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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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ABSTRACT

China's one-child policy is one of the most controversial population control measures implemented in modern society. While most literature focuses on the effects this policy has had on China's population size and economic growth, very little research has been dedicated to analyzing how this policy has affected wage differentials between Chinese men and women. Research suggests that the one-child policy redirected more educational resources towards Chinese daughters than in the past. Human capital theory hypothesizes that equalization in educational attainment corresponds to an equalizing in relative earnings. This paper uses data from the American Community Survey to test the hypothesis that the one-child policy advanced the relative earnings of Chinese immigrant women in the United States. A difference-in-differences methodology is used to answer two questions: first, to what extent is the one-child policy's effect on educational attainment for Chinese women reflected in the immigrant population? Second, if the one-child policy had a positive effect on the level of educational attainment for Chinese immigrant women, is this reflected in their wage-earning profile, relative to their Chinese male immigrant counterparts? The findings of this research suggest that Chinese immigrant women born after the one-child policy attain higher levels of education than those born before. The impacts of these findings are not presently reflected in the wage-earning profiles of Chinese female immigrants because of their young age. However, this provides an opportunity for future research on the positive effects of education on earnings once women born under the one-child policy have engaged in work for a more substantial amount of time.

Table of Contents

Section 1: Introduction **2**

Section 2: Literature Review **3**

Section 2.2: Wage Gap Studies *7*

Section 3: Theory and Hypothesis **8**

Section 3.1: The Human Capital Decision to Invest in Education *9*
Section 3.2 Human Capital Theory *10*

Section 4: Data **12**

Section 4.1: Difference-in-Differences; Education *12*
Section 4.2: Difference-in-Differences; Wages *13*

Section 5: Difference-in-Difference Analysis **14**

Section 5.1: Difference-in-Differences Analyses; Education *14*
Section 5.2 Difference-in-Differences Analyses; Wages *18*

Section 6: Earnings Regression Analysis **21**

Section 6.1: Mincer Earnings Functions *21*
Section 6.2: Results *23*

Section 7: Conclusion **27**

Works Cited **30**

Appendix of Tables **32**

Table A.1: Disaggregated Education Data- Chinese Immigrants *32*
Table A.2: Disaggregated Education Data- Natives *32*
Table A.3: Disaggregated Education Data- Taiwanese Immigrants *33*
Table A.4: Difference-in-Differences: Native Bachelor's Degree *33*
Table A.5: Difference-in-Differences: Taiwanese Immigrant Bachelor's Degree *33*
Table A.6: ln(wage) Regression Results for Natives ..... ***Error! Bookmark not defined.***
Table A.6: ln(wage) Regression Results for Natives *34*

Section 1: Introduction

China's one-child policy was 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 Chinese families to have only one child. Throughout the 60's and 70's, the fertility rate in China was 5.8, meaning that on average, a Chinese woman gave birth to 5.8 children during the course of her life (Fung 2014). After its implementation in 1979, this number decreased to 2.3 (Fung 2014). The drastic decline in 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, Chinese 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) found that Chinese daughters in one-child households systematically attained significantly higher levels of education than those with brothers or multiple children (Fong 2002).

The implication of these findings for the United States are most directly manifest in the way the one-child policy has affected the characteristics of immigrants from China. As of 2012, over 1,283,000 Chinese immigrant women resided in the US, comprising 6.1% of all foreign-born females (American Immigration Council 2012). As the number of immigrant women from

China and other nations is projected to increase over the next decade, how Chinese immigrant women interact in the workforce will be an important issue.

In order to shed light on the effects of the one-child policy on Chinese immigrant workers, this paper explores two related research questions. First, is the one-child policy's positive effect on educational attainment for Chinese women reflected in the immigrant population, and if so, to what extent? Second, if Chinese immigrant women's educational experience was benefited by the one-child policy, is this reflected in their age earnings profile, relative to their Chinese immigrant male counterparts?

This paper analyzes these questions through the application of literature and theory to a set of empirical models. **Section 2** explores existing literature on both immigration studies and gender-wage gap studies. **Section 3** presents this paper's hypotheses and the economic theories that support them, specifically, human capital theory, and theories of positive and negative selection bias. **Section 4** introduces the data and methodology used to test the hypotheses. **Section 5** presents difference-in-differences analyses for both education and wages to determine whether Chinese women born under the one-child policy benefited in terms of educational attainment and wage earnings relative to several comparison groups. **Section 6** reports the results of the OLS earnings regression models. **Section 7** concludes.

Section 2: Literature Review

This paper draws from two bodies of literature: immigration studies and gender-wage gap studies. In order to analyze the relationship between the one-child policy's effect on education and the wages of Chinese female immigrants, an in-depth understanding of both the decision to immigrate and the relationship between male and female workers in the labor force is imperative.

Section 2.1 Immigration Studies

Substantial literature in the field of immigration explains why certain immigrant groups perform better in the labor market than others (Lin, 2013; Garg and Seeborg, 2010; Cobb-Clark 1993; Dowhan and Duleep, 2008). These studies are typically categorized into two groups: those that focus on the immigrant selection process, and those that emphasize the impact of worker characteristics on the decision to migrate.

The relationship between a migrant's home country and target country directly affects the decision to migrate. Borjas (1987) contended that immigrants are not randomly selected, but rather, the differences in opportunity between the sending and receiving countries systemically influences whether an individual decides to migrate. Similarly, through its legal system, the receiving country is also a participant in the immigrant selection process, as applications are reviewed and either rejected or accepted. Robinson and Tomes (1982) constructed earnings differentials between immigrants' receiving and sending provinces within Canada to find that the opportunity to earn higher wages for immigrants in a fixed education bracket was a significant motivator to migrate. This study has been replicated multiple times with the same basic finding that differences in net economic advantages and wages are the main causes of migration.

That being said, differences in opportunity between countries affect workers differently. Roy's 1951 model on the distribution of earnings is one of the earliest papers on self-selection. In his paper, *Some Thoughts on the Distribution of Earnings,* Roy hypothesizes that in a world with only two occupations: fishing and hunting, whether the best fishers will fish and the best hunters will hunt is based on four things: the distribution of skills, the correlation between these skills in the population, the technology available to enhance these skills, and consumer tastes and preferences (Roy 1951). Roy's main finding was that, based on these four factors, workers will

self-select the occupation that maximizes their earnings. In his 1987 paper, *Self-Selection and the Earnings of Immigrants*, Borjas applies Roy's model on self-selection to the decision to immigrate. Borjas hypothesized that different subsets of workers in a given source country find it worthwhile to migrate based on differences in rates of returns to human capital investment between the source and target countries (Borjas 1987). This hypothesis can be depicted graphically, as in *figure 2.1,* which depicts the self-selection decision for migrants.

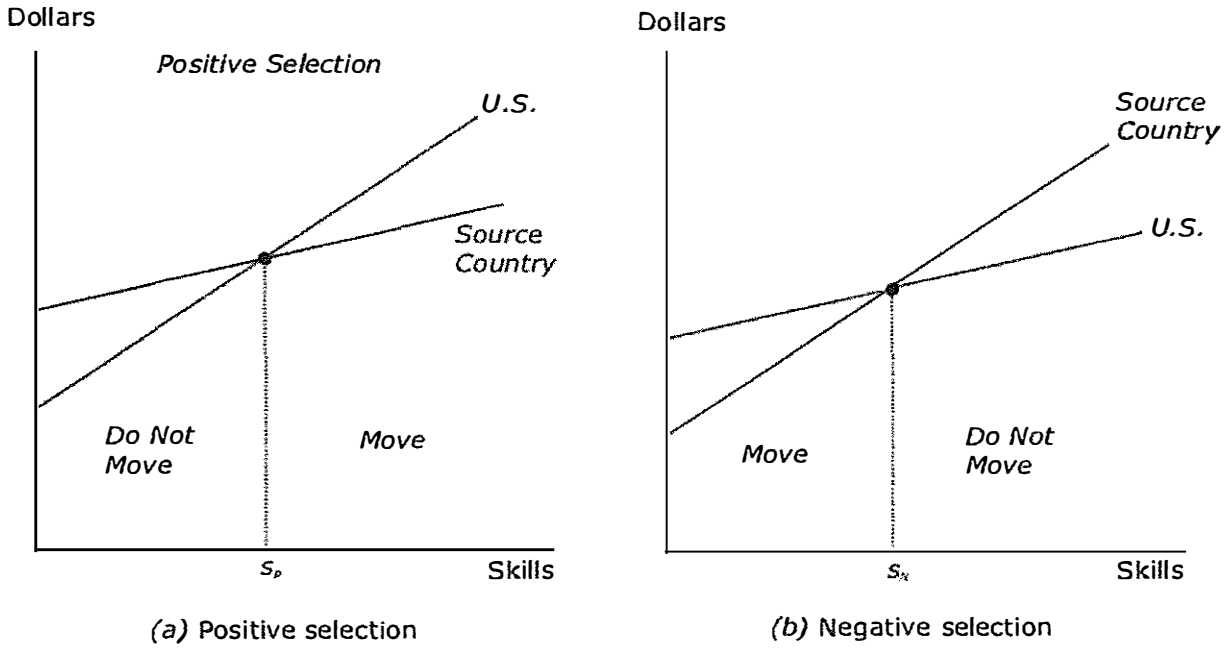

figure 2.1

In *figure 2.1*[1], the source country is the migrant's home country and the target country is the United States. If the migrant's home country offers a low rate of return to the worker's human capital investment in skill, the wage profile will be flatter, meaning that those who are skilled are do not earn much more than the unskilled. This is the case in scenario (a) in *figure 2.1.* In this scenario, low rates of return in the migrant's home country incentivizes migration if the individual is skilled at a level higher than S_p and remaining in the home country if the

[1] Graphs reprinted from Borjas, George J. Labor Economics. 6th ed. Boston: McGraw-Hill/Irwin, 2005. 329-43. Print.

individual is skilled below. This is because those who are skilled have an incentive to seek out higher wage opportunities in a target country with higher returns to skills, such as the United States. If the opposite situation is true, as is the case in scenario (b), migrants on the lower end of the skill distribution in the source country will be incentivized to migrate to capitalize on the potential for higher earnings in the target country. The impact of the combined conclusions of both Borjas and Roy challenged the previously accepted assumption that workers from low-wage countries migrate to high-wage countries without regard to rates of return to skill.

The makeup of an immigrant population based on these two factors is a determinant of how well immigrants from the same country of origin perform in the labor force. Carl (2013) finds that immigrants that are positively selected tend to have higher levels of human capital investment and perform better than the native population as a result. In contrast, immigrants that are negatively selected tend to fill jobs that require lower levels of skill and receive lower wages as a result.

The characteristic make-up of different immigrant groups has been the focus of much literature. These studies pay special attention to differences in the natural endowment, 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 labor market 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 among female immigrants (Garg and Seeborg, 2010). The results of this paper suggest that in addition to human capital endowments, gender is a significant determinant in the wage outcome of

immigrants to the United States. These findings are supported by a number of similar studies that address similar questions (Antecol, 2001; Butcher, 2002; Kunze, 2000).

Section 2.2: Wage Gap Studies

As applicable to both immigrant and native workers, it is apparent that gender has a substantial effect on wages in a few ways. First, inherent differences in preferences 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 work 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 to pursue different fields of study and levels of education. These differences in turn, cause gaps in earnings between men and women, since differences in educational tastes propel women towards different career paths than men.

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 understandings of women'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. Similarly, Card (1999) uses 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 findings in favor of the

effects of education on earnings provide a literature base for the hypothesis that as levels of education between men and women equalize, the relative wage gap diminishes.

The importance of the relationship between both gender and immigration studies for this paper is manifest in the differences in characteristics between men and women within the same immigrant group. Because women have substantially different human capital investments and preferences than men, differentials in economic opportunity between the source and receiving country will affect them differently. Whether the one-child policy's positive effect on educational attainment for Chinese women is reflected in the immigrant population will be an indicator of the extent to which existing literature is able to explain the findings of this study.

Section 3: Theory and Hypothesis

Human capital theory is an extension of Adam Smith's explanation of differences in wages 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 uses 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 the wage differential between Chinese immigrant men and women.

Section 3.1: 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 age-earnings profile *(Figure 3.1)*. In this case, if an individual doesn't invest in education beyond high school, the line labeled "Returns High School Graduate" models expected earnings over his or her lifetime. 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. In particular, the slope of this curve is the rate of return for education. A key characteristic of the age-earnings profile is that the returns for a college graduate are not immediately realized- in fact, the age-earnings profile for an individual just out of college is below the earnings stream for individuals with high-school degree. If the present value of the benefits of attending college outweigh the present value of both the opportunity and direct costs,

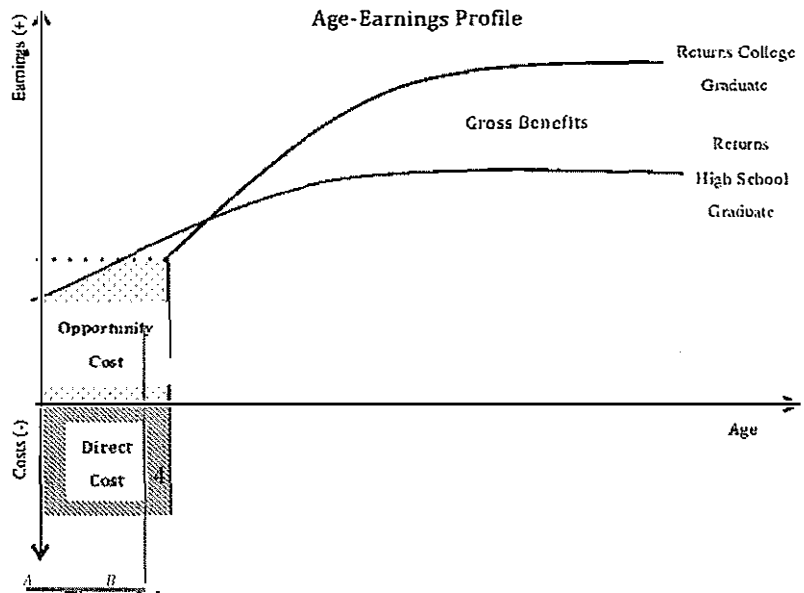

Figure 3.1

it is in the best economic interest of the individual to invest in a college degree. The same intuition applies to higher levels of education.

Human capital theory's application in the context of educational decision making within the family is an important theory for this paper because of the way the one-child policy redefined the Chinese family structure. An understanding of the effect of the one-child policy on the decision to invest in education provides support for this paper's hypothesis that the one-child policy had a positive effect on education for Chinese immigrant women.

Section 3.2 Human Capital Theory

The decision to invest in education is typically a family decision. Before the one-child policy, Chinese families systematically chose to invest more 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.

An important cultural characteristic of the Chinese familial structure is the traditional expectation that as parents age, they rely on their oldest son for support and income. Often, parents move in with their son and his family after they retire (Zhang 2009). In contrast, it is not unusual for daughters to move in with their husband's family after marriage. 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 before the one-child policy. 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). Because parents frequently moved in with their sons, an investment in their education was an investment in their future standard of living. 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 was especially pertinent to traditional Chinese parents before the one-child policy. This cultural and economic explanation could account for why parents systematically invested more in sons than in daughters before the one-child policy.

It is likely that the educational attainment disparity that existed before the one-child policy contributed to the wage gap between Chinese male and female workers. 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. Secondly, specialized knowledge gained while in school means that the company doesn't have to invest as much in training, making educated people less costly to hire. Third, an education can act as a screening device or signal. Per this view, employers have imperfect information about the work applicant and a diploma form either a college or high school acts as a signal to the employer about the applicant's work ethic and trainability. Therefore, employers view degrees as a signal of a more productive employee (Blau et al. 1986).

If the one-child policy increased the level of educational attainment for Chinese daughters, both human capital and screening theories predict 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 basis for its two hypotheses. First, that Chinese female immigrants born after the one-child policy will attain higher levels of education relative to their male counterparts than they did before the one-child policy. Second, that wages for Chinese immigrant men and women born after the one-child policy have converged as a result.

Section 4: Data

In order to address this paper's first hypothesis—that Chinese female immigrants born after the one-child policy are more educated than Chinese female immigrants born before—data from the Integrated Public Use Microdata Series-USA (IPUMS-USA); American Community Survey (ACS) are used to analyze educational and wage-earning trends among Chinese immigrants to the United States. The ACS is an annual survey of approximately 2 million households conducted by the U.S. Census Bureau (Ruggles, et. al., 2013). For the purposes of this paper, data are extracted from the 2010, 2011, 2012, 2013, and 2014 samples. These five years represent the five most recent years of the survey and provide the most updated data available. Five sample years are chosen to create a pool of data sufficiently large enough to obtain accurate results.

Section 4.1: Difference-in-Differences; Education

In order to test this paper's first hypothesis that the one-child policy positively affected the educational attainment of Chinese female immigrants to the United States, this paper uses a difference-in-differences analysis to compare the gains in educational attainment for Chinese immigrant women relative to their male counterparts, native women, and Taiwanese women both before and after the one-child policy. The sample containing only Chinese immigrants is restricted to those who immigrated after the age of 17 to exclude those whose families immigrated to the United States while they were young and had the opportunity to have more than one child. It also eliminates those who didn't grow up under the one-child policy and didn't benefit from the resulting equalization in education. This is an important aspect of this paper because it restricts the sample size to only those who were actually affected by the one-child policy.

Taiwanese immigrants are subject to this same restriction to ensure that the data from this sample reflects the conditions of being raised in Taiwan and not in the United States. Additionally, all subjects for the educational descriptive statistics are above the age of 25 to ensure that most respondents had the opportunity to complete their formal education. After controlling for these factors, the samples consist of 34,826 Chinese immigrants, 9,106,904 Natives, and 13,270 Taiwanese immigrants. While the difference in sample size is notable, they are objectively large enough to ensure representative results. Furthermore, the difference-in-differences analyses are expressed in percentages relative to the size of the appropriate sample.

Section 4.2: Difference-in-Differences; Wages

To test the relationship between education and wages, this paper uses both difference-in-differences and OLS regression analysis on three specific sample groups. While the descriptive statistics for wages utilize the same difference-in-differences methodology as section 4.1, the samples for these are limited to those who worked full-time and year round. This additional constraint is necessary to prevent those who were unemployed or still in school during the survey from negatively biasing the data for wages. After these additional data restrictions, the sample size is 14,615 for Chinese immigrants; 4,106,045 for natives, and 6,937 for Taiwanese immigrants. These samples sizes are notably smaller than the samples for the difference-in-differences analysis for education due to the increased restrictions.

The three different samples extracted from the IPUMS-ACS dataset for the analysis are:

1. *Chinese immigrants* who immigrated to the United States after the age of 17 and are engaged in full-time work.
2. *Native Workers* born in the United States over the age of 17 who are engaged in full-time work.

3. *Taiwanese immigrants* who immigrated to the United States after the age of 17 and are engaged in full-time work.

The purpose of including a second and third sample group is to control for the educational gains that women, in general, have made over time. Therefore, to isolate the educational effect of the one-child policy, it is important to compare the educational gains made by Chinese women to other groups of women. To do this, Chinese female immigrants are compared to their male counterparts, native women, and Taiwanese women for both sections of difference-in-differences analyses.

Section 5: Difference-in-Difference Analysis

Section 5.1: Difference-in-Differences Analyses; Education

The first section of this paper's analysis employs difference-in-differences techniques, such as those in David Card's 1989 Mariel Boatlift paper. A total of three difference-in-differences analyses are run for education. Each compares the educational attainment of Chinese female immigrants to a comparison group. The three comparisons are:

- Chinese immigrant women vs. Chinese immigrant men
- Chinese immigrant women vs. Native women
- Chinese immigrant women vs. Taiwanese women

Each of the three difference-in-differences analyses proceeds in four steps. For example, the difference-in-differences analysis for Chinese immigrant women vs. Chinese immigrant men is calculated as follows:

1. Partition the sample of Chinese immigrant women and men into two groups: Those born before the one-child policy (1979) and those born after.

   a. In Table 5.1.1, this step is represented by the values in the columns labeled **Born Before 1979 (Pre-One Child Policy)** and **Born 1979 or Later (Post-One Child Policy)**

2. For those Chinese immigrants born before the one-child policy (1979), find the difference in the probability of having a bachelor's degree or higher between women and men.
   a. In Table 5.1.1 this is represented by the **Attainment Gap for Bachelor's Degree**: 38% - 46%= - **8%.**

3. For those Chinese immigrants born after the one-child policy (1979), find the difference in the probability of having a bachelor's degree or higher between women and men.
   a. In Table 5.1.1 this is represented by the **Attainment Gap for Bachelor's Degree**: 72% - 64%= +**8%**.

4. To calculate the difference-in-differences, find the difference between the values calculated for steps 2 and 3.
   a. In Table 5.1.1 this is represented by the variable **Progress for Chinese Women**: 9% - (-8%) = **+17%**

These steps are repeated for each of the three comparisons to get a holistic perspective on how Chinese immigrants' change in educational attainment has progressed over time. Educational data is aggregated into two categories: those who have achieved a bachelor's degree or more and those who have received less than a bachelor's degree. For the disaggregated tables, see Appendix A.

Table 5.1.1: Difference-in-Differences: Chinese Immigrant Educational Attainment Before and After 1979

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
Bachelor's Degree or Higher	46%	38%	64%	72%
Attainment Gap for Bachelor's Degree	-8%		+8%	
Progress for Chinese Women	+16%			

n =34,826

Table 5.1.1 shows that for the Chinese immigrants born before the one-child policy, women were 8% less likely to complete at bachelor's degree or higher than their male counterparts. However, for those born after the one-child policy, women were 8% *more* likely to obtain a bachelor's degree or higher than their male counterparts. The relative gains for women were 17%. In other words, the level of educational attainment for men born after the one-child policy (by this standard of measurement) increased 18% and women's increased 34%. The difference between these two figures is 16%, which suggests that Chinese women born after the one-child policy made substantial gains in education.

This initial finding supports this paper's hypothesis that the one-child policy had a positive effect on the Chinese immigrant population to the United States. In order to determine whether these improvements are due to the one-child policy, as opposed to gains in education made by women in general, **Table 5.1.2** displays the difference-in-difference results for native and Chinese immigrant women and **Table 5.1.3** reports the difference-in-difference results for Chinese and Taiwanese immigrant women.

Table 5.1.2: Difference-in-Differences: Educational Attainment Before and After 1979; Chinese Immigrant Women vs. Native Women

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Native Women	Chinese Women	Native Women	Chinese Women
Bachelor's Degree or Higher	28%	38%	39%	72%
Attainment Gap for Bachelor's Degree	+10%		+33%	
Progress for Chinese Women	+43%			

Native Women: n=4,761,223
Chinese Women: n=18,362

Table 5.1.2 shows that for Chinese and native women born before the one-child policy, Chinese immigrant women were 10% more likely to complete a degree equal to or greater than a bachelor's degree than native women. However, for native and Chinese immigrant women born after the one-child policy, Chinese immigrants were 33% more likely to obtain at least a bachelor's degree, increasing the disparity in educational attainment by 23%. This provides evidence that Chinese women born after the one child policy made substantial gains in educational attainment relative to native women.

Table 5.1.3: Difference-in-Differences: Educational Attainment Before and After 1979; Chinese Immigrant Women vs. Taiwanese Women

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Taiwanese Women	Chinese Women	Taiwanese Women	Chinese Women
Bachelor's Degree or Higher	76%	38%	78%	72%
Attainment Gap for Bachelor's Degree	-38%		-6%	
Progress for Chinese Women	+32%			

Taiwanese Women: n=7,514
Chinese Women: n=18,362

Table 5.1.3 shows that the difference-in-difference comparison between Taiwanese and Chinese immigrant women exhibits the same pattern of results. Taiwanese women historically have a higher average level of education than Mainland Chinese women. Of those born before 1979, 76% of Taiwanese females attained at least a bachelor's degree compared to only 38% of Chinese women. Similarly, for those born after 1979, 78% of Taiwanese immigrant women had at least a bachelor's degree compared to 72% for Chinese women. The change in relative educational attainment improved from -38% to -6% for Chinese immigrant women. In total, the relative gains reflected a 32% increase in educational standing for Chinese immigrant women relative to Taiwanese immigrant women.

Taken together, the results from the three difference-in-difference analyses suggest that the one-child policy is correlated with an increase in education for Chinese female immigrants in a way that is substantially different from the educational gains made by Chinese men, native women, and Taiwanese immigrant women.

Section 5.2 Difference-in-Differences Analyses; Wages

Because human capital theory hypothesizes a positive relationship between education and wages, it is expected that Chinese female immigrants born after the one-child policy will have substantially higher wages than their pre-one-child policy counterparts. In order to test this relationship, the difference-in-differences analysis for this section includes only those who worked full-time, year round. Specifically, the data includes only those who worked at least an average of 35 hours per week for more than 40 weeks during the past year of survey. The following three tables show the difference-in-difference calculations for the mean earnings of Chinese female immigrants compared to three groups: Chinese immigrant men (**Table 5.2.1**), native females (**Table 5.2.2**), and Taiwanese female immigrants (**Table 5.2.3**).

Table 5.2.1: Difference-in-Differences: Chinese Immigrants-Mean Annual Wages

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Female	Male	Female	Male
Chinese Immigrants	$80,803.02	$65,351.14	$62,891.25	$57,104.10
Wage Gap	-$15,451.87		-$5,787.15	
Progress for Chinese Women	+$9,664.72			
n=14,615				

Table 5.2.1 shows that for the Chinese immigrants born before the one-child policy, women workers earned an average of $15,251.87 less than their male counterparts. In contrast, for Chinese immigrants born after the one-child policy, women workers only earned $5,787.15 less than their male counterparts, an improvement in equity of $9,464.72. These findings provide support for the human capital-based hypothesis that education and wages are positively correlated, as the equalization in wages corresponds to the increase in educational attainment for Chinese immigrant women.

A note of discrepancy though is that while women born after the 1979 are more likely to have a bachelor's degree than men, their wages are still lower. This could be due to a variety of other human capital factors that difference-in-differences analysis cannot control for, such as exits from the workplace, differences in preferences for work, and discrimination. Similarly important to note is that the pre-one-child policy sample has a higher average wage for both men and women due to the positive effect of experience on wages. Since subjects in this sample are older, the average pre-one child policy individual will have more experience. Because of this, the difference between the two averages is more useful as an analytical tool than mean wages alone.

Table 5.2.2: Difference-in-Differences: Chinese Female Women vs. Native Women

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Chinese Immigrant Females	Native Females	Chinese Immigrant Females	Native Females
Chinese Female Immigrants vs. Native Female	$80,042.02	$69,760.17	$62,891.25	$40,301.92
Wage Gap	+$11,451.85		+$22,589.33	
Progress for Chinese women	+$11,137.48			

Native Women: n=1,802,235
Chinese Women: n =6,694

Table 5.2.2 shows that for women born before the one-child policy, Chinese immigrant females had a substantial earnings advantage. The increase in relative earnings for Chinese women after the one-child policy was $11,137.48, which intensified the wage gap between Chinese immigrant women and native women. These results are slightly surprising, as we would expect immigrants in general to have lower wages because of issues of assimilation. However, taking Borjas immigrant selection theory into consideration, this finding could be explained by positive selection. In order to compare two similar immigrant groups and control for immigrant selection and assimilation, **Table 5.2.3** compares mean annual earnings for Chinese immigrants to Taiwanese immigrants.

Table 5.2.3: Difference-in-Differences: Chinese Female Women vs. Taiwanese Women

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Chinese Immigrant Females	Taiwanese Immigrant Females	Chinese Immigrant Females	Taiwanese Immigrant Females
Chinese Female Immigrants vs. Taiwanese Female Immigrants	$80,803.02	$104,056.09	$62,891.25	$66,207.72
Wage Gap	-$23,253.07		-$3,316.47	
Progress for Chinese Women	+$19,936.60			

Native Women: n=3,247
Chinese Women: n =6,694

Table 5.2.3 shows that the annual mean earnings differentials for Chinese and Taiwanese female immigrants are the largest of all three comparison groups. The Taiwanese women born before 1979 earn an average of $104,056.09 per year compared to $80,803.02 for Chinese female immigrants. The especially high average for Taiwanese women contributes substantially to the large difference between the two immigrant groups, especially since Chinese females born after the one-child policy have only a $3,316.47 relative earnings disadvantage. These trends are promising for Chinese women because the earnings differentials presented in **Table 5.2.3** reflect the difference-in-differences analysis in education for these two immigrant groups. If the increase in educational attainment for Chinese immigrant women from 38% to 72% is a substantial cause for the equalization of the wage profiles between these two immigrant groups, then the future earning-streams are likely to improve substantially for Chinese females born after 1979.

Taken together, the data from these three tables seem to suggest that there is a positive relationship between education and wages for Chinese female immigrants. However, because these analyses are biased by the lack of controls for experience and age, a regression analysis with built in controls for these characteristics is useful and provides additional perspective.

Section 6: Earnings Regression Analysis

Section 6.1: Mincer Earnings Functions

This section adds another dimension to my research by including three OLS regression models to predict the natural log of wages for Chinese immigrants. These regression results will help to illuminate the relationship between education and wage earnings to test the extent to

which education is a determinant of wages. The purpose of running three separate models is to analyze three effects:

1. The effect of being female on earnings
2. The effect of being a female born before the one-child policy on earnings
3. Whether changes in educational attainment due to the one-child policy may have caused changes in earnings for Chinese immigrants.

A set of Mincer earnings functions is used to construct econometric models for the three respective tests. They are as follows:

Model 1: $\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3 female$

Model 2: $\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female * onechild) + \beta_4(female * notonechild)$

Model 3: $\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female * oneChild) + \beta_4(female * notonechild) + \beta_5(bachormore)$

These variables and their descriptions, as well as expected signs are displayed in **Table 6.1**

Table 6.1.1: Variables, Description, and Expected Signs

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 1 = female	negative
onechild	0 = born after the one-child policy (age < 33) 1 = born before the one-child policy (age ≥ 33)	negative
notonechild	0 = born before the one-child policy (age ≥ 33) 1 = born after the one-child policy (age < 33)	negative
bachormore	0 = completed less than a bachelor's degree 1= completed a bachelor's degree or more	positive

Because age is a proxy for experience, it is expected that as one gets older, wages should increase, but at a decreasing rate. Thus, a positive coefficient for *age* and a negative coefficient for age^2 is expected. Being *female* has been proven throughout literature to negatively affect wages relative to male workers, due to differences in preference, labor force participation, and discrimination (Kunze 2015).

The variables *onechild* and *notonechild* are interacted with the *female* variable to create β_3 and β_4 for the second and third equations respectively. This means that the reference group for all three models is Chinese immigrant men.

The introduction of the dummy variable, *bachormore,* is expected to measure how the one-child policy affected labor market outcomes through its indirect effect on education. An aggregated variable is chosen to represent education as opposed to a set of disaggregated variables because many of those in the younger, one-child sample have not completed schooling. Therefore the *bachormore* variable helps to control for this by assuming that those who will receive more than a bachelor's degree will have already completed the bachelor's degree by the age of 25 and thus will be included in the *bachormore* variable, even if they haven't finished their education to the highest extent.

Section 6.2: Results

The regression results presented in this section are used to analyze the accuracy of this paper's two hypotheses: First, Chinese female immigrants born after the one-child policy have higher levels of educational attainment relative to their male counterparts than those born before. Second, wages for Chinese immigrant men and women born after the one-child policy have converged as a result.

Results in the **Model 1** column correspond to the output for the first equation: $\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3 female$. This is a baseline regression to test for the relationship between wages and age and gender. Output for the second equation, $\ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female * onechild) + \beta_4(female * \neg onechild)$, can be found in the second column. This model adds in the effect of being born under the one-child policy by interacting the *onechild* and $\neg onechild$ variables with the *female* variable. Finally, the output for **Model 3,** $= \ln(wage) = \alpha + \beta_1(age) + \beta_2(age^2) + \beta_3(female * oneChild) + \beta_4(female * notonechild) + \beta_5(bachormore)$, is found in the third column of **Table 6.2** and includes the variable for education, *bachormore*. The reference group for all three models is working Chinese immigrant men. These three models are run for Chinese immigrants as well as the two control groups; natives and Taiwanese immigrants. The results for the latter two tables can be found in Appendix A.

Table 6.2: Results for Chinese Immigrants

	Model 1		**Model 2**		**Model 3**	
	B	Sig.	B	Sig.	B	Sig.
(Constant)	9.917	.000*** (86.977)	9.842	.000*** (75.294)	9.034	.000*** (84.154)
Age	.051	.000*** (10.781)	.054	.000*** (10.120)	.057	.000*** (12.987)
Age²	-.001	.000*** (-11.735)	-.001	.000*** (-11.153)	-.001	.000*** (-12.956)
Female	-.179	.000*** (-12.512)				
FemOneChild			-.125	.000*** (-2.617)	-.215	.000*** (-5.476)
FemNotOneChild			-.183	.009*** (-12.445)	-.148	.000*** (-12.337)
BachOrMore					.990	.000*** (82.748)
R^2	.021		.022		.345	
N	14,615					

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level
T-statistics indicated in parentheses

Output for **Model** 1 offers support for the notion that being *female* is a statistically significant negative predictor of earnings. That is, Chinese female immigrants are predicted to earn significantly less than their Chinese male counterparts after controlling for *age.* This is in line with the findings from the difference-in-differences analysis as well.

The results for **Model 2** in Table 6.2 suggest that in addition to the findings for **Model 1**, Chinese immigrant females born before the one-child policy (*femnotonechild*) and Chinese immigrant females born after the one-child policy (*femonechild*) earn lower wages relative to their male reference group. Because the coefficient for *femonechild,* -.125, is substantially less negative than coefficient for *femnotonechild* ,-.183. Chinese female immigrants born after the one-child policy seem to be at less of an earnings disadvantage than those born before. Because education is not controlled for in this model, these results support the hypothesis that the one-child policy contributed to the diminishing wage gap between Chinese immigrant men and women. Whether these findings are due to the policy's effect on education are addressed in **Model 3.**

Model 3 adds a control variable for education, *bachormore,* which allows for the analysis the one-child policy's effect on wages of Chinese immigrant women after controlling for education. The change of the coefficient for *femnotonechild* from -.183 in **Model 2** to -148 in **Model 3** can be explained by the fact that Chinese immigrant women born before the one-child policy have substantially lower levels of education than their male counterparts (see **Table 5.1.1)**. Controlling for education in **Model** 3 caused the gender wage gap between Chinese immigrants born before the one-child policy to decrease because controlling for effects of education has a more negative effect on the wages for the more educated men in the reference group than on the women born before the one-child policy.

In contrast, the coefficient for *femonechild* changed in the opposite direction from -.123 in **Model** 2 to -.215 in **Model 3**, suggesting that education accounted for a substantial portion of the relative wage gains made by Chinese immigrant women born after the one-child policy. Because Chinese immigrant women born after the one-child policy attained higher levels of education relative to their male counterparts (see **Table 5.1.**1), controlling for education diminishes the wage gains made by Chinese immigrant women born after the one-child policy and increases the gender wage gap.

An additional relationship to note is the magnitude of the coefficients for *femonechild* and *femnotonechild* in **Model 3**. The coefficients for these variables are -.215 and -.148, respectively. This relationship is reversed from the output for **Model 2,** where women born before the one-child policy were at a greater earnings disadvantage than women born after. The reversal of this relationship between earnings for women born before and after the policy is likely due to the short-term tradeoff between and educated and experience. Because the women born after the one-child policy are younger and more educated, they are likely still at the beginning of their earnings function, which means that they are at the low point of their earnings-functions. This is evident in *Figure 3.1* (pg10). An implication of this is that the unexpected wage disadvantage of Chinese immigrant women born after the one-child policy relative to Chinese immigrant women born before is likely to change as the younger, post-one-child policy cohort move up their age earnings profiles over time.

These results imply that Chinese immigrant women born after the one-child policy have just entered the workforce and haven't realized the full returns to their education yet. Over time, their earnings function will be steeper than those who didn't attain at least a bachelor's degree because of the investment in education's rate of return. However, the realization of these returns

take time and for the younger, one-child cohort, it is likely that at the time of this study, not enough time has passed for the returns to education to be reflected in their annualized wages yet.

Finally, it is important to note that the adjusted R^2 increases for each model, which is expected because the addition of two and three more variables in **Model 2** and **Model 3** respectively, increases the explanatory power of the model.

Section 7: Conclusion

This paper has explored the effects of the one-child policy on the relative levels of educational attainment and wage earnings of Chinese female immigrant workers to answer two questions: first, did the one-child policy positively affect the levels of education for Chinese immigrant women; second, did wages for Chinese immigrant women converge with their male counterparts as a result? This paper used data from the American Community Survey to conduct difference-in-differences analysis for both educational attainment and wages. The findings of these analyses suggest that the one-child policy had a positive impact on both the relative levels of educational attainment and the wage gap for Chinese female immigrants. This paper expanded on these findings by using a set of three Mincer earnings functions to analyze the relationship between education and wages in a set of OLS regression models. The findings from this analysis suggest that Chinese female immigrants generally earn less than their Chinese male immigrant counterparts. The earnings disadvantage was especially high for Chinese female immigrants born before the one-child policy. However, once education was controlled for, women born after the one-child policy had a higher earnings disadvantage relative to both their male counterparts and women in the sample who were born before the one-child policy. Two potential reasons for this unexpected finding are related to this cohort's young age and high level of education. The

combination of these characteristics suggests that the earnings disadvantage exists for women born after the one-child policy for two reasons. First, because many of these women are young and highly educated, they are still at the beginning of their age-earnings profile and have not yet benefited from the returns to education. Second, those who will achieve the highest levels of education were excluded from the regression model because they are likely still in school. Because education and wages are positively correlated, the exclusion of the most highly educated individuals will negatively bias the data for this particular group.

These two explanations suggest that future research should revisit these earnings functions after those born after the one-child policy have had the opportunity to establish themselves in the workforce and benefit from their returns to education. Additional research could also address further shortcomings of this paper by analyzing these same questions by following the same cohort of Chinese immigrants born after the-one-child policy over a period of time and comparing their salaries to a similar cohort born before the one-child policy. A third route for potential future research would be to use Chinese data to analyze the same questions this paper addresses. Utilizing Chinese data would shift the focus away from the one-child policy's effect on immigrants, to its effect on Chinese citizens. It would have the additional benefit of mitigating selection biases inherent in addressing a question of this sort by using immigrant data.

In conclusion, the goal of this paper was to analyze the educational and labor market effects of the one-child policy on Chinese female immigrants. The difference-in-differences outcomes for educational attainment are substantial and provide evidence that supports this paper's hypothesis that the one-child policy had a positive effect on the educational outcomes for Chinese immigrant women. Both the differences-in-differences and regression analysis for the

effect of the one-child policy on wages is inconclusive and should be revisited in the future. The implications of this study are important because they help inform the relationship between social policy and wages, specifically the indirect routes through which social policy can affect education and wages.

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Appendix of Tables

Table A.1: Disaggregated Education Data- Chinese Immigrants

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
LessThanHSD	27%	30%	7%	6%
HSdiploma	15%	17%	11%	7%
SomeCollege	8%	8%	14%	7%
Bachelor's	16%	19%	43%	47%
Masters	16%	13%	13%	13%
Professional	3%	2%	5%	9%
Doctoral	11%	4%	2%	4%
Associate	4%	6%	5%	8%

Table A.2: Disaggregated Education Data- Natives

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
LessThanHSD	12%	10%	19%	15%
HSdiploma	31%	31%	29%	22%
SomeCollege	21%	22%	29%	32%
Bachelor's	17%	17%	13%	18%
Masters	8%	9%	2%	5%
Professional	3%	1%	1%	1%
Doctoral	2%	1%	0%	0%
Associate	7%	9%	6%	7%

Table A.3: Disaggregated Education Data- Taiwanese Immigrants

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
LessThanHSD	4%	8%	1%	1%
HSdiploma	7%	12%	5%	2%
SomeCollege	8%	9%	12%	8%
Bachelor's	25%	31%	52%	51%
Masters	30%	23%	15%	18%
Professional	7%	3%	6%	14%
Doctoral	14%	4%	4%	2%
Associate	5%	9%	4%	5%

Table A.4: Difference-in-Differences: Native Bachelor's Degree

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
< Bachelor's Degree	71%	72%	71%	61%
≥ Bachelor's Degree	29%	28%	29%	39%
Attainment Gap for Bachelor's Degree	-1%		+10%	
Progress for Women	+11%			

Table A.5: Difference-in-Differences: Taiwanese Immigrant Bachelor's Degree

	Born Before 1979 (Pre-One Child Policy)		Born 1979 or Later (Post-One Child Policy)	
	Male	Female	Male	Female
< Bachelor's Degree	24%	38%	22%	15%
≥ Bachelor's Degree	76%	62%	78%	85%
Attainment Gap for Bachelor's Degree	-14%		+7%	
Progress for Women	+21%			

Table A.6: ln(wage) Regression Results for Natives

	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
(Constant)	8.746	.000*** (2360.02)	8.518	.000*** (2019.348)	8.548	.000*** (2224.89)
Age	.088	.000*** (505.13)	.097	.000*** (506.231)	.086	.000*** (492.264)
Age^2	-.001	.000*** (438.726)	-.001	.000*** (-450.949)	-.001	.000*** (-433.29)
Female	-.274	.000*** (-396.31)				.000*** (-182.76)
FemOneChild			-.144	.000*** (-106.766)	-.225	.000*** (-445.94)
FemNotOneChild			-.313	.000*** (-405.211)	-.314	.000*** (896.992)
BachOrMore					.582	.000*** (2224.89)
R^2	.125		.125		.276	
N	4,106,045					

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level
T-statistics included in parentheses

Table A.7: ln(wage) Regression Results for Taiwanese Immigrants

	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
(Constant)	9.817	.000*** (59.75)	9.642	.000*** (51.882)	8.982	.000*** (51.96)
Age	.066	.000*** (9.359)	.073	.000*** (9.3)	.074	.000*** (10.167)
Age^2	-.001	.000*** (-9.508)	-.001	.000*** (-9.525)	-.001	.000*** (-10.09)
Female	-.317	.000*** (-17.043)				
FemOneChild			-.209	.000*** (-3.628)	-.198	.000*** (-3.73)
FemNotOneChild			-.328	.000*** (-16.976)	-.259	.000*** (-14.453)
BachOrMore					.699	.000*** (33.746)
R^2	.125		.125		.276	
N	4,106,045					

***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level
T-statistics included in parentheses