigrant share expansion reduces the relative wage of earlier immigrants for the high school dropout group when age is controlled, but the situation is converse without fix effects. The increase

of relative recent immigrant share also expands the wage of earlier immigrants for university group. It is obvious that the effect on earlier immigrants is larger than the effect on natives attributable to that recent immigrants may take the similar jobs as earlier immigrants for the low skilled groups. It is noted that the rise of the relative share of recent immigrants for old group 50-59 dwindles the relative native wage without fixed effects and weight, but it has no significant negative effect on the earlier immigrants for this group. Another main finding is that the relative wage of the middle age group of both natives and earlier immigrants will increase if the relative share of recent immigrants rises.

Table 2.4 explores that the effect of recent immigrants to earlier immigrants according to the various place of birth. Without fixed effects, the coefficients of four education groups except high school group are positive and significant for earlier immigrants from Asian and Others. Nevertheless, when the fixed effects are included, the rise of the relative recent immigrants share increases the relative wage of university group of Asian earlier immigrants, but it transitions to insignificant for US&Europe and Others. Further, immigrants also substantially diminish the relative wage of high school dropout group of US&Europe. The second panel mentions the age group. The coefficients for young and middle age groups with fixed effects are positive and significant for all three places of birth. The last panel examines all workers. The increase of the relative share of immigrants expands the relative wage of earlier immigrants from different place of birth for all workers without fixed effects, whereas the coefficients become insignificant with education and age fixed effects.

2.4 Wage inequality and demand measure shifts

Trends in wage inequality are documented in this part. Figure 2.3 shows that evolution of wage inequality for natives and immigrants by year. Top two panels reveal that Log wage differential for lower tail 50/10 is higher than upper tail 90/10 for both natives and immigrants. Immigrants experienced larger 50/10 inequality than natives, while upper tail 90/10 inequality for immigrants is higher than natives. Bottom two panels highlight the cumulative log wage change at the 10th, 50th and 90th wage percentile. Wage growth of 90th wage percentile for natives is higher than immigrants. Wage growth of 50th and 10th is negative for both natives and immigrants, the wage drops more for immigrants than natives.

Figure 2.4 shows the change in real log weekly wage from 1990 to 2005 for various groups. This figure normalizes wage in 1990 as 0. The first panel is about the education group. Wage in each education group for both natives and immigrants dropped strikingly between 1990 and 1995. Native college group experienced rise from 1995 to 2005, whereas, immigrant university group encountered heavily plummet during the same period. The second panel refers to wage change by the age group. The wage change from 1990 to 1995 is negative for each age group except the native old group. During this period, young age group diminished more than any other group for natives, while the middle group dropped most for immigrants. Wage plummeted in the young group for both natives and immigrants between 2000 and 2005. For wage change of the old group during the same period, natives increased, while immigrants decreased. The third and fourth panels highlight the difference of wage change by age groups through dividing education into two categories. All groups underwent decrease between 1990 and 1995. The young group experienced a rise between 1995 and 2000 in each panel, and the young group encountered a decline between 2000 and 2005 except the native college group. Between 1995 and 2005, the wage of middle age group diminished for native high school and immigrant college categories, while it somewhat rose for other two categories. For the wage of old groups, immigrants dwindled over the whole period between 1990 and 2005, while natives experienced a decrease between 1990 to 2005 as well as an increase between 2000 and 2005.

As revealed in Figure 2.5, smoothed changes in wage relative to the median by wage percentile are similar between 2000 and 2005 for natives and immigrants. For 1990-1995, the shape of immigrants is roughly linear which indicates that change in log wage/median is increasing along the wage percentile, but the change for natives is going down from 80 percentile onward.

Overall and residual standard deviation for natives and immigrants are highlighted in Figure 2.6. The four education categories and seven age groups, as well as all possible interactions between the two variables are controlled. The left panel of the figure indicates that an acceleration in overall and residual inequality during 1990 and 1995, a decline during 1995 and 2000, and an increase during 2000 and 2005 for natives. The situation in the right panel is similar for immigrants except that the residual standard deviation experienced a modest rise during 1995 and 2000. In addition, the overall and residual standard deviation is larger for immigrants than natives. Education and age account for a larger proportion of the overall wage standard deviation for natives than immigrants during 1990 and 1995.

Between-group wage inequality is shown in Figure 2.7. It highlights that the wage gap between College (college and university) and High School (dropout and high school) for natives' young group rises from 1990 to 2005, but declines for natives' old group from 1995 to 2005. From 1995 to 2005, wage gap for the middle group expands for natives, while dwindles for immigrants.

Table 2.5 makes clear that worker share by four education and three age groups. The share of high school dropout workers, high school workers, and university workers increased monotonically from 1990 to 2005 for both immigrants and natives, whereas the share of college workers for immigrants declined from 31.7% in 1990 to 27% in 2005. The share of all education groups except university group uniformly dropped for native and immigrant workers who are younger than 35, while the share of all education groups except high school dropout group consistently rose who are older than 49 for both immigrants and natives.

Table 2.6 highlights the within-group wage dispersion, measured as 50-10 and 90-50 wage gap by four education and three age groups. Wage dispersion of 90-50 for all native education groups uniformly rose from 1990 to 2005. For example, wage dispersion for native high school dropout rose from 0.521 in 1990 to 0.604 in 2005. Immigrant college and university group also experienced a rise in 90-50 wage gap from 1990 to 2005. As the 90-50 wage gap for the university group, each age group experienced a monotonical expansion for both immigrants and natives. The 50-10 wage gap for native university workers older than 34 also increased.

Figure 2.8 vividly illustrates the wage inequality including the 90/50 and 50/10 log wage gap in each census year for immigrants by 15 different places of birth. Wage inequality for the lower tail is larger than the upper tail for US&Europe. Asian immigrants especially Chinese have very highest inequality for both the upper and lower tail. What causes the wage inequality, the role of composition or prices? This section will explore this question.

2.4.1 Wage inequality: the role of composition and prices

A. Implementation

Similar to Autor, Katz, and Kearney (2008), this part applies kernel reweighting approach introduced by DiNardo, Fortin, and Lemieux (1996) to investigate the counterfactual wage distribution if the workforce composition had remained unchanged. This section mainly concentrates on upper- and lower-tail inequality for natives and immigrants.

The observed density of log wages w in years t and t' is decomposed into a "price" g (.) providing the conditional distributional of wages for a given attributes and time, and a "composition" function h (.) that gives the density of attributes in that time period.

$$f(w|T=t) = \int g(w|x,T=t)h(x|T=t)dx \qquad (2.5)$$

and

$$f(w|T=t') = \int g(w|x,T=t')h(x|T=t')dx \qquad (2.6)$$

Here, w represents the logarithm of the weekly wage, T indicates the year from which an observation is drawn, $g(w|x,T=t)$ specifies the density of log wages in the year t for observable characteristics x, and $h(x|T=t)$ represents the density of characteristics x in the year t. In order to calculate the counterfactual wage distribution in the year t that would have existed if the labor force composition was identical as in the year t, it need to reweight the price function $g(.)$ in year t by the ratio $h_t(.)/h_{t'}(.)$ of the densities of characteristics x in the years t and t'.

Employing the Bayes's rule, this reweighting function can be computed as

$$\frac{h(x|T=t')}{h(x|T=t)} = \frac{1-Pr(T=t')}{Pr(T=t')} * \frac{Pr(T=t'|x)}{1-Pr(T=t'|x)} \qquad (2.7)$$

I estimate the reweighting function employing a logit model applied to the pooled data sources, $h(x)$ from the year t to t'.

To evaluate the importance of shifts in composition and prices to observed changes in overall and residual wage inequality of native-born workers in Canada, Census of Canada weekly wage sample from 1990 to 2005 is applied to construct counterfactual wage distributions. In each sample year t, labor force composition data from the four years 1990, 1995, 2000 and 2005 is used. This procedure replicates a hypothetical set of cases through reweighting. In the set of cases, labor force composition is permitted to transform as actually happened over 1990 to 2005 when labor market prices are held at 1990, 1995, 2000 and 2005 period levels.

In order to compute the reweighting function (equation 2.7), the similar covariates in the x vector as used by Lemieux (2006b) are employed. For example, one control consists of a full set of age dummies, education dummies, and a full set of interactions among the education dummies and a quartic in age. This decomposition method calculates counterfactuals for overall inequality. To recover counterfactuals for residual inequality, the pricing function $g_t(w|x,T=t)$ is replaced with the residual pricing function $g_t(\varepsilon|x,T=t)$. To obtain the residual pricing function, the weekly wages in each year are regressed on the full set of covariates in x, and the wage observations in $g_t(w|x,T=t)$ are replaced with their corresponding residuals from the OLS

regression. This residual price function supplies the conditional distribution of wage residuals in the year t and can be employed analogously to $g_t(w|x, T = t)$ to compute the counterfactual residual densities.

B. Results

The observed and counterfactual overall and residual inequality are shown in Tables 2.7 and 2.8, as well as plotted in Figures 2.9-2.13. Table 2.7 applies the two categories of controls and reports trends in observed and counterfactual overall and residual inequality for natives. Table 2.8 employs the three different controls to investigate the inequality of immigrants. The figures indicate that the effect of the prices on the overall and residual wage inequality, keeping labor force composition at their 1990 (1995, 2000 and 2005) levels, is the differences in the vertical height of each series within the year 1990 (1995, 2000 and 2005). The figures also illustrate that if holding prices at the given year's level, the effect of variation in labor force composition is shown by variation in the level of each line moving along the x-axis.

Table 2.7 and Figures 2.9-2.10 indicate trends in observed and counterfactual overall and residual inequality for natives. There are three interquantile ranges: 90–10 (Panel A), 90–50 (Panel B), and 50–10 (Panel C). The first row in each panel represents the observed change for each wage inequality, and the next four rows represent the counterfactual change that would have occurred if the labor force composition were the same as in 1990, 1995, 2000 or 2005. The overall 90/10 wage inequality expanded by around 9.4 log points during the first sub-period 1990-1995 and by 7.0 log points during the last sub-period 2000-2005, but fell by 2.1 log points during the middle sub-period 1995-2000. If the labor force composition had stayed the same as in 1990, the overall 90/10 wage inequality would have expanded by 11.2 log points between 1990 and 1995, and diminished by 2.6 log points between 1990 and 2005. The findings are comparable when the labor force composition in 1995, 2000 or 2005 is employed to compute the composition-constant increase in overall inequality.

Now turn to the upper tail and lower tail overall wage inequality for native. The lower-tail 50/10 overall or residual wage inequality diminished, but upper-tail 90/50 wage inequality expanded for natives from 1990-1995 to 2000-2005. If the labor force composition had remained the same as in 1990, on the one hand, the upper-tail overall inequality rose by about 2.8 log points between 1990 and 1995 and expanded by 8.3 log points for the whole period 1990 and 2005. On

the other hand, the lower-tail overall inequality, increased by only 2.8 log points between 1990 and 1995, comparing with 8.7 for the observed inequality, and fell by 0.2 log points between 1995 and 2000, comparing with 4.7 for the observed inequality, and expanded by only 2.8 log points for the whole period, much less than the observed change, 8.6. This finding is also shown in the upper panel of Figure 2.9, which plots actual and counterfactual native 90/50, as well as 50/10 overall inequality from 1990 to 2005. This indicates that composition effects play a more important role in the lower tail than for the upper tail of the wage distribution if the labor force composition had remained the same as in 1990. During the three subperiods, changes in labor force composition can explain up to 95% of the increase in lower-tail overall inequality for 1990 characteristics, while expansion in upper-tail overall inequality is mainly explained by the price effects. This is similar to findings for the United States, where the impact of changes in labor force composition is concentrated at the lower tail of the wage distribution (Autor, Katz, and Kearney 2008), but different from the finding for the Germany, where the impact of variations in labor force composition is concentrated at the upper tail of the wage distribution (Dustmann, Ludsteck, and Schonberg 2009).

Next, consider the evolution of residual inequality for native. The first row in the Panel B of Table 2.7 illustrates that native 90/50 (upper-tail) residual wage inequality all rose during three subperiods: by 3.1 log points from 1990 to 1995, by 1.3 log points from 1995 to 2000, and by 2.2 log points from 2000 to 2005. The qualitative patterns are not changed if I keep labor force composition constant at its given year's levels for the next four rows. Therefore, price effects play an overriding role in the upper tail residual inequality, as visible in the lower left panel of Figure 2.9, which graphs the observed and counterfactual native 90/50 residual inequality over 1990 to 2005. The contrast of vertical measurements of 1990, 1995, 2000 or 2005 series illustrates that counterfactual native 90/50 residual inequality expanded considerably during all three sub-periods. However, compositional shifts dwindle residual inequality as demonstrated by the downward slopes of each composition-constant series (moving along the x-axis).

Now turn to the lower-tail residual inequality during 1990 to 2005. Native 50/10 residual inequality expanded by 6.1 log points between 1990 and 1995 and dwindled by 1.7 log points between 1990 and 2000, and then rose by 3.0 log points between 2000 and 2005 (Panel C of Table 2.7). Next, think about the roles of prices and labor force composition in these shifts. The lower right panel of Figure 2.9 demonstrates that prices changes account largely for the expansion and

compaction of native lower-tail 50/10 inequality. Specifically, during the first period of the sample, the counterfactual growth of residual 50/10 inequality was larger than observed growth. In the middle period of the sample, price changes also exert a supreme effect: counterfactual lower-tail residual inequality diminished by between 1.4 and 2.1 log points during the middle period 1995 to 2000, as visible in the lower right panel of Figure 2.9 which shows that labor force composition play a contrary, upward effect on lower-tail residual inequality after 1995. Overall, the fact that a net drop in lower-tail residual inequality between 1995 and 2000 demonstrate that price effects dominate the composition effects for the evolution of residual 50/10 inequality, which is different from the finding for the overall 50/10 inequality especially for holding the 1990 labor force composition constant. This result is similar to the finding for the United States (Autor, Katz, and Kearney 2008).

The result about the additional control for the occupation and industry dummies is shown in the panel D to F in Table 2.7 and Figure 2.10. The relative importance of price and composition effects for the evolution of residual inequality with additional control can be compared to that with the basic control. The obvious variation is that in the lower tail of wage distribution for the overall inequality holding the labor force composition in 1990. What are the main factors that explain the relative importance of the role of price or labor force composition in changing the upper-tail inequality and lower-tail inequality: rising education, population aging or different occupation and industry? When considering the changes in the education structure, the age structure, occupation, and industry structure, the counterfactual wage inequality in the lower tail overall wage inequality is substantially different from when I only control for education and age structure during all the three subperiods for the 1990 characteristics. This suggests that both the expansion and compression of the lower-tail inequality are largely accounted for by the price changes when additionally controlling for the occupation and industry dummies. However, as the upper tail overall and residual wage inequality, labor force composition plays a larger role in additional controls than in the basic controls. In addition, the upper tail overall or residual wage inequality expanded less than lower tail wage inequality for immigrants during whole period 1990 to 2005, which is converse to natives.

What is the difference for immigrant inequality if control variables are variant? Specifically, when the place of birth dummies, occupation or industry dummies are controlled, the counterfactual inequality expansion or compression for all the comparisons 90/10, 90/50 and 50/10

over the whole period 1990 to 2005 is examined in this section. Table 2.8 and Figures 2.11-2.13 provide an overview of the trends in observed and counterfactual overall and residual inequality for immigrants. The residuals relative to control 1 are obtained from an OLS regression of log weekly wages on seven age dummies, four education dummies and a full set of interactions among the education dummies and a quartic in age. Control 2 refers to that control 1 adds place of birth dummies. Control 3 indicates that control 2 pluses occupation and industry dummies. Compositional adjustments are also made using the Dinardo, Fortin, and Lemieux (1996) kernel reweighting approach. The conclusions below are based on the comparison of Tables 2.7 and 2.8. First, it is obvious that although the price effects are the principal factor to the increase of upper tail and lower tail wage inequality, the labor force composition exerts substantially more effect on inequality for immigrants than natives comparing with Table 2.8 and 2.7, as well as Figures 2.9-2.13. Second, the more control variables are applied, the larger effect the labor force composition makes, especially for the upper tail inequality. Third, for the lower tail overall inequality, the effect of labor force composition is substantially smaller for immigrants than natives under the control 1. However, when places of dummies are additionally controlled, the labor force composition becomes the principal factor, accounting for around 89% for the lower tail residual wage inequality.

A comparison of actual and counterfactual wage change in percentile in Figure 2.14 indicates that if the education and age had remained at 1990 level, the counterfactual wage change for 1990 to 2005 would have considerably differed for the observed wage change for each wage percentile. The left and right panel of Figure 2.14 represents the native and immigrant wage change respectively. The figure shows that natives would have experienced a larger wage growth if education and age remained at the 1990 level from the bottom wage percentile to around the 75th percentile. However, the counterfactual wage growth for immigrants would be larger than actual wage growth for each wage percentile except the 99th percentile. The effect of education and age is considerably pronounced at the lower wage percentile than at the top wage percentile. Specifically, for natives, wage growth in 2005 would have been 17% at the 2nd percentile, while only 0.4% at the 76th percentile, wage growth in 2005 would have been negative from 77th percentile onward, such as -2.2% at the 99th percentile. For immigrants, wage growth in 2005 would have been 36% at the 3rd percentile, but only 0.7% at the 98th percentile, and -1.8% at the 99th percentile.

Similarly, Figure 2.15 illustrates comparisons of different counterfactual wage growth from 1990 to 2005 in percentile for natives and immigrants. The counterfactual wage growth for natives from 1990 to 2005 depicted in the left panel is almost 0 for each percentile if education, age, occupation, and industry were same as the 1990 level. As shown in the right panel, the counterfactual wage growth from 1990 to 2005 is almost 0 for each percentile if education, age, and places of birth had remained at the 1990 level. The counterfactual wage growth in this situation is smaller than when only education and age at the 1990 level, but larger than when education, age, places of birth, occupation, and industry had remained at the 1990 level.

2.4.2 Measured Demand Shifts

As we all know, the wage is decided simultaneously by labor supply and demand. This section considers wage issue from the perspectives of demand. Several important factors such as technology have progressed dramatically since last century, which will definitely cause the demand shift within and between industry (occupation, etc). A large amount of literature applies within and between method to examine the demand shifts issue (e.g. Katz and Murphy (1992); Berman, Bound, and Griliches (1994); Blau and Kahn (1996); Autor, Katz, and Krueger (1998); Autor, Levy, and Murnane (2003); Dustmann, Ludsteck, and Schonberg (2009); Philippon and Reshef (2012); Goos, Manning, and Salomons (2014)).

It is obvious that substantial shifts in relative labor demand are essential to account for varies in the wage structure since the early 1990s. It is helpful to consider relative labor demand shifts as coming from two types of changes which contain within and between sector analysis. Similar to Katz and Murphy (1992) who elucidated the interpretation of the demand shift measures, the economy in this chapter is divided into 16 industries[7]and 12 occupations[8] categories, therefore, the 198 industry-occupation cells are taken as sectors. Consistent with most previous work, adding

[7] Industry (1980 Standard Industry Classification)
1 Agriculture 2 Other primary industries 3 Manufacturing 4 Construction 5 Transportation and storage 6 Communication and other utilities 7 Wholesale trade 8 Retail trade 9 Finance, insurance and real estate 10 Business services 11 Government services: Federal 12 Government services: Other 13 Educational services 14 Health and social services 15 Accommodation, food and beverage services 16 Other services

[8] Occupation (Employment equity designations – based on the National Occupational Classification)
1 Managers 2 Professionals 3 Semi-professionals and technicians 4 Supervisors 5 Administrative and senior clerical personnel 6 Skilled sales and service personnel 7 Skilled crafts and trades workers 8 Clerical personnel 9 Intermediate sales and service personnel 10 Semi-skilled manual workers 11 Other sales and service personnel 12 Other manual workers

occupations to the industry taxonomies can provide some dimensions of within-industry shifts in labor demand, as well as between-industry shifts.

To implement Katz and Murphy' approach to measuring demand shifts, I define the index of the between-sector change in demand for skilled group g measured relative to base year employment of group g in efficiency units E_g, as

$$\Delta D_g = \sum_i \left(\frac{E_{ig}}{E_g}\right)\left(\frac{\Delta E_i}{E_i}\right) \qquad (2.8)$$

The overall (industry-occupation) demand shift index for the group, ΔD_g, is defined as the index given in equation (2.8), where i corresponds to our 168 sectors (industry-occupation cells), g indexes skilled groups, E_i is total labor input measured in efficiency units in sector i, $\frac{E_{ig}}{E_g}$ correspond to group g's employment share in efficiency units in sector i in the base year.

This index is also decomposed into between-industry and within-industry parts. The between-industry demand shift index for the group ΔD_g^b, is provided by the index in equation (2.8) when i indicates 16 industries. The within-industry demand shift index for ΔD_g^w (i.e., $\Delta D_g^w = \Delta D_g - \Delta D_g^b$) refers to the shifts in employment among occupations within industries.

Figures 2.16 and 2.17 present an overview of average immigrant share change and native wage change by occupations and industries. Figure 2.16 explores that average immigrant share change and average native wage change from 1990 to 2005 by occupation. The left panel illustrates that immigrants' share in these three occupations consisting of 'skilled crafts and trades workers', 'supervisor', as well as 'other manual workers' are less in 2005 than 1990, which will be shown shortly again in within and between analysis section. There is a slight rise for 'managers', 'skilled sales and service personnel'. Immigrants in these occupations which include 'intermediate sales and service personnel', 'clerical personnel', as well as 'professionals' have higher positive share change than any other occupation. The right panel of this figure also reveals that the native positive wage change is relatively high for 'supervisor', 'semi-professionals and technicians', 'skilled sales and service personnel'. In contrast, 'other sales and service personnel' and 'other manual workers' undergo heavily negative wage change, which attributes to that the substitution of elasticity between immigrants and natives is high in these two occupations.

The average immigrants share change and the native wage change in each industry are graphed in Figure 2.17. The average change of native in agriculture is higher than any other industry from 1990 to 2005, and the average immigrants share in agriculture has a highest negative

value, -0.1. Similarly, natives in 'other services' experience large positive wage change, just a little less than agriculture. 'Construction' and 'education' industry face the negative immigrants share, but the average native wage change in both industries is negative from 1990 to 2005. Besides, natives in 'business service', 'government services: Other' encounter a wage loss and the immigrant share in these occupations experiences positive change, especially 'government services: Other', which has a largest immigrant expansion in this occupation. It is noted that 'wholesale trade' industry experiences the largest immigrant increase, but the average native wage rise during this period.

The two categories of demand shifts are examined in the following part.

The first category is shown in Table 2.9 which refers to relative demand shift estimates for eight demographic groups for the whole period and three sub-periods. The overall measure of demand shifts for the entire period increases in education level for natives except for the HS dropout group, which plummets by almost -15. The largest increase is college group which rises by almost 8. For immigrants, the overall demand shift expands sharply for university group, almost 18, and HS dropout drops by 16, college group diminishes by around 5. The overall measure shift is in favor of natives relative to immigrants within education groups except for university group from 1990 to 2005. Within-sector shifts in employment monotonically expand the demand for immigrants' university group for the entire periods and all the sub-periods. In contrast, the demand shift for college groups is converse comparing with university groups except for the first subperiod 1990-1995. Between industry demand shift is much smaller compared to the within demand shifts. To a large extent, the finding explored in this table is consistent with results of Figures 2.1 and 2.2 analyzed before.

The second category is indicated in Figure 2.18 illustrating occupational employment change from 1990 to 2005 within and between industries for male full-time workers. The difference between natives and immigrants can be compared based on the left panel and right panel. As documented in Figure 2.18, the shift in demand is mainly caused by within industry change. Within industry demand shifts in employment substantially expand the demand for immigrants' 'professionals' more than natives' 'professionals', which is 5.2 and 1.8 respectively. 'Professionals' is the second highest within the measure of demand shift for natives, and it is less than 'skilled crafts and trades worker', 2.8. Besides, within demand shift of 'killed crafts and trades worker' for immigrants is a contrast to that for natives, which is -0.6 and 2.9 respectively. Within

demand shift for ‘manager’ is similar for immigrants and natives. Between demand shift for ‘supervisors’ favors native than immigrants, which is 0.31 and -0.28 for natives and immigrants respectively. In contrast, between demand shift for ‘clerical personnel’ experiences a slight increase for immigrants whereas a bit decrease for natives. It is also noted that the within and between demand shift for ‘semi-skilled manual workers’ monotonically expand for immigrants and uniformly dwindle for natives. On the whole, the findings from this figure make a clear explanation of the results of Figures 2.16 and 2.17.

Overall, results from the demand shift analysis provide a reasonable interpretation of the wage effect and wage inequality examination on labor demand side.

2.5 Conclusions

This chapter examines the wage structure in Canada, consisting of the effect of immigration on wage structure of native-born men and wage inequality. There are three main findings.

First, wage effect of immigrants on natives is diverse according to various groups. The results interpret that the negative impact on relative wage of the young native is substantially more discernible than any other age groups. Therefore, it is instructive to allocate the natives to different age groups to scrutinize the effect of the wage structure. Besides, immigrants make a negative effect on the natives who have the university degree or above. Furthermore, Immigrants have more discernible negative effects on the second generation than the third generation for the university group. The relative wage of the second generation of immigrants who are young or university group is negatively influenced more than the third generation by immigrants because the elasticity substitution of the first generation and the second generation is higher in these subgroups.

Second, recent immigrants make a greater effect on earlier immigrants than natives, specifically, immigrants lessen the relative wage of the high school dropout of earlier immigrants, not that of natives. Recent immigrants have substantially more negative effect on high school dropout of US & European earlier immigrants.

Third, the exploration of wage inequality for the natives and immigrants is another substantial wage structure analysis. This chapter applies the counterfactual method to get the conclusion that the lower-tail overall or residual wage inequality declined, while upper-tail wage inequality increased for natives from the first subperiod 1990-1995 to the last subperiod 2000-2005. The

upper tail overall or residual wage inequality expanded more than lower tail wage inequality for natives during the whole period 1990 to 2005, which is a contrast to immigrants. Price effects are the principal factor to the expansion or compression in the upper tail and lower tail wage inequality, but labor force composition effects play a considerably foremost role in the lower tail 50/10 overall wage inequality if holding the labor force composition same as in 1990. In addition, the results of demand shift analysis confirm the wage effect and wage inequality explored in this chapter.

It is my future work to examine the immigrants' effect on native wage structure applying the instrument variable. The instrument variable employs the 1980 immigrant concentration (from the 1981 Census) interacted with year dummies. Indeed immigrants from same countries tend to settle in the same place, in this way are they easier to search job and share the information. In addition, it is helpful to examine and compare the wage of natives and immigrants who are self-employment. Moreover, the selection issue will be considered to further scrutinize the wage structure problem.

Tables and Figures

Table 2.1 Estimates of the elasticity of substitution between immigrants and natives

	1	2	3	4	5	6	7
Education groups							
HS dropout	0.048	0.041	0.037	0.048	0.039	0.033	-0.009
	(0.037)	(0.119)	(0.123)	(0.037)	(0.120)	(0.036)	(0.122)
High School	0.035	0.088	0.099	0.034	0.086	0.019	0.063
	(0.044)	(0.077)	(0.074)	(0.043)	(0.080)	(0.041)	(0.088)
Some College	0.077***	0.166***	0.161***	0.076***	0.166***	0.064***	0.162***
	(0.017)	(0.020)	(0.026)	(0.017)	(0.020)	(0.016)	(0.021)
University	-0.071	-0.099***	-0.087***	-0.069	-0.098***	-0.081**	-0.092***
	(0.038)	(0.018)	(0.018)	(0.037)	(0.018)	(0.028)	(0.018)
Age groups							
25–34	-0.025*	-0.069	-0.094**	-0.026*	-0.068	-0.028	-0.064
	(0.012)	(0.037)	(0.037)	(0.012)	(0.037)	(0.015)	(0.038)
35–49	-0.025	0.054*	0.060**	-0.023	0.054*	-0.001	0.063**
	(0.033)	(0.029)	(0.025)	(0.034)	(0.028)	(0.041)	(0.028)
50–59	0.092	0.143***	0.146***	0.094	0.142***	0.122*	0.142***
	(0.053)	(0.032)	(0.041)	(0.053)	(0.032)	(0.056)	(0.036)
All	0.004	0.051**	0.048*	0.005	0.051**	0.009	0.057**
	(0.020)	(0.022)	(0.025)	(0.020)	(0.022)	(0.018)	(0.023)
Fixed effects:	No	Yes	Yes	No	Yes	No	Yes
Weight	W1	W1	No	W2	W2	W3	W3

Note: The data source is Canada Censuses 1991, 1995, 2000 and 2005. The heteroskedasticity-robust standard errors are in parentheses and are clustered over the 28 education-age groups. Fixed effects for education groups are age. Fixed effects for age groups are education and year. Fixed effects for all full-time workers are age*education and year. Each cell in column 1 and 2 is weighted by its employment. Each cell in column 4 and 5 is weighted by w=(sizewn*sizewm)/(sizewn+sizewm). Each cell in column 6 and 7 is weighted by the inverse of the variance of the dependent variable: $\omega_{eat} = \left\{ var\left[\ln\left(\frac{\bar{w}_{eat}^{N}}{\bar{w}_{eat}^{M}} \right) \right] \right\}^{-1} = \frac{N_{eat}^{N}(\bar{\omega}_{eat}^{N})^{2} N_{eat}^{M}(\bar{\omega}_{eat}^{M})^{2}}{(\theta_{eat}^{N})^{2} N_{eat}^{M}(\bar{\omega}_{eat}^{M})^{2} + (\theta_{eat}^{M})^{2} N_{eat}^{N}(\bar{\omega}_{eat}^{N})^{2}}$

* p<0.10, ** p<0.05, *** p<0.01.

Table 2.2 The effect of immigrants to natives (2nd generation of immigrants and 3rd generation)

	Second generation			Third generation		
	1	2	3	4	5	6
Education groups						
HS dropout	-0.046	-0.050	-0.043	0.051	0.342***	0.325***
	(0.066)	(0.236)	(0.223)	(0.058)	(0.075)	(0.070)
High School	-0.020	0.342	0.352	0.055	0.163	0.196
	(0.038)	(0.244)	(0.221)	(0.095)	(0.100)	(0.128)
Some College	0.050	0.283***	0.290**	0.100***	0.196*	0.175*
	(0.035)	(0.076)	(0.085)	(0.016)	(0.085)	(0.086)
University	-0.092**	-0.273*	-0.271*	-0.128	-0.158	-0.158
	(0.036)	(0.128)	(0.125)	(0.067)	(0.095)	(0.098)
Age groups						
25–34	-0.047	-0.144***	-0.171***	0.005	-0.104**	-0.126***
	(0.031)	(0.015)	(0.046)	(0.021)	(0.035)	(0.031)
35–49	-0.056***	0.049	0.071	-0.082***	0.050	0.059
	(0.017)	(0.063)	(0.058)	(0.017)	(0.048)	(0.050)
50–59	0.038	0.166	0.127	0.046	0.191***	0.192***
	(0.065)	(0.106)	(0.108)	(0.057)	(0.031)	(0.037)
All	-0.030	0.042	0.045	-0.023	0.060	0.063
	(0.021)	(0.076)	(0.098)	(0.021)	(0.045)	(0.050)
Fixed effects:	No	Yes	Yes	No	Yes	Yes
Weight	Yes	yes	No	Yes	yes	No

Note: Each cell in column 1 ,2 ,4 and 5 is weighted by its employment. * p<0.10, ** p<0.05, *** p<0.01

Table 2.3 The effect of recent immigrants to natives and earlier immigrants

	Natives				Earlier immigrants	
	1	2	3	4	5	6
Education groups						
HS dropout	0.150**	-0.080	-0.068	0.098***	-0.148*	-0.139*
	(0.048)	(0.112)	(0.117)	(0.020)	(0.066)	(0.064)
High School	0.112**	-0.083	-0.061	0.064**	-0.093	-0.090
	(0.042)	(0.056)	(0.077)	(0.022)	(0.053)	(0.055)
Some College	0.136***	0.104	0.094	0.096***	0.005	0.038
	(0.029)	(0.067)	(0.060)	(0.008)	(0.060)	(0.058)
University	0.122**	0.009	0.012	0.102***	0.161**	0.151***
	(0.044)	(0.032)	(0.034)	(0.024)	(0.045)	(0.033)
Age groups						
25–34	0.045	0.080	0.066	0.059*	0.152**	0.171**
	(0.038)	(0.068)	(0.076)	(0.029)	(0.058)	(0.060)
35–49	0.019	0.070**	0.063**	0.050***	0.074***	0.077***
	(0.020)	(0.024)	(0.023)	(0.013)	(0.015)	(0.014)
50–59	-0.060*	-0.032	-0.026	-0.003	0.021	0.019
	(0.028)	(0.052)	(0.036)	(0.021)	(0.040)	(0.038)
All	0.073***	0.026	0.021	0.082***	0.036	0.037
	(0.017)	(0.033)	(0.030)	(0.008)	(0.031)	(0.030)
Fixed effects:	No	Yes	Yes	No	Yes	Yes
Weight	Yes	yes	No	Yes	yes	No

Note: Each cell in column 1 ,2 ,4 and 5 is weighted by its employment. * p<0.10, ** p<0.05, *** p<0.01

Table 2.4 The effect of recent immigrants to earlier immigrants according to different place of birth

	Asia		US &Europe		Others	
	1	2	3	4	5	6
Education groups						
HS dropout	0.072*	0.016	0.042	-0.244**	0.068**	-0.042
	(0.031)	(0.065)	(0.024)	(0.093)	(0.035)	(0.065)
High School	0.007	-0.034	0.079**	-0.143	0.068	-0.036
	(0.020)	(0.024)	(0.026)	(0.127)	(0.026)	(0.038)
Some College	0.072***	0.044	0.077***	-0.048	0.073***	0.067
	(0.011)	(0.052)	(0.006)	(0.121)	(0.005)	(0.061)
University	0.062***	0.152*	0.082***	0.003	0.100***	0.066
	(0.010)	(0.063)	(0.019)	(0.034)	(0.017)	(0.049)
Age groups						
25–34	0.055	0.056**	0.028	0.224*	0.057*	0.125**
	(0.038)	(0.049)	(0.039)	(0.099)	(0.027)	(0.042)
35–49	0.023	0.056**	0.015	0.054***	-0.002	0.048**
	(0.013)	(0.019)	(0.018)	(0.015)	(0.016)	(0.016)
50–59	0.033	0.074	-0.015	0.035	-0.010	0.077***
	(0.045)	(0.046)	(0.021)	(0.027)	(0.020)	(0.019)
All	0.050***	0.058	0.058***	0.022	0.054***	0.038
	(0.012)	(0.037)	(0.008)	(0.039)	(0.011)	(0.031)
Fixed effects	No	Yes	No	Yes	No	Yes
Weight	Yes	Yes	Yes	Yes	Yes	Yes

Note: Each cell in column 1 ,2 ,4 and 5 is weighted by its employment. * p<0.10, ** p<0.05, *** p<0.01

Table 2.5 Male full-time employment share by education and age

	Native				Immigrant			
	1990	1995	2000	2005	1990	1995	2000	2005
				High School Dropout				
25-34	9.99	6.76	5.11	3.3	6.34	5.39	3.73	1.86
35-49	12.11	11.7	11.23	6.66	11.8	10.8	10	5.47
50-59	6.93	5.74	5.59	4.07	9.11	6.96	6.4	4.08
All	29.03	24.2	21.93	14.02	27.25	23.15	20.12	11.41
				High School				
25-34	9.78	8.25	7.08	7.27	6.09	5.81	4.8	4.72
35-49	9.88	11.16	11.7	11.54	8.36	8.6	9.1	9.85
50-59	2.41	2.87	4.06	6	2.92	3.01	4.55	5.45
All	22.06	22.28	22.84	24.81	17.37	17.42	18.45	20.02
				College				
25-34	13.82	12.17	10.75	11.22	7.54	7.4	5.89	4.94
35-49	14.26	17.73	19.12	19.48	16.28	15.81	14.18	13.58
50-59	3.91	4.64	6.27	8.83	7.85	8.46	8.74	8.5
All	31.99	34.54	36.14	39.53	31.67	31.68	28.8	27.02
				University				
25-34	6.63	6.68	6.39	7.03	6.22	7.15	8.58	9.75
35-49	8.41	9.4	8.93	9.71	13.29	14.4	16.22	22
50-59	1.87	2.89	3.77	4.9	4.2	6.2	7.83	9.79
All	16.92	18.97	19.09	21.64	23.71	27.75	32.63	41.54

Table 2.6 Within-group wage dispersion by education and age

		Native				Immigrant			
		1990	1995	2000	2005	1990	1995	2000	2005
					High School Dropout				
25-34	50-10	0.763	0.788	0.736	0.842	0.757	0.695	0.810	0.869
	90-50	0.520	0.578	0.591	0.646	0.558	0.599	0.592	0.586
35-49	50-10	0.704	0.799	0.747	0.769	0.732	0.846	0.739	0.784
	90-50	0.494	0.527	0.537	0.563	0.511	0.552	0.608	0.563
50-59	50-10	0.753	0.790	0.768	0.808	0.712	0.799	0.823	0.891
	90-50	0.514	0.546	0.545	0.578	0.492	0.533	0.559	0.585
All	50-10	0.732	0.797	0.761	0.811	0.745	0.801	0.777	0.875
	90-50	0.521	0.556	0.570	0.604	0.530	0.587	0.600	0.595
					High School				
25-34	50-10	0.667	0.717	0.724	0.754	0.695	0.741	0.730	0.775
	90-50	0.482	0.524	0.553	0.568	0.571	0.550	0.606	0.583
35-49	50-10	0.634	0.692	0.683	0.735	0.767	0.834	0.827	0.856
	90-50	0.437	0.471	0.511	0.534	0.517	0.615	0.600	0.614
50-59	50-10	0.738	0.737	0.766	0.739	0.801	0.875	0.825	0.838
	90-50	0.423	0.511	0.546	0.551	0.532	0.595	0.571	0.616
All	50-10	0.684	0.717	0.718	0.749	0.753	0.836	0.808	0.836
	90-50	0.481	0.515	0.529	0.579	0.579	0.642	0.604	0.629
					College				
25-34	50-10	0.612	0.732	0.666	0.703	0.708	0.773	0.703	0.807
	90-50	0.465	0.493	0.516	0.553	0.495	0.520	0.539	0.571
35-49	50-10	0.648	0.712	0.693	0.703	0.693	0.833	0.731	0.854
	90-50	0.412	0.454	0.475	0.503	0.442	0.489	0.550	0.532
50-59	50-10	0.693	0.799	0.775	0.782	0.693	0.856	0.816	0.841
	90-50	0.425	0.453	0.452	0.502	0.406	0.479	0.473	0.530
All	50-10	0.644	0.760	0.711	0.741	0.725	0.833	0.744	0.858
	90-50	0.454	0.470	0.503	0.537	0.481	0.536	0.549	0.566
					University				
25-34	50-10	0.686	0.764	0.717	0.801	0.806	0.847	0.896	0.875
	90-50	0.429	0.467	0.501	0.519	0.486	0.529	0.599	0.642
35-49	50-10	0.655	0.690	0.709	0.736	0.816	0.946	0.895	0.966
	90-50	0.326	0.356	0.361	0.417	0.405	0.489	0.554	0.600
50-59	50-10	0.751	0.760	0.860	0.852	0.883	1.108	1.040	1.030
	90-50	0.313	0.322	0.353	0.386	0.378	0.384	0.454	0.549
All	50-10	0.731	0.801	0.749	0.815	0.836	0.963	0.934	0.944
	90-50	0.387	0.412	0.429	0.451	0.463	0.523	0.555	0.634

Table 2.7 Observed and composition-constant overall and residual weekly wage inequality (Natives)

	Overall Inequality				Residual Inequality			
	1990-1995	1995-2000	2000-2005	1990-2005	1990-1995	1995-2000	2000-2005	1990-2005
				A:Δ90/10				
Observed	9.4	-2.1	7.0	14.4	9.3	-0.4	5.2	14.1
1990 X's	11.2	-2.6	10.5	19.1	10.4	-0.6	7.3	17.1
1995 X's	10.2	-2.8	10.0	17.4	10.2	-0.3	6.8	16.7
2000 X's	8.8	-0.5	10.2	18.5	10.2	-0.2	6.2	16.2
2005 X's	12.5	-0.1	5.5	18.0	10.5	0.1	5.5	16.1
				B:Δ90/50				
Observed	0.8	2.7	2.4	5.8	3.1	1.3	2.2	6.6
1990 X's	2.8	2.6	2.8	8.3	4.2	1.6	2.9	8.6
1995 X's	1.1	2.9	3.6	7.6	3.9	1.6	3.0	8.5
2000 X's	1.6	3.9	3.9	9.5	3.9	1.5	2.9	8.4
2005 X's	5.5	1.9	3.2	10.6	3.9	1.5	2.9	8.2
				C:Δ50/10				
Observed	8.7	-4.7	4.6	8.6	6.1	-1.7	3.0	7.5
1990 X's	2.8	-0.2	0.2	2.8	6.2	-2.1	4.4	8.5
1995 X's	9.1	-5.7	6.4	9.8	6.4	-1.9	3.7	8.2
2000 X's	7.2	-4.4	6.4	9.1	6.3	-1.7	3.2	7.8
2005 X's	7.0	-2.0	2.3	7.4	6.6	-1.4	2.6	7.8
	Additional control for occupation and industry							
				D:Δ90/10				
Observed	9.4	-2.1	7.0	14.4	6.7	0.7	4.1	11.4
1990 X's	10.1	-4.0	14.2	20.3	7.2	0.1	7.3	14.6
1995 X's	8.7	-3.3	11.5	16.9	6.7	0.2	6.5	13.4
2000 X's	7.6	-1.1	10.5	17.0	6.9	-0.1	6.2	13.0
2005 X's	7.0	-2.7	5.6	10.0	6.0	0.1	3.0	9.2
				E:Δ90/50				
Observed	0.8	2.7	2.4	5.8	2.0	1.0	1.7	4.7
1990 X's	1.9	1.1	6.5	9.5	2.4	1.1	2.6	6.0
1995 X's	1.1	2.4	5.4	8.9	2.1	1.0	2.5	5.6
2000 X's	-0.2	3.4	4.1	7.3	2.2	0.9	2.5	5.5
2005 X's	0.4	2.8	2.4	5.7	2.0	0.7	1.1	3.8
				F:Δ50/10				
Observed	8.7	-4.7	4.6	8.6	4.7	-0.2	2.3	6.8
1990 X's	8.2	-5.1	7.7	10.8	4.8	-0.9	4.7	8.6
1995 X's	7.5	-5.7	6.1	8.0	4.6	-0.8	4.0	7.9
2000 X's	7.8	-4.4	6.4	9.7	4.7	-1.0	3.7	7.4
2005 X's	6.6	-5.5	3.2	4.3	4.1	-0.6	1.9	5.4

Note: In each panel, the first row reports the observed change and the next four rows represent the change that would have prevailed if the age and education distributions were the same as in 1990, 1995, 2000 or 2005, respectively. In panels A-C, the residuals are obtained from an OLS regression of log weekly wages on seven age dummies, four education dummies and a full set of interactions among the education dummies and a quartic in age. In panels D-F, occupation and industry dummies were added as additional controls. Compositional adjustments are made using the Dinardo-Fortin-Lemieux (1996) kernel reweighting approach.

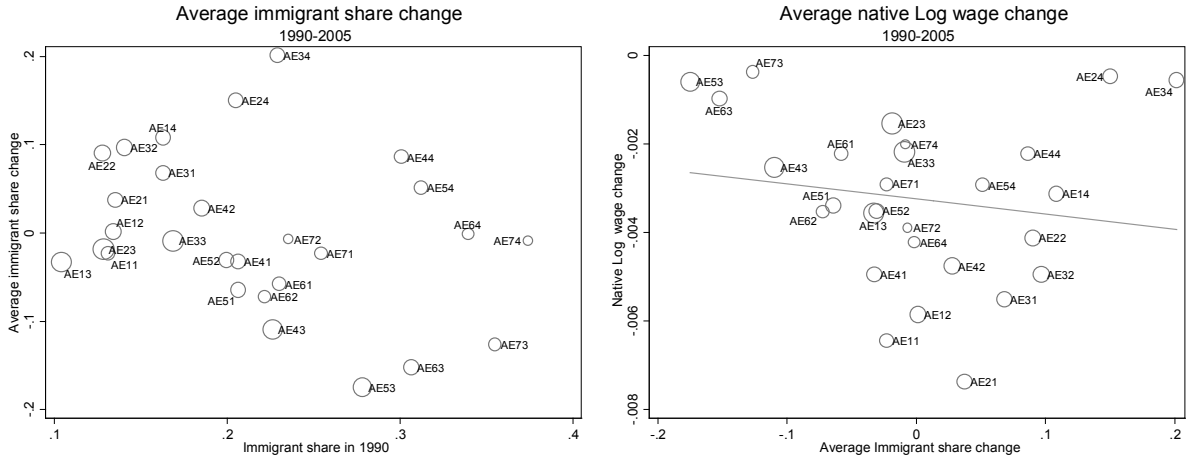
Table 2.8 Observed and composition-constant overall and residual weekly wage inequality (Immigrants, 1990-2005)

	Overall Inequality			Residual Inequality		
	C1	C2	C3	C1	C2	C3
			A:Δ90/10			
Observed	18.1	18.1	18.1	26.5	25.2	21.2
1990 X's	17.6	14.6	15.8	23.9	19.1	17.5
1995 X's	20.7	16.0	15.6	24.8	19.8	17.0
2000 X's	20.4	16.9	17.2	24.8	20.4	17.7
2005 X's	20.3	16.6	14.2	26.0	21.8	16.2
			B:Δ90/50			
Observed	9.9	9.9	9.9	12.3	11.2	7.9
1990 X's	10.4	7.1	8.4	11.9	8.4	6.2
1995 X's	12.7	8.2	9.3	12.6	9.0	6.7
2000 X's	13.1	10.7	10.3	12.8	9.6	7.7
2005 X's	13.4	10.3	6.6	13.9	10.9	6.0
			C:Δ50/10			
Observed	8.2	8.2	8.2	14.2	14.1	13.2
1990 X's	7.2	7.5	7.5	11.9	1.5	11.3
1995 X's	8.0	7.8	6.3	12.2	10.8	10.3
2000 X's	7.3	6.3	7.0	12.0	10.7	10.1
2005 X's	7.0	6.3	7.6	12.1	11.0	10.1

Note: C1 corresponds to control 1, the residuals are obtained from an OLS regression of log weekly wages on seven age dummies, four education dummies and a full set of interactions among the education dummies and a quartic in age. C2 corresponds to control 2, the residuals are obtained from an OLS regression of log weekly wages on seven age dummies, four education dummies and a full set of interactions among the education dummies and a quartic in age, place of birth dummies. C3 corresponds to control 3, the residuals are obtained from an OLS regression of log weekly wages on seven age dummies, four education dummies and a full set of interactions among the education dummies and a quartic in age, place of birth dummies, occupation, and industry dummies. Compositional adjustments are made using the Dinardo-Fortin-Lemieux (1996) kernel reweighting approach.

Table 2.9 Within, between and overall demand shift measures

	within	between	overall	within	between	overall
		1990-1995			1995-2000	
Natives						
HS Dropout	-4.786	-0.039	-4.825	-2.852	0.576	-2.276
High School	0.21	0.01	0.219	0.398	0.156	0.554
College	2.709	-0.155	2.553	1.415	0.187	1.601
University	1.868	0.184	2.053	1.039	-0.918	0.121
Immigrants						
HS Dropout	-3.759	-0.349	-4.109	-3.822	0.805	-3.017
High School	-0.122	0.18	0.058	0.601	0.42	1.02
College	0.113	-0.101	0.012	-3.141	0.261	-2.88
University	3.769	0.271	4.039	6.362	-1.485	4.877
		2000-2005			1990-2005	
Natives						
HS Dropout	-7.529	-0.355	-7.884	-15.053	0.067	-14.986
High School	1.929	0.084	2.014	2.653	0.134	2.787
College	3.756	-0.371	3.386	7.601	-0.061	7.54
University	1.844	0.641	2.485	4.799	-0.14	4.658
Immigrants						
HS Dropout	-8.358	-0.326	-8.684	-15.737	-0.073	-15.81
High School	1.67	-0.026	1.644	2.095	0.627	2.722
College	-1.652	-0.143	-1.794	-4.558	-0.105	-4.663
University	8.34	0.495	8.834	18.2	-0.449	17.751



Note: Computations are based on the Census samples for year t (t=5, 1990, 1995, 2000, 2005) include men who were aged 25-59 in that year. There are 7 age groups from 25 to 59 and 4 education groups. AE11 indicates people who are age 25-29 and high school dropout. AE74 indicates people who are age 55-59 and university degree.

Figure 2-1 Average native weekly wage change and average immigrant share change

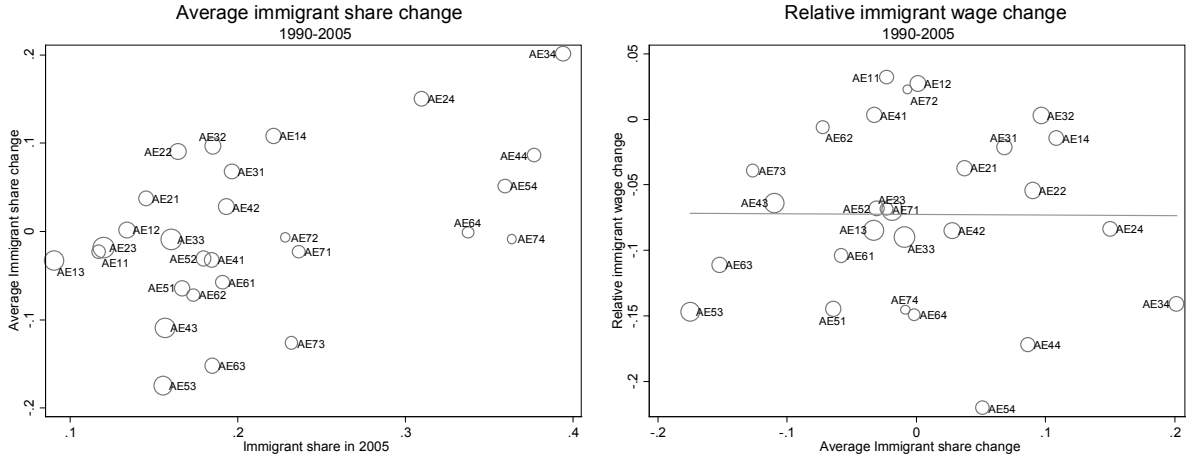
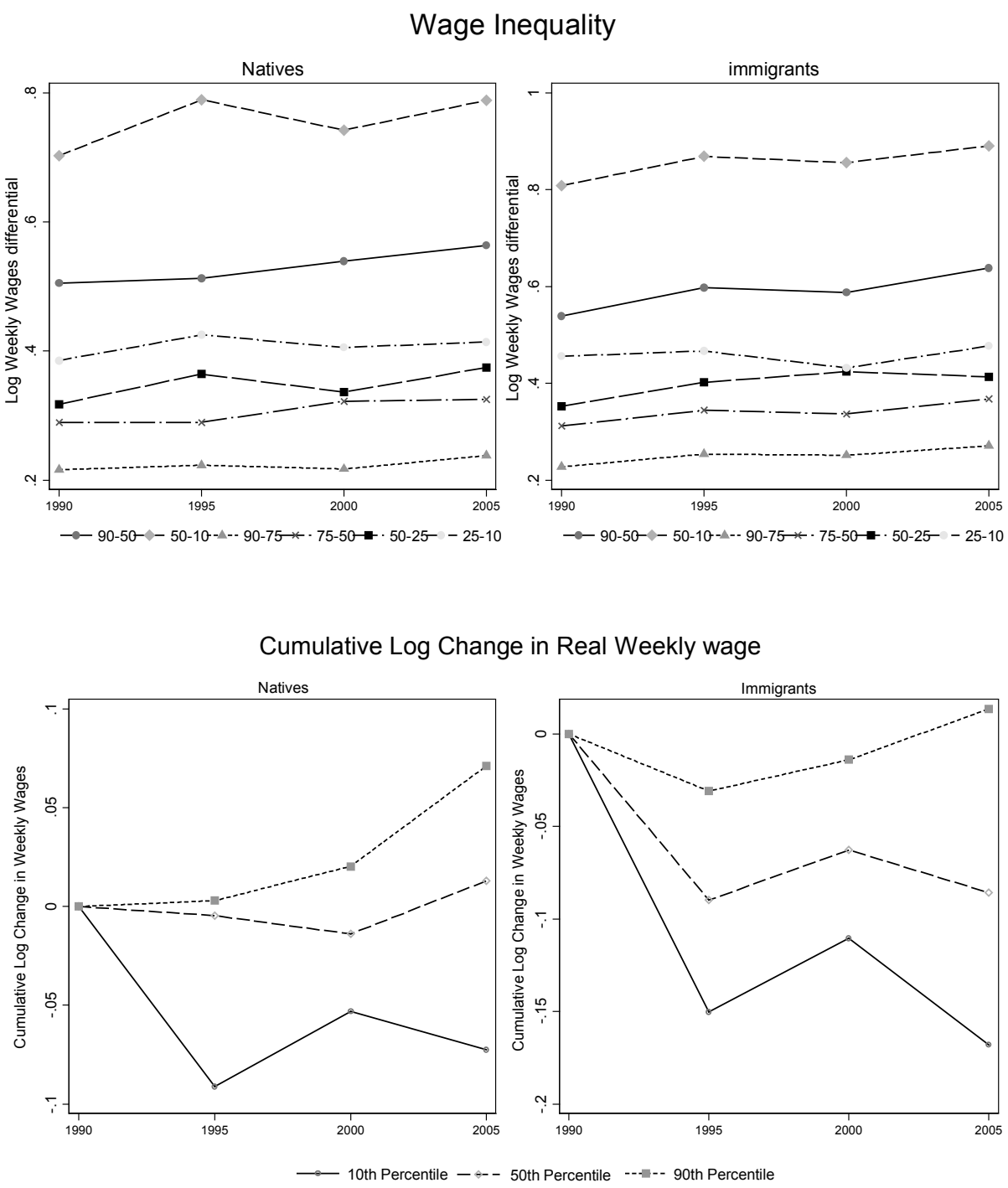


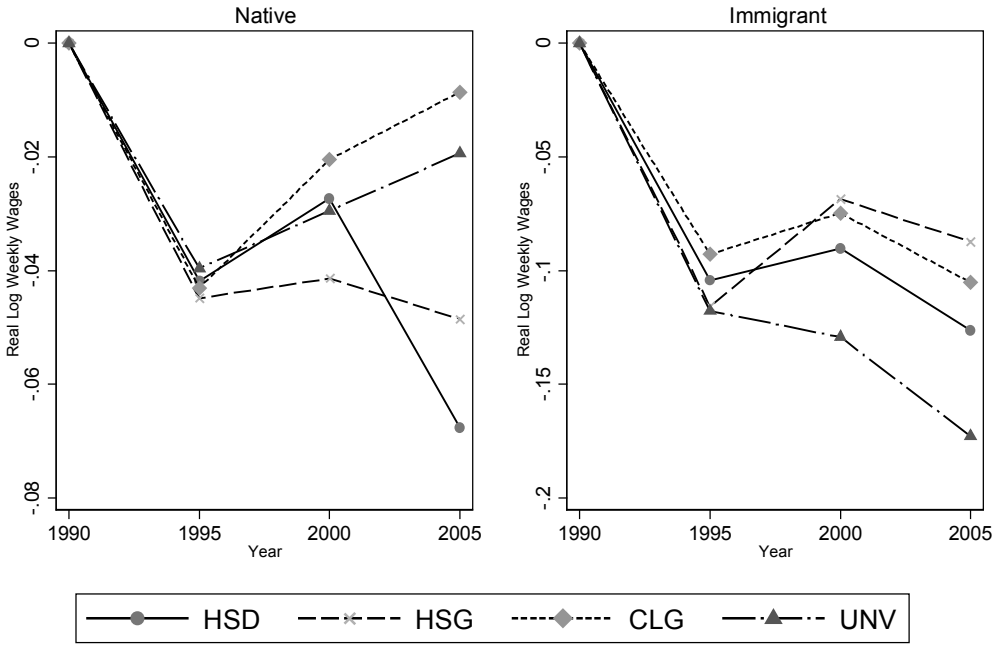
Figure 2-2 Relative immigrant wage change and average immigrant share change



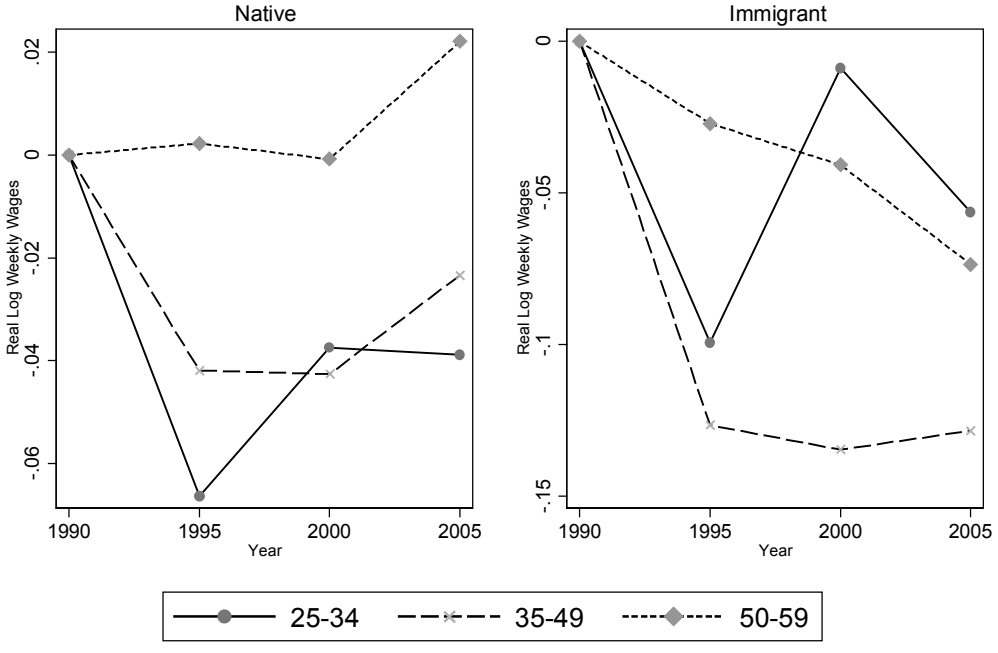
Note: Cumulative Log Change in Real Weekly wage at the 10th, 50th and 90th wage percentile

Figure 2-3 Wage inequality for native and immigrants by year

Change in real Log Weekly Wages
by education group



Change in real Log Weekly Wages
by age group



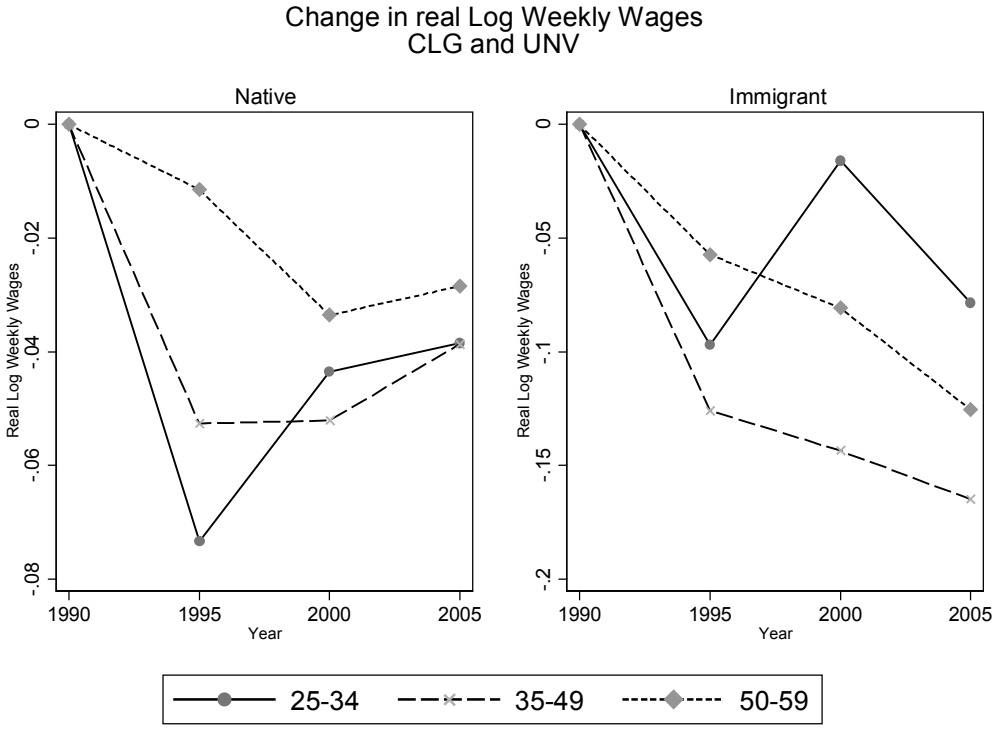


Figure 2-4 Change in real Log weekly wage

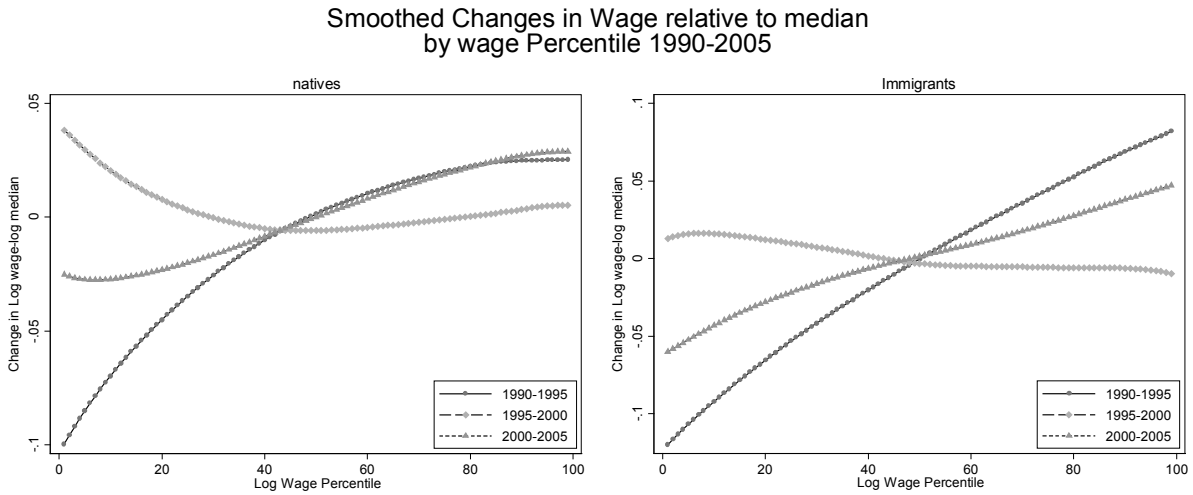


Figure 2-5 Smoothed changes in wage relative to the median by wage percentile

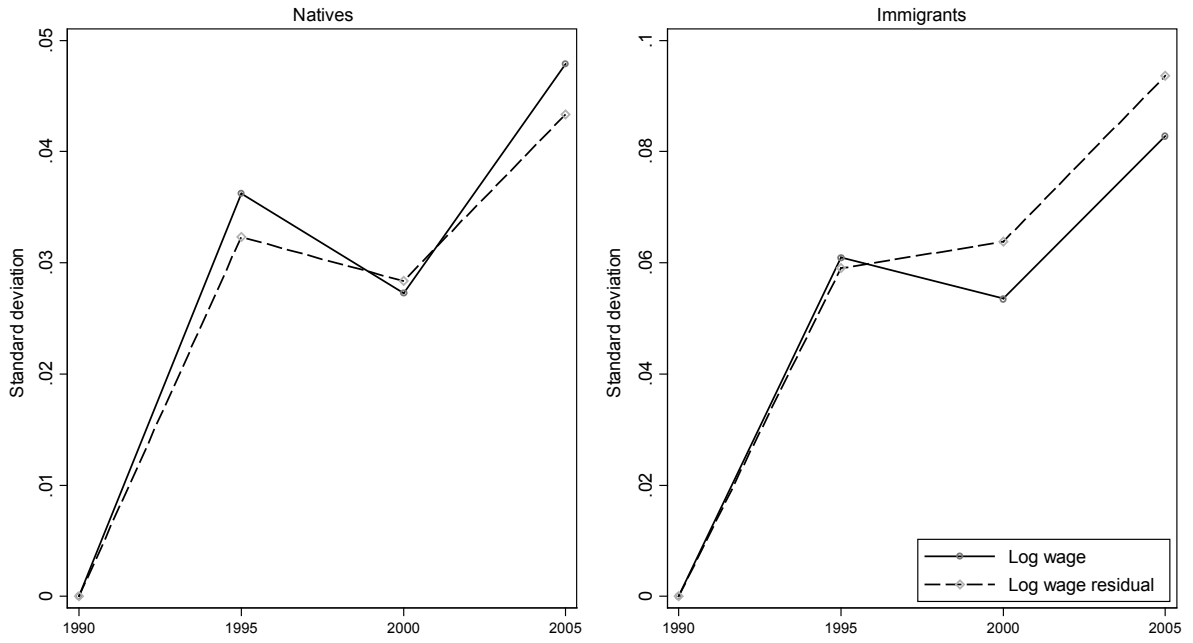


Figure 2-6 Overall standard deviation and residual standard deviation

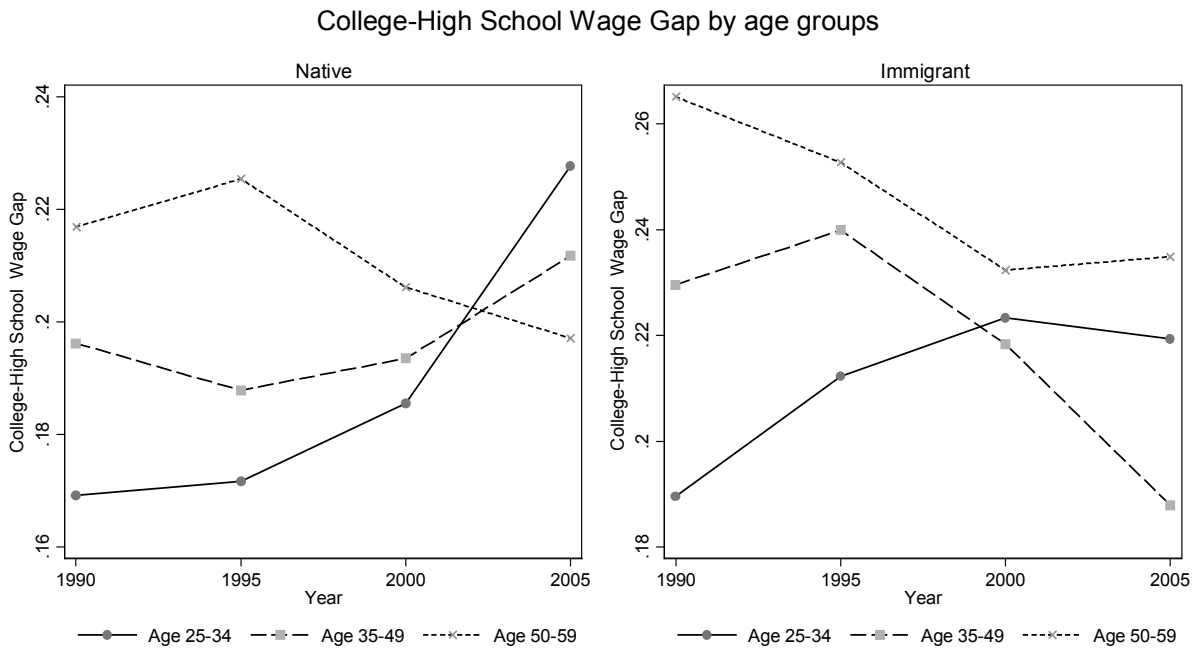
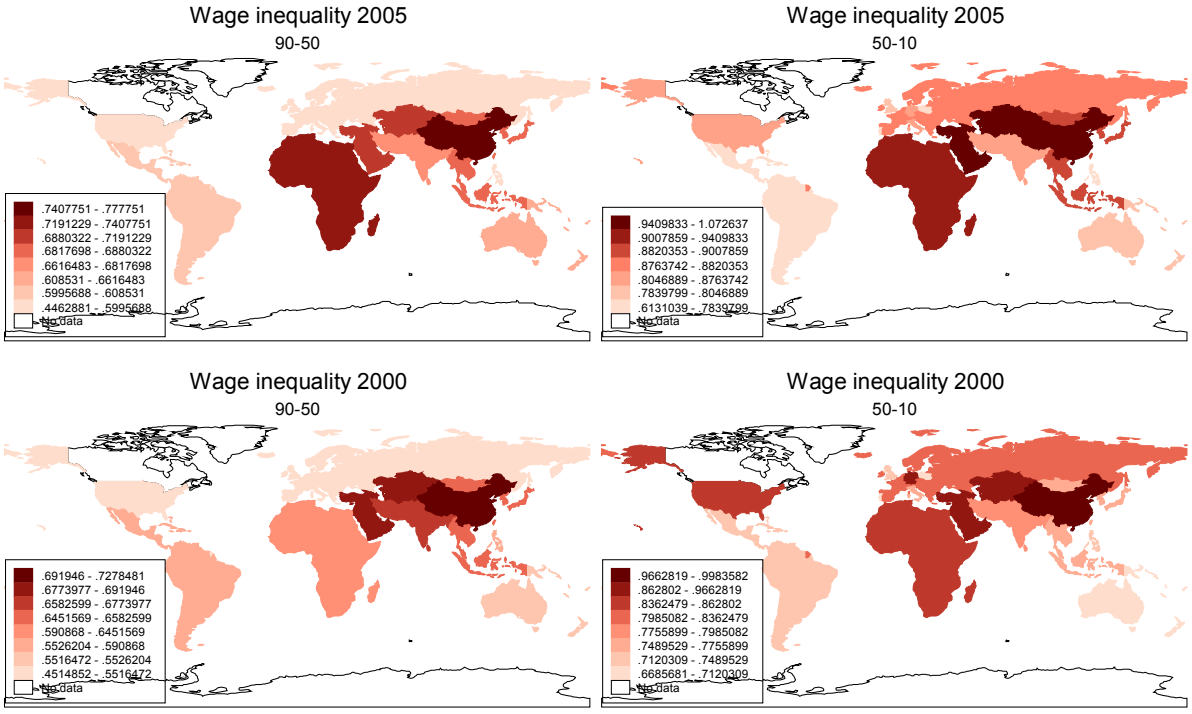
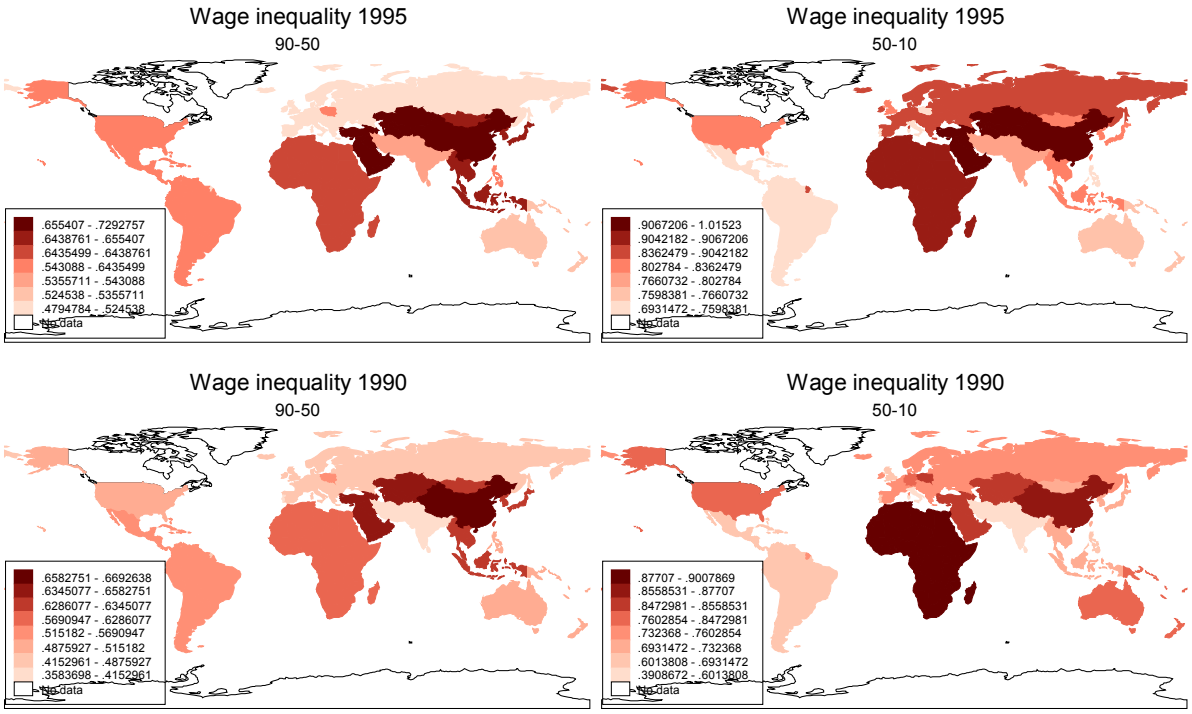


Figure 2-7 College-high school log wage gap by age groups and years





Note: The data is drawn from Canada Censuses 1991, 1995, 2000 and 2005. The graph is based on male full-time immigrants from the 15 places of birth: United States of America; United Kingdom; Germany; Italy; Portugal; Poland; Other European; West, Central Asia and the Middle East, Southern Asia; People's Republic of China; Philippines; Other Eastern and South East Asia; Africa; Central America; Caribbean and Bermuda and South America; Others.

Figure 2-8 Immigrant weekly wage inequality by year

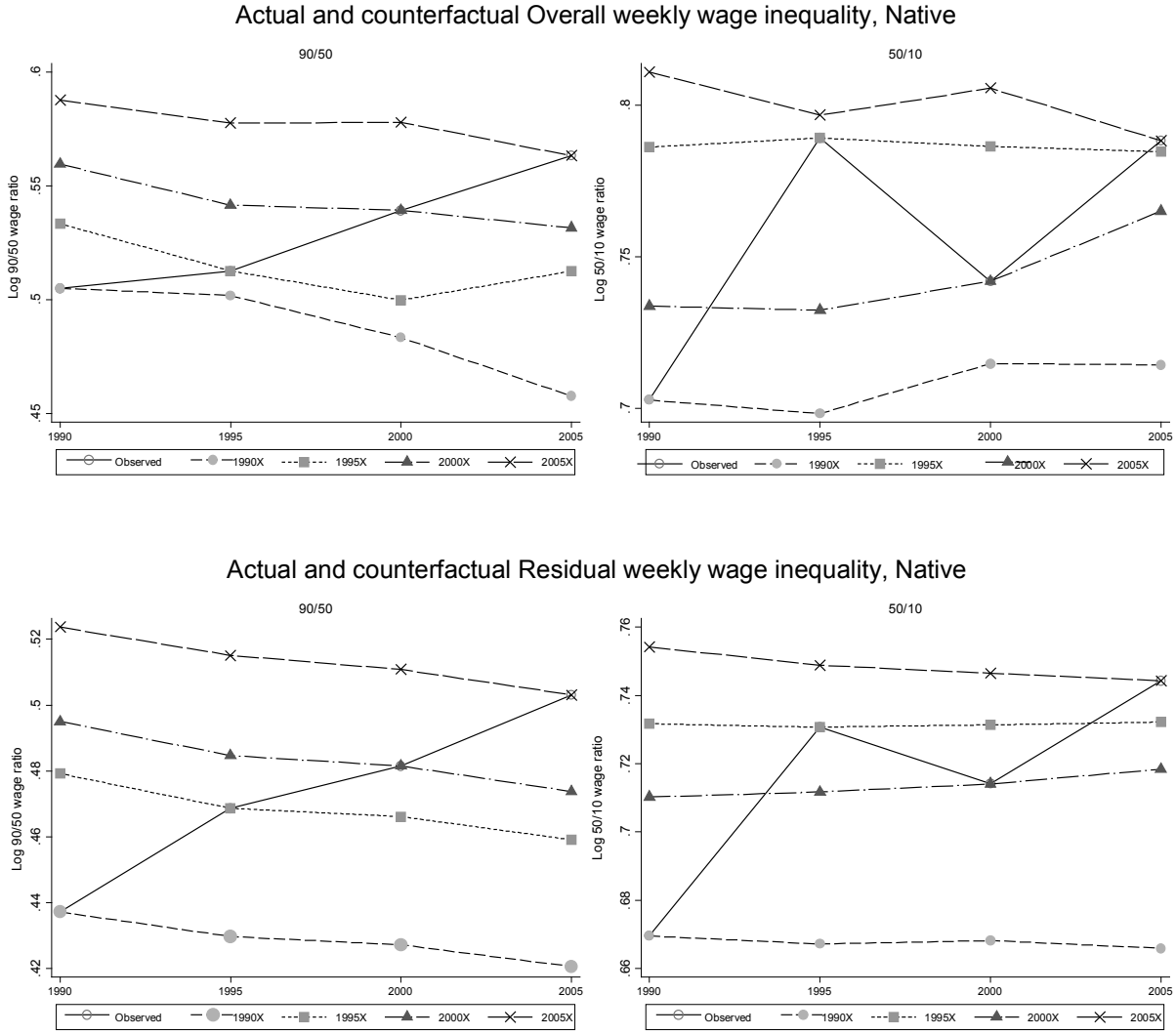


Figure 2-9 Actual and counterfactual weekly wage inequality for native, control for education and age

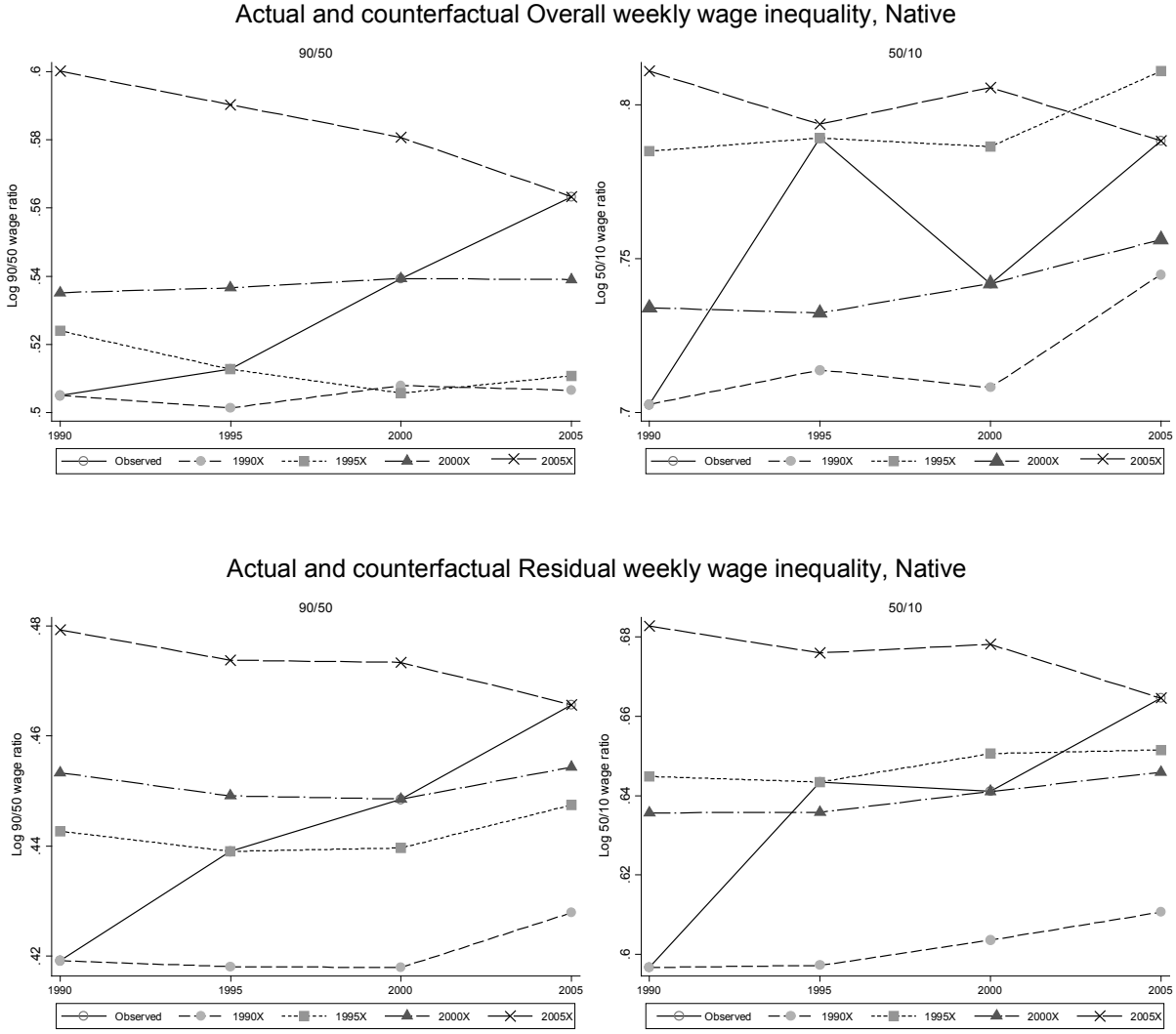


Figure 2-10 Actual and counterfactual weekly wage inequality for native, additional control for occupation and industry dummies

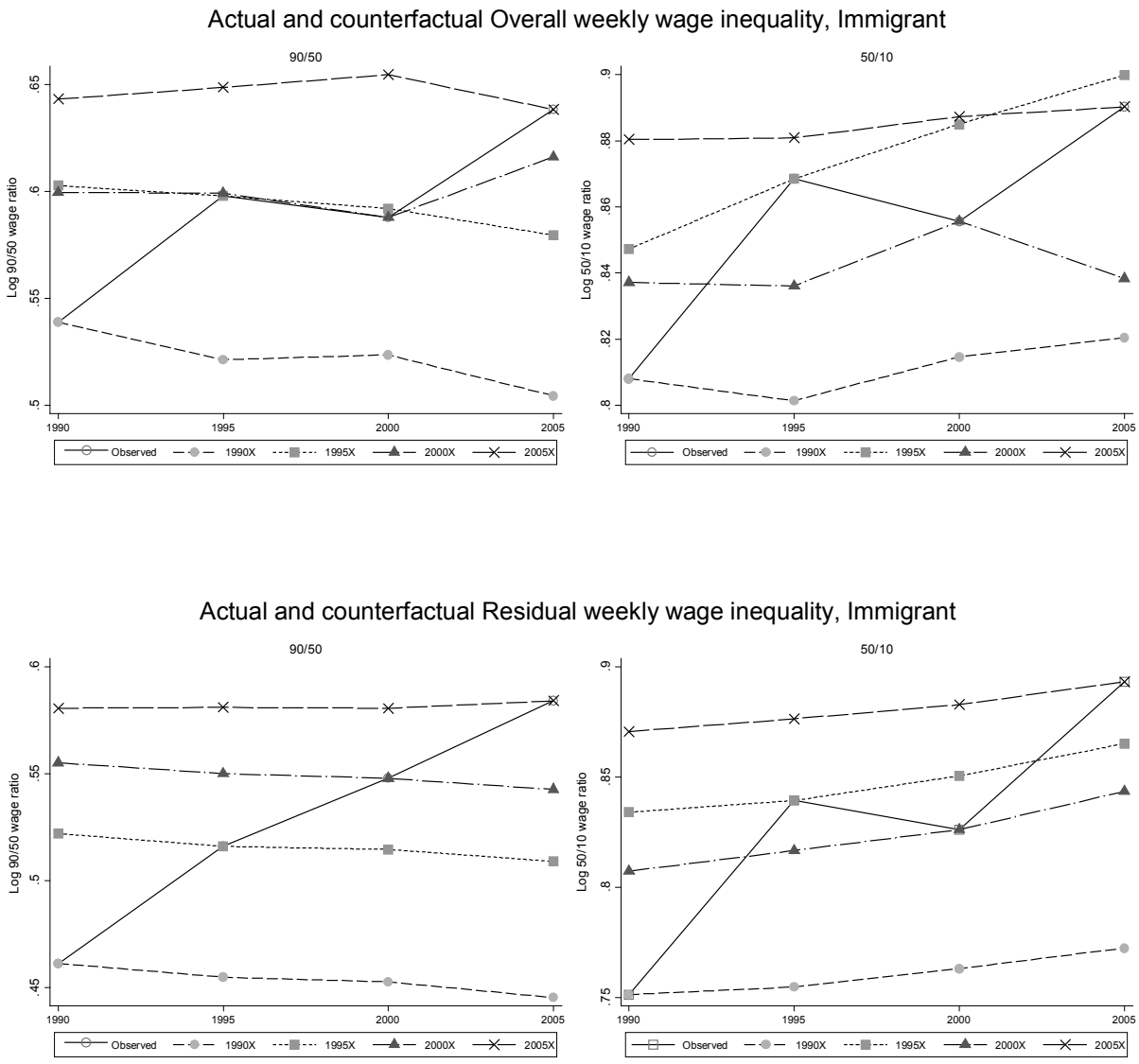


Figure 2-11 Actual and counterfactual weekly wage inequality for immigrant, control 1

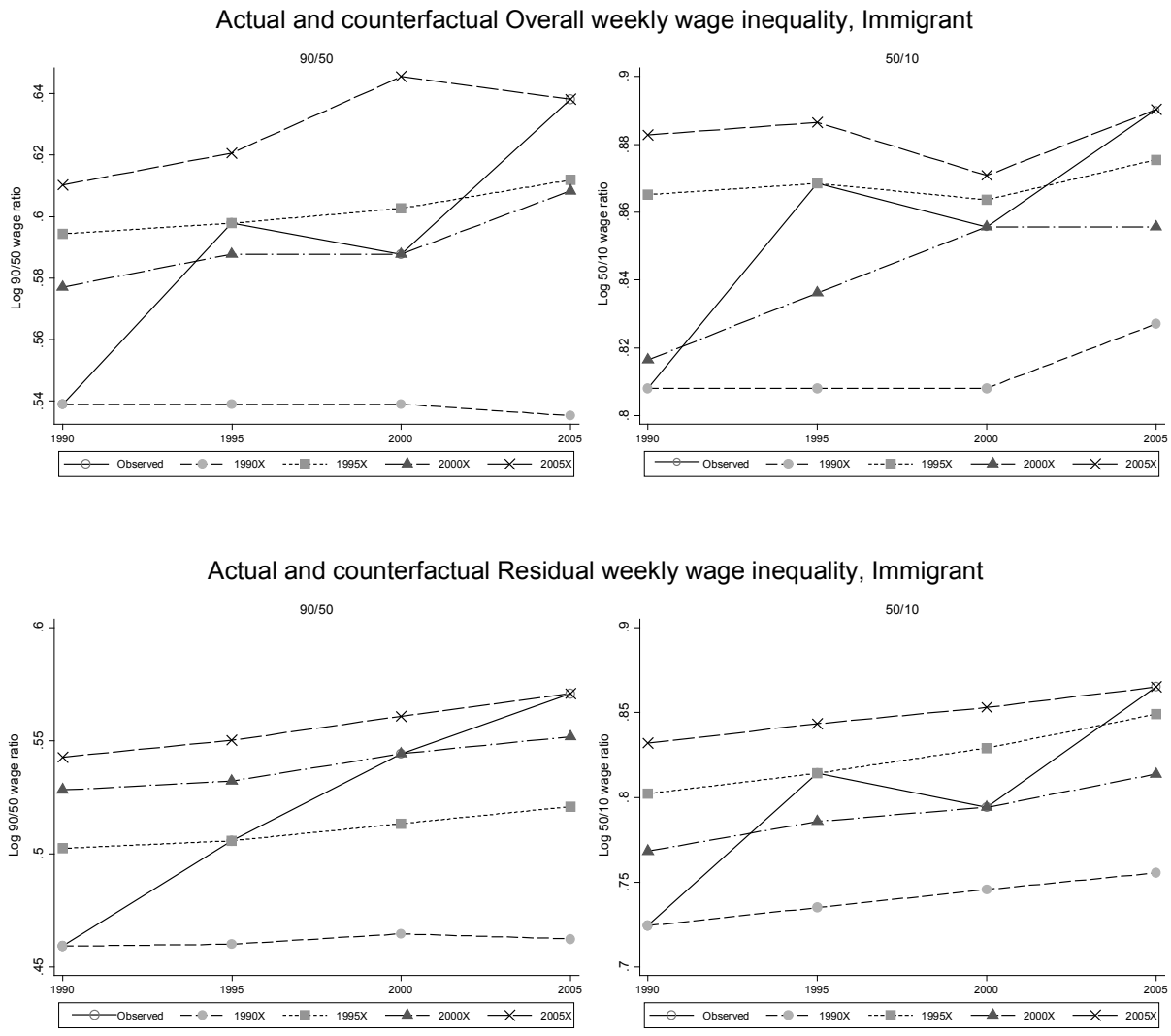


Figure 2-12 Actual and counterfactual weekly wage inequality for immigrant, control 2

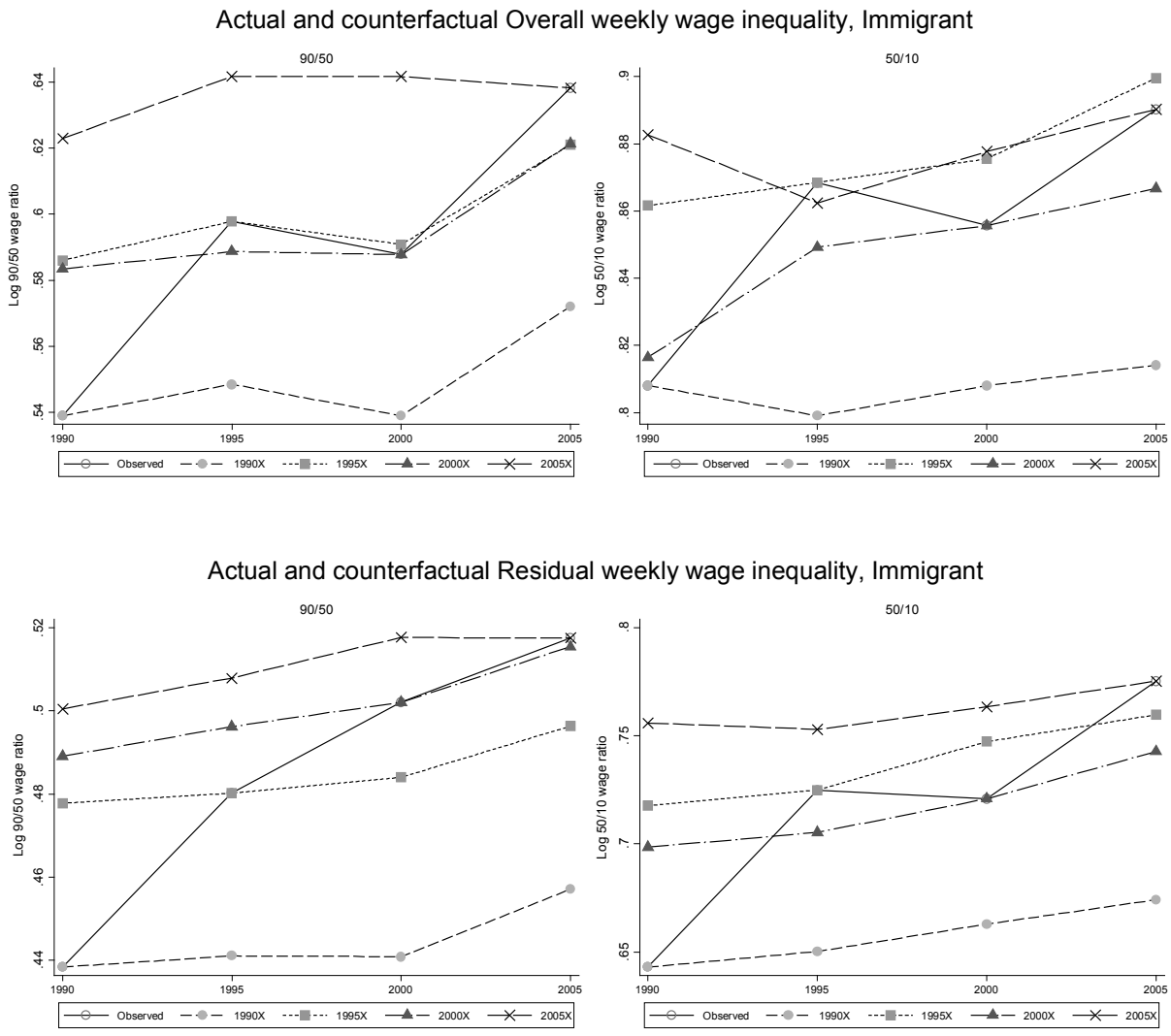
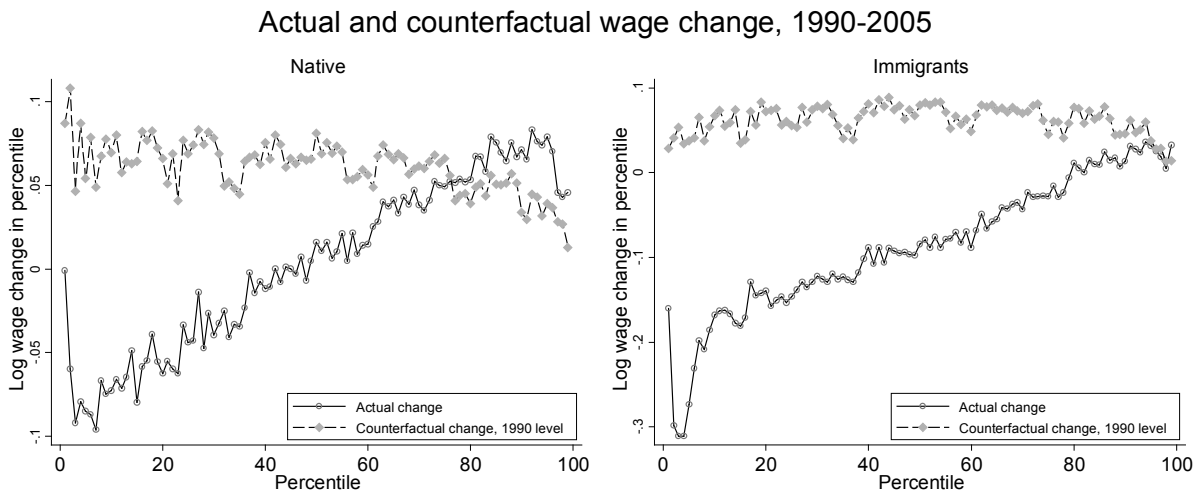
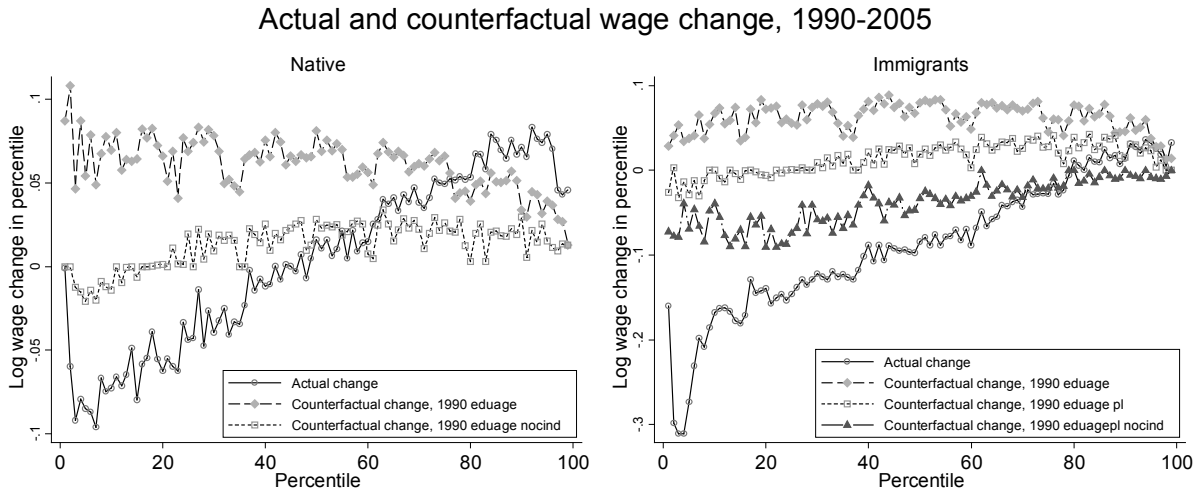


Figure 2-13 Actual and counterfactual weekly wage inequality for immigrant, control 3



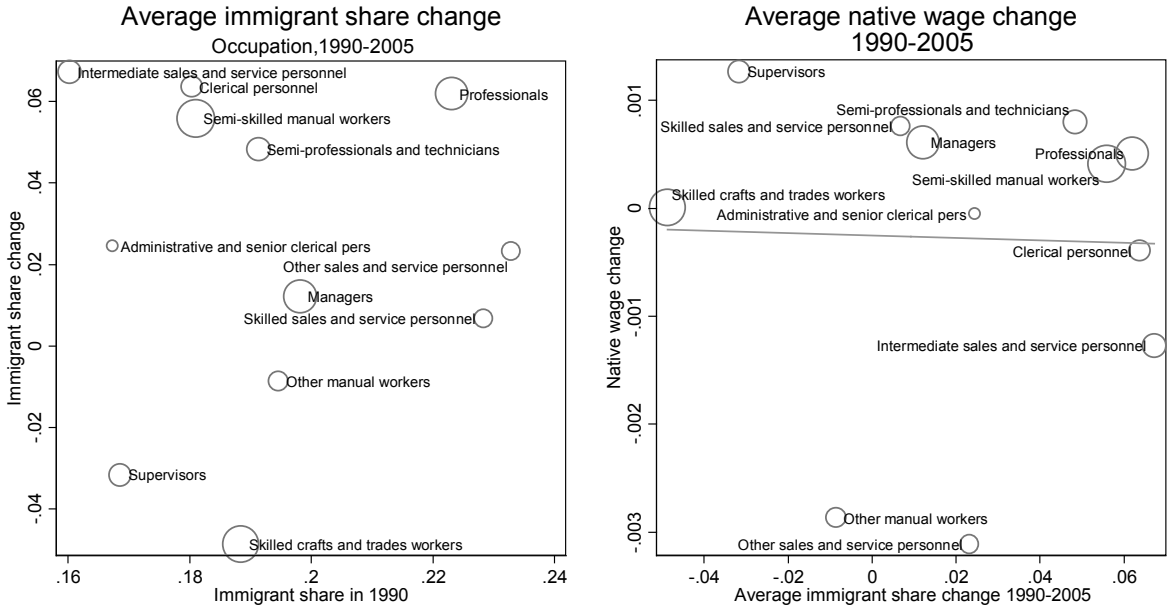
Note: "counterfactual" indicates education and age at 1990 level

Figure 2-14 Actual and Counterfactual wage change, 1990-2005



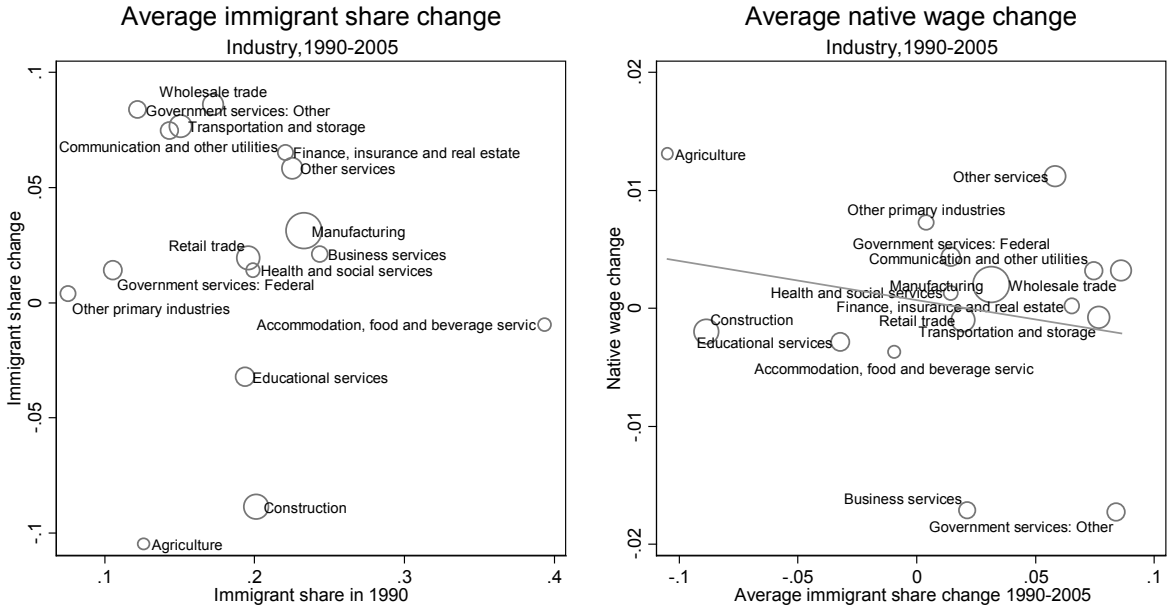
Note: "counterfactual" indicates education and age, etc. at 1990 level. Specifically, eduage indicates education and age. eduagenocind indicates education, age, occupation and industry. eduagepl indicates education, age and place. eduageplnocind indicates education, age, place occupation and industry.

Figure 2-15 Actual and Counterfactual wage change, 1990-2005



Weight is average native numbers.

Figure 2-16 Average immigrant share change and native wage change by occupation: 1990-2005



Weight is average native numbers.

Figure 2-17 Average immigrant share change and native wage change by industry: 1990-2005

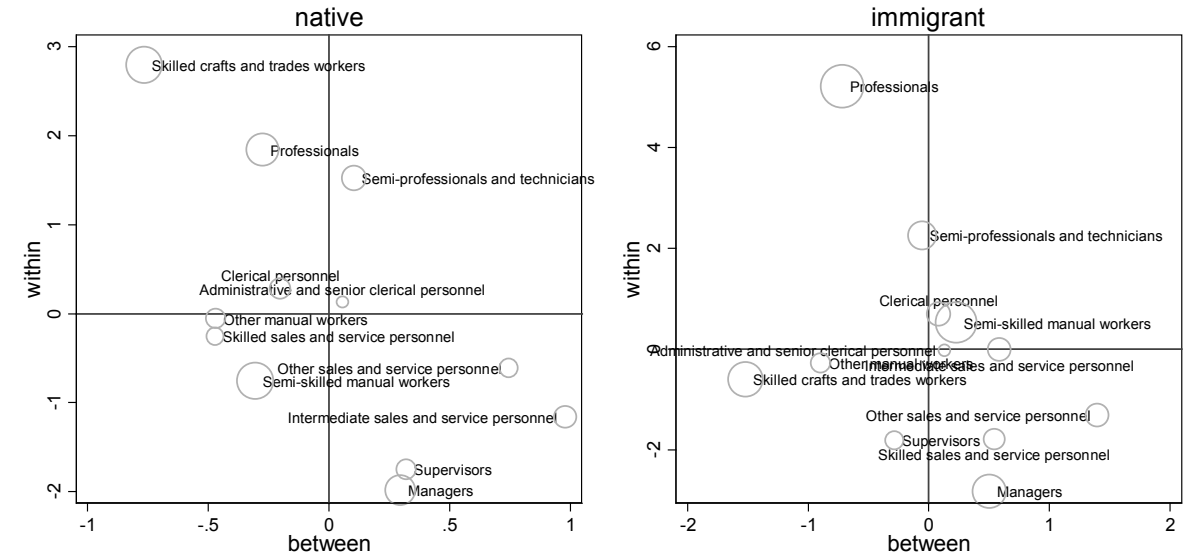


Figure 2-18 Occupational employment change within and between industries

Appendix

Table A2.1: Index of dissimilarity in Occupational distribution between immigrants and natives.

	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59
HS Dropout	0.113	0.107	0.120	0.106	0.089	0.121	0.123
High School	0.081	0.084	0.094	0.105	0.103	0.104	0.122
College	0.080	0.077	0.065	0.065	0.058	0.054	0.046
University	0.107	0.134	0.170	0.169	0.166	0.160	0.128

To examine if immigrants and natives who have similar education but different age are not perfect substitutes, the Segregation Index (Dissimilarity index) is used to solve this question by analyzing whether this occupation is more likely to have a larger number of immigrants or natives. Usually, there are two ways to investigate the dissimilarity in the occupation distributions of immigrants and natives. One is Welch's [1999] index of congruence, the other is Duncan index.

For example, Borjas (2003) applies the Welch's method to calculate the index of congruence in occupation distributions of immigrants and natives within education groups. Specifically, the index for any two categories n and i is defined by

$$C_{ni} = \frac{\sum_a (f_{na} - \overline{f}_a)(f_{ia} - \overline{f}_a)/\overline{f}_a}{\sqrt{\sum_a (f_{na} - \overline{f}_a)^2/\overline{f}_a}\sqrt{\sum_a (f_{ia} - \overline{f}_a)^2/\overline{f}_a}}$$

where f_{ha} indicates the fraction of group h ($h = n, i$) hired in occupation a, and $\overline{f}_a$ indicates the fraction of all workers hired in that occupation. The value of index C_{ni} is: $1 \leq C_{ni} \leq 1$. The smaller the index, the bigger the degree of dissimilarity. The index $C_{ni} = 1$ when the two categories have identical occupation distributions.

I calculate Ducan dissimilarity index for the distribution of immigrants and natives across occupations (12 categories according to National occupation classification) in terms of education and age (for each of 28 age-education cells). Duncan Index is defined by:

$$I = \frac{1}{2}\sum_{i=1}^{i=n} |N_i - M_i|$$

Where N_i and M_i indicates the fraction of natives and immigrants employed in that occupation respectively. $\sum_{i=1}^{i=n} N_i = 1$, and $\sum_{i=1}^{i=n} M_i = 1$. The value of index: $0 \leq I \leq 1$. $I = 0$ ($N_i = M_i$) represents that there is no segregation in any occupation. $I = 1$(N_i >0, the M_i = 0 and vice versa.) represents that there is complete segregation in all occupation.

Table A2.2 Log weekly wage inequality

Year	GE(0)	GE(1)	GE(2)	A(0.5)	A(1)	A(2)	Gini
				Natives			
1990	0.0035	0.0034	0.0032	0.0017	0.0035	0.0075	0.0421
1995	0.0040	0.0038	0.0036	0.0020	0.0040	0.0085	0.0452
2000	0.0039	0.0037	0.0035	0.0019	0.0039	0.0082	0.0446
2005	0.0041	0.0039	0.0037	0.0020	0.0041	0.0086	0.0463
% growth	16.147	16.418	16.563	15.698	16.193	15.550	10.000
				Immigrants			
	0.0047	0.0044	0.0042	0.0023	0.0046	0.0098	0.0497
1990	0.0039	0.0037	0.0036	0.0019	0.0039	0.0083	0.0452
1995	0.0048	0.0046	0.0044	0.0023	0.0048	0.0101	0.0507
2000	0.0047	0.0045	0.0043	0.0023	0.0047	0.0099	0.0499
2005	0.0051	0.0048	0.0046	0.0025	0.0050	0.0106	0.0523
% growth	28.753	29.223	29.412	28.796	28.571	28.329	15.741

Note: GE(0) refers to the mean log deviation, GE(1) indicates the Theil index, and GE(2) corresponds to half the squared coefficient of variation. A (0.5), A (1), and A (2) indicates the Atkinson Index with coefficient 0.5, 1, and 2 respectively. Gini is the Gini Index.

Atkinson inequality indices:

$$A_\epsilon(y) = 1 - [\left(\frac{1}{N}\right)\sum_{i=1}^{N}(y_i/\mu)^{1-\epsilon}]^{\frac{1}{1-\epsilon}}, \epsilon \geq 0, \epsilon \neq 1$$

$$A_\epsilon(y) = 1 - exp[\left(\frac{1}{N}\right)\sum_{i=1}^{N} log(y_i/\mu)], \epsilon = 1$$

Parameter ϵ specifies i a measure of inequality aversion. $\epsilon = 0$ refers to no inequality aversion. $\epsilon \to -\infty$ is Rawlsian inequality aversion.

Generalized Entropy indices:

$$I_e(y) = \left(\frac{1}{e(e-1)}\right)\left[\left(\left(\frac{1}{N}\right)\sum_{i=1}^{N}(y_i/\mu)^e\right) - 1\right], e \neq 0,1$$

$$I_1(y) = \left(\frac{1}{N}\right)\sum_{i=1}^{N}(y_i/\mu)\ log(y_i/\mu), e = 1$$

$$I_0(y) = \left(\frac{1}{N}\right)\sum_{i=1}^{N} log(y_i/\mu), e = 0$$

I_2 is half CV squared; $I_1$is Theil index; I_0 is Mean Log Deviation.

Parameter e indicates sensitivity to earnings differences in various parts of the wage distribution. Smaller $e < 0$ corresponds to higher sensitivity to low earnings values; Bigger $e > 0$ corresponds to higher sensitivity to high earnings values.

Total inequality corresponds to the total of weighted sum of the inequalities within each subgroup and inequality between groups: $I(y) = I_{Within} + I_{Between}$

Where $I_{Within} = \sum_m w_m\,(y_m)$ for subgroups $m = 1, \dots, M$

$I_{between} = I(\mu_1, \mu_2, \dots, \mu_m)$

$w_m = w_m(\mu_m, N_m)$

Table A2.3 Decomposition of Log weekly wage inequality by education groups

Year		GE(0)	GE(1)	GE(2)	A(0.5)	A(1)	A(2)
				Natives			
1990	within	0.0034	0.0032	0.0031	0.0016	0.0034	0.0072
	%within	96.03	95.82	95.63	95.91	95.75	95.97
	between	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
	%between	3.97	99.04	99.04	99.04	99.04	99.04
1995	within	0.0039	0.0037	0.0035	0.0019	0.0039	0.0082
	%within	96.52	96.33	95.88	96.41	96.27	96.35
	between	0.0001	0.0001	0.0002	0.0001	0.0002	0.0003
	%between	3.48	3.67	4.12	3.59	3.73	3.65
2000	within	0.0037	0.0035	0.0034	0.0018	0.0037	0.0079
	%within	96.39	96.20	96.02	96.28	96.38	96.34
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003
	%between	3.61	3.80	3.98	3.72	3.62	3.66
2005	within	0.0039	0.0037	0.0036	0.0019	0.0039	0.0083
	%within	95.85	95.64	95.45	95.98	95.84	95.94
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0004
	%between	4.15	4.36	4.55	4.02	4.16	4.06
% growth	within	15.93	16.20	16.67	16.46	15.98	15.80
	between	21.43	21.43	21.43	14.29	13.33	16.67
				Immigrants			
1990	within	0.0038	0.0036	0.0034	0.0018	0.0037	0.0079
	%within	0.96	0.95	0.95	0.95	0.95	0.96
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0004
	%between	99.04	99.05	99.05	99.05	99.05	99.04
1995	within	0.0038	0.0036	0.0034	0.0018	0.0037	0.0079
	%within	95.66	95.44	95.24	95.29	95.41	95.65
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0004
	%between	4.34	4.56	4.76	4.71	4.59	4.35
2000	within	0.0046	0.0043	0.0041	0.0022	0.0045	0.0096
	%within	97.01	96.86	96.72	96.93	97.01	97.26
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003
	%between	2.99	3.14	3.28	3.07	2.99	2.74
2005	within	0.0050	0.0047	0.0045	0.0024	0.0049	0.0104
	%within	97.83	97.72	97.62	97.57	97.82	98.02
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
	%between	2.17	2.28	2.38	2.43	2.18	1.98
% growth	within	32.00	32.30	32.65	32.42	32.09	31.35
	between	-35.29	-35.29	-35.29	-33.33	-38.89	-41.67

Note: %within (between) indicates the percentage of inequality attributed to the within(between)-group dispersion.

Table A2.4 Decomposition of Log weekly wage inequality by age groups

Year		GE(0)	GE(1)	GE(2)	A(0.5)	A(1)	A(2)
				Natives			
1990	within	0.0034	0.0032	0.0031	0.0017	0.0034	0.0072
	%within	96.32	96.12	95.94	96.49	96.32	96.51
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003
	%between	3.68	3.88	4.06	3.51	3.68	3.49
1995	within	0.0039	0.0037	0.0035	0.0019	0.0039	0.0082
	%within	95.78	95.80	95.59	95.90	95.77	96.12
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0003
	%between	4.22	4.20	4.41	4.10	4.23	3.88
2000	within	0.0038	0.0036	0.0034	0.0018	0.0038	0.0080
	%within	96.91	97.00	96.87	96.83	96.91	97.19
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
	%between	3.09	3.00	3.13	3.17	3.09	2.81
2005	within	0.0040	0.0038	0.0036	0.0019	0.0039	0.0083
	%within	96.34	96.15	96.24	96.48	96.33	96.52
	between	0.0002	0.0002	0.0001	0.0001	0.0002	0.0003
	%between	3.66	3.85	3.76	3.52	3.67	3.48
% growth	within	5.33	5.63	5.60	5.49	5.35	4.92
	between	7.14	15.38	7.69	0.00	7.14	11.11
				Immigrants			
1990	within	0.0038	0.0036	0.0034	0.0018	0.0038	0.0079
	%within	95.67	95.71	95.52	95.81	95.66	95.77
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0004
	%between	4.33	4.29	4.48	4.19	4.34	4.23
1995	within	0.0046	0.0044	0.0042	0.0022	0.0046	0.0097
	%within	95.83	95.62	95.44	95.73	95.82	96.13
	between	0.0002	0.0002	0.0002	0.0001	0.0002	0.0004
	%between	4.17	4.38	4.56	4.27	4.18	3.87
2000	within	0.0046	0.0044	0.0042	0.0022	0.0046	0.0097
	%within	98.29	98.21	98.13	98.25	98.29	98.48
	between	0.0001	0.0001	0.0001	0.0000	0.0001	0.0002
	%between	1.71	1.79	1.87	1.75	1.71	1.52
2005	within	0.0050	0.0047	0.0045	0.0024	0.0050	0.0104
	%within	98.02	97.93	97.84	97.97	98.02	98.21
	between	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
	%between	1.98	2.07	2.16	2.03	1.98	1.79
% growth	within	9.49	9.77	9.95	9.55	9.51	9.13
	between	-16.67	-16.67	-16.67	-16.67	-16.67	-20.83

Table A2.5 The effects of immigrants on native across different occupations

Occupation	1	2	3
1 Managers	0.001	0.124	0.161
	(0.054)	(0.092)	(0.12)
2 Professionals	-0.026	0.178***	0.386
	(0.033)	(0.056)	(0.232)
3 Semi-professionals and technicians	-0.027	-0.003	-0.015
	(0.017)	(0.053)	(0.136)
4 Supervisors	-0.088	0.042	0.045
	(0.07)	(0.11)	(0.131)
5 Administrative and senior clerical personnel	-0.051	0.084	0.145
	(0.05)	(0.122)	(0.148)
6 Skilled sales and service personnel	-0.101**	0.019	-0.019
	(0.039)	(0.119)	(0.111)
7 Skilled crafts and trades workers	-0.023	0.018	0.065
	(0.018)	(0.067)	(0.064)
8 Clerical personnel	-0.060***	0.019	0.106
	(0.021)	(0.077)	(0.129)
9 Intermediate sales and service personnel	-0.067**	0.027	0.082
	(0.026)	(0.108)	(0.104)
10 Semi-skilled manual workers	-0.021	0.116	0.04
	(0.021)	(0.069)	(0.085)
11 Other sales and service personnel	-0.013	-0.009	-0.07
	(0.027)	(0.067)	(0.08)
12 Other manual workers	0.025	0.019	0.223*
	(0.032)	(0.061)	(0.126)
Fixed effects	No	Yes	Yes
Weight	Yes	Yes	No

Note: Canada Censuses 1991, 1995, 2000 and 2005. The heteroskedasticity-robust standard errors are in parentheses and are clustered over the 28 education-age groups. Fixed effects for occupation groups is education × age and year. Each cell in columns 1 and 2 is weighted by its employment. * p<0.10, ** p<0.05, *** p<0.01

Table A2.6 The effects of immigrants on native across different industry

Industry	1	2	3
1 Agriculture	0.066	0.028	-0.012
	(0.078)	(0.095)	(0.107)
2 Other primary industries	0.023	-0.046	-0.017
	(0.037)	(0.091)	(0.090)
3 Manufacturing	-0.062***	0.066	0.039
	(0.019)	(0.047)	(0.042)
4 Construction	0.009	-0.069	-0.094
	(0.026)	(0.067)	(0.085)
5 Transportation and storage	-0.037	0.036	0.022
	(0.038)	(0.057)	(0.062)
6 Communication and other utilities	0.041*	0.000	0.036
	(0.022)	(0.070)	(0.075)
7 Wholesale trade	-0.060*	0.150*	0.150
	(0.032)	(0.076)	(0.097)
8 Retail trade	-0.089**	0.008	0.018
	(0.041)	(0.116)	(0.124)
9 Finance, insurance and real estate	-0.033	-0.007	-0.037
	(0.031)	(0.090)	(0.105)
10 Business services	-0.082***	0.047	-0.062
	(0.024)	(0.088)	(0.089)
11 Government services: Federal	-0.044*	0.037	-0.003
	(0.023)	(0.063)	(0.057)
12 Government services: Other	-0.100**	-0.044	-0.108
	(0.037)	(0.084)	(0.091)
13 Educational services	0.043	0.096	0.099
	(0.044)	(0.104)	(0.085)
14 Health and social services	-0.012	0.010	0.001
	(0.050)	(0.099)	(0.110)
15 Accommodation, food and beverage services	-0.082**	-0.077	-0.065
	(0.035)	(0.120)	(0.146)
16 Other services	-0.022	-0.070	-0.039
	(0.025)	(0.068)	(0.062)
Fixed effects	No	Yes	Yes
Weight	Yes	Yes	No

Note: Canada Censuses 1991, 1995, 2000 and 2005. The heteroskedasticity-robust standard errors are in parentheses and are clustered over the 28 education-age groups. Fixed effects for industry groups is education × age and year. Each cell in columns 1 and 2 is weighted by its employment. * p<0.10, ** p<0.05, *** p<0.01

Table A2.7: The effects of immigrants on native along different wage distribution

Distribution	1		2		3		4	
	Education groups							
	HS dropout		HS Graduates		Some College		University	
0-10%	0.049**	-0.087	0.019	-0.07	0.034	0.101	0.043	0.011
	(0.015)	(0.066)	(0.060)	(0.109)	(0.022)	(0.126)	(0.024)	(0.049)
0-25%	0.035*	0.043	0.007	-0.059	0.016	0.133**	0.041*	-0.057
	(0.014)	(0.074)	(0.021)	(0.052)	(0.016)	(0.052)	(0.021)	(0.050)
25-50%	0.005	-0.013	0.006	0.032***	0.001	0.011	-0.006	-0.019
	(0.003)	(0.010)	(0.008)	(0.007)	(0.006)	(0.008)	(0.004)	(0.023)
50-75%	0.010	-0.012	0.000	0.007	0.001	-0.005	-0.014***	0.008
	(0.006)	(0.017)	(0.004)	(0.007)	(0.002)	(0.007)	(0.003)	(0.009)
75-100%	0.011	0.047**	-0.004	0.049	0.011*	0.028*	0.018***	0.018
	(0.013)	(0.016)	(0.018)	(0.029)	(0.004)	(0.013)	(0.004)	(0.013)
90-100%	0.014**	0.015*	0.022**	0.027	0.007	0.025***	0.010	0.009
	(0.005)	(0.007)	(0.008)	(0.015)	(0.005)	(0.006)	(0.005)	(0.007)
	Age groups							
	25–34		35–49		50–59		All (25-59)	
0-10%	-0.011	-0.031	0.036	0.041	0.025	0.111	0.032**	0.031
	(0.011)	(0.021)	(0.026)	(0.036)	(0.023)	(0.067)	(0.012)	(0.037)
0-25%	0.023***	0.017	0.062***	0.026	0.086***	0.091	0.042***	0.023
	(0.007)	(0.009)	(0.017)	(0.032)	(0.016)	(0.064)	(0.008)	(0.033)
25-50%	-0.007	-0.005	-0.006	0.002	0.013**	0.000	-0.002	0.003
	(0.006)	(0.010)	(0.004)	(0.006)	(0.005)	(0.009)	(0.003)	(0.009)
50-75%	-0.003	-0.003	-0.011**	-0.003	-0.007	0.006	-0.005*	-0.004
	(0.002)	(0.005)	(0.004)	(0.007)	(0.008)	(0.006)	(0.003)	(0.007)
75-100%	0.011***	0.029***	0.009	0.023**	0.026***	0.003	0.009***	0.021**
	(0.003)	(0.005)	(0.007)	(0.008)	(0.006)	(0.005)	(0.003)	(0.009)
90-100%	0.011**	0.020**	0.008	0.018***	0.015**	-0.002	0.009***	0.017***
	(0.003)	(0.006)	(0.004)	(0.005)	(0.005)	(0.004)	(0.002)	(0.005)
Fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Weight	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

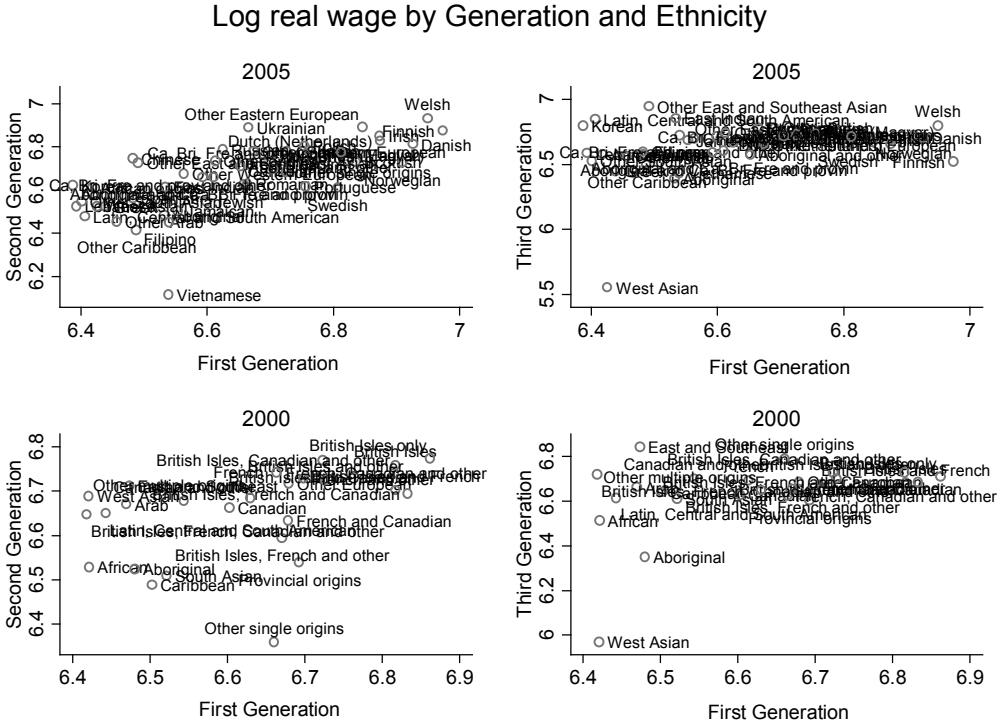


Figure A2-1: Log real wage by generation and Ethnicity

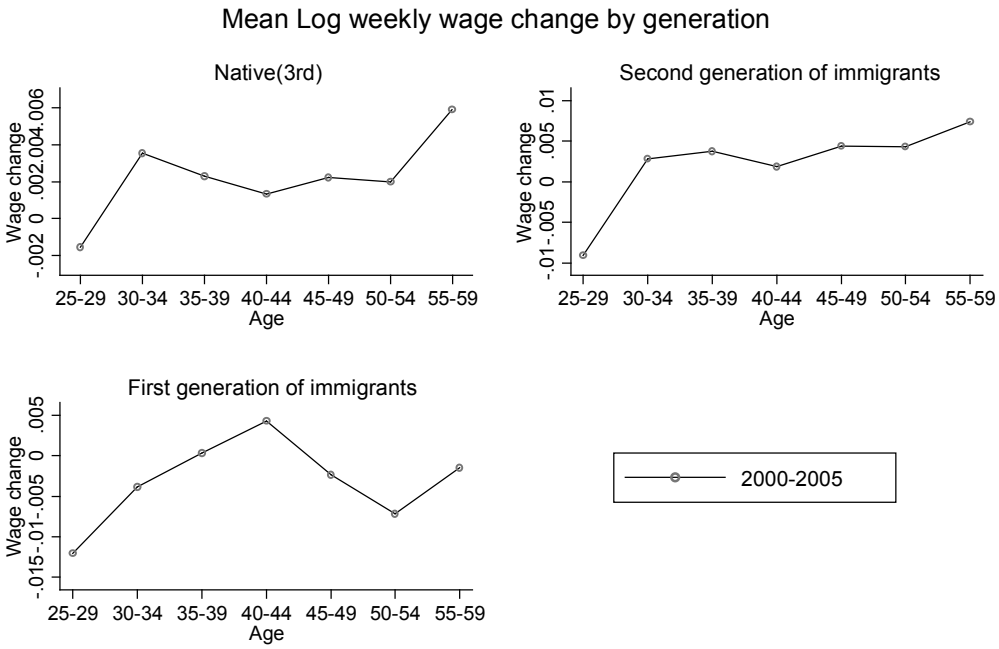


Figure A2-2: Mean log weekly change from 2005 to 2005 by generation and age

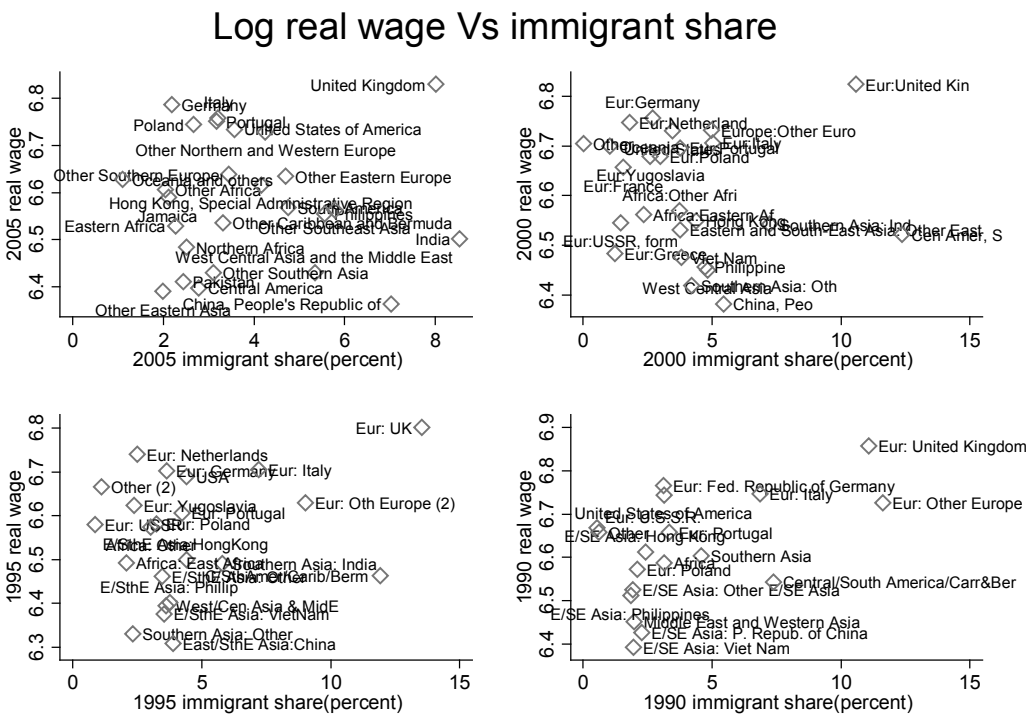


Figure A2-3: Log real wage and immigrant share by place of birth

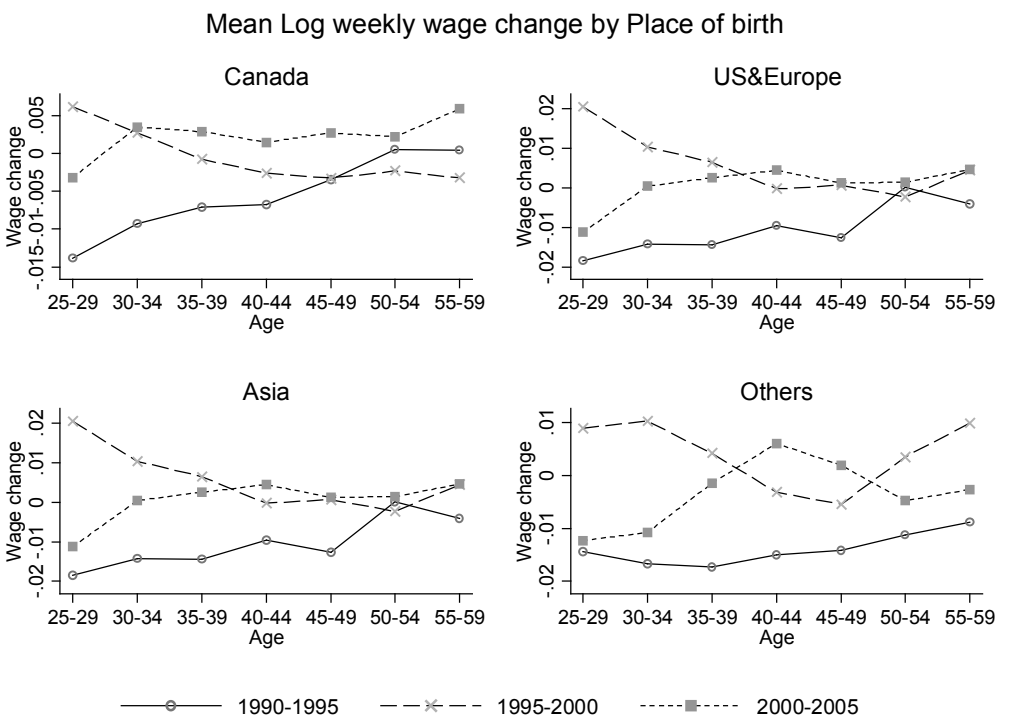


Figure A2-4: Mean log weekly wage change by place of birth and age group

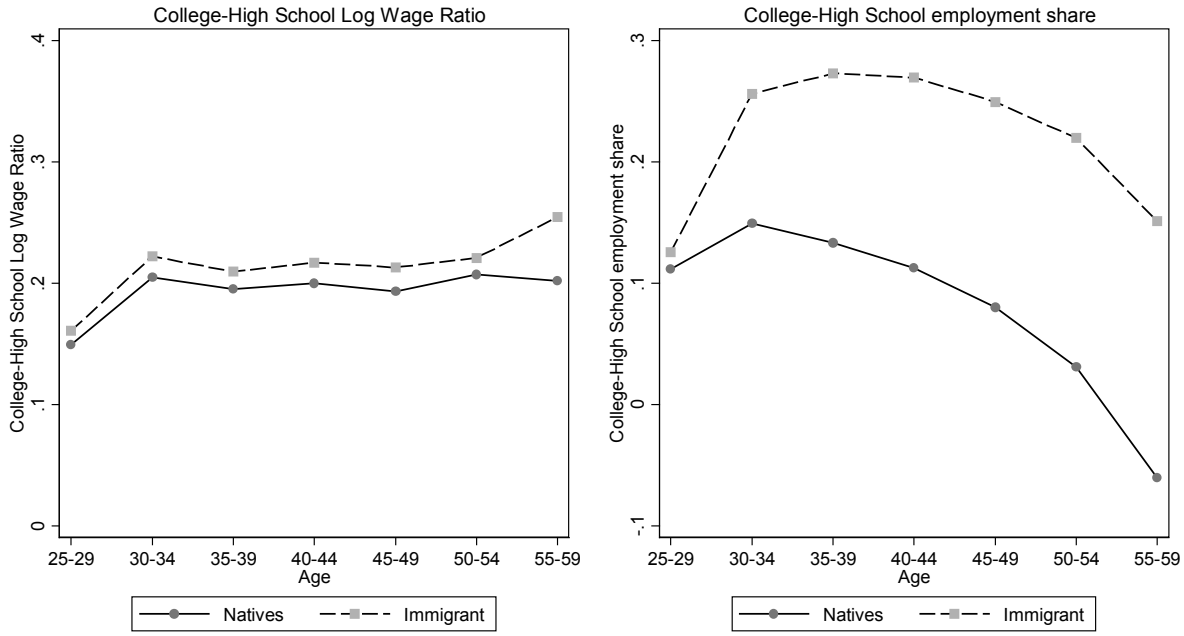


Figure A2-5: College-high school log wage ratio and employment share change

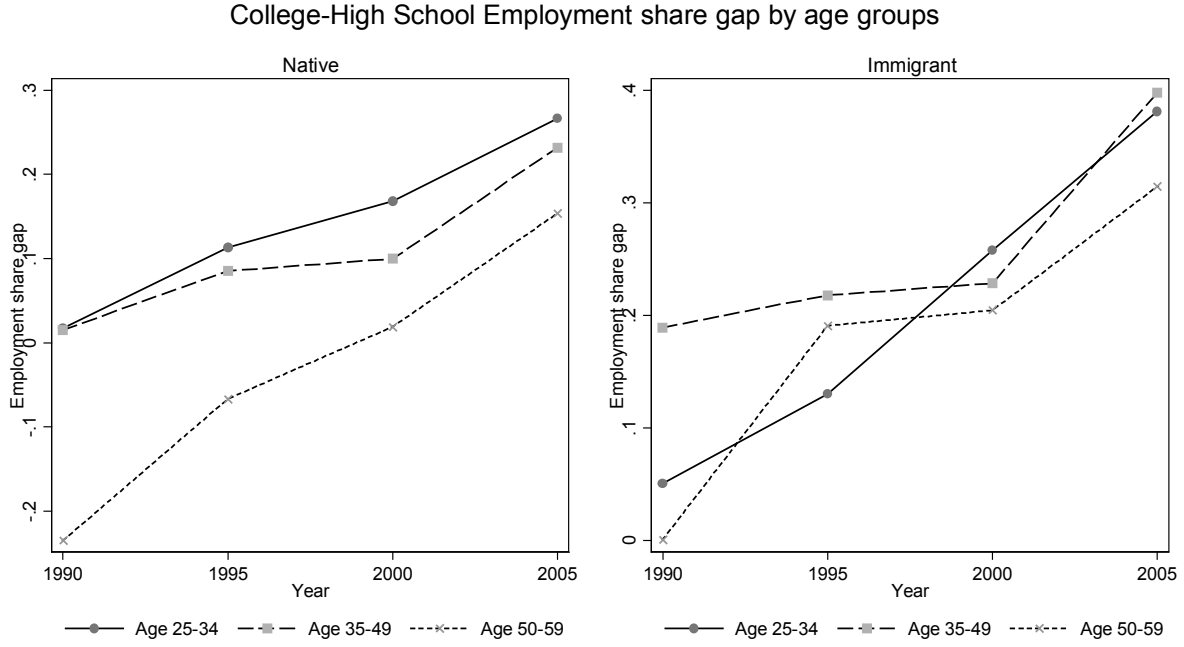


Figure A2-6: College-high school employment share change by age groups and years

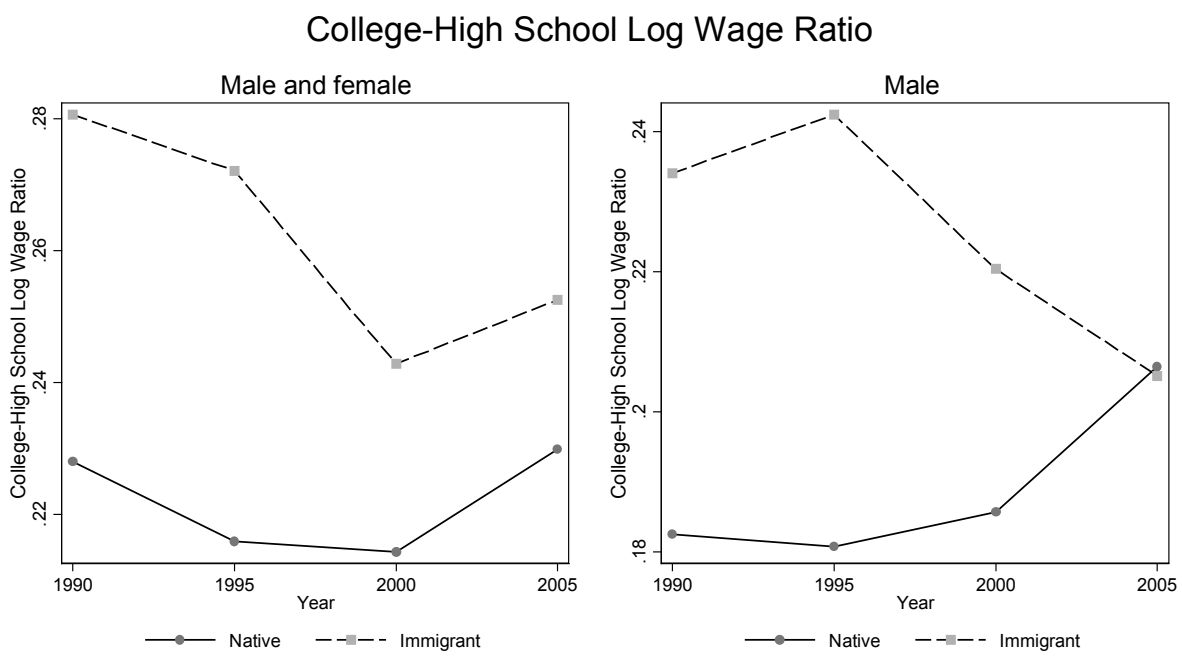


Figure A2-7: College-high school log wage ratio by year

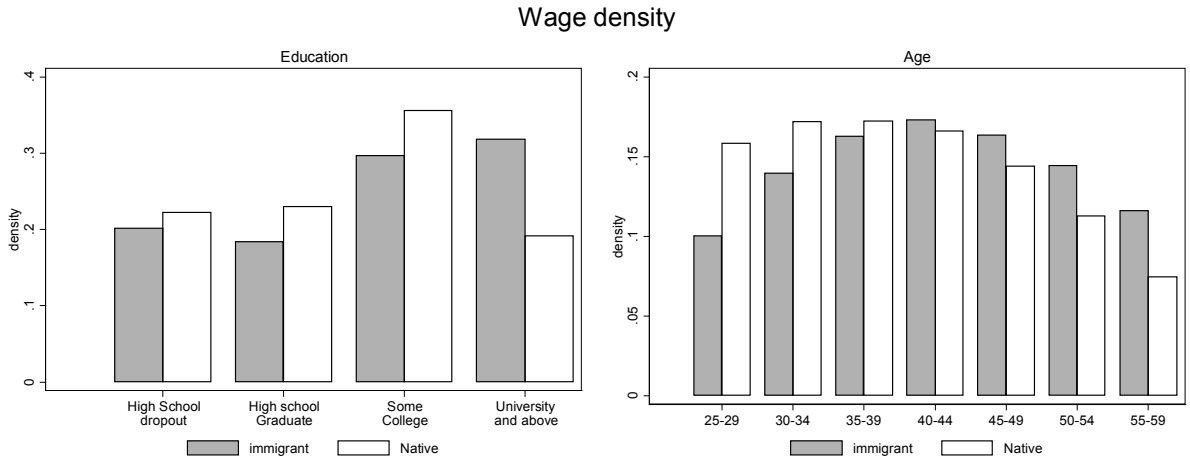


Figure A2-8: Density of immigrant and native by education and age groups

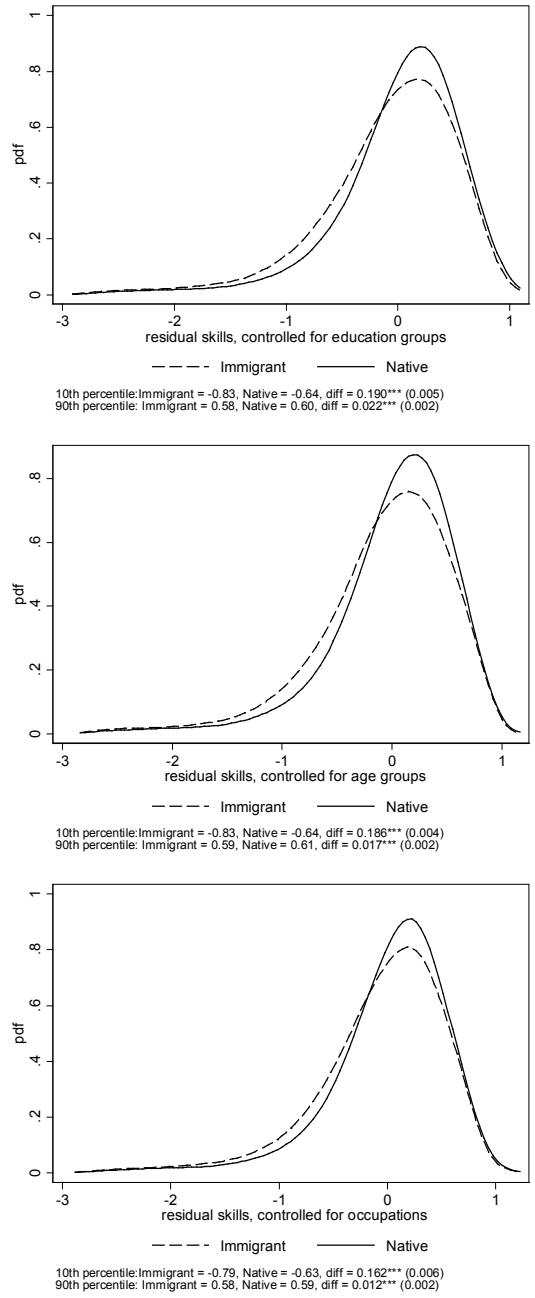


Figure A2-9: Residual density of immigrant and native

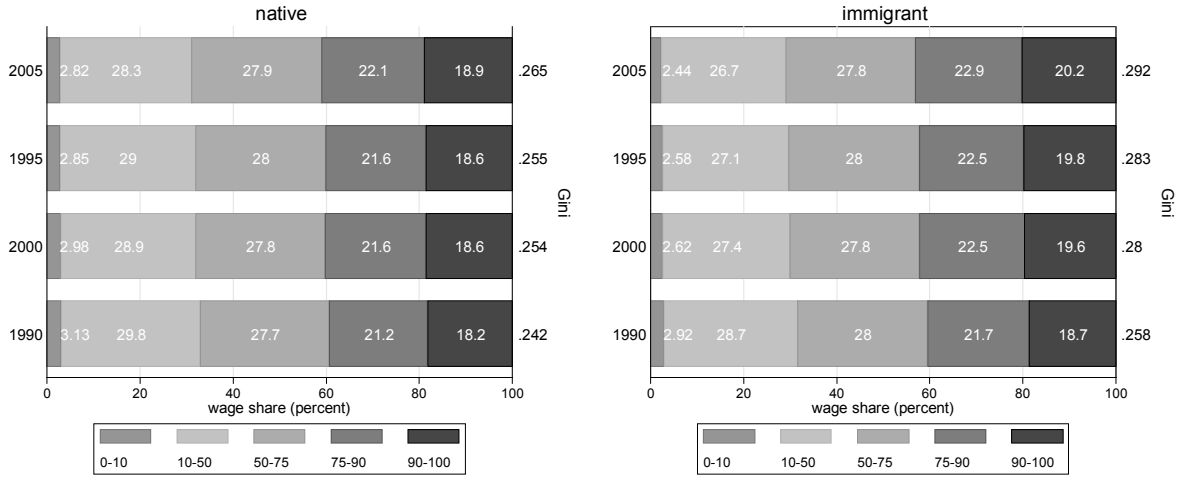


Figure A2-10: Percentile share by year for native and immigrant

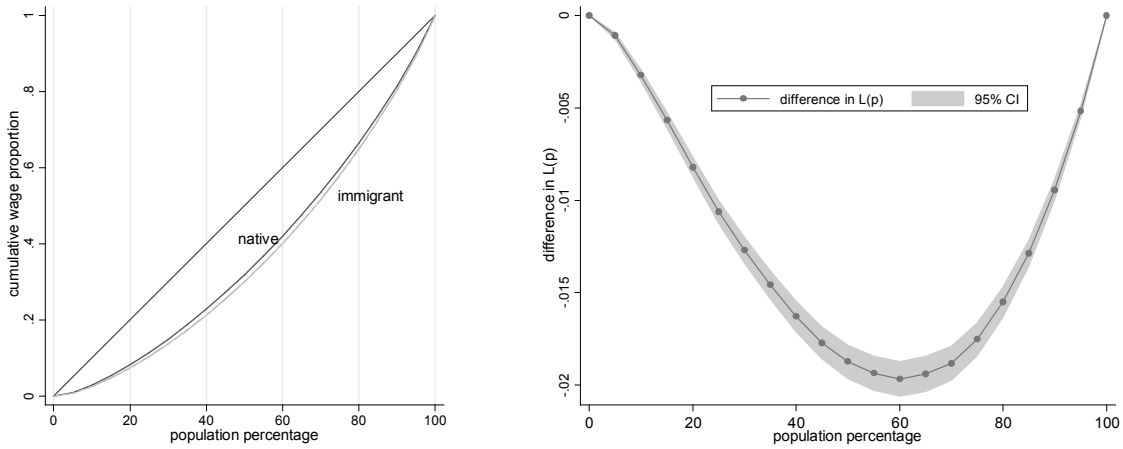


Figure A2-11(a): Lorenz curve (left), Diffference in lorenz curve between immigrants and natives (right).

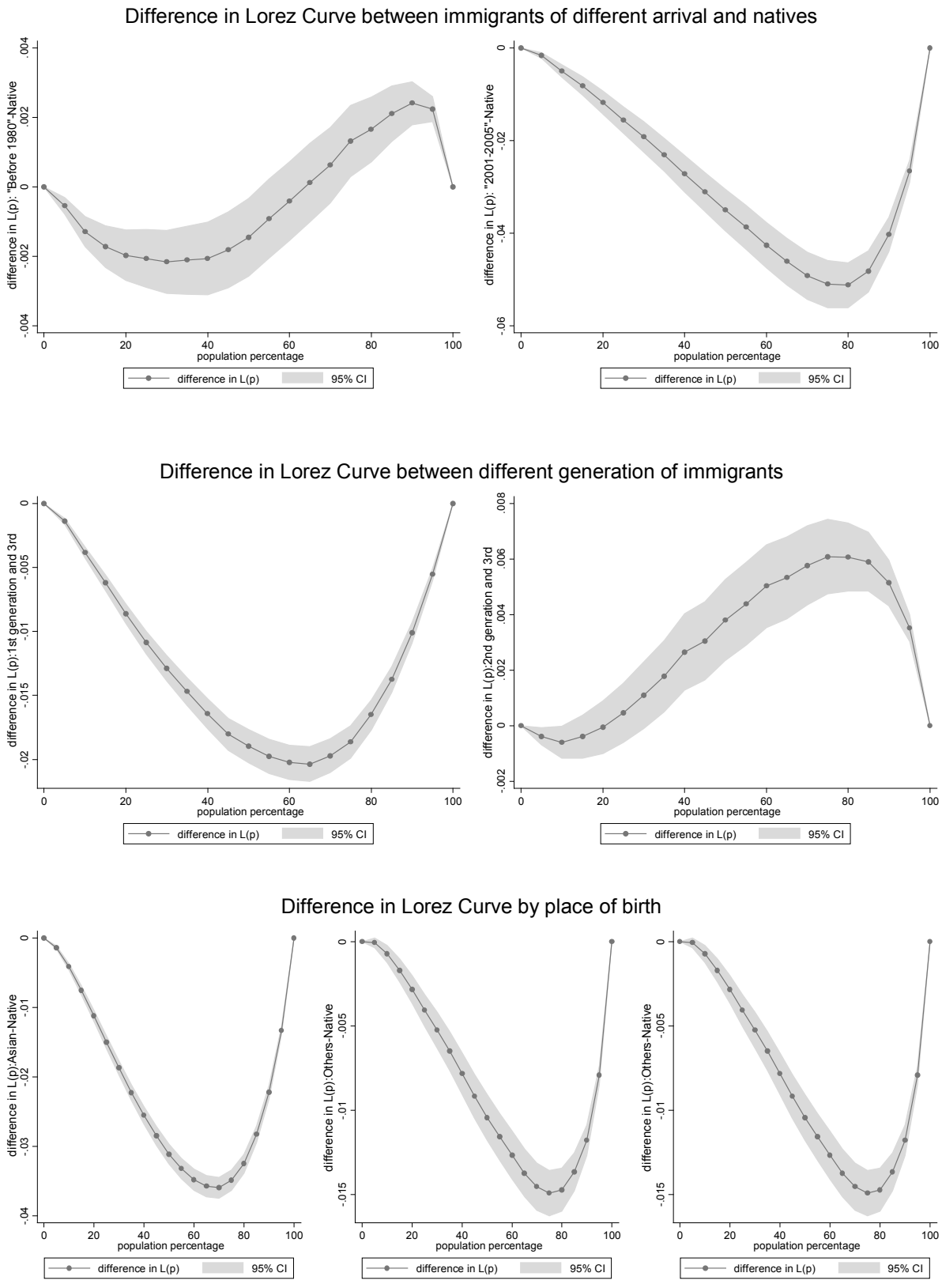


Figure A2-11(b): Diffference in lorenz curve by heterogeneous groups

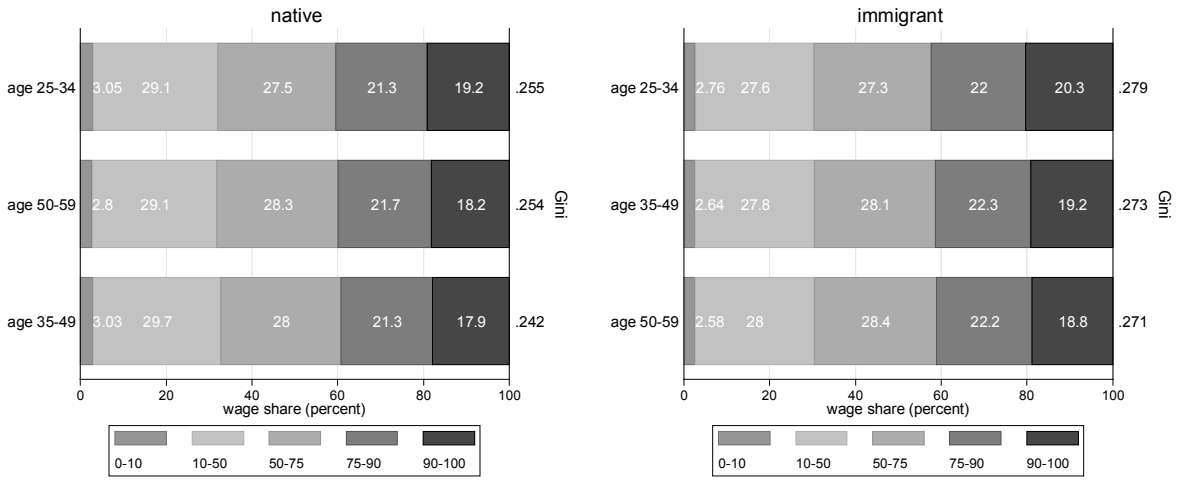


Figure A2-12: Percentile share by age groups for native and immigrant

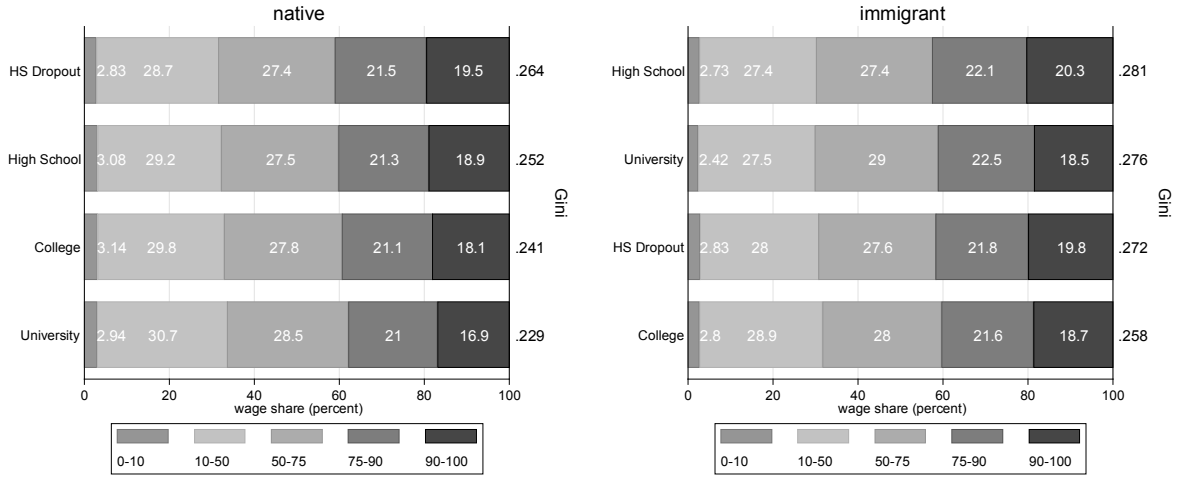


Figure A2-13: Percentile share by education groups for native and immigrant.

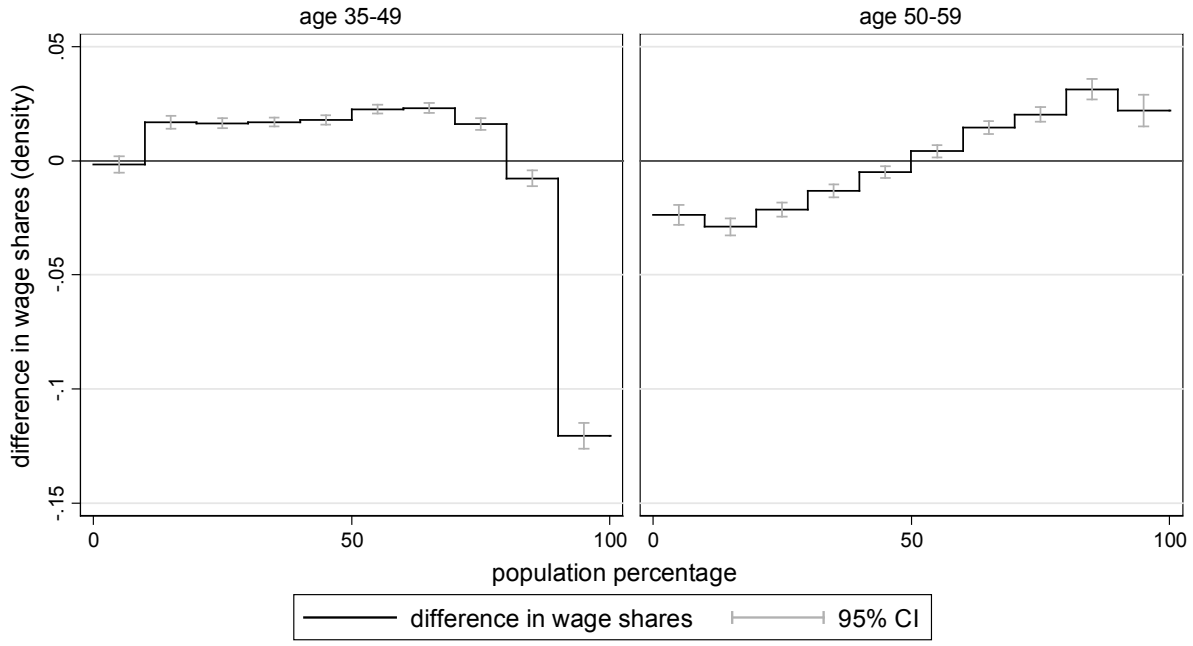


Figure A2-14: difference in wage distribution between middle, old and young group age 25-34: native

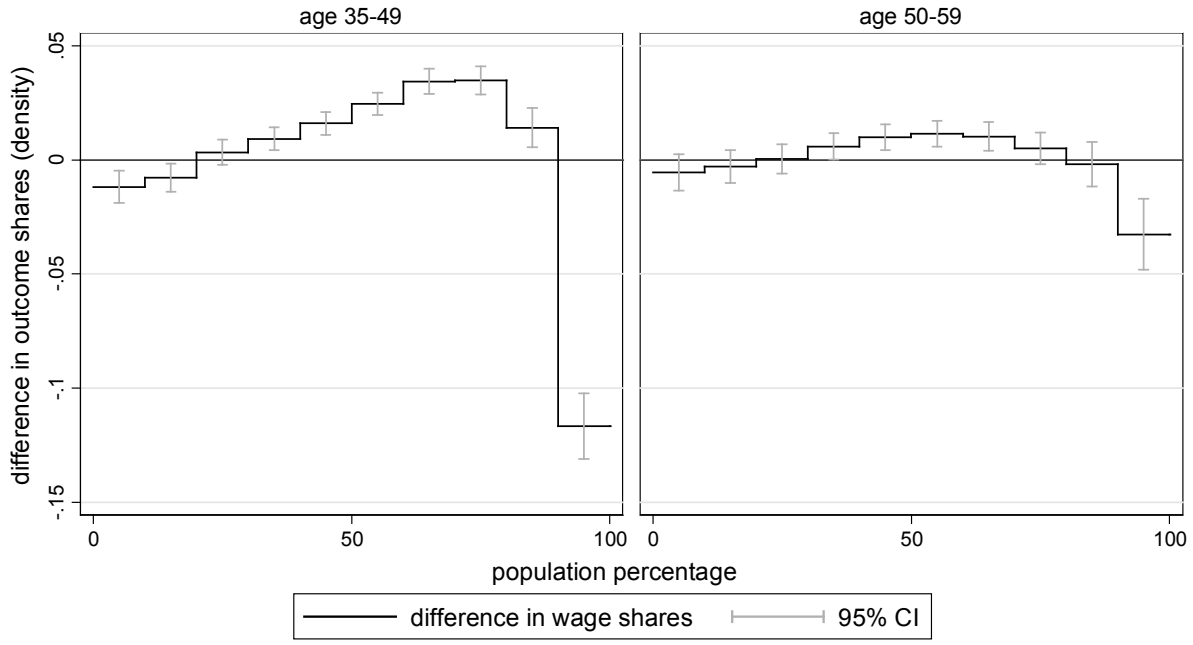


Figure A2-15: difference in wage distribution between age groups: immigrant

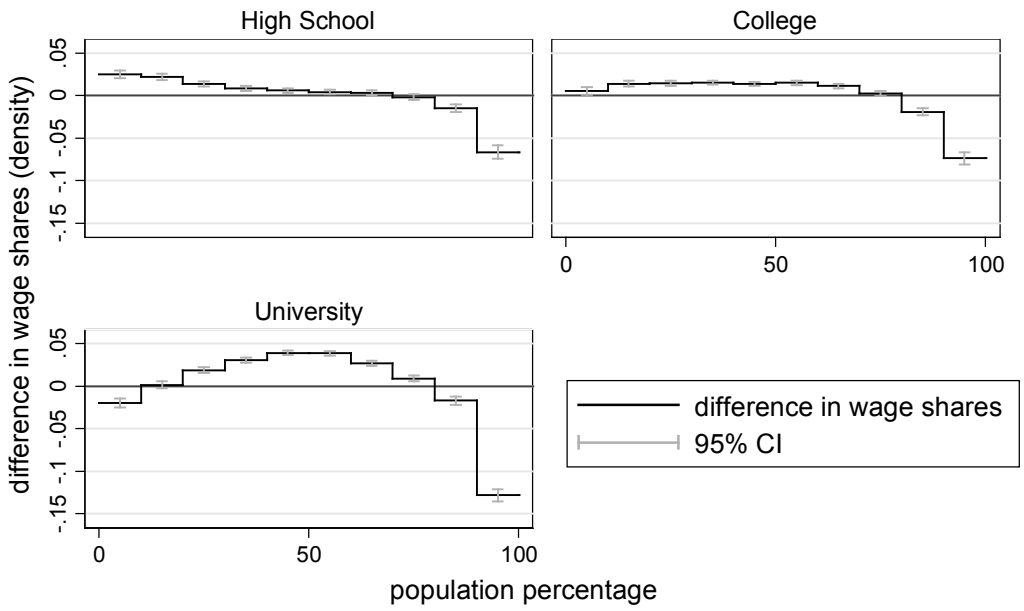


Figure A2-16: difference in wage distribution by education groups (to the High school dropout): native

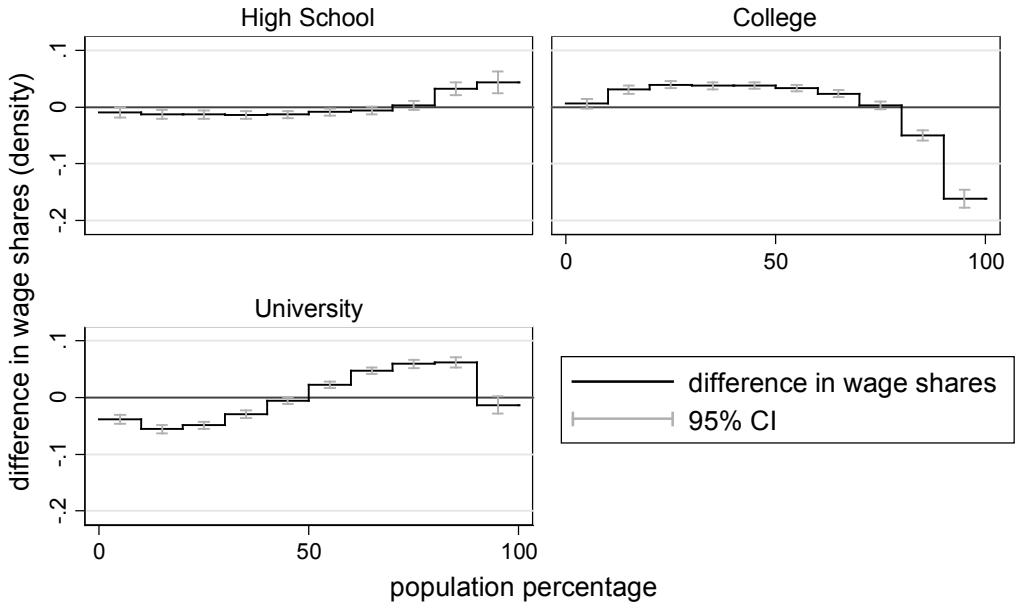


Figure A2-17: difference in wage distribution by education groups: immigrant

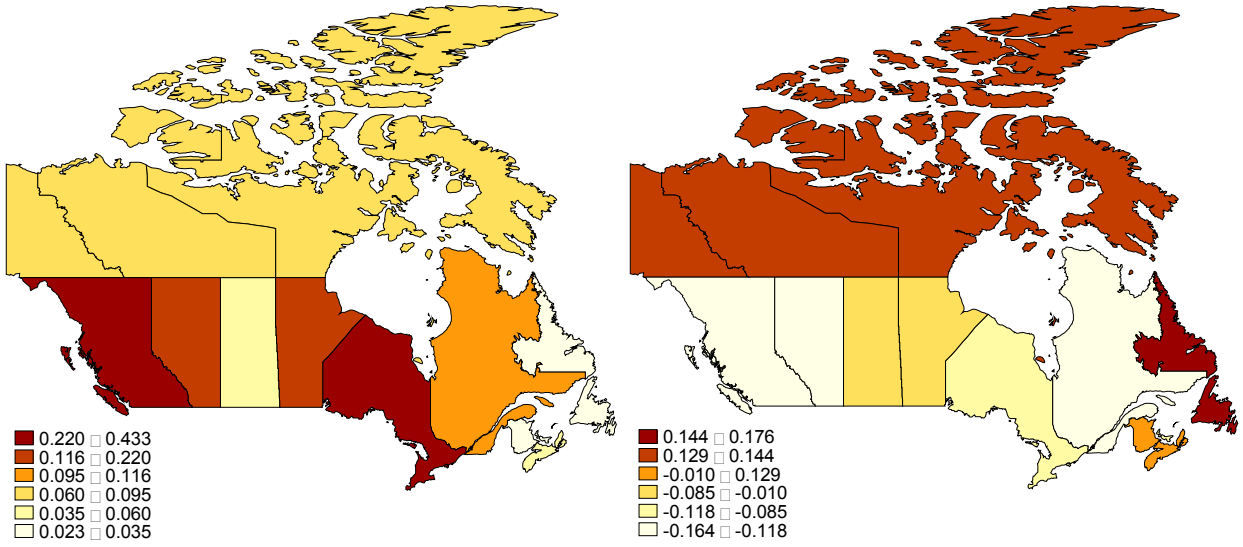


Figure A2-18: Immigrant share (immigrant/native) by province (left), Log relative wage by province (right).

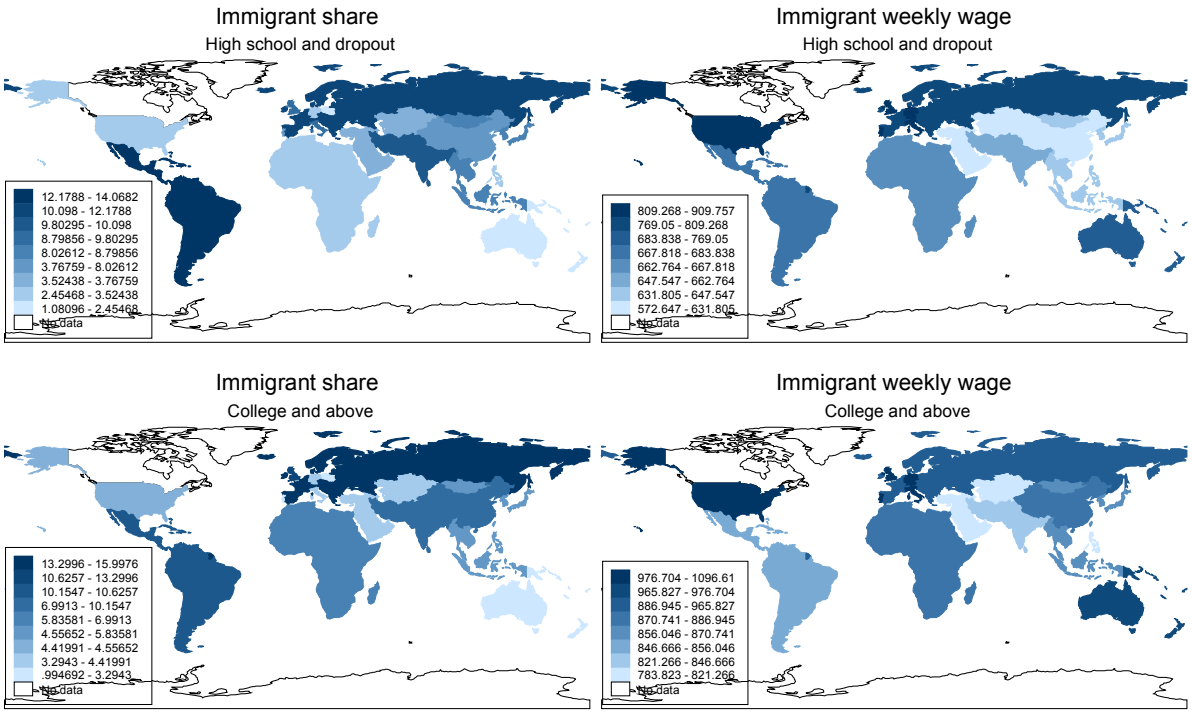


Figure A2-19: Immigrant share and wage distribution by education groups

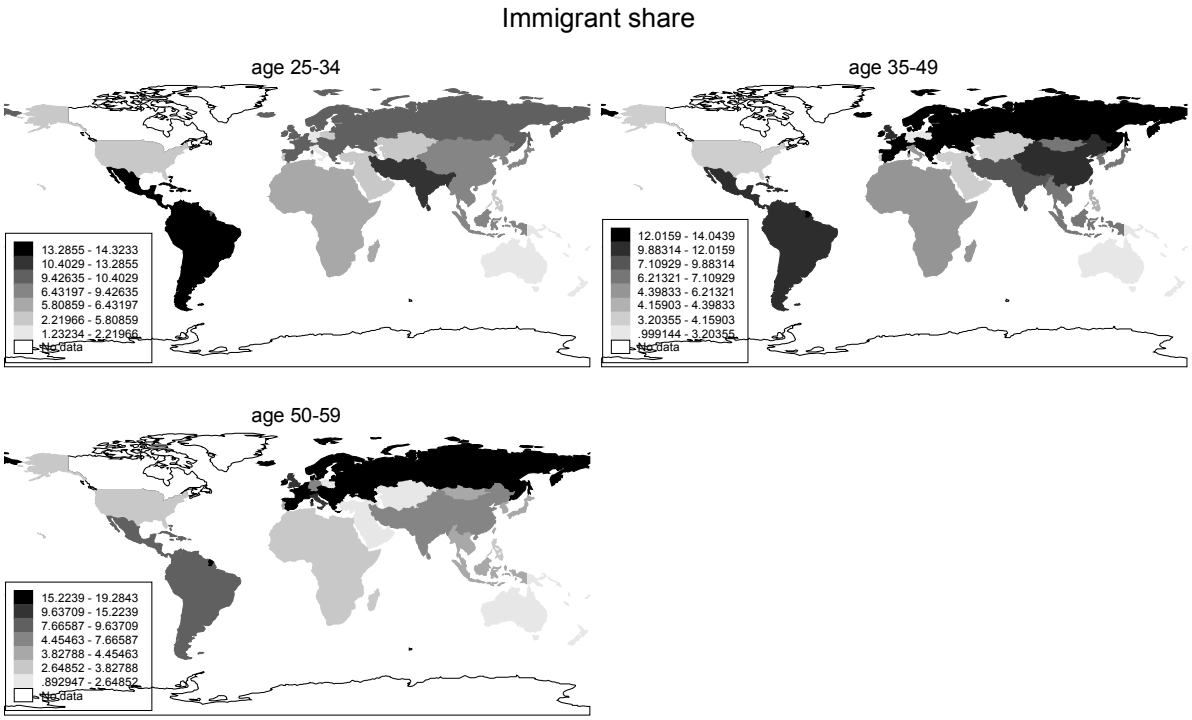


Figure A2-20: Immigrant share distribution for three age groups.

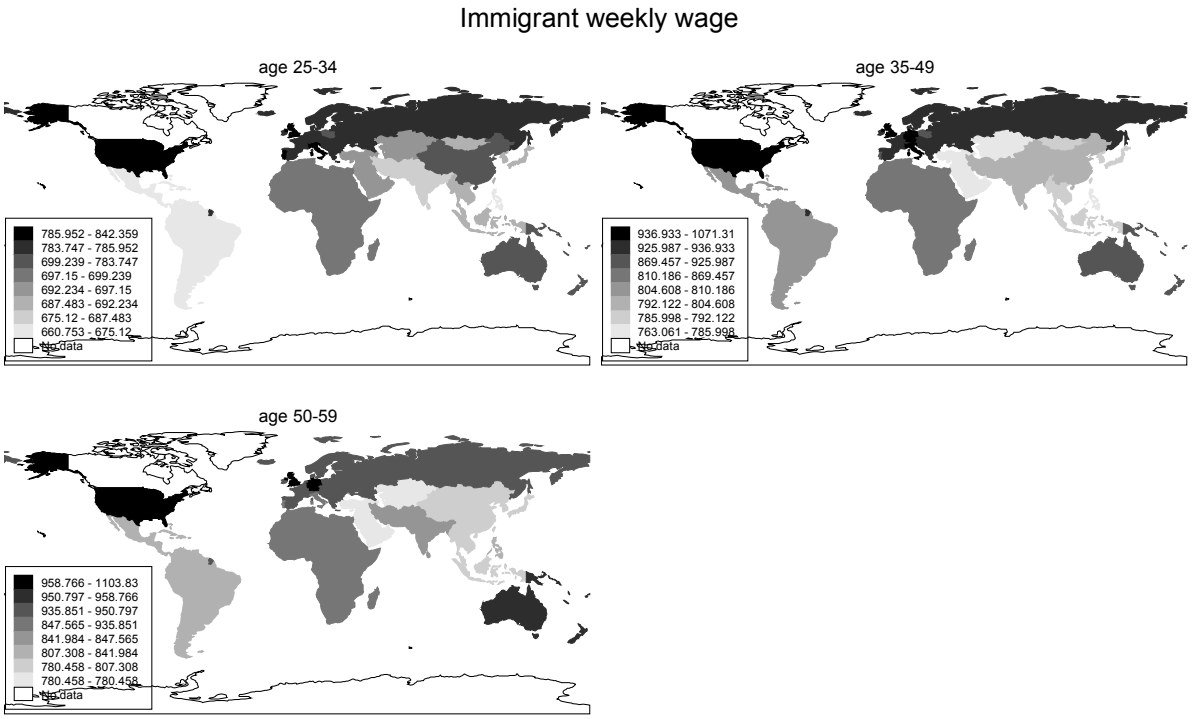


Figure A2-21: Immigrant weekly wage distribution for three age groups

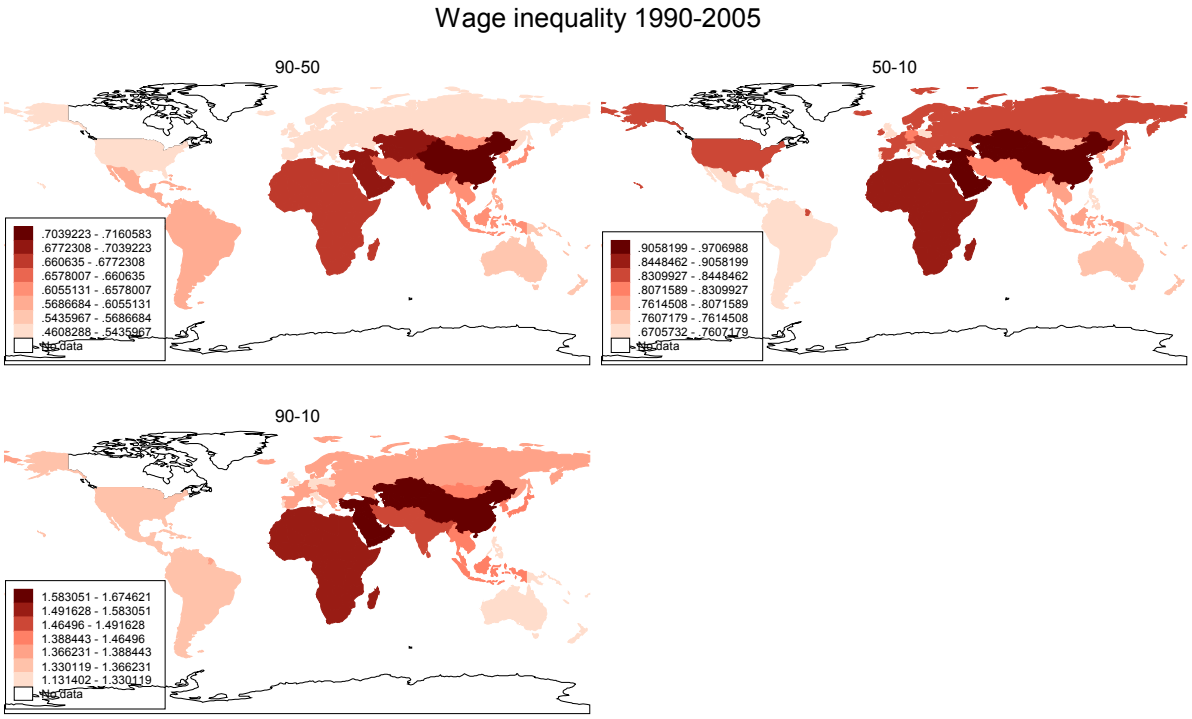
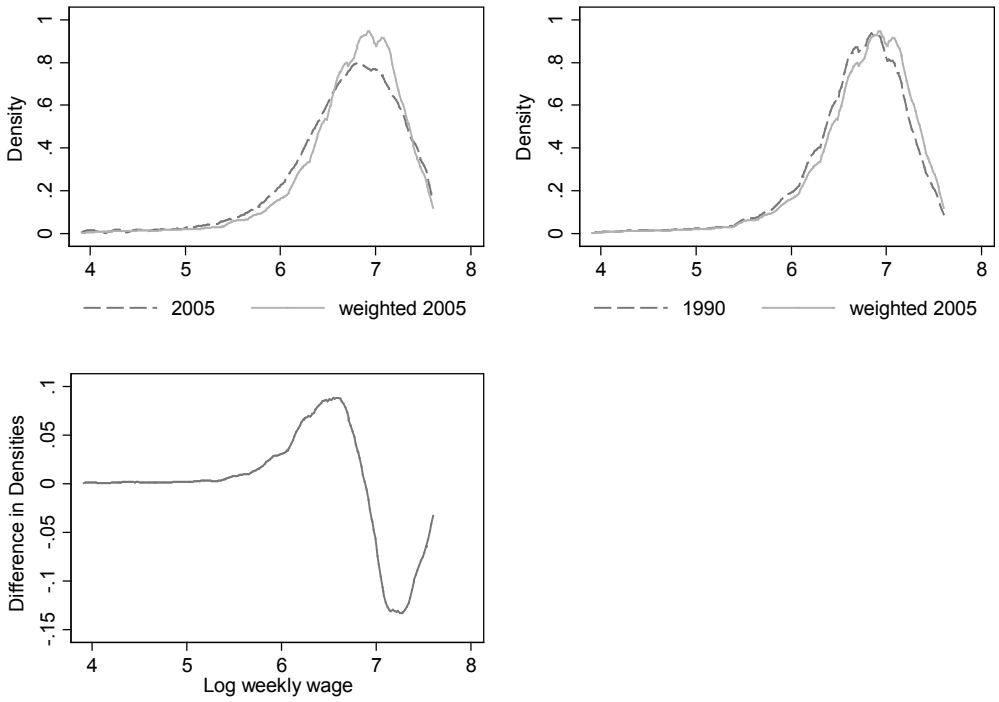


Figure A2-22: Immigrant weekly wage inequality



Note: Weight is using the Dinardo-Fortin-Lemieux (1996) kernel reweighting approach.

Figure A2-23: Estimates of Log wage density for native: actual 1990 and counterfactual 2005 at 1990 prices

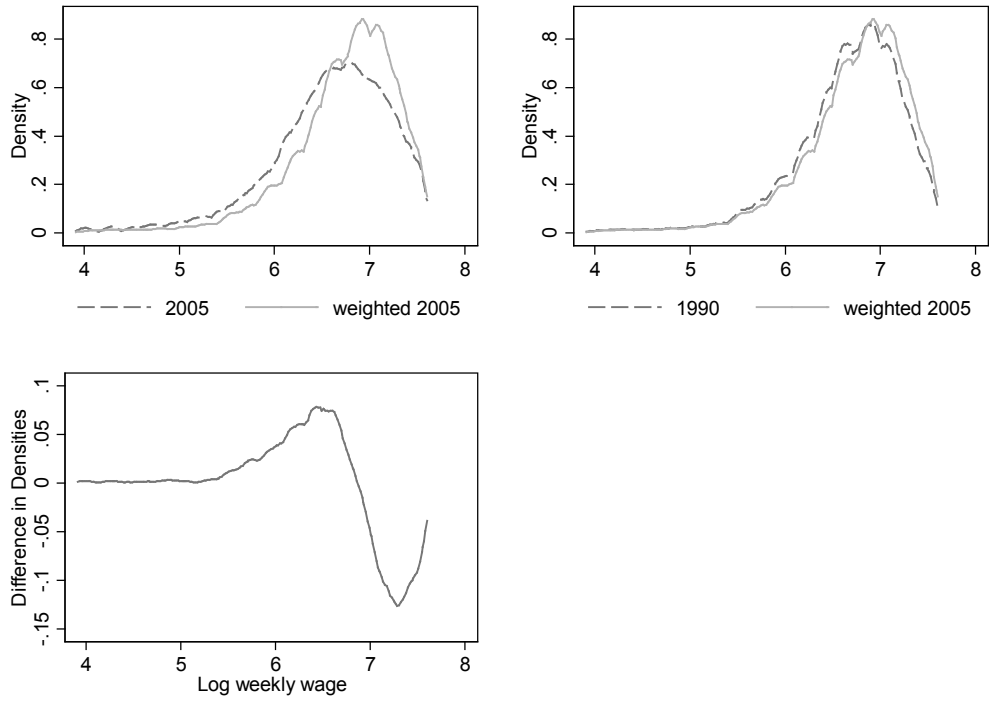


Figure A2-24: Estimates of Log wage density for immigrant: actual 1990 and counterfactual 2005 at 1990 prices

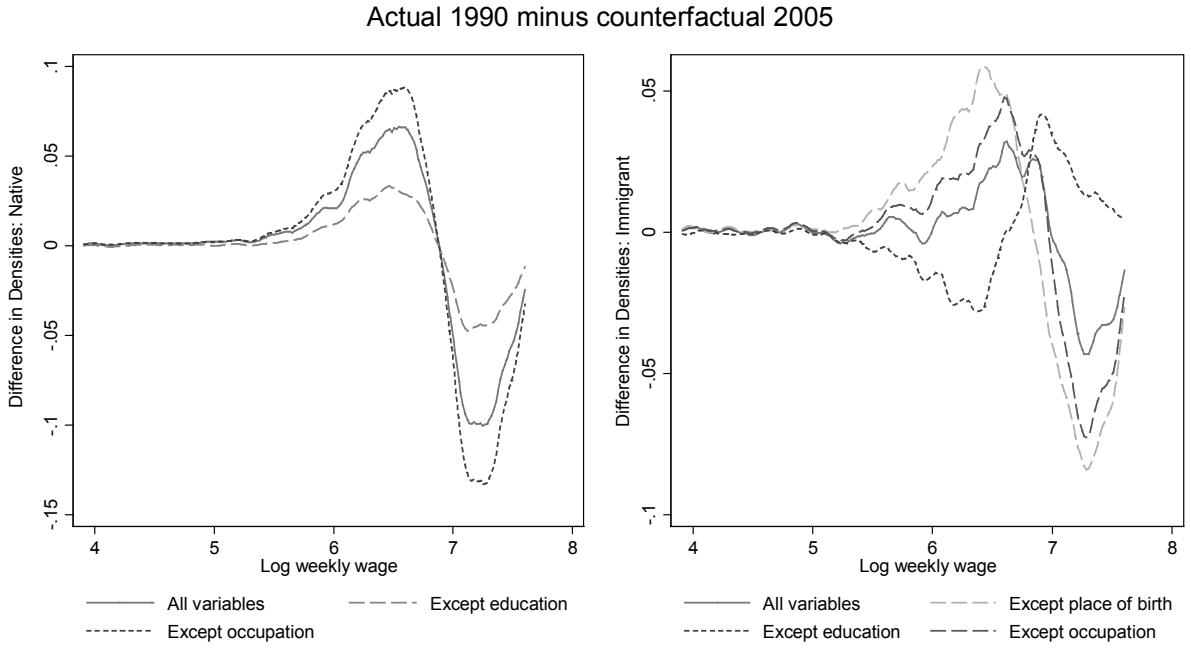


Figure A2-25: Difference in wage densities between actual 1990 and counterfactual 2005 at 1990 prices

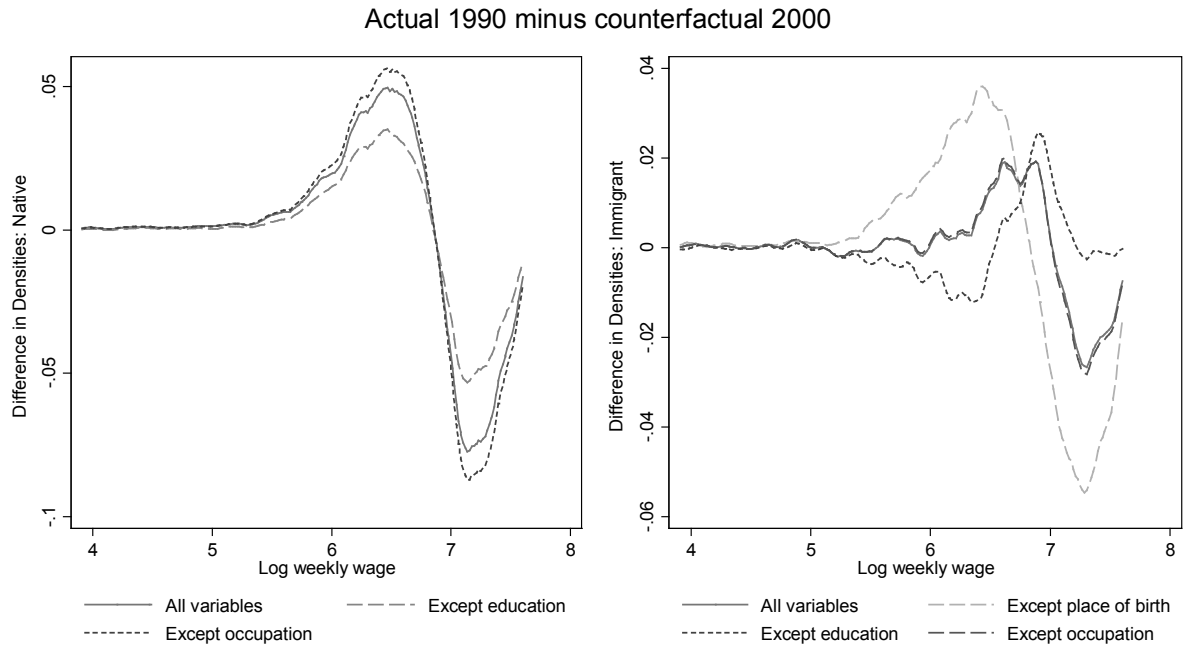


Figure A2-26: Difference in wage densities between actual 1990 and counterfactual 2000 at 1990 prices

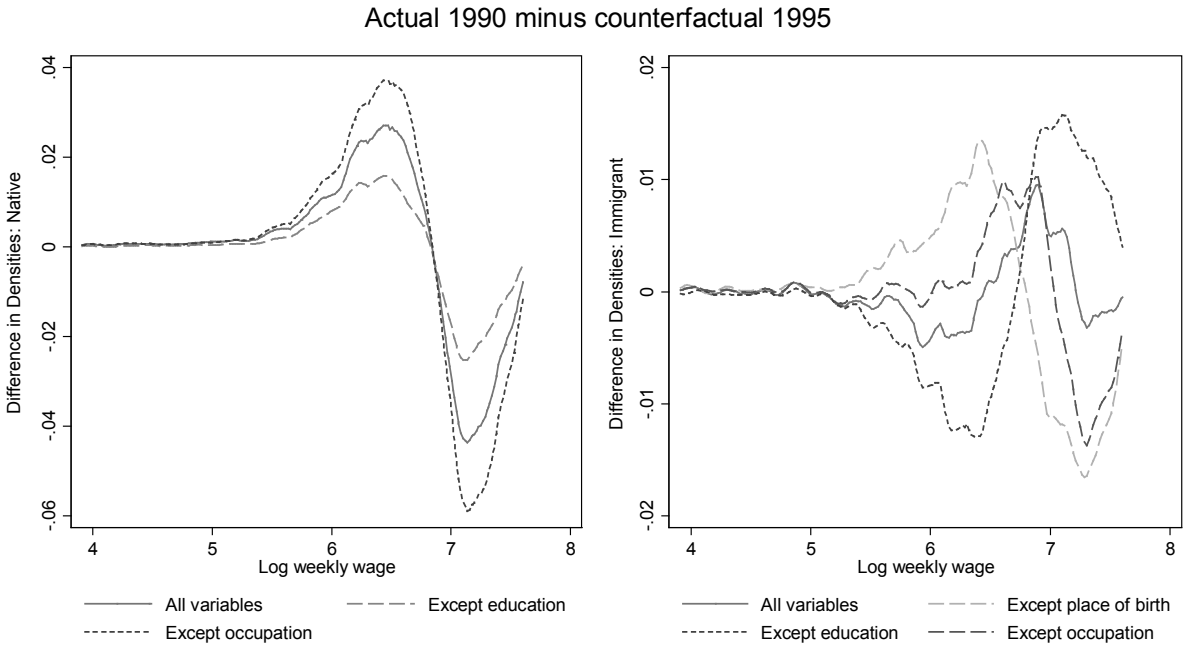


Figure A2-27: Difference in wage densities between actual 1990 and counterfactual 1995 at 1990 prices

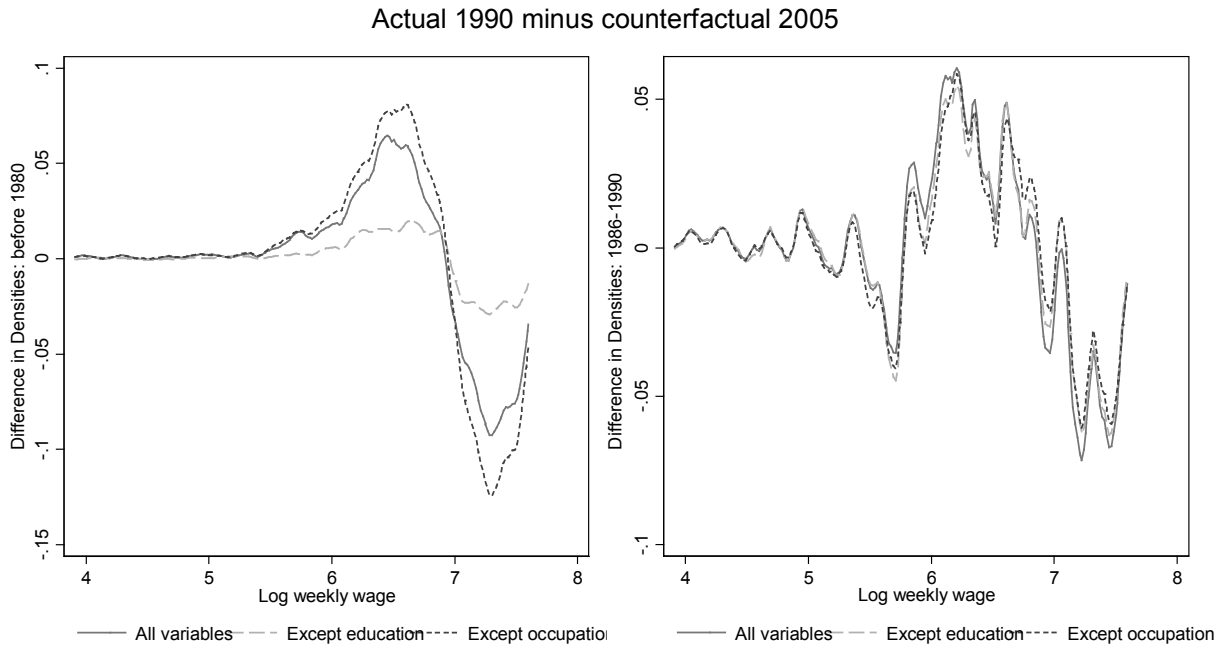


Figure A2-28: Difference in wage densities between actual 1990 and counterfactual 2005 at 1990 prices by year of arrival

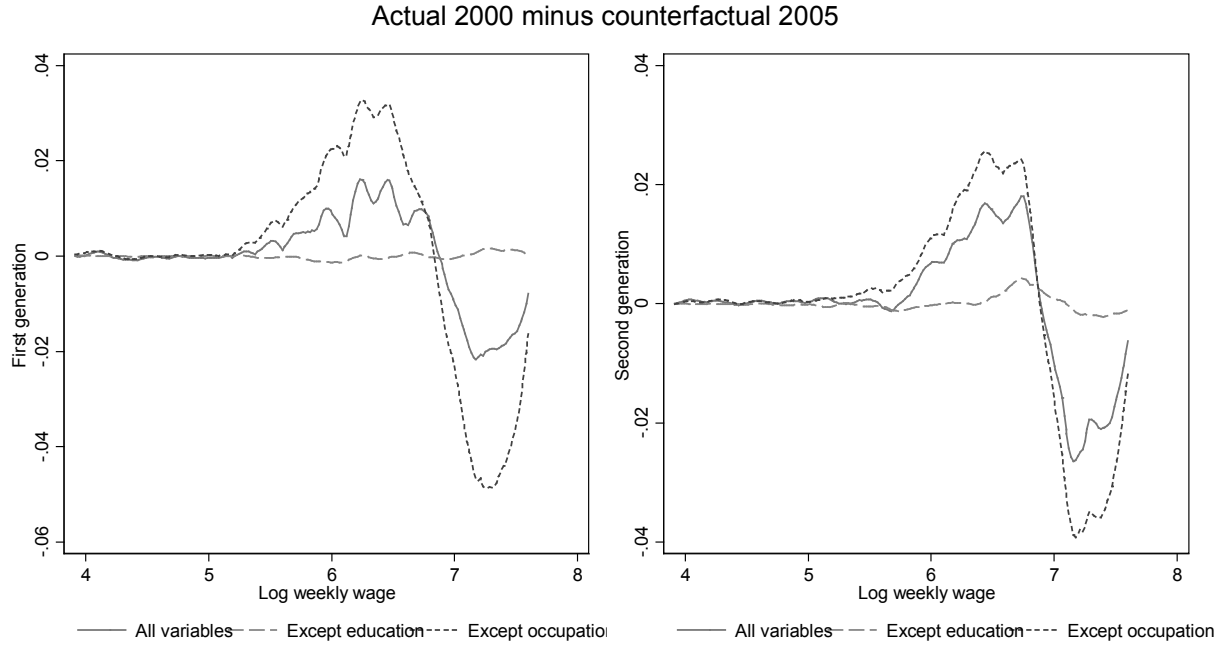


Figure A2-29: Difference in wage densities between actual 2000 and counterfactual 2005 at 2000 prices by generations

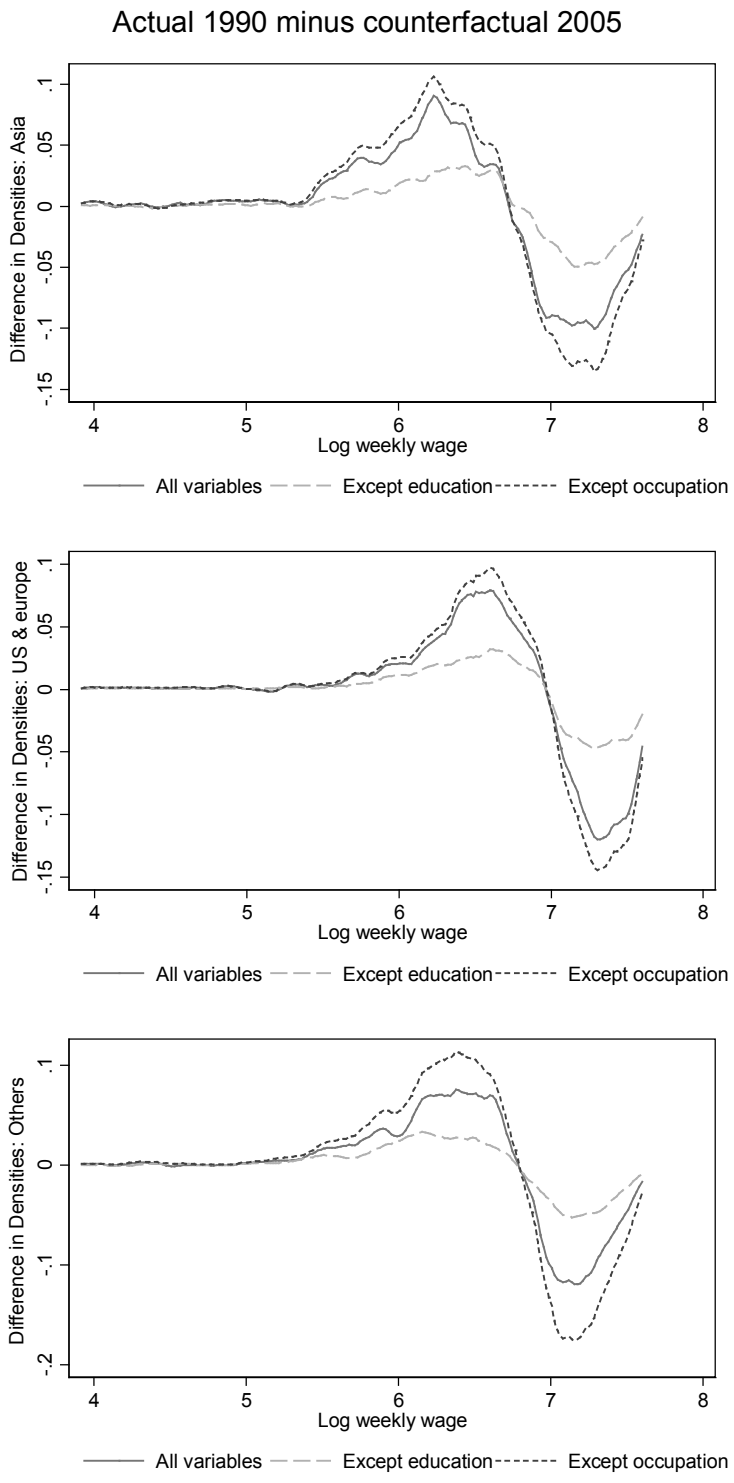


Figure A2-30: Difference in wage densities between actual 1990 and counterfactual 2005 at 1990 prices by place of birth

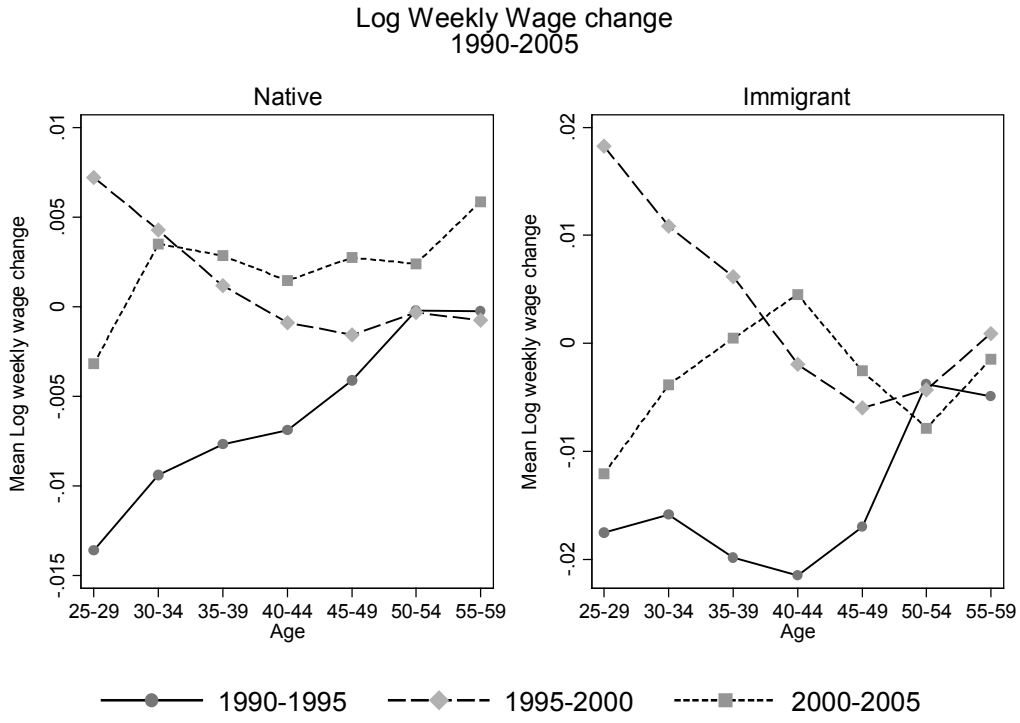
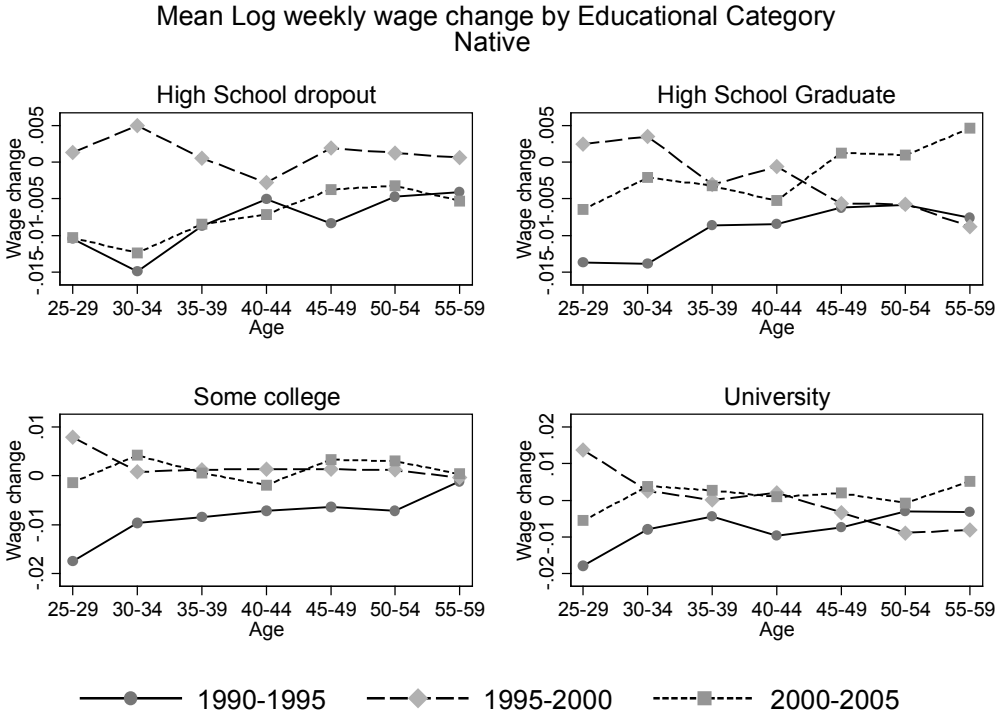


Figure A2-31: Weekly wage change by age group



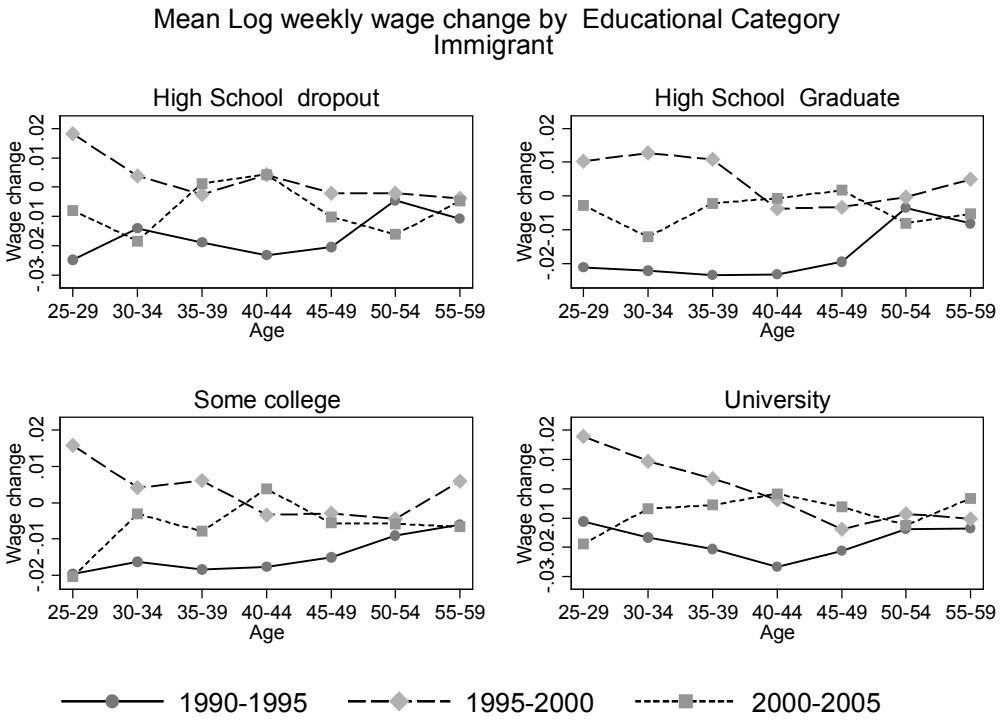
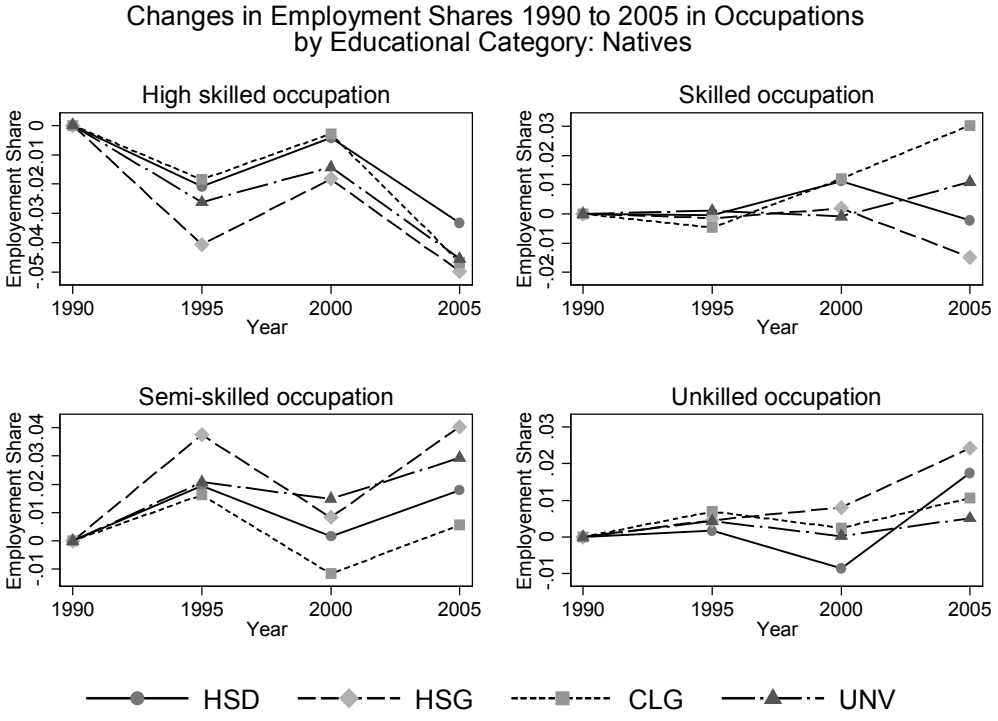


Figure A2-32: Weekly wage change by education and age group



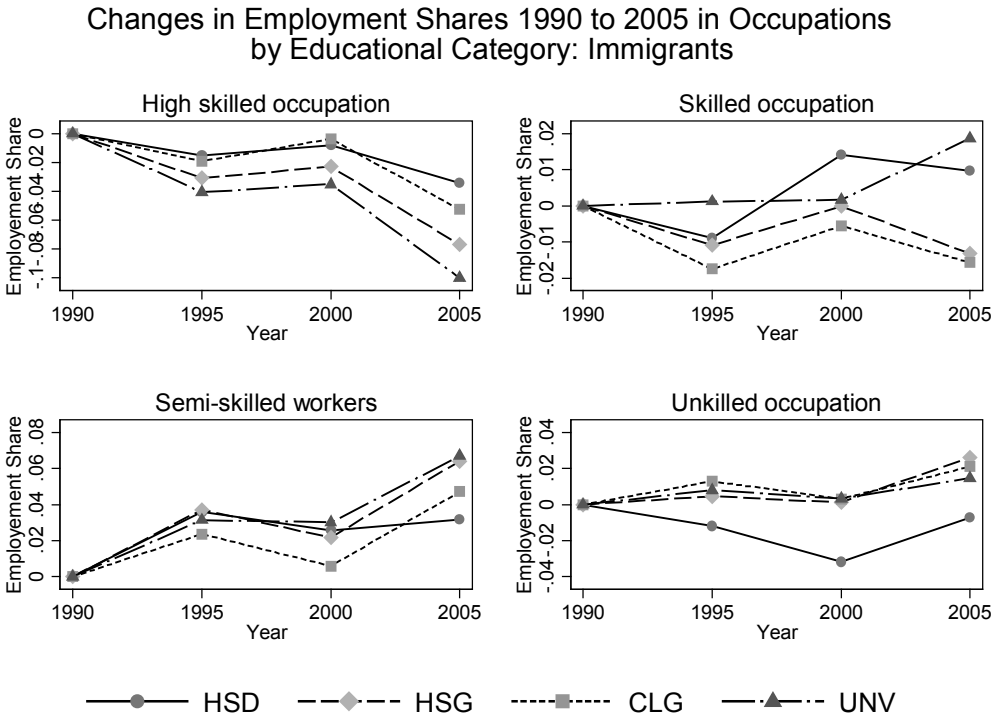
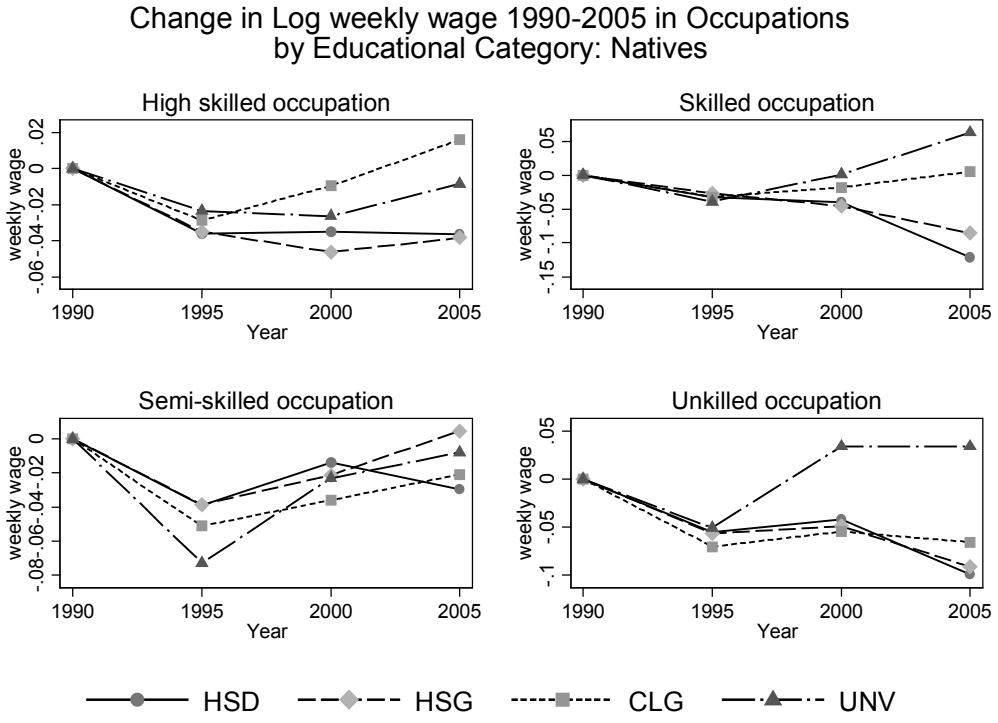


Figure A2-33: Changes in employment shares in occupations by education category



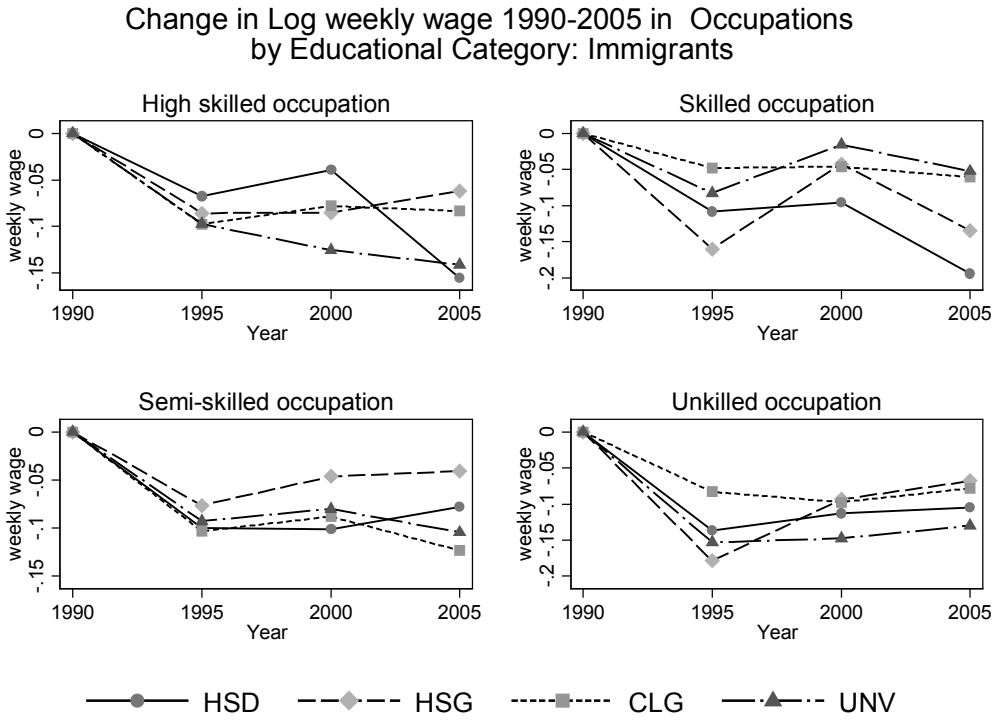


Figure A2-34: Changes in Log weekly wage in occupations by education category

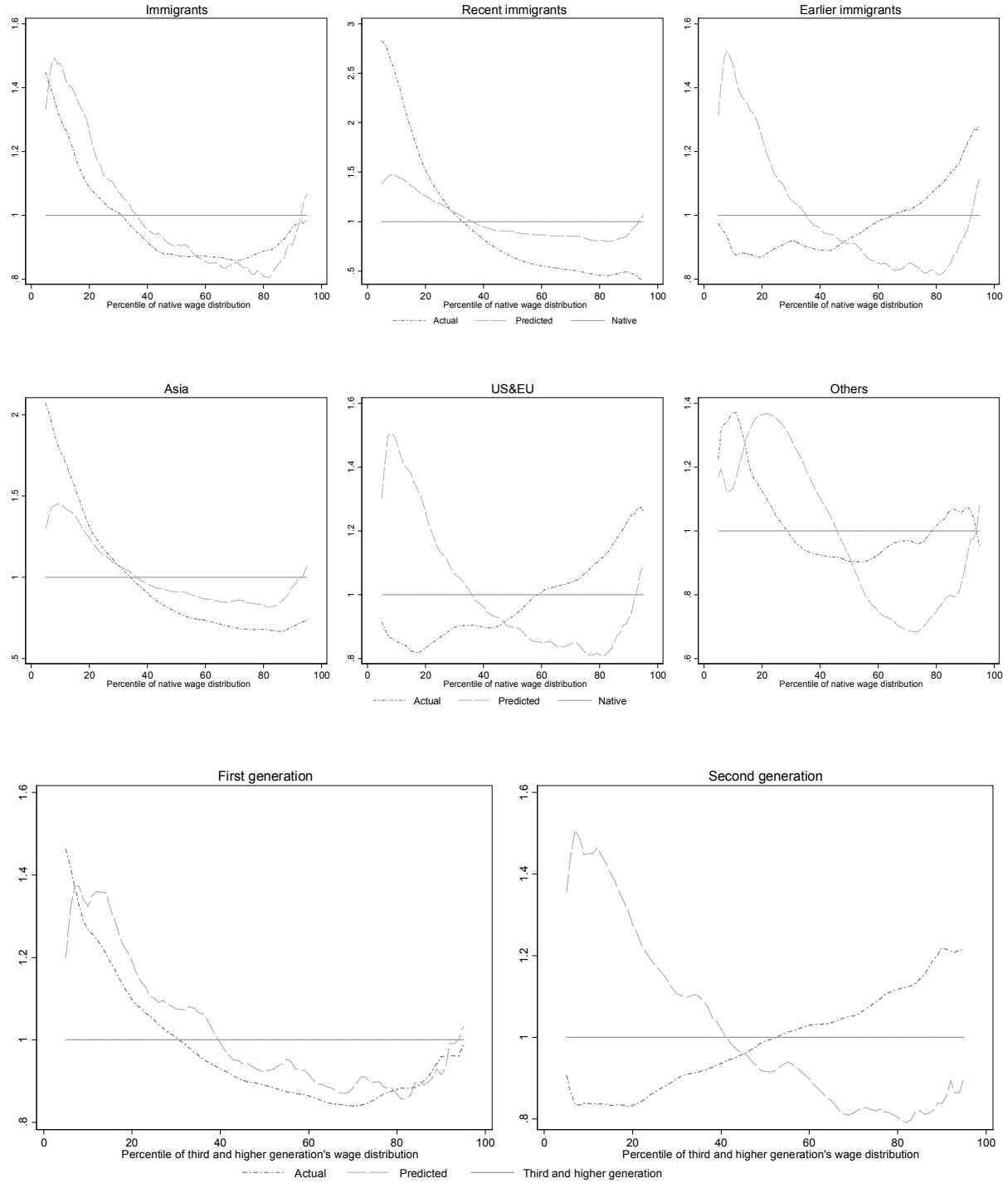


Figure A2-35: Predicted and actual position of immigration in wage distribution

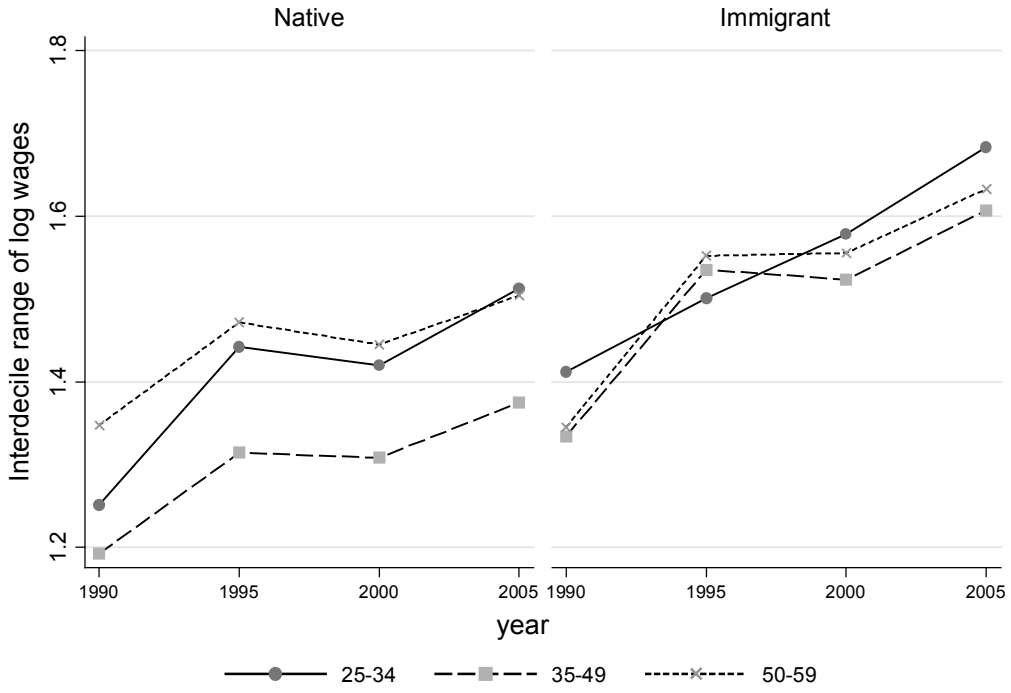


Figure A2-36: Interdecile range of log wages by age groups

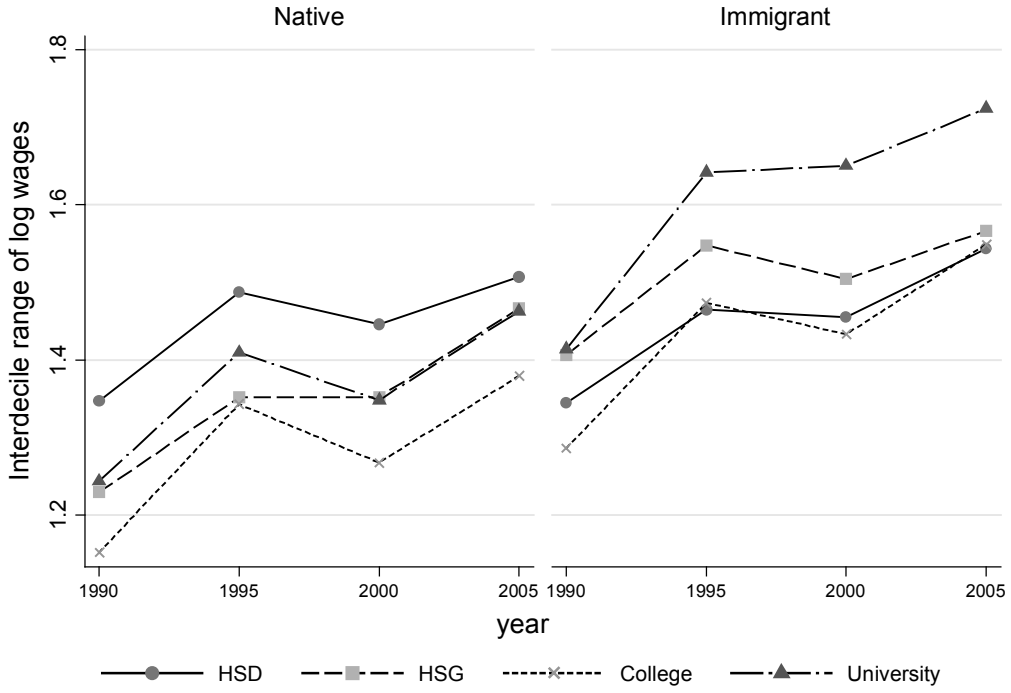


Figure A2-37: Interdecile range of log wages by education groups

Chapter 3

Cyclical Behavior of Bank Loan and Deposit Spreads[9]

This paper studies the behavior across business cycles of representative bank loan-deposit spreads and their components for Canada, Italy, Germany, the Netherlands, Switzerland, the United Kingdom, and the United States. A main finding is that the loan rate (adjusted for movements in overall market interest rates) in most countries is countercyclical, consistent with "financial accelerator" theories of the business cycle. Another main finding is that historically in the continental European countries the spreads between savings-deposit and time-deposit rates and overall market interest rates were large and markedly counter-cyclical, and much more so than in the English-speaking countries. This is consistent with banks in these countries exploiting market power over "core deposits" systematically across business cycles, possibly to buffer cyclical shocks to banks' borrowers. However, the levels and cyclical properties of spreads across the two groups of countries have largely converged in the past two decades.

3.1 Introduction

This paper studies the cyclical behavior of various bank loan-deposit spreads and their components for seven major economies—Canada, Italy, Germany, the Netherlands, Switzerland, the United Kingdom, and the United States. Motivation for this analysis is twofold. First, estimates of the behavior of bank loan and deposit pricing across business cycles may provide insight into whether banks exploit market power in certain deposit market segments (e.g., ordinary savings deposits) either to buffer adverse shocks to other (more competitive) deposit market segments

[9] This chapter is coauthored with professor R. Todd Smith and professor Dick Beason.

(e.g., time deposits or eurodeposits) or to their loan customers. Second, the amplitude of business cycle fluctuations themselves likely depends heavily on banks' pricing of loans (relative to other interest rates) at different stages of the business cycle. One reason for this is that financial distress and bankruptcies are countercyclical, and loan rates should reflect this. Another reason is that informational frictions in credit markets may be exacerbated during recessions. Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) present formal models of this "financial accelerator" mechanism. In these models, cyclical downturns negatively impact borrowers' net worth or collateral, and that raises the cost of borrowing and therefore amplifies the downturn (see also Bernanke, Gertler, and Gilchrist (1996)).

The empirical analysis leads to five main conclusions. First, loan rate spreads were historically less countercyclical in the continental European countries or the euro-area countries than in the English-speaking countries, but this difference has gone away over time, and even reversed. Nevertheless, a main prediction of financial accelerator theories of the business cycle—countercyclical loan spreads—is confirmed in our analysis. Moreover, the quantitative implications of this for a financial accelerator mechanism underlying business cycles could be important.

Second, savings-deposit spreads in the continental or euro-area countries were historically larger and more countercyclical than in the English-speaking countries, but both of these differences have disappeared over time. Third, the same is true of time-deposit spreads although they were never as large or as countercyclical as savings-deposit spreads. Fourth, eurodeposit spreads in the continental or euro-area countries were historically greatly procyclical but much less so in the English-speaking countries, and this difference has disappeared over time. Fifth, all deposit spreads have in all country groups become over time roughly acyclical. As a result, spreads computed from loan rates and deposit rates of all types have become much less cyclical over time. In sum, there has been a considerable degree of cross-country convergence in the *cyclical behavior* of spreads and in the *level* of spreads over time.

The evidence presented in this paper is consistent with banks in the Continental-European countries historically being able to systematically exploit market power over savings deposit rates and time deposit rates across the business cycle to buffer adverse shocks to their borrowers. The evidence is consistent also with the Continental-European banking systems adjusting the cost of domestic deposit liabilities (relative to overall market interest rates) across the business cycle much

more than is the case in the English-speaking countries. A plausible explanation for this is that historically the English-speaking countries have had better developed securities markets that may have resulted in greater competition in national bank deposit markets—both among banks for securitized deposits and with other money market securities. To the extent that this is true, less competitive domestic deposit markets may have helped banks "finance" bank-borrower relationships in countries that have been categorized as having "relationship banking systems." If deposit markets in these countries were less competitive, in part due to less developed securities markets, then this may have facilitated these bank-borrower relationships by allowing banks to vary the cost of deposits in line with movements in the cost of maintaining relationships. What is striking, however, is that the ability to utilize deposit rates to facilitate bank-borrower relationships has virtually disappeared in the past two decades.

The paper complements existing studies of bank "net interest margins"—bank-level aggregated spreads. In contrast to studying bank net interest margins, the analysis below studies for seven countries benchmark loan interest rates and interest rates on three reasonably standardized types of deposits—ordinary savings accounts, domestic time deposits, and eurodeposits. The present paper differs from other related work in that the focus here is on the cyclical behavior of bank loan-deposit spreads and their components, for seven banking systems over the past nearly half-century.

The format of the paper is as follows. Section 3.2 discusses related literature and presents an analytical framework for interpreting the cyclical behavior of banking interest rate spreads. Section 3.3 discusses data and the empirical methodology. Section 3.4 presents the empirical findings. The final section provides further analysis of the results and offers an interpretation of the empirical findings based on the analytical framework discussed in Section 3.5 and contains concluding remarks.

3.2 Interpreting Loan-Deposit Spreads

Theoretical studies (e.g., Ho and Saunders (1981), Wong (1997), Zarruk (1989)) identify various determinants of loan-deposit spreads, including the volatility of short-term interest rates, bank market power in loan and deposit markets, bank risk aversion, and credit risk on bank loans. There have been numerous empirical studies of banking interest rate spreads, although most

empirical studies focus on the aggregated accounting variable "net interest margin," which is a bank's total interest income less interest expenses divided by the value of interest-earning assets.[10] There are many such studies including Graddy and Karna (1984), Olson and Simonson (1982), McShane and Sharpe (1985), Ho and Saunders (1981), Angbazo (1997), Busch and Memmel (2016), and Demiguc-Kunt and Huizanga (1999). In addition, Drechsler, Savov, and Schnabl (2017) argue that the deposit channel is a new channel for the transmission of monetary policy. They theoretically and empirically demonstrate that deposit spreads expand more in concentrated market attributable to market power in deposit market, which is in line with the market power mechanism.

An important factor for interest rate spreads or net interest margin is credit risk. Such a link is the central idea of financial accelerator models of the business cycle. Specifically, the seminal papers by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) show that business cycles are exacerbated by the cyclical behavior of lending rates because borrowers' net worth (or collateral) deteriorates during recessions—the financial accelerator. That is, borrower creditworthiness is directly linked with the stage of the business cycle. This link could be strengthened if the returns on borrowers' investment projects are procyclical and if banks systematically weaken lending standards (including price and non-price contractual elements) over the business cycle (Asea and Blomberg (1998)).

Several studies have established empirically that costs of credit are in fact countercyclical. This is true in corporate bond markets (e.g. Gertler and Lown (1999), Gilchrist and Zakrajšek (2012)) as well as bank lending rates, with much of this work focused on the United States (e.g. Chava and Purnanandam (2011), Santos and Winton (2008)). There are also factors that weaken the financial accelerator mechanism and its prediction of a countercyclical loan rate. This is a well-known prediction of universal banking theory and "relationship banking" arguments more generally (e.g. Benston (1994)).

The prediction of the financial accelerator mechanism for the link between the business cycle, borrower creditworthiness, and bank spreads is the *Baseline Hypothesis* used in the paper to

[10] Net interest margin is equal to a loan-deposit spread—which is the focus of theoretical models—when loans as well as deposits are homogeneous and when reported net interest income equals loan interest less deposit interest. In practice, net interest margins lump together many different loan interest rates and deposit interest rates and they often include other types of income and expenses (e.g., net interest income in some countries includes income on a bank's securities holdings).

interpret loan-deposit spreads. Specifically, controlling for various other determinants of bank spreads, the baseline hypothesis is that loan-deposit spreads are countercyclical—they increase during recessions and decrease during economic expansions—and the reason for this is that *loan spreads*—loan rate markups over a benchmark interest rate—have a marked countercyclical component. The predictions of the baseline hypothesis are recorded in Table 3.1. Note that the baseline hypothesis assumes deposit markets are competitive and thus loan-deposit spreads should exhibit the same cyclical behavior as loan spreads alone.

The baseline hypothesis therefore focuses on the link from cyclical movements in borrower creditworthiness to loan rates and therefore to bank loan-deposit spreads. This hypothesis is arguably uncontroversial when loan and deposit markets are perfectly competitive. When loan or deposit markets are not perfectly competitive, however, loan or deposit rates may plausibly exhibit marked cyclical behavior caused by banks systematically changing loan or deposit rates *relative* to a benchmark interest rate, at cyclical frequencies.[11] We outline three further hypotheses tying bank market power in deposit or loan markets to predictions for the cyclical behavior of bank spreads.

The *Relationship Hypothesis 1* builds on existing research that emphasizes banks with market power may exploit this market power in order to smooth loan rates as part of long-term relationships between banks and their loan customers, even *absent deposit market power*. When market power pertains to loan markets, banks and their borrowers may enter into multi-period contracts that involve smoothing loan rates across time (e.g. Peterson and Rajan (1995)). This argument would tend to weaken or even eliminate the countercyclical movement of loan spreads predicted by the baseline hypothesis. In fact, it is possible that such a relationship between banks and their borrowers could impart a procyclical loan spread if the bank reduces loan spreads in bad economic times (a cyclical downturn) and makes up for them with larger spreads in better times. In short, the relationship hypothesis predicts either weak countercyclicality or possibly procyclicality of loan spreads. In this hypothesis, deposit markets are assumed to be competitive and thus loan-deposit spreads should exhibit the same cyclical behavior as loan spreads alone.

[11] There is evidence that banks have historically had market power in both loan markets and at least some segments of the deposit market. For instance, Hannan and Berger (1991) and Neumark and Sharpe (1992) present evidence of this for certain U.S. deposit markets and Peterson and Rajan (1995), Santos and Winton (2008), and Chava and Purnanandam (2011) present evidence for bank loan markets.

The third hypothesis, termed the *Relationship Hypothesis 2*, incorporates the possibility that market power in deposit markets can facilitate loan-rate-smoothing (or other forms of borrower-bank relationships that are countercyclical in their benefits to borrowers), because banks can utilize deposit market power to insulate themselves from variations in the cost of smoothing loan rates. Berlin and Mester (1999), for example, present evidence that banks with market power in deposit markets smooth loan rates more than banks with less deposit market power. The specific form of the relationship hypothesis studied in this paper is that banks set deposit rates (relative to overall market rates) to buffer shocks that would otherwise impact loan rates and thus profitability. This hypothesis predicts that interest rates on deposits in less competitive segments of the deposit market will, relative to overall market interest rates, have a significant countercyclical component. For deposits over which banks have less market power (e.g., offshore wholesale deposits), one would expect less countercyclical behavior of deposit rates (again, relative to overall market interest rates) or possibly procyclical deposit spreads—competitive deposit rates may rise relative to benchmark interest rates in an economic upturn when banks' demand for funds is largest. As regards loan-deposit spreads, this hypothesis predicts that loan-deposit spreads in less competitive deposit market segments should be less countercyclical than deposit spreads alone but more countercyclical than loan-deposit spread based on more competitive deposit market segments.

The two relationship hypotheses focus mainly on loan rates as the essence of bank relationships with borrowers. In practice, lending relationships could involve other aspects besides loan rates (e.g. loan covenants, collateral requirements, and working with distressed borrowers). For instance, Allen and Gale (1995) emphasize that a key difference between the German and Japanese banking systems on the one hand and the U.S. banking system on the other hand is a willingness and, for legal reasons, the ability to engage in debt workouts with distressed borrowers. If this is the main aspect of bank-borrower relationships, then one would not necessarily expect to observe smoothed loan rates, but banks may still "pay for" relationships across the business cycle partly by varying (countercyclically) deposit rates (relative to overall market interest rates) in those segments of the deposit market over which they have market power.

The final hypothesis we characterize focuses squarely on market power in some segments of the deposit market relative to other segments. We term this the *Deposit Competition Hypothesis*. The essential idea here is that banks exploit market power in certain segments of the deposit markets to buffer adverse shocks to banks' cost of funds in more competitive segments of the

deposit market.[12] For instance, eurodeposits are surely a more competitive market than that of savings deposits. If competition in the eurodeposit market is systematically more intense at certain stages of the business cycle (e.g., at cyclical peaks when demand for loans is high), then this will likely result in eurodeposits spreads tightening at these times—i.e. a narrower spread between overall market interest rates and the eurodeposit rate, or countercyclical deposit spreads in these deposit market segments. By the same token, for deposit rates over which the bank has considerable market power, the spread between overall market interest rates and those deposit rates is predicted to behave procyclically, or at least less pronounced countercyclical behavior, depending on the degree of market power in the deposit market segment. This hypothesis therefore has the following prediction: the cyclical behavior of deposit rates (relative to overall market interest rates) over which the bank has market power will be quantitatively less, or qualitatively opposite, the countercyclical behavior of deposit rates over which the bank has little market power.[13]

The purpose of introducing these four hypotheses is to establish an analytical framework that can be used to interpret the empirical results. The Baseline Hypothesis imposes the most structure on bank market structure and interest-rate setting behavior over the cycle. Consequently, it has the most straightforward predictions. The other three hypotheses generalize bank behavior and market structure and therefore build on the predictions of the Baseline Hypothesis. Table 3.1 shows the main predictions of these hypotheses for the cyclical properties of the various interest rate spreads. These hypotheses are not mutually exclusive—there is some overlap in predictions, although no two are identical in their predictions. Nevertheless, a combination of some hypotheses is possible. For instance, a bank might manipulate deposit rates in less competitive segments of the deposit market both to buffer adverse shocks to loan customers (loan-rate smoothing) and adverse shocks to more competitive segments of the deposit market.

[12] Deposit rates may also have cyclical properties (relative to overall market rates) if there is no deposit insurance on the class of deposits under consideration. Deposit insurance systems are briefly summarized in the appendix, and their potential role in the paper's findings is discussed in section 5. Note, however, that in the empirical analysis bank deposit rates are measured relative to overall market interest rates, and for the latter, several possible interest rates are considered, including an interbank rate (interbank deposits are generally explicitly excluded from deposit insurance coverage). It turns out that the results are not sensitive to which interest rate is used.

[13] It is possible that a bank might exploit loan market power to buffer adverse funding shocks. In that event, the prediction of this hypothesis is that loan rates and competitive deposit rates have opposite cyclical properties.

3.2.1. Discussion: Relationship versus Transactional Banking Systems

Allen and Gale (1995) distinguish between transactional and relationship banks. They associate the German and Japanese systems with the latter and the U.S. and the U.K. banking systems with the former. In their definition, relationship banking systems are distinguished by banks providing both equity and debt finance to firms, having long-term ties to firms, possibly having direct input into the management of the firms, and renegotiating with distressed borrowers. In contrast, transactional banks specialize largely in just providing debt financing to firms and are reluctant for legal reasons to renegotiate with troubled borrowers.

Allocating banking systems to these two categories is useful for some purposes, but for other purposes it may be unhelpful. Specifically, if relationships are defined alternatively as continuous monitoring of borrowers' financial conditions, the option to refinance a distressed borrower (possibly with concessions), and long-term smoothing of lending terms, then "relationship banking" may characterize well some transactional banking systems. Berlin and Mester (1998, 1999) emphasize some of these forms of relationships between U.S. banks and their borrowers. Thus, it is not clear cut that one should expect smoother loan rates in so-called relationship banking systems. Rather, the key difference between relationship and transactional banking systems is likely the manner and degree to which banks deal with distressed borrowers and have input (via large equity stakes) into the management of non-bank firms.

There may also be significant differences in the closeness of relationships between banks and their loan customers across different relationship banking systems and across different transactional banking systems. For example, the Canadian banking system is typically categorized as a transactional banking system. However, certain features of the bankruptcy code in Canada (Buckley (1997)), as well as the ability of Canadian banks to acquire sizable stakes in non-financial firms (Barth et. al (1997)), suggest the Canadian banking system shares some key features attributed to relationship banking systems. Similarly, Barca (1996) emphasizes aspects of bank-borrower relationships in Italy versus the United States or Germany.

3.3 Data and Empirical Methodology

3.3.1 Data

To interpret loan-deposit spreads in terms of the factors discussed in Section 3.2 it is important that bank lending and deposit rates are not tightly regulated. Six major industrial countries were identified where loan and deposit rates were deregulated by the mid-1970s (or sooner) and for which data was available. These countries are Canada, Germany, Italy, the Netherlands, Switzerland, and the United Kingdom.[14] The United States is also included in the analysis, in large part because it has been the focus of much of the work on bank behavior and net interest rate margins. One should bear in mind when interpreting the U.S. results that several bank interest rates were regulated until the 1980s (see OECD (1989)).

The appendix contains details of data, sample ranges, and data sources. Bank loan rates considered in the study are typically "benchmark" or "representative" rates in each country. While the lending rates are most often associated with short-term business financing, longer-term business lending in many countries is often at floating interest rates that are tied to the loan rates under consideration here (Gambacorta, 2008). In Canada, for instance, most bank lending is floating-rate loans priced as a markup over the "prime rate" used in this paper. Similarly, commentators have noted that historically much bank lending in the other countries considered is tied to a prime or base lending rate (e.g. Borio and Fritz (1995), The Economist (1998)). We emphasize that, on the one hand, care is required in making precise quantitative comparisons of results across countries—because loan rates do not apply to precisely the same group of borrowers in each country. On the other hand, the loan rates considered provide a starting point for assessing differences and similarities in the behavior of loan-deposit spreads across countries.

[14] The source for historical accounts of interest rate regulations is Annex III, Section 1, OECD (1989). The following is a brief discussion of bank loan and deposit rate deregulation in these six countries.

Canada eliminated all remaining restrictions on bank loan and deposit rates in 1967. Also in 1967, Germany abolished the Interest Rate Decree which fully deregulated bank lending and deposit rates. In Italy, the interbank agreement on bank loan and deposit rates was terminated in 1969. Netherlands and Switzerland were free of official regulations on bank loan and deposit rates by 1960. In the case of Switzerland, through the 1980s there were local or regional interbank agreements affecting bank lending rates. However, these agreements were not government regulations; rather they appear to be the consequence of financial system architecture. While it will be important to keep this fact in mind when interpreting the empirical results, because these are not governmental regulations Switzerland is included in the analysis. Finally, in the United Kingdom, the interest rate cartel of London Clearing Banks and Scottish banks was dismantled in 1971 at official request. The Recommended Interest Rate System of building societies was continued through 1984, but that is unimportant for the present study as the loan and deposit rates studied below are associated with the activities of London Clearing Banks.

Rates of interest on deposits are surely more comparable across countries as a deposit contract is a fairly homogeneous contract across the countries we are focused on (i.e. advanced economies). The paper considers three deposit interest rates for each country. First, the rate on ordinary savings deposits. Intuition suggests that ordinary savings deposits are probably the least competitive interest-bearing deposit market segment. Second, a local (i.e. home-country) time deposit rate. These are typically three-month deposit rates. Third, three-month eurodeposit (i.e. offshore deposit) rates denominated in the currencies of each of the seven countries considered.

The analysis uses quarterly data.[15] Sample periods begin in the early 1960s or early 1970s and end in 2013 in most cases. Exceptions are eurodeposit rates for Canada and Italy which are not available until the mid-1970s.

3.3.2. Econometric Specification

The first stage of the empirical analysis is estimating a model of loan-deposit spreads. The second stage is determining the contribution to the cyclical behavior of total spreads of their components, deposit rates and loan rates. If interest rates generally have a cyclical component, then loan and deposit rates will probably also contain this component, although to a greater or lesser degree depending on the specific bank interest rate. One must be careful in the second stage, therefore, to separate any general cyclical component in loan and deposit rates from the cyclical component specific to these bank interest rates.

Begin by defining a loan-deposit spread in period t as $R_{L,t} - R_{D,t}$. One can define a corresponding loan spread as $R_{L,t} - R_{b,t}$, and a corresponding deposit spread as $R_{b,t} - R_{D,t}$, where $R_{b,t}$ is an interest rate that captures the overall behavior of shorter-term interest rates. Note that the sum of the loan spread and the deposit spread is exactly equal to the corresponding loan-deposit spread. In the empirical analysis, two alternative interest rate series are considered for $R_{b,t}$: a "short-term money rate," which is typically an overnight funds rate (such as the U.S. Federal Funds Rate), and a "benchmark rate," which is typically a three-month interest rate barometer (such as the U.S. 3-month T-bill rate).

The model estimated country i is:

[15] Data on interest rate spreads is available at monthly frequencies for several of these countries, but reliable historical data on economy-wide output and various other data on control variables (discussed below) is available only at quarterly intervals.

$$spread_{i,t} = E_t A(L) YGROW_{i,t} + X'_{i,t}\beta + \varepsilon_{i,t}. \qquad (3.1)$$

$spread_{i,t}$ is a spread for country i in period t. $YGROW$ is the (seasonally-adjusted) growth rate of real GDP and X is a vector of control variables. The first term on the right side, which is a polynomial in the lag/lead operator, measures the cyclical behavior of the spread. $A(L)$ is a main focus of the paper. Real GDP is divided by its sample standard deviation, so the coefficients on $YGROW$ can be interpreted as the effect of a one-standard deviation change in real GDP on the spread. Lagged and contemporaneous GDP may matter for spreads because borrower creditworthiness is countercyclical; this is the main point of Bernanke and Gertler (1989) and Kiyotaki and Moore (1997). Expected future GDP may matter for similar reasons: an anticipated deterioration in borrower creditworthiness could be reflected in current loan rates as current loans are repaid at a future time. We experimented with alternative specifications for the lag/lead length and the results are quite robust to different specifications. The specification estimated in section 4 includes four leads, four lags, and contemporaneous $YGROW$.

In addition to a constant, eight control variables are included in the vector $X_{i,t}$. These control variables are not of primary interest to this study, but including them is important for estimating $A(L)$ correctly. The first control variable is a short-term interest rate that measures the marginal cost of funds to banks, denoted $SHORT_{i,t}$.[16] This could matter for spreads if the flexibility of bank lending rates and deposit rates differ; a special case of this is that loans have longer maturities than deposits.[17] Normally it is suggested that spreads will be increasing in the level of short-term interest rates, but the opposite is also possible for at least two reasons. First, loan interest rates may be adjusted less frequently than some deposit rates (e.g. eurodeposits). Thus, a loan-deposit spread constructed from loans and deposits with this property may be decreasing in the short-term interest rate. Second, Wong's (1997) analysis suggests that the qualitative effect of short-term interest rates on bank spreads depends on whether a bank has a long or short position in interbank markets.

A second control variable is the volatility of short-term interest rates, denoted $SHORTVOL_{i,t}$. This variable has been suggested by several authors (e.g. Ho and Saunders (1981), Wong (1997), and Angbazo (1997)). If banks are risk averse and have a maturity mismatch between liabilities

[16] For a precise definition of this interest rate in each country see the item "short-term money" in the appendix.

[17] See Wong (1997) for a theoretical argument linking bank spreads to a short-term interest rate; see also Slovin and Sushka's (1983) work on loan rate pricing. Flannery (1980,1981) studies empirically the link between a short-term interest rate and bank profitability, and Olson and Simonson (1982) and Graddy and Karna (1984) study the link between a short-term interest rate and bank net interest margins.

and assets, then higher interest rate volatility may increase spreads. On the other hand, if loan rates and deposit rates have quite different "dynamic impulse response functions" to interest rate shocks, it is possible that higher volatility could, at least temporarily, reduce certain loan-deposit spreads. Previous empirical studies (e.g. Flannery (1981), McShane and Sharpe (1985), Ho and Saunders (1981), Angbazo (1997)) consider a variety of proxies for the volatility of short-term interest rates. In this study, interest rate volatility during each quarter is measured by the average over the quarter of squared monthly deviations of the short-term interest rate $SHORT_{i,t}$ from the trend of this interest rate. The trend of this interest rate is estimated using the Hodrick-Prescott filter (Hodrick and Prescott (1996)).

The third control variable is ratio of bank reserves to total assets, denoted $RESERVES_{i,t}$ (see Angbazo (1997)). This could be an important determinant of bank spreads for two reasons that have conflicting predictions for the spread. First, the level of reserves is directly associated with bank liquidity risk which is probably important for bank spreads. Second, reserves are relatively costly for banks to hold. Because these two effects have opposite effects on the spread, it is not a priori clear what sign the coefficient will be.

The remaining control variables are: the slope of the yield curve, denoted $SLOPE_{i,t}$; the inflation rate, denoted $INF_{i,t}$; the lagged ratio of savings deposits to demand deposits for the banking system, denoted $DEP_{i,t-1}$; the lagged ratio of loans to total assets for the banking system, denoted $LOAN_{i,t-1}$; and a time trend.[18] Including more lags of these explanatory variables does not significantly alter the reported estimates of $A(L)$. A time trend is included, as in Berlin and Mester (1999), to capture structural changes in banking systems, and we also include a dummy variable for the euro-area countries during the euro period.

$SLOPE_{i,t}$ is defined as the spread between a three-month rate and the overnight rate.[19] The motivation for including $SLOPE_{i,t}$ is that a bank loan-deposit spread could, in part, reflect differences in maturities of the loan and deposit that make up of the spread. If the loan has a longer (shorter) period of time between adjustments in its rate than does a particular type of deposit, then one would expect $SLOPE_{i,t}$ to be positively (negatively) related to the loan-deposit spread.

[18] For the United Kingdom, the IFS database does not report demand and time deposits separately. The ratio of total deposits to total assets is therefore used in this instance.

[19] The three-month interest rate used is the "benchmark rate" (see the appendix).

The motivation for including $INF_{i,t}$ is that bank spreads are the difference between two nominal interest rates, and thus if inflation shocks are not passed through to both rates equally quickly then spreads may reflect this. Cottarelli and Kourelis (1994) have found inflation to be important for explaining the flexibility of loan rates across countries and thus it may also be important for bank spreads. The relationship between inflation and the spread could go either way depending on which rate adjusts more quickly.

The final two explanatory variables, $DEP_{i,t-1}$ and $LOAN_{i,t-1}$, capture the influence on spreads of the supply of deposits and the demand for loans. Zarruk (1989) argues that, if the supply of deposits is stochastic, then deposit variability may be important for bank spreads. A similar argument would apply with a stochastic demand for loans. If these variables are procyclical, for example, then that could exert a procyclical influence on bank spreads. The qualitative relationship between these variables and bank spreads is unclear. We use the lagged values of both of these variables because of the contemporaneous endogeneity of loans, deposits, and bank spreads.

3.3.3 Estimation

There are three main econometric hurdles involved in estimating (3.1). First, (3.1) includes as explanatory variables expected future growth rates of real output, which are unobservable. If expectations are unbiased then we can include realized values of this variable in place of expected values. However, this introduces correlation between the right-hand-side variables and the disturbance term. OLS is biased and inconsistent in these circumstances. Second, there is quite likely a simultaneous-equations bias because $YGROW_{i,t}$, as well as possibly $SHORT_{i,t}$ and $SLOPE_{i,t}$, may be determined simultaneously with the spread. Third, the disturbance term in (3.1) will not satisfy the classical properties: at a minimum, the first point above introduces an MA(4) process (or MA(5) if contemporaneous $YGROW$ should rightly also be treated as an expectation) into the disturbance term. In addition, the fairly long period of time over which spreads are studied could plausibly lead to heteroskedasticity.

A standard instrumental variables (IV) estimator is consistent (though inefficient) in these circumstances. The estimated standard covariance matrix is also incorrect. To investigate the properties of the disturbance term, we first estimate (3.1) by IV and test for heteroskedasticity and

serial correlation.[20] Without exception, for all of the regressions discussed in section 3.4, the null hypothesis of homoskedasticity is rejected, as is the null hypothesis of serially uncorrelated errors.

Under these circumstances--both autocorrelation and heteroskedasticity of unknown form—it has been argued that heteroskedasticity and autocorrelation consistent estimators (HAC) "come into their own", and are greatly superior to a classical estimator or White's heteroskedasticity-robust estimator.[21] In sum, to accommodate these various econometric issues we employ an efficient instrumental variables estimator and estimate the covariance matrix of the parameter estimates using Newey and West's (1987) HAC estimator.[22] Specifically, the results are based on a GMM estimator.[23] The instrument set includes lags of right hand side variables (beginning with period ($t-1$) as well as the contemporaneous values of INF and $RESERVES$.

3.4 Results

Consider first some general features of loan-deposit spreads for the full sample periods (Figure 3.1). Three observations are noteworthy. First, in all countries there is a marked decrease in average spreads moving left to right across the table, namely from savings deposits to time deposits and then to eurodeposits. This is consistent with our conjecture above about the relative competitiveness of these three deposit markets. Second, consistent with savings deposits being "core deposits," spreads calculated using savings deposit rates are economically very large. Third, the continental European countries generally have the largest spreads for saving and local time deposits, whereas the U.S. and U.K. have the lowest spreads. As noted above, this could be because deposit markets have historically been subjected to greater competition from securities markets (particularly money markets) in the U.S. and U.K.

The sample periods span approximately forty years and it is well known that financial markets have become increasingly market oriented, especially in the past decade or two. Banks, and deposit

[20] The test for heteroskedasticity is the Breusch-Pagan LM test. The variables included in the artificial regression to calculate the LM test statistic (i.e. normalized, squared residuals regressed on a set of variables present in the initial regression) are all of the variables discussed above except future output growth. The test for serial correlation used is the portmanteau Q statistic.

[21] See Andrews (1991) for Monte Carlo results that establish this. See also Davidson and MacKinnon (1993) for discussion.

[22] The Bartlett kernel is used and the lag parameter is data dependent as in Newey and West (1994).

[23] If the disturbances satisfy the classical assumptions the GMM parameter estimates will be identical to those obtained with a standard IV estimator. With non-spherical disturbances, the GMM estimator is consistent and efficient, whereas the conventional instrumental variables estimator is consistent but inefficient.

and loan markets, surely have not been immune from these market forces, and thus the argument can be made that it may not make much sense to focus on results that span the full sample. Of course, this is an empirical question, and our analysis suggests it is a valid one. We therefore proceed by splitting the samples roughly in half, and study two sub-samples: from the beginning of the samples through 1989 and from 1990 through the end of our samples.

3.4.1 Pre-1990 Sub-Samples

Turning to estimates of the model of spreads for the early sub-samples, consider first loan-deposit spreads calculated using savings-deposit rates (Panel A of Table 3.2). Note that, for presentation purposes, the estimated coefficients on $YGROW$ are reported as aggregates of lags (including current output) and leads.

Spreads are statistically and economically significantly countercyclical in all countries, with the exception of the U.K. where the spread is not statistically significant. For example, a one-standard-deviation increase in the growth rate of real GDP persisting for nine quarters decreases this spread by half a percentage point in Canada and between two and four percentage points in the continental European countries, with Germany being the largest. A shock of one standard deviation that persists for nine quarters is used to match the order of the polynomial $A(L)$, and is not an unreasonable duration for an economic upturn. [24] The largest (in absolute value) single coefficient in the polynomial $A(L)$ (not shown) ranges from -0.12 in Canada to -0.63 in Germany; thus, even a shock lasting one quarter can be economically important.

A second conclusion from Panel A of Table 3.2 is the increase in spreads during an economic downturn (for example) generally begins well in advance of the downturn and continues well into it—this is reflected by the significance of both "lags" and "leads" in the table. A third conclusion is that the countercyclical behavior of spreads appears to be economically less significant in the English-speaking countries.

We next decompose spread dynamics by estimating (3.1) for loan spreads and savings-deposit spreads separately. Note first that all of the results are unchanged when the "benchmark rate" (a government short-term interest rate as defined in the appendix) is used in place of "short-term

[24] The sample standard deviations of (seasonally-adjusted) real GDP growth rates (in percent) for the full sample are as follows: 0.99 for the U.K., 0.87 for Switzerland, 1.13 for Italy, 0.89 for Canada, 1.04 for Germany, 1.09 for the Netherlands, and 0.87 for the United States.

money," and thus we report only the latter. Loan spreads are countercyclical in five countries. Canada exhibits slight procyclicality, and Italy considerably more (Panel A of Table 3.3). While it may be that banks in these two countries are smoothing loan rates over the cycle, in the case of Italy it is arguably important to recognize that, as Gambacorta (2008) discusses, prior to the (gradual) implementation of the Consolidated Law on Banking between the mid-1980s and the early 1990s, Italian bank lending was heavily regulated through lending ceilings, foreign exchange controls, and limits on branching and the supply of long-term lending. A major effect of these regulations on the quantity of bank credit was that Italian bank lending rates were slow to adjust to other interest rates generally (Gamabcorta, 2008). It is not difficult to construct scenarios where such regulations could have imparted a procyclical bias to the loan spread. For instance, a reduction in central bank interest rates due to an easing of monetary policy and an associated increase in economic activity could, with sluggish loan rates, impart a procyclical bias to the loan spread.

These estimates for loan spreads have predictions for the potential importance of the financial accelerator mechanism discussed above. A one-standard-deviation negative shock to real GDP persisting for nine quarters raises loan rates relative to overall market interest rates by roughly 40 to 110 basis points in five countries, but lowers them slightly in Canada and by a more significant amount (100 basis points) in Italy. The United States is at the upper end in terms of the cyclical behavior of loan rates. The largest (in absolute value) coefficient in the polynomial $A(L)$ for the United States is -0.29. It is noteworthy that Berlin and Mester (1999) estimate that the countercyclical behavior of the loan rate in the United States for above-prime borrowers falls in the range 40-94 basis points for a one-period, one-standard deviation shock to GDP, depending on the amount of core deposits in the bank.[25] Santos and Winton (2008) estimate that the contemporaneous effect of a recession on loan spreads (the loan rate minus Libor) is 20-40 basis points, depending on whether one controls for cross-sectional differences in firm specific risk. Our estimate of 29 basis points therefore seems reasonable. In addition, the implied financial accelerator effect on the business cycle is economically large. For example, a one-standard deviation decrease in real GDP growth in two successive quarters increases the loan rate relative to overall market interest rates by around two percentage points in the United States, the

[25] Specifically, Berlin and Mester's estimate of the pure cyclical component is 98 basis points (for a one-standard-deviation change in GDP), minus an amount ranging between 4 and 58 basis points depending on the bank's "core deposit ratio." Their specification measures just the contemporaneous effect as their model not allow for dynamic effects.

Netherlands, and Germany and by nearly one percentage point in the United Kingdom and Switzerland.

Regarding savings-deposit spreads, most striking is that savings-deposit spreads tend to be much more countercyclical than loan spreads (Panel A of Table 3.4). In fact, the majority of the countercyclicality of loan-deposit spreads owes to the marked countercyclicality of savings-deposit spreads; the U.K. is an exception to this, but here the cyclicality of the total and component spreads is comparatively weak. Finally, with respect to the above observation that loan-savings deposit spreads are less strongly countercyclical in the English-speaking countries, this fact is attributable entirely to savings-deposit spreads being much less countercyclical in these countries than in the continental European countries. In sum, the countercyclical behavior of loan-deposit spreads using savings deposits is in most countries attributable to countercyclical behavior of both loan and deposit spreads, and particularly deposit spreads.

Consider next spreads using local time deposit rates (Panel A of Tables 3.5-3.6). The main observation from loan-deposit spreads is that they are uniformly less countercyclical using time deposits than savings deposits and are actually procyclical in one country—Switzerland. The reason for this is that time-deposit spreads themselves are considerably less countercyclical than savings-deposit spreads (see Panel A of Table 3.6). In fact, time-deposit spreads in three countries (the United States, the United Kingdom, and Switzerland) have modest procyclical behavior, whereas in the other continental European countries as well as Canada time-deposit spreads are (as with savings deposits) generally countercyclical, though less so than with savings deposits.

Finally, loan-deposit spreads calculated using eurodeposit rates exhibit even less countercyclicality, and in fact are procyclical in three countries (see Panel A of Table 3.7). This is because eurodeposit spreads are uniformly procyclical (Panel A of Table 3.8).

In sum, loan rates are generally countercyclical in the earlier subsample and the cyclicality of deposit rates depends heavily on the type of deposits. The arguably least competitive segment of the deposit market—savings deposits—exhibits generally strong countercyclicality and this weakens and even reverses as one looks at increasingly more competitive segments of the deposit market—first local time deposits and then offshore deposits.

3.4.2 Post-1989 Sample

The post-1989 sample period is arguably impacted by significant structural forces. These include deregulation of financial services, the growth of markets and the marketization of risk, and increased competition, both among banking institutions within and across borders and between banks and markets. Moreover, in the European Community the common currency—the euro—was introduced in 1999, further stimulating competition faced by local banks for deposits and loans. For these reasons, we study this subsample separately which will illuminate the significance of these structural forces for the cyclical behavior of banking interest rate spreads relative to the earlier sample period.

We begin by looking at the behavior of average loan-deposit spreads across the two subsamples (Figure 3.2). Average spreads do not show a marked reduction across the two sample periods. Saving deposit spreads are on average down slightly (by 0.2 percentage points), time deposit spreads are virtually identical on average, and eurodeposit spreads are wider. However, the average across seven countries masks an important fact: spreads using local savings and time deposit rates are considerably lower in the more recent period in the continental European countries, and higher in the other countries. This "convergence" in spreads is reflected in the variation of spreads across countries. Specifically, for the three loan-deposit spreads the standard deviations of spreads across countries in the recent sample are roughly 30 percent lower than the earlier sample.

Turning to the cyclical behavior of spreads, we estimate the same set of equations as above with the only change being that we include a dummy variable for the euro period in regressions involving the euro-area countries. Except for the United Kingdom, the loan-saving deposit spread very clearly has much less countercyclicality, and especially in the continental European countries (Panel B of Table 3.2). In fact, in the continental European countries the countercyclicality of this spread decreased by almost 90 percent in Germany, 30 percent in Italy, and disappeared entirely in the Netherlands and Switzerland. This reduction in the countercyclical behavior of total loan-saving deposit spreads is in large part due to almost complete disappearance of countercyclicality of the saving deposit spread itself, although in those countries which exhibited a clear financial accelerator mechanism in the early sample period, the magnitude of such is generally weaker in the recent sample period (Panel B of Tables 3.3-3.4). Moreover, this pattern is also true of spreads using time-deposit rates (Panel B of Tables 3.5-3.6). For eurodeposit rates, the fairly strong

procyclicality of eurodeposit spreads in the earlier sample has significantly moderated in the more recent sample period, with all countries having either slightly positive or slightly negative cyclicality of these deposit rates (Panel B of Tables 3.7-3.8). Further, the differences in the behavior of local time deposit rates and eurodeposit rates evident in the earlier sample have disappeared to a large extent in the more recent sample. This may be because of the closer integration of onshore and offshore finance or, in other words, the globalization of finance.

3.5 Interpretation of the Results and Concluding Remarks

The results for individual countries suggest that some countries have behaved similarly both within a sample period and across sample periods. To investigate this further, as well as to collate the large collection of results from individual countries presented above, we next aggregate results across several alternative country groupings. These results are displayed in Figure 3.3.

There are five main observations from component loan and deposit spreads. First, loan-rate spreads were historically less countercyclical in the continental European countries or the euro-area countries than in the English-speaking countries, but this difference has gone away over time, and even reversed. Nevertheless, a main prediction of the baseline hypothesis—countercyclical loan spreads—is confirmed in our analysis *on average*. Moreover, the quantitative implications of this for a financial accelerator mechanism underlying business cycles could be important.

Second, saving deposit spreads in the continental or euro-area countries were historically greatly countercyclical but only mildly so in the English-speaking countries, but this difference has disappeared over time. Third, the same is true of time-deposit spreads although they were never as countercyclical as saving deposit spreads. Fourth, eurodeposit spreads in the continental or euro-area countries were historically highly procyclical but much less so in the English-speaking countries, and this difference has disappeared over time. Fifth, *all deposit spreads have in all country groups become roughly acyclical*. As a result, spreads computed from loan rates and deposit rates of all types have become much less cyclical over time.

In sum, the cyclical behavior of bank interest rate spreads differed greatly historically, but there has been a considerable degree of cross-country convergence in the cyclical properties of spreads as well as in the magnitudes of spreads. This is reflected most clearly by the very significant decrease in the cross-country standard deviation of the cyclical behavior of the various

spreads. These are shown in Figure 3.4. The variation in the cyclical behavior of loan rates across countries has fallen by 50 percent across the two sample periods, whereas variation in deposit rate cyclicality has fallen by between 70 and 85 percent depending on the type of deposits. Cyclicality has to a large extent converged.

Turning to the hypotheses outlined previously, in the early period it is evident that the Relationship 2 hypothesis best matches the evidence presented, whereas in the more recent period the baseline or Relationship 1 hypotheses are more consistent with the data. Clearly, if our interpretation of the evidence is correct, banking markets, especially for deposits have become more competitive, even those for savings deposits, the one that banks may have the most market power over. Note, however, that inferences about market power based on average spreads is not straightforward as savings deposits also provide the greatest liquidity services to depositors. While banks are still able to reap large spreads on some deposits, the cyclicality of these spreads has evaporated, which we assert is due to competitive pressures in their funding markets.

The explanation for our findings does not appear to be caused by features of deposit insurance systems. If deposit insurance systems are lesser in some countries than in others, then it could lead to a countercyclical risk premium in deposit rates in the former countries. The facts about deposit insurance coverage (see the appendix) do not suggest clear-cut evidence in this direction of inquiry. It is possible that bank riskiness is a factor in explaining eurodeposit spreads. Specifically, this might be factor underlying the procyclical behavior of eurodeposit rates in the few countries where this occurs. However, even for eurodeposit spreads it is not clear that little or no insurance for eurodeposits accounts for our findings. On the one hand, most countries explicitly exclude "interbank" deposits—which includes much of the eurodeposit market—from deposit insurance coverage. On the other hand, our analysis uses the spread between deposit rates and "short-term money," which in most cases is an interbank rate, and interbank deposits are also officially excluded in most countries. Moreover, as Rochet and Tirole (1996) note, governments have implicitly insured most interbank claims—particularly those of larger banks that tend to be active in the eurodeposit market.

In summary, the evidence presented in this paper is consistent with banks in the Continental-European countries historically being able to exploit market power over savings deposit rates and time deposit rates, across the business cycle to buffer adverse shocks to their borrowers. The evidence is consistent also with the Continental-European banking systems adjusting the cost of

domestic deposit liabilities (relative to overall market interest rates) across the business cycle much more than is the case in the English-speaking countries. As we suggested above, a plausible explanation for this is that historically the English-speaking countries have had better developed securities markets that may have resulted in greater competition in national bank deposit markets—both among banks for securitized deposits and with other money market securities. To the extent that this is true, less competitive domestic deposit markets may have helped banks "finance" bank-borrower relationships in countries that have been categorized as having "relationship banking systems." If deposit markets in these countries are less competitive, in part due to less developed securities markets, then this may have facilitated these bank-borrower relationships by allowing banks to vary the cost of deposits in line with movements in the cost of maintaining relationships. What is striking, however, is that the ability to utilize deposit rates to facilitate bank-borrower relationships has virtually disappeared in the past two decades.

Tables and Figures

Table 3.1 Predictions of the Hypotheses

	Baseline	Relationship 1	Relationship 2	Deposit Competition
Loan Spread	CC	weak CC/PC	weak CC/PC	-
Savings Deposit Spread	AC	AC	CC	PC
Time Deposit Spread	AC	AC	less CC/PC	intermediate
Eurodeposit Spread	AC	AC	less CC/PC	CC
Loan-Saving Spread	CC	weak CC/PC	CC	-
Loan-Time Spread	CC	weak CC/PC	less CC/PC	-
Loan-Euro Spread	CC	weak CC/PC	less CC/PC	-

Note: “CC” denotes countercyclical, “PC” procyclical, and “AC” acyclical.

Table 3.2 Spread between Loan Rate and Savings Deposit Rate

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom
			Panel A: Pre-1990			
YGROW						
total	-0.488	-3.713	-2.076	-2.567	-2.058	-0.072
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.375)
lags	-0.317	-1.710	-0.474	-0.245	0.038	-0.233
	(0.000)	(0.000)	(0.000)	(0.006)	(0.249)	(0.000)
leads	-0.171	-2.003	-1.602	-2.321	-2.096	0.161
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Control Variables						
INF	-0.127	-0.004	0.035	0.254	0.312	0.135
	(0.000)	(0.779)	(0.225)	(0.000)	(0.000)	(0.000)
DEP	-0.001	0.002	-0.064	0.007	-0.004	0.070
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	0.074	0.035	-0.017	0.077	0.032	0.029
	(0.000)	(0.000)	(0.013)	(0.000)	(0.000)	(0.000)
RESERVES	0.013	-0.030	-0.185	-0.143	0.208	-0.096
	(0.635)	(0.202)	(0.000)	(0.004)	(0.000)	(0.017)
SHORTVOL	0.001	0.108	-0.029	0.001	0.067	0.028
	(0.831)	(0.000)	(0.000)	(0.496)	(0.000)	(0.000)
SHORT	0.050	0.097	0.394	-0.054	-0.128	0.022
	(0.000)	(0.000)	(0.000)	(0.013)	(0.000)	(0.381)
SLOPE	-0.015	0.287	0.169	-0.400	-0.546	-0.185
	(0.370)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.94	0.94	0.89	0.71	0.66	0.40
Hansen's J	1.000	1.000	1.000	1.000	1.000	1.000
Obs.	87	55	53	85	56	80

Table 3.2 (Continued)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom
			Panel B: Post-1989			
YGROW						
total	-0.332	-0.527	-1.438	0.175	0.504	-0.877
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lags	-0.587	-0.270	-0.601	0.421	0.517	-0.394
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
leads	0.255	-0.257	-0.837	-0.246	-0.014	-0.483
	(0.000)	(0.000)	(0.000)	(0.000)	(0.555)	(0.000)
Control Variables						
INF	0.398	0.055	0.139	0.269	1.097	-0.195
	(0.000)	(0.383)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	0.002	0.015	-0.011	0.005	0.000	-0.172
	(0.002)	(0.000)	(0.000)	(0.000)	(0.082)	(0.000)
LOAN	0.024	-0.010	0.014	-0.040	0.012	-0.084
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	1.122	0.466	-0.035	-0.067	-0.052	-0.997
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.210	-0.546	-0.328	0.258	0.518	-0.489
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORT	0.854	1.510	0.318	-0.174	0.214	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.962)
SLOPE	0.295	-2.741	-0.050	0.243	0.751	0.695
	(0.001)	(0.000)	(0.025)	(0.000)	(0.000)	(0.000)
EURODUMMY		-0.216	1.148	1.797		
		(0.201)	(0.000)	(0.000)		
R2	0.77	0.89	0.75	0.81	0.80	0.77
Hansen's J	1.000	1.000	1.000	1.000	1.000	1.000
Obs.	55	66	67	59	68	68

Note: This table estimates the effect of one-standard deviation change in real GDP on the spread. For YGROW, "total" is the sum of the parameter estimates for four leads and four lags, and current real output growth ("lags" includes current and four lags). All regressions include a constant and time trend. "Hansen's J" is the p-value for the chi-squared test that the overidentifying restrictions are not rejected. Pre-1990 indicates "before 1989q4", and the Post-1989 indicates time period "after 1990q1". p-values are in parentheses. This note is applied in Tables 3.2-3.8.

Table 3.3 Spread between Loan Rate and Short-Term Money

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: Pre-1990			
YGROW							
total	0.159	-0.593	1.002	-1.022	-0.450	-0.359	-1.089
	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lags	-0.033	-0.817	0.761	-0.465	-0.608	-0.033	-0.570
	(0.284)	(0.000)	(0.000)	(0.000)	(0.000)	(0.321)	(0.000)
leads	0.192	0.224	0.241	-0.557	0.158	-0.327	-0.520
	(0.000)	(0.000)	(0.000)	(0.000)	(0.055)	(0.000)	(0.000)
R^2	0.58	0.92	0.97	0.86	0.73	0.58	0.71
Obs.	87	55	53	85	56	80	95
				Panel B: Post-1989			
YGROW							
total	-0.061	-0.666	-0.803	-0.173	0.210	-0.431	0.058
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lags	-0.026	-0.648	-0.569	-0.260	0.135	-0.245	0.050
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
leads	-0.034	-0.018	-0.234	0.087	0.075	-0.186	0.008
	(0.000)	(0.659)	(0.000)	(0.000)	(0.001)	(0.000)	(0.007)
R^2	0.75	0.85	0.49	0.94	0.85	0.81	0.71
Obs.	55	66	67	59	68	68	57

Note: The estimation of control varaibles for Tables 3.3-3.8 are listed in the Appendix Tables A3.1-A3.6.

Table 3.4 Spread between Saving Deposit Rate and Short-Term Money

	Panel A: Pre-1990				Panel B: Post-1989			
		YGROW		R^2		YGROW		R^2
	total	lags	leads	[Obs.]	total	lags	leads	[Obs.]
Canada	-0.645	-0.281	-0.364	0.84	-0.272	-0.561	0.289	0.76
	(0.000)	(0.000)	(0.000)	[87]	(0.000)	(0.000)	(0.000)	[55]
Germany	-3.121	-0.892	-2.229	0.95	0.136	0.136	-0.245	0.81
	(0.000)	(0.000)	(0.000)	[55]	(0.000)	(0.000)	(0.000)	[66]
Italy	-3.065	-1.222	-1.843	0.95	-0.633	-0.028	-0.605	0.85
	(0.000)	(0.000)	(0.000)	[53]	(0.000)	(0.106)	(0.000)	[67]
Netherlands	-1.541	0.229	-1.770	0.86	0.351	0.682	-0.332	0.89
	(0.000)	(0.009)	(0.000)	[85]	(0.000)	(0.000)	(0.000)	[59]
Switzerland	-1.581	0.659	-2.239	0.73	0.291	0.381	-0.090	0.81
	(0.000)	(0.000)	(0.000)	[56]	(0.000)	(0.000)	(0.000)	[68]
United Kingdom	0.300	-0.191	0.491	0.41	-0.452	-0.150	-0.302	0.89
	(0.001)	(0.002)	(0.000)	[80]	(0.000)	(0.000)	(0.000)	[68]

Table 3.5 Spread between Loan Rate and Time Deposits

	Panel A: Pre-1990				Panel B: Post-1989			
		YGROW		R^2		YGROW		R^2
	total	lags	leads	[Obs.]	total	lags	leads	[Obs.]
Canada	-0.166	-0.318	0.152	0.87	-0.200	-0.349	0.149	0.69
	(0.001)	(0.000)	(0.000)	[87]	(0.000)	(0.000)	(0.000)	[55]
Germany	-1.239	-1.151	-0.087	0.82	-0.464	-0.112	-0.352	0.86
	(0.000)	(0.000)	(0.000)	[56]	(0.000)	(0.117)	(0.000)	[66]
Italy	-1.465	-0.077	-1.388	0.84	-0.841	-0.226	-0.616	0.74
	(0.000)	(0.000)	(0.000)	[53]	(0.000)	(0.000)	(0.000)	[65]
Netherlands	-1.377	0.335	-1.712	0.64	0.014	0.070	-0.056	0.84
	(0.000)	(0.000)	(0.000)	[85]	(0.409)	(0.000)	(0.000)	[59]
Switzerland	0.530	-0.335	0.865	0.72	0.509	0.276	0.233	0.90
	(0.002)	(0.000)	(0.000)	[56]	(0.000)	(0.000)	(0.000)	[68]
United Kingdom	-0.049	0.078	-0.127	0.53	-0.020	-0.046	0.026	0.71
	(0.184)	(0.001)	(0.001)	[80]	(0.781)	(0.262)	(0.000)	[68]
United States	-0.829	-0.389	-0.440	0.76	-0.176	-0.353	0.177	0.80
	(0.000)	(0.000)	(0.000)	[95]	(0.000)	(0.000)	(0.000)	[57]

Table 3.6 Spread between Time Deposit Rate and Short-Term Money

	Panel A: Pre-1990				Panel B: Post-1990			
		YGROW		R^2		YGROW		R^2
	total	lags	leads	[Obs.]	total	lags	leads	[Obs.]
Canada	-0.320	-0.281	-0.038	0.87	-0.137	-0.321	0.185	0.60
	(0.000)	(0.000)	(0.403)	87	(0.000)	(0.000)	(0.000)	55
Germany	-0.645	-0.333	-0.313	0.88	0.196	0.537	-0.341	0.77
	(0.000)	(0.000)	(0.000)	55	(0.000)	(0.000)	(0.000)	66
Italy	-2.462	-0.839	-1.623	0.96	-0.024	0.328	-0.352	0.81
	(0.000)	(0.000)	(0.000)	53	(0.530)	(0.000)	(0.000)	65
Netherlands	-0.353	0.807	-1.160	0.87	0.189	0.330	-0.141	0.96
	(0.001)	(0.000)	(0.000)	85	(0.000)	(0.000)	(0.000)	59
Switzerland	0.976	0.275	0.701	0.92	0.302	0.145	0.157	0.73
	(0.000)	(0.000)	(0.000)	56	(0.000)	(0.000)	(0.000)	68
United Kingdom	0.317	0.115	0.202	0.70	0.407	0.198	0.209	0.74
	(0.000)	(0.001)	(0.000)	80	(0.000)	(0.000)	(0.000)	68
United States	0.266	0.182	0.084	0.56	-0.233	-0.403	0.170	0.79
	(0.000)	(0.000)	(0.001)	95	(0.000)	(0.000)	(0.000)	57

Table 3.7 Spread between Loan Rate and Eurodeposits

	Continental European countries				English-speaking countries		
	Germany	Italy	Netherlands	Switzerland	Canada	United Kingdom	United States
				Panel A: Pre-1990			
YGROW							
total	0.138	4.445	-0.458	1.290	-0.155	0.422	-0.915
	(0.041)	(0.000)	(0.032)	(0.000)	(0.000)	(0.000)	(0.000)
lags	-0.831	1.791	-0.291	-0.238	-0.290	0.111	-0.336
	(0.000)	(0.000)	(0.086)	(0.000)	(0.000)	(0.048)	(0.000)
leads	0.708	2.654	-0.168	1.528	0.135	0.311	-0.580
	(0.000)	(0.000)	(0.388)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.84	0.63	0.53	0.72	0.42	0.53	0.77
Obs.	55	43	85	56	56	80	95
				Panel B: Post-1989			
YGROW							
total	-0.512	-0.504	-0.204	0.359	-0.209	-0.024	-0.173
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.725)	(0.000)
lags	-0.610	-0.423	-0.281	0.189	-0.326	-0.048	-0.374
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.224)	(0.000)
leads	0.097	-0.080	0.076	0.170	0.117	0.024	0.200
	(0.004)	(0.013)	(0.000)	(0.000)	(0.000)	(0.452)	(0.000)
R^2	0.87	0.62	0.93	0.88	0.75	0.72	0.88
Obs.	66	67	59	68	55	68	57

Table 3.8 Spread between Eurodeposit Rate and Short-Term Money

	Continental European countries				English-speaking countries		
	Germany	Italy	Netherlands	Switzerland	Canada	United Kingdom	United States
				Panel A: Pre-1990			
YGROW							
total	0.472	3.917	0.681	1.746	0.206	0.786	0.181
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
lags	-0.015	1.252	0.147	0.377	0.124	0.150	0.237
	(0.687)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)
leads	0.486	2.665	0.534	1.369	0.081	0.636	-0.056
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.096)
R^2	0.52	0.80	0.66	0.89	0.90	0.58	0.47
Obs.	55	43	85	56	56	80	95
				Panel B: Post-1989			
YGROW							
total	0.152	0.301	-0.032	0.147	-0.149	0.403	-0.231
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lags	0.038	0.147	-0.021	0.054	-0.301	0.196	-0.423
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
leads	0.115	0.155	-0.011	0.093	0.151	0.207	0.192
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.87	0.84	0.99	0.50	0.78	0.74	0.86
Obs.	66	67	59	68	55	68	57

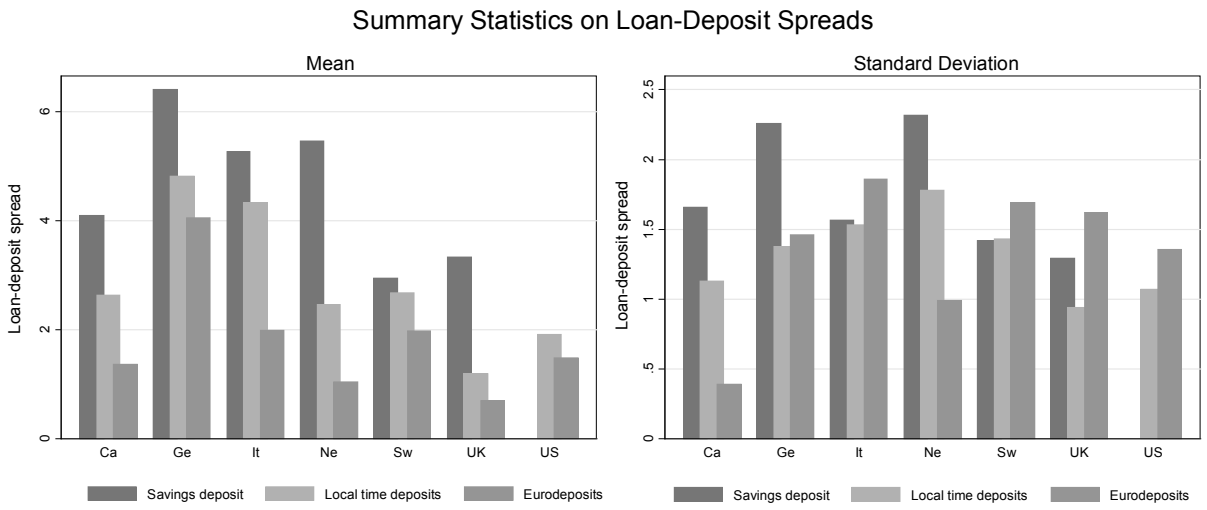


Figure 3-1 Summary Statistics on Loan-Deposit Spreads

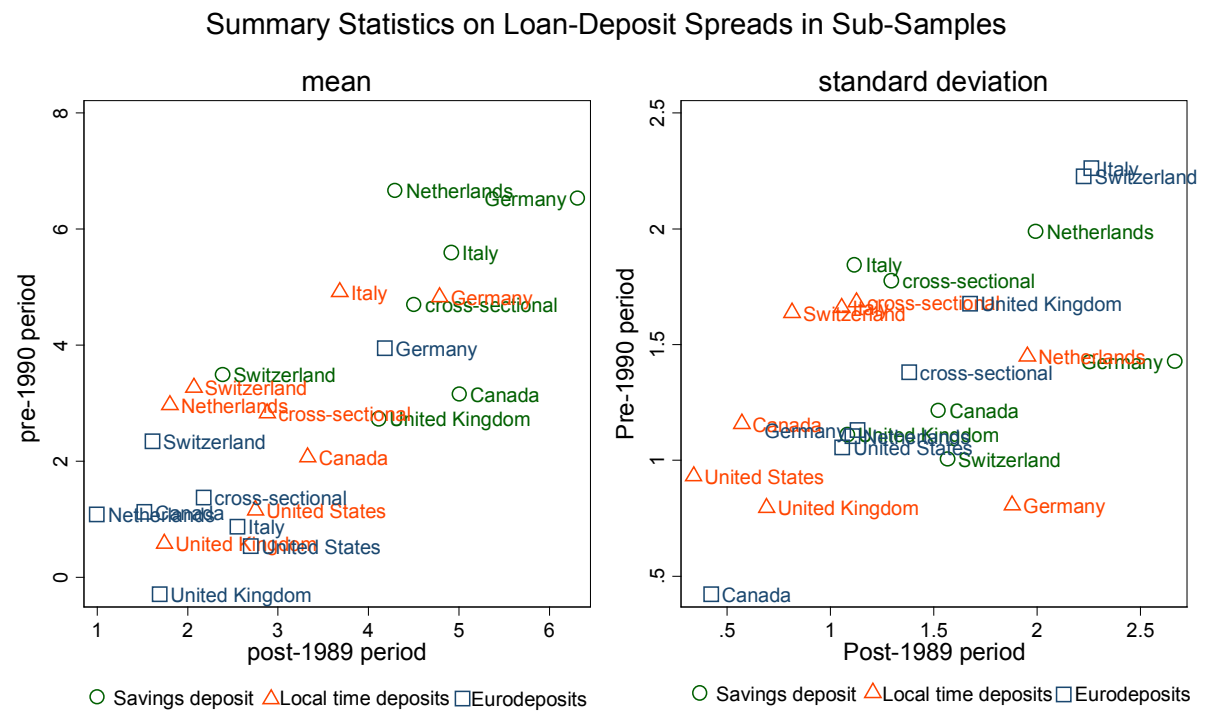


Figure 3-2 Summary Statistics on Loan-Deposit Spreads in Sub-Samples

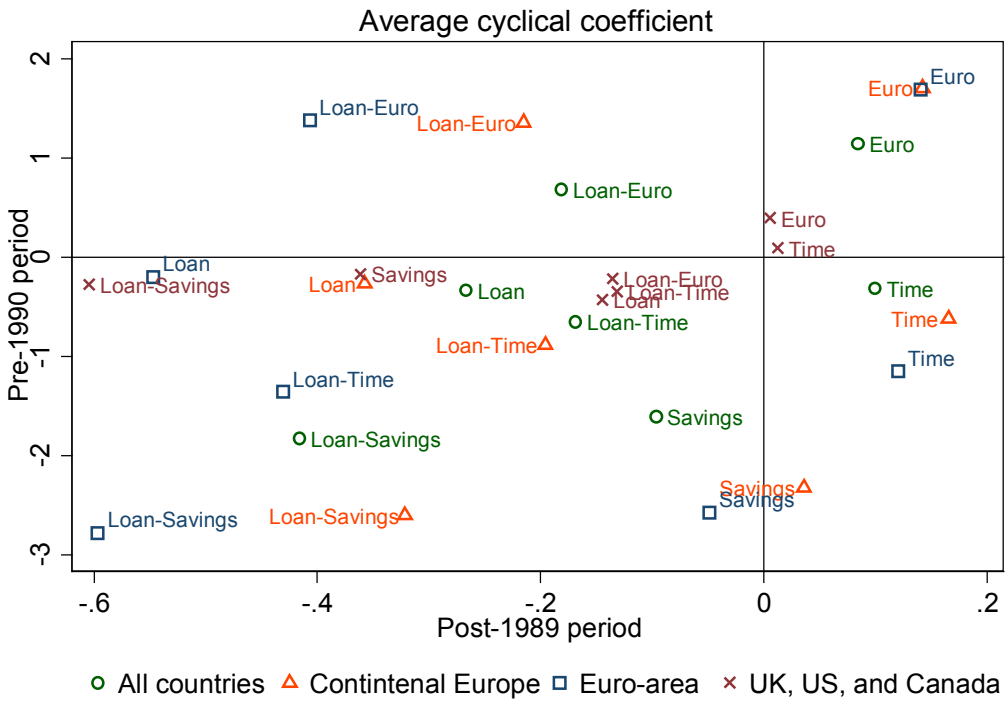


Figure 3-3 Average cyclical coefficient

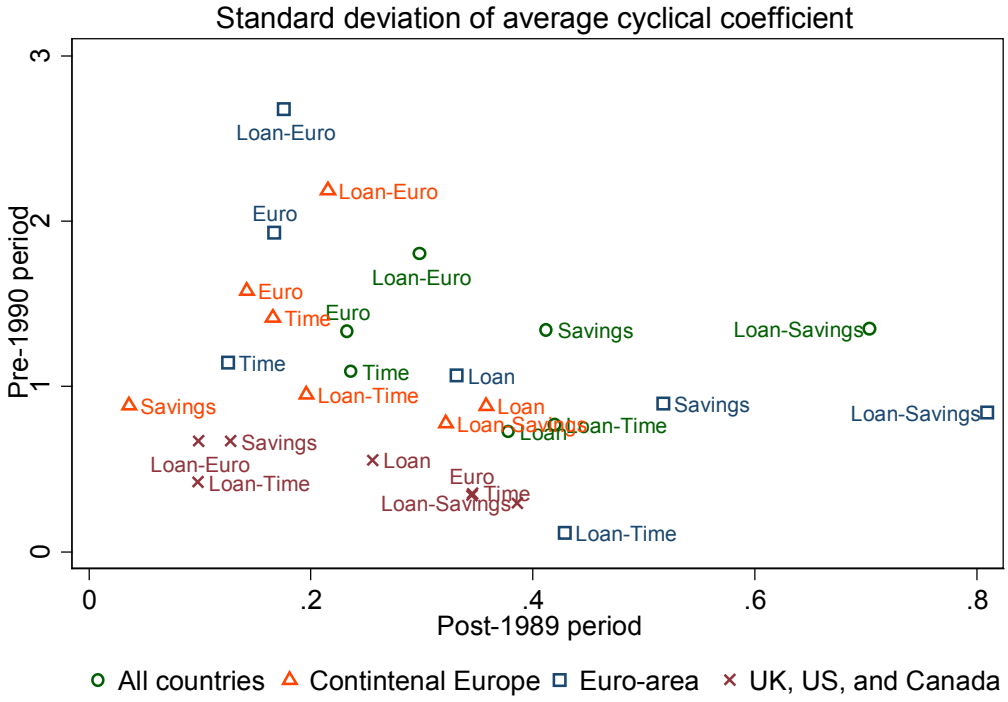


Figure 3-4 Standard deviation of average cyclical coefficient

Appendix

Appendix A: Data

Sample periods vary depending on the availability of data for specific spreads and are, of course, affected by the number of lags/leads used. The sample periods for which individual interest rates are available are noted below.

I. Interest Rate Data

Offshore Deposit Rate

The offshore deposit rate for the USA and the U.K. are eurodeposit rates. For the other countries the rates are a splice of eurodeposit rates (which are generally unavailable beginning in the 1990s) and Libor rates (first collected by the British Bankers Association in the mid-1980s). The issue then is how comparable are these two different series? In principle they can be different because one refers to purely interbank borrowing (Libor) while one refers to wholesale funding generally in offshore markets (eurodeposits). Snider and Youle (2014) show that prior to the 2007 financial crisis these rates were almost always a fixed spread from one another, and thus correlated perfectly. After the crisis, there were instances where the two diverged. Nevertheless, the correlations between the two series is extremely high, on the order of 0.99, and this is true even for the post-crisis period for the currencies for which data is available on both series (the U.S. and U.K.), whether in daily or lower frequency data. Thus, since we are using quarterly data and our main focus is with cyclical matters, the tight correlation between these two series means that it is of minimal importance to use the spliced series for the offshore deposit rate.

Country Notes

Canada

Offshore Canadian Dollar Deposit Rate: three-month rate; average of monthly rates. From 1975.jan - 1990.Jun CAD eurodeposits (source: Datastream) and from 1990.Jul -2013.May CAD Libor (source: Global Financial Data). Note: at the splice point the two series are equal.

Local time deposit: three-month time deposit. Average of rates on the last Wednesday of the month for individual (non-commercial) deposits. Sample 1961.Jan - 2013.Jan. Source: Global Financial Data.

Savings deposit rate: non-checkable savings deposits with banks. Average of rates on the last Wednesday of the month. Sample 1967.Apr - 2013.Jan. Source: Global Financial Data.

Short-term money: overnight money market financing rate. Since January 1975 average of daily rates; previously, average of rates on the last Wednesday of the month. Sample 1960.Jan - 2013.May. Source: OECD, Financial Statistics Monthly Databank (pre-1975) and Statistics Canada/CANSIM (from 1975).

Benchmark rate: three-month treasury bill rate. Average of rates on the last Wednesday of the month. Yields are auction yields through 1989 and secondary market yields from 1990. Sample 1960.Jan - 2013.May. Source: Global Financial Data.

Lending rate: prime lending rate. Loan rates are the interest rates charged to the most credit-worthy borrowers by commercial banks. When there are differences in the rate charged by individual banks, the most typical rate or rates are taken. Average of rates on the last Wednesday of the month. Sample 1960.Jan - 2013.May. Source: Global Financial Data.

Germany

Offshore German Currency Rate: three-month rate; average of monthly rates. From 1963.Jan - 1990.Jun deutschemark eurodeposits (source: OECD Financial Statistics Monthly); from 1990.Jul-1998.Dec Deutschemark Libor (source: British Bankers Association); from 1999.Jan - 2013.May Euro-Libor (source: Global Financial Data). Note: at the splice point of the first and second segments the two series values are equal; the second and third do not overlap because the currency changed.

Local time deposit: three-month time deposits. Sample 1960.Jan - 2013.Apr. Source: pre-1975 OECD Financial Statistics Monthly Databank, and from 1975 Global Financial Data.

Savings deposit rate: Average of monthly rates for sight deposits. Sample 1975.Jan - 2013.Apr. Source: Global Financial Data.

Short-term money: average of daily rates on overnight money. Sample 1960.Jan - 2012.May. Source: Bundesbank.

Benchmark rate: average of monthly yield on 3-month treasury bills. Sample 1960.Jan - 2013.May. Source: Global Financial Data.

Lending rate: average of monthly prime rates through June 2003 (source: OECD Financial Statistics Monthly and Global Financial Data) and from July 2003 average corporate lending rate (source: Global Financial Data. Sample: 1975.Feb – 2013.Apr.

Italy

Offshore Italy Currency Rate: three-month rate; average of monthly rates. From 1978.Jun- 1990.May Lira eurodeposits (source: Datastream); from 1990.Jun -1998.Dec Lira Libor (source: British Bankers Association); from 1999.Jan - 2013.May Euro-Libor (source: Global Financial Data). Sample: 1978.Jun - 2013.May. Note: at the splice point of the first and second segments the two series values are equal; the second and third segments do not overlap because the currency changed.

Local time deposit: weighted-average monthly rate on time deposits (3-month time deposits through Jan 1995, up to 6 months from Feb 1995 - Feb 2004, and up to 1 year from March 2004). Sample 1962.Mar – 2011.Apr. Source: 1962.Mar - 1995.Mar (OECD); 1995.Feb - 2004.Feb (Bank of Italy); 2004.Mar - 2011.Apr (Global Financial Data).

Savings deposit rate: weighted-average rate on current accounts. Sample 1962.May – 2003.Apr. Sample 1962.Mar – 2003.Apr. Source: through 1982.Dec (OECD Financial Statistics Monthly Databank); 1983.Jan - 2003.Apr (Global Financial Data).

Short-term money: average of end-of-month rates. From 1960.Jan - 2008.Dec the discount rate, and from 2009 on the overnight interbank rate. Sample 1960.Jan - 2013.Apr. Source: Global Financial Data (discount rate) and Bank of Italy (overnight interbank rate).

Benchmark rate: average of monthly rates on three-month treasury bills. Sample 1960.Jan - 2013.May. Source: Global Financial Data.

Lending rate: Average of monthly rates; average prime rate from commercial banks through Dec 2004 and from Jan 2005 the corporate lending rate. Sample 1966.Jan - 2013.Apr. Source: OECD, Bank of Italy, and Global Financial Data.

Netherlands

Offshore Dutch Currency Rate: three-month rate; average of monthly rates. From 1962.Jan- 1992.Nov Guilder eurodeposits (source: OECD Financial Statistics Monthly); from 1992.Dec-1998.Dec Guilder Libor (source: British Bankers Association); from 1999.Jan - 2013.May Euro-Libor (source: Global Financial Data). Sample: 1962.Jan - 2013.May. Note: at the splice point of the first and second segments the two series values are equal; the second and third segments do not overlap because the currency changed.

Local time deposit: three-month time deposit. Monthly average of rates paid by universal banks, the Postbank, and the pilot rate announced by the Rabobanks. Sample 1960.Jan - 2013.Jan. Source: Global Financial Data.

Savings deposit rate: monthly average of rates on overnight sight deposits. Sample 1967.Dec - 2013.Apr. Source: Global Financial Data.

Short-term money: average of monthly rates on overnight interbank rates through 1998 and EONIA (euro-area overnight interbank weighted average) from 1999. Sample 1960.Jan - 2013.Apr. Source: Global Financial Data.

Benchmark rate: average of monthly rates on three-month treasury bills through 1985 and subsequently rates on loans to local authorities. Sample 1960.Jan - 2013.Jan. Source: Global Financial Data.

Lending rate: Monthly average base rate for prime borrowers. Sample 1960.Jan - 2013.Apr. Source: Global Financial Data.

Switzerland

Offshore Swiss Franc Rate: three-month rate; average of monthly rates. From 1963.Jan - 1988.Feb eurodeposits (source: OECD Financial Statistics Monthly); from 1988.Mar -2013.May Libor (source: Global Financial Data). Sample: 1963.Jan - 2013.May. Note: at the splice point the two series values are equal.

Local time deposit: three-month deposit rate. Average of monthly rates. Sample 1960.Jan - 2013.Feb. Source: Global Financial Data.

Savings deposit rate: average of monthly rates on ordinary savings accounts. Sample 1960.Jan - 2013.Feb Source: Global Financial Data.

Short-term money: Call money rate through 1972.Feb and subsequently the overnight rate; average of monthly values. Sample 1960.Jan - 2013.May. Source: Swiss National Bank.

Benchmark rate: three-month rate on interbank deposits in Zurich (source: Swiss National Bank) through 1980s.Jan, and subsequently three-month T-bill rate (source: Global Financial Data). Average of monthly rates. Sample 1974.Jan - 2013.May.

Lending rate: average of end-of-month rates for prime lending. Sample 1966.Jan - 2013.May. Source: Global Financial Data.

United Kingdom

Eurodeposit British pound sterling rate: three-month rate. Up to December 1995, average of end-of-month rates; from January 1996, average of daily rates. Sample 1967.Jan - 2013.Mar. Source: OECD Financial Statistics Monthly Databank (through 1996) and Bank of England (from 1997).

Local time deposit: three-month certificate of deposit rate. Average of daily rates. Sample 1969.Jan - 2013.Mar. Source: OECD Financial Statistics Monthly Databank (through 1977) and Bank of England (from 1978).

Savings deposit rate: prior to January 1984, seven-day sight deposits of London Clearing Banks; since January 1984, instant access savings accounts at London Clearing Banks. Sample 1960.Jan - 2012.Dec. Source: International Financial Statistics through January 1999 and Global Financial Data from February 1999.

Short-term money: Call Money rate pre-1997, and SONIA (overnight rate) post 1996. Average of end-of-month maximum rates pre-1997 and average of daily rates post 1996. Sample 1960.Jan - 2013.May. Source OECD, Financial Statistics Monthly Databank for pre-1996 and Bank of England for post-1996.

Benchmark rate: three-month Treasury bill rate. Average of weekly rates. Sample 1960.Jan - 2013.May. Source: OECD Financial Statistics Monthly Databank (pre-1975) and Bank of England (post-1974).

Lending rate: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate on overdrafts to private non-financial corporations. End-of-month

rate through August 1977; since September 1977, monthly average of daily rates. Sample 1960.Jan - 2013.Apr. Source: OECD, Financial Statistics Monthly Databank and Bank of England.

United States

Eurodeposit U.S. dollar Rate: three-month rate. Up to December 1970, average of end-of-month rates; from January 1971, average of daily rates. Sample 1968.Jan-2013.Apr. Source: OECD Financial Statistics Monthly Databank (to 1970.Dec) and Federal Reserve Board from 1971.Jan.

Local time deposit: three-month certificate of deposit rate on secondary market; average of daily rates. Sample 1964.Jun - 2013.Apr. Source: Federal Reserve Board.

Savings deposit rate: NA.

Short-term money: overnight effective federal funds rate. Average of daily rates. Sample 1960.Jan-2013.Apr. Source: Federal Reserve Board.

Benchmark rate: 3-Month Treasury Bill, secondary market rate, averages of business days. Sample 1960.Jan - 2013.Apr. Source: Federal Reserve Board.

Lending rate: Averages of daily prime rates posted by a majority of top 25 (by assets in domestic offices) insured U.S.-chartered commercial banks. Sample 1960.Jan - 2013.Apr. Source: Federal Reserve Board.

II. Other Data

GDP and price index: Real GDP is computed from nominal SA GDP and the SA GDP deflator. For Germany (IFS), Italy (IFS), Netherlands (IFS/OECD) GDP data expressed in euros using the euro conversion rate. Note there is a break in the German data due to unification: from 1991 onwards these data include unification. To deal with this we adjust German nominal GDP data as follows: for data after 1990 we multiply GDP data by the ratio of GDP in West Germany to GDP in unified Germany both in 1991 Q1 (this ratio is 0.8849 based on data from the Bundesbank). Data for USA from FRED, UK from the OECD, and Switzerland from the OECD.

Bank reserves: defined as reserves of deposit money banks. Source: unless otherwise noted International Financial Statistics (International Monetary Fund), series 20. For the U.S., St. Louis Adjusted Reserves from FRED; for euro area countries figures are spliced series 20 and 320 (the latter is the continuation of series 20 after euro) and the spliced series is expressed in euros.

Deposits: demand deposits (series 24) and time+savings+foreign currency deposits (series 25) from the IFS. For the United Kingdom the aggregate series 25l is used which includes demand, time, savings, and foreign currency deposits. For euro area countries figures are spliced series 24/25 and 324/325 (the latter is the continuation of the former after euro) and the spliced series is expressed in euros.

Loans: from the IFS, series 22a+22b+22d.

Total banking system assets: defined as the sum of the following series from IFS: series 20 (reserves), 21(foreign assets), claims on government (series 22), and claims on private sector (series 22d). Note for euro-area countries we exclude foreign assets for the simple reason that this series post euro is defined as claims on non-euro area countries which results in a break in the series at the splice point.

Appendix B: Deposit Insurance Systems

The sources for the following brief overview of deposit insurance systems are Kyei (1995) and Garcia (2000). In addition to the historical discussion below, note that deposit insurance systems in the European Union were harmonized as of 1995. As a general fact, foreign currency deposits and/or interbank deposits are typically excluded from deposit insurance coverage, and thus eurodeposits are generally outside of (explicit) deposit insurance system coverage.

United Kingdom. The deposit insurance system began with an implicit guarantee in 1973 under the "lifeboat fund." Explicit protection began in 1982 (The Deposit Protection Board). There is no coverage for certificates of deposit, interbank deposits, or foreign currency deposits. In addition, the coverage ratio for insured deposits is 75 percent up to a specified maximum nominal amount.

Germany. Deposit insurance was implemented in 1966 and covers most deposits. Excludes interbank deposits but does include deposits of German bank branches abroad.

Italy. The 1936 Banking Law provided for implicit deposit insurance. The Interbank Deposit Protection Fund was established in 1987 to provide further protection. Covers most deposits, excluding interbank.

The Netherlands. Established in 1979. Covers all household deposits and those of small enterprises. Excludes interbank and large corporations' deposits.

Switzerland. Established in 1984. Covers all household deposits, and excludes interbank and most non-household deposits.

Canada. The Canadian Deposit Insurance Corporation was established in 1967. Excludes only interbank and foreign currency deposits.

United States. The Federal Deposit Insurance Corporation was established in 1934 and the Federal Savings and Loans Insurance Corporation was established one year later. Covers all deposits except those booked offshore.

Appendix C: Tables and Figures

Table A3.1 Coefficients of control variables for Table 3.3

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: Pre-1990			
INF	0.351	0.077	0.073	0.167	-0.417	0.001	-0.037
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.867)	(0.281)
DEP	-0.001	0.005	-0.073	-0.014	-0.003	-0.039	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	0.002	-0.012	0.066	-0.031	0.111	-0.004	-0.038
	(0.640)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	0.036	0.134	0.021	0.421	0.117	0.073	-1.038
	(0.395)	(0.000)	(0.066)	(0.000)	(0.000)	(0.014)	(0.000)
SHORTVOL	0.019	-0.008	-0.040	-0.007	-0.016	0.014	0.044
	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
SHORT	-0.129	-0.281	-0.267	-0.186	-0.612	-0.112	-0.237
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	0.600	0.753	0.214	0.591	-0.263	0.754	0.908
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
				Panel B: Post-1989			
INF	0.002	-0.213	0.160	-0.033	0.551	-0.039	-0.101
	(0.372)	(0.002)	(0.000)	(0.032)	(0.000)	(0.001)	(0.000)
DEP	0.000	0.013	-0.005	0.005	-0.001	0.050	0.000
	(0.214)	(0.000)	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)
LOAN	0.001	-0.003	-0.015	0.006	-0.011	-0.018	0.007
	(0.000)	(0.122)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)
RESERVES	-0.002	0.723	-0.122	0.066	-0.056	0.029	0.015
	(0.612)	(0.000)	(0.000)	(0.000)	(0.000)	(0.024)	(0.000)
SHORTVOL	-0.012	-0.794	-0.399	-0.045	0.030	-0.300	0.005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.269)	(0.000)	(0.000)
SHORT	0.164	0.933	-0.316	-0.182	-0.287	-0.365	-0.081
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	0.135	-1.839	0.052	0.094	0.055	0.877	0.087
	(0.000)	(0.000)	(0.168)	(0.004)	(0.564)	(0.000)	(0.000)
EURODUMMY		0.020	1.280	-0.216			
		(0.902)	(0.000)	(0.000)			

Note: P-values are in parentheses. Pre-1990 indicates “before 1989q4”, and the Post-1989 indicates time period “after 1990q1”. This note is applied in Tables A3.1-A3.5.

Table A3.2 Coefficients of control variables for Table 3.4

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom
				Panel A: Pre-1990		
INF	-0.475	-0.080	-0.035	0.088	0.735	0.136
	(0.000)	(0.000)	(0.020)	(0.026)	(0.000)	(0.000)
DEP	0.000	-0.004	0.008	0.021	-0.001	0.109
	(0.015)	(0.000)	(0.009)	(0.000)	(0.413)	(0.000)
LOAN	0.072	0.047	-0.082	0.108	-0.077	0.034
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	-0.020	-0.163	-0.203	-0.563	0.092	-0.165
	(0.727)	(0.000)	(0.000)	(0.000)	(0.045)	(0.000)
SHORTVOL	-0.019	0.116	0.012	0.008	0.083	0.014
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
SHORT	0.179	0.376	0.656	0.133	0.484	0.137
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	-0.622	-0.466	-0.048	-0.989	-0.282	-0.941
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
				Panel B: Post-1989		
INF	0.397	0.276	-0.023	0.303	0.529	-0.154
	(0.000)	(0.000)	(0.138)	(0.000)	(0.000)	(0.000)
DEP	0.002	0.002	-0.006	0.000	0.001	-0.222
	(0.002)	(0.000)	(0.000)	(0.748)	(0.000)	(0.000)
LOAN	0.024	-0.007	0.029	-0.046	0.023	-0.066
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	1.125	-0.253	0.086	-0.131	0.001	-1.025
	(0.000)	(0.000)	(0.000)	(0.000)	(0.838)	(0.000)
SHORTVOL	0.222	0.252	0.072	0.302	0.491	-0.190
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORT	0.687	0.567	0.631	0.005	0.505	0.366
	(0.000)	(0.000)	(0.000)	(0.910)	(0.000)	(0.000)
SLOPE	0.162	-0.886	-0.103	0.147	0.687	-0.168
	(0.052)	(0.000)	(0.000)	(0.003)	(0.000)	(0.001)
EURODUMMY		-0.208	-0.135	2.017		
		(0.000)	(0.012)	(0.000)		

Table A3.3 Coefficients of control variables for Table 3.5

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: Pre-1990			
INF	0.014	0.091	0.053	0.310	-0.403	0.066	-0.166
	(0.174)	(0.000)	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.001	0.009	-0.065	0.007	0.000	-0.028	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.641)	(0.000)	(0.079)
LOAN	-0.037	-0.015	0.005	0.063	0.122	-0.003	-0.041
	(0.000)	(0.000)	(0.356)	(0.000)	(0.000)	(0.001)	(0.000)
RESERVES	-0.218	-0.101	0.147	-0.299	0.020	-0.198	-1.771
	(0.000)	(0.000)	(0.000)	(0.000)	(0.536)	(0.000)	(0.000)
SHORTVOL	0.051	-0.011	-0.015	0.001	-0.034	0.009	0.048
	(0.000)	(0.000)	(0.000)	(0.407)	(0.000)	(0.000)	(0.000)
SHORT	-0.002	-0.113	0.320	-0.073	-0.494	-0.152	-0.259
	(0.760)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	-0.164	0.535	0.209	-0.390	-1.005	-0.212	0.506
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
				Panel B: Post-1989			
INF	0.153	-0.237	0.145	0.079	0.515	-0.073	0.221
	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.002	0.016	-0.017	-0.002	-0.002	0.079	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	0.003	0.005	0.013	0.002	0.008	-0.007	-0.037
	(0.000)	(0.013)	(0.000)	(0.279)	(0.016)	(0.031)	(0.000)
RESERVES	0.081	0.351	0.030	0.015	-0.033	-0.053	-0.130
	(0.000)	(0.000)	(0.067)	(0.000)	(0.000)	(0.002)	(0.000)
SHORTVOL	0.042	-0.516	-0.295	0.199	-0.012	-0.292	0.048
	(0.000)	(0.000)	(0.000)	(0.000)	(0.684)	(0.000)	(0.000)
SHORT	0.494	0.746	0.167	0.076	-0.134	-0.261	-0.014
	(0.000)	(0.000)	(0.000)	(0.001)	(0.003)	(0.000)	(0.323)
SLOPE	0.207	-1.952	-0.568	-0.216	-0.313	-0.051	-0.516
	(0.000)	(0.000)	(0.000)	(0.000)	(0.031)	(0.365)	(0.000)
EURODUMMY		-0.210	0.780	1.248			
		(0.278)	(0.000)	(0.000)			

Table A3.4 Coefficients of control variables for Table 3.6

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: Pre-1990			
INF	-0.336	0.013	-0.018	0.146	0.015	0.065	-0.127
	(0.000)	(0.041)	(0.115)	(0.000)	(0.442)	(0.000)	(0.000)
DEP	0.000	0.003	0.008	0.021	0.003	0.010	-0.002
	(0.519)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)
LOAN	-0.040	-0.003	-0.060	0.094	0.011	0.001	-0.002
	(0.000)	(0.002)	(0.000)	(0.000)	(0.162)	(0.432)	(0.558)
RESERVES	-0.252	-0.235	0.129	-0.722	-0.098	-0.276	-0.735
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.031	-0.002	0.025	0.008	-0.019	-0.005	0.003
	(0.000)	(0.063)	(0.000)	(0.001)	(0.000)	(0.000)	(0.062)
SHORT	0.128	0.169	0.586	0.112	0.119	-0.040	-0.022
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	-0.764	-0.216	-0.002	-0.980	-0.744	-0.968	-0.404
	(0.000)	(0.000)	(0.852)	(0.000)	(0.000)	(0.000)	(0.000)
				Panel B: Post-1989			
INF	0.150	-0.019	0.016	0.113	-0.050	-0.035	0.322
	(0.000)	(0.541)	(0.422)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.002	0.004	-0.011	-0.007	-0.001	0.031	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	0.002	0.008	0.029	-0.004	0.019	0.012	-0.044
	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	0.083	-0.369	0.158	-0.051	0.021	-0.082	-0.146
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.055	0.276	0.099	0.244	-0.040	0.007	0.043
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.306)	(0.000)
SHORT	0.329	-0.195	0.537	0.257	0.163	0.101	0.067
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	0.070	-0.103	-0.700	-0.312	-0.364	-0.924	-0.602
	(0.001)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EURODUMMY		-0.221	-0.494	1.469			
		(0.000)	(0.000)	(0.000)			

Table A3.5 Coefficients of control variables for Table 3.7

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: pre-1990			
INF	-0.072	0.100	0.138	0.349	-0.455	0.156	-0.183
	(0.000)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.001	0.009	-0.072	-0.009	0.003	-0.095	0.007
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
LOAN	0.022	-0.012	-0.443	-0.022	0.110	-0.027	-0.017
	(0.000)	(0.000)	(0.000)	(0.212)	(0.000)	(0.000)	(0.010)
RESERVES	-0.351	0.161	-1.792	0.191	-0.035	-0.339	-0.489
	(0.000)	(0.000)	(0.000)	(0.072)	(0.297)	(0.000)	(0.000)
SHORTVOL	0.025	-0.018	0.117	0.016	-0.025	0.031	0.062
	(0.000)	(0.000)	(0.000)	(0.006)	(0.001)	(0.000)	(0.000)
SHORT	-0.091	-0.475	-0.268	-0.059	-0.598	-0.056	-0.261
	(0.000)	(0.000)	(0.000)	(0.038)	(0.000)	(0.000)	(0.000)
SLOPE	0.067	0.587	-1.600	0.461	-1.030	-0.870	0.839
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
				Panel B: post-1989			
INF	0.057	-0.075	0.114	-0.021	0.469	-0.084	0.246
	(0.000)	(0.264)	(0.000)	(0.195)	(0.000)	(0.000)	(0.000)
DEP	-0.003	0.009	-0.007	0.004	-0.004	0.074	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	-0.013	-0.010	-0.013	0.006	0.010	-0.007	-0.046
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.040)	(0.000)
RESERVES	0.053	0.688	-0.234	0.067	-0.015	-0.062	-0.221
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
SHORTVOL	0.051	-0.862	-0.466	-0.041	-0.038	-0.302	0.050
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORT	0.137	0.986	-0.440	-0.161	-0.040	-0.272	0.017
	(0.000)	(0.000)	(0.000)	(0.000)	(0.068)	(0.000)	(0.311)
SLOPE	-0.331	-2.422	-0.491	-0.873	-0.410	-0.083	-0.565
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.149)	(0.000)
EURODUMMY		-0.014	0.979	-0.331			
		(0.922)	(0.000)	(0.000)			

Table A3.6 Coefficients of control variables for Table 3.8

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
				Panel A: Pre-1990			
INF	-0.138	0.020	0.118	0.186	-0.036	0.157	-0.146
	(0.000)	(0.341)	(0.009)	(0.000)	(0.001)	(0.000)	(0.000)
DEP	0.000	0.004	-0.034	0.004	0.006	-0.058	0.004
	(0.003)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	-0.025	0.000	-0.416	0.018	0.000	-0.023	0.021
	(0.000)	(0.980)	(0.000)	(0.002)	(0.949)	(0.000)	(0.000)
RESERVES	-0.180	0.023	-1.821	-0.133	-0.153	-0.416	0.547
	(0.000)	(0.453)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.006	-0.010	0.072	0.024	-0.009	0.017	0.018
	(0.000)	(0.015)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)
SHORT	-0.002	-0.195	-0.193	0.104	0.013	0.057	-0.024
	(0.479)	(0.000)	(0.000)	(0.000)	(0.034)	(0.000)	(0.005)
SLOPE	-0.688	-0.167	-1.625	-0.156	-0.767	-1.625	-0.070
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.014)
				Panel B: Post-1989			
INF	0.056	0.140	-0.048	0.013	-0.094	-0.045	0.348
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.003	-0.003	-0.002	-0.001	-0.003	0.027	-0.002
	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	-0.014	-0.006	0.002	0.001	0.020	0.012	-0.053
	(0.000)	(0.000)	(0.026)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	0.055	-0.033	-0.111	0.001	0.038	-0.092	-0.236
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.063	-0.068	-0.066	0.003	-0.066	-0.004	0.045
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.525)	(0.000)
SHORT	-0.029	0.054	-0.122	0.021	0.245	0.091	0.098
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	-0.467	-0.579	-0.546	-0.967	-0.477	-0.957	-0.651
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EURODUMMY		-0.027	-0.297	-0.116			
		(0.102)	(0.000)	(0.000)			

Table A3.7 Spread Between Loan Rate and Savings Deposit Rate (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom
YGROW						
total	-0.381	-1.566	-2.425	-1.720	-0.195	-0.461
	(0.000)	(0.000)	(0.000)	(0.000)	(0.075)	(0.002)
lags	-0.247	-0.008	-0.628	0.169	0.731	0.059
	(0.000)	(0.960)	(0.000)	(0.046)	(0.000)	(0.433)
leads	-0.134	-1.558	-1.797	-1.889	-0.926	-0.519
	(0.091)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
			Control Variables			
INF	-0.103	0.713	-0.179	0.308	0.689	0.139
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.001	0.005	-0.039	0.015	-0.002	0.088
	(0.001)	(0.037)	(0.000)	(0.000)	(0.001)	(0.000)
LOAN	0.035	0.051	-0.014	0.033	0.020	0.017
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVES	0.819	0.039	-0.005	-0.045	-0.076	-0.099
	(0.000)	(0.440)	(0.788)	(0.041)	(0.000)	(0.149)
SHORTVOL	-0.004	0.045	-0.056	-0.016	0.092	-0.013
	(0.733)	(0.011)	(0.000)	(0.000)	(0.000)	(0.149)
SHORT	0.122	-0.662	0.595	0.032	-0.118	0.065
	(0.000)	(0.000)	(0.000)	(0.183)	(0.001)	(0.080)
SLOPE	0.411	-0.914	0.019	-0.568	-0.233	-0.195
	(0.000)	(0.000)	(0.567)	(0.000)	(0.000)	(0.043)
R^2	0.8022	0.6715	0.7727	0.6866	0.7062	0.1563
Hansen's J (p-value)	0.9843	1.000	1.000	1.000	1.000	1.000
Obs.	167	146	145	168	149	173

Note: p-values are in parentheses. Time period in this table is whole period: from 1960s to 2013. This note is applied in Tables A3.7-3.13

Table A3.8 Spread Between Loan Rate and Short-Term Money (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
YGROW							
total	0.154	-0.305	-0.439	-1.052	-1.483	-0.551	-0.154
	(0.017)	(0.033)	(0.000)	(0.000)	(0.000)	(0.000)	(0.231)
lags	0.107	-0.297	-0.613	-0.524	-0.557	-0.175	-0.161
	(0.007)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.035)
leads	0.047	-0.008	0.174	-0.527	-0.926	-0.376	0.007
	(0.283)	(0.912)	(0.025)	(0.000)	(0.000)	(0.000)	(0.949)
				Control Variables			
INF	0.288	-0.122	0.295	-0.067	-0.211	-0.014	0.104
	(0.000)	(0.003)	(0.000)	(0.148)	(0.000)	(0.194)	(0.235)
DEP	-0.001	0.000	-0.001	-0.013	-0.001	-0.024	-0.001
	(0.000)	(0.947)	(0.680)	(0.000)	(0.049)	(0.000)	(0.000)
LOAN	0.007	0.051	-0.012	-0.036	-0.061	-0.006	0.01
	(0.000)	(0.000)	(0.028)	(0.000)	(0.000)	(0.000)	(0.234)
RESERVES	-0.231	0.172	-0.320	0.156	-0.162	0.064	-0.033
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.366)
SHORTVOL	0.001	-0.029	-0.002	-0.002	-0.026	0.001	0.036
	(0.887)	(0.021)	(0.813)	(0.648)	(0.000)	(0.857)	(0.003)
SHORT	-0.076	-0.786	0.174	-0.185	-0.493	-0.097	-0.297
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SLOPE	0.352	0.580	0.318	0.645	-0.511	0.794	0.54
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.3924	0.5464	0.7084	0.7070	0.7927	0.5241	0.8478
Hansen's J (p-value)	1.000	1.000	1.000	1.000	1.000	1.000	0.976
Obs.	167	146	145	168	149	173	177

Table A3.9 Spread Between Saving Deposit Rate and Short-Term Money (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom
YGROW						
total	-0.559	-1.382	-1.965	-0.671	1.304	0.112
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.377)
lags	-0.362	0.228	0.026	0.671	1.289	0.243
	(0.000)	(0.050)	(0.922)	(0.000)	(0.000)	(0.000)
leads	-0.196	-1.610	-1.990	-1.342	0.015	-0.131
	(0.079)	0.000	0.000	0.000	(0.864)	(0.221)
				Control Variables		
INF	-0.396	0.830	-0.426	0.385	0.897	0.151
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DEP	-0.001	0.005	-0.038	0.029	-0.001	0.117
	(0.013)	(0.000)	(0.000)	(0.000)	(0.116)	(0.000)
LOAN	0.028	0.002	0.004	0.066	0.081	0.024
	(0.000)	(0.633)	(0.749)	(0.000)	(0.000)	(0.000)
RESERVES	1.088	-0.141	0.326	-0.221	0.085	-0.169
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.017)
SHORTVOL	-0.003	0.072	-0.059	-0.015	0.118	-0.016
	(0.814)	(0.000)	(0.005)	(0.000)	(0.000)	(0.051)
SHORT	0.200	0.155	0.393	0.220	0.374	0.166
	(0.000)	(0.162)	(0.010)	(0.000)	(0.000)	(0.000)
SLOPE	0.109	-1.438	-0.294	-1.219	0.283	-0.977
	(0.387)	(0.000)	(0.028)	(0.000)	(0.000)	(0.000)
R^2	0.7199	0.6424	0.7301	0.7942	0.6990	0.2107
Hansen's J (p-value)	0.9999	1.000	1.000	1.000	1.000	1.000
Obs.	167	146	145	168	149	173

Table A3.10 Spread Between Loan Rate and Time Deposits (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
YGROW							
total	-0.252	-1.016	-1.795	-1.027	-1.543	-0.199	-0.151
	(0.019)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.053)
lags	-0.373	-0.180	-0.445	0.248	-0.697	-0.028	-0.147
	(0.000)	(0.287)	(0.000)	(0.011)	(0.000)	(0.274)	(0.000)
leads	0.121	-0.836	-1.350	-1.276	-0.845	-0.170	-0.004
	(0.073)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.940)
				Control Variables			
INF	-0.017	-0.082	-0.065	0.206	-0.419	0.072	0.015
	(0.414)	(0.162)	(0.001)	(0.000)	(0.000)	(0.000)	(0.779)
DEP	0.000	0.000	-0.044	0.016	-0.001	-0.020	-0.001
	(0.014)	(0.855)	(0.000)	(0.000)	(0.028)	(0.000)	(0.000)
LOAN	-0.005	0.043	-0.017	0.042	-0.057	-0.006	-0.011
	(0.022)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.261)
RESERVES	0.575	-0.092	-0.087	0.007	-0.202	-0.097	-0.163
	(0.000)	(0.175)	(0.000)	(0.711)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.046	-0.027	-0.010	-0.020	-0.065	-0.005	0.057
	(0.000)	(0.130)	(0.103)	(0.000)	(0.000)	(0.225)	(0.000)
SHORT	0.042	-0.811	0.602	-0.013	-0.355	-0.143	-0.297
	(0.005)	(0.000)	(0.000)	(0.596)	(0.000)	(0.000)	(0.000)
SLOPE	0.021	0.366	-0.104	-0.736	-1.229	-0.021	0.271
	(0.571)	(0.000)	(0.006)	(0.000)	(0.000)	(0.582)	(0.000)
R^2	0.7450	0.5738	0.7439	0.4693	0.6615	0.6014	0.8316
Hansen's J (p-value)	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Obs.	167	146	143	168	149	173	177

Table A3.11 Spread Between Time Deposit Rate and Short-Term Money (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
YGROW							
total	-0.410	-0.784	-1.268	0.012	0.054	0.335	0.030
	(0.001)	(0.000)	(0.000)	(0.914)	(0.286)	(0.000)	(0.364)
lags	-0.472	0.066	0.226	0.750	-0.137	0.146	0.042
	(0.000)	(0.135)	(0.179)	(0.000)	(0.000)	(0.000)	(0.001)
leads	0.062	-0.850	-1.493	-0.738	0.084	0.189	-0.013
	(0.455)	(0.000)	(0.000)	(0.000)	(0.045)	(0.000)	(0.656)
				Control Variables			
INF	-0.303	0.067	-0.331	0.282	-0.210	0.085	-0.060
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
DEP	0.000	0.002	-0.038	0.030	0.000	0.003	0.000
	(0.563)	(0.000)	(0.000)	(0.000)	(0.357)	(0.141)	(0.000)
LOAN	-0.011	-0.007	-0.001	0.073	0.005	0.000	-0.020
	(0.000)	(0.000)	(0.955)	(0.000)	(0.010)	(0.536)	(0.000)
RESERVES	0.806	-0.264	0.241	-0.170	-0.041	-0.154	-0.095
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.042	-0.010	-0.013	-0.020	-0.039	-0.006	0.015
	(0.000)	(0.017)	(0.529)	(0.000)	(0.000)	(0.000)	(0.000)
SHORT	0.121	0.008	0.465	0.179	0.136	-0.048	-0.007
	(0.000)	(0.856)	(0.000)	(0.000)	(0.000)	(0.000)	(0.459)
SLOPE	-0.343	-0.177	-0.468	-1.387	-0.716	-0.817	-0.280
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.7032	0.5281	0.7632	0.6966	0.8555	0.7357	0.5059
Hansen's J (p-value)	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Obs.	167	146	143	168	149	173	177

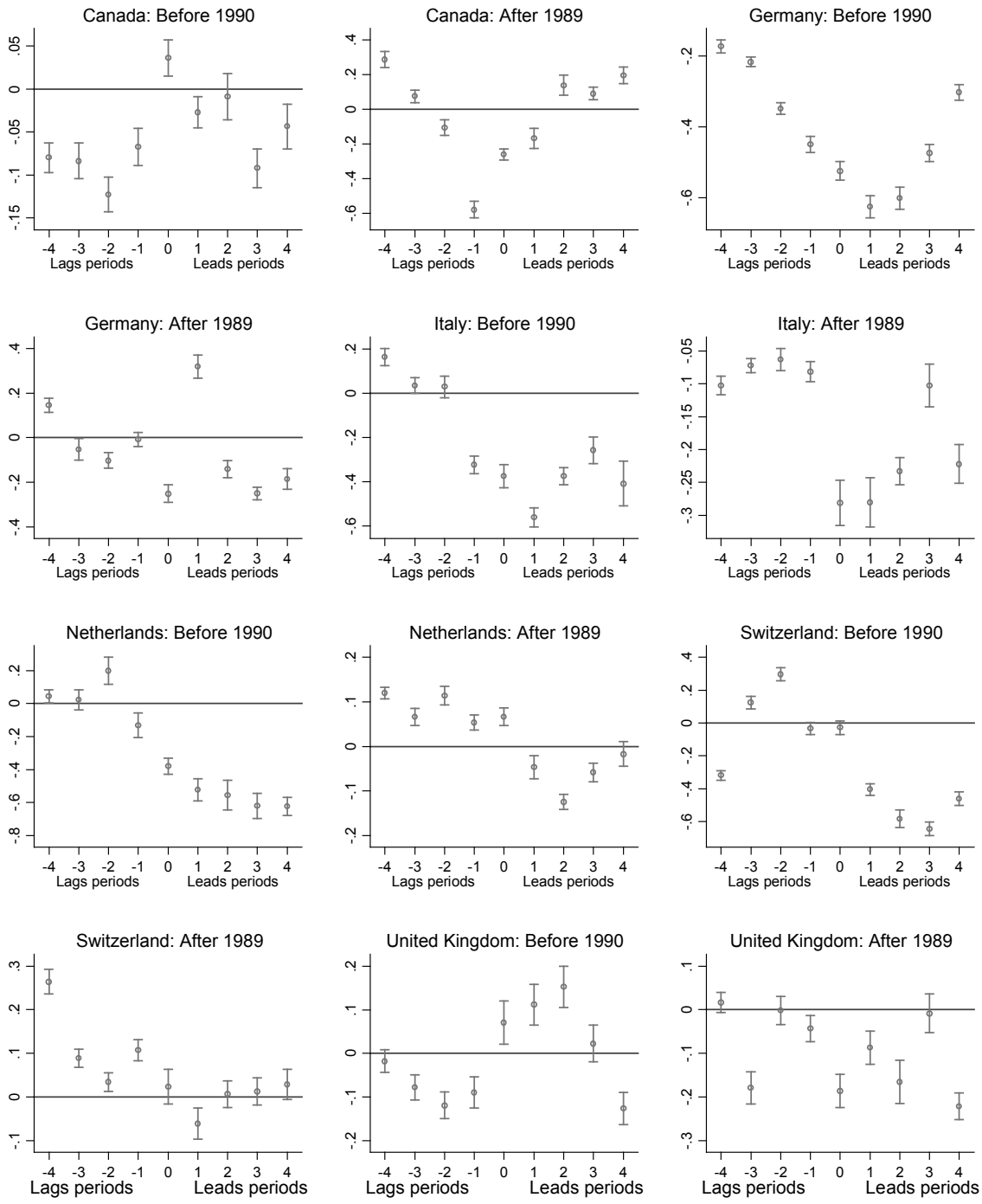
Table A3.12 Spread Between Loan Rate and Eurodeposits (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
YGROW							
total	0.096	-0.026	0.981	-0.786	-1.392	0.134	-0.206
	(0.001)	(0.855)	(0.000)	(0.000)	(0.000)	(0.034)	(0.014)
lags	-0.091	-0.199	0.568	-0.582	-0.690	-0.064	-0.133
	(0.000)	(0.014)	(0.000)	(0.000)	(0.000)	(0.182)	(0.001)
leads	0.187	0.173	0.413	-0.204	-0.702	0.198	-0.073
	(0.000)	(0.037)	(0.000)	(0.014)	(0.000)	(0.002)	(0.209)
				Control Variables			
INF	0.094	-0.118	-0.070	0.044	-0.433	0.080	-0.044
	(0.000)	(0.009)	(0.086)	(0.258)	(0.000)	(0.000)	(0.521)
DEP	-0.001	-0.002	0.001	-0.009	-0.002	-0.059	-0.002
	(0.000)	(0.306)	(0.812)	(0.000)	(0.000)	(0.000)	(0.000)
LOAN	0.001	0.053	0.012	-0.031	-0.05	-0.019	-0.027
	(0.269)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)	(0.001)
RESERVES	-0.123	0.099	-0.108	0.110	-0.178	-0.330	-0.265
	(0.000)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SHORTVOL	0.025	-0.043	0.022	0.011	-0.074	0.013	0.059
	(0.000)	(0.001)	(0.082)	(0.000)	(0.000)	(0.003)	(0.000)
SHORT	-0.064	-1.142	-0.681	-0.057	-0.399	-0.053	-0.274
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
SLOPE	0.038	0.414	-0.769	0.352	-1.256	-0.470	0.456
	(0.027)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.3884	0.5608	0.5201	0.4955	0.6363	0.6875	0.8776
Hansen's J (p-value)	1.0000	0.9973	1.0000	1.0000	1.0000	0.9999	0.9996
Obs.	136	146	135	168	149	173	177

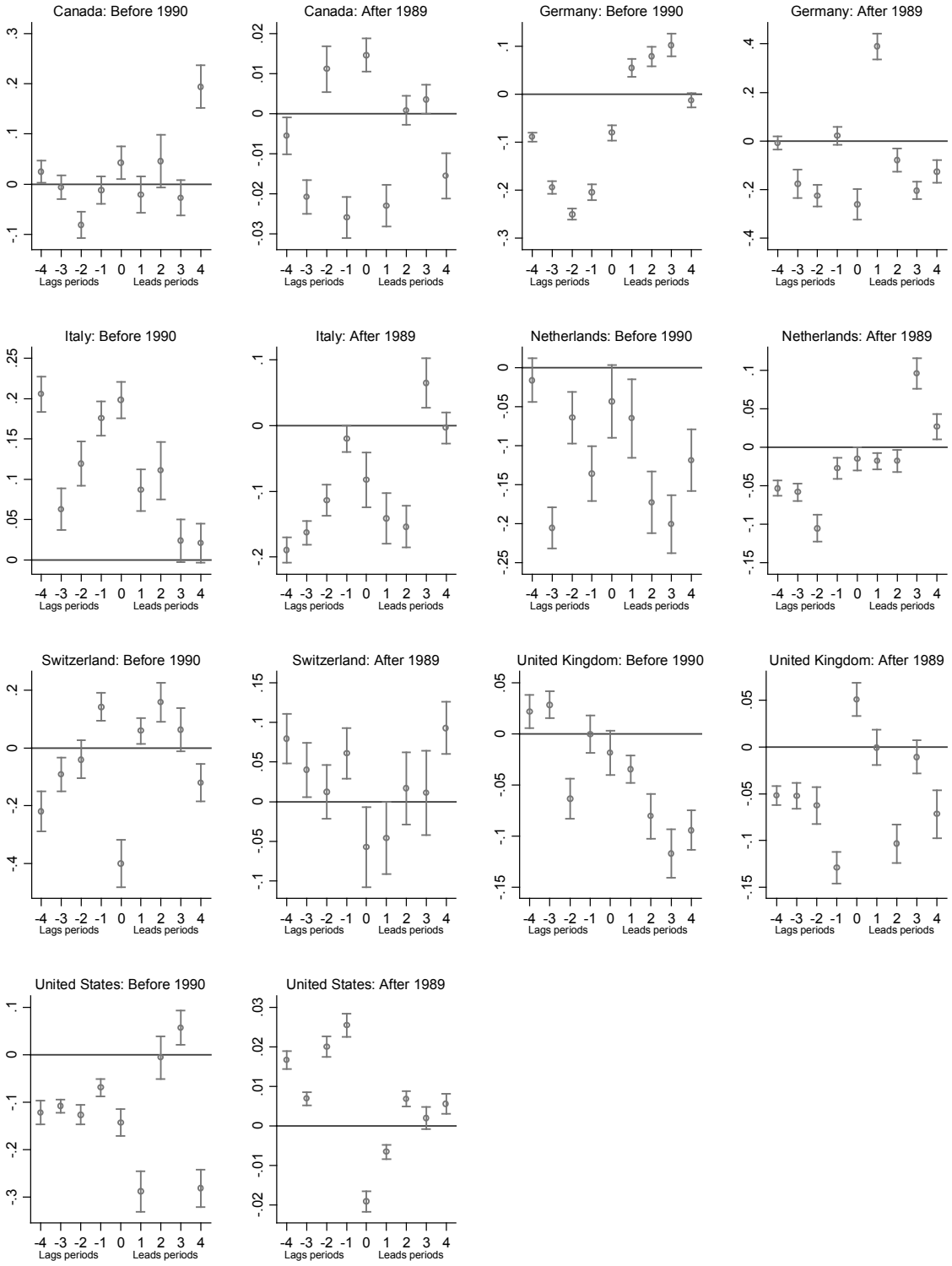
Table A3.13 Spread Between Eurodeposit Rate and Short-Term Money (Whole period)

	Canada	Germany	Italy	Netherlands	Switzerland	United Kingdom	United States
YGROW							
total	0.020	0.268	1.393	0.211	0.101	0.682	-0.035
	(0.695)	(0.000)	(0.000)	(0.008)	(0.251)	(0.000)	(0.464)
lags	-0.089	0.089	1.083	-0.090	-0.134	0.119	0.060
	(0.001)	(0.001)	(0.000)	(0.041)	(0.000)	(0.019)	(0.001)
leads	0.109	0.179	0.310	0.301	0.235	0.562	-0.094
	(0.000)	(0.000)	(0.039)	(0.000)	(0.000)	(0.000)	(0.022)
				Control Variables			
INF	-0.112	0.007	-0.436	0.077	-0.229	0.095	-0.128
	(0.000)	(0.536)	(0.000)	(0.015)	(0.000)	(0.000)	(0.000)
DEP	-0.001	-0.002	0.010	0.004	-0.001	-0.041	-0.001
	(0.000)	(0.000)	(0.018)	(0.000)	(0.001)	(0.000)	(0.000)
LOAN	-0.01	0.002	0.036	0.003	0.012	-0.013	-0.035
	(0.000)	(0.001)	(0.000)	(0.269)	(0.001)	(0.000)	(0.000)
RESERVES	0.048	-0.077	0.258	-0.050	-0.017	-0.359	-0.194
	(0.013)	(0.000)	(0.000)	(0.002)	(0.007)	(0.000)	(0.000)
SHORTVOL	0.022	-0.015	-0.041	0.012	-0.048	0.013	0.015
	(0.000)	(0.000)	(0.070)	(0.000)	(0.000)	(0.009)	(0.000)
SHORT	0.004	-0.352	-0.907	0.136	0.096	0.036	0.016
	(0.320)	(0.000)	(0.000)	(0.000)	(0.001)	(0.254)	(0.202)
SLOPE	-0.536	-0.163	-0.880	-0.301	-0.736	-1.275	-0.081
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
R^2	0.7455	0.4362	0.5562	0.6245	0.8061	0.6491	0.6037
Hansen's J (p-value)	1.000	1.000	0.452	0.623	1.000	1.000	1.000
No. Obs.	136	146	135	168	149	173	177

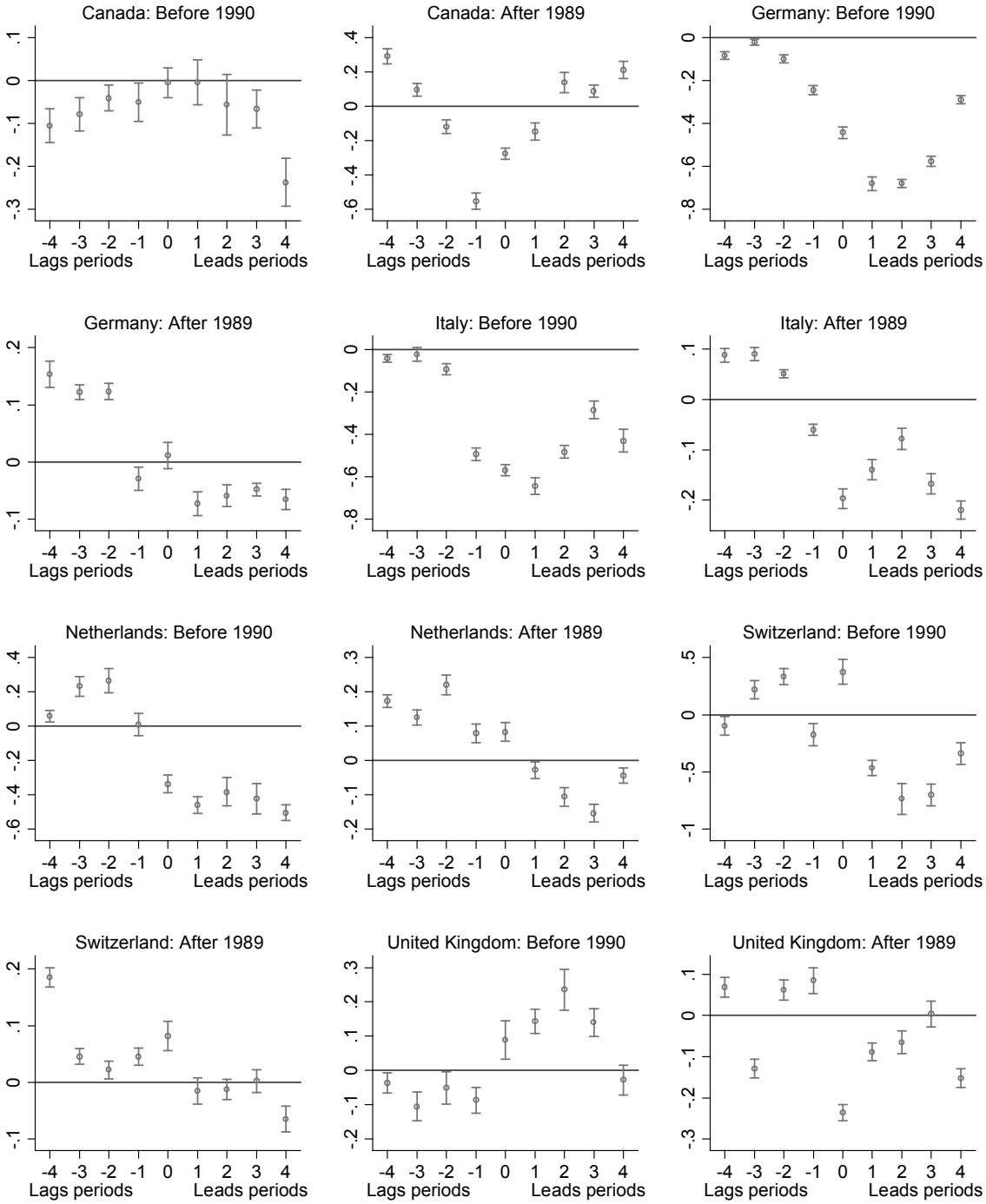
Figure A3-1: Lags and leads



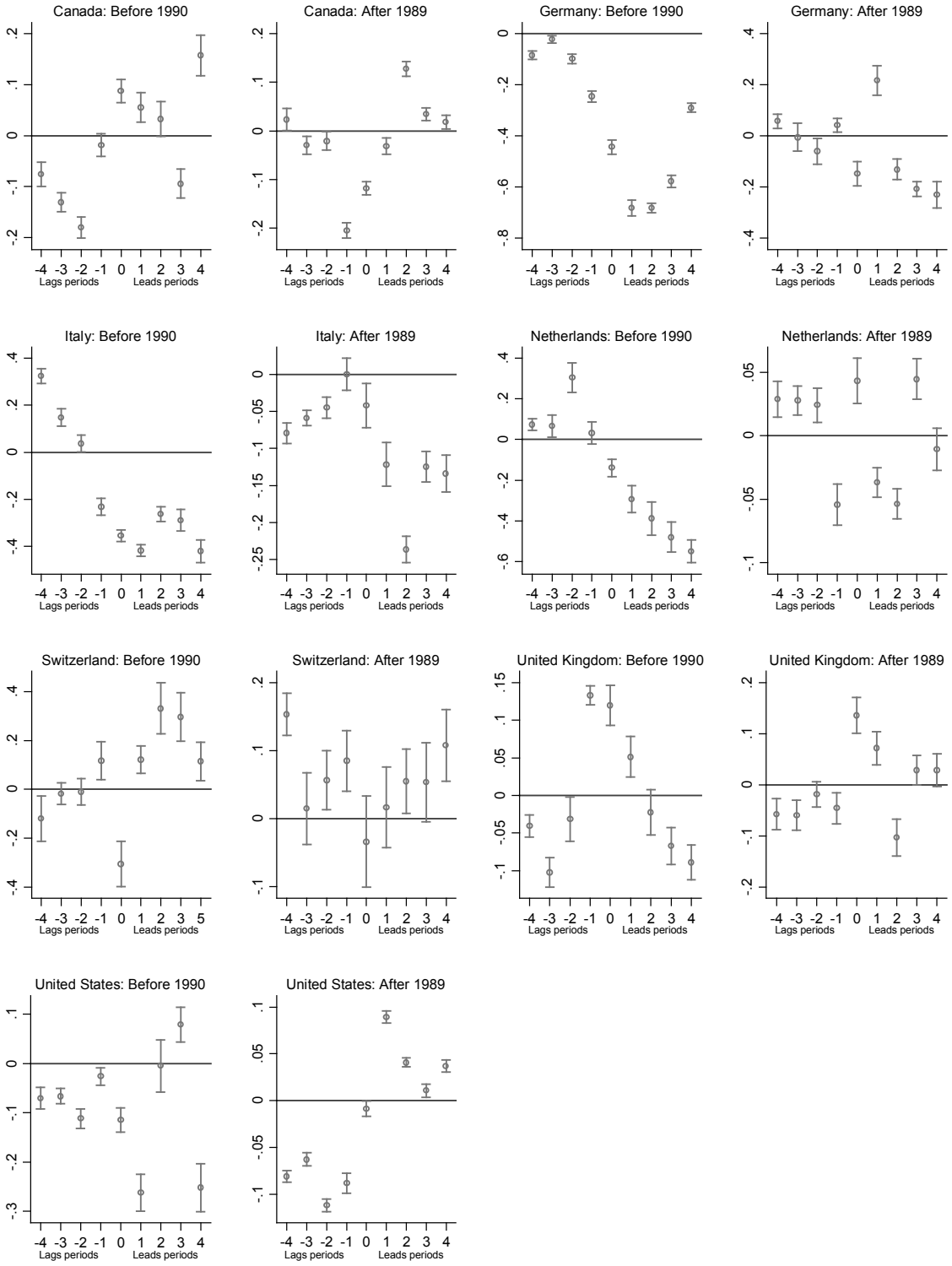
Note: Lags and Leads: the estimated coefficients for Table 3.2-Spread Between Loan Rate and Savings Deposit Rate, with 95% confidence interval.



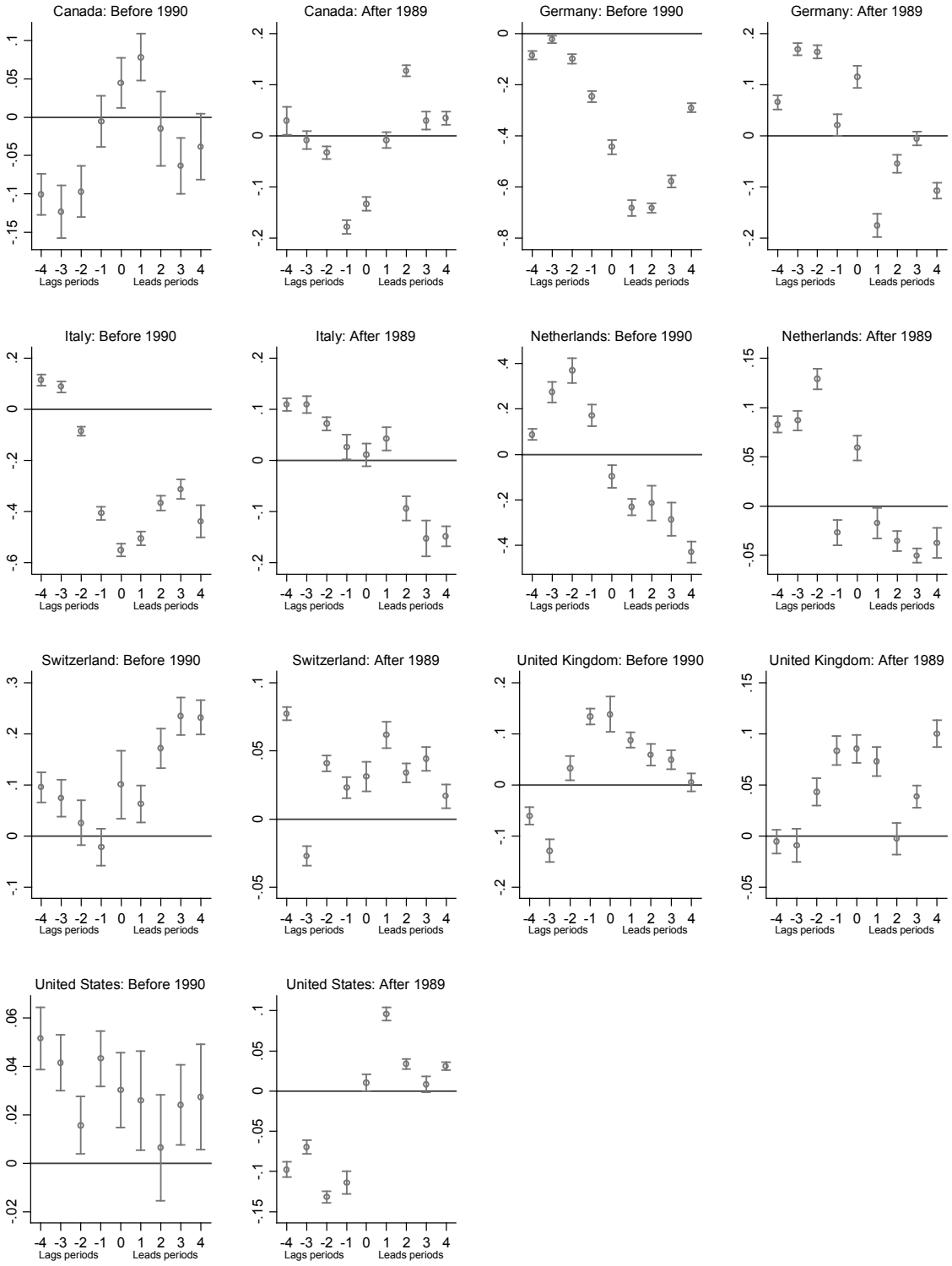
Note: Lags and Leads: the estimated coefficients for Table 3.3-Spread Between Loan Rate and Short-Term Money, with 95% confidence interval.



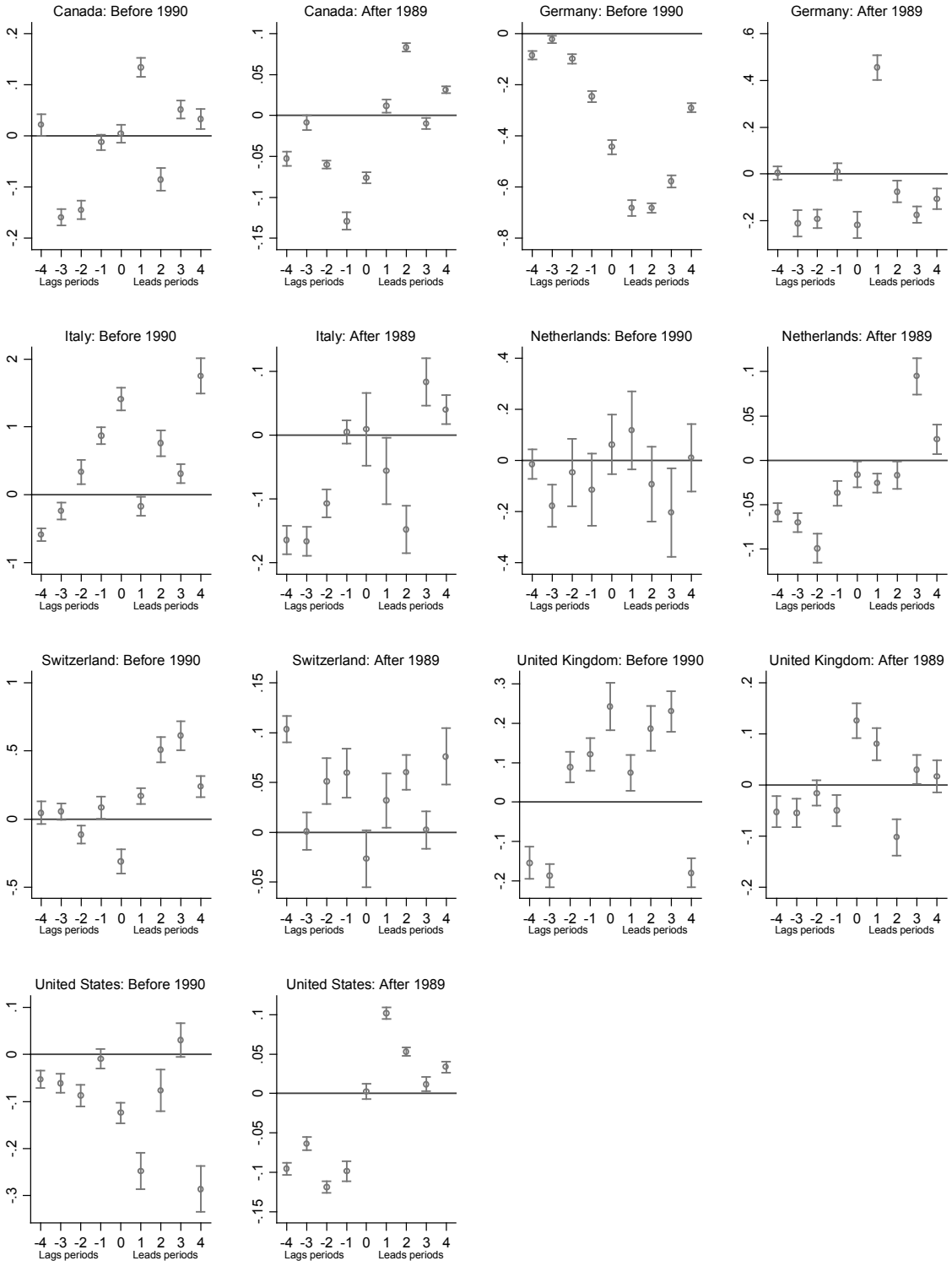
Note: Lags and Leads: the estimated coefficients for Table 3.4-Spread Between Saving Deposit Rate and Short-Term Money, with 95% confidence interval.



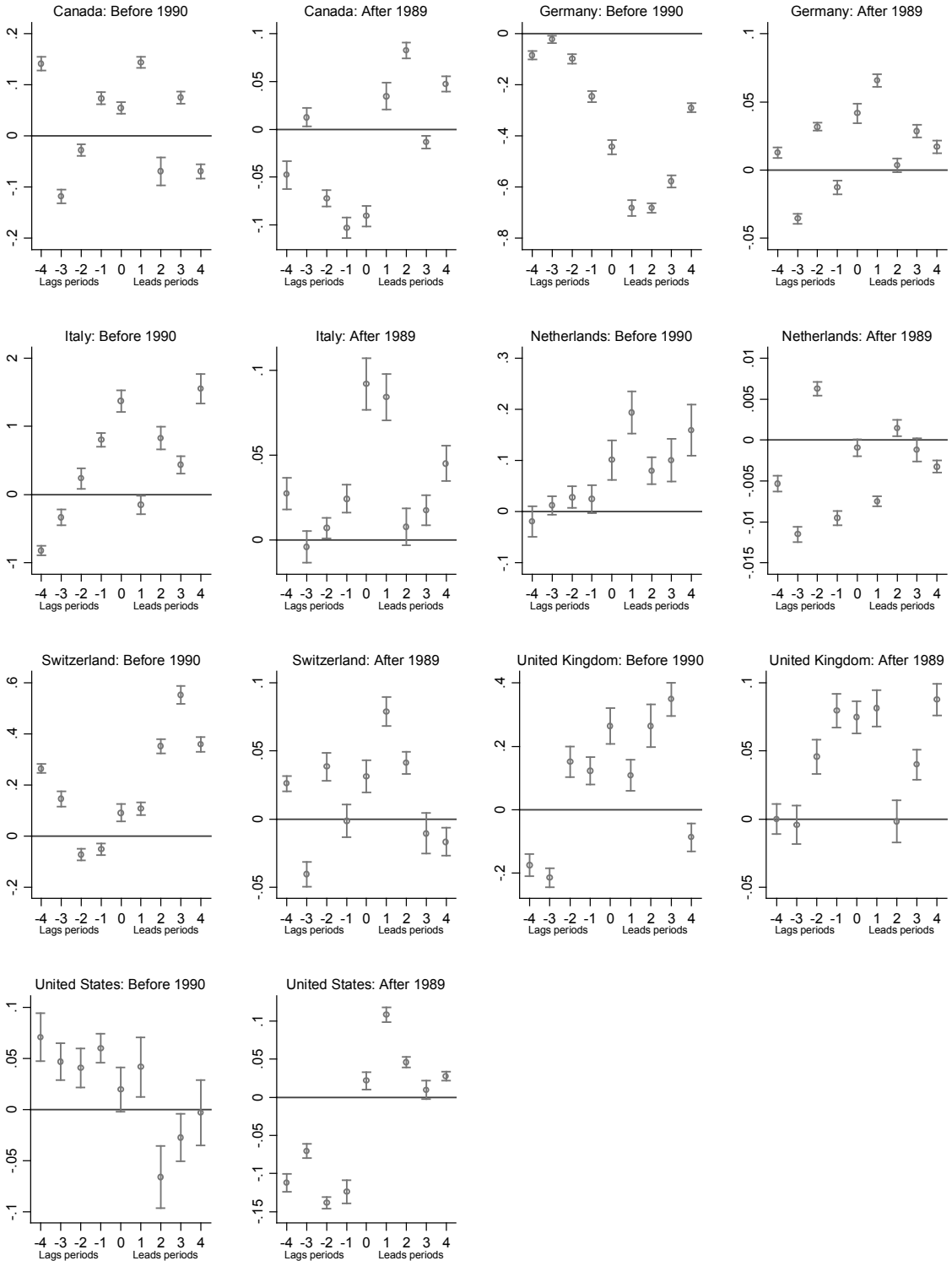
Note: Lags and Leads: the estimated coefficients for Table 3.5-Spread Between Loan Rate and Time Deposits, with 95% confidence interval.



Note: Lags and Leads: the estimated coefficients for Table 3.6-Spread Between Time Deposit Rate and Short-Term Money, with 95% confidence interval.

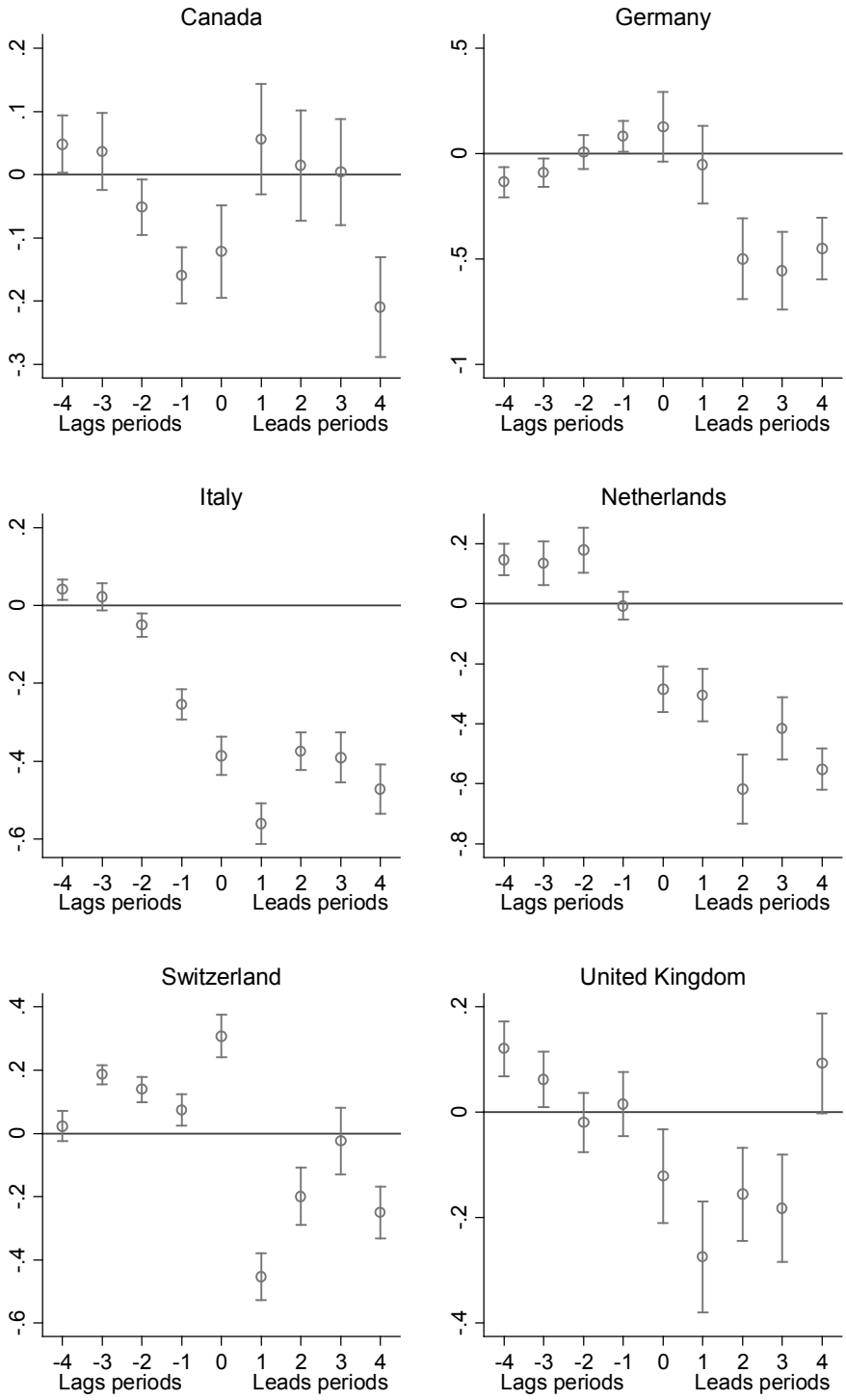


Note: Lags and Leads: the estimated coefficients for Table 3.7-Spread Between Loan Rate and Eurodeposits, with 95% confidence interval.

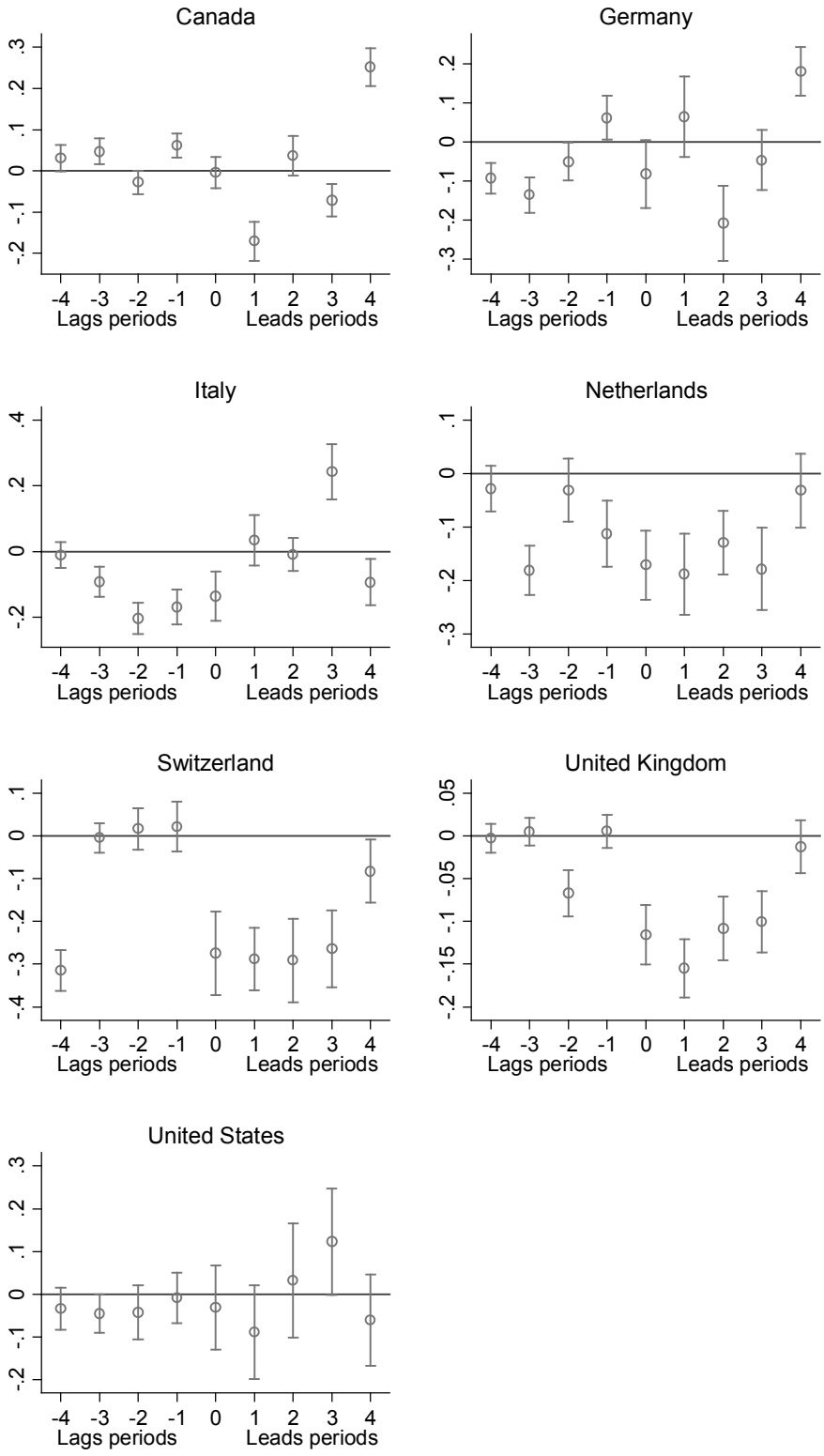


Note: Lags and Leads: the estimated coefficients for Table 3.8-Spread Between Eurodeposit Rate and Short-Term Money, with 95% confidence interval.

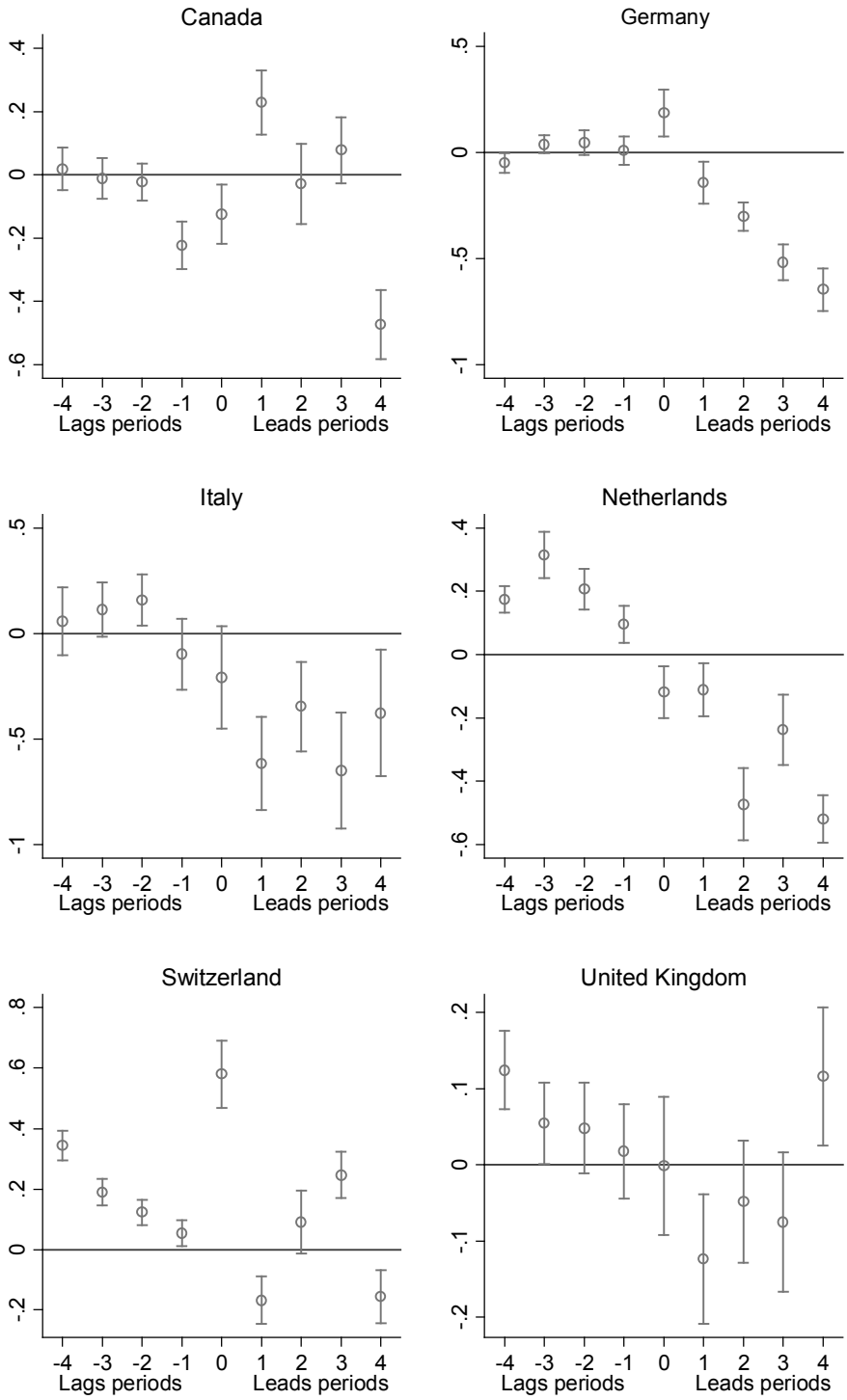
Figure A3-2 Lags and Leads: Whole periods.



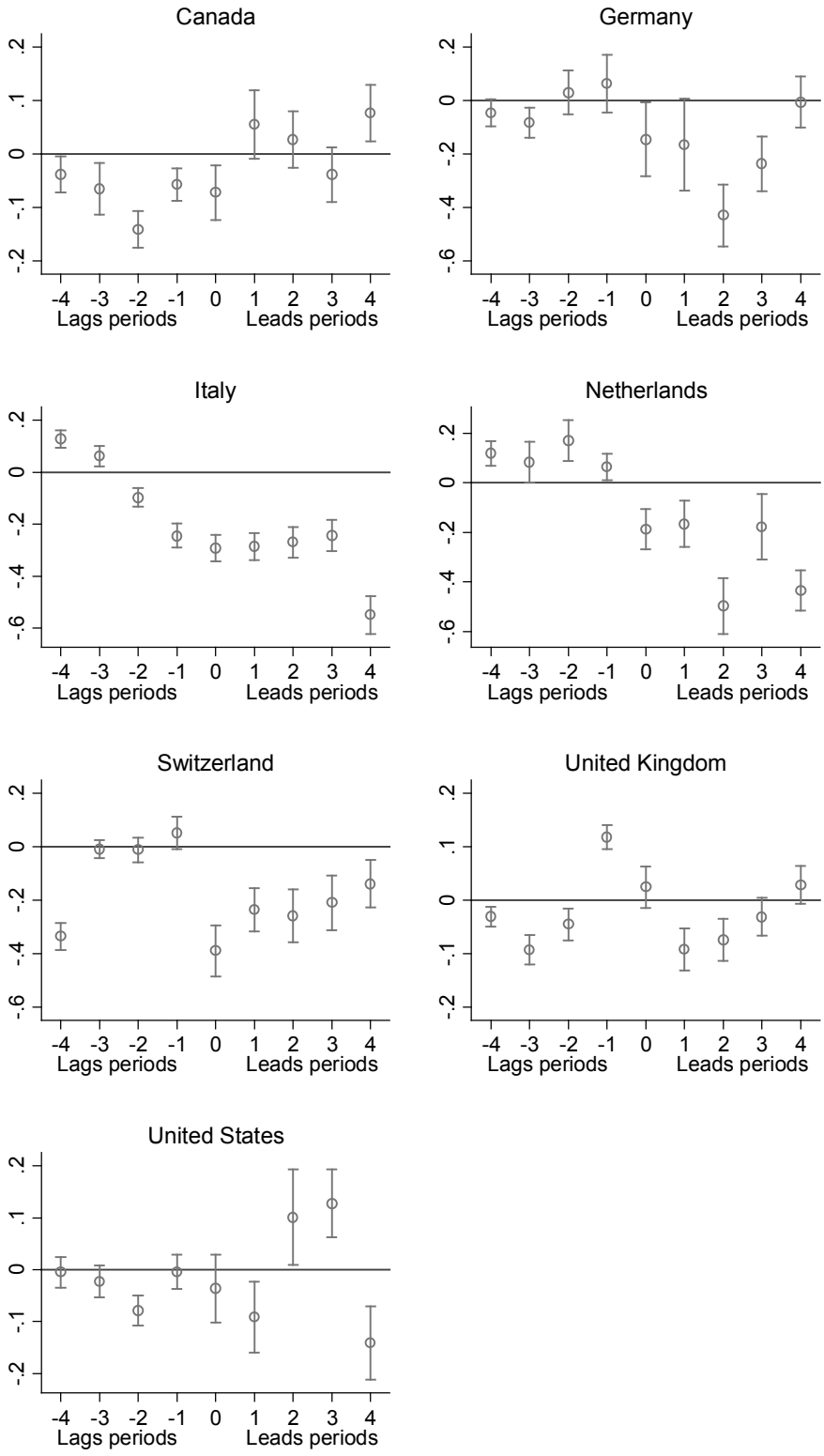
Note: Lags and Leads: the estimated coefficients for Table A3.7, with 95% confidence interval.



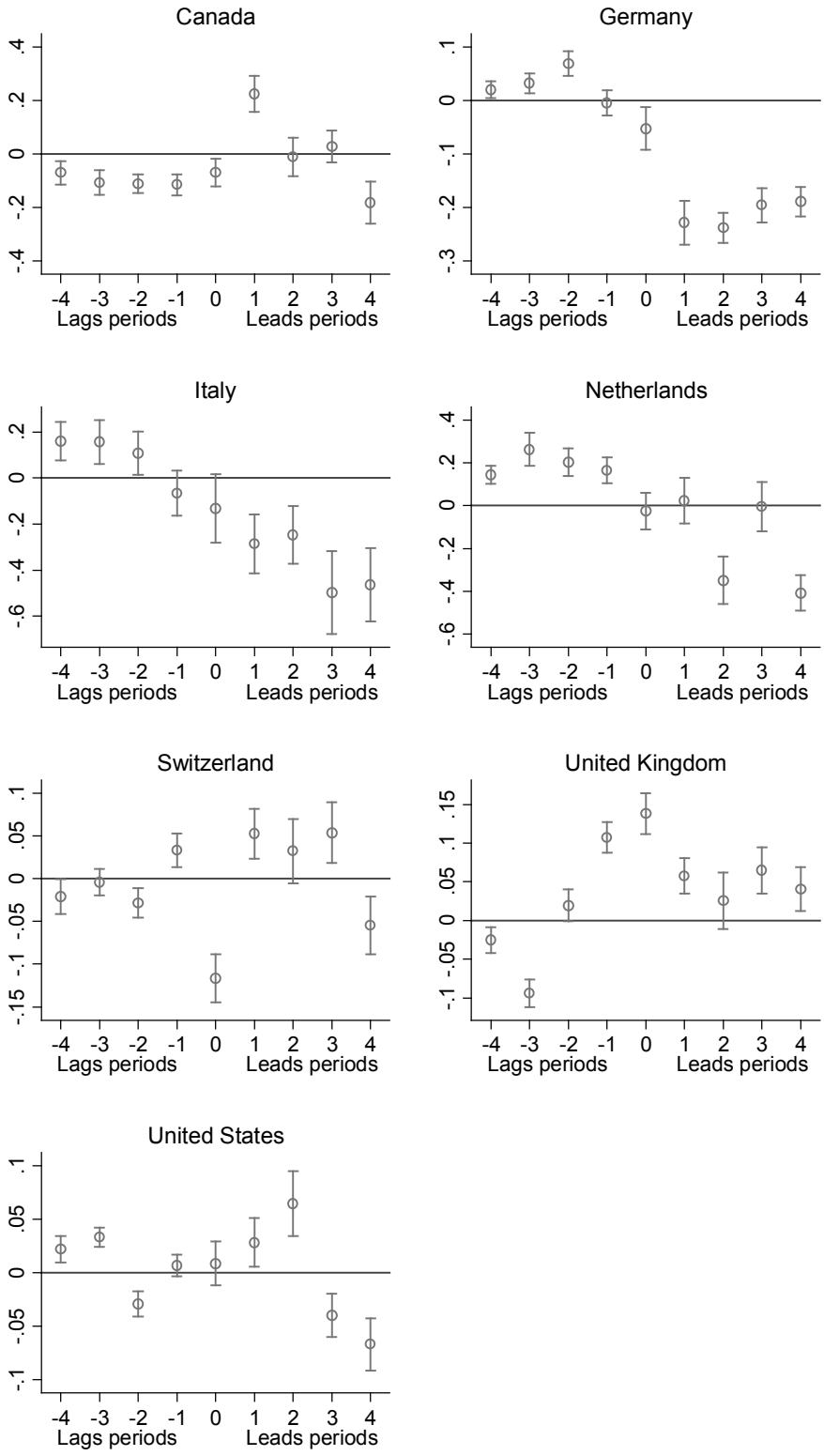
Note: Lags and Leads: the estimated coefficients for Table A3.8, with 95% confidence interval.



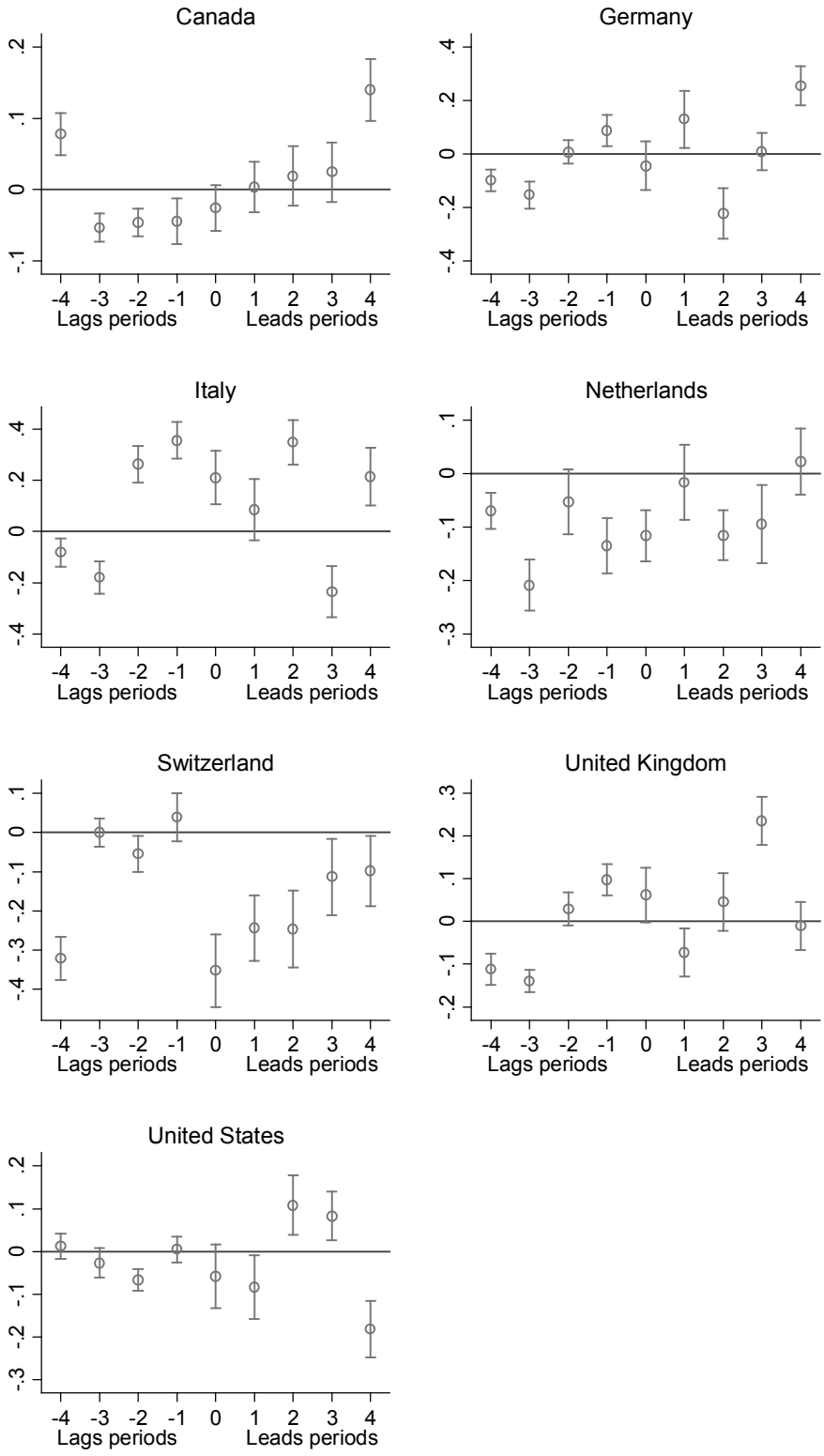
Note: Lags and Leads: the estimated coefficients for Table A3.9, with 95% confidence interval.



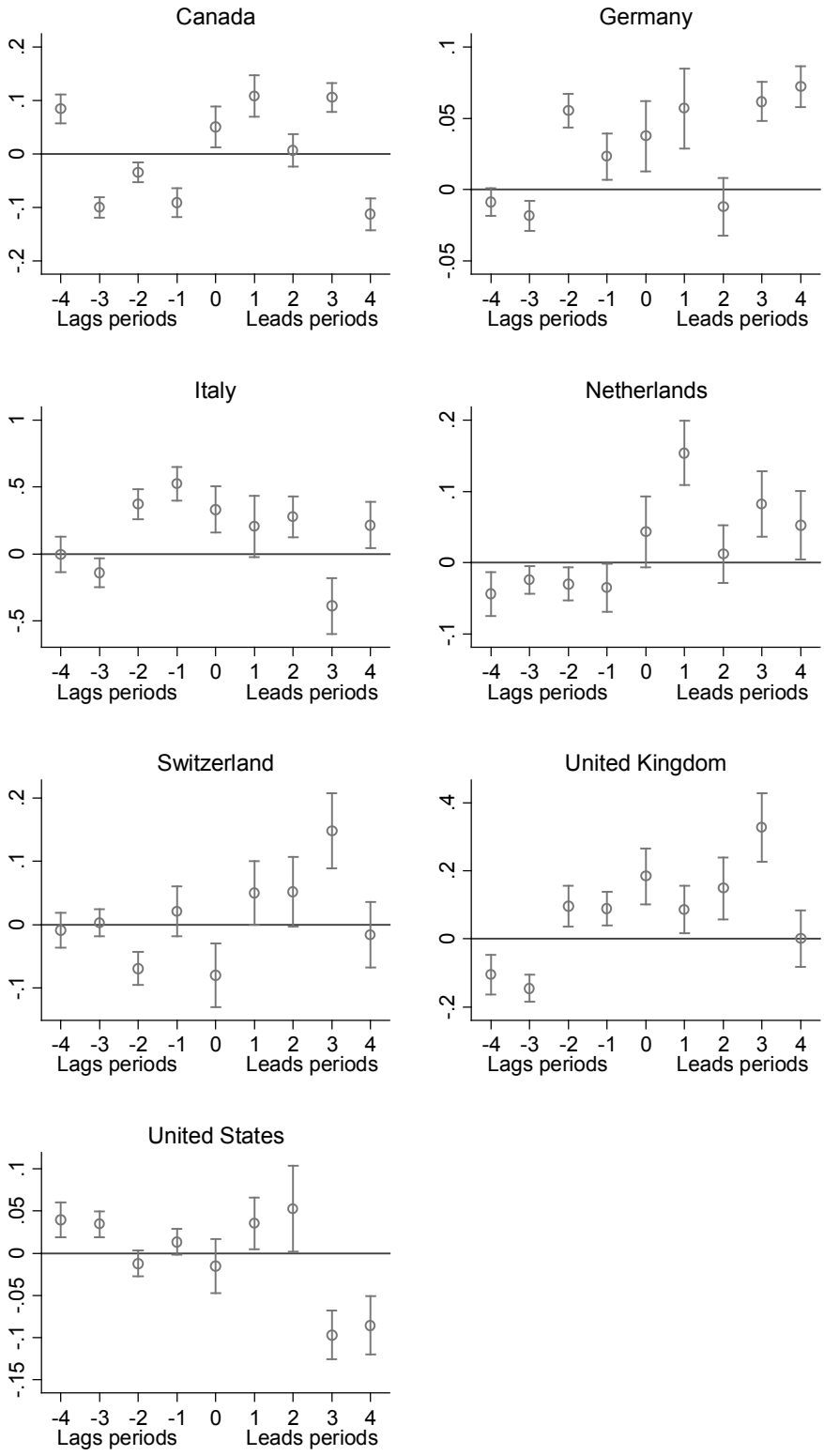
Note: Lags and Leads: the estimated coefficients for Table A3.10, with 95% confidence interval.



Note: Lags and Leads: the estimated coefficients for Table A3.11, with 95% confidence interval.

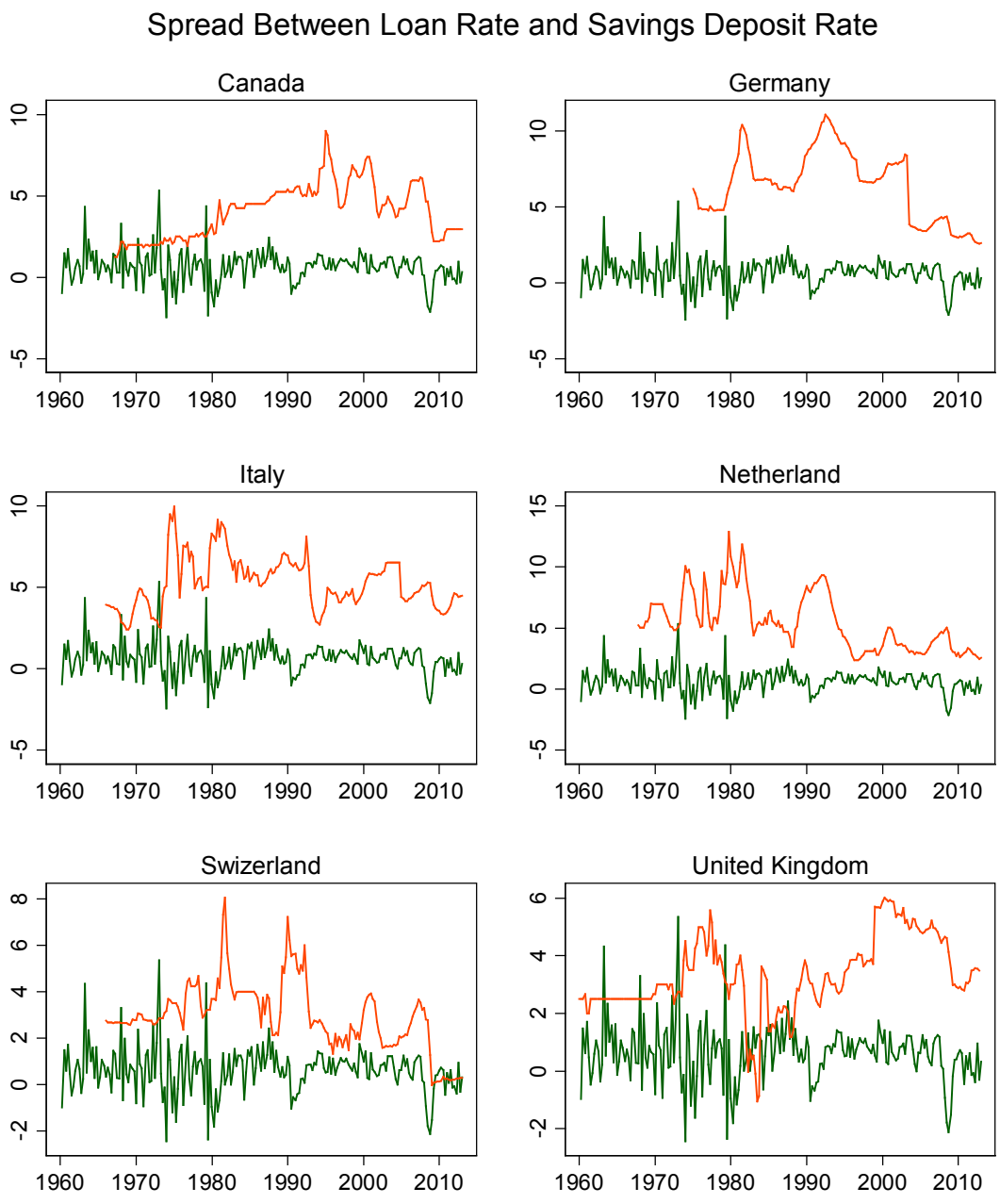


Note: Lags and Leads: the estimated coefficients for Table A3.12, with 95% confidence interval.



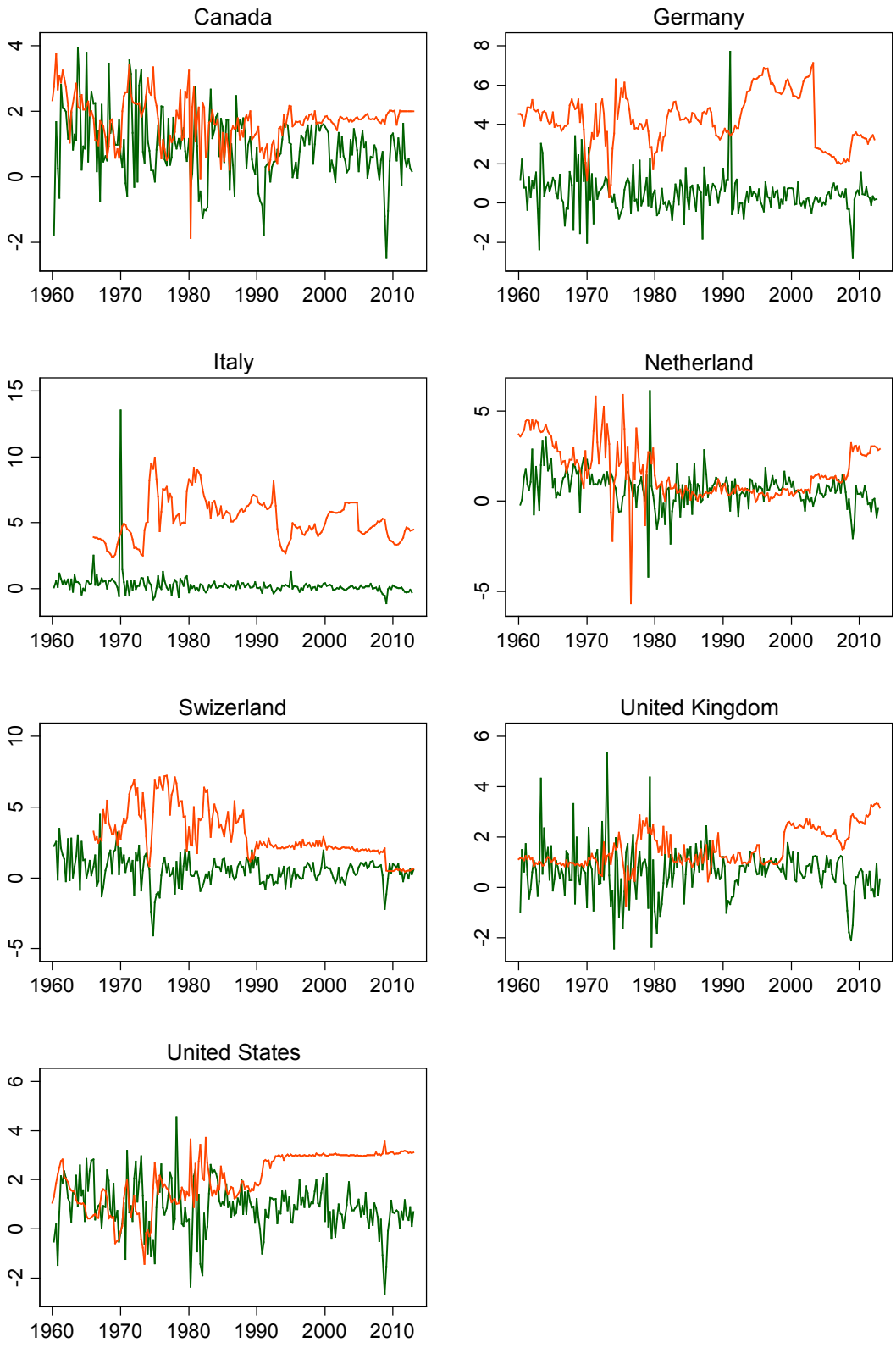
Note: Lags and Leads: the estimated coefficients for Table A3.13, with 95% confidence interval.

Figure A3-3 Seven different Spread and growth rate of real GDP for each country

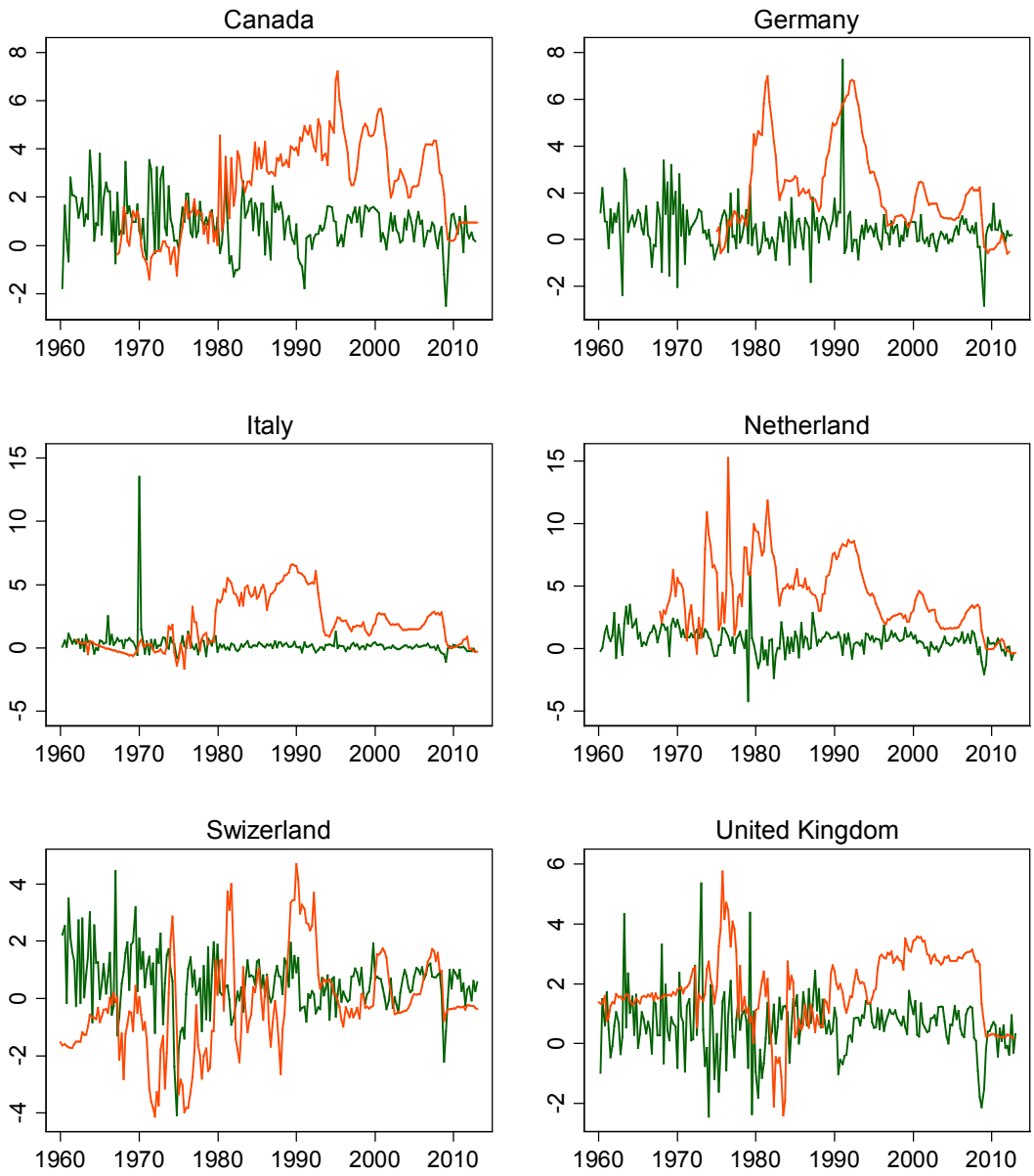


Note: Red line indicates ‘Spread’. Green line indicates “Growth rate of real GDP’.

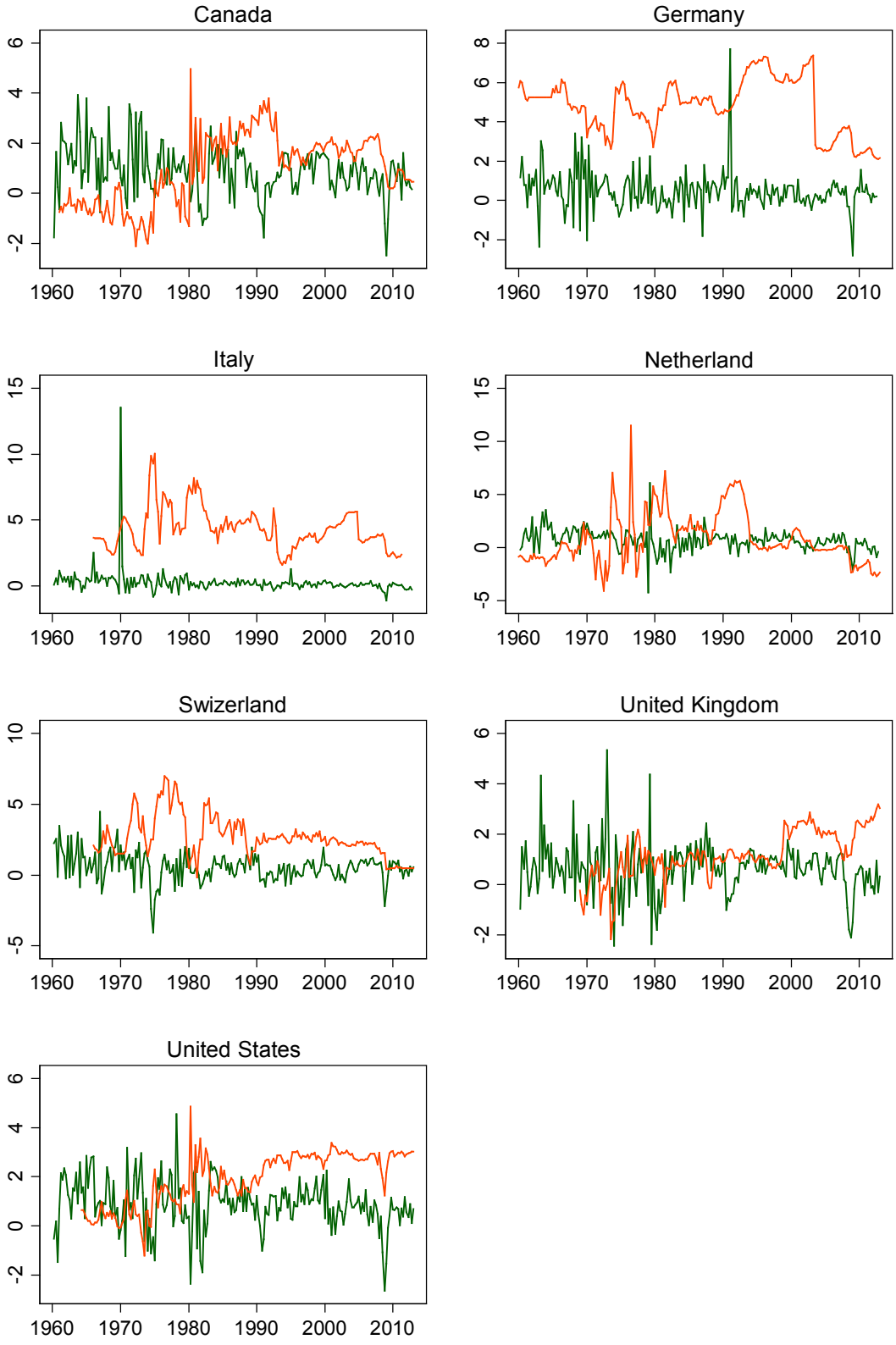
Spread Between Loan Rate and Short-Term Money



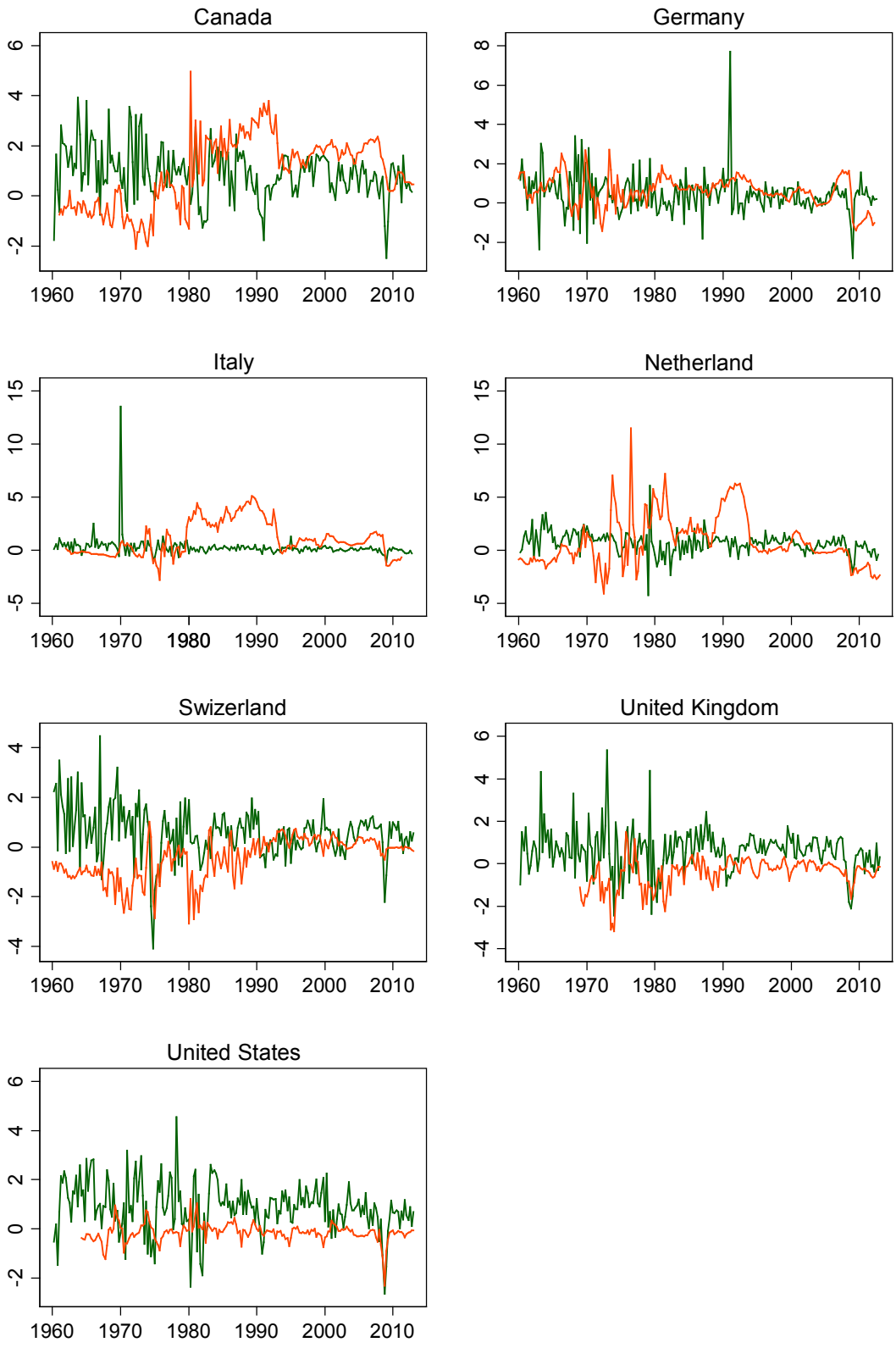
Spread Between Saving Deposit Rate and Short-Term Money



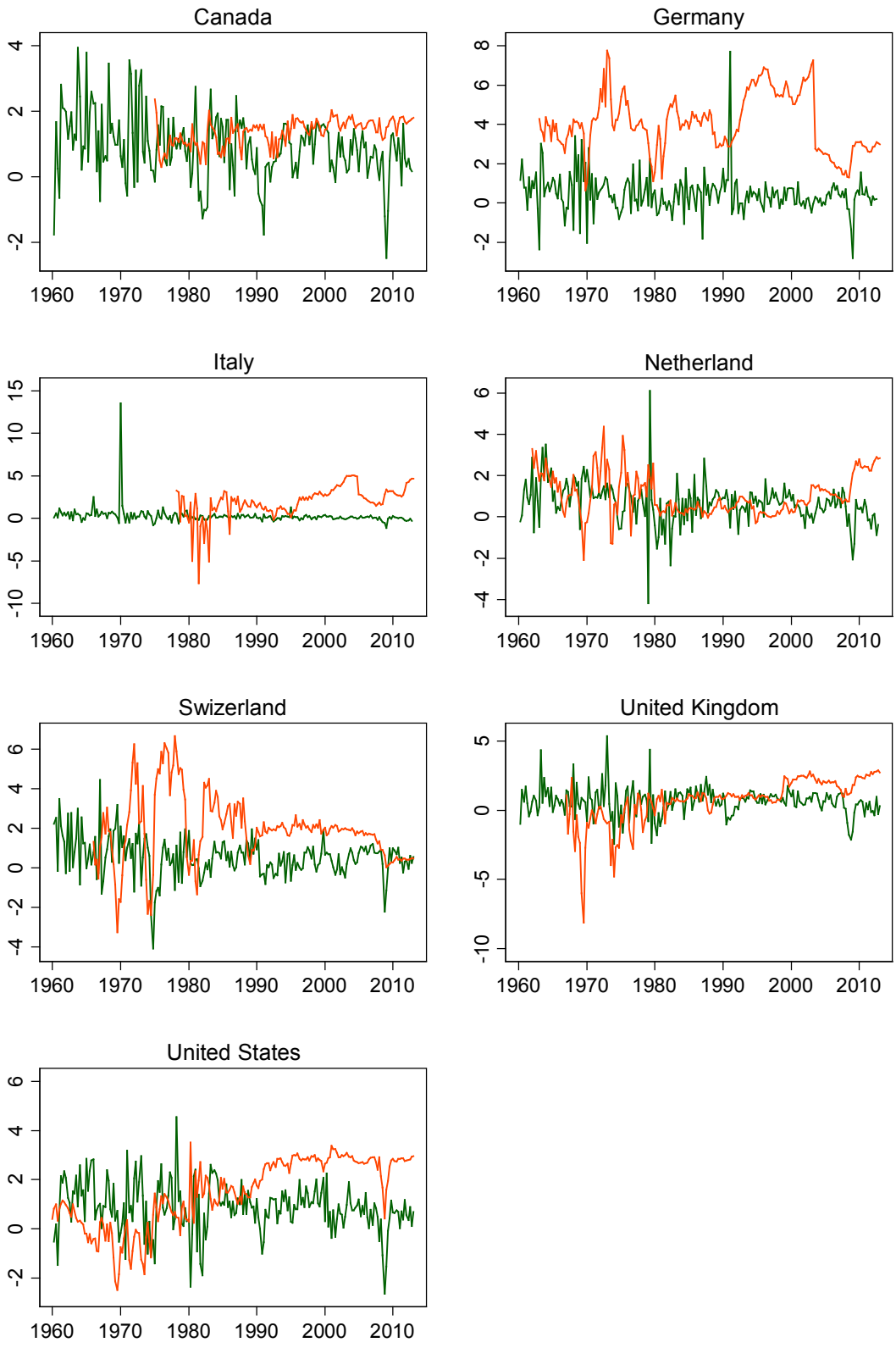
Spread Between Loan Rate and Time Deposits



Spread Between Time Deposit Rate and Short-Term Money



Spread Between Loan Rate and Eurodeposits



Spread Between Eurodeposit Rate and Short-Term Money

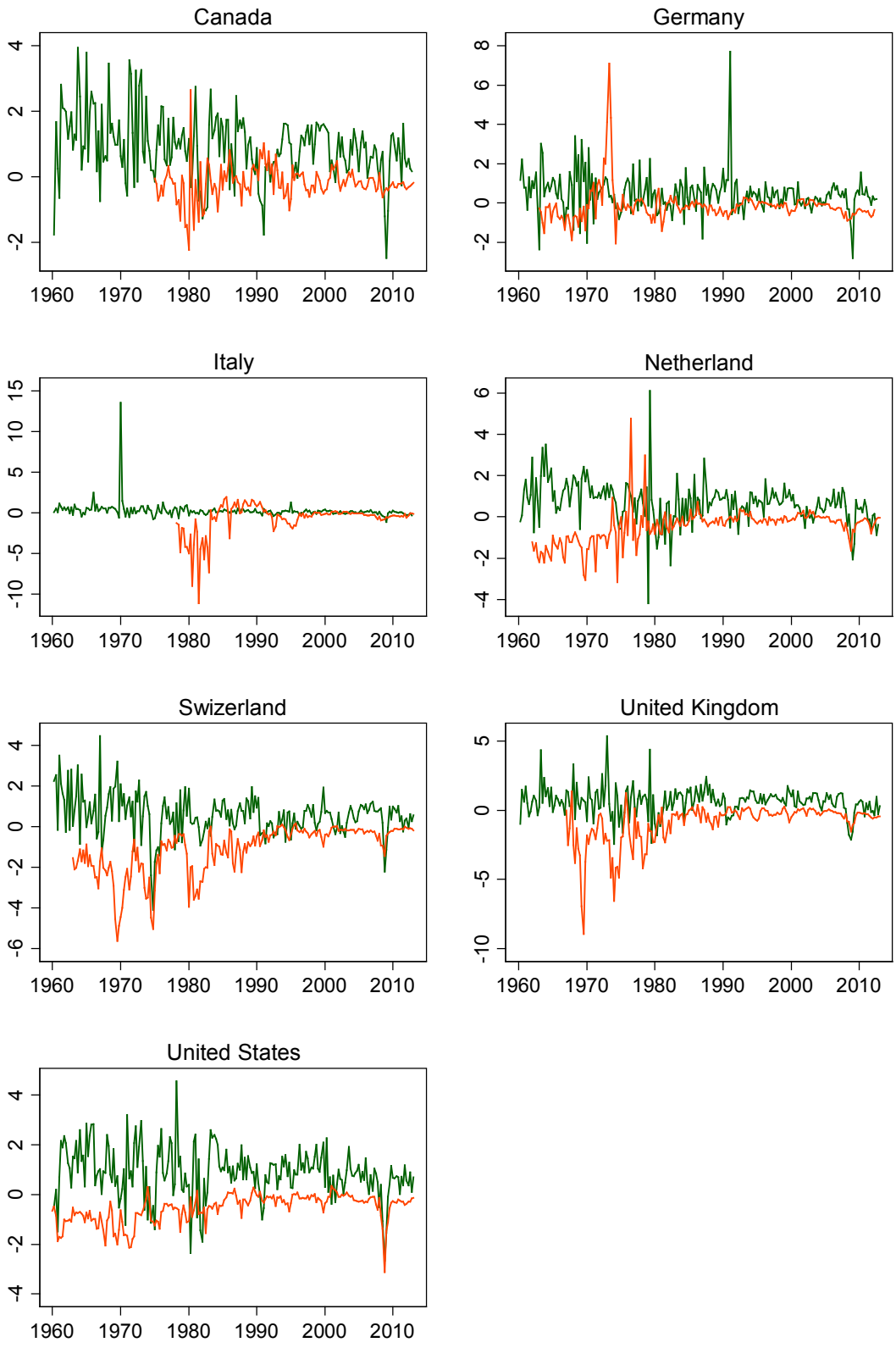
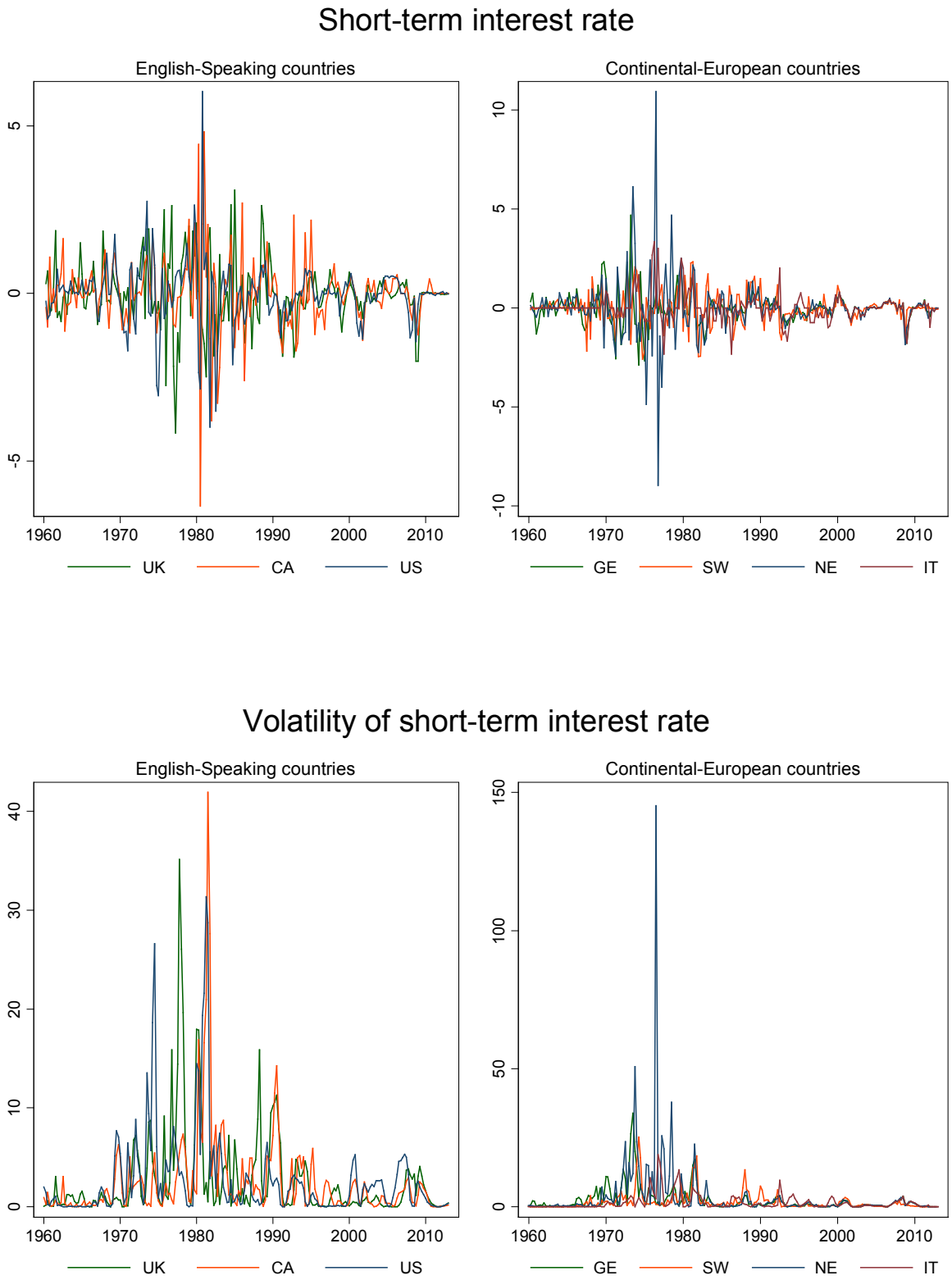
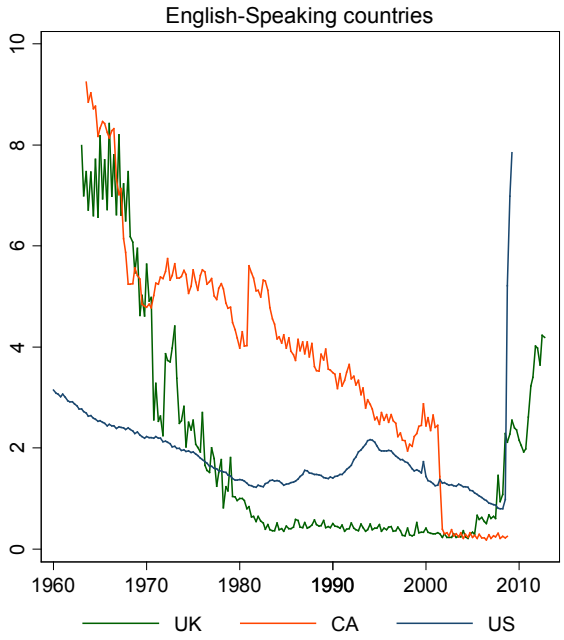
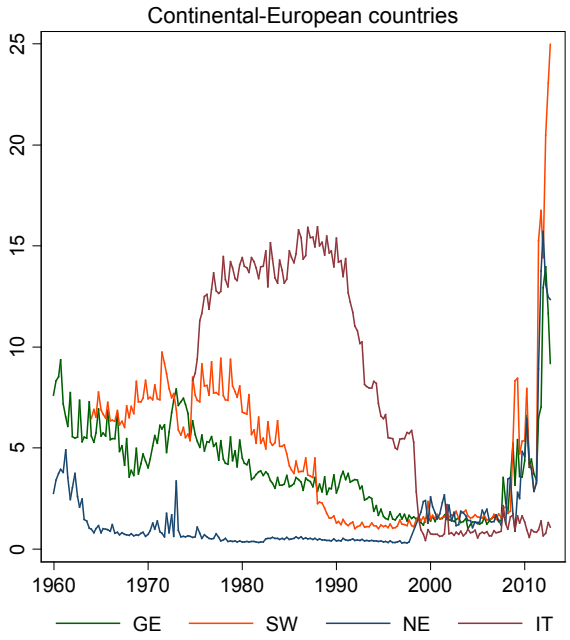


Figure A3-4 Seven control variables

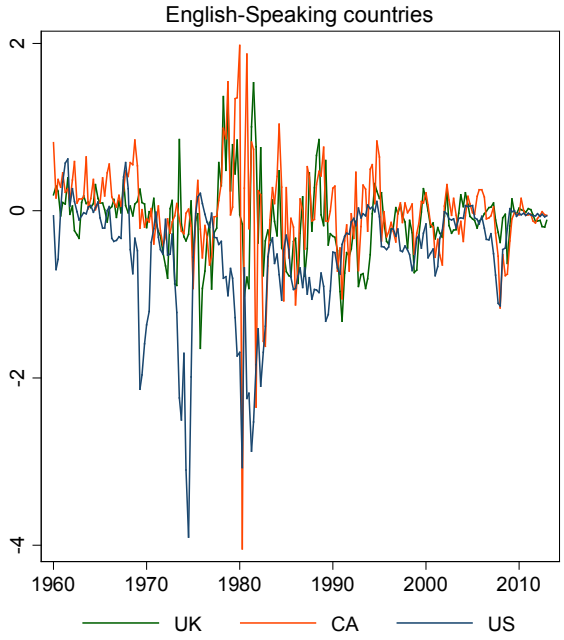


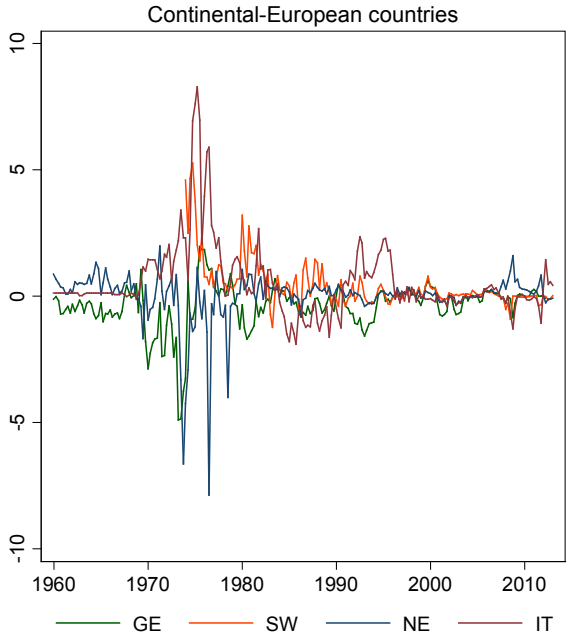
Ratio of bank reserves to total assets



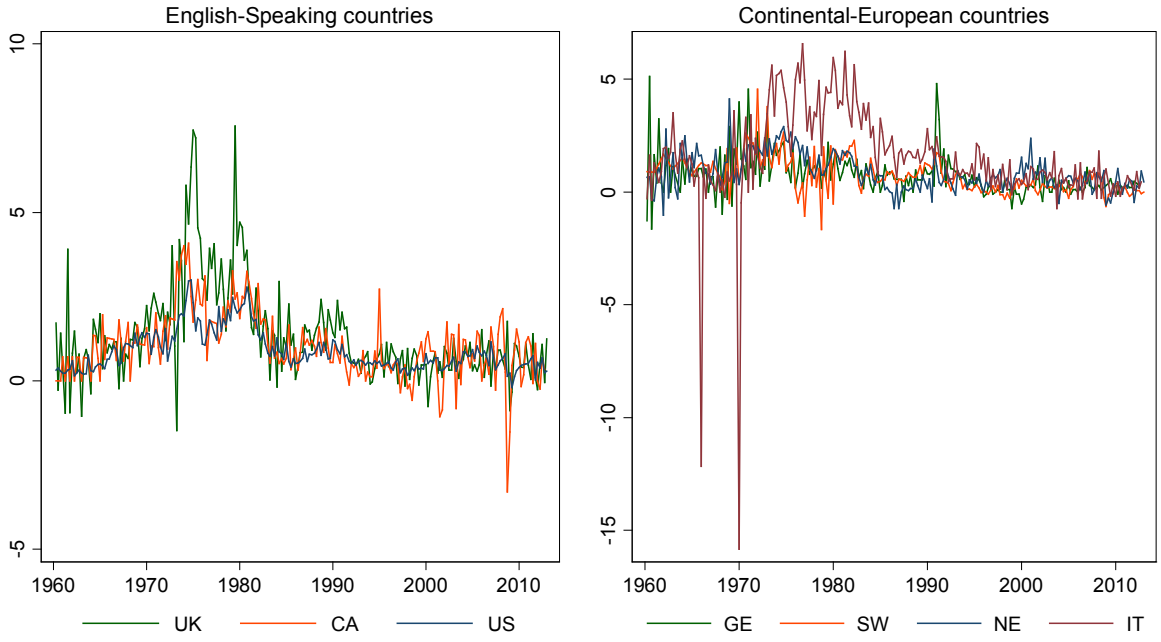


The slope of the yield curve

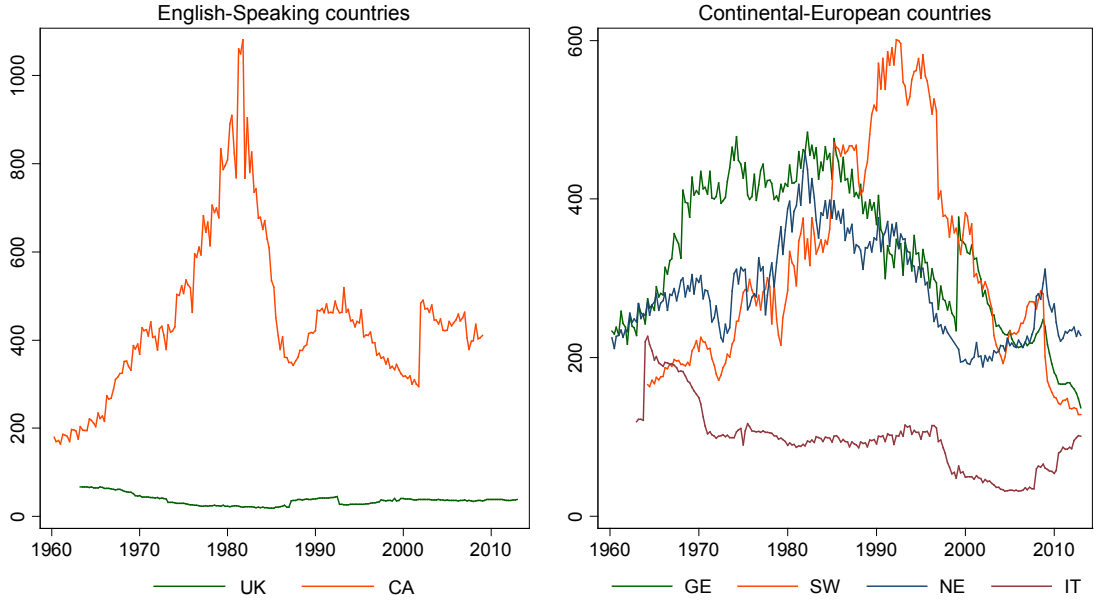




Inflation Rate



The lagged ratio of savings deposits to demand deposits for the banking system



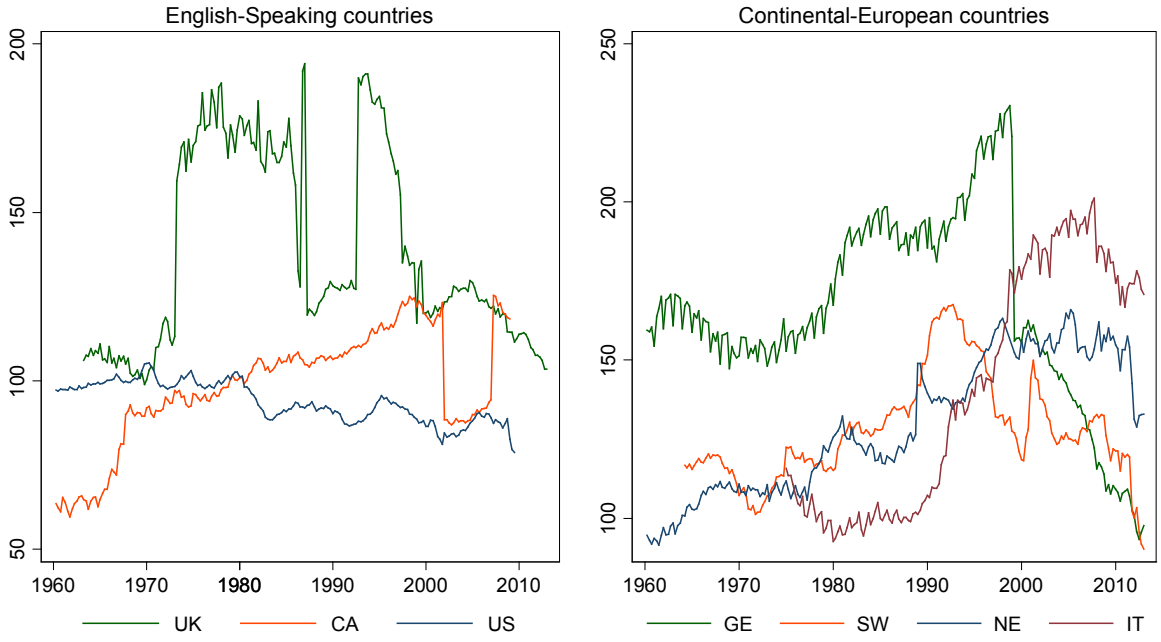
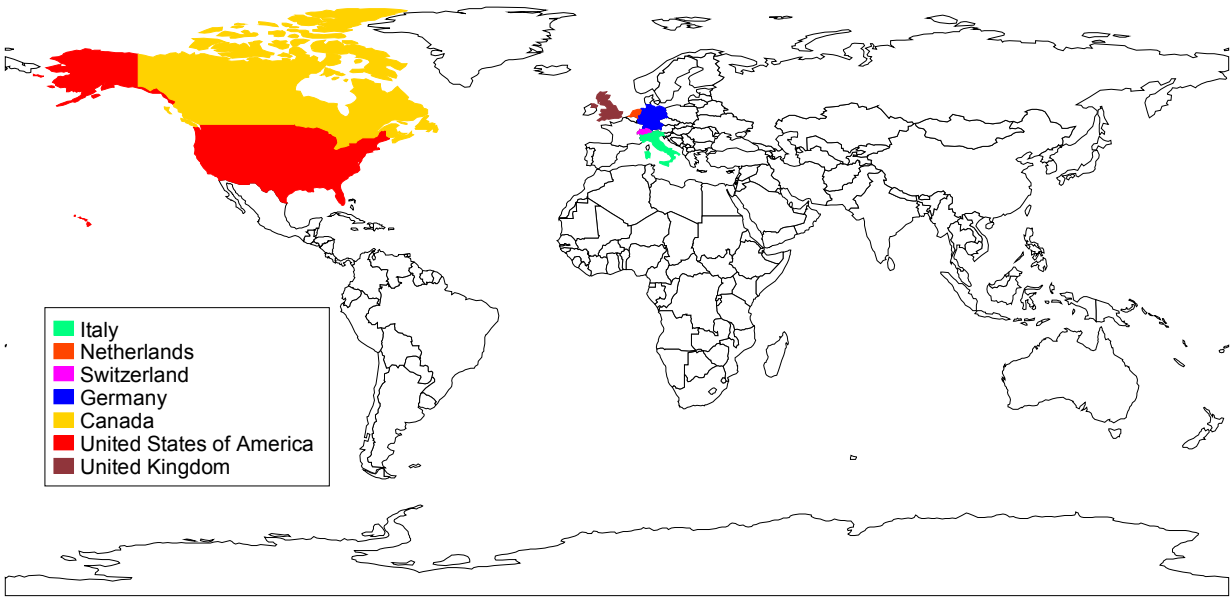


Figure A3-5 Seven countries researched in this chapter.



References

Abramitzky, Ran. (2008). "The Limits of Equality: Insights from the Israeli Kibbutz." *Quarterly Journal of Economics* 123 (3): 1111-1159.

Abramitzky, Ran, Leah Platt Boustan, And Katherine Eriksson. (2012). "Europe's Tired, Poor, Huddled Masses: Self-Selection and Economic Outcomes in the Age of Mass Migration." *American Economic Review* 102 (5): 1832-1856.

Abramitzky, Ran, Leah Platt Boustan, and Katherine Eriksson. (2014). "A Nation of Immigrants: Assimilation and Economic Outcomes in the Age of Mass Migration." *Journal of Political Economy* 122 (3): 467-506.

Aguiar, Mark., and Erik Hurst. (2007). "Measuring Trends in Leisure: The Allocation of Time Over Five Decades." *Quarterly Journal of Economics* 122 (3): 969-1006.

Akerman, Anders, Ingvil Gaarder, and Magne Mogstad. (2015). "The Skill Complementarity of Broadband Internet." *Quarterly Journal of Economics* 130 (4): 1781-1824.

Albrecht, James, Anders Björklund, and Susan Vroman. (2003). "Is There a Glass Ceiling in Sweden?" *Journal of Labor Economics* 21 (1): 145-177.

Allen, Franklin and Douglas Gale. (1995). "A Welfare Comparison of Intermediaries and Financial Markets in Germany and the United States." *European Economic Review* 39 (2): 179-209.

Andrews, Donald W.K. (1991). "Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimation." *Econometrica* 59 (3): 817-858.

Andrews, Donald W.K. and J. Christopher Monahan. (1992). "An Improved Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimator." *Econometrica* 60 (4): 953-966.

Angbazo, Lazarus. (1997). "Commercial Bank Net Interest Margins, Default Risk, Interest Rate Risk, and Off-Balance Sheet Banking." *Journal of Banking and Finance* 21 (1): 55-87.

Angrist, Josh. (2002). "How Do Sex Ratios Affect Marriage and Labor Markets? Evidence from America's Second Generation." *Quarterly Journal of Economics* 117 (3): 997-1038.

Antecol, Heather, Peter J. Kuhn, and Stephen J. Trejo. (2006). "Assimilation via Prices or Quantities? Sources of Immigrant Earnings Growth in Australia, Canada, and the United States." *Journal of Human Resource* 41 (4): 821–40.

Asea, Patrick K. and Brock Blomberg. (1998). "Lending Cycles." *Journal of Econometrics* 83 (1-2): 89-128.

Aydemir, Abdurrahman, and Mikal Skuterud. (2005). "Explaining the Deteriorating Entry Earnings of Canada's Immigrant Cohorts, 1966–2000." *Canadian Journal of Economics* 38 (2): 641-671

Aydemir, Abdurrahman and George J. Borjas. (2007). "Cross-Country Variation in the Impact of International Migration: Canada, Mexico, and the United States." *Journal of the European Economic Association* 5 (4): 663–708.

Aydemir, Abdurrahman, Wen-Hao Chen, and Miles Corak. (2009) "Intergenerational Earnings Mobility among the Children of Canadian Immigrants Full Access." *Review of Economics and Statistics* 91 (2): 377-397

Aydemir, Abdurrahman and George J. Borjas. (2011). "Attenuation Bias in Measuring the Wage Impact of Immigration." *Journal of Labor Economics* 29 (1): 69-112.

Autor, David. H., Lawrence F. Katz, and Alan B. Krueger. (1998). "Computing Inequality: Have Computers Changed the Labor Market?" *Quarterly Journal of Economics* 113 (4): 1169-1214

Autor, David H. (2001). "Why Do Temporary Help Firms Provide Free General Skills Training?" *Quarterly Journal of Economics* 116 (4):1409–1448.

Autor, David H., and Mark G. Duggan. (2003). "The Rise in the Disability Rolls and the Decline in Unemployment." *Quarterly Journal of Economics* 118(1): 157–205.

Autor, David. H., Frank Levy, and Richard J. Murnane. (2003). ''The Skill Content of Recent Technological Change: An Empirical Exploration.'' *Quarterly Journal of Economics* 118 (4): 1279–1333.

Autor, David. H., Daron Acemoglu, and David Lyle. (2004). "Women War and Wages: The Impact of Female Labor Supply on the Wage Structure at Mid-Century." *Journal of Political Economy* 112 (3):497–551

Autor, David. H., Lawrence F. Katz, and Melissa S. Kearney. (2008) ''Trends in US Wage Inequality: Revising the Revisionists.'' *Review of Economics and Statistics* 90 (2): 300–323.

Autor, David H., and David Scarborough. (2008). "Does Job Testing Harm Minority Workers? Evidence from Retail Establishments." *Quarterly Journal of Economics* 123(1): 219–277.

Autor, David. H., and David Dorn. (2013). ''The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market.'' *American Economic Review* 103 (5): 1553–1597.

Autor, David H., David Dorn, and Gordon Hanson. (2013). "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121–2168.

Autor, David. H., David Dorn, Gordon H. Hanson, and Jae Song. (2014). "Trade Adjustment: Worker-Level Evidence." *Quarterly Journal of Economics* 129 (4): 1799-1860.

Autor, David H., Alan Manning, and Christopher L. Smith. (2016). "The Contribution of the Minimum Wage to U.S. Wage Inequality over Three Decades: A Reassessment." *American Economic Journal: Applied Economics* 8 (1): 58–99.

Autor, David H., Susan N. Houseman, and Sari Pekkala Kerr. (2017). "The Effect of Work First Job Placements on the Distribution of Earnings: An Instrumental Variables Quantile Regression Approach." *Journal of Labor Economics* 35 (1): 149-190.

Baker, Michael, and Dwayne Benjamin. (1994). "The Performance of Immigrants in the Canadian Labor Market." *Journal of Labor Economics* 12 (3): 369–405.

Bandiera, Oriana, Robin Burgess, Narayan Das, Selim Gulesci, Imran Rasul, and Munshi Sulaiman. (2017). "Labor Markets and Poverty in Village Economies." *Quarterly Journal of Economics* 132 (2): 811-870.

Barca, Fabrizio. (1996). "On Corporate Governance in Italy: Issue, Facts and Agenda." Nota Di Lavoro 10.96, Fondazione ENI Enrico Mattei.

Baron, Matthew D. and Wei Xiong. (2017). "Credit Expansion and Neglected Crash Risk." *Quarterly Journal of Economics* 132 (2): 713-764..

Barth, James R., Nolle, Daniel E., and Tara N. Rice. (1997). "Commercial Banking Structure, Regulation, and Performance: An International Comparison." *Managerial Finance* 23 (11): 1-39.

Baum-Snow, Nathaniel, and Ronni Pavan. (2012). "Understanding the City Size Wage Gap." *Review of Economic Studies* 79 (1): 88–127.

Bell, Brian D. (1997). "The Performance of Immigrants in the United Kingdom: Evidence from the GHS." *Economic Journal* 107 (441): 333-344.

Benston, George J. (1994). "Universal Banking." *Journal of Economic Perspectives* 8 (3): 121-144.

Berlin, Mitchell and Loretta J. Mester. (1998). "On the Profitability and Cost of Relationship Lending." *Journal of Banking and Finance* 22 (6): 873-879.

Berlin, Mitchell and Loretta J. Mester. (1999). "Deposits and Relationship Lending." *Review of Financial Studies* 12 (3): 579-607.

Berman, Eli, John Bound, and Zvi Griliches. (1994). "Changes in the Demand For Skilled Labor within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufacturing." *Quarterly Journal of Economics* 109 (2): 367-397.

Bernanke, Ben, and Mark Gertler (1989). "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79 (1): 14-31.

Bernanke, Ben, Gertler, Mark, and Simon Gilchrist. (1996). "The Financial Accelerator and the Flight to Quality." *Review of Economics and Statistics* 78 (1): 1-15.

Bertrand, Marianne, Emir Kamenica, and Jessica Pan. (2015). "Gender Identity and Relative Income within Households." *Quarterly Journal of Economics* 130 (2): 571-614.

Blau, Francine D., and Lawrence M. Kahn. (1996). "International Differences in Male Wage Inequality: Institutions versus Market Forces." *Journal of Political Economy* 104 (4): 791-837.

Blau, Francine D., and Lawrence M. Kahn. (1997). "Swimming Upstream: Trends in the Gender Wage Differential in the 1980s." *Journal of Labor Economics* 15 (1), pt.1: 1–42.

Blundell, Richard, Amanda Gosling, Hidehiko Ichimura, and Costas Meghir. (2007). "Changes in the Distribution of Male and Female Wages Accounting for Employment Composition Using Bounds." *Econometrica* 75 (2): 323– 363.

Borio, Claudio E.V., and Wilhelm Fritz. (1995). "The Response of Short-Term Bank Lending Rates to Policy Rates: A Cross-Country Perspective." (Basle: Bank for International Settlements).

Borjas, George J. (1985). "Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants." *Journal of Labor Economics* 3 (4): 463–89.

Borjas, George J. (1992). "Ethnic Capital and Intergenerational Mobility," *Quarterly Journal of Economics* 107 (1): 123–150.

Borjas, George J. (1993). "The Intergenerational Mobility of Immigrants," *Journal of Labor Economics* 11 (1), pt.1: 113–135.

Borjas, George J. (1994). "Long-Run Convergence of Ethnic Skill Differentials:The Children and Grandchildren of the Great Migration." *Industrial and Labor Relations Review* 47 (4): 553-573.

Borjas, George J. (1995). "Assimilation and Changes in Cohort Quality Revisited: What Happened to Immigrant Earnings in the 1980s?" *Journal of Labor Economics* 13 (2):201–45.

Borjas, George J., and Valerie A. Ramey. (1995). "Foreign Competition, Market Power, and Wage Inequality." *Quarterly Journal of Economics* 110 (4): 1075-1110.

Borjas, George J. and Lynette Hilton. (1996). "Immigration and the Welfare State: Immigrant Participation in Means-Tested Entitlement Programs." *Quarterly Journal of Economics* 111 (2): 575-604.

Borjas, George J. (2003). "The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *The Quarterly Journal of Economics* 118 (4): 1335–74.

Borjas, George J., Jeffrey Grogger, and Gordon H. Hanson. (2012). "Comment: On Estimating Elasticities of Substition." *Journal of the European Economic Association* 10 (1): 198-210.

Borjas, George J. and Kirk D. Doran. (2012). "The Collapse of the Soviet Union and the Productivity of American Mathematicians." *Quarterly Journal of Economics* 127 (3): 1143-1203.

Borjas, George J. (2015). "The Slowdown in the Economic Assimilation of Immigrants: Aging and Cohort Effects Revisited Again." *Journal of Human Capital* 9 (4): 483-517.

Borjas, George J. (2017). "The Wage Impact of the Marielitos: A Reappraisal." *Industrial and Labor Relations Review* forthcoming.

Boudarbat, Brahim and Lemieux,Thomas. (2014). "Why are the Relative Wages of Immigrants Declining? A Distributional Approach." *Industrial and Labor Relations Review* 67 (4):1127-1165.

Bound, John, and Freeman, Richard B. (1992). ‘‘What Went Wrong? The Erosion of Relative Earnings and Employment among Young Black Men in the 1980s.’’ *Quarterly Journal of Economics* 107 (1): 201–32.

Bound, John, and George Johnson. (1992). “Changes in the Structure of Wages During the 1980s: An Evaluation of Alternative Explanations.” *American Economic Review* 82 (3): 371-92.

Boustan, Leah Platt. (2010). “Was Postwar Suburbanization “White Flight”? Evidence from the Black Migration.” *Quarterly Journal of Economics* 125 (1): 417-443.

Bowles, Samuel. (1970). “Aggregation of labor inputs in the economics of growth and planning: experiments with at wo-level CES function.” *Journal of Political Economy* 78 (1): 68–81.

Bratsberg, Bernt, and Oddbjørn Raaum. (2012). “Immigration and Wages: Evidence from Construction.” *Economic Journal* 122 (565):1177–1205.

Buchinsky, Moshe. (1994). “Changes in the U.S. Wage Structure 1963–1987: Application of Quantile Regression.” *Econometrica* 62 (2): 405–58.

Buckley, F.H. (1997). “The Canadian Keiretsu.” *Journal of Applied Corporate Finance* 9: 46-56.

Burgess, Robin, Matthew Hansen, Benjamin A. Olken, Peter Potapov, and Stefanie Sieber. (2012). “The Political Economy of Deforestation in the Tropics.” *Quarterly Journal of Economics* 127 (4): 1707-1754.

Busch, Ramona, and Christoph Memmel. (2016). “Quantifying the Components of the Banks’ Net Interest Margin.” *Financial Markets and Portfolio Management* 30 (4): 371-396.

Butcher, Kristin F., and John E. DiNardo. (2002). “The Immigrant and Native-Born Wage Distributions: Evidence from United States Censuses.” *Industrial and Labor Relations Review*, 56 (1): 97-121.

Brian D. Bell. (1997). “The Performance of Immigrants in the United Kingdom: Evidence from the GHS.” *Economic Journal* 107 (441): 333-344.

Card, David. (1990). “The impact of the Mariel Boatlift on the Miami labor market.” *Industrial and Labor Relations Review* 43 (2): 245–57.

Card, David, and Alan B. Krueger. (1992). “School Quality and Black-White Relative Earnings: A Direct Assessment.” *Quarterly Journal of Economics* 107 (1): 151–200.

Card, David. (2001). “Immigrant inflows, native outflows and the local labor market impacts of higher immigration.” *Journal of Labor Economics* 19 (1): 22–64.

Card, David and DiNardo, John E. (2000). “Do immigrant inflows lead to native outflows?” *American Economic Review* 90 (2): 360–67.

Card, David and Thomas Lemieux. (2001). “Can falling supply explain the rising return to college for younger men? A cohort-based analysis.” *Quarterly Journal of Economics* 116 (2): 705–46.

Card, David, and John E. DiNardo. (2002). "Skill-biased technological change and rising wage inequality: Some problems and puzzles." *Journal of Labor Economics* 20 (4): 733–83.

Card, David. (2005). "Is the new immigration really so bad?" *The Economic Journal* 115 (507): 300–323.

Card, David, Raj Chetty, and Andrea Weber. (2007). "Cash-on-Hand and Competing Models of Intertemporal Behavior: New Evidence from the Labor Market." *Quarterly Journal of Economics* 122 (4): 1511-1560.

Card, David, Alexandre Mas, and Jesse Rothstein. (2008). "Tipping and the Dynamics of Segregation." *Quarterly Journal of Economics* 123 (1): 177–218.

Card, David. (2009). "Richard T. Ely Lecture: Immigration and Inequality." *American Economic Review* 99 (2): 1–21.

Card, David, Jörg Heining, and Patrick Kline. (2013). "Work place heterogeneity and the rise of West German wage inequality." *Quarterly Journal of Economics* 128 (3): 967–1015.

Card, David, Ana Rute Cardoso and Patrick Kline. (2016). "Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women." *Quarterly Journal of Economics* 131 (2): 633-686.

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline. (2017). "Firms and Labor Market Inequality: Evidence and Some Theory." *Journal of Labor Economics*: forthcoming.

Carrell, Scott E., Marianne E. Page, and James E. West. (2010). "Sex and Science: How Professor Gender Perpetuates the Gender Gap." *The Quarterly Journal of Economics* 125 (3): 1101-1144.

Carroll, Christopher D., Byung-Kun Rhee, and Changyong Rhee. (1994). "Are There Cultural Effects on Saving? Some Cross-Sectional Evidence" *Quarterly Journal of Economics* 109 (3): 685-699.

Chava, Sudheer, and Amiyatosh Purnanandam. (2011). "The Effect of Banking Crisis on Bank-Dependent Borrowers." *Journal of Financial Economics* 99 (1): 116–135.

Chetty, Raj, John N. Friedman, Tore Olsen, and Luigi Pistaferri. (2011). Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records. *Quarterly Journal of Economics* 126 (2): 749-804.

Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez. (2014). "Where is the land of Opportunity? The Geography of Intergenerational Mobility in the United States." *Quarterly Journal of Economics* 129 (4): 1553-1623.

Chevalier, Judith, and Austan Goolsbee. (2009). "Are Durable Goods Consumers Forward-Looking? Evidence from College Textbooks." *Quarterly Journal of Economics* 124 (4): 1853-1884.

Chiquiar, Daniel, and Gordon H. Hanson. (2005). "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States." *Journal of Political Economy* 113 (2): 239–81.

Chiswick, Barry R. (1978). "The Effect of Americanization on the Earnings of Foreign-Born Men." *Journal of Political Economy* 86 (5): 897–921.

Cortés, Patricia. (2008). "The Effect of Low-Skilled Immigration on US Prices: Evidence from CPI Data." *Journal of Political Economy* 116 (3): 381–422.

Cortés, Patricia, and José Tessada. (2011). "Low-Skilled Immigration and the Labor Supply of Highly Skilled Women." *American Economic Journal: Applied Economics* 3 (3): 88–123.

Cottarelli, Carlo and Angeliki Kourelis. (1994). "Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy." *International Monetary Fund Staff Papers* 41 (4): 587-623.

Coulter, Fiona A. E., Frank A. Cowell, and Stephen P. Jenkins. (1992). "Equivalence Scale Relativities and the Extent of Inequality and Poverty." *Economic Journal* 102 (414): 1067-1082.

Cowell, Frank A., and Stephen P. Jenkins. (1995). "How Much Inequality Can we Explain? A Methodology and an Application to the United States." *Economic Journal* 105 (429): 421-430.

Cunha, Flávio, and James Heckman. (2016). "Decomposing Trends in Inequality in Earnings into Forecastable and Uncertain Components." *Journal of Labor Economics* 34 (2), pt. 2: S31-S65.

Cutler, David M., and Edward L. Glaeser. (1997). "Are Ghettos Good or Bad?" *Quarterly Journal of Economics* 112 (3): 827-872.

Davidson, Russell and James G. MacKinnon. (1993). "Estimation and Inference in Econometrics." New York: Oxford University Press.

De Silva, Dakshina G, Robert P. McComb, Young-Kyu Moh, Anita R. Schiller and Andres J. Vargas. (2010). "The effects of migration on wages: evidence from a natural experiment." *American Economic Review: Papers & Proceedings* 100 (2): 321–326.

Demirguc-Kunt, Asli, and Harry Huizinga. (1999). "Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence." *The World Bank Economic Review* 13 (2): 379-408.

Diamond, Rebecca. (2016). "The Determinants and Welfare Implications of US Workers' Diverging Location Choices by Skill: 1980–2000." *American Economic Review* 106(3): 479–524.

DiNardo, John, Nicole M. Fortin, and Thomas Lemieux. (1996). "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semiparametric Approach." *Econometrica* 64 (5): 1001–1044.

Douglas Gollin, David Lagakos, and Michael E.Waugh. (2014) "The Agricultural Productivity Gap." *Quarterly Journal of Economics* 129 (2): 939-993.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl. (2017). "The Deposits Channel of Monetary Policy." *Quarterly Journal of Economics*: forthcoming.

Dustmann, Christian and Francesca Fabbri. (2003). "Language Proficiency and Labour Market Performance of Immigrants in the UK." *Economic Journal* 113 (489): 695–717.

Dustmann, Christian, Francesca Fabbri, and Ian Preston. (2005). "The Impact of Immigration on the British Labour Market." *Economic Journal* 115 (507): 324–341.

Dustmann, Christian, Johannes Ludsteck, and Uta Schönberg, (2009) ''Revisiting the German Wage Structure.'' *Quarterly Journal of Economics* 124 (2): 843–881.

Dustmann, Christian, Frattini, Tommaso and Preston, Ian. (2013). "The effect of immigration along the distribution of wages." *Review of Economic Studies* 80 (1):145–73.

Dustmann, Christian, and Albrecht Glitz. (2015). "How Do Industries and Firms Respond to Changes in Local Labor Supply?" *Journal of Labor Economics*. 33 (3): 711–50.

Dustmann, Christian, Uta Schönberg, and Jan Stuhler. (2017). "Labor Supply Shocks, Native Wages, and the Adjustment of Local Employment." *Quarterly Journal of Economics* 132 (1): 435-483.

Edin, Per-Anders, Peter Fredriksson, and Olof Åslund. (2003). "Ethnic Enclaves and the Economic Success of Immigrants—Evidence from a Natural Experiment." *Quarterly Journal of Economics* 118 (1): 329-357.

Eeckhout, Jan, Roberto Pinheiro, and Kurt Schmidheiny. (2014). "Spatial Sorting." *Journal of Political Economy* 122 (3): 554–620.

Farber, Henry S. (2015). "Why you Can't Find a Taxi in the Rain and Other Labor Supply Lessons from Cab Drivers." *Quarterly Journal of Economics* 130 (4): 1975-2026.

Ferrie, Joseph P., and Jason Long. (2013). "Intergenerational Occupational Mobility in Great Britain and the United States since 1850." *American Economic Review* 103 (7): 1109–37.

Finkelstein, Amy, Matthew Gentzkow, and Heidi Williams. (2016). "Sources of Geographic Variation in Health Care: Evidence From Patient Migration." *Quarterly Journal of Economics* 131 (4): 1681-1726.

Flannery, Mark J. (1980). "How Do Changes in Market Interest Rates Affect Bank Profits?" *Business Review*, Federal Reserve Bank of Philadelphia, November-December: 13-22.

Flannery, Mark J. (1981). "Market Interest Rates and Commercial Bank Profitability: An Empirical Investigation." *Journal of Finance* 36 (5): 1085-1101.

Foged, Mette, and Giovanni Peri. (2016). "Immigrants' Effect on Native Workers: New Analysis on Longitudinal Data." *American Economic Journal: Applied Economics* 8 (2): 1–34.

Friedberg, Rachel M. (2001). "The impact of mass migration on the Israeli labor market." *Quarterly Journal of Economics* 116 (4):1373–408.

Gabaix, Xavier, and Augustin Landier. (2008). "Why Has CEO Pay Increased So Much?" *Quarterly Journal of Economics* 123 (1): 49–100.

Gambacorta, Leonardo. (2008). "How do banks set interest rates?" *European Economic Review* 52 (5): 792-819.

Garcia, Gillain G.H. (2000). "Deposit insurance: Actual and good practices." Occasional paper No. 197. *International Monetary Fund*, Washington, DC.

Gertler, Mark and Cara S. Lown. (1999). "The Information in the High Yield Bond Spread for the Business Cycle: Evidence and Some Implications." *Oxford Review of Economic Policy*, 15 (3): 132–150.

Gilchrist, Simon, and Egon Zakrajšek. (2012). "Credit Spreads and Business Cycle Fluctuations." *American Economic Review* 102 (4): 1692–1720.

Glitz, Albrecht. (2012). ''The Labor Market Impact of Immigration: A Quasi-Experiment Exploiting Immigrant Location Rules in Germany.'' *Journal of Labor Economics* 30 (1): 175–213.

Gobillon, Laurent, Dominique Meurs, and Se´bastien Roux. (2015). "Estimating Gender Differences in Access to Jobs." *Journal of Labor Economics* 33 (2): 317-363.

Goldin, Claudia. (2014). "A Grand Gender Convergence: Its Last Chapter." *American Economic Review* 104 (4): 1091–119.

Goldin, Claudia, and Robert A. Margo. (1992). "The Great Compression: The Wage Structure in the United States at Mid- Century." *Quarterly Journal of Economics* 107 (1):1-34.

Goldschmidt, Deborah, and Johannes F. Schmieder. (2017). "The Rise of Domestic Outsourcing and the Evolution of the German Wage Structure." *Quarterly Journal of Economics*: forthcoming.

Goos, Maarten, Alan Manning and Anna Salomons. (2014) "Explaining Job Polarization: Routine-Biased Technological Change and Offshoring." *American Economic Review* 104 (8): 2509-2526

Gosling, Amanda, Stephen Machin and Costas Meghir. (2000). "The Changing Distribution of Male Wages in the U.K." *Review of Economic Studies* 67 (4): 635-666

Gould, E. D., V. Lavy, and M. D. Paserman. (2004). "Immigrating to Opportunity: Estimating the Effect of School Quality Using a Natural Experiment on Ethiopians in Israel." *Quarterly Journal of Economics* 119 (2): 489-526.

Graddy, Duane B. and Adi S. Karna. (1984). "Net Interest Margin Sensitivity Among Banks of Different Sizes." *Journal of Bank Research* 14 (4): 283-290.

Green, David A., and Worswick Christopher. (2010). "Entry earnings of immigrant men in Canada: The roles of labor market entry effects and returns to foreign experience." In McDonald Ted, Ruddick Elizabeth, Sweetman Arthur, and Worswick Christopher (Eds.), *Canadian Immigration: Economic Evidence for a Dynamic Policy Environment*: 77–110. Kingston: McGill-Queen's University Press.

Hannan, Timothy H. and Allen N. Berger. (1991). "The Rigidity of Prices: Evidence from the Banking Industry." *American Economic Review* 81 (4): 938-945.

Hanson, Gordon H., and Antonio Spilimbergo. (1999). "Illegal Immigration, Border Enforcement, and Relative Wages: Evidence from Apprehensions at the U.S.-Mexico Border." *American Economic Review* 89 (5): 1337–1357.

Heywood, John S. and Daniel Parent. (2012). "Performance Pay and the White-Black Wage Gap." *Journal of Labor Economics* 30 (2): 249-290.

Ho, Thomas S.Y. and Anthony Saunders. (1981). "The Determinants of Bank Interest Margins: Theory and Empirical Evidence." *Journal of Financial and Quantitative Analysis* 16 (4): 581-600.

Hodrick, Robert J. and Edward C. Prescott. (1997). "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit, and Banking* 29: 1-16.

Hornung, Erik. (2014). ''Immigration and the Diffusion of Technology: The Huguenot Diaspora in Prussia.'' *American Economic Review* 104 (1): 84–122.

Hottman, Colin J., Stephen J. Redding, and David E. Weinstein. (2016). "Quantifying the Sources of Firm Heterogeneity." *Quarterly Journal of Economics* 131 (3): 1291-1364.

Jann, Ben. (2008). "The Blinder-Oaxaca decomposition for linear regression models." *Stata Journal* 8(4): 453–479.

Jenkins, Stephen P. (1994). "Earnings discrimination measurement A distributional approach." *Journal of Econometrics* 61 (1): 81-102.

Jenkins, Stephen P. and Frank A. Cowell. (1994). "Parametric Equivalence Scales and Scale Relativities." *Economic Journal* 104 (425): 891-900.

Jones, Charles. (2005). "The Shape of Production Functions and the Direction of Technical Change." *Quarterly Journal of Economics*, 120 (2): 517–549.

Juhn, Chinhui. (1992) "Decline of male labor market participation: The role of declining market opportunities." *Quarterly Journal of Economics* 107 (1): 79–121.

Juhn, Chinhui, Murphy, Kevin M.; and Pierce, Brooks. (1993). ''Wage Inequality and the Rise in Returns to Skill.'' *Journal of Political Economy* 101 (3): 410–42.

Juhn, Chinhui, Dae Il Kim. (1999). "The Effects of Rising Female Labor Supply on Male Wages." *Journal of Labor Economics* 17 (1): 23-48.

Juhn, Chinhui, and Kevin M. Murphy. (1997). "Wage inequality and family labor supply." *Journal of Labor Economics* 15 (1), pt.1: 72–97.

Juhn, Chinhui; Murphy, Kevin M.; and Pierce, Brooks. (1993). ''Wage Inequality and the Rise in Returns to Skill.'' *Journal of Political Economy* 101 (3): 410–42.

Karabarbounis, Loukas and Brent Neiman. (2014). "The Global Decline of the Labor Share." *Quarterly Journal of Economics* 129 (1): 61-103

Katz, Lawrence F., and Kevin M. Murphy. (1992). "Changes in Relative Wages, 1963-1987: Supply and Demand Factors." *Quarterly Journal of Economics* 107 (1): 35-78.

Katz, Lawrence F.,and Autor, David H. (1999), "Changes in the Wage Structure and Earnings Inequality." *Handbook of Labor Economics* 3 (A): 1463–1555

Kerr, William R., and William F. Lincoln. (2010). "The Supply Side of Innovation: H-1B Visa Reforms and U.S. Ethnic Invention." *Journal of Labor Economics* 28 (3): 473–508.

Kiyotaki, Nobuhiro and John Moore. (1997). "Credit Cycles." *Journal of Political Economy* 105 (2): 211-248.

Kleven, Henrik Jacobsen, Camille Landais, Emmanuel Saez, and Esben Schultz. (2014). "Migration and Wage Effects of Taxing Top Earners: Evidence from the Foreigners' Tax Scheme in Denmark." *Quarterly Journal of Economics* 129 (1): 333-378.

Koenker, R., and G. Bassett. (1978). "Regression Quantiles." *Econometrica* 46 (1): 33-50.

Kopczuk, Wojciech, Emmanuel Saez, and Jae Song. (2010). "Earnings Inequality and Mobility in the United States: Evidence from Social Security Data Since 1937." *Quarterly Journal of Economics:* 125 (1): 91-128.

Kuhn, Peter, and Kailing Shen. (2013). "Gender Discrimination in Job Ads: Evidence from China." *Quarterly Journal of Economics* 128 (1): 287-336.

Kyei, Alexander. (1995). "Deposit Protection Arrangements: A Survey." *IMF* WP 95/134, December.

Peter Kuhn and Kailing Shen. (2013). "Gender Discrimination in Job Ads: Evidence from China." *Quarterly Journal of Economics* 128 (1): 287-336.

Pinotti, Paolo. (2017). "Clicking on Heaven's Door: The Effect of Immigrant Legalization on Crime." *American Economic Review* 107(1): 138–168.

Lazear, Edward P. (1999). "Culture and language." *Journal of Political Economy* 107 (6), 95–126.

Lee, David S. (1999). "Wage Inequality in the United States During the 1980s: Rising Dispersion or Falling Minimum Wage?" *Quarterly Journal of Economics* 114 (3):977-1023

Lemieux, Thomas. (2006a). "Increasing Residual Wage Inequality: Composition Effects, Noisy Data, or Rising Demand for Skill?" *American Economic Review* 96 (3): 1–64.

Lemieux, Thomas. (2006b). "Post-secondary Education and Increasing Wage Inequality." *American Economic Review* 96 (2):1–23.

Lemieux, Thomas, Bentley Macleod and Daniel Parent. (2009). "Performance Pay and Wage Inequality." *Quarterly Journal of Economics* 124 (1): 1-49

Leuven, Edwin, Hessel Oosterbeek and Hans van Ophem. (2004). "Explaining International Differences in Male Skill Wage Differentials by Differences in Demand and Supply of Skill." *Economic Journal* 114 (495): 466–86.

Levine, Ross, and Yona Rubinstein. (2017). "Smart and Illicit: Who Becomes an Entrepreneur and Do They Earn More?" *Quarterly Journal of Economics* 132 (2): 963-1018.

Lewis, Ethan G. (2011). "Immigration, Skill Mix, and Capital-skill Complementarity." *Quarterly Journal of Economics* 126 (2): 1029–069.

López-Salido, David, and Jeremy C. Stein, and Egon Zakrajšek. (2017). "Credit-Market Sentiment and the Business Cycle." *Quarterly Journal of Economics*: forthcoming.

Lubotsky, Darren. (2007). "Chutes or Ladders? A Longitudinal Analysis of Immigrant Earnings." *Journal of Political Economy* 115 (5): 820–67.

Manacorda, Marco, Alan Manning, and Jonathan Wadsworth. (2012). "The Impact of Immigration on the Structure of Male Wages: Theory and Evidence from Britain." *Journal of the European Economic Association* 10 (1):120-151.

McShane, R.W. and I.G. Sharpe. (1985). "A Time Series/Cross Section Analysis of the Determinants of Australian Trading Bank Loan/Deposit Interest Margins: 1962-1981." *Journal of Banking and Finance* 9 (1): 115-136.

Mian, Atif, Amir Sufi, and Emil Verner. (2017). "Household Debt and Business Cycles Worldwide." *Quarterly Journal of Economics*: forthcoming.

Mulligan, Casey, and Yona Rubinstein. (2008). "Selection, Investment, and Women's Relative Wages over Time." *Quarterly Journal of Economics* 123 (3): 1061–110.

Munshi, Kaivan. (2003). "Networks in the Modern Economy: Mexican Migrants in the US Labor Market." *Quarterly Journal of Economics* 118 (2): 549–99.

Murphy, Kevin M., and Finis Welch. (1990). "Empirical Age-Earnings Profiles." *Journal of Labor Economics* 8 (2): 202–229.

Murphy, Kevin M., and Finis Welch. (1992). "The Structure of Wages." *Quarterly Journal of Economics* 107 (1): 285-326.

Nancy Qiann (2008). "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance." *Quarterly Journal of Economics* 123 (3): 1251-1285.

Neal, Derek A., and Johnson, William R. (1996). ''The Role of Premarket Factors in Black-White Wage Differences.'' *Journal of Political Economy* 104 (5): 869–95.

Neumark, David, and Steven A. Sharpe. (1992). "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits." *Quarterly Journal of Economics* 107 (2): 657-680.

Newey, Whitney K., and Ken D. West. (1987). "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica* 55 (3): 703–708.

Newey, Whitney K., and Ken D. West. (1987). "Automatic Lag Selection in Covariance Matrix Estimation." *Review of Economic Studies* 61 (4): 631–653.

Oaxaca, Ronald L., and Michael R. Ransom. (1994). ''On Discrimination and the Decomposition of Wage Differentials.'' Journal of Econometrics 61 (1): 5–21.

OECD (1989) "Competition in Banking." (Paris: OECD).

Olson, Ronald L. and Donald G. Simonson. (1982). "Gap Management and Market Rate Sensitivity in Banks." *Journal of Bank Research*, Spring: 53-58.

Ottaviano, Gianmarco, and Giovanni Peri. (2012). "Rethinking the Effect of Immigration on Wages." *Journal of the European Economic Association* 10 (1):152-197

Ottaviano, Gianmarco, Giovanni Peri, and Greg C. Wright. (2013). "Immigration, Offshoring, and American Jobs." *American Economic Review* 103 (5): 1925-1959.

Peri, Giovanni and Chad Sparber. (2009). "Task Specialization, Immigration, and Wages." *American Economic Journal: Applied Economics* 1 (3), 135–169.

Peri, Giovanni. (2012). "The Effect of Immigration on Productivity: Evidence from U.S. States." *Review of Economics and Statistics* 94 (1): 348-35.

Peterson, M.A. and R.G. Rajan. (1995). "The Effect of Credit Market Competition on Lending Relationships." *Quarterly Journal of Economics* 110 (2): 407-443.

Philippon, Thomas, and Ariell Reshef. (2012). "Wages and Human Capital in the U.S. Finance Industry: 1909–2006." *Quarterly Journal of Economics* 127 (4): 1551-1609

Pierce, Brooks. (2001). "Compensation Inequality" *Quarterly Journal of Economics*. 116 (4): 1493-1525.

Piketty, Thomas, and Emmanuel Saez. (2003). "Income Inequality in the United States, 1913–1998." *Quarterly Journal of Economics* 118 (1): 1-41.

Pinotti, Paolo. (2017). "Clicking on Heaven's Door: The Effect of Immigrant Legalization on Crime." *American Economic Review* 107 (1): 138–168.

Pisati, Maurizio. (2012). "Exploratory spatial data analysis using Stata." *German Stata User Group meeting*, Berlin. 2012: 07.

Putterman, Louis, and David N. Weil. (2010). "Post-1500 Population Flows and The Long-Run Determinants of Economic Growth and Inequality." *Quarterly Journal of Economics* 125 (4): 1627-1682.

Roca, Jorge De La and Diego Puga. (2017). "Learning by Working in Big Cities" Revie*w of Economic Studies* 84 (1): 106–142.

Rochet, Jean-Charles and Jean Tirole. (1996). "Interbank Lending and Systemic Risk." *Journal of Money, Credit and Banking* 28: 733-762.

Santos, Joao A.C. and Andrew Winton. (2008). "Bank Loans, Bonds, and Information Monopolies across the Business Cycle." *Journal of Finance* 63 (3): 1315-1359.

Schularick, Moritz, and Alan M. Taylor. (2012). "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crisis, 1870–2008." American Economic Review 102 (2): 1029–1061.

Slovin, Myron B. and Marie Elizabeth Sushka. (1983). "A Model of the Commercial Loan Rate." *Journal of Finance* 38 (5): 1583-1596.

Smith, Christopher L. (2012). "The Impact of Low-Skilled Immigration on the Youth Labor Market." *Journal of Labor Economics* 30 (1): 55–89.

Smith, James. (2006). "Immigrants and the labor market." *Journal of Labor Economics* 24 (2): 203-33.

Snider, Connan, and Thomas Youle. (2014). "The Fix is in: Detecting Portfolio Driven Manipulation of the LIBOR." Working paper, October.

The Economist (1998). "Euro Towers or Fawlty Towers?" October 31.

Trejo, Stephen J. (1997). "Why Do Mexican Americans Earn Low Wages?" *Journal of Political Economy* 105 (6): 1235–68.

Welch, Finis. (1979). "Effects of Cohort Size on Earnings: The Baby Boom Babies Financial Boost." *Journal of Political Economy* 87 (5), pt.2: 65–97.

Welch, Finis. (1997). "Wages and participation." *Journal of Labor Economics* 15 (1), pt. 2: S77–S103.

Welch, Finis. (1999). "In Defense of Inequality." *American Economic Review* 89 (2): 1-17.

Wong, Kit Pong. (1997) "On the Determinants of Bank Interest Margins under Credit and Interest Rate Risks." *Journal of Banking and Finance* 21(2): 251-271.

Young, Alwyn. (2013). "Inequality, the Urban-Rural Gap, and Migration." *Quarterly Journal of Economics* 128 (4): 1727-1785.

Zarruk, Emilio R. (1989). "Bank Spread with Uncertain Deposit Level and Risk Aversion." *Journal of Banking and Finance* 13 (6): 797-810.