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# The Effect of China's One-Child Policy on Male and Female Immigrant Earnings:Does it Pay to be an Only Child?

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*An extended treatment of this topic was awarded University Honors and may be found in the Department of Economics Honors Projects collection.*

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Key Words: immigration, Chinese, women, human capital theory

## I. Introduction

China's one-child policy is one of the most controversial population control measures implemented in modern society. Enacted in 1979, the purpose of the policy was to alleviate the pressures of an increasingly growing population by using economic and social incentives to encourage families to have only one child. Throughout the 60's and 70's, the average family in China had 5.8 children (Fung 2014). After its implementation in 1980, this number decreased to 2.3 (Fung 2014). The drastic decline in the fertility rate had a surprising effect on the educational attainment of Chinese daughters born under the policy (Fong 2002). Traditionally, in families with multiple children, parents had to decide how to distribute limited educational resources. Because of cultural and economic reasons, families disproportionally invested these resources in the eldest son. The one-child policy drastically changed the distribution of family investments in education by altering the resource allocation decision. Under the one-child policy, families' only child became the sole recipient of educational resources, regardless of gender. In a study that compared the educational attainments of Chinese daughters in single-child households to the educational attainments of Chinese daughters in households with brothers, Fong (2002) finds that Chinese daughters in one-child households systematically attain significantly higher levels of education than those with brothers or multiple children (Fong 2002).

The implications of these findings for the United States are most directly manifested in the way the one-child policy affected the characteristics of immigrants from China. As of 2012, the population of Chinese women in the United States was 1,283,000, comprising 6.1% of all foreign-born females (American Immigration Council 2012). Given that this population is increasing, whether the educational attainment of Chinese women is reflected in the immigrant population will have important implications.

Assuming that, like their home-country counterparts, the one-child policy had a positive impact on the educational attainment of Chinese female immigrants, human capital theory suggests that there

should be a corresponding increase in earnings. First, this paper assess the educational attainment gap between Chinese immigrant men and women since the implementation of the one-child policy. Secondly, it examines the convergence of wages between Chinese female and male immigrants.

## II. Literature Review

This paper draws from two bodies of literature: immigration studies and the gender-wage gap studies. In order to answer the research question of whether the one-child policy had a positive effect on the wages of Chinese immigrant females relative to their male counterparts, literature from both of these fields will be drawn.

Substantial literature in the field of immigration explains why certain immigrant groups perform better in the work force than others (Lin, 2013; Garg and Seeborg, 2010; Cobb-Clark 1993; Dowhan and Duleep, 2008). These studies pay special attention to differences in the natural endowment of immigrants, such as language abilities and cultural similarities, as well as human capital investments such as education and experience, and their relative levels of explanatory power in determining differences in work performance outcomes. In particular, Garg and Seeborg's paper finds that both human capital endowments and personal characteristics are significant variables in describing the differences in earnings amongst female immigrants (Garg and Seeborg, 2010). The results of this paper suggest that in addition to human capital endowments and personal characteristics, gender is a significant determinant in the wage outcome of immigrants to the United States. These findings are supported by a number of other studies as well (Antecol, 2001; Butcher, 2002; Kunze, 2000).

It is apparent that gender has significant explanatory power on wage earnings in a few ways. First, inherent differences in preference between men and women mean that women differ from men significantly in terms of tastes and experiences. Women tend to have substantially different levels of education, formal training, and experience than men, which have direct effects on productivity and contribute to the gender wage gap between men and women (Blau et al. 1986).

Second, because of differences in preferences, women make considerably different human capital choices than men. For example, they choose different fields of study and amounts of education. These differ-ences, in turn, cause gaps in earnings between men and women since differences in educational tastes propel women towards different career paths than men.

Additionally, labor market discrimination could provide an additional, but not mutually exclusive, explanation for gender differences in earnings over time. Because of difficulties in measuring qualitative variables like discrimination, this paper will focus on the human capital explanations for the gender-wage gap and control for discrimination effects by using a control group and by comparing the differences in wage earnings between male and female Chinese immigrants within a single cohort. Antecol (2001) uses cross-sectional data for the earning outcomes of 21 immigrant groups to the U.S. and finds that the wage gap variance between these different cohorts can be explained by cultural factors such as the traditional concepts of a woman's role in the household and workplace, as well as educational attainment and literacy. The implication of these findings is that as levels of educational attainment equalize between men and women, the wage gap should diminish. Card (1999) strengthens these findings by using a twin study to analyze sets of siblings in which one twin attains a higher level of education than the other, thereby in theory, controlling for differences in aptitude and innate ability. Taken together, these strong findings in favor of the effects of education on earnings outcome provide a literature base for the hypothesis that as levels of education between men and women equalize, the relative wage gap diminishes.

## III. Theory and Hypothesis

Human capital theory is an extension of Adam Smith's explanation of wage differentials between individuals as a function of time, effort, and resource investments in productivity-increasing activities (Marshall 1998). In modern economic theory, economists such as Mincer and Becker argue that all else held equal, income varies as a direct result of investments in human capital such as education, training, and experience. This paper will use human capital theory as understood by Mincer and Becker as a framework for exploring the effects of the one-child policy on educational attainment and wage outcomes for Chinese immigrant female workers. By understanding how the one-child policy affected the

decision to invest in education, changes in patterns of educational attainment of Chinese females can provide context for how this policy affected changes in wage differentials between Chinese immigrant males and females.

*A. The Human Capital Decision to Invest in Education*

The decision to invest in human capital is a combination of expected returns as well as opportunity and direct costs. These decisions are typically made through collaboration between the individual and their family in order to invest resources in the short run to increase returns in the long run. The classic example of a decision to invest in human capital, and the focus of this paper, is education. The decision to invest in education can best be portrayed in an earnings-age profile (Figure 3.1).
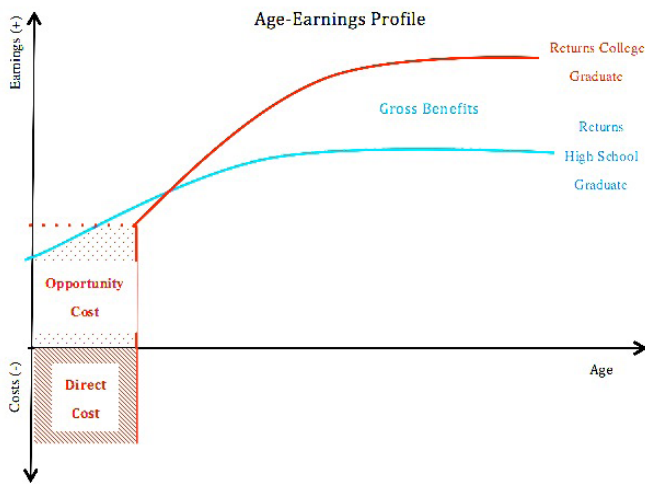


Figure 3.1

In this case, if an individual does not invest in education beyond high school, expected earnings over a lifetime can be modeled by the line labeled Returns High School Graduate. Alternatively, if an individual decides to invest in a college education, the earning function Returns College Graduate best models expected lifetime earnings. The return schedule for a college graduate is steeper to reflect the increase in productivity that comes with a college education. If the gross benefits of attending college outweigh the sum of the opportunity and direct costs, it is in the best economic interest of the individual to invest in a college degree.

Important to note is that the earnings function for the College Graduate is consistently negative for the first four years as the individual incurs direct costs such as books, tuitions, and living expenses (assuming he or she does not work during college). This is graphically represented by line AB. Total direct cost accumulated during the time spent in college is captured by the shaded Direct Cost box in Figure 3.1. In addition to direct costs of education, another important consideration is the opportunity cost of a college degree. The opportunity cost of attending college is most explicitly evident in the forgone wages the individual could have earned if they had worked instead of going to school. This paper will apply human capital theory within the context of decision making within the family. The one-child policy redefined the family structure in a way that significantly affected the allocation of educational resources to sons and daughters.

*B. Human Capital Theory*

The Chinese decision to invest in human capital is typically a family decision. Before the one-child policy, Chinese families systematically chose to invest limited educational resources in the oldest son as opposed to daughters (Zhang 2009). In order to understand this phenomenon, both economic and cultural considerations need to be accounted for.

Culturally unique to Chinese familial structure is the traditional expectation that as parents age, they increasingly rely on the oldest son for support and income, often times moving in with him and his family (Zhang 2009). In contrast, it is not unusual for daughters to move in with their husbands and take care of their husbands' aging parents. In the context of human capital theory, this cultural norm had significant effects on the decision to send sons to school at a higher rate than daughters in a pre-one-child society. Since traditionally, parents rarely moved in with daughters or relied on them as a source of income in the long-run, the net present value for sending a daughter to school was less than the net present value of investing in a son's education (Zhang 2009). An investment in a son's education was able to benefit the family in the long run especially since parents disproportionately moved in with sons. In contrast, parents would not realize higher earning streams by daughters if they moved in with their husbands' families, as was often the case (Zhang 2009). Because Chinese parents depend more heavily on their children as a source of income later on in life, considerations of both future earning streams as well as the short-term opportunity costs for sending a child to school is especially pertinent to Chinese parents. This

cultural and economic explanation could account for why before the one-child policy parents systematically invested more in sons than in daughters.

The educational attainment disparity that existed before the one-child policy likely contributed to the wage gap between Chinese male and female workers in a large way. Human capital theory claims that educational attainment and income are directly related. Intuitively, this makes sense for a few reasons. First, education increases productivity-enhancing skills such as efficiency, punctuality, and the ability to work with others. Second, specialized knowledge gained while in school means that the company does not have to invest as much in training, making educated people less costly. Third, an education can act as a screening device or signal. In this view, employers have imperfect information about the work applicant. The value of a diploma is that it provides information to the employer about the applicant and their work abilities. Employers view degrees as a signal of a more productive employee (Blau et al. 1986). As such, more able individuals have higher returns to investing in education, and as a result, are more likely to invest in education than less able individuals. If the one-child policy increased the level of educational attainment for Chinese daughters, human capital theory predicts that there should be a corresponding increase in wages for Chinese females. The positive correlation between education and earnings is what this paper uses as a warrant in answering the question of whether the educational attainment gap between Chinese immigrant men and women has narrowed since the implementation of the one-child policy, and if the wages between Chinese female and male immigrants have converged as a result. The resulting hypothesis is that, based on the predictions of human capital theory, the educational attainment gap between Chinese immigrant men and women has narrowed since the implementation of the one-child policy, and that the wages between Chinese female and male immigrants have converged as a result.

IV. Data

In order to test this paper's hypothesis, data from IPUMS-USA American Community Survey (ACS) will be used to analyze trends among Chinese immigrants to the United States. The ACS is an annual survey conducted by the U.S. Census Bureau of approximately 2 million households (Ruggles, et. al.,

2013). The 2013 cohort is chosen specifically because it is the most current dataset available and contains a large sample of over 24,000 Chinese men and women born both before and after the policy. In this dataset, those younger than 33 were born after the one-child policy was enacted in 1980 and those older than 33 were born before the policy was implemented. Three different samples are extracted from the IPUMS-ACS dataset for analysis and are as follows:

1. Chinese immigrants between ages 18 and 65 who worked more than 35 hours in the previous week, excluding immigrants from Hong Kong and Taiwan
2. Immigrants from all other countries between the ages of 18 and 65 who worked more than 35 hours in the previous week.
3. Taiwanese immigrants between the ages of 18 and 65 who worked more than 35 hours in the previous week.

The purpose of including a second and third sample group in this research is to control for the effects of aging over time and discrimination bias. As women and men age, the relative wage gap tends to increase for a variety of reasons including frequent entrance and exits into the workforce by many women and discrimination against women (Blau et al. 1986). By using two different control groups, exterior factors such as changes in the economic environment and changes in labor force will be controlled for. In doing so, having two separate control groups helps eliminate other possible causes for the change in Chinese male and female wage differentials. Therefore, wage differentials are recomputed for these two control groups to ensure that there are not extraneous factors unaccounted for that may have caused the change.

V. Empirical Model
A. Descriptive Statistics

Similar to David Card's 1989 Mariel Boatlift paper, this paper uses a difference-in-differences approach to compare both the wage gap between young Chinese female and male immigrants born after the one-child policy to the wage gap between male and female Chinese immigrants born before the policy. The ratio of the wage gap for individuals born under the policy relative to the gap for individuals born after will be compared, so that differences

between the sample group (Chinese immigrants) and the control groups (Taiwan, all other immigrants) will be controlled for. Taiwan presents itself as a natural control group for this project because it has similar traditions, cultural practices, and experiences as China. Because Taiwan is an autonomous region of China, it was not subject to the one-child policy when it was enacted.

Graphically, a comparison of the earnings-age profile for Chinese immigrants against the control groups can help conceptualize the expected hypothesis (See Figure 5.1). In these two graphs, MChinese represents the age-earning profiles for Chinese immigrant males and the FChinese function represents the expected age-earning profile for Chinese immigrant females. Similarly, MControl represents the average age-earning profile for men in the control group(s) and FControl represent the age-earning profile for a woman in the control group(s).

Figure 5.1
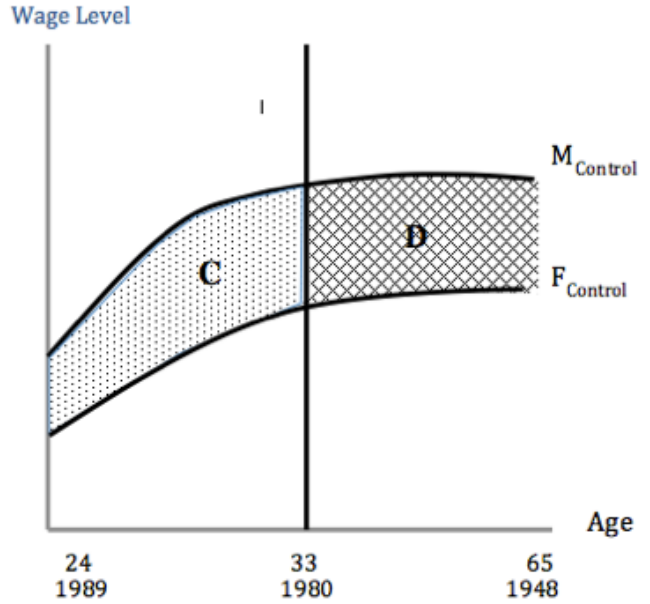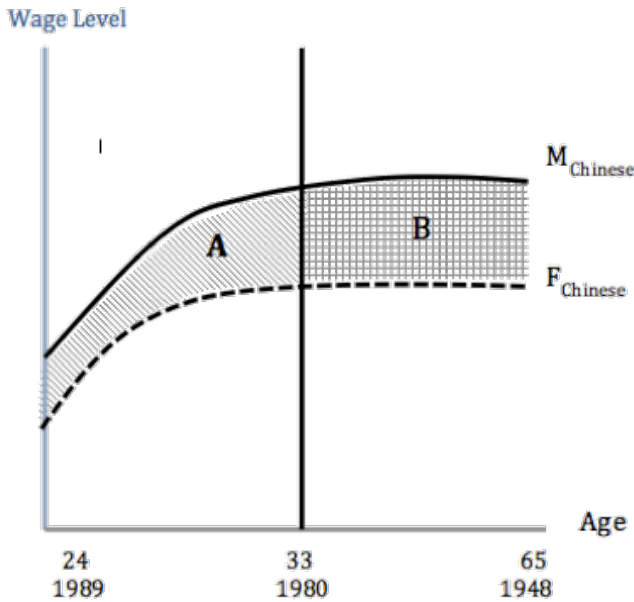


Descriptive statistics will compare the difference (MChinese- FChinese) between the age functions for men and women in both the cohort of interest (Chinese immigrants) and the control group (all other immigrants and Taiwanese immigrants). The horizontal line in Figure 5.1 delineates between those who are younger than 33 and were born under the one-child policy (section A and C) and those who are older and were born before the policy (sections B and D). If the one-child policy had a significant effect on both education and wages for female Chinese immigrants, then it would be expected that Chinese women born after the one-child policy (younger than 33) would have more similar wages to their male counterparts than women born before the one-child policy (older than 33). Similarly, Chinese immigrant women affected by the policy should have wages more similar to their Chinese male counterparts than immigrant women from other nations where a similar policy was not enacted. Both of these expectations can be captured in Figure 5.1 by looking at the relative areas of A, B C and D.

Comparing the areas of A, B, C, and D, is a useful and unique approach to difference-in-difference analysis. Because sample characteristics and size varies for all three test groups, comparing the difference between male and female earnings after the one-child policy to the wage gap before the one-child policy in the form of a ratio index will be useful in comparing the difference between differences across multiple samples. Quantitatively, this equation is as follows:

$$\frac{(\int M_{Chinese} - \int F_{Chinese})^{OneChild}_{\leq33}}{(\int M_{Chinese} - \int F_{Chinese})^{\neg OneChild}_{>33}}$$

If this paper's hypothesis that the difference between Chinese male and female immigrants decreased significantly after the one-child policy is correct, then the following relationship would be expected:

$$\frac{(\int M_{Chinese} - \int F_{Chinese})^{OneChild}_{\leq33}}{(\int M_{Chinese} - \int F_{Chinese})^{\neg OneChild}_{>33}} < \frac{(\int M_{Control} - \int F_{Control})^{OneChild}_{\leq33}}{(\int M_{Control} - \int F_{Control})^{\neg OneChild}_{>33}}$$

Put more explicitly and in the context of Figure 5.1 :

$$\frac{A}{B} < \frac{C}{D}$$

the large wage gap of the older cohort makes the ratio smaller. However, by looking at the average earnings of all three cohorts after the one-child policy, it is clear in terms of the size of the wage gap that Chinese immigrant women perform relatively similarly to their male counterparts than the other two control groups.

*B. Regression Analysis*

Because it is not possible to test the significance of these results using only descriptive statistics, this paper will add another dimension to this study by including three OLS regression models to predict the natural log of wages for Chinese immigrants, all other immigrants, and Taiwanese immigrants.

**Table 5.1.2: Descriptive Statistics: Annual Mean Wage and Salary**

| | Affected: Post One-Child (< 33) | | Not Affected: Pre One-Child (>33) | | Ratio of Wage Gap After and Before |
| --- | --- | --- | --- | --- | --- |
| | Female | Male | Female | Male | *Wage Gap Post Poli* / *Wage Gap Pre Poli* |
| Chinese Immigrants | $15,457 | $19,562 | $30,559 | $51,658 | |
| *Wage Gap* | | $4,105 | | $21,099 | .194 |
| All Other Immigrants | $12,389 | $16,893 | $19,098 | $33,209 | |
| *Wage Gap* | | $4,504 | | $14,111 | .319 |
| Taiwanese Immigrants | $26,135 | $31,887 | $35,296 | $64,492 | |
| *Wage Gap* | | $5,752 | | $ 29,196 | .197 |

The results of these descriptive calculations can be found in Table 5.1.2. This table displays the mean annual income for both male and female immigrants for all three samples as well as the change in the gender gap, which is representative of the relationship previously discussed.

The results of the descriptive statistics suggest that the relationship predicted is observed. China's change in the gender gap index before and after the one-child policy is the lowest with a value of .194. Taiwan's is slightly higher with a value of .197 and the second control group, all other immigrants, is the highest at .319. Important to note in these findings is that Taiwan's value is only marginally larger than China's. These findings are less significant in magnitude than expected and can potentially be explained by the size of Taiwan's pre-policy wage gap of $29,196. Because the pre one-child policy wage gap is in the denominator of the "wage gap after and before" ratio,

This section will use a Mincer earnings function to test the effect of being a female Chinese immigrant worker born before the one-child policy on wage earnings vis-à-vis being a female Chinese immigrant worker born after the one-child policy. The same regression will be used in all three cases to measure the magnitude of the effect of being a Chinese female born before the policy on earnings. By running the same model for all three groups, a comparison of coefficients for the $\beta\_3$ and $\beta\_4$ can be used to analyze the relative affects of being born before the one-child policy. By comparing these findings to two separate control groups, the relative magnitude of this difference can be quantified.

The model is as follows:
$$\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female*OneChild) + \beta_4(female*\neg OneChild)$$
Where: age represents the age of a subject and acts as a proxy for work experience

age2 is the polynomial transformation of age as per the Mincer earnings function

female : 1 if female

OneChild : 1 if born after the one-child policy (younger than 33)

¬OneChild : 1 if born before the one-child policy (older than 33)

These variables and their descriptions, as well as expected signs are displayed in Table 5.2.1.

| Variable | Description | Expected Sign |
|---|---|---|
| **Dependent** | | |
| ln(wage) | Natural log of wage | |
| **Independent** | | |
| *age* | Subject's age at last birthday | Positive |
| *age²* | Polynomial transformation of age | Negative |
| *female* | 0 = male | Negative |
| | 1 = female | |
| *OneChild* | 0 = born after the one-child policy (age < 33) | Negative |
| | 1 = born before the one-child policy (age ≥ 33) | |
| *¬OneChild* | 0 = born before the one-child policy (age ≥ 33) | Negative |
| | 1 = born after the one-child policy (age < 33) | |

It is expected that the absolute value of $\beta_3$ FemOneChild will be less than the absolute value of beta $\beta_4$ FemNotOneChild. While we would expect both coefficients to be negative, because the reference group in all cases is men in the sample, Chinese immigrant women born under the one-child policy should be relatively less disadvantaged than Chinese immigrant women born before the one-child policy because of the equalization of education. These results are analyzed in the following section.

VI. Results

The regression results presented in this section are used to analyze the accuracy of this paper's hypothesis: that the one-child policy had a positive effect on Chinese women immigrant earning functions relative to their male counterparts. In order to test for this, an OLS regression was run with the following equation:
$$\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female*OneChild) + \beta_4(female*\neg OneChild)$$

Table 6.1 presents the output of this regression, followed by an analysis of their meanings in the context of the problem.

Table 6.1: Regression Results

| Model 1 | China | | All Immigrants | | Taiwan | |
|---|---|---|---|---|---|---|
| | B | Sig. | B | Sig. | B | Sig. |
| (Constant) | 4.67 | .000*** | 6.36 | .000*** | 5.547 | .000*** |
| | | (37.81) | | (246.56) | | (16.15) |
| Age | .261 | .000*** | .172 | .000*** | .227 | .000*** |
| | | (46.21) | | (146.55) | | (15.03) |
| Age² | -.003 | .000*** | -.002 | .000*** | -.002 | .000*** |
| | | (-43.28) | | (-133.69) | | (-14.07) |
| FemOneChild | -.169 | .000*** | -.243 | .000*** | -.290 | .036** |
| | | (-4.248) | | (-26.484) | | (-2.09) |
| FemNotOneChild | -.410 | .000*** | -.454 | .000*** | -.498 | .000*** |
| | | (-18.5) | | (-84.03) | | (-10.337) |
| *Difference* | **.241** | | **.211** | | **.199** | |
| *R²* | .208 | | .156 | | .145 | |
| *N* | 24,248 | | 359,356 | | 4,028 | |

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level

The regression results show that, in accordance with what was expected, the coefficient for Age was positive in all three regressions and negative for Age2. Similarly, the coefficients for both FemOneChild and FemNotOneChild were negative, as expected. Because the reference group for the set of dummy variables was immigrant men, this intuitively makes sense, as literature suggests that women systematically make less than men, holding constant birthplace, education, and other human capital factors (Antecol, 2001; Butcher, 2002; Kunze, 2000).

Similarly, an analysis of the magnitude of the coefficients coincides with aging theory and this paper's assumptions. In all cases, female immigrant workers born before the one-child policy (over the age of 33) have coefficients that are more negative than their one-child policy, female counterparts. This means that those women who were born before the one-child policy, regardless of country of origin, earn significantly less than their male counterparts relative to females born after the one-child policy. This pattern is expected, and is explained in literature on development theory, aging effects, and consequences of discrimination (Blau et al. 1986). Because of the difference-in-differences approach utilized in this paper, the differences between the beta coefficients for FemNotOneChild and FemOneChild have been calculated. The results can be found in the last row named Differences. The Chinese immigrant value of .241 is the highest and suggests that the Chinese immigrant women population experienced the greatest gains to education from pre-one-child policy times to post-one-child policy times. Also important to note is that the beta coefficient for FemOneChild for the

Chinese immigrant cohort is the least negative of all the immigrant groups, implying that young Chinese immigrant women born under the one-child policy experience the smallest wage gap between them and their male counterparts, relative to all other immigrants and Taiwanese immigrants. In contrast, the difference between $\beta\_3$ and $\beta\_3$ for all other immigrants and Taiwanese immigrants are .211 and .199 respectively, implying that both cohorts experienced less of a change in gender gaps before and after the one-child policy than did Chinese immigrants. While the pattern is as expected, it is important to note that the differences between .241, .211 and .199 is relatively small. This suggests that relative gains from education experienced by Chinese female immigrants did not have substantially more wage-equalizing power than all other immigrants and Taiwanese immigrants.

## VII. Conclusion

This paper has explored the effect of the one-child policy on the relative wages of Chinese female immigrant workers. By using a difference-in-differences analysis of both descriptive and regression statistics, the findings of this paper suggest that, in line with human capital theory, the one-child policy had a positive impact on the relative wages of Chinese female immigrants. While the patterns in differences between the means and coefficients in both the descriptive statistics and regression model indicate that Chinese female immigrants perform relatively better than the older, pre-policy counterparts, the weak difference between the Chinese immigrant cohort and the two control groups suggest that China's situation is not substantially different.

A major weakness of this study is the inability to test the significance of the difference in coefficients between the Chinese immigrant sample and the two other control groups. This issue could potentially be solved by measuring the rate of change in wages of different immigrant groups as opposed to looking at whether or not a change exists. Additionally, while this paper analyzes the effects the one-child policy had on the relative wages of Chinese female immigrants, an avenue for future research could analyze the role educational attainment has as a part of this narrative. Existing literature suggests that education is directly related to wage earnings in immigrant groups, so an analysis of the indirect effects of education on wage earnings could provide additional insight (Blau et al. 1986; Card 1999; Kunze 2000). This could be done by re-running the regression with the inclusion of variables to estimate education. A comparison between the beta values for both of these regressions could illuminate the effect education has on immigrant wages as an indirect pathway.

With the recent change from the one-child policy to the two-child policy, the implications of this research are especially pertinent as they help inform how social policy can have indirect effects on education and the relative wage earnings of Chinese immigrant women.

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