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**The Impact of New Immigration on native Wages:
A Cross-occupation Analysis of a Small Open Economy**


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# The Impact of New Immigration on Native Wages: A Cross-occupation Analysis of a Small Open Economy[*]

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## Abstract

This paper examines how immigration affects native wages by exploiting an unexpected episode of immigrant influx. The episode happened in Hong Kong, when its government unexpectedly relaxed the restriction on immigration from mainland China in 1993, resulting in a seven-fold increase in the net inflow of Chinese immigrants between 1992 and 1993. We use variation in the employment share of immigrants across occupations for identification. To tackle endogeneity between wages and immigrant inflows across occupations, we use Welch's (1999) congruence indices, which capture the degree of substitutability between workers from different skill groups, to construct instruments for the prevalence of Chinese immigrants in an occupation. Using micro-level data, our two-stage-least-squares estimates show that a 1 percentage point increase in the ratio of new Chinese immigrants to natives decreases native monthly real wages in the same occupation by 2.8-3.6 percents (controlling for immigrant shocks in similar occupations). Within an occupation, female and more skilled native workers experience more adverse wage impact, reflecting a high switching cost associated with occupation-specific human capital.

**JEL Classification Numbers:** F22, J61
**Key Words:** Immigration, labor market outcomes, occupation-specific human capital

# 1 Introduction

Whether immigrant inflows adversely affect native labor market outcomes remains a controversial issue for both academics and policy makers. This paper provides an empirical analysis of a small open economy, Hong Kong, in hopes of advancing our understanding of the issue. Under the "one country, two systems" arrangement, the Hong Kong's immigration laws stipulate that mainland Chinese cannot reside in Hong Kong unless they obtain a "one-way" permit issued by the Hong Kong government. To accelerate social integration between Hong Kong and mainland China in anticipation of the sovereignty transfer, the Hong Kong government unexpectedly relaxed the restrictions on immigration in 1993. As a result, the annual Chinese immigrant inflow increased seven-fold from 7,500 to 57,900 between 1992 and 1993. This substantial rise in Chinese immigrants in Hong Kong provides an interesting case for studying the wage impact of immigration. By exploring variation in the employment share of Chinese immigrants across occupations, we examine whether and to what degree this wave of immigration affects native wages.

There is a huge literature that studies the impact of immigrant inflows on the host countries' labor market outcomes. The literature generally takes two different paths. One strand of the literature focuses on the variation of immigrant presence across geographic areas (the "area studies") (Altonji and Card, 1991; Goldin, 1994; LaLonde and Topel, 1991; Pischke and Velling, 1997), while the other focuses on inequality across skill groups (the "skill-group studies") (Borjas et al., 1992, 1996, 1997; Jaeger, 1996; Borjas, 2003). The first strand generally finds either no or negligible negative effects of immigration on native wages and employment within the same region. The core assumption of this literature is that the outflow of native workers from regions affected by immigration or factor price equalization through goods trade is assumed to be insufficient to "undo" the labor supply shock, at least in the short run. This assumption is supported by some recent studies that find little evidence of the offsetting effects due to out-migration of natives (Card and DiNardo, 2000; Peri and Sparber, 2008).

To circumvent the attenuation problem due to native out-migration, the second strand of the literature examines the impact of immigrant inflows on native labor market outcomes across skill groups, which have been classified according to workers' education and experience levels (Borjas et al., 1992, 1996, 1997; Jaeger, 1996; Borjas, 2003) or occupations (Friedberg, 2001; Card, 2001). Based on imperfect substitutability and limited "arbitrage" of wages between workers from different skill groups, these studies find more sizable employment and wage effects of immigration on natives. The "occupation studies" approach

(Brown et al., 1980; Friedberg, 2001; Card, 2001; Liu et al., 2004), in particular, considers an occupation as a single labor market, and investigates the impact of immigration on native labor market outcomes in the same occupation. This approach assumes that occupation-specific skills are associated with significant adjustment costs for workers moving between occupations. As these costs limit cross-occupation labor mobility in the short run, the labor supply for an occupation is likely to increase with the inflow of immigrants. This view receives support from recent findings in Kambourov and Manovskii (2008a,b, 2009), who show that occupation-specific skills are more important than firm-specific or sector-specific skills in determining wages.

This paper adopts the "occupation studies" approach. Using micro-level data from three censuses, we examine whether a labor supply shock arising from the sudden influx of mainland Chinese immigrants since the change in the immigration law in 1993 affects native wages in the same occupation in Hong Kong over 1991-2001. We focus on the occupation dimension in our study, based on an assumption that occupation-specific human capital raises the adjustment cost for native workers who move to another occupation.

There are several advantages of using data from Hong Kong to study the wage impact of immigration. The first is related to the small size of Hong Kong. Hong Kong is a small economy, with limited outflow of native workers to other economies. Despite the large volume of capital and goods flows between Hong Kong and mainland China, their labor markets are far from integrated. Administrative hurdles abound; many Hong Kong professionals cannot work in the mainland because their professional qualification is not being recognized. Moreover, Hong Kong locals are reluctant to look for jobs in the mainland, especially in the 1990s, when the wage differential between the two places was enormous. In fact, the wage differential back then was so large that it effectively deprived Hong Kong natives of the option to supply their labor in another city. These factors resolve the problem of endogenous outflows of native workers from the local labor market.

The second advantage has to do with the unique feature of the immigration policy change that took place in Hong Kong in 1993. The policy change aimed mainly to facilitate social integration between mainland China and Hong Kong in preparation for the sovereignty hand-over from the British to the Chinese government in July 1997. The design of the policy was driven by the city's social and political needs, rather than by its economic situations. Attracting talents is not the objective of this policy change. For this reason, the distribution of the Chinese immigrants who were able to come after the policy change should be orthogonal to the prevailing skill distribution of Hong Kong.

Third, the large immigrant inflow gave rise to a pronounced variation of immigrant shares across occupations for identification.

Fourth, the city had a long history of immigration even prior to the drastic policy change. This creates a heterogeneous pool of "natives" characterized by different lengths of residence in the city, which in turn allows us to gauge the effects of immigration on different "native" groups due to assimilation.

The last advantage is about the unique demographic structure of the immigrants. Females accounted for about 70% of Chinese immigrants who migrated to Hong Kong since 1993. The reason is that the majority of the mainland Chinese who were permitted to migrate to Hong Kong were for family reunion. This group of potential migrants was composed mainly of wives of Hong Kong citizens, who frequently commuted to mainland China for work. This gender-biased immigration episode is a unique case for studying the impact of immigration on gender inequality.

Despite the exogenous change in the immigration policy, immigrants' selection of occupations is another source of endogeneity. To tackle potential endogeneity between the presence of Chinese immigrants and wages across occupations, we use the congruence index proposed by Welch (1999), which captures the degree of substitutability between a pair of workers from different skill groups, to construct an instrument for the labor share of Chinese immigrants in an occupation. Specifically, we use a full set of congruence indices for any skill pair within an occupation to gauge the likelihood of immigrants being hired into the occupation. The validity of the instrument is grounded on the evidence of imperfect substitutability between broadly-defined skill groups, as emphasized by (Borjas et al., 1992; Borjas, 1994; Borjas et al., 1996, 1997; Jaeger, 1996; Borjas, 2003). Since an immigrant's education, experience, and gender were predetermined before her entry into Hong Kong, the likelihood index of the representative immigrant from a skill group serves as a valid instrument for the fraction of immigrants in an occupation.

In our baseline analysis, we focus on the short-run effects of recent immigrants, who came to Hong Kong in the past five years. We find a strongly negative impact of immigrants on native wages. In particular, our two-stage-least-squares estimates from the individual-level regressions show that a 1 percentage point increase in the ratio of Chinese immigrants to natives decreases the natives' monthly real wages between 2.8 to 3.6 percents. These results are obtained after we control for the labor shares of immigrants in similar occupations and in the same education group of the worker.

There are several potential reasons for the large wage effects, compared to existing findings in the literature. First, which is also a merit of this paper, is that our study is done on a small open economy, where

movement of natives to neighboring labor markets in response to labor supply shocks is much more restricted than the case in a large country, like the U.S. Moreover, mainland Chinese share many physical and cultural similarities with the Hong Kong natives. Some of them even speak the same dialect (Cantonese) as the natives. Because of these similarities, assimilation into the local economy is much easier. Wage discrimination is also potentially less severe compared to some of the countries examined by the existing literature. Thus, to the extent that substitutability between natives and immigrants is likely to be much higher in Hong Kong than many countries, the negative wage impact can be significantly bigger. This conjecture is supported by our findings that wage effects dissipate when we relax our definition of immigrants to include those who migrated to Hong Kong in the past 10 years to 15 years. Finally, based on occupation-level regressions, we find weak effects of new immigration on native employment. These findings are consistent with a large wage adjustment, and provide support to our approach of treating occupations as skill groups to examine the wage impact of immigration.

We also explore the impact of immigration on different skill and demographic groups within an occupation. As expected, given the disproportional presence of females in the immigrant pool, we find that the results are almost entirely driven by the impact on female native workers. Perhaps surprisingly, we also find that *within an occupation*, the effects of immigration are most significant for natives who are relatively more educated (high-school educated and above) and experienced. These results appear to be counterintuitive at first sight, as the skill distribution of the immigrants is skewed towards the lower end of education. However, they are consistent with our approach that relies on limited mobility of workers across occupations. Because an individual's endowment of occupation-specific skills increases the cost of changing occupation, we would expect to see a larger negative impact of the immigrant shock on the more experienced and educated natives within an occupation.

Our paper not only deepens our understandings of the relationship between immigration and wages, but also contributes to understanding the rising income inequality in Hong Kong, a problem that has drawn a significant amount of public attention in the city in recent years. For example, the term "income inequality" appeared 3,937 times in major Hong Kong newspapers between 1999 and 2003. The number increased to 9,789 in the period between 2004 and 2008.[1] This increase is consistent with the rising trend of the city's income inequality. The United Nations Human Settlements Program (2008) released a report in 2008 indicating that Hong Kong as a city has the highest Gini coefficient not only in China, but also in the entire

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[1] We obtain these numbers from WiseNews, a Hong Kong-based news service provider.

Asia. This paper provides evidence that the foregoing change of immigration policy contributed to the rising income inequality in Hong Kong.

This paper proceeds as follows. In Section 2, we discuss the immigration policies in Hong Kong in the 1990s. In Section 3, we introduce the theoretical framework for the empirical analysis. Section 4 discusses our empirical specification, and the construction of the instrument for the Chinese immigrant share in an occupation. Section 5 describes the data, followed by a discussion of the empirical results in Section 6. The final section concludes.

## 2    Background

In much of the twentieth century, Hong Kong[2] was a haven for Chinese refugees who escaped from their country because of waves of domestic political turbulence such as the Japanese Occupation, the Communist takeover, and the Cultural Revolution. The colonial government's initial attitude toward these Chinese illegal immigrants was largely sympathetic. Illegal immigrants who managed to sneak through the border without getting caught were allowed to stay in Hong Kong legally for good. As more and more immigrants arrived, however, the colonial government feared that the city would no longer be able to absorb the massive immigrant influx. Starting from the early 1980s, it decided to expel even those who successfully sneaked through the border.

In 1984, the Chinese government signed the Sino-British Joint Declaration, which stipulated the handover of the former British colony back to China in 1997. To facilitate the post-handover social integration between the mainland and Hong Kong, the colonial government gradually relaxed its immigration policy in the 1990s. In 1993, a new quota system was introduced. Everyday 105 Chinese nationals were given a "one-way permit;" that is, they were allowed to enter Hong Kong and gained the citizenship. These 105 permits were mainly given to those who had close family ties in Hong Kong (for example, spouses and children). As a result of this policy change, the net immigrant movement increased seven-fold between 1992 and 1993, from 7,500 to 57,900. The daily quota was further expanded to 150 in 1995. By casual calculation, the daily quota adds up to an annual increase of about 50,000 residents in Hong Kong. In 2005, a decade after the new quota system was adopted, the population of Hong Kong stood at 6.8 million, in which more than 9 percent arrived in Hong Kong in or after 1993.

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[2]Hong Kong was a British colony between 1842 and 1997.

The effect of this policy change is mirrored by the level change displayed in Figure 1. Table 1 shows the level of and changes in immigrants' population by immigrants' birth place. More than 90 percent of the change in immigrants between 1991 and 2001 comes from the category "Mainland Chinese." This drastic increase is in large part due to the change of immigration policy.

# 3   Theory

Before proceeding to the empirical framework, it is helpful to sketch the theory underlying our empirical analyses. Readers are referred to Altonji and Card (1991) and Borjas (2003) for a formal theoretical analysis. To fix ideas, consider a one-sector economy (*Home*) that is initially closed to immigration. Production of goods requires capital and labor as inputs, and exhibits diminishing marginal returns to each input. All else equal, a higher supply of a factor would result in a lower real return to that factor.

Suppose there exists heterogeneous labor in the form of different occupations. The equilibrium wage in each occupation is determined by the elastic labor demand and labor supply of the occupation. A positive demand shock for an occupation would shift the download-sloping labor demand curve out, driving up the equilibrium wage rate. On the other hand, a positive supply shock would drive the upward-sloping labor supply curve out, forcing down the equilibrium wage rate. Notice that if labor are perfect substitutes between occupations, labor mobility could "arbitrage" away the wage gap between occupations due to the shocks, attenuating the initial wage and employment impact substantially. The empirical section of this paper relies on imperfect substitutability of labor across occupations, due to the existence of occupation-specific skills. These specific skills in turn imply significant adjustment costs for workers who change occupations, reducing the "arbitrage" effects on wages. The importance of occupation-specific human capital has been highlighted in a series of recent studies by Kambourov and Manovskii (2008a,b, 2009), who find that occupation tenure has a more significant impact on wages, compared with industry and employer tenure.

Consider now the *Home* government relaxes its immigration policies by allowing more immigrants to enter the country. Suppose there are foreign nationals being attracted by this policy change, which leads to a substantial immigrant influx into *Home*. These immigrants would then be hired into different occupations at *Home*.[3] Given a fixed amount of capital in the short run, this sudden increase in labor supply would lower real wages. In other words, the equilibrium wage rate of all workers, regardless of natives or

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[3]The flows of the immigrants into occupations need not be evenly distributed.

immigrants, would decrease in all occupations. In the short run when moving costs between occupations are high, the decline in wages would be more pronounced in occupations where the labor supply shocks are larger.[4] To better capture the wage effects of immigrants, we will focus on the effects of the inflow of new immigrants into an occupation, rather than immigrants who came over 15 years ago. This approach also fits our identification strategy that relies on occupation specificity of skills.

## 4   Empirical Strategy

### 4.1   Individual-level Regressions

To examine the effects of immigration on native wages, we estimate the following specification using individual-level data:

$$\omega_{ikct} = \alpha + \beta\theta_{kct} + \mathbf{X}_i\phi + \eta_k + \gamma_c + \delta_t + \varepsilon_{ikct}, \tag{1}$$

where $c$, $k$ and $t$ stand for occupation, industry and census year, respectively. $\omega_{ikct}$ is the log real monthly salary of individual $i$ employed in occupation $c$ in industry $k$ in year $t$. The regressor of interest is

$$\theta_{ct} = \frac{m_{ct}}{n_{ct}},$$

which is the ratio of Chinese immigrants ($m_{ct}$) to native workers ($n_{ct}$) in the work force of occupation $c$ in year $t$. Following previous literature, we treat this ratio as a labor supply shock from immigration (Friedberg, 2001).[5] $\mathbf{X}_i$ is a vector of control variables, which include highest education level attained (and its square term), work experience (and its square term), marital status, and gender; $\eta_k$ is an industry dummy at the 1-digit level, $\gamma_c$ is an occupation dummy, and $\delta_t$ is the year fixed effect that takes into account year-specific business-cycle effects on wages across all occupations. The error term $\varepsilon_{ikct}$ is assumed to be i.i.d. across industry, occupation, and time.

The possibility of non-random distribution of immigrants across occupations implies non-zero correlation between immigrant inflows and $\varepsilon_{ct}$, which would lead to biases in the OLS estimates. Note that the bias

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[4]Based on a more structural set up that spells out the elasticities of substitution between different occupations, one can potentially examine cross-occupation impacts of immigrant inflows into other occupations. We leave this exploration for future research.

[5]Alternatively, we can use $\ln\theta_{ct}$ as our regressor and interpret $\beta$ differently. Using this alternative measure as the regressor of interest yields qualitatively identical results.

can cut both directions. Suppose immigrants coming to Hong Kong are attracted by high-wage occupations (the selection effect). Then the estimate of β will be biased upward. On the other hand, unobserved factors, such as social norms, language requirements, or cultural factors may make it difficult for immigrants to be hired into a certain job. Suppose immigrants' job opportunities are limited to low-wage occupations, the estimate of β will then be biased downward (the confinement effect). A priori, we do not know the direction of the bias. To this end, in addition to including occupation fixed effects to capture any trends in employment during the sample period, we adopt an instrumental variables (IV) approach. In the following section, we will discuss in detail the instrument we propose for the presence of Chinese immigrants in an occupation in each year.

## 4.2 Construction of the Instrument

The policy experiment of Hong Kong – that is, the exogenous change in immigration policy in 1993 aiming to enhance social integration before 1997 sovereignty hand-over in Hong Kong – provides a good case to study the effect of immigrants on native wages. The new immigration program implemented in 1993 did not screen immigrants based on skills. As long as the spouse of a mainland Chinese is a Hong Kong citizen, he or she is eligible to apply for a one-way permit, with a probability of success independent of skills. This policy change undermines the potential correlation between immigrants' skill backgrounds and the labor market conditions in the final destination. In other words, the nature of the program weakens the potential endogeneity in our analysis arising from the Hong Kong government selecting immigrants. However, it cannot circumvent another bias due to Chinese immigrants' self-selection into migration.

We propose an instrument to deal with a potential bias arising from Chinese immigrants' occupational choices. Our proposed instrument predicts how likely a Chinese immigrant would be hired into a particular occupation, based on his/her pre-migration characteristics including gender, education, and experience. This instrument, we will argue, is independent of the factors that affect native wages other than the immigrant shock itself.

Constructing the instrument involves three steps. We first calculate congruence indices between each pair of skill groups based on Welch (1999). Then we use these congruence indices to construct a job-matching index, which captures the "goodness of fit" between an occupation and all skill groups in the economy. Finally, the instrument for each occupation in each year is constructed by summing up the multiples between a job-matching index and the corresponding ratio of Chinese immigrants to natives across skill

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groups.

Let us now discuss each step in detail. In step 1, we compute for each individual immigrant a set of congruence indices with any skill groups in the economy, using the method proposed by Borjas (2003). A skill group is defined as an education-experience-gender cell.[6] To fix idea, consider a representative immigrant in skill group $k$. Suppose there are $m$ education groups (indexed by $i$), and $n$ experience groups (indexed by $j$), there will be $m \times n \times 2$ congruence indices for a worker in group $k$.

The congruence between skill group $k$ and skill group $l$ is computed as in Welch (1999) as follows:

$$G_{kl} = \frac{\sum_c (q_{kc} - \bar{q}_c)(q_{lc} - \bar{q}_c)/\bar{q}_c}{\sqrt{\left(\sum_c (q_{kc} - \bar{q}_c)^2/\bar{q}_c\right)\left(\sum_c (q_{lc} - \bar{q}_c)^2/\bar{q}_c\right)}}, \quad (2)$$

where $c$ stands for occupation, $q_{hc}$ is the fraction of group $h$ workers employed in occupation $c$, where $h \in \{k,l\}$. $\bar{q}_c$ gives the fraction of the entire workforce employed in that occupation. To circumvent the potential endogeneity bias due to non-random assignment of immigrants into different skill groups and occupations, we use data from 1991, two years before the implementation of the new immigration laws, to compute all $q$'s in equation (2). By construction, $G_{kl}$ ranges between -1 and 1, with a higher $G_{kl}$ implying a greater substitutability between groups $k$ and $l$. Workers from the same group $k$ are assumed to be perfect substitutes, i.e., $G_{kk} = 1$.[7]

In step 2, we use $G_{kl}$ for all skill-group pairs with group $k$ to construct a job-matching index between group $k$ and occupation $c$. The index, denoted by $M_{kc}$, essentially captures the degree of fit between a worker from group $k$ (given her education-experience level and gender) and occupation $c$. Formally,

$$M_{kc} = \sum_l \frac{n_{lc}}{n_c} G_{kl}, \quad (3)$$

where $n_{lc}$ is the number of group-$l$ *native* workers in occupation $c$, and $n_c$ is the total number of native workers employed in the same occupation. $M_{kc}$ is a weighted average of $G_{kl}$ across all $l$ (weighted by the share of group-$l$ in occupation $c$'s native workforce), which represents how likely worker $k$ would be hired

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[6]In addition to the existing literature that mostly considers a skill group as an education-experience combination (Borjas, 2003), we add the gender dimension to the definition of skill groups. This addition is especially important if substitutability between a female and a male worker of the same skill and experience is imperfect.

[7]$G_{kk} = \frac{\sum_c(q_{kc}-\bar{q}_c)(q_{kc}-\bar{q}_c)/\bar{q}_c}{\sqrt{(\sum_c(q_{kc}-\bar{q}_c)^2/\bar{q}_c)(\sum_c(q_{kc}-\bar{q}_c)^2/\bar{q}_c)}} = \frac{\sum_c(q_{kc}-\bar{q}_c)^2/\bar{q}_c}{\sum_c(q_{kc}-\bar{q}_c)^2/\bar{q}_c}.$

into occupation $c$.[8] A higher $M_{kc}$, due to higher weights (i.e., $n_{lc}/n_c$) attached to the larger congruence indices of worker $k$, reflects a better match between worker $k$ and the occupation. $M_{kc}$ is assumed to be time-invariant, based on the assumption that the composition of education and experience requirements for an occupation is stable over time. Furthermore, to minimize the potential endogeneity bias arising from changing composition of native and immigrants in the workforce of an occupation, we use data from 1991 to calculate the weights $n_{lc}/n_c \ \forall l$.[9]

Figure 2 shows job matching indices $M_{kc}$ for two occupations. As can be seen, high-skilled jobs (e.g. legal, accounting, and related professionals) have higher $M_{kc}$ for the more educated. Consider a worker with less than 10 years of work experience (Experience Group I), higher education (Education Group 7) yields a higher job-matching index than lower education (Education Group 1) for the legal, accounting, and related professionals. Low-skilled jobs (e.g. sales and services elementary occupations) display an opposite trend.

Before moving to the final step of the instrument construction, a remark is in order. A simpler job-matching index $M_{kc}$ can be potentially constructed by using the share of native workers of skill group $k$ in total native workforce in occupation $c$ (i.e. $n_{kc}/n_c$). A potential complication of this approach, we argue, is that the number of skill-group $k$ workers required by an occupation may change over time. This is especially relevant to Hong Kong, which went through waves of offshoring in the 1980s and early 1990s, in which many firms outsource the manufacturing part of production to mainland China, keeping the administrative offices in Hong Kong (Hsieh, 2005). We note that while the "goodness of fit" between skill groups and occupations may vary significantly over time, due possibly to offshoring or migration, the substitutability between one skill group with another is more long-lasting. To avoid the bias introduced by occupations' changing demand for skills, we decided to use a slightly more complicated but more robust congruence index $G_{kl}$ as a basis for constructing the job-matching index $M_{kc}$.

In step 3, we construct the instrument for occupation $c$ in year $t$ by summing up the multiples between

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[8]To better understand the meaning of the job-matching index $M_{kc}$, consider an economy where there are only two education levels: college (1), and no college (0). For expositional purposes, let us assume that all workers have the same experience level at a given point in time. A worker with college degree will have two congruence indices: $G_{11} = 1$ and $G_{10} \in (-1, 1)$. If an occupation has all workers being college-educated, then $M_{kc} = 1$. On the contrary, if an occupation has all workers without college degrees, then $M_{kc} = G_{10} \in (-1, 1)$. In practice, the distribution of workers of different education and experience levels for an occupation lies somewhere between the two extremes.

[9]We also calculate the job-matching index $M_{kc}$ for the whole sample period (1991-2001) to check robustness. The results are available from the authors upon request.

$M_{kc}$ and the share of immigrants in group $k$ as follows:

$$Z_{ct} = \sum_k \frac{m_{kt}}{n_{kt}} M_{kc},\tag{4}$$

where $m_{kt}$ and $n_{kt}$ represent the number of group-$k$ immigrants and natives in year $t$, respectively. Notice that the ratio $m_{kt}/n_{kt}$ is the only time-varying component in the instrument. The ratio can vary across time due to the change in immigration policies under study. The key idea behind using this instrument is the following question: conditional on the skill composition of Chinese immigrants, what is the implied impact in different occupations? Intuitively, $Z_{ct}$ captures the average "goodness of fit" for the cohort of immigrants who are employed in occupation $c$ in year $t$.[10]

Our proposed instrument is correlated with the immigrant's likelihood of entering a certain occupation, based on imperfect substitutability between workers of different skills and gender.[11] Figure 3 depicts the correlation between the ratio of Chinese immigrants to natives and our proposed instrument $Z_{ct}$ across occupations by year. Because an immigrant's education-experience level is determined prior to the immigrant's arrival in Hong Kong, his/her post-migration occupational choices are also limited. As such, $Z_{ct}$ is unlikely to be correlated with unobserved factors that affect native wages in that occupation subsequent to the immigrants' arrival. Since the immigration program was unexpected and designed for family reunion for those who were married to Hong Kong citizens, immigrants' human capital investment decisions are orthogonal to the labor market situations in Hong Kong. This further enhances the validity of $Z_{ct}$ as an instrument for the ratio of Chinese immigrants to natives in occupations. We will postpone the systematic analysis of the strength of the instrument to Section 6.

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[10]It is worth emphasizing that our instrument, $Z_{ct}$, is structurally similar to the instrument used by Friedberg (2001). In her paper, the variable of interest, $p$, in the second stage is the ratio of Russian immigrants' to native workers in occupation $c$, while the instrument is the percentage of those Russian immigrants having the same occupation in Russia. The instrument has to be, by definition, smaller than the variable of interest in the second stage (see Table 2 of Friedberg (2001), the coefficient of $p$ is 0.240, far from 1). To use the formula of our instrument to understand Friedberg's, consider $\mathbf{I}_i^{\mathbf{c}}$, an indicator function that is equal to 1 if Chinese immigrant $i$ holds occupation $c$, both before (in mainland China) and after migration, and 0 otherwise. We can express the instrument proposed by Friedberg (2001) as $p_c = \frac{1}{n_c} \sum_{i \in m_c} \mathbf{I}_i^{\mathbf{c}}$, where $m_c$ denotes the number of Chinese immigrants in occupation $c$.

The difference between Friedberg's instrument and ours is that we replace $\mathbf{I}_i^{\mathbf{c}}$ with the job-matching index $M_{kc}$. In other words, Friedberg adds up the number of immigrants in an occupation, while we add up the job-matching indices of skill groups across all immigrants employed in that occupation.

[11]For example, immigrants with a college degree are more likely to enter legal or accounting professions than those who have mere primary education.

# 5 Data Sample

We use three waves of Hong Kong Census Household Survey Data: 1991, 1996, and 2001. While 1% sample data are available for 1991 and 1996, 5% sample data are available for 2001. The information required to construct the instrument is readily available in these census surveys. In particular, the census data contain each subject's highest education level attained. To measure an individual's work experience, we subtract the age at which she attained her highest education level from her age at which the survey was taken. We restrict our sample to all full-time workers in Hong Kong, between 16 and 65 years old. The lower age bound is approximately the age when a person has fulfilled her compulsory 9-year education in Hong Kong, while the upper age bound corresponds to the official retirement age of civil servants and employees in most major corporations. We exclude the small fraction of workers who reported to have a second job, so that we can focus on the immigrants' impact on the wages of the main occupation. Readers are referred to the data appendix for details.

## 5.1 A Glance at the Data

In the multiple cross-sectional sample, we classify a person as an immigrant if the person (1) was born in mainland China, and (2) has lived in Hong Kong for less than or equal to 5 years. In the literature, immigrants are often defined by criterion (1) alone. In our case, however, the 5-year benchmark is important because mainland Chinese share a lot of cultural similarities with Hong Kong natives. This implies that Chinese immigrants are able to overcome the language barriers, social labeling, and assimilate into the Hong Kong labor market faster than immigrants from other countries. We believe that including the 5-year criteria in the definition of immigrants is consistent with the short-run nature of a labor supply shock. To check the robustness of our empirical results, we will use two additional cut points, 10 and 15 years, to define immigrants. As expected, both economic and statistical significance decline when we relax the "duration of residence" criteria.

Table 2 reports some key characteristics of the group of Chinese immigrants and the non-immigrants. In all three years, Chinese immigrants on average had fewer years of schooling. Moreover, they were on average younger and are less likely to participate in the labor force. The lower labor participation rate can be explained by the predominance of females among the Chinese immigrants.[12] It is noteworthy that com-

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[12]It is commonly observed that the labor force participation rate is higher among men than women.

pared with natives, among whom about half were females, the share of females in the Chinese immigrants exceeded 63% in 1991, and increased to almost 71% in 2001.[13] The predominance of females in Chinese immigrants can be attributed to the Hong Kong's migration policy in the 90s, that was implemented mainly for family reunion for the mainland Chinese who married Hong Kong citizens. Cultural norms influence the rates of inter-regional marriage between native males and females in Hong Kong. For example, in 2001, there are almost 8 times more Hong Kong males marrying to a mainland bride than Hong Kong females marrying to a mainland groom (Census and Statistics Department of Hong Kong, 2007). For this reason, most of the spouses who came to Hong Kong for family reunion were females.

As expected, Chinese immigrants receive a lower salary than natives, despite a small gap between their average years of education. On average, they earn 35 percent less than their native counterparts. This difference is in part due to the over-representation of females in the pool of the Chinese immigrants, and in part due to their failure to assimilate into Hong Kong's labor market.

## 6    Results

### 6.1    Preliminary Cross-occupation Patterns

Table 3 shows the occupation distribution of both natives and immigrants in three census sample years, 1991, 1996, and 2001. Note that the new immigration law was passed in 1993 to allow more mainland Chinese to migrate to Hong Kong. Data from the 1996 and 2001 census surveys show that the distributions of immigrant and native workers across occupations are substantially different. For example, there was a significantly larger share of natives working as "office clerks" (census code = 410), while a much larger share of Chinese immigrants working as personal and protective services workers.[14] For some occupations, the workforce share of immigrants resembles that of natives (for example, "sales and services elementary occupations" (census code = 910)). The table provides suggestive evidence that recent Chinese immigrants are more likely to work in unskilled blue-collar jobs than the natives. Table 4 highlights another dimension of variation – differences in the presence of recent Chinese immigrants across occupations and years. This pronounced variation across occupations and time, which arose partly due to the new immigration law in

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[13]This number increases to 80% in 2006.

[14]According to the data appendix of 2001 Hong Kong Census, the occupation "Personal and protective services workers" includes 1) travel attendants and guides; 2) personal care workers; 3) hairdressers, barbers, beauticians and related workers; 4) discipline and protective service workers.

1993, allows us to identify the effects of the Chinese immigration on native wages.

To illustrate the relationship between natives' wages and immigrants' presence across occupations, Figure 4 plots average (log) monthly salary of natives against the fraction of Chinese immigrants in the same occupation in 2001, the last year of our sample. A person is defined as a Chinese immigrant if he/she was born in mainland China, and had resided in Hong Kong for less than or equal to 5 years. There is a strongly negative relationship between the two. Figure 5 depicts the correlation between the first differences of the corresponding variables for the period between 1991 and 2001. The slope of the estimated line is -2.04, suggesting that a 1 percentage point increase in the immigrant-native ratio in the occupation is associated with approximately 2% decline in the growth rate of natives' monthly salary in the same occupation. Table A.1 in the appendix reports the corresponding cross-occupation and first-difference regression results. It is worth emphasizing that the coefficients on the immigrant ratios $\theta_{ct}$ are negative and statistically significant across all specifications.

## 6.2   Individual-Level Analysis

### 6.2.1   Baseline Results

The above occupation-level plots hide a substantial within-occupation worker heterogeneity in skills, as well as within-occupation distribution of industries. To control for these determinants of wages, as well as to study what types of native workers are more adversely affected by the Chinese immigrants, we run a series of individual-level regressions controlling for individual covariates.

We pool the micro-samples of Hong Kong Census Household Survey Data for 1991, 1996, and 2001. The unit of observation is a native worker in a census year. The dependent variable is the log of real monthly salary. In addition to the regressor of interest, we always include the worker's highest level of education attained (and its square term), work experience (and its square term), marital status, and gender as controls. All regressions include year, occupation (3-digit), and industry (1-digit) fixed effects. We define natives as either (1) anyone other than Chinese immigrants or (2) anyone other than immigrants (or non-immigrants for short). To check robustness and gain an understanding towards the relevance of substitutability among Chinese immigrants themselves, we test if our estimates are sensitive to different definitions of immigrants. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: born in mainland China and had resided in Hong Kong for less than or equal to 5, 10 or 15 years.

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Table 5 presents the baseline results based on OLS. After controlling for various individual covariates, we observe a statistically significant, negative relationship between native wages and the ratio of immigrants to natives. Standard errors, reported in the parentheses, are clustered at the occupation-year level.[15] In Columns (1) and (2), where we define natives as anyone other than Chinese immigrants, and define immigrants as those who have resided in Hong Kong for less than or equal to 5 years, the point estimate for the immigrant-native ratio is -1.745 when industry fixed effects are excluded, and -1.804 when they are included. Both estimates are significant at the 5 percent statistical level. This implies that a 1 percentage point increase in the immigrant-to-native ratio is associated with approximately a 1.8 percent fall in natives' monthly salaries. In column (3), we include in the regression (log) total workforce in the occupation to proxy for labor demand shocks. The magnitude and the statistical significance of the coefficient on the ratio of Chinese immigrants to natives remains almost identical.

Other covariates generally have expected signs and are statistically significant. More educated and experienced workers earn more. Experience exhibits decreasing returns. Married individuals earn 8 percent more than singles. Male workers earn higher monthly salaries than female workers on average.

When we adopt a more restrictive definition of natives by excluding all non-Chinese immigrants who came in the past 5 years in columns (4) through (6), the size of the point estimate drops slightly, but remains statistically significant at the 5 percent level. This decline in magnitude suggests the possibility that non-Chinese immigrants, who are included in the native sample for the analysis in columns (1) through (3), experience a more negative impact from the influx of Chinese immigrants.

**Cross-occupation Effects**    Before presenting our 2SLS regression results, we examine the validity of our approach that studies the wage impact on a native worker due to immigrant inflows into his/her occupation. One could question if cross-occupation movement may affect our estimates. For example, in response to an increased labor supply due to the immigrant shock, low-skilled native workers can move from one occupation to another provided that both occupations require similar types of skills. If this cross-occupation "arbitrage" is effective, our estimates would be biased upward to zero. On the contrary, if the immigrant inflow into an occupation forces displaced workers to find employment in similar occupations (displaced workers

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[15]We cluster the standard errors at the occupation-year level rather than at the occupation level, because an exogenous shock may be specific to an occupation only in a particular year. Consider, for example, the IT industry in year 2000.

As Wooldridge (2003) and Angrist and Pischke (2009) point out, clustered standard errors computed based on a "small" number of clusters could be misleading. In unreported results, we use White (1980) robust standard errors in square brackets. The robust standard errors for our variable of interest are significantly smaller than the clustered ones reported here.

move from the occupation as office clerks (410) to customer service clerks (420)), our estimates could be biased downward away from zero, as we attribute the total negative wage impact to a single occupation-specific labor supply shock. Counteracting this force, cross-occupation complementarity may weaken the negative wage effects from other occupations. Suppose two occupations are complements, an inflow of immigrants into an occupation (e.g. extraction and building trades workers (710)) can raise labor demand in the complementary occupation (e.g. metal and machinery trades worker (720)).

Without a structural framework, such as the one proposed by Ottaviano and Peri (2011), exact cross-occupation wage elasticities to immigrant shocks cannot be identified. Since our goal is to make sure that our estimates do not include negative wage effects coming from outside the occupation, we continue to use our reduced-form specification but now include measures to control for external immigrant shocks. The results of this new exercise are reported in Table 6. First, we exploit the fact that our unit of observation is at the 3-digit occupation level to include the ratio of Chinese immigrants to natives in other occupations within the same 1-digit occupation group in column (1) (see Table 3 for detailed description of the occupations). As is shown, own-occupation immigrant shock remains negative and significant, while the shock from similar occupations is negative but is statistically insignificant at any conventional levels. These results show that the immigrants' effects on wages are mostly confined within occupations, which support our identification assumption of limited cross-occupation labor mobility. In column (2), instead of controlling for immigrant shocks in similar occupations, we control for shocks in the education group of the worker. The coefficient on the occupation-specific immigrant shock remains significant at the 1 percent level, although the magnitude declines to -1.27. The coefficient on the immigrant shock in the same education group is negative but statistically insignificant. In columns (3) and (4), we repeat the exercises of columns (1) and (2) over a sample that excludes all non-Chinese immigrants (defined as those who came in the past 5 years). Results remain robust.

Ideally, we would also examine the effects of immigrant inflows on employment using individual data. However, with only multiple cross-section data, a study of the displacement effects of immigration at the individual level is not possible. Instead, we examine the relation between the presence of Chinese immigrants and native employment across occupations. The hypothesis is that a larger inflow of Chinese immigrants into an occupation will crowd out natives to other occupations, all else being equal. Table A.2 in the appendix presents these cross-occupation results. As is shown, the coefficients on the ratio of Chinese immigrants to natives are negative but insignificant from Columns (1) through (3), regardless of whether we include

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year or occupation fixed effects. In Columns (4) and (5), when we use first differences instead of levels to parse out occupation fixed effects, we find no evidence that the presence of Chinese immigrants is negatively correlated with native employment across occupations. Figure 6 illustrates the lack of significant relationship between the two variables (both in first difference) for the period 1996-2001. In sum, there is no evidence that immigration affects native employment. These results provide additional support to our approach, which highlights occupation specificity of skills and considers occupations as well-defined skill groups for the current study. The results are also consistent with the lack of evidence of cross-occupation wage effects of immigration, as reported in Table 6.

**The Instrumental Variables Regression Results**     As discussed in Section 4, the results reported in Table 5 and Table 6 are subject to a potential endogeneity problem. Reverse causality may arise if immigrants are confined to low-wage jobs (the "confinement effect"), resulting in more negative correlations reported in Table 5. On the other hand, if the Chinese immigrants select high-wage (or high wage growth) occupations to enter, or decided to migrate to Hong Kong because of the existence of those opportunities, selection could result in an upward bias in the OLS estimates (the "selection effect"). With no prior about the direction of the bias, we use congruence indices discussed in Section 4.3 to construct instruments for the ratios of Chinese immigrants to natives in each occupation. Intuitively, the instrument, $Z_{ct}$, measures the likelihood of immigrants being hired into occupation $c$, and is expected to be positively correlated with the ratio of Chinese immigrants to natives in the first stage of a two-stage-least-squares (2SLS) estimation. Table 7 reports the 2SLS estimation results corresponding to the six specifications in Table 5. We include the same set of control variables and fixed effects. Standard errors are continued to be clustered at the occupation-year level.

   The coefficient on the instrument $Z_{ct}$ is positive and statistically significant (at 1-percent level) in the first-stage regression across all six specifications. Importantly, the Kleibergen-Paap Wald F-statistics of the first stage all exceed the Stock and Yogo (2002) weak ID test critical values by a large margin (of both 10 percent and 25 percent maximal IV size), implying a rejection of the hypothesis of weak instrument at the 5-percent level. In the second stage, all coefficients on the immigrant ratio remain negative, and become more significant economically and statistically. As shown in Column (1), a 1 percentage point increase in the ratio of Chinese immigrants (who came to Hong Kong within the past 5 years) to natives results in about 3.6 percent decrease in natives' monthly salary on average, compared to a less than 2-percent negative

impact based on the OLS estimate (see Table 5). These results imply the dominance of the "selection effect" over the "confinement effect," resulting in an upward bias in the OLS estimates. In other words, the more pronounced effects of immigration reported in Table 7 imply that mainland Chinese immigration has a causal and negative impact on native wages in the same occupation. Also note that once we control for industry-level fixed effects, the impact becomes stronger (Column (2)). When we exclude non-Chinese ($\leq$5-year residence) immigrants from the native sample (Columns (4) - (6)), we continue to observe a significantly negative wage impact, though the magnitude of the coefficients somewhat decreases.

Table 8 reports the 2SLS results, using the instrument proposed in section 4 for the ratio of Chinese immigrants to natives in the occupation. The four columns in the table are parallel to those in Table 6 in terms of the specification used. Controlling for immigrant shocks in similar occupations or in the same education group, the effects of Chinese immigrants entering into the same occupation remain significant and negative, confirming the OLS results in Table 6. Again, the 2SLS results shown in Table 8 indicate that the OLS estimates are biased upward. Our preferred estimate (column (4)), which is also the most conservative, shows that a 1 percentage-point increase in the ratio of Chinese immigrants to natives in an occupation decreases the native wages by 2.8 log points.

### 6.2.2 The Impact of New Chinese Immigrants on Different Native Groups

In Table 9, we use a more restrictive definition of natives by excluding immigrants who came beyond the 5-year cutoff. In Column (1), we relax the definition of immigrants by including those who have resided in Hong Kong up to 10 years. While we still observe a negative impact of the inflows of Chinese immigrants on native wages, the point estimate on the Chinese immigrant ratio decreases from -3.6 in the baseline case to about -2.2. The wage impact on natives due to immigrants who arrived in the host economy more than 5 years ago but less than 10 years would be weaker, compared with the shock coming from more recent immigrants. Part of the reason is that native workers have more time to respond to the inflow of immigrants who came more than 5 years, perhaps by investing in general skills useful for other occupations, which enhance one's outside option. As such, the effect of the inflow of immigrants to Hong Kong 10 years ago would be mitigated by native outflows from the affected occupation, dampening the negative wage impact of immigration. The native outflows suggest that it is possible for native workers to overcome the occupation-specific hurdles, and move from one occupation to another. The results here, however, also show that overcoming such hurdles takes a long time. The costly cross-occupation movement highlights

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the advantage of exploiting the occupation dimension, as with our instrument, to study labor supply *shock*, which is a short-run phenomenon. In Column (2), we further relax the definition of immigrants by including those who have resided in Hong Kong for up to 15 years. Despite the expected sign, the coefficient on the ratio of Chinese immigrants to natives ($\theta_{ct}$) is marginally significant. This result again is consistent with the idea of natives' gradual adjustment to immigrant shocks.[16]

Despite our focus on the impact of Chinese immigrants, we further relax our definition of immigrants by including immigrants who went to Hong Kong within the past 10 or 15 years in Columns (3) and (4), respectively. Note that both the magnitude and significance of the estimated coefficient on the ratio of Chinese immigrants to natives dissipate as the definition of immigrants becomes more inclusive (from $\leq 5$ years to $\leq 15$ years). This is not surprising because an inclusive definition of immigrants implies that much of the labor market effects brought by the policy change has already been mitigated by natives' adjustment over time.

Furthermore, the findings that the magnitude of the immigration impact declines in the inclusiveness of immigrants provide indirect evidence supporting the idea of assimilation of immigrants. Compared to non-Chinese immigrants, it takes relatively shorter time for the Chinese immigrants to assimilate into Hong Kong's labor market, especially for those who speak the same dialect (i.e. Cantonese). Since a more inclusive definition of immigrants includes some of the immigrants who have already successfully adopted to the local working environments, the estimated effects of immigration are weaker as the definition of immigrants moves from $\leq 10$ years to $\leq 15$ years.

The idea of assimilation can be another explanation of the differences in coefficients in columns (1) and (3). When non-Chinese immigrants are included in the "native" sample, the estimated effect of the Chinese immigration is more significant. An explanation is that non-Chinese immigrants face more difficulty in assimilating into the local labor market. Owing to physiological and cultural differences, local employers may continue to perceive this group as immigrants even after they have stayed in Hong Kong for years. They can assimilate into Hong Kong's labor market up to a point (the coefficient increases from $\leq 5$ years to $\leq 10$ years), after which the assimilation effects may disappear, or at least become insufficient to counter other effects such as age that may be correlated with the length of stay and wages. The net result is that Chinese immigrants are more substitutable for other non-Chinese immigrants relative to the natives. For this

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[16]The Hong Kong census for 1991 reports duration of residence in Hong Kong up to only 9 years. In both columns (1) and (2), we define immigrants in 1991 as those who have resided in Hong Kong for less than or equal to 9 years.

reason, the coefficient is economically more significant when these non-Chinese immigrants are included in the "native" sample (column (1)) than that associated with a more restrictive "native" sample (column (3))

### 6.2.3 The Impact of New Chinese Immigrants on Different Groups within an Occupation

To gain an understanding of how the labor market impact of Chinese immigrants varies across demographic and skill groups within an occupation, we interact our variable of interest with different demographic and skill variables. The results are presented in Table 10. In Column (1), we interact the ratio of Chinese immigrants to natives ($\theta_{ct}$) with a female dummy. While the coefficient on the stand-alone immigrant ratio becomes less statistically significant (only significant at the 10-percent level), the coefficient on the interaction term is negative and significant at the 1-percent level. This result has two implications. First, consistent with the observation that working-age females are over-represented in the pool of the Chinese immigrants (see Table 2), female native workers bear the brunt of the negative labor market impact brought by the Chinese immigrants. Specifically, a one percentage point increase in the ratio of Chinese immigrants to natives would result in a 9.595 ($1.931 - 11.525$) log-point decline in monthly salary among the female workers. Second, the labor market outcomes of male native workers appear to be less vulnerable to the influx of these Chinese immigrants.

Columns (2) to (4) of Table 10 show the impacts of Chinese immigrants on different educational groups. In Column (2), we interact the ratio of Chinese immigrants to natives ($\theta_{ct}$) with the education variable, school, which takes values from 1 to 7 and its square (see Appendix). High values indicate higher education levels. The coefficient on the stand-alone immigrant shock, $\theta_{ct}$, is positive and statistically significant at the 5-percent level, indicating that with more immigrants entering into an occupation, the natives of the very low-skilled (school category equal to 1 and 2) within the same occupation actually experience a positive wage impact. Note, however, the interaction term is negative, which suggests that the influx of Chinese immigrants hurt the more educated more *within an occupation*. Given that the skill distribution of the immigrants is skewed towards the lower end of education, these results appear to be counterintuitive. However, the results are consistent with our prior assumption that occupation-specific skills imply costly movement across occupations in the short run. The negative coefficient on the interaction term implies that workers with high-education levels have more occupation-specific skills, and would need to incur a large loss of human capital if they move to another occupation. Consequently, they face a relatively more negative labor market impact as a result of the influx of Chinese immigrants. In columns (3) and (4), we interact the vari-

able of interest with high-school and college dummies, respectively. The extra wage effects for the more skilled natives within an occupation are negative and statistically significant. Specifically, the extra wage effect for the high-school group compared to those without a high school degree is -10.83 log points (column (3)). The within-occupation negative wage effect for the college-educated is even larger, as is reported in column (4).

Finally, we include an interaction term between the ratio of Chinese immigrants to natives ($\theta_{ct}$) and the worker's years of work experience. Since the effect of experience on wages is non-linear (see Table 5), we also interact $\theta_{ct}$ with the square of experience. We find non-linear wage impact of immigration on native workers with different years of work experience. Experienced workers are affected more negatively by the inflows of Chinese immigrants than the less experienced, though the negative impact is weakened at a high level of experience. Specifically, if we evaluate the extra effects at the median value of experience (i.e., 21 years), workers with 21 years of work experience would suffer an extra -5.92 log points wage loss due to the immigrant shock ($\approx 8.024 - 1.18 \times (21) + 0.025 \times (21)^2$), compared to those with zero experience within the same occupation. To the extent that a worker's experience is positively correlated with occupation-specific skills, the results that more experienced natives experience a larger wage impact from immigrant inflows provides indirect support to our approach, which relies on occupation specificity of skills and thus limited short-run cross-occupation mobility. A more experienced worker experiences a larger wage loss partly because the potential wage decline due to a job displacement by immigrants is increasing in the worker's level of occupation-specific skills.

# 7 Conclusion

Using micro-level data, we find evidence that the influx of Chinese immigrants has a significant short-run negative impact on native wages in the same occupation in Hong Kong, when its government substantially increased the number of "one-way" permits for mainland Chinese coming to Hong Kong for family reunion. The negative wage effects are robust to the control of immigrant inflows into similar occupations and to the same education group. Occupation-level regression results show weak effects on native employment.

To tackle endogeneity arising from potential non-random selection of immigrants into occupations, we propose an instrument for the presence of Chinese immigrants, which measures the likelihood of the immigrants being hired into an occupation. Our 2SLS results show that the OLS estimates are biased towards

zero, suggesting that selection by immigrants into different occupations may weaken the negative impact found in the OLS estimates.

The negative wage effects on natives dissipate gradually when we relax our definition of immigrants by considering those who migrated to Hong Kong longer time ago. These results highlight the importance of potential assimilation of Chinese immigrants, as well as natives' endogenous response to the immigrant inflows over a longer time horizon. They also shed light on why our estimated wage impact are larger than those found in previous studies.

We find that the negative wage impact of this wave of immigration is almost entirely driven by the impact on female native workers. Within an occupation, the effects of immigration are more pronounced for natives who are relatively more educated and experienced. These results provide support to our identification assumption, which postulates limited cross-occupation labor mobility in the short run due to the high switching cost accompanied with occupation-specific human capital.

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Figure 1: Immigration to Hong Kong
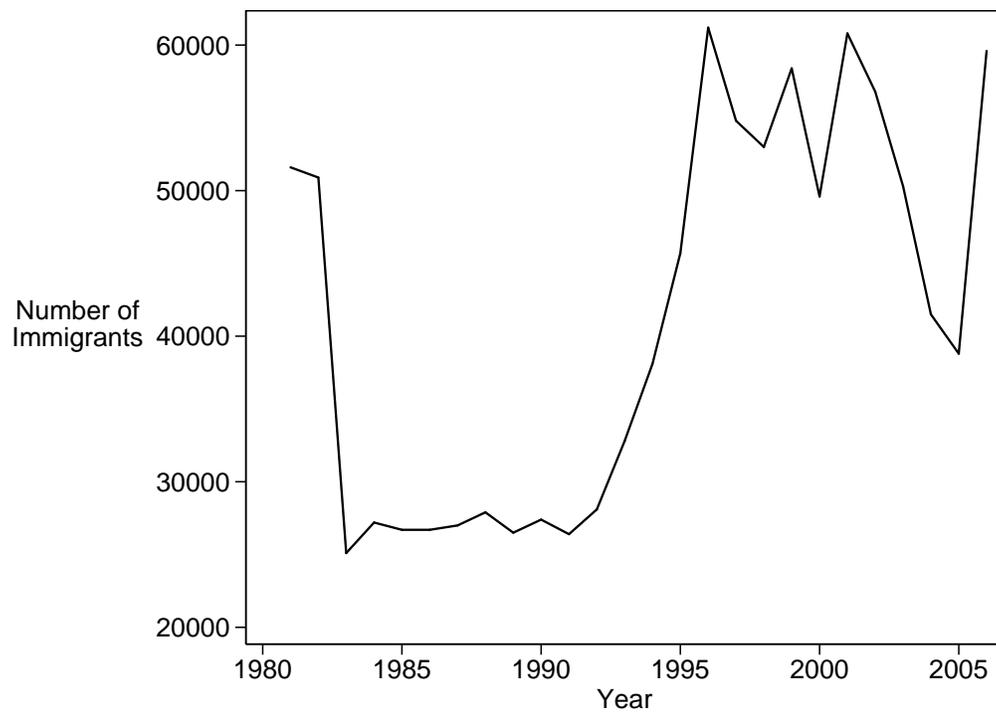


Source: Census and Statistics Department of Hong Kong: *Hong Kong Population Projections* (various years).
Note: Only Chinese immigrants holding "one-way permits" are included.

Figure 2: Job Matching Index in Two Occupation Types

## Legal, Accounting, And Related Professionals



## Sales And Services Elementary Occupations
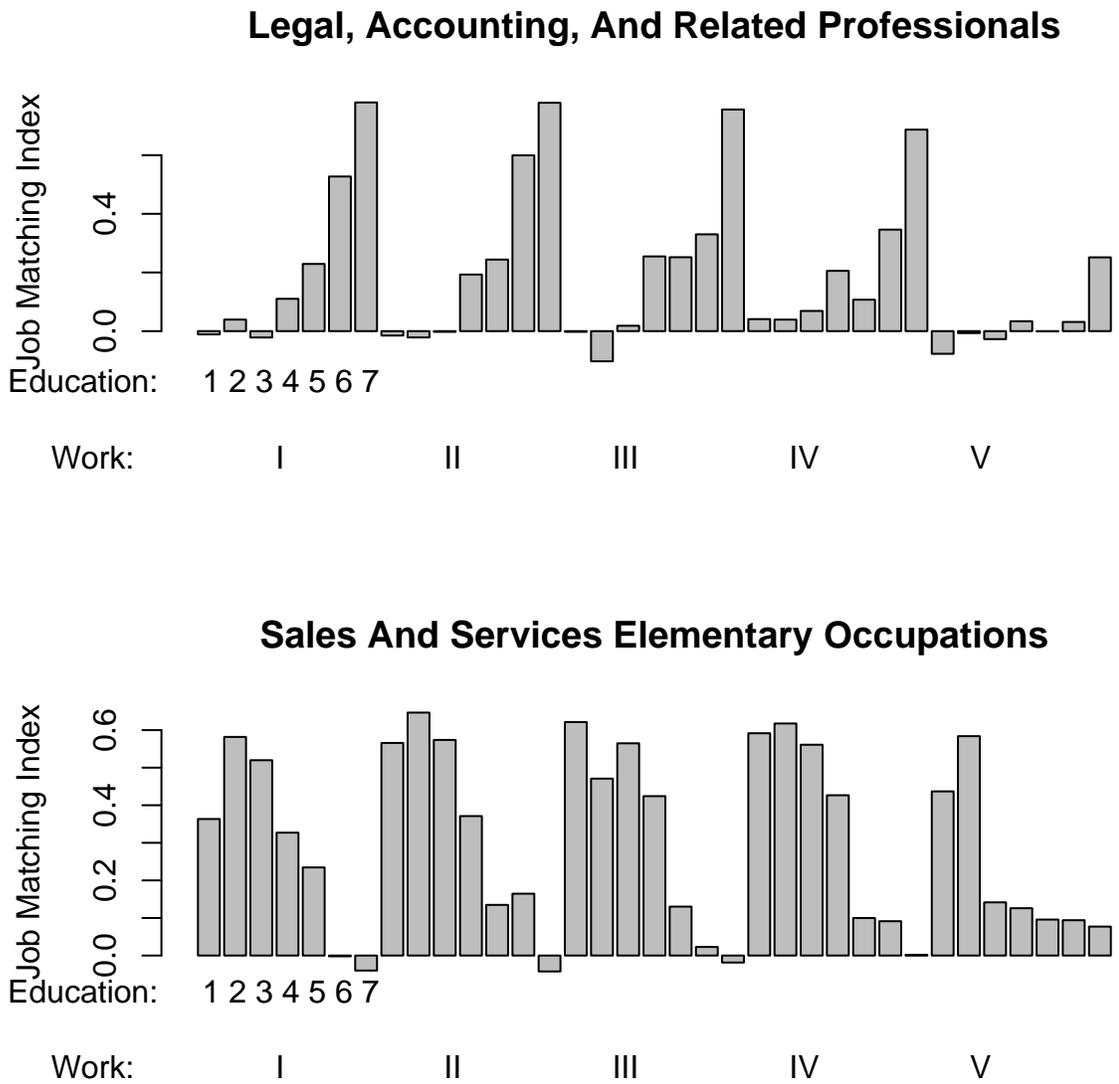


Notes: There are seven education levels (denoted by 1-7) and five work experience levels (denoted by I-V). See the Appendix for detailed grouping procedure.

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Figure 3: Correlation Between the Ratio of Chinese Immigrants to Natives and the IV Across Occupations
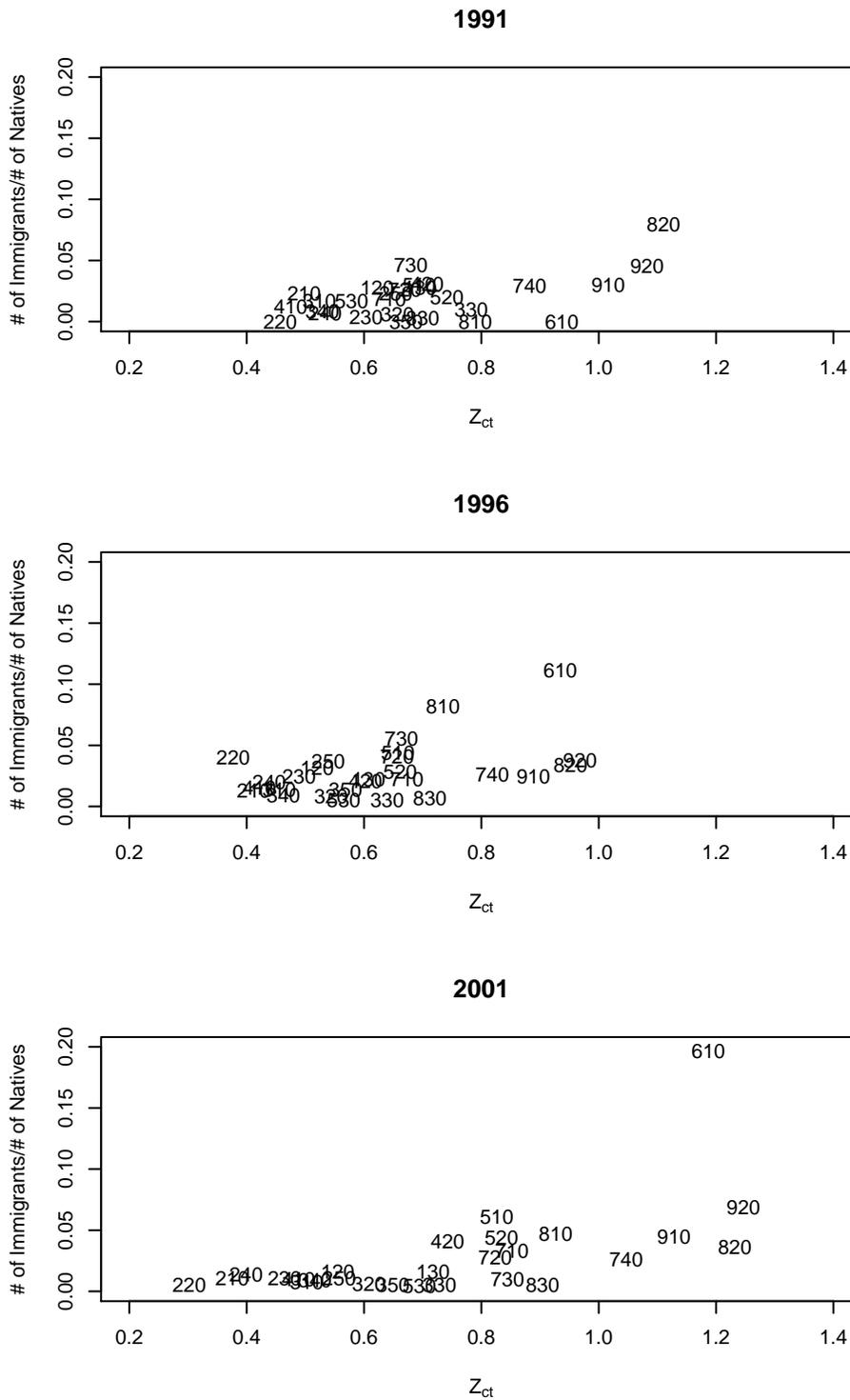


Notes: A person is considered a Chinese immigrant if he/she was born in mainland China, and has resided in Hong Kong for less than or equal to 5 years. See Table 3 for occupation coding.

Figure 4: The Relationship Between ln(Average Monthly Salary of Natives) and the Ratio of Chinese Immigrants to Natives Across Occupations, 2001
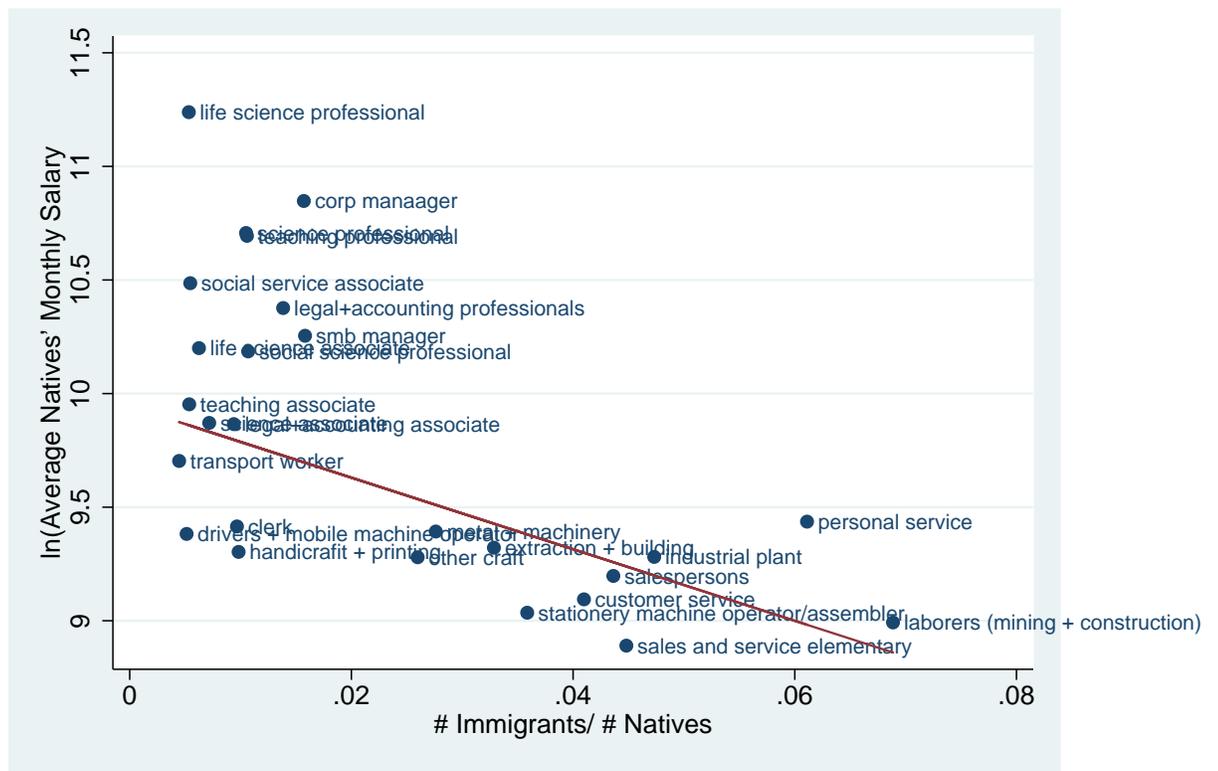


Notes: Weighted by the size of employment by occupation. Coefficient = -15.750; t-stat=-2.61. "Agricultural and fishery" occupation is excluded.

Figure 5: 1996-2001 Change in ln(Average Monthly Salary of Natives) on Change in the Ratio of Chinese Immigrants and Natives Across Occupations
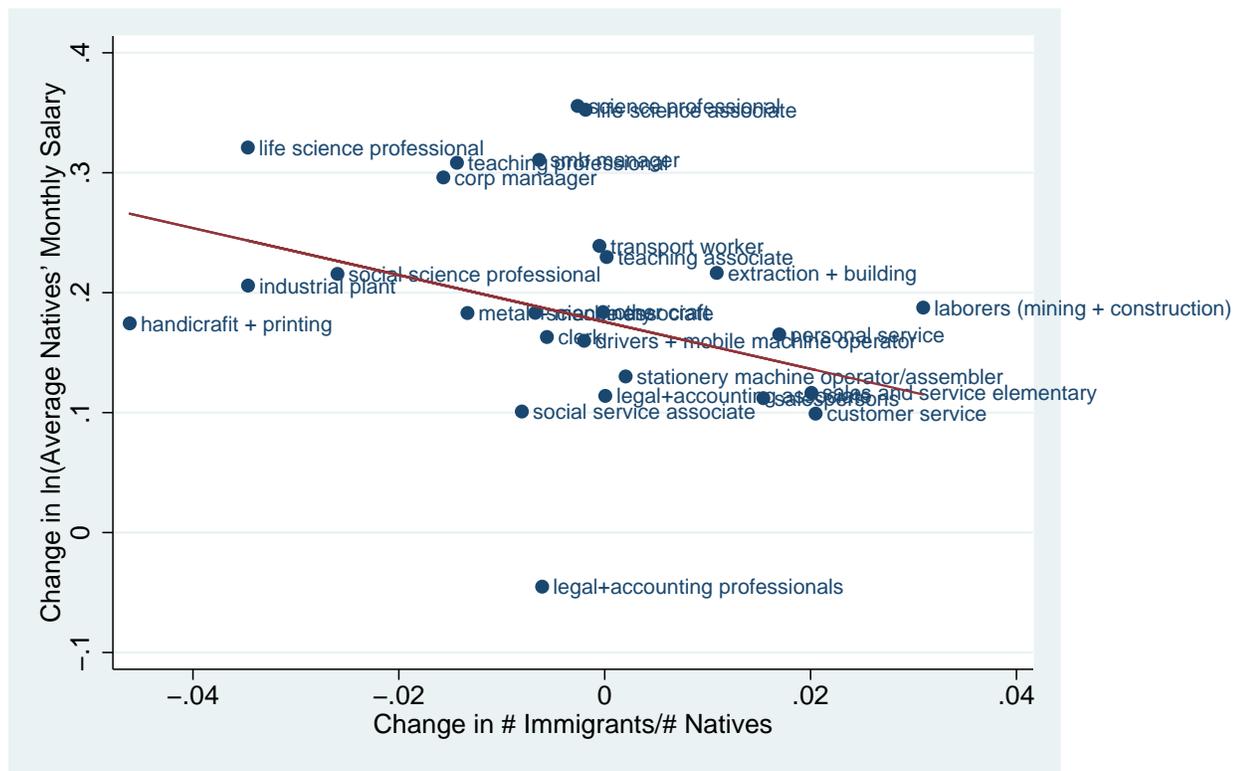


Notes: Weighted by the size of employment by occupation. Coefficient=-2.038; t-stat=-2.66. "Agricultural and fishery" occupation is excluded.

Figure 6: 1996-2001 Change in ln(Native Employment) on Change in the Ratio of Chinese Immigrants to Natives Across Occupations
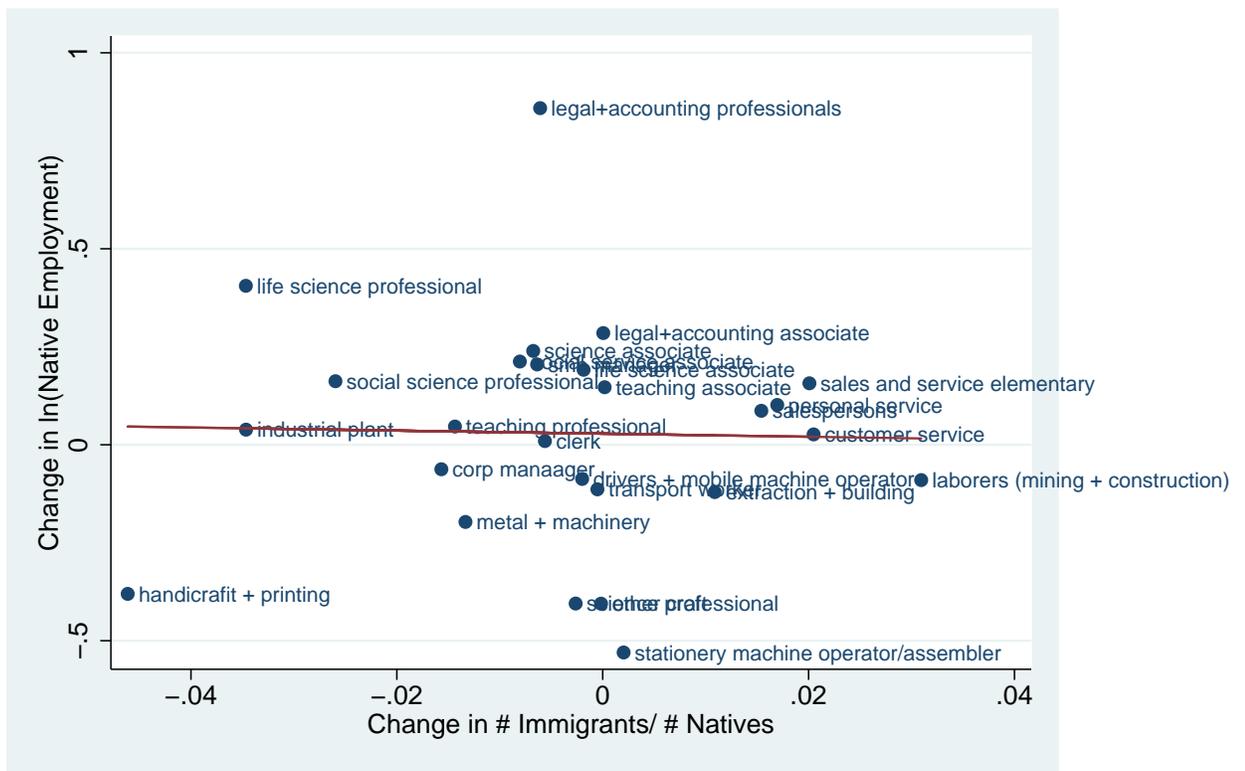


Notes: Coefficient = -0.393; t-stat = -0.13; 26 occupations; Agricultural and fishery occupation is excluded. Adding it will strengthen the negative relation slightly.

Figure 7: 1996-2001 (Ratio of Chinese Immigrants to Natives in Other Occupations within the same 1-digit Occupation Group) against (Ratio of Chinese Immigrants to Natives) across 3-digit occupations
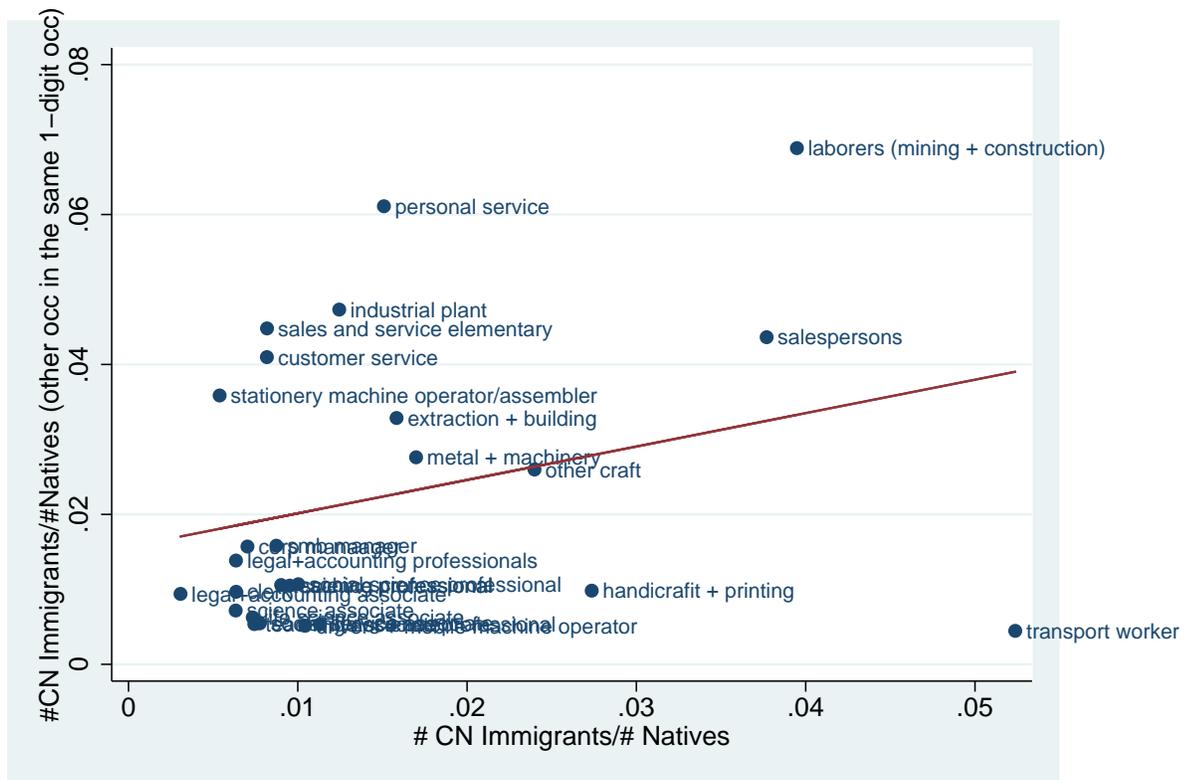


Notes: 26 occupations; Coefficient = 0.446; t-stat = 0.95

Table 1: Immigrant Population by Immigrants' Birth Place

| Birth Place | 1991 | 1996 | 2001 | Change 1991-1996 | Change 1991-2001 | As a % of Change in Immigrants 1991-1996 | As a % of Change in Immigrants 1991-2001 |
|---|---|---|---|---|---|---|---|
| Mainland China (including Taiwan) | 1,845,700 | 2,022,400 | 2,192,140 | 176,700 | 346,440 | 84.5 | 90.7 |
| Macau | 64,900 | 74,700 | 72,540 | 9,800 | 7,640 | 4.7 | 2 |
| UK | 26,200 | 31,100 | 23,500 | 4,900 | -2,700 | 2.3 | -0.7 |
| Japan | 10,400 | 17,500 | 15,700 | 7,100 | 5,300 | 3.4 | 1.4 |
| Philippines | 66,300 | 124,600 | 137,560 | 58,300 | 71,260 | 27.9 | 18.7 |
| Thailand | 14,500 | 19,300 | 20,720 | 4,800 | 6,220 | 2.3 | 1.6 |
| India, Pakistan, Bangladesh & Sri Lanka | 15,200 | 27,000 | 26,260 | 11,800 | 11,060 | 5.6 | 2.9 |
| Australia & New Zealand | 6,800 | 8,000 | 8,780 | 1,200 | 1,980 | 0.6 | 0.5 |
| USA | 10,400 | 19,000 | 15,020 | 8,600 | 4,620 | 4.1 | 1.2 |
| Canada | 5,400 | 11,100 | 16,420 | 5,700 | 11,020 | 2.7 | 2.9 |
| Others | 114,100 | 34,300 | 33,340 | -79,800 | -80,760 | -38.2 | -21.1 |
| Total Population | 5,815,300 | 6,466,600 | 6,730,330 | 651,300 | 915,030 | | |

Source: Hong Kong Census Household Survey data (various years).

Notes: Population figures are adjusted for the size difference across census samples. Immigrants in this table are defined simply by people born outside of Hong Kong. In what follows, we adopt a more restrictive definition of immigrants, as the Chinese immigrants assimilate into Hong Kong society fairly quickly.

Table 2: Summary Statistics

| | Natives | | | Chinese Immigrants | | |
|---|---|---|---|---|---|---|
| | 1991 | 1996 | 2001 | 1991 | 1996 | 2001 |
| *All* | | | | | | |
| Age | 36.7 | 37.56 | 38.39 | 34.29 | 34.91 | 35.46 |
| Year of Schooling | 8.62 | 9.66 | 10.25 | 8.41 | 9.53 | 8.72 |
| Labor Participation Rate (%) | 59.36 | 60.64 | 59.63 | 54.29 | 53.43 | 42.14 |
| Female (%) | 48.12 | 49.48 | 50.64 | 63.62 | 67.25 | 77.3 |
| | | | | | | |
| *In the Workforce (Age $\geq$ 16 & $\leq$ 65)* | | | | | | |
| Age | 35.07 | 36.11 | 37.14 | 33.84 | 34.65 | 36.49 |
| Year of Schooling | 9.31 | 10.31 | 10.87 | 8.82 | 9.86 | 9.08 |
| Female (%) | 39.21 | 41.99 | 46.53 | 58.33 | 56.67 | 70.9 |
| Nominal Monthly Wage | 7254.89 | 13173.11 | 15536.78 | 4912.66 | 9639.54 | 8505.95 |
| Real Monthly Wage | 10360.82 | 13173.11 | 16150.09 | 7015.85 | 9639.54 | 8841.72 |

Source: Hong Kong Census Household Survey data (various years).

Notes: A person is considered a Chinese immigrant if he/she was born in mainland China, and has resided in Hong Kong for less than or equal to 5 years. A person is considered to be in the workforce if he/she was not a part-time student, had positive salary, and was currently active in the labor market.

Table 3: Distribution of Natives and Immigrants Across Occupations

| Occupation Code | Occupation | Year | | | | | |
|---|---|---|---|---|---|---|---|
| | | % Chinese Immigrants in | | | % Natives in | | |
| | | 1991 | 1996 | 2001 | 1991 | 1996 | 2001 |
| 120 | corporate managers | 3.18 | 6.12 | 2.39 | 3.08 | 4.65 | 4.16 |
| 130 | small business managers | 1.41 | 2.64 | 1.93 | 1.38 | 2.84 | 3.32 |
| 210 | physical, mathematical and engineering science professionals | 1.24 | 0.99 | 0.44 | 1.41 | 1.80 | 1.15 |
| 220 | life science and health professionals | 0.00 | 0.33 | 0.06 | 0.14 | 0.20 | 0.28 |
| 230 | teaching professionals | 0.18 | 1.49 | 0.55 | 1.20 | 1.42 | 1.42 |
| 240 | legal, accounting, business and related professionals | 0.18 | 0.83 | 1.13 | 0.66 | 0.99 | 2.23 |
| 250 | social science and other professionals | 0.53 | 1.16 | 0.33 | 0.61 | 0.75 | 0.84 |
| 310 | physical, mathematical and engineering science associate professionals | 1.77 | 1.82 | 0.99 | 2.75 | 3.12 | 3.77 |
| 320 | life science and health associate professionals | 0.35 | 0.50 | 0.39 | 1.53 | 1.46 | 1.68 |
| 330 | teaching associate professionals | 0.53 | 0.33 | 0.33 | 1.40 | 1.52 | 1.68 |
| 340 | legal, accounting, business and related associate professionals | 1.77 | 2.64 | 2.95 | 5.55 | 6.76 | 8.56 |
| 350 | social services and other associate professionals | 0.00 | 0.33 | 0.14 | 0.62 | 0.58 | 0.69 |
| 410 | office clerks | 7.42 | 10.25 | 5.45 | 15.86 | 15.99 | 15.38 |
| 420 | customer service clerks | 2.83 | 2.48 | 4.24 | 2.44 | 2.89 | 2.82 |
| 510 | personal and protective services workers | 9.89 | 16.03 | 20.45 | 8.74 | 8.67 | 9.14 |
| 520 | salespersons and models | 3.00 | 5.79 | 8.12 | 3.96 | 4.89 | 5.08 |
| 530 | transport and other services workers | 0.35 | 0.17 | 0.11 | 0.55 | 0.79 | 0.67 |
| 610 | market-oriented agricultural and fishery workers | 0.00 | 0.50 | 0.58 | 0.21 | 0.11 | 0.08 |
| 710 | extraction and building trades workers | 3.18 | 3.97 | 4.38 | 4.59 | 4.31 | 3.64 |
| 720 | metal and machinery trades workers | 5.83 | 8.60 | 3.96 | 5.92 | 5.01 | 3.92 |
| 730 | precision, handicraft, printing and related trades workers | 2.47 | 2.48 | 0.25 | 1.43 | 1.06 | 0.69 |
| 740 | other craft and related workers | 3.36 | 2.64 | 1.46 | 3.05 | 2.41 | 1.53 |
| 810 | industrial plant operators | 0.00 | 0.83 | 0.41 | 0.18 | 0.24 | 0.24 |
| 820 | stationery machine operators and assemblers | 25.62 | 4.13 | 2.15 | 8.57 | 2.92 | 1.63 |
| 830 | drivers and mobile machine operators | 0.53 | 1.65 | 0.91 | 5.17 | 5.53 | 4.83 |
| 910 | sales and services elementary occupations | 16.08 | 16.86 | 29.76 | 14.14 | 16.27 | 18.13 |
| 920 | laborers in mining, construction, manufacturing, agricultural and fishing | 8.30 | 4.46 | 6.17 | 4.87 | 2.81 | 2.44 |

Source: Hong Kong Census Household Survey data (various years).

Notes: The definition of Chinese immigrants is described in Table 2. Natives include anyone other than Chinese immigrants.

Table 4: Ratio of Chinese Immigrants to Natives by Occupation (in %)

| Occupation Code | Occupation | Year | | |
|---|---|---|---|---|
| | | 1991 | 1996 | 2001 |
| 120 | corporate managers | 2.75 | 3.14 | 1.57 |
| 130 | small business managers | 2.74 | 2.22 | 1.58 |
| 210 | physical, mathematical and engineering science professionals | 2.34 | 1.31 | 1.05 |
| 220 | life science and health professionals | 0.00 | 4.00 | 0.53 |
| 230 | teaching professionals | 0.39 | 2.49 | 1.06 |
| 240 | legal, accounting, business and related professionals | 0.71 | 1.99 | 1.38 |
| 250 | social science and other professionals | 2.33 | 3.66 | 1.07 |
| 310 | physical, mathematical and engineering science associate professionals | 1.72 | 1.39 | 0.72 |
| 320 | life science and health associate professionals | 0.62 | 0.81 | 0.63 |
| 330 | teaching associate professionals | 1.01 | 0.52 | 0.54 |
| 340 | legal, accounting, business and related associate professionals | 0.85 | 0.93 | 0.94 |
| 350 | social services and other associate professionals | 0.00 | 1.35 | 0.55 |
| 410 | office clerks | 1.25 | 1.53 | 0.97 |
| 420 | customer service clerks | 3.09 | 2.05 | 4.10 |
| 510 | personal and protective services workers | 3.02 | 4.42 | 6.11 |
| 520 | salespersons and models | 2.02 | 2.82 | 4.36 |
| 530 | transport and other services workers | 1.71 | 0.50 | 0.45 |
| 610 | market-oriented agricultural and fishery workers | 0.00 | 11.11 | 19.63 |
| 710 | extraction and building trades workers | 1.85 | 2.20 | 3.29 |
| 720 | metal and machinery trades workers | 2.63 | 4.09 | 2.76 |
| 730 | precision, handicraft, printing and related trades workers | 4.62 | 5.60 | 0.98 |
| 740 | other craft and related workers | 2.93 | 2.61 | 2.60 |
| 810 | industrial plant operators | 0.00 | 8.20 | 4.73 |
| 820 | stationery machine operators and assemblers | 7.98 | 3.38 | 3.59 |
| 830 | drivers and mobile machine operators | 0.27 | 0.71 | 0.51 |
| 910 | sales and services elementary occupations | 3.03 | 2.47 | 4.48 |
| 920 | laborers in mining, construction, manufacturing, agricultural and fishing | 4.55 | 3.79 | 6.89 |

Source: Hong Kong Census Household Survey data (various years).
Notes: The definition of Chinese immigrants is described in Table 2. Natives include anyone other than Chinese immigrants.

Table 5: OLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: Individual Level with Different Definitions of Natives

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Definition of Immigrants (resided in Hong Kong for) | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs |
| Industry Fixed-Effects | No | Yes | Yes | No | Yes | Yes |
| Definition of Natives | Anyone Other Than Chinese Immigrants | | | Non-Immigrants | | |
| Ratios of Chinese Immigrants to Natives ($\theta_{ct}$) | -1.745** | -1.804** | -1.797** | -1.526** | -1.609** | -1.601** |
| | (0.768) | (0.727) | (0.766) | (0.695) | (0.664) | (0.715) |
| School | 0.049 | 0.045 | 0.044 | 0.071** | 0.064** | 0.064** |
| | (0.035) | (0.032) | (0.032) | (0.032) | (0.030) | (0.030) |
| School$^2$ | 0.005 | 0.005* | 0.005* | 0.004 | 0.004 | 0.004 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Experience | 0.046*** | 0.046*** | 0.046*** | 0.048*** | 0.047*** | 0.047*** |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| Experience$^2$ | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Married | 0.082*** | 0.082*** | 0.082*** | 0.089*** | 0.090*** | 0.090*** |
| | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) |
| Male | 0.265*** | 0.255*** | 0.255*** | 0.238*** | 0.233*** | 0.233*** |
| | (0.060) | (0.053) | (0.053) | (0.051) | (0.048) | (0.048) |
| ln(Employment) | | | -0.030 | | | -0.017 |
| | | | (0.034) | | | (0.028) |
| Number of Obs. | 179647 | 179586 | 179586 | 169952 | 169892 | 169892 |
| $R^2$ | 0.589 | 0.594 | 0.594 | 0.559 | 0.564 | 0.564 |

Notes: Standard errors clustered at the occupation-year level are reported in parentheses. All regression models include fixed effects of census year and occupation (3-digit level). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 5 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 5 years. Native workers are defined either as anyone other than Chinese immigrants or non-immigrants. ***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Table 6: OLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: Controlling for Immigrant Shocks in Similar Occupations

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Definition of Immigrants (resided in Hong Kong for) | $\leq 5$ yrs | $\leq 5$ yrs | $\leq 5$ yrs | $\leq 5$ yrs |
| Industry Fixed-Effects | Yes | Yes | Yes | Yes |
| Individual Controls | School, School$^2$, Experience, Experience$^2$, Married, and Male | | | |
| Occupation Controls | ln(Employment) | | | |
| Definition of Natives | Anyone Other Than Chinese Immigrants | | Non-Immigrants | |
| Ratios of Chinese Immigrants to Natives ($\theta_{ct}$) | -1.882*** | -1.271** | -1.767*** | -1.141** |
| | (0.650) | (0.606) | (0.584) | (0.529) |
| Ratio of Chinese (Same 1-digit Occupation Group) | -0.166 | | -0.403 | |
| | (0.751) | | (0.630) | |
| Ratio of Chinese (Same Education Group) | | -0.958 | | -1.167 |
| | | (1.135) | | (0.855) |
| Number of Obs. | 179408 | 179586 | 169715 | 169892 |
| $R^2$ | 0.594 | 0.594 | 0.565 | 0.565 |

Notes: Standard errors clustered at the occupation-year level are reported in parentheses. All regression models include fixed effects of census year and occupation (3-digit level). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 5 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 5 years. Native workers are defined either as anyone other than Chinese immigrants or non-immigrants. ***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Table 7: 2SLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: Individual Level with Different Definitions of Natives

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Definition of Immigrants (resided in Hong Kong for) | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs | $\leq$ 5 yrs |
| Industry Fixed-Effects | No | Yes | Yes | No | Yes | Yes |
| Individual Controls | School, School$^2$, Experience, Experience$^2$, Married, and Male | | | | | |
| Occupation Controls | | | ln(Employment) | | | ln(Employment) |
| Definition of Natives | Anyone Other Than Chinese Immigrants | | | Non-Immigrants | | |
| **Second Stage** | | | | | | |
| Ratios of Chinese Immigrants to Natives ($\theta_{ct}$) | -3.614*** | -3.738*** | -3.623*** | -3.457*** | -3.666*** | -3.390*** |
| | (1.224) | (1.158) | (0.967) | (1.196) | (1.140) | (0.904) |
| $R^2$ | 0.589 | 0.593 | 0.593 | 0.559 | 0.564 | 0.564 |
| **First Stage** | | | | | | |
| $Z_{ct}$ | 0.093*** | 0.093*** | 0.126*** | 0.091*** | 0.091*** | 0.127*** |
| | (0.017) | (0.017) | (0.014) | (0.017) | (0.017) | (0.014) |
| Kleibergen-Paap F stats | 31.318 | 31.289 | 85.847 | 29.068 | 29.034 | 78.806 |
| Number of Obs. | 179647 | 179586 | 179586 | 169952 | 169892 | 169892 |

Notes: Standard errors clustered at the occupation-year level are reported in parentheses. Other covariates not being displayed are school and its square, experience and its square, marital status, and gender. All regression models include fixed effects of census year and occupation (3-digit level). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 5 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 5 years. Native workers are defined either as anyone other than Chinese immigrant or non-immigrant workers. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. The instrument for the ratio of Chinese immigrants to natives is $Z_{ct}$ (see Equation 4 in text).

Table 8: 2SLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: External Shocks

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Individual Controls | School, School$^2$, Experience, Experience$^2$, Married, and Male | | | |
| Occupation Controls | ln(Employment) | | | |
| Definition of Natives | Anyone Other Than Chinese Immigrants | | Non-Immigrants | |
| | | | | |
| **Second Stage** | | | | |
| Ratios of Chinese Immigrants to Natives ($\theta_{ct}$) | -3.649*** | -3.218*** | -3.357*** | -2.827*** |
| | (1.032) | (1.182) | (0.954) | (1.055) |
| Ratio of Chinese (Same 1-digit Occupation Group) | 0.813 | | 0.499 | |
| | (1.144) | | (0.912) | |
| Ratio of Chinese (Same Education Group) | | -0.680 | | -0.923 |
| | | (1.190) | | (0.913) |
| $R^2$ | 0.589 | 0.594 | 0.559 | 0.564 |
| | | | | |
| **First Stage** | | | | |
| $Z_{ct}$ | 0.123*** | 0.126*** | 0.124*** | 0.126*** |
| | (0.011) | (0.014) | (0.011) | (0.015) |
| Kleibergen-Paap F-stat | 128.691 | 82.454 | 123.457 | 74.957 |
| Number of Obs. | 179469 | 179586 | 169775 | 169892 |

Notes: Standard errors clustered at occupation-year level are reported in parentheses. Other covariates not being displayed are school and its square, experience and its square, marital status, and gender. All regression models include fixed effects of census year, occupation (3-digit level), and industry (1-digit level). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 5 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 5 years. Native workers are defined either as anyone other than Chinese immigrant or non-immigrant workers. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. The instrument for the ratio of Chinese immigrants to natives is $Z_{ct}$ (see Equation 4 in text).

Table 9: 2SLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: Individual Level with Different Definitions of Immigrants

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Definition of Immigrants (resided in Hong Kong for) | $\leq 10$ yrs | $\leq 15$ yrs | $\leq 10$ yrs | $\leq 15$ yrs |
| Individual Controls | School, School$^2$, Experience, Experience$^2$, Married, and Male | | | |
| Occupation Controls | ln(Employment) | | | |
| Definition of Natives | Anyone Other Than Chinese Immigrants | | Non-Immigrants | |
| | | | | |
| Second Stage | | | | |
| Ratios of Chinese Immigrants to Natives ($\theta_{ct}$) | -2.222*** | -3.514* | -1.590** | -2.305** |
| | (0.789) | (1.823) | (0.618) | (0.991) |
| $R^2$ | .595 | .597 | .561 | .563 |
| | | | | |
| First Stage | | | | |
| $Z_{ct}$ | 0.097*** | 0.047*** | 0.097*** | 0.048*** |
| | (0.017) | (0.014) | (0.017) | (0.015) |
| Kleibergen-Paap F-stat | 34.569 | 10.489 | 32.285 | 10.701 |
| Number of Obs. | 175146 | 171003 | 161803 | 156443 |

Notes: Standard errors clustered at occupation-year level are reported in parentheses. Other covariates not being displayed are school and its square, experience and its square, marital status, and gender. All regression models include fixed effects of census year, occupation (3-digit level), and industry (1-digit level). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 10 or 15 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 10 or 15 years. Native workers are defined either as anyone other than Chinese immigrant or non-immigrant workers. The 1991 census data record immigrants' duration of residence in Hong Kong up to 9 years. Columns (2) and (4), thus, do not contain the 1991 census data, while in Columns (1) and (3), we replace the 10-year immigrant definition with a 9-year one when analyzing the 1991 census data. ***, ** and * denote 1%, 5% and 10% significance levels, respectively. The instrument for the ratio of Chinese immigrants to natives is $Z_{ct}$ (see Equation 4 in text).

Table 10: 2SLS Estimation of the Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation: Gender and Different Education and Experience Levels

| Dep. Var. = ln(monthly salary native) | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Definition of Natives | Non-Immigrants | | | | |
| $\theta_{ct}$ Interacted With $X$ | Female Dummy | School | High School Dummy | College Dummy | Experience & Experience$^2$ |
| Individual Controls | School, School$^2$, Experience, Experience$^2$, Married, and Male | | | | |
| Occupation Controls | ln(Employment) | | | | |
| Second Stage | | | | | |
| Ratios of Chinese Immigrants to Natives $(\theta_{ct}, \beta_1)$ | 1.931* | 8.267** | 1.808 | -1.413* | 8.024*** |
| | (1.143) | (3.849) | (1.620) | (0.822) | (2.698) |
| $X$ | 0.089*** | 0.309*** | 0.441*** | 0.222** | 0.081*** |
| | (0.031) | (0.111) | (0.153) | (0.087) | (0.007) |
| $\theta_{ct} \times X$ (, $\beta_2$) | -11.525*** | -4.865* | -12.633*** | -14.565*** | -1.180*** |
| | (1.481) | (2.618) | (4.117) | (3.649) | (0.233) |
| $X^2$ | | -0.014 | | | -0.002*** |
| | | (0.013) | | | (0.000) |
| $\theta_{ct} \times X^2$ (, $\beta_3$) | | 0.039 | | | 0.025*** |
| | | (0.349) | | | (0.004) |
| Extra Effects | -9.595*** | -5.978*** | -10.826*** | -15.977*** | -5.919*** |
| | (1.368) | (1.925) | (2.869) | (3.394) | (1.166) |
| First Stage (1) | | | | | |
| $\overline{Z_{ct}}$ | 0.126*** | 0.128*** | 0.127*** | 0.127*** | 0.128*** |
| | (0.014) | (0.014) | (0.014) | (0.014) | (0.015) |
| | [51.00] | [28.63] | [44.02] | [42.09] | [39.34] |
| First Stage (2) | | | | | |
| $\overline{Z_{ct} \times X}$ | 0.059*** | 0.039*** | 0.049*** | 0.053*** | 0.071*** |
| | (0.008) | (0.020) | (0.008) | (0.008) | (0.020) |
| | [52.05] | [46.06] | [36.29] | [26.87] | [48.74] |
| First Stage (3) | | | | | |
| $\overline{Z_{ct} \times X^2}$ | | 0.068*** | | | 0.042*** |
| | | (0.018) | | | (0.014) |
| | | [41.39] | | | [47.15] |
| Number of Obs. | 169892 | 169892 | 169892 | 169892 | 169892 |
| $R^2$ | 0.57 | 0.556 | 0.552 | 0.565 | 0.565 |

Notes: Standard errors clustered at the occupation-year level are reported in parentheses. Kleibergen-Paap F-statistics are reported in square brackets. Other covariates not being displayed are school and its square, experience and its square, marital status, and gender. All regression models include fixed effects of census year, occupation (3-digit level), and industry (1-digit level). The instrument for the ratio of Chinese immigrants to natives is $Z_{ct}$ (see Equation 4 in text). A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than or equal to 5 years. A worker is classified as an immigrant if he/she satisfied the following criteria: i) born outside Hong Kong and ii) had resided in Hong Kong for less than or equal to 5 years. Native workers are defined as non-immigrant workers. Extra effect of an increase in the ratio of Chinese immigrants to natives is calculated by the formula $(\beta_1 + \beta_2)$ if a dummy is used in Columns (1), (3) and (4). If the group variable is not a dummy (in Columns (2) and (5)), then extra effect is calculated at the median value $(\beta_1 + \beta_2 \times X_{med})$. ***, ** and * denote 1%, 5% and 10% significance levels, respectively.

# Appendix

## Data Source

Our main data source is the micro-data from the Hong Kong Population Censuses. We use the 1-percent sample of the 1991 and 1996 census surveys and the 5-percent sample of the 2001 census survey. We divide education levels into seven groups: Group 1 with highest education attained $\leq$ Grade 3; Group 2 $>$ Grade 3 and $\leq$ Grade 6; Group 3 $>$Grade 6 and $\leq$Grade 9; Group 4: $>$ Grade 9 & $\leq$ Grade 11; Group 5: $>$ Grade 11 & $\leq$ Grade 13; and Group 6 $>$Grade 13. We take the difference between a worker's age at which the census was conducted and the age at which one typically receives the worker's highest education level as the worker's work experience. We further divide work experience into five groups, with $>$1 & $\leq$10 years as Group 1, $>$10 & $\leq$20 years as Group 2, $>$20 & $\leq$30 years as Group 3, $>$30 & $\leq$40 years as Group 4, and $>$40 & $\leq$50 years as Group 5. The sample is restricted to employed people between the ages of 16 and 65 inclusive. The wage is measured by the monthly income of main employment. The definition of immigrants is described in Table 2. The GDP deflator used to deflate nominal income to real income is from the IMF's International Financial Statistics.

Table A.1: The Impact of Chinese Immigrants' Labor Supply on Natives' Wages by Occupation

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Definition of Natives | Anyone Other Than Chinese Immigrants ($\leq$ 5 yrs) | | | | |
| Dep. Var. | ln(avg. monthly salary) | | | $\Delta$ ln(avg. monthly salary) | |
| Ratio of Chinese Immigrants to Natives ($\theta_{ct}$) | -12.452*** | -12.672*** | -1.829** | | |
| | (3.930) | (0.900) | (1.360) | | |
| $\Delta$ Ratio of Chinese Immigrants to Natives | | | | -1.486** | -1.573* |
| | | | | (0.648) | (0.631) |
| Year FE | N | Y | Y | N | Y |
| Occupation FE | N | N | Y | N | N |
| Number of Obs. | 81 | 81 | 81 | 54 | 54 |
| $R^2$ | 0.168 | 0.255 | 0.992 | 0.096 | 0.114 |

Notes: Observations in all regressions are weighted by the size of employment of each occupation (27 of them). Analytic-weighted standard errors are reported in parentheses. A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is then classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than and equal to 5 years. Native workers are defined as anyone other than Chinese immigrants. ***, ** and * denote 1%, 5% and 10% significance levels, respectively.

Table A.2: Impact of Chinese Immigrant Inflow on Native Employment by Occupations

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Definition of Natives | Anyone Other Than Chinese Immigrants ($\leq$ 5 yrs) | | | | |
| Dep. Var. | ln(employment) | | | $\Delta$ ln(employment) | |
| Ratio of Chinese Immigrants to Natives | -7.867 | -8.632 | -1.306 | | |
| ($\theta_{ct}$) | (6.958) | (6.999) | (2.913) | | |
| $\Delta$ Ratio of Chinese Immigrants to Natives | | | | 0.137 | -0.553 |
| | | | | (2.558) | (2.705) |
| Year FE | N | Y | Y | N | Y |
| Occupation FE | N | N | Y | N | N |
| Number of Obs. | 81 | 81 | 81 | 54 | 54 |
| $R^2$ | 0.031 | 0.044 | 0.961 | 0.00012 | 0.085 |

Notes: Observations in all regressions are weighted by the size of employment of each occupation (27 of them). Analytic-weighted standard errors are reported in parentheses. A person is defined as a worker if he/she i) was aged 16-65, ii) was not a part-time student, iii) had positive salary, iv) and was coded in the census as currently active in the labor market. A worker is then classified as a Chinese immigrant if he/she satisfied the following criteria: i) born in mainland China and ii) had resided in Hong Kong for less than and equal to 5 years. Native workers are defined as anyone other than Chinese immigrants. ***, ** and * denote 1%, 5% and 10% significance levels, respectively.