Impacts of Different Demographic Policies Adopted by the Government on the Chinese Population Dynamics

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Abstract

This dissertation focuses on three demographic policies that Chinese government adopted after Eonomic reform in 1978: the one-child policy, the two-child policy, and the migration policy. In the first chapter, I employ regional and provincial level data to re-estimate the effect of the one-child policy on Chinese fertility applying a difference-in-differences (DD) methodology. I introduce geographic and other individual factors to show how the one-child policy distorted fertility rates and sex ratios in China after its implementation. For the second chapter, I also employing a DD approach, I focus on rural-to-urban migration and estimate the effect of the 1992 migration policy on the rural households' migration decision. In the final chapter, I study in an OLG model how the two-child policy in China will change the current Pay-As-you-Go (PAYG) pension system in the future, and simulate different scenarios to evaluate the pension programme.

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Introduction

As is well known, China is the most populous country in the world. Any demographic policy introduced will not only bring huge influence to the country itself, but also a considerable change from a world population perspectives. More than 30 years of the one-child policy has aroused the great concern of the whole world, and the recent two-child policy from 2016 would have the same effect as well. These family planning programmes not only affect the fertility rate and sex ratio in the short-term but also, for example, the sustainability of the pension system in the long-run. While family control policies are concerned with reshaping the demographic structure, China's migration policy is intended to reallocate the resources in the society, since China is a developing country with a large population but a fairly poor economic foundation and relatively inadequate natural resources (Peng, 1994). Therefore, this thesis will focus on the one-child policy in 1979, the two-child policy in 2016 and the migration policy in 1992 to explore whether these demographic policies can bring a positive effect on the Chinese economy and society or not.

The Motivation of the Research

Global population is going through a very fundamental phase of demographic transition. Global population remained relatively stable from 10,000 BC to the beginning of the Industrial Revolution. Despite very high birth rates, the world population remained stationary, due to high death rates.

Such stationary population continued in different phased of human civilizations; from the Stone Age to agricultural revolution along with developments in pottery, irrigation system, metallurgy, writing, mathematics and finally then towards development of large cities that manifested in the form of

Greek and Roman civilizations in the West and Sino-Indian civilizations in the East. Development of production technology and advancement in the application of scientific methods including those in the health science after the Industrial Revolutions then set a motion of demographic transition in the global economy after 1800 AD. Global population was about 1 billion in 1803 and it became 2 billion in 1928 after 125 years. Then the space of population growth remained faster and double again to 4 billion by 1985 and is expected to reach 8 billion by 2024.

China's population was less than 140 million in Han, Song, Yuan and Ming dynasties till 1700, less than 400 million till 1910 - period of the Qin Dynasty. Thus surge in population occurred in China slightly before and after the Cultural Revolution in 1967.

Concerns over the population explosion grew by 1979 when China opened up to the world on trade and started controlled liberalizations of the economy. One child policy in China was, similar to the forced sterilization in India around 1975, came as the life expectancy and longevity grew significantly due to advancement of medical technology and its coverage to the masses of population.

The preliminary motivation of the first chapter is that although Li et al. (2005) and Li et al. (2011) applied the Difference-in-differences (DD) strategic to examine the effect of the one-child policy over the whole country, its effect on each region and province were still unclear. Therefore, based on their research, we hope to give a more detailed report of the effect of the one-child policy on both sex ratio and fertility rate not only from the dimension of the whole country but also to the six major regions and finally to each provinces in China. Our study not only involves the geographic factors, but also other individual and social economic characteristics. By considering the traditional son preference issue in China, the author hopes to pay much more attention to the female cohorts, and try to summarize as much as the possible features (as additional control variables) from the 1990 census data, which may make the population gap between male and female even larger.

The intuitive motivation of the second chapter is that, major existing research on migration decisions in China focus on the geographic and individual level. Thus, the author is motivated to conduct specific research on the impact of migration policy on rural migrants' migration decision. By using the census data in China, this migration research can be expanded from some specific provinces to the whole country. The author aims to employ a Difference-in-differences method to estimate the effect of the migration policy on the migrants, especially the rural-to-urban cluster in contrast to other existing papers which may ignore or pay less attention to the impact of the policy factor on migration decisions. Other influence factors such as age group and education level, which are directly available from the census data, and the regional gap (using data collected from other databases) are all considered in the report.

For the third chapter, considering the two-child policy is a brand new demographic policy, which was only officially decreed after 2016. In other words, it is a completely blank status for all kinds of researchers in every field to explore and investigate. The core purpose of the two-child policy is to replace the one-child policy and to increase the fertility rate. Meanwhile, the Pay-As-You-Go (PAYG) pension system in China is highly dependent on the number of its contributors as well as the beneficiaries from every generation. Therefore, the change of the child policy in China would definitely affect the pension programme both in the short-term and the long-run. It is very interesting and also necessary to build a suitable model to explore and predict whether the current Pay-As-You-Go (PAYG) pension system can be sustainable or not after the two-child policy is introduced.

An Overall Summary of the Research

For the convenience of illustrating this research, we report the main results of each chapter in this section.

Summary of First Chapter

In the first chapter, we apply a Difference-in-differences (DD) method to re-estimate the effect of the one-child policy on sex ratio and fertility. Based on the 1990 Chinese population census, the estimated effect of the one-child policy on fertility is large. The average effect on the probability of having a second child in the post-treatment groups (1943-1970) is as large as -10.9 percentage points between the Han group and ethnic minorities. Moreover, the DD estimators are statistically significant for those cohorts who were aged below 33 when the one-child policy was introduced in 1979.

For the sex ratio estimation, the probability of being a girl was as large as -1.06 percentage points in the 1980s. This indicates that the one-child policy has increased the sex ratio by 4.4, and 93.62 per cent of the rise in sex ratio is for Han Chinese throughout the 1980s. The strong son preference issue also leads to sex ratio imbalance, especially in higher birth parities. The disparity between the Han and minorities becomes more significant, especially in autonomous regions such as Xinjiang, Guangxi and Ningxia. All five autonomous regions shows a disparity more than three times that of all the rest of the provinces in China.

By applying a sub-sample estimation, we also find that the one-child policy has had much more effect on those Han women with urban registration who have a high education level and high income level.

Finally, by combing the two major estimations, we conclude that more highly developed regions show less probability of having a second child, while less developed areas reveal less probability of being a girl.

Summary of Second Chapter

Still using a Difference-in-differences (DD) method, the second chapter estimates the effect of the migration policy on disparity between two types of hukou migrants, with particular attention given to the roles of regional economic development and the impacts of age and education on spatial patterns of migration.

By combining data from the 1990 and 2000 Chinese population censuses, the estimator of effect of the 1992 migration policy on migration is -0.149 percentage points. In other words, the probability of rural hukou migration is 14.9 per cent less than that of urban hukou holders, which implies that the degree of freedom to migrate as an urban hukou migrant, is much higher than that of the rural hukou cohort, even under the encouragement from migration policy. However, our robustness test reflects that our DD estimates of the effect of the migration policy are very likely confounded by other factors, such as regional economic development and the variations of the migration patterns by age and education, for rural and urban hukou migrants.

Analyses at the province level shows that migration flows from the interior to the coastal areas have surged over time and that economic growth poles emerged as major migration destinations at different stages of economic reforms. Thus, the migration gap between rural and urban hukou migrants reduced in both the highly developed regions as recipients and those less developed regions as donors.

For the age-specific estimation, among urban hukou holders, the young working-age group is larger than that of older age population, which reflects that young adults are more mobile and more sensitive than older cohorts to interregional differentials in employment opportunity. In contrast, among rural hukou migrants, the duration of mobility is much longer across all age groups. Therefore, the disparity of migration between two types of hukou becomes smaller as the age increases. Nearly the whole of the interior is suffered from massive outflows of rural households from young labour migrants to older working-age population. The only exceptions are those provinces which depend heavily on natural resources, such as Shanxi, Xinjiang and Ningxia. Unlike other donors of inland provinces they were major recipients of rural migrants of mid-working age and above.

Analysis of education level shows that, it is a very important factor for most rural hukou holders when they decide to migrate. Illiteracy helps to decrease the estimation value for most provinces in China; in other words, the less educated people are, the more they are motivated to migrate. Most coastal provinces are major destinations of less-educated migrants, but only a few of them, including Guangdong and Beijing, particularly benefit from the regional competition for educated rural migrants.

By contrast, the central and western regions as a whole have increasingly suffered from losses of both highly-educated and less-educated rural labours, as in the case of Sichuan province, one of the most populous and agricultural provinces in China. Two other agricultural provinces, Anhui and Henan, only lost large numbers of less-educated rural people. Hubei and Hunan, although two provinces have many higher education institutions but the employment opportunities for educated people are relatively few, compared to their neighbouring coastal provinces. And thus, both two provinces were suffered a significant brain drain.

Summary of Third Chapter

In the third chapter, we set up a calibrated overlapping generation general equilibrium model to investigate the impact of the child policy change on China's Pay-As-You-Go (PAYG) pension system. After the child policy changed, the demographic structure, total dependency ratio and the amount of pension labour will all more or less suffer effects in the future. One more child for households means that they need to squeeze out more individual saving, reduce stock of capital and reduce consumption during retirement in order to rear their second child. As for the government, higher fertility will provide more pension workers with more pension capital from contributors in the future. The large number of labour, however, will retire and become pension beneficiaries in the very long-run situation. Therefore, in our model, first of all, even if we assume the two child policy is implemented well and the pension coverage rate is close to whole country, the prediction still reveals that the pension system will loss around 3 percent, even in the best circumstances.

In addition, we simulate solutions such as absorption of rural migrant workers into urban pension programmes and increase in the pension tax ratio. For the first solution, although the newly migrant workers will directly support existing pension labour, sharing part of responsibility for current pension labour, they will become beneficiaries after they retire and reduce the share of other capital resources of current pension labour. Increasing the pension tax rate can bring significant benefits for the pension system, but it will also have dramatic negative impact on the rest of every household's life. If central government hopes the two-child policy will be implemented well, larger transfer from workers to retirees by increasing the pension tax rate should be the last measure.

Our prediction reflects an unsustainable pension programme as a result of the future effects of the two-child policy. Meanwhile, the current recessionary economic growth in China may drive everything even more severely and lead to unsustainability earlier than expected.

The Contributions of the Research

The contribution of this PhD thesis is that by estimating three major demograophic policiese after nearly 40 years economics reform and opening-up in 1978, we can have a better perspective of policy effect on today's Chinese society pros and cons. Three demographic policies are summarized especially as follows. The first and second chapter are both empirical estimations and the last one is theoretical research.

(1) The contribution of the first chapter is that we improve the approach by applying a Difference-in-differences (DD) method not only across the whole country but also by reducing the estimation scale to the six regional level, and then even to the provincial level to present a more detailed picture of the child policy in every area. We point out that the family control policy has had a significant influence on fertility and sex ratio imbalance. Apart from geographic characteristics, more individual features are considered in this research. For example, the types of registration, education level, employment

status and social economic factor like regional gap of GDP per capita are all included and reported in the second chapter.

(2) For the contribution of the second chapter, it is the first research to focus on the effect of policy on the migration decision, especially for rural-to-urban migrants in China. It also applies a Difference-in-differences (DD) method to analyse the first policy to encourage large scale migration for rural migrants in 1992. Other characteristics such as regional gap, education level and different age groups are also considered in the model, to show more comprehensively effect of the 1992 migration policy on the rural migrants' migration decision.

(3) Since the two-child policy is brand new, there is nearly no research to explore the effect of the two-child policy in the long-run. The major contribution of the third chapter is that it is the first research to focus on prediction of the future of the Pay-As-You-Go (PAYG) pension system under the two-child policy decreed in 2016. We employ a calibrated overlapping generation general equilibrium model to estimate and predict the PAYG pension system under child policy change in the future. We illustrate both situations of the two-child policy implement well and failure and scenarios in between. To sum up, we give a brief picture of the child policy effect on the pension programme in the future.

The Structure of Research

This thesis consists of three chapters. The first chapter re-estimates the impact of the China's one-child policy on both sex ratio and fertility, across the whole country and in each provinces as well. Brief background on the one-child policy and different ethnics groups (Han and other ethnicities) will be introduced. Then a description of the census data and the details of research design will be provided, explaining the Difference-in-differences method in modelling, measurement and regression. And finally, all the estimations based on different control variables will be summarized and presented and an overall conclusion with relevant policy suggestions will be given at the end.

The second chapter estimates the impact of migration policy on the rural migrants' migration decision. An overall introduction about migration history, the unique hukou system in China and the regional development history will be presented first. In addition, a detailed illustration of the Difference-in-differences method with the process of combing data from two censuses will be reported. Then, the empirical results with different control features will be showed. Finally, a conclusion part with relevant policy suggestions, limitations and suggestions for further study will be presented.

The last chapter simulates the recently decreed the two-child policy replacing the one-child after more than 30 years since it was first introduced in 1979. In particular, an integrated background of Chinese pension and the change of child policy will be constructed first and then a calibrated overlapping generation general equilibrium model will be employed to estimate and predict the current PAYG pension system under child policy change in the future. Relevant sensitivity testing test and the final results will be reported at the end.

Chapter One

Estimating the Effect of the One-Child Policy on Fertility and Sex Ratio in China across Provinces

Abstract

In China, the fertility rate has significantly decreased and sex ratio increased since more than two and a half decades of the one-child policy implementation. Because ethnic groups other than Han Chinese were exempted when the one-child policy was first implemented, we apply a difference-in-differences (DD) strategy to estimate the impact of the family control policy on sex ratio and fertility. Using the Chinese Population Census in 1990, we point out that the family control policy has had a significant influence on fertility and sex ratio imbalance. The average influence on the post-treatment groups' probability of having a second child is -10.9 percentage points significant. The probability of being a girl was as large as -1.06 percentage points in the 1980s. This also indicates that the one-child policy has increased the sex ratio by 4.4, and 93.62 per cent of the rise in sex ratio for Han Chinese throughout the 1980s. Our robustness tests suggest that other policies or socio-economic changes may not be the driving factors to impact the DD estimation of the differing effect of the one-child policy between Han and other minorities. Our sub-sample estimation indicates that Han women with urban registration who have high education level and high income level suffered the most influence as a result of the one-child policy. More highly developed areas show less chance or willing to have a second child, while less developed regions reflect a stronger preference for sons.

Keywords: One-child policy, Fertility rate, Sex ratio imbalance, Difference-in-differences

1.1. Introduction

This chapter is a re-estimated exploration based on Li, Zhang and Zhu (2005) and Li, Yi and Zhang (2011), by applying difference-in-differences estimation to analyse the impact of China's one-child policy. One-child policy in China was introduced in 1979. Although the Chinese government claimed that it was a short-term measure, the family control policy has had a great impact on the lives of nearly a quarter of the world's population for a quarter of a century. Under this policy, each household is limited only one child, especially in urban areas. Women are given birth quotas, and households are penalized for above-quota births.

Family control as a counter-natal policy has occurred relatively rarely compared with pro-natal policies in human history. Regarding pro-natal policies, empirical researchers such as Whittington et al. (1990) and Zhang et al. (1994) find that child subsidies or tax deductions have a positive impact on increasing fertility. Regarding the counter-natal policy, the large scale of family control in China provides an unusual opportunity for economists, demographers and other social scientists to examine various aspects of the one-child policy. Li (1995) studied the Heibei Province and found that financial penalties do affect fertility, but the birth-quota system is still inefficient. Couples may still ignore or find ways to circumvent the system to have more than one child, particularly more sons. When the effects of different variables are compared, son preference is clearly seen to be of paramount importance, especially in the progression from second to third parity. Greenhalgh's (1993) fieldwork in several villages in Shaanxi Province revealed that, in order to encourage families to follow the one-child policy, local government may offer child health subsidies for couples who had only one child. Interestingly, most scholars focus on the impact of the family control policy on a specific area or province, except a few researchers like Li, Zhang and Zhu (2005) and Li, Yi and Zhang (2011), who treat the whole country as a research target and apply DD estimation to examine the one-child policy.

A unique aspect of the one-child policy is that it only applies to Han Chinese women especially before 1984. Ethnicity women were generally permitted to have at least two children until the end of the 1980s, whereas Han women could only being allowed one child. The differential application of the family control policy between the Han group and other minority groups has been embodied in various regulations (Hardee-

Cleaveland & Banister, 1988; Park & Han, 1990; Peng 1996; Qian, 1997). Moreover, the difference of child policy across minority groups has evidently been exogenously imposed. Therefore, the consistent condition of Han and minority groups before the family control policy implementation matches the criterion of the difference-in-differences (DD) method (Angrist & Krueger, 1999). In particular, the idea of DD is that there are differences between the Han Chinese and ethnic minorities, both for birth cohorts that are affected by the policy (post-treatment group) and birth cohorts that are unaffected by the policy (pre-treatment group). It provides a precious and unique chance to identify the causal effect of this policy on the fertility and sex ratio imbalance in China. Using data from the 1990 Chinese population census, our DD estimations show that the one-child policy has indeed had a significant impact on reducing the probability of second births and increasing the sex ratio among the Han Chinese, compared with the ethnicities.

Empirically, for the fertility estimation, the mean effect on the probability of having a second child on the post-treatment cohort (those women who were born after 1946) is -10.9 percentage points and statistically significant. The largest magnitude of 21.5 percentage points is identified for those women who were aged around 31 in 1990, the census year. For the sex ratio test, the treatment effect on the probability of being a girl is as large as -1.07 percentage points for the 1980-1990 birth cohorts. This means that during this period, the sex ratio causally increased by 4.4 and the percentage of the rise in sex ratio for Han Chinese was 93.62 per cent. Our robustness tests suggest that other policies or socio-economic changes are not likely to impact the DD estimation of the differential effect of the birth control policy between Han and the minorities.

One of the differences between this chapter and with the two most related papers is that, instead of estimating effects for the whole country, we further the DD research by applying regional and provincial level estimation. This reveals that, less developed regions like the central south, southwest and northwest and part of those provinces with relatively high proportion of minorities still shows significant outcome, while in most provinces, outcomes are statistically insignificant.

By applying sub-sample estimation, we also find that factors like urban type of registration, higher education level, women with stable and high human capital required occupations and relatively high wage income in better developed areas all contributed to the one-child policy becoming much more effective. In summary, those Han women with urban registration who have high education level and high income level suffered the most influence from the one-child policy.

Finally, the policy implication based on our empirical findings is that the unbalanced effect of the one-child policy further exacerbates the inequality in Chinese society. The shortage of women may have increased mental health issues and socially disruptive behaviour among men and has left some men unable to marry and have a family.

The structure of the chapter is as follows. The next section provides the background information on the unique two types of registration and birth control policy in China especially how the policy was mandatory for the Han Chinese and exempted the ethnic minorities, and the consequential phenomena of fertility decrease and sex ratio imbalance. In the next two sections, we specify our empirical methodology and introduce the data of the Population Census of China in 1990. In Section 4 we report our DD estimates of the effect of the one-child policy on fertility and sex ratio, and perform a robustness test, and the last section is the conclusion.

1.2. Background

1.2.1. The One-Child Policy

In 1979, the Chinese government embarked on an ambition programme of market reform following the economic stagnation of the Cultural Revolution. At the time, China was home to a quarter of the world's people, who were occupying just 7 per cent of world's arable land. Two thirds of the population were under the age of 30 years, and the baby boom generation of the 1950s and 1960s were entering their reproductive years. The government saw strict population containment as essential to economic reform and to an improvement in living standards. For this reason, the one-child family policy was introduced.

Under this family control policy, each family is allowed to have only one child. To implement the policy and while to incorporate local characteristics, the central government allowed each provincial government to draw up its own birth control regulations or rules, based on the national policies (CCCPC, 1984). Local governments at all levels, were given incentive contracts in the form of fiscal rewards for fulfilling birth targets, with heavy penalties if they fell short (Hardee-Cleaveland & Banister, 1988; Short & Zhai. 1998). For each household, the rewards and penalties regime varied widely as well. They included economic incentives for compliance and substantial fines, confiscation of belongings, and dismissal from work for non-compliance.

Contraception and abortion are the two major ways of implementing the one-child policy. A total of 87 per cent of married women use contraception (Yin, 2003). There is heavy reliance on long-term contraception, with intrauterine devices and sterilizations together accounting for more than 90 per cent of contraceptive methods used since the mid-1980s (Yang, 1994; Yin, 2003). The number of sterilizations has declined since the peak in the early 1990s. According to Yin’s (2003) report, 80 per cent of women had no choice and just accepted the method recommended by the family-planning worker.

There are a few exceptions, especially for urban residents and government employees. For those families, if the first child has a congenital disease or disability, they can have one more child. If both parents work in high risk occupations (such as mining) or are themselves from one-child families (in some areas), these type of families can also gain exemption. In rural areas, which contain approximately 70 per cent of the Chinese population, a second child is generally allowed after five years, but this provision sometimes applies only if the first child is a girl, which as a clear acknowledgment of the Chinese traditional preference for boys.

Apart from the exception examples above, a unique situation of the Chinese family control policy is that it is a policy that has exemption aspects with respect to ethnic minorities. The government has enacted tighter control over the birth rate of Han Chinese women, compared to that of ethnic minority women. For example, in Xinjiang province, minority women can have as many as four children. In rural areas of Tibet, there are no restrictions on the number of children that minority women can have (Li, Zhang & Zhu, 2005). After five years exemption, in April 1984, the government for the first time started that there should also be birth control policies for ethnic minorities, but emphasized that the policy should be less restrictive for such groups (CCCPC, 1984; Hardee-Cleaveland & Banister, 1988). However, four years later at the end of

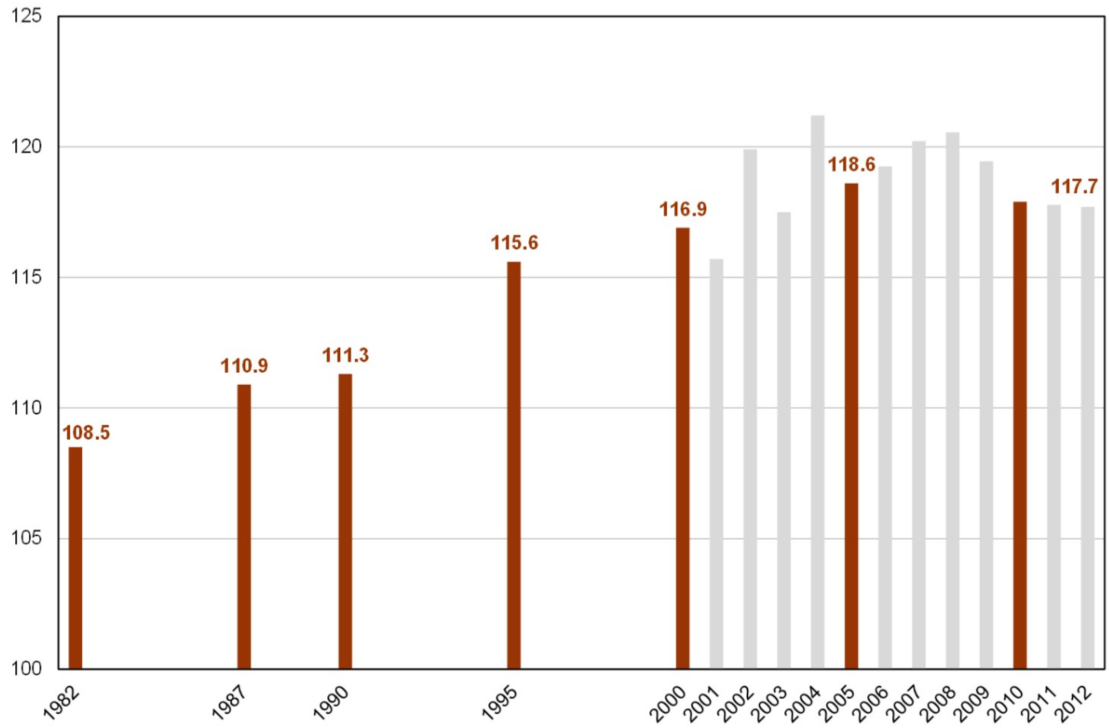
1988, minority women were allowed to have a second child (Deng, 1995), and for ethnic groups with a population of less than 10 million, a second or even a third child was allowed. Only those ethnic groups with a population of more than 10 million were still limited by the same policy as the Han. At the end of the 1980s, only the Zhuang group had a population more than 10 million, most of whom lived in Guangxi. On 17 September 1988, the Guangxi provincial government introduced the one-child policy for ethnic Zhuang families (Guangxi Autonomous Government, 1988), and other provinces started to apply the same policy in the 1990s. By 1990, the population of the Manchu, the second largest ethnic group in China, had also topped 10 million, and they therefore became subject to the one-child policy. To summarize, for most of the 1980s, minority women were allowed to have more than one child, which provides a unique natural experiment with which to estimate the effect of the birth control policy on fertility (Li et al., 2005).

1.2.2. Fertility Decrease and Sex Ratio Imbalance

In order to set a target population of 1.2 billion by the year 2000, the Chinese government introduced the one-child policy from 1979. When the census of 2000 report came out, it puts the population of China at 1.27 billion, although some demographers regard this number as an underestimate. Chinese authorities claim that the policy has prevented 250 to 300 million births. The total fertility rate decreased from 2.9 in 1979, with a significant fall before 1995, and then stabilized at approximately 1.6 until 2015.

The effect of the policy on the sex-ratio has received considerable attention. In China, parents have historically preferred sons to daughters and in some circumstances discarded daughters upon birth (Coale & Banister, 1994). In the 1960s, when fertility was high and infant mortality was low, this pattern was temporarily muted by the fact that most mothers were likely to have at least one surviving son without resorting to sex selection. Since the onset of the one-child policy, there has been a steady increase in the reported sex ratio, from 1.06 in 1979, to 1.11 in 1988, to 1.17 in 2001 (Kang & Wang, 2003). There are marked and well-documented local differences, with ratios of up to 1.3 in Anhui, Guangdong and Qinghai provinces. What happens to all the missing girls is a matter of speculation. Sex-selective abortion after ultrasonography undoubtedly accounts for a large proportion of the decline in female births. Actual figures are impossible to obtain, because sex-selective abortion is illegal but is known to be widely carried out, helped by a burgeoning private sector. Nonregistration of female births also contributes to the sex-ratio gap (Short & Zhai, 1998). A 1995 household survey carried out in three provinces found a normal sex ratio in the under-14 age group, with the actual number of girls exceeding the number registered by 22 per cent (Bogg, 1998). Although infanticide of girls is probably very rare now, less aggressive treatment of sick female infants is known to occur (Wu et al. 2003). We also provide the sex ratios in general and by rural and urban areas to highlight the imbalance issue after one-child policy implementation as follows:

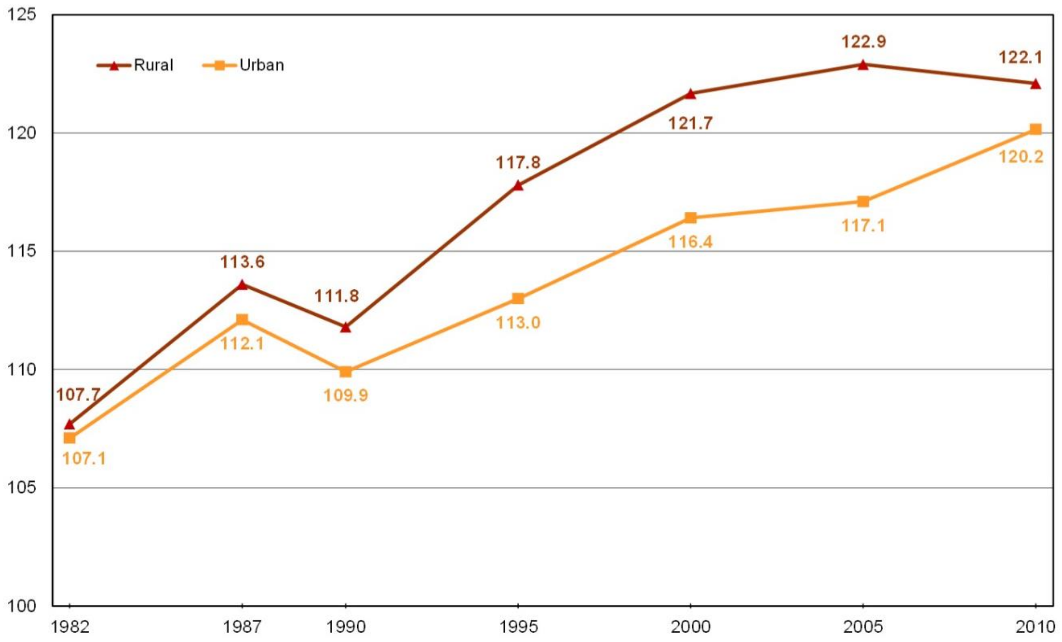
Figure 1.1: Male births per 100 female births, 1982-2012



Source: National Bureau of Statistics, 1982, 1990, 2000, and 2010 Population Censuses, (respectively published in 1985, 1993, 2002 and 2012); 1987, 1995 and 2005 One Per cent Population Sample Surveys (respectively published in 1988, 1997 and 2007); Annual National Sample Survey on Population Changes, other years (published via annual Statistical Communiqué on the National Economic and Social Development).

In the absence of intervention, the human sex ratio at birth lies between 103 and 107 male births per 100 female births. As men have a higher mortality rate than women, the sex ratio at birth is higher than the sex ratio observed later in life, such as at reproductive age. In China, the sex ratio at birth has become increasingly skewed in general, growing from 109 males per 100 females in 1982 to 118 males per 100 females in recent years. The abnormally high SRB and the associated number of "missing women" in China highlights the extent to which girls are denied the right to life and reflects deep-seated sex discrimination that adversely affects girls' development

Figure 1.2 : Sex ratio at birth, rural and urban, 1982-2010



Source: National Bureau of Statistics, 1982, 1990, 2000, and 2010 Population Censuses, (respectively published in 1985, 1993, 2002 and 2012); 1987, 1995 and 2005 One Per cent Population Sample Surveys (respectively published in 1988, 1997 and 2007).

The sex ratio at birth is higher in rural areas than in urban areas. Over the last two decades, the sex ratio at birth has increased in both urban and rural areas, but more rapidly in rural areas until 2005. Data from 2010 Population Census indicates a decrease of sex ratio at birth in rural area. Accordingly, the urban-rural disparity reached its highest in 2005, and then decreased in 2010.

1.2.3. Hukou

The household registration system (Hukou zhidu) was initially developed in the 1950s to carry out vital registration, to limit rural-to-urban migration, and to impose effective political and social controls. Each person in China has an official record, i.e. the household registration (Hukou)—recording personal characteristics and background information including date of birth, place of birth, place of origin (father’s or grandfather's place of birth), and present place of residence. The Public Security Bureau (Gong An Ju) maintains the record at the village level in rural areas and at the neighbourhood community level in urban locations (Goldstein 1987, 1990; Goldstein & Goldstein 1987-1988). Household registration classifies Chinese people into two groups and, essentially, two different societies. The first group, commonly designated "peasant registration", "rural registration" or "agricultural registration" (nongcun Hukou), is composed of people who depend mainly on agriculture for their subsistence; the second group, "worker registration", "urban registration" or "non-agricultural registration" (chengshi Hukou), draw wages or other allocations from the state.

An individual with rural type of registration mainly produces agricultural products to obtain cash and food. There is no food quota that can be received directly from the government. Instead, the food quota is determined by the local village committee; usually this was the production team before the rural economic reform. Since the economic reform of 1979, peasants sell a certain amount of their produce to the government according to a contract (Wiens 1987). Individuals with agricultural registration are not guaranteed food, cash income, medical insurance or old age pensions (Wang, Li & Wen 1990).

In contrast, individuals with a non-agricultural type of registration is guaranteed formal employment and a pension for retirement, and depends mainly on salary to buy commercially produced food; a certain food ration is allocated directly by local government. Career promotion and major benefits such as housing, medical services, children's education, and maternity leave are also guaranteed, but are controlled directly by the government through the work unit (Goldstein & Goldstein 1987-1988; Guo & Liu 1990). If an individual violates any regulations or policies, he or she may undergo severe administrative and/or economic sanctions through the work unit, by reduction, cancellation, or postponement of benefits expected as an urban resident. Although the most commonly imposed sanctions are economic, the government can even revoke individuals' non-agricultural registration and send them to rural or remote areas as a punishment (Guo & Liu 1990). Hence, individuals with urban registration are controlled more easily by the government, while simultaneously receiving more benefits. Thus, the distinction in household registration type can be used as a variable reflecting the degree of government control.

1.2.4. Han and other Minority Groups in China

As a large united multi-national state, China is composed of 56 ethnic groups. Among them Han Chinese account for 92.04% of the overall Chinese population and the other 55 share the remaining 7.96% according to the forth National Population Census of 1990. As the combined population of these other minorities is far fewer than that of the Han, they form the 55 minorities of China.

With more than ninety percent of Chinese population, the Han Chinese can be found in almost every part of China. However, they mainly live in the middle and lower reaches of the Yellow River, Yangtze River and the Pearl River, and also in the Northeast Plain Region. They form the largest ethnic group within China and as well as the largest in the world. As for non-Han people, although they make up only a small proportion of the overall Chinese population, the 55 minority ethnic groups are distributed extensively throughout different regions of China. The regions where they are most concentrated are Southwest China, Northwest China and Northeast China. No matter whether it is Inner Mongolia, Xinjiang, Ningxia, Guangxi, Tibet, Yunnan, Guizhou, Qinghai or Sichuan, Gansu, Hubei, Hunan or another province, one can find Chinese minorities (see Appendix). From the areas listed above, the greatest number of minorities can be found in Yunnan Province (25 ethnic groups). Zhuang has the largest population (more than 16 million) of minority ethnic groups.

In order to ensure that the 56 Chinese ethnic groups live together in harmony, the government introduced a series of polices including ones to secure the equality and unity of ethnic groups, give regional autonomy to ethnic minorities and promote respect for the faith and customs of ethnic groups, the exemption of the one-child policy. Also five autonomous regions; Inner Mongolia, Xinjiang, Guangxi, Ningxia and Tibet, as well as numerous autonomous prefectures, counties, nationality townships and towns have been set up. With guidance from the Chinese government, the minorities in areas that have been given regional autonomy are entitled to deal with their own affairs. Together with the Han people, the Chinese minorities are making great efforts to build a prosperous China.

1.3. Difference-in-differences Strategy

In this section, we aim to explain how we apply the difference-in-differences (DD) strategy in order to measure the effect of the one-child policy on fertility and gender.

This difference-in-differences (DD) statistical technique was first introduced by Angrist and Krueger (1999). By studying the differential effect of a treatment on a 'treatment group' versus a 'control group' in a natural experiment, it calculates the effect of a treatment (i.e., an explanatory variable or an independent variable) on an outcome (i.e., a response variable or dependent variable) by comparing the average change over time in the outcome variable for the treatment group, compared to the average change over time for the control group.

In this case, the interaction term of DD can be applied to identify the change which attributes from the one-child policy after its introduction. To introduce this identification strategy, we need first to follow the criteria above to set up the treatment group and control group in order to explain how the DD method can be applied to estimate the effect of the one-child policy. The difference-in-differences strategy works because the birth control policy only applied to the Han group. Thus, we have the treatment group, which is the Han people, with other minorities as the control group. A distinct characteristic of the family planning policy is that the timing of the treatment is continuous, as would be the case in most situations to which a DD method might be applied, such as joining a training programme (Li et al., 2005).

1.3.1. Probability of having a second child

The differential application of the one-child policy between Han and other ethnic groups serves as a quasi-experiment to identify the causal effect on probability of having a second child. Essentially, we estimate the coefficient of the interaction of age and the Han dummy[1]. However, setting pre-treatment and post-treatment groups for fertility testing is a somewhat more difficult testing for the probability of being a boy, because the cut-off year 1979 can be directly applied to the birth cohort of children, but for the women cohort, another suitable cut-off year for having a second child should be considered.

We set up children ever born as a dummy and dependent variable, which should equal 1 if a woman has more than one child and 0 if she only has one child. In addition, we set T and H as dummies for the time effect of birth cohort and ethnicity respectively; H=1 for Han women, 0 for women of other minorities. T=1 for those women in the

[1] Measure of the timing of the policy, as women of different ages have different childbearing periods that overlap with the period of the one-child policy.

post-treatment group who may suffer from the one-child policy and distort their wish to have one more child, and equalling T=0 for those of the pre-treatment group who already had at least a second child before the one-child policy was introduced.

Additionally, the treatment is a matter of degree that decreases with the age of a woman. For example, in 1979 when the one-child policy was decreed, a Han woman aged 25 would suffered more influence by the one-child policy than a Han woman who was already 50 years old in that year, because there are fewer childbearing years left for the an older woman, both considering by her physical condition and mental willingness. Hence, a suitable pre-treatment group should be identified. The eligible women of this group would be pre-treatment women who by 1979 should already have had their second child if they wanted and were able to do so. Then we turn to identify the cut-off age for the pre-treatment cohort. According to previous studies, Li et al. (2005) set the cut-off age, 37 as the biological limit during that period based on 1982 and 1990 census data. Because earlier cohorts tended to have children earlier in their lifecycle than later cohorts, we decide to follow the assumption of Li et al. (2005) that women who were aged 37 or above had already had their second child if they wanted and were able to. The cut-off age 37 in 1979 means that the birth year of the cut-off women cohort should be around 1942. Therefore, we set up the 1942 and earlier cohorts as the pre-treatment group in our difference-in-difference estimation.

Therefore, for the fertility test, we have four groups. For the pre-treatment groups we have: Han women who were born before 1942, and minority women who were born before 1942. The post-treatment groups are Han women born after 1942 and women of the ethnic groups were born after 1942. The four groups can be illustrated as in the following table:

	Han	Other ethnic groups
Birth year before 1942	$E(F_i \mid H=1, T=0)$	$E(F_i \mid H=0, T=0)$
Birth year after 1942	$E(F_i \mid H=1, T=1)$	$E(F_i \mid H=0, T=1)$

We use the following DD framework to control for systematic differences across both ethnic groups and birth cohorts. Differencing the mean value of sex ratio or fertility based on different analysis, across birth cohorts and ethnic groups gives

$$\left(F_{Han}^{After} - F_{Han}^{Before}\right) - \left(F_{Oth}^{After} - F_{Oth}^{Before}\right) = \alpha_0 + \alpha_1 P^{After} + \varepsilon \qquad (1.1)$$

In this equation, the DD estimation captures the causal effect of the one-child policy on any target value. Where F_{Han}^{After}, F_{Han}^{Before}represents sex ratio/fertility rate among Han people under or before the one child policy and F_{Oth}^{After}, F_{Oth}^{Before} are similar measure among the non-Han people under or before the one child policy. And the P^{After} is just the policy effect we are looking for.

In practice, the following regression-adjusted DD model is used to identify the effect of the one-child policy on the probability of having a second child.

Consider

$$Y_i = \alpha_0 + \alpha_1 H_i + \alpha_2 T_i + \alpha_3 H_i T_i + X_i \beta + \varepsilon_i \tag{1.2}$$

where H_i and T_i, pick up ethnicity and time effects, respectively. The coefficient of the interaction term of $H_i T_i$, or α_3 captures the causal effect of the one-child policy on the fertility of a Han women who was born after 1942. In fact, α_3 is identical to our DD in Eq.1. Now the probabilities of having a second child for the four groups are as follows:

	Han	Other ethnicities	Difference
Before 1942	$\alpha_0 + \alpha_1$	α_0	α_1
After 1942	$\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3$	$\alpha_0 + \alpha_2$	$\alpha_1 + \alpha_3$
Difference	$\alpha_2 + \alpha_3$	α_2	α_3

Thus, the policy effect on the probability of having a second child is α_3. Supposing that there is no one-child policy had been decreed to change fertility, it should remain unchanged both for Han women and ethnic minority women between 1979 and 1990, the difference-in-differences estimator picks up the effect of the one-child policy on fertility. In other words, the interaction term reflects the disparity of fertility between Han and women of other ethnic groups which is affirmatively contributed by the one-child policy. We expect a negative coefficient of the estimator term, which can demonstrate that the family planning policy has reduced the fertility of Han Chinese compared to other cohorts of exempted ethnic minorities.

Before we go further, we need to discuss the estimator we used in this DD strategy, we summarize the properties of four estimators below:

	Properties
OLS	Linear least squares. This is a method for approximately determining the unknown parameters located in a linear regression model.
Maximum likelihood	A method used in estimating the parameters of a statistical model and for fitting a statistical model to data.
Pseudolikelihood	An approximation to the joint probability distribution of a collection of random variables. The practical use of this is that it can provide an approximation to the likelihood function of a set of observed data which may either provide a computationally simpler problem for estimation.
Pooled panel	Pooled OLS is simply an OLS technique run on Panel data.

Obviously, based on equation 1.2, the DD estimation is a linear regression model, with dummy independent variables, and there is no time series since our data is the population census for each individual only. Thus, the estimator applied in this analysis is the OLS estimator.

It is worthwhile noting that we add a vector of variables X_i in the equation to control for some demographic characteristics and geographic features that may also be correlated with the probability of having a second child. The value of α_3 can only be changed by the vector X_i if H_iT_i and X_i are correlated, conditional on the two main effects of being Han and the one-child policy. In this chapter, to test the robustness of our estimated result, we will carry out both regressions with and without X_i. For details, the control variables we consider in the chapter are women's hukou, women's education level and their husband's education level for fertility test and child's hukou registration and their own birth place for sex ratio estimation.

1.3.2. Likelihood of being a girl

The gender test is easier than the fertility one. We set gender as a dependent indicator, equalling 1 if it is a girl and 0 for a boy. The Han dummy remains unchanged, and the time effect can use the policy introduction year, 1979 as the cut-off year. It equals 1 if a child was born after 1979 and 0 for births before 1979. Then the four groups for the gender test are: Han children born before 1979, ethnic minority children born before 1979; Han children born after 1979 and ethnic minority children born after 1979.

Recall the empirical method of Eq. (2) above, for the sex ratio test, now the average probabilities of being a girl for the four groups are:

	Han	Ethnicity	Difference
Born before 1979	$\alpha_0 + \alpha_1$	α_0	α_1
Born after 1979	$\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3$	$\alpha_0 + \alpha_2$	$\alpha_1 + \alpha_3$
Difference	$\alpha_2 + \alpha_3$	α_2	α_3

Considering that the definition of sex ratio is the number of males per 100 females in the population, we also need to get the probability of being a girl. Using the estimates in Eq. (2), the ratios of males over females for the four groups are:

	Han	Ethnicity
Before 1979	$[1-(\alpha_0+\alpha_1)]/(\alpha_0+\alpha_1)$	$(1-\alpha_0)/\alpha_0$
After 1979	$[1-(\alpha_0+\alpha_1+\alpha_2+\alpha_3)]/(\alpha_0+\alpha_1+\alpha_2+\alpha_3)$	$[1-(\alpha_0+\alpha_2)]/(\alpha_0+\alpha_2)$

Thus, the policy effect on the sex ratio imbalanced (*PESRI*) can be calculated as

$$PESRI = 100 * \left\{\left[\frac{1-(\alpha_0+\alpha_1+\alpha_2+\alpha_3)}{(\alpha_0+\alpha_1+\alpha_2+\alpha_3)} - \frac{1-(\alpha_0+\alpha_1)}{(\alpha_0+\alpha_1)}\right] - \left[\frac{1-(\alpha_0+\alpha_2)}{(\alpha_0+\alpha_2)} - \frac{(1-\alpha_0)}{\alpha_0}\right]\right\} \tag{1.3}$$

Obviously, *PESRI* will equal zero if there is no policy effect on the sex ratio.

Finally, the percentage of the change in sex imbalanced contributed from by the one-child policy (*POCP*) for the Han Chinese is:

$$POCP = \frac{PESRI}{\left[\frac{1-(\alpha_0+\alpha_1+\alpha_2+\alpha_3)}{(\alpha_0+\alpha_1+\alpha_2+\alpha_3)} - \frac{1-(\alpha_0+\alpha_1)}{(\alpha_0+\alpha_1)}\right]} \tag{1.4}$$

where $\left[\frac{1-(\alpha_0+\alpha_1+\alpha_2+\alpha_3)}{(\alpha_0+\alpha_1+\alpha_2+\alpha_3)} - \frac{1-(\alpha_0+\alpha_1)}{(\alpha_0+\alpha_1)}\right]$ is the total change in sex ratios for the Han Chinese and *PESRI* is the part attributed to the one-child policy.

1.4. Data Description

Data comes from a 1% sample of the 1990 Chinese Population Census that was collected by the IPUMS International. To evaluate the effect of China's birth control policy on the probability of being a girl and the probability of having a second child at the national and provincial levels, the reason for using census data is self-evident, compared with other survey data, which were derived at the provincial level or even at the country level. The record of each household is followed by a record for each individual residing in the household. Variables that relate to individuals include location, registration type, and the composition of the household, demographic characteristics, occupation, education level, ethnicity, marital status, and fertility. Meanwhile, in view of a delayed family control policy, compared to the 1982 population census, applying the 1990 census allows us an appropriate ten years' lagged length of time after the implementation of the one-child policy in 1979. Last but not least, the union household registration (hukou) system in China was still strictly regulated in the 1990s, and thus there was little household mobility. Thus, the data on registration type (urban hukou holder vs. rural hukou holder) and other geographic features are more reliable to apply.

Since our two major empirical analyses are conducted on the probability of being a girl (sex ratio) and the probability of having a second child (fertility), these two analyses require two different types of research cohort. Thus, sample 1 includes all women who were household head or spouse of the head, aged between 20 and 64 in the census year 1990. For these cohorts, there should at least have complete information about ethnicity, gender, age, registration type, number of children and own education level.

In order to make sure the target cohorts had already become mothers, first of all, we need to restrict the sample to women who are either the spouse of the household head or just head of the household. Next, the ages of these women should be in the range of 20 to 64 years in the census year. Because 20 is the legal age of marriage for women in China, births to women below the age 20 are rare. Hence we set up 20 as the lower bound. On the other hand, since the census does not ask women who are older than 64 for fertility information, so we can simply set 64 as the upper bound. Last, considering the one-child policy only limits the birth of second children, our target women should already have had at least one child. With these restrictions and criteria, we collect a sample of 2,351,083 women from the 1990 census. Of these women, 92.39 per cent are Han Chinese. Since the one-child policy does not affect the first child, the dummy variable can be applied, equalling 0 if there is only one child and 1 for more than one[2].

As for Sample 2, consider that 18 is the legal minimum age for full-time work in China, and most children younger than 18 are treated as economically dependent and have to live with their parents. Therefore, for the sample selection, only children born after 1972 with ethnicity, gender, age, registration type, and geographic information are considered. Moreover, the maximum age of children in the census year of 1990 is 18. Combining all these restrictions, we obtain a sample of 1,521,563 children who were born during 1973 to 1979 as the pre-policy cohort and 2,334,926 for the post-policy cohort, and the total number of observations is 3,856,489.

[2] Note we choose children ever born as a variable instead of number of children in family in our data application, because number of children may contain adopted children in a reconstituted family.

Table 1.1: Descriptive Statistics of 1% Sample of 1990 Population Census

		Sample 1		Sample 2	
Variables	Definitions				
Gender	1=male; 0=female	0.520	(0.500)	0.520	(0.500)
Han	1=Han; 0=Minorities	0.930	(0.254)	0.903	(0.296)
Rural	1=non-agricultural Hukou;	0.231	(0.421)	0.160	(0.367)
	0=agricultural Hukou				
Treat1	1=born after 1942;	0.743	(0.437)		
	0=born between 1926-1942				
Treat2	1=born after 1979			0.606	(0.489)
	0=born before 1979				
Fertility					
Num. of children born		2.980	(1.827)		
Having a first child	1=one child;0=otherwise	0.720	(0.449)		
Having a second child	1=two children;0=otherwise	0.531	(0.499)		
Having a third child	1=three; 0=otherwise	0.348	(0.476)		
Education					
Illiterate	1=illiterate; 0=otherwise	0.370	(0.483)		
Primary school	1=primary; 0=otherwise	0.536	(0.499)		
Secondary	1=secondary; 0=otherwise	0.091	(0.288)		
Higher education	1=higher edu; 0=otherwise	0.003	(0.057)		
Number of Observations		2351083		3856489	

Note: Sample 1 contains all mothers aged 20 to 64 in the Chinese population census in 1990 (1% sample) for whom there is information on age, gender and registration type. Sample 2 includes all children aged 0 to 17 in the Chinese population census in 1990 (1% sample) for whom there is information on age, gender and registration type.

We summarize part of the variables of the 1990 census in Table 1.1. It gives variable definitions and summary statistics for the two subsamples. In sample 1, Gender, Han, rural and treat are four dummy variables indicating sex, ethnicity, household registration type, and birth cohort of the women. Four dummy variables are all equal to one if a person is a Han woman who was born after 1942 and she is a non-agricultural hukou holder. And it also equals to 1 for sample 2, for a Han girl born in an urban area after 1979. As we mentioned before, since the household hukou system remained relatively strictly regulated in China before 1990, household registration type can also be indicated as the geographic feature of each individual. Also the differential application of the family control policy for households is based on registration type instead of geographic location type. The performance of sample 2 is the same as in Li, Yi and Zhang (2011), while the number of observations in sample 1 is slightly less than reported by Li, Zhang and Zhu (2005). Since we define the status of mother by using the spouse of the household head or head of the household, whether it includes single mothers or not is uncertain.

For sample 1, one thing worth noting is that the average number of children per woman is far greater than one, despite the fact that the one-child policy had been in force for ten years by the time of the census in 1990. Also the proportion of women who had a second or third child was 0.531 and 0.348 respectively, compared with 0.720 for having a first child. The educational levels of women are classified into four categories: illiterate (including semiliterate), primary school, secondary school and higher education (i.e. university). The proportion of primary-educated women accounts for more than half (53.6%) while only 0.3% women had completed the university level of education.

1.5. Empirical Results

In order to make sure our sample size selection are as close possible to Li, Zhang and Zhu (2005) and Li, Yi and Zhang (2011), first, we re-examine part of the effect of the one-Child policy based on their procedures.

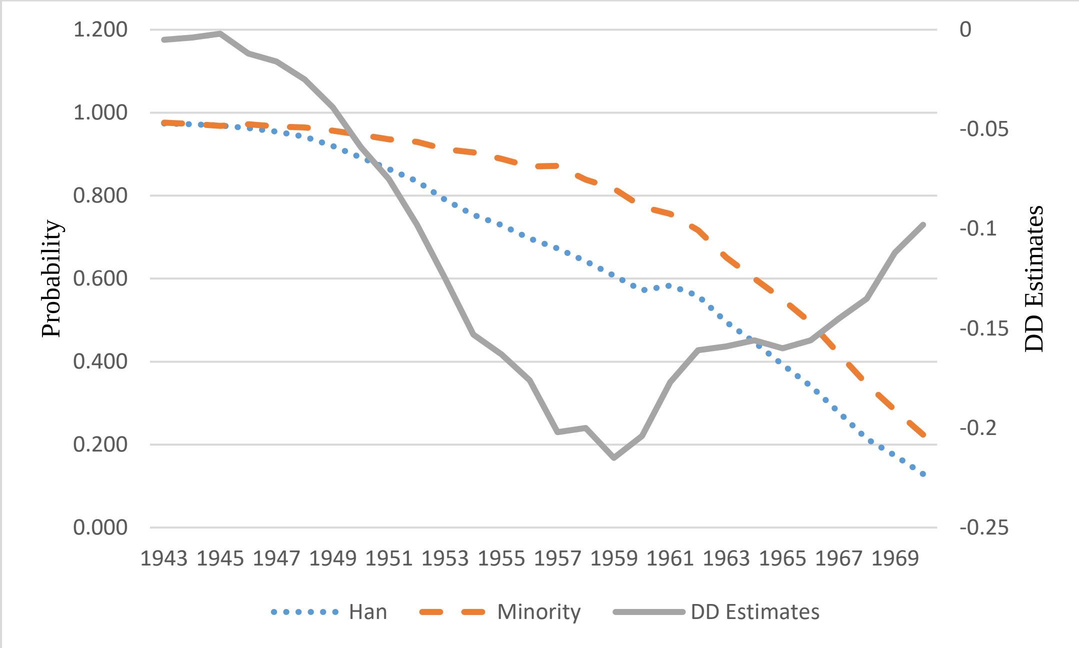
1.5.1. Re-estimation of the Effect on the One-Child Policy in China

Table 1.2: DD Estimates of the Effect of One-Child Policy on the Probability of Having a Second Child: 1990 Census

Birth Cohort	Age in 1990	Han	Minority	Han-Minority		DD Estimates (α3)	
Pre-Treatment (*T*=0)							
(N=603729)		1	2	3		4	
1926-1942	64-48	0.972	0.969	0.003	(0.001)***		
Post-Treatment (*T*=1)							
(N=1747354)							
1943	47	0.974	0.976	-0.002	(0.003)	-0.005	(0.003)*
1944	46	0.972	0.973	-0.001	(0.003)	-0.004	(0.003)
1945	45	0.969	0.968	0.001	(0.003)	-0.002	(0.003)
1946	44	0.963	0.972	-0.008	(0.003)***	-0.012	(0.003)***
1947	43	0.954	0.967	-0.013	(0.003)***	-0.016	(0.003)***
1948	42	0.942	0.964	-0.022	(0.003)***	-0.025	(0.003)***
1949	41	0.920	0.957	-0.036	(0.003)***	-0.039	(0.003)***
1950	40	0.892	0.947	-0.056	(0.003)***	-0.059	(0.003)***
1951	39	0.864	0.936	-0.072	(0.003)***	-0.075	(0.003)***
1952	38	0.835	0.930	-0.095	(0.003)***	-0.098	(0.003)***
1953	37	0.790	0.912	-0.122	(0.003)***	-0.125	(0.003)***
1954	36	0.754	0.904	-0.149	(0.003)***	-0.153	(0.003)***
1955	35	0.729	0.889	-0.160	(0.003)***	-0.163	(0.003)***
1956	34	0.697	0.870	-0.173	(0.003)***	-0.176	(0.003)***
1957	33	0.673	0.872	-0.199	(0.003)***	-0.202	(0.003)***
1958	32	0.642	0.839	-0.197	(0.003)***	-0.200	(0.003)***
1959	31	0.607	0.817	-0.212	(0.003)***	-0.215	(0.004)***
1960	30	0.572	0.773	-0.201	(0.003)***	-0.204	(0.003)***
1961	29	0.583	0.756	-0.174	(0.004)***	-0.177	(0.004)***
1962	28	0.559	0.717	-0.158	(0.003)***	-0.161	(0.003)***
1963	27	0.495	0.651	-0.156	(0.003)***	-0.159	(0.003)***
1964	26	0.447	0.600	-0.153	(0.003)***	-0.156	(0.003)***
1965	25	0.393	0.550	-0.156	(0.003)***	-0.160	(0.003)***
1966	24	0.341	0.494	-0.153	(0.003)***	-0.156	(0.003)***
1967	23	0.278	0.419	-0.141	(0.004)***	-0.145	(0.004)***
1968	22	0.214	0.346	-0.132	(0.004)***	-0.135	(0.004)***
1969	21	0.174	0.283	-0.109	(0.005)***	-0.112	(0.005)***
1970	20	0.129	0.224	-0.095	(0.006)***	-0.098	(0.006)***
1943-1970	47-20	0.694	0.800	-0.106	(0.001)***	-0.109	(0.002)***

Notes: Standard errors are in parentheses. The dependent variable is a dummy variable indicating the probability of having a second child; it equals 1 if the family has more than one child, and 0 for a one-child family. **p*<.10; ***p*<.05; ****p*<.01

Figure 1.3: Probability of having a second child



The estimation results for the 1990 census are reported in Table 1.2. As displayed in column 4, the DD estimators are negative and significant for almost all in the post-treatment groups. Combined with Figure 1.3, we can clearly see the trend of the gap between Han and Minority groups on the probability of having a second child. It shows a continuous decline with the magnitude of DD estimation reaching the maximum value of 21.5 per cent for the 1959 cohort, and then increases.

Clearly, the one-child policy has had a significant effect on decreasing the fertility of Han Chinese relative to ethnic minorities. The DD estimators for each cohorts of women between 1946 and 1959, in other words, those aged between 20 and 33 when the policy was enacted in 1979, is statistically significant. The cohorts who were aged around 20 suffered the most effect of the one-child policy. Women around 20 are in the optimum reproductive age, and most of these cohorts may have just get married or not had a baby yet. The change of the policy directly influenced their willingness to have a second child. The average effect on the post-treatment groups is -10.9 percentage points for the 1990 census.

The following analysis is a robustness check. We only report the DD estimates in tables, due to space limitations.

Table 1.3: DD Estimates of the Effect of One-Child Policy on the Probability of Having a Second Child: 1990 Census (With other control variables)

Birth Cohort	No Control		Women's Hukou		Women's Education		Husband's Education	
Post-Treatment								
(N=2351083)								
1943	-0.005	(0.003)*	-0.005	(0.003)*	-0.004	(0.003)	-0.005	(0.003)*
1944	-0.004	(0.003)	-0.004	(0.003)	-0.003	(0.003)	-0.004	(0.003)
1945	-0.002	(0.003)	-0.002	(0.003)	-0.001	(0.003)	-0.002	(0.003)
1946	-0.012	(0.003)***	-0.012	(0.003)***	-0.010	(0.003)***	-0.012	(0.003)***
1947	-0.016	(0.003)***	-0.017	(0.003)***	-0.015	(0.003)***	-0.016	(0.003)***
1948	-0.025	(0.003)***	-0.030	(0.003)***	-0.024	(0.003)***	-0.025	(0.003)***
1949	-0.039	(0.003)***	-0.040	(0.003)***	-0.039	(0.003)***	-0.039	(0.003)***
1950	-0.059	(0.003)***	-0.059	(0.003)***	-0.057	(0.003)***	-0.058	(0.003)***
1951	-0.075	(0.003)***	-0.077	(0.003)***	-0.074	(0.003)***	-0.075	(0.003)***
1952	-0.098	(0.003)***	-0.101	(0.003)***	-0.097	(0.003)***	-0.098	(0.003)***
1953	-0.125	(0.003)***	-0.128	(0.003)***	-0.123	(0.003)***	-0.125	(0.003)***
1954	-0.153	(0.003)***	-0.155	(0.003)***	-0.151	(0.003)***	-0.152	(0.003)***
1955	-0.163	(0.003)***	-0.166	(0.003)***	-0.161	(0.003)***	-0.163	(0.003)***
1956	-0.176	(0.003)***	-0.180	(0.003)***	-0.175	(0.003)***	-0.176	(0.003)***
1957	-0.202	(0.003)***	-0.204	(0.003)***	-0.200	(0.003)***	-0.202	(0.003)***
1958	-0.200	(0.003)***	-0.203	(0.003)***	-0.199	(0.003)***	-0.200	(0.003)***
1959	-0.215	(0.004)***	-0.217	(0.004)***	-0.212	(0.004)***	-0.215	(0.004)***
1960	-0.204	(0.003)***	-0.206	(0.003)***	-0.202	(0.003)***	-0.204	(0.003)***
1961	-0.177	(0.004)***	-0.180	(0.004)***	-0.175	(0.004)***	-0.177	(0.004)***
1962	-0.161	(0.003)***	-0.165	(0.003)***	-0.158	(0.003)***	-0.161	(0.003)***
1963	-0.159	(0.003)***	-0.164	(0.003)***	-0.157	(0.003)***	-0.159	(0.003)***
1964	-0.156	(0.003)***	-0.160	(0.003)***	-0.153	(0.003)***	-0.156	(0.003)***
1965	-0.160	(0.003)***	-0.163	(0.003)***	-0.157	(0.003)***	-0.159	(0.003)***
1966	-0.156	(0.003)***	-0.159	(0.003)***	-0.154	(0.003)***	-0.156	(0.003)***
1967	-0.145	(0.004)***	-0.147	(0.004)***	-0.142	(0.004)***	-0.144	(0.004)***
1968	-0.135	(0.004)***	-0.138	(0.004)***	-0.133	(0.004)***	-0.135	(0.004)***
1969	-0.112	(0.005)***	-0.114	(0.005)***	-0.110	(0.005)***	-0.112	(0.005)***
1970	-0.098	(0.006)***	-0.100	(0.006)***	-0.097	(0.006)***	-0.098	(0.006)***
1943-1970	-0.109	(0.002)***	-0.119	(0.002)***	-0.098	(0.002)***	-0.107	(0.002)***

Notes: Standard errors are in parentheses. The dependent variable is a dummy variable indicating the probability of having a second child; it equals 1 if the family has more than one child, and 0 for a one-child family. **p*<.10; ***p*<.05; ****p*<.01

In Table 1.3, we apply Eq (1.2) by adding geographic location and education as two control variables respectively. Theoretically, adding one more control variable which reflects by other policies or social-economic conditions can not only estimate the correlation, but also test the robustness of our DD estimates. If the DD estimator reflects the effect of cross-cohort changes in other differences between the Han and other ethnicities, then controlling for this variable will weaken the magnitude of the estimator. However, if the one-child policy is uncorrelated with this variable, then our DD estimates should undergo no significant change even after controlling for this variable (Li et al., 2005).

We apply women's household registration type of as a dummy to capture geographic features that influence parental preferences and the cost of childrearing. We use education as a dummy to capture the preference of women and the opportunity cost of children. Compared with column 1, which has no other control variables, the magnitudes of the DD estimators show little sensitivity to inclusion of these variables. The second column includes the household registration type of women cohort as a control variable; the magnitude of the DD increases only very slightly, and the average DD estimation increases slightly to 11.9 per cent. Columns 3 and 4 reflect the DD estimates from the regressions that control for the education level of women and their husbands. Compare with column 1, adding parents' education as control variables results in only marginal reduction by less than one percentage point for most of the cohorts. The average DD estimation decreases to 9.8 per cent by adding women's education and 10.7 per cent for couple's education respectively. Overall, controlling for these covariates causes very small changes in the DD estimates implying that the Difference-in-differences method captures a great extent of the effect of the one-child policy.

Generally, the DD estimations above denote that the one-child policy has had a significant effect on restricting and decreasing the fertility of Han Chinese compared to other minorities. The DD estimations for those cohorts after 1946, the women in which were aged below 33 when the family planning policy was introduced in 1979, are statistically significant. The average effect on the post-treatment cohorts, on the probability of having a second child, is as large as -10.9 percentage points. However, since the policy only allows one child for most families in China, this may also lead to a sex ratio imbalance because of abortion for son preference, progress in gender-selection technology and so on. Therefore, in the next section we will focus on how the sex ratio imbalance is affected by the one-child policy.

Table 1.4: Difference-in-differences (DD) estimates of the effect of the one-child policy on the likelihood of being a girl

Birth Cohort	Han (1)	Minorities (2)	Differences: Han-Minorities (3)		DD Estimates (α_3) (4)		DD Estimates (controlling for Province) (5)		DD Estimates (controlling for province and Hukou) (6)	
Pre-Policy (*T*=0) (N=1,521,563)										
1973-1979	0.4847	0.4851	-0.0004	(0.0014)						
Post-Policy (*T*=1) (N=2,334,926)										
1980	0.4804	0.4883	-0.0079	(0.0040)**	-0.0075	(0.0040)*	-0.0076	(0.0040)*	-0.0076	(0.0040)*
1981	0.4810	0.4977	-0.0167	(0.0039) ***	-0.0163	(0.0039) ***	-0.0164	(0.0039)***	-0.0164	(0.0039) ***
1982	0.4785	0.4869	-0.0084	(0.0037) **	-0.0080	(0.0037)**	-0.0081	(0.0038)**	-0.0081	(0.0038)**
1983	0.4760	0.4895	-0.0135	(0.0039) ***	-0.0131	(0.0039)***	-0.0133	(0.0039)***	-0.0133	(0.0039)***
1984	0.4787	0.4918	-0.0131	(0.0038) ***	-0.0127	(0.0038)***	-0.0129	(0.0038)***	-0.0129	(0.0038)***
1985	0.4803	0.4894	-0.0091	(0.0038)**	-0.0087	(0.0038)**	-0.0089	(0.0038)**	-0.0089	(0.0038)**
1986	0.4791	0.4841	-0.0050	(0.0037)	-0.0046	(0.0037)	-0.0048	(0.0037)	-0.0048	(0.0037)
1987	0.4760	0.4886	-0.0126	(0.0037) ***	-0.0122	(0.0037)***	-0.0123	(0.0037)***	-0.0123	(0.0037)***
1988	0.4722	0.4798	-0.0076	(0.0038) **	-0.0072	(0.0038)*	-0.0072	(0.0038)*	-0.0072	(0.0038)*
1989	0.4710	0.4841	-0.0131	(0.0037) ***	-0.0127	(0.0037)***	-0.0127	(0.0037)***	-0.0127	(0.0037)***
1990	0.4675	0.4815	-0.0140	(0.0053) ***	-0.0136	(0.0053)**	-0.0136	(0.0053)**	-0.0136	(0.0053)**
1980-1990	0.4766	0.4876	-0.0110	(0.0018) ***	-0.0106	(0.0018)***	-0.0107	(0.0018)***	-0.0107	(0.0018)***

Notes: Standard errors are in parentheses. The dependent variable is a dummy variable indicating the gender of the child; it equals 1 if the child is a girl and 0 for boy. The data set used is Sample 1, with a total of 3,856,489 observations. **p*<.10; ***p*<.05; ****p*<.01.

Table 1.4 shows the DD estimations of the treatment effect of the one-child policy on the gender of the child by birth cohort. Row one is the mean value of gender for cohorts born in the pre-policy change period, and the mean value of gender for each cohort born in the post-policy change period is in the rows below. We also calculate the average treatment effect during the entire post-policy change period, in the last row. The average values of gender for Han and minorities are in columns one and two respectively, and column three presents the disparity between the two groups. The fourth column is for the DD estimator, which equals the value of the third column minus the mean difference in gender during the pre–policy change period.

Table 1.4 also shows that the magnitude of the gap between the Han and other ethnic groups in gender before the child policy changed is very close to zero and is statistically insignificant. In contrast, the disparity dramatically increases to -0.0106 for the entire post-policy enacted period and is statistically significant at 1%. This denotes that the sex ratio for the Han is, on average, 4.7 per cent lower than for the exempted ethnic cohorts under the entire post–policy change period.[3]

Columns five and six reveal the DD estimators by including the province and type of registration as control variables. Both province and type of registration are dummy variables. The province indicates the birthplace of the child; the dummy value equals 0 if the child was born in one of the five autonomous ethnic regions where most minorities live, and 1 otherwise. Type of registration is so called hukou in China, it implies either urban or rural area of the child's birth; the dummy value equals 1 if the child was born in an urban area, and 0 for rural case. It is worth noting that, even adding province and type of registration as control variables, the DD estimators after the child policy changed are quite close to the original DD estimates without controlling for them (fourth column). This denotes that geographic factors such as living in an ethnic autonomous region or not have very little impact on the expanded disparity in the Han-minority sex ratios. The last row of columns five and six shows that the mean treatment effect on the probability of being a girl is -0.0107. By employing Eq. (3) and (4), this implies that the one-child policy has increased the sex

[3] The difference in sex ratios between the Han and minorities in the post–policy change period is given by [(1-0.477)/0.477- (1- 0.488)/0.488]*100, which equals 4.7 (note that 0.477 and 0.488 are from the last row of columns 1 and 2 in Table 2.4).

ratio (number of males per 100 females) by 4.4, and there is a 93.62 per cent of the rise in the sex ratio for Han Chinese throughout the 1980s.

1.5.2. Son Preference Test

In order to prove that the phenomena of sex selection exists in Chinese society, we now consider the birth order and create sub-sample 2, which is extracted from sample 2, in which children should satisfy three criteria as follow. First of all, the identification of these children is sons or daughters of household heads. Second, there is complete information about their parents and especially siblings; in other words, there should not be only children. The third condition is that their mothers' age is between 20 and 38 years old. For the last requirement, considering the census survey contains no record of children no longer living with their parents, excluding those households with children living outside the home will result in a biased sample. Therefore, we restrict mother's age to be less than or equal to 38 following Angrist and Evans (1998) to mitigate the sample-selection problem. Meanwhile, since the minimum age for marriage as prescribed by the Law of Chinese Marriage is 20, the age cut-off is 17 for the eldest children of those women, and most of these children are still living with their parents.

Table 1.5 reports our DD estimates by birth order without other control variables. We find that as the first birth parity, the probability of being a girl for Han Chinese after one-child policy implementation is still positive at 0.0014, but is statistically insignificant. However, if a family has more than two children, for the second birth parities, the probability of being a girl is negative (-0.0104) and is marginally significant at the 10% level. Moreover, the DD estimate on the third and higher birth parities is as large as -0.0162, which is statistically significant at the 5% level.

The likelihood of being a girl across different birth parities continuously decreases as birth order increases. This implies that, under the restriction of birth quota of the family control policy, sex ratio distortion more obviously emerges in the second and higher birth parities. Since the policy limits families to only one child, those parents who are willing to take the risk of having a second or third birth should have stronger son preference on average than those who follow the rule and have only one child and those cohorts are more likely to apply gender-selection abortion.

We further analyse the DD estimation by both birth order and gender composition of elder siblings in Table 1.5. We also find that the likelihood of being a girl reduces to -0.0284 and is statistically significant at the 1% level for those children born in the second parity with an older sister. For higher birth parities, if the family already has two older brothers, the probability of being a girl can reach as high as 0.0622 and is statistically significant at the 1% level. On the contrary, if there are two older sisters in the family, the estimation dramatically drops to -0.0295 and is statistically significant at the 10% level.

To sum up, son preference does exist in Chinese society, especially after the one-child policy implementation. Under the one-child policy, for parents who are willing to take the risk of violating the birth quota, there is no other way but to practise gender selection at the second or higher birth parities, especially when the first child is a girl or when children at low birth parities are all girls.

Table 1.5: Difference-in-differences (DD) estimates of the effect of the one-child policy on the probability of being a girl by birth order and gender composition of elder siblings

	Birth Order=1		Birth Order=2		Birth Order>2	
By Birth Order	0.0014	(0.0044)	-0.0104	(0.0054)*	-0.0162	(0.0082)**
By Birth Order and Gender Composition of Elder Sibling(s)						
By Family size and Birth Order[4]						
Family size=2	0.0030	(0.0068)	-0.0135	(0.0106)		
Family size>2	0.0082	(0.0063)	0.0214	(0.0067)***	-0.0171	(0.0088)*
One boy			0.0077	(0.0074)		
One girl			-0.0284	(0.0078)***		
Two boys					0.0622	(0.0155)***
Two girls					-0.0295	(0.0156)*
One girl, one boy					-0.0137	(0.0122)

Notes: Standard errors are in parentheses. The dependent variable is a dummy variable indicating the gender of the child; it equals 1 if the child is a girl, and 0 otherwise. The data set used is sub-sample2, with a total of 1,654,080 observations. *p<.10; **p<.05; ***p<.01.

1.5.3. Difference-in-differences at Provincial Level

After general estimation of the effect of the one-child policy over the whole country, we now question whether this phenomenon still applies when we perform regional

[4] We cannot report the family size=1 in this table compared with Li, Yi and Zhang (2011), since children in this sample size have at least one sibling.

estimation. First, we select six geographic regions in China, to examine which part of China is under more influence of the one-child policy.

Table 1.6: Difference-in-differences (DD) estimates of the effect of the one-child policy on the probability of being a girl by Six Regions in China

	North China		Northeast China		East China	
Birth Cohort						
1980	0.009	(0.014)	-0.013	(0.013)	-0.016	(0.032)
1981	-0.010	(0.013)	-0.014	(0.013)	0.004	(0.030)
1982	-0.018	(0.012)	-0.007	(0.012)	-0.005	(0.028)
1983	-0.012	(0.013)	0.002	(0.013)	0.000	(0.027)
1984	-0.026	(0.012)**	-0.006	(0.013)	0.003	(0.030)
1985	-0.028	(0.012)**	0.030	(0.013)**	0.028	(0.028)
1986	-0.001	(0.012)	0.001	(0.012)	0.053	(0.028)*
1987	-0.009	(0.012)	0.002	(0.011)	0.002	(0.027)
1988	0.005	(0.012)	0.014	(0.012)	-0.020	(0.027)
1989	-0.002	(0.012)	0.003	(0.012)	-0.025	(0.026)
1990	0.025	(0.017)	-0.016	(0.016)	0.011	(0.035)
1980-1990	-0.008	(0.006)	0.001	(0.006)	0.003	(0.013)
N	438236		325373		1112470	
	Central South China		Southwest China		Northwest China	
Birth Cohort						
1980	-0.011	(0.007)	-0.005	(0.008)	-0.022	(0.010)**
1981	-0.020	(0.007)	-0.012	(0.007)	-0.016	(0.010)
1982	0.005	(0.007)	-0.006	(0.007)	-0.036	(0.010)***
1983	-0.022	(0.007)***	0.013	(0.008)*	-0.017	(0.010)*
1984	-0.021	(0.007)***	-0.001	(0.008)	-0.006	(0.010)
1985	-0.011	(0.007)	-0.016	(0.007)**	-0.005	(0.010)
1986	0.002	(0.007)	-0.011	(0.007)	-0.019	(0.009)**
1987	-0.012	(0.007)*	-0.017	(0.007)**	-0.007	(0.009)
1988	-0.015	(0.007)**	0.000	(0.007)	-0.014	(0.009)
1989	-0.008	(0.007)	-0.015	(0.007)**	-0.022	(0.009)**
1990	-0.009	(0.011)	0.001	(0.010)	-0.033	(0.013)***
1980-1990	-0.011	(0.003)***	-0.009	(0.003)***	-0.017	(0.005)***
N	1102501		583123		294786	

Notes: Standard errors are in parentheses. The dependent variable is a dummy variable indicating the gender of the child; it equals 1 if the child is a girl and 0 for a boy. The data set used is Sample 1, with a total of 3,856,489 observations. *p<.10; **p<.05; ***p<.01.

Details of provinces in the six geographic regions are as follows:

North China: Beijing, Tianjin, Hebei, Shanxi, Inner-Mongolia; Northeast China: Liaoning, Jilin, Heilongjiang; East China: Shanghai, Shandong, Jiangsu, Zhejiang, Anhui, Fuzhou, Jiangxi; Central South China: Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan; Southwest China: Sichuan, Guizhou, Yunnan, Tibet; Northwest China: Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang.

As Table 1.6 illustrates, the magnitude of the difference between Han and ethnic group of being a girl is negative and is statistically significant in the regions of Central south China, Southwest and Northwest China. As for the other three regions, North, Northeast and East of China, the DD estimation after child policy implemented are statistically almost insignificant. In China, there is quite a large gap in development between east and west, and to a lesser extent between north and south. Our result may imply that the effect of the one-child policy is more significant in the less developed regions of China. Our speculation is reasonable because poor families or rural households usually have more children than the relatively rich and those households who live in urban areas. The one-child policy, with the limitation to one child, forces rural families to reduce the number of their descendants. Adding son preference as a common factor in China, the probability of being a girl in those less developed regions drops dramatically, compared with ethnic groups that were not under family control during that time.

Another reason to explain our regional result is that, in China, there around 43.67 per cent of the total population of minorities live in the five autonomous regions, and these five autonomous regions are geographically located in the western and southern parts of China[5]. After the economic reform in the late 1970s, there was unbalanced regional development across the country, from coastal areas to inland, from east to west and from the autonomous regions to the rest of the provinces. Simultaneously, the sex ratio imbalance in China is suggested to have been correlated with socioeconomic development (Qian 2008). Therefore, the necessity of estimating the treatment effect at the provincial level of China is that the Han and minorities should be more homogenously affected by the economic reform within the same area, and thus the interfering effect of socioeconomic development can be held constant or eliminated.

[5] See Appendix, Figure 1.9a.

Table 1.7: Difference-in-differences (DD) estimates of the effect of the one-child policy on the probability of being a girl at Provincial Level in China

Provinces versus autonomous regions			
Provinces (H 93.6%)	-0.007 (0.002)***	Autonomous (H 56.3%)	-0.023 (0.004)***
	3515358 (91.2%)		341131 (8.9%)
All 30 provincial regions			
Beijing[1] (H 96.2%)	-0.029 (0.029) 26394	Henan (H 98.8%)	-0.017 (0.020) 298180
Tianjin[1] (H 97.7%)	-0.002 (0.040) 29105	Hubei (H 96.0%)	-0.021 (0.011)* 181837
Hebei (H 96.1%)	-0.002 (0.011) 197514	Hunan (H 92.1%)	0.004 (0.008) 207050
Shanxi (H 99.7%)	-0.034 (0.047) 101615	Guangdong (H 99.4%)	-0.007 (0.032) 216402
Inner-Mongolia[2] (H 80.6%)	-0.010 (0.009) 83608	Guangxi[2] (H 60.8%)	-0.024 (0.005)*** 172455
Liaoning (H 84.4%)	-0.004 (0.008) 117066	Hainan (H 83.0%)	0.002 (0.016) 26577
Jilin (H 89.8%)	-0.017 (0.012) 83137	Sichuan (H 95.4%)	-0.001 (0.008) 309809
Heilongjiang (H 94.3%)	0.022 (0.012)* 125170	Guizhou (H 65.3%)	-0.002 (0.006) 123370
Shanghai[1] (H 99.5%)	-0.030 (0.078) 28932	Yunnan (H 66.58%)	-0.006 (0.006) 140166
Jiangsu (H 99.8%)	-0.142 (0.056)** 192785	Shaanxi (H 99.5%)	0.061 (0.046) 115829
Zhejiang (H 99.5%)	-0.048 (0.041) 118821	Gansu (H 91.7%)	-0.022 (0.013)* 81473
Anhui (H 99.4%)	0.018 (0.035) 222048	Qinghai (H 57.9%)	-0.003 (0.014) 22194
Fujian (H 98.5%)	0.007 (0.020) 124605	Ningxia[2] (H 66.7%)	-0.036 (0.017)** 16106
Jiangxi (H 99.7%)	0.079 (0.053) 170980	Xinjiang[2] (H 37.6%)	-0.018 (0.009)* 59184
Shandong (H 99.4%)	0.012 (0.027) 254299	Tibet[2] (H 3.7%)	0.041 (0.188) 9778

Notes: (1) represents three municipalities and (2) denotes five autonomous regions in China in 1990; Standard errors are in parentheses. The dependent variable is a dummy variable indicating the gender of the child; it equals 1 if the child is a girl and 0 for a boy. The data set used is Sample 1, *p<.10; **p<.05; ***p<.01.

Table 1.7 displays our DD estimates for all five autonomous regions versus the rest of the provinces in the first row. The rest of the table reports the details of 27 provinces (including five autonomous regions) and adding three municipalities with their total observation as well[6]. The first row shows that people who live outside of the autonomous regions constitute a dominant share of 91.2% of the total child population in the census year, of which 93.6% are Han. Only 8.9% of the Chinese population live in the five autonomous regions, and almost 44% of the residents living there are minorities. Clearly, we find that both the DD estimators are negative but for a Han family the likelihood of being a girl in the autonomous regions is even smaller than in the rest of the country and is statistically significant at the 1% level. This is because in the autonomous regions, the amount of control group is much higher than rest of province. The disparity between Han and ethnic minorities are performed more significantly.

For those provinces with around 90% and above of Han population, only four provinces show statistical significance. Hubei and Gansu are negative and significant at the 10% level, while Heilongjiang is positive and significant at the 5% level. Jiangsu is the province with the highest percentage of Han children (99.8%) and still its DD estimator is negative and significant at the 5% level.

Regarding the five autonomous regions, all except Tibet have positive of DD estimations. The reason for the insignificant DD estimate for Tibet may be that, as presented in Table 1.7, the relatively small of observations (9778) compared to other regions may lead to the statistically insignificant. Also, only around 0.35% of the children in Tibet are Han. Thus, in other words, most people in Tibet were exempted from the family control policy during that time. Although it is insignificant, the positive DD estimate for Tibet may still imply a less strong son preference with socioeconomic development.

Overall, based on the 1990 Chinese population census, the estimated effect of the one-child policy on the probability of being a girl was as large as -1.06 percentage points in the 1980s. This denotes that the strict enforcement of the one-child policy causally increased the sex ratio by 4.56, accounting for about 96.93 percent of the rise in sex ratio for Han Chinese throughout the 1980s. Hence, by combining fertility control and son preference as cultural background, women cohorts or females population are the most direct victims of the one-child policy. Since women cohorts play a much more important role in breeding the next generation, the shrinking number of females in

[6] Data for Taiwan is not available in the 1990 Population Census.

China will lead to longer-term influence, even after the one-child policy ends. Nevertheless, other factors may also restrict the birth willingness of Han women especially combined with introduction of the one-child policy.

1.5.4. The Effect of the One-Child Policy Based on Sub-Samples Test

1.5.4.1. Rural and Urban Registration Type

In this section, we apply conditional sub-samples and systematically examine what other factors could be "catalysts" to lower fertility and expand the gap between the Han group and other ethnic groups after the one-child policy was introduced in the 1980s.

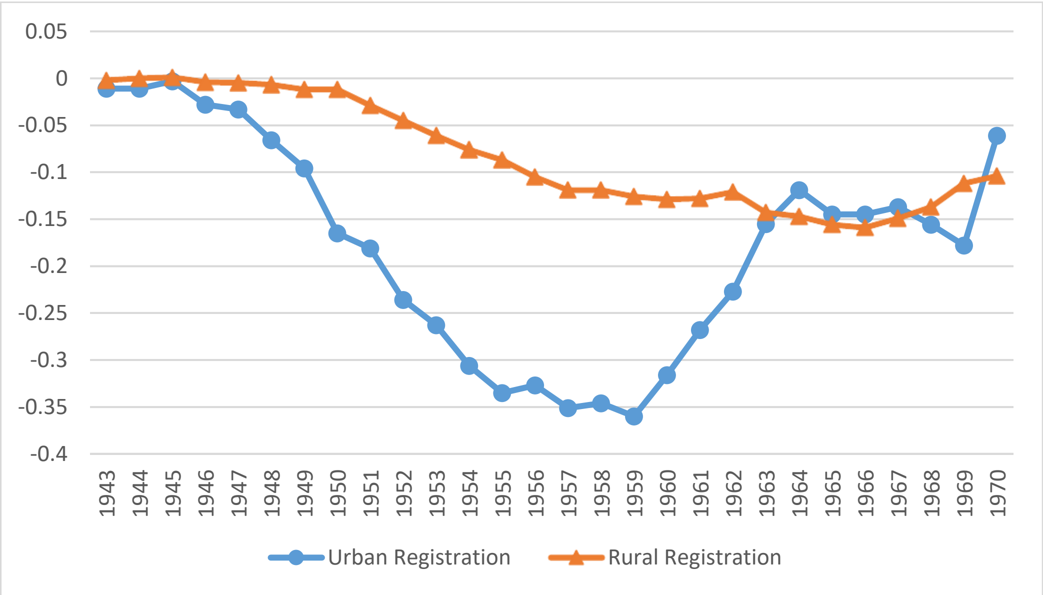
The effect of the one-child policy on fertility is significant in the whole census sample, but we do not know whether the influence differs between rural and urban hukou registration. Previous empirical studies have found that the one-child policy is stricter in urban areas. As the population in urban areas are much more concentrated than in the rural area, while medical conditions are more advanced than in rural areas, the one-child policy implementation is more efficient and applied directly to the target cohorts in urban areas than in the rural areas (Zhang & Spencer, 1992; Ahn, 1994).

There are also many other empirical evidences to show that the one-child policy may be less effective and influential in most rural areas. Firstly, in China, the above-quota births in rural areas are very common; traditional peasants usually have a stronger motivation to have more than one child, even under the cost of penalty fines for against the birth control policy (Li, 1995). For most of peasant families, children are a very important investment, because they can offer manual labour, such as carrying out house and farm work. Moreover, having more children can particularly provide parents with security in their old age. Especially the case for sons, which are more preferred in rural China, because they provide much more physical support like carrying out heavy farm work and care for aging parents as mentioned before, but also continue the family name and receive the family inheritance (Dasgupta, 1995; Graham et al., 1998). Most cases of exceeding the birth quota in rural areas arise due to son preference, whereby families are willing to have more children until they get a boy (Zhang, 1994).

Meanwhile, in urban China, the opportunity cost of having a child is much higher than in rural areas (Croll, 1983), not only due to the soaring cost of nurturing a child, but also to the higher and longer cost of educating descendants. The son preference is slightly less prevalent in urban areas compared with rural areas. Even if the first child is a girl, urban parents may still have weak incentive to have a second child.

In order to test the difference in the effect of the one-child policy between urban and rural areas, we apply the DD estimation with urban and rural subsamples. Figure 1.4 confirms the fact that the impact of the one-child policy has been less in rural regions than urban China. The DD estimations in Table 1.8 gives detail information for each post-treatment group. For most of the cohorts (1947-1969) both with urban and rural hukou, the effects are negative and statistically significant. The urban-rural disparity in the treatment effect is sizable. On average, the child control policy has restricted the probability of a rural Han woman having a second child by 7.3 per cent (see column 5), while the reduction is more than double, 17.7 per cent (see column 2) for those Han women who live in an urban area. The effect for urban Han women reaches up to 36 percentage points (1959 cohort); whereas the maximum effect for rural areas is only 15.9 percentage points in 1966. Those women during the best childbearing age in the urban areas suffer the most influence of the birth control policy, reflected in a U-shape in Figure 1.4.

Figure 1.4: Han-Minority DD by Registration



Our Difference-in-difference estimations of the effect of the family control policy are consistent with previous findings that there is an obvious distinction between rural and urban areas. Moreover, the policy has proved more effective in deterring Han Chinese women in urban areas from having their second child than it has been for Han Chinese women from rural regions. Another important thing we need to mention is that, after 1984, the Chinese government adjusted the family control policy such that, if couples are both only children, they can have two children instead of only one child[7]. And since the urban areas suffered more severe restriction than rural, there are more families that match the criterion and the discrepancy in the likelihood of having a second child between Han and ethnicities gradually increases.

[7] Many provinces are followed continuously except Hubei, Gansu, Inner-Mongolia and Henan.

Table 1.8: Probability of having a second child

Birth Cohort	Urban Registration		Rural Registration	
Post-Treatment				
1943	-0.011	(0.009)	-0.002	(0.003)
1944	-0.011	(0.009)	0.000	(0.003)
1945	-0.003	(0.009)	0.001	(0.003)
1946	-0.028	(0.009)***	-0.004	(0.003)
1947	-0.033	(0.009)***	-0.005	(0.003)*
1948	-0.066	(0.009)***	-0.007	(0.003)**
1949	-0.096	(0.009)***	-0.012	(0.003)***
1950	-0.165	(0.009)***	-0.012	(0.003)***
1951	-0.181	(0.010)***	-0.029	(0.003)***
1952	-0.236	(0.009)***	-0.045	(0.003)***
1953	-0.263	(0.009)***	-0.061	(0.003)***
1954	-0.306	(0.009)***	-0.076	(0.003)***
1955	-0.335	(0.008)***	-0.087	(0.003)***
1956	-0.327	(0.008)***	-0.105	(0.003)***
1957	-0.351	(0.008)***	-0.119	(0.003)***
1958	-0.346	(0.008)***	-0.119	(0.003)***
1959	-0.360	(0.009)***	-0.126	(0.004)***
1960	-0.316	(0.008)***	-0.129	(0.003)***
1961	-0.268	(0.009)***	-0.128	(0.004)***
1962	-0.227	(0.007)***	-0.121	(0.003)***
1963	-0.155	(0.007)***	-0.143	(0.003)***
1964	-0.119	(0.008)***	-0.147	(0.004)***
1965	-0.145	(0.008)***	-0.156	(0.004)***
1966	-0.145	(0.010)***	-0.159	(0.004)***
1967	-0.137	(0.013)***	-0.149	(0.004)***
1968	-0.156	(0.016)***	-0.137	(0.004)***
1969	-0.178	(0.022)***	-0.112	(0.005)***
1970	-0.061	(0.036)*	-0.104	(0.006)***
1943-1970	-0.177	(0.006)***	-0.073	(0.002)***
N	542,817		1,808,266	

Notes: Standard errors are in parentheses. The variable of type of registration is a dummy variable indicating; it equals 1 if it is urban registration, and 0 for rural. *p<.10; **p<.05; ***p<.01

1.5.4.2. Education Level of Women

Another critical issue that we point out in this chapter is whether women with different levels of education may suffer different effect from the one-child policy. Most empirical evidence suggests that a woman's education may interact with the family control policy in fertility reduction. Usually, the higher level of education the women has, the more willing she is to abide by the policy. Intuitively, women with more education should also have better understanding, knowledge and intention towards effective contraceptive methods, and hence engage in better birth control. More educated women, on the one hand, usually have a higher occupation, a higher income, and a more respectable social status. On the other hand, they may be less likely to have an additional child, possibly reflecting weaker son preference and lower dependence on children for elderly support.

Even though the mechanisms through which education interacts with the one-child policy are not well documented, a few studies have pointed out that higher-educated women are more likely to comply with the one-child policy (Wang, 1989; Zhang & Spencer, 1992; Ahn, 1994). Moreover, when those highly-educated women get a higher occupation, a large penalty fines on above-quota birth can have a greater deterrent effect than on poor households (Li & Zhang, 2004).

We estimate the same DD analysis for the four groups of education level (illiterate, primary school, secondary school, and higher education (senior, university and above)) to test for differences in the treatment effect. The DD estimated results are reported in Table 1.9 and plotted in Figure 1.5.

Figure 1.5: Han-Minority DD by Education Level

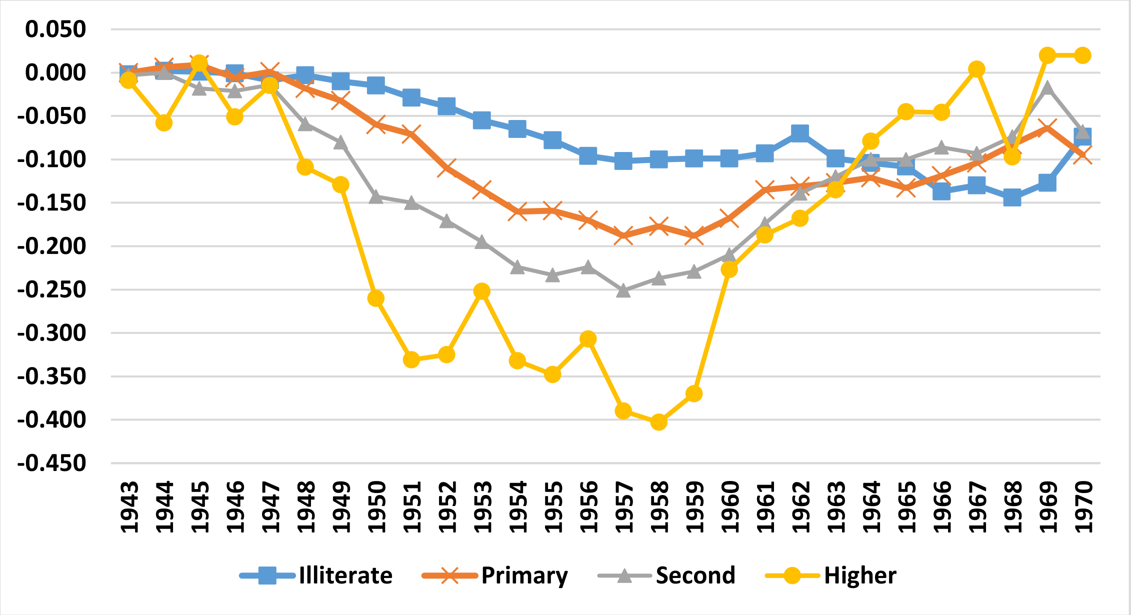


Table 1.9: Difference-in-differences Estimates of the Effect of One-Child Policy on the Probability of Having a Second Child: 1990 Census (by education level)

Probability of having a second child by education level								
Birth Cohort	Illiterate		Primary		Secondary		Higher Education	
Post-Treatment								
1943	-0.002	(0.004)	0.000	(0.006)	-0.003	(0.012)	-0.009	(0.036)
1944	0.002	(0.004)	0.006	(0.005)	0.000	(0.012)	-0.058	(0.032)*
1945	0.001	(0.004)	0.009	(0.005)*	-0.018	(0.012)	0.011	(0.031)
1946	-0.001	(0.004)	-0.006	(0.005)	-0.021	(0.013)	-0.051	(0.036)
1947	-0.009	(0.004)**	0.001	(0.005)	-0.014	(0.013)	-0.015	(0.033)
1948	-0.003	(0.004)	-0.018	(0.005)***	-0.059	(0.012)***	-0.109	(0.036)***
1949	-0.010	(0.003)***	-0.032	(0.005)***	-0.080	(0.013)***	-0.129	(0.033)***
1950	-0.015	(0.003)***	-0.060	(0.005)***	-0.143	(0.013)***	-0.260	(0.032)***
1951	-0.029	(0.004)***	-0.071	(0.006)***	-0.150	(0.014)***	-0.331	(0.034)***
1952	-0.039	(0.003)***	-0.110	(0.006)***	-0.171	(0.013)***	-0.325	(0.029)***
1953	-0.055	(0.003)***	-0.135	(0.006)***	-0.195	(0.014)***	-0.252	(0.028)***
1954	-0.065	(0.003)***	-0.160	(0.006)***	-0.224	(0.013)***	-0.332	(0.026)***
1955	-0.078	(0.004)***	-0.159	(0.006)***	-0.233	(0.013)***	-0.348	(0.026)***
1956	-0.096	(0.004)***	-0.170	(0.006)***	-0.224	(0.013)***	-0.307	(0.025)***
1957	-0.102	(0.004)***	-0.188	(0.006)***	-0.251	(0.013)***	-0.390	(0.026)***
1958	-0.100	(0.004)***	-0.177	(0.006)***	-0.237	(0.012)***	-0.403	(0.030)***
1959	-0.099	(0.005)***	-0.188	(0.007)***	-0.229	(0.012)***	-0.370	(0.033)***
1960	-0.099	(0.005)***	-0.168	(0.006)***	-0.210	(0.012)***	-0.227	(0.027)***
1961	-0.093	(0.005)***	-0.135	(0.007)***	-0.174	(0.013)***	-0.187	(0.029)***
1962	-0.070	(0.004)***	-0.131	(0.006)***	-0.139	(0.012)***	-0.168	(0.023)***
1963	-0.099	(0.004)***	-0.127	(0.006)***	-0.120	(0.012)***	-0.135	(0.022)***
1964	-0.104	(0.004)***	-0.121	(0.006)***	-0.100	(0.011)***	-0.079	(0.023)***
1965	-0.108	(0.004)***	-0.133	(0.006)***	-0.100	(0.011)***	-0.045	(0.028)
1966	-0.137	(0.005)***	-0.119	(0.006)***	-0.086	(0.011)***	-0.046	(0.037)
1967	-0.130	(0.005)***	-0.104	(0.007)***	-0.093	(0.012)***	0.004	(0.056)
1968	-0.144	(0.005)***	-0.083	(0.006)***	-0.074	(0.012)***	-0.097	(0.073)
1969	-0.127	(0.007)***	-0.064	(0.008)***	-0.017	(0.016)	0.020	(0.135)
1970	-0.074	(0.008)***	-0.095	(0.010)***	-0.068	(0.022)***	0.020	(0.306)
1943-1970	-0.032	(0.002)***	-0.096	(0.006)***	-0.139	(0.012)***	-0.149	(0.018)***

Notes: Standard errors are in parentheses. The education variable is a dummy variable; it equals 1 for the relevant education level in each column, and 0 otherwise. *p<.10; **p<.05; ***p<.0.

Our DD test indicates that the one-child policy indeed shows a more significant effect for women who have higher level of education. The average effect of the one-child policy for women with higher education is as large as -14.9 percentage points, which is nearly five times than for the illiterate group (-3.2). Figure 1.5 shows that the higher level of education revealing a shaper U-shape for the disparity between Han and other ethnic groups' women. In the Figure 1.5, the line representing the illiterate cohort is on the top for quite a long time, and is the flattest one. The slope and the fluctuation of the line increase with higher education, and the lines for the primary and secondary education groups are at the bottom for those women aged around 20 to 24 in the one-child policy implemented year. For the higher education group, the maximum difference between Han women and minorities even reaches to 40.3 per cent, more than three times higher than for the illiterate group. After suffering ten years of Cultural Revolution, the Chinese government resumed the college entrance examination in 1977, so according to our figure, those Han urban women who were aged between 20 and 28 in the year the policy was implemented may had more opportunity to access higher education at that time, and naturally have less time and willingness to have another child.

1.5.4.3. Employment Status of Women

After discussing education, we need to extend our interest because taking occupations is the next step after finishing schooling for most persons in this society. Therefore, whether the influence of the one-child policy varies with the employment status of the women is the focus of our next analysis.

Figure 1.6: Probability of having a second child by Employment status

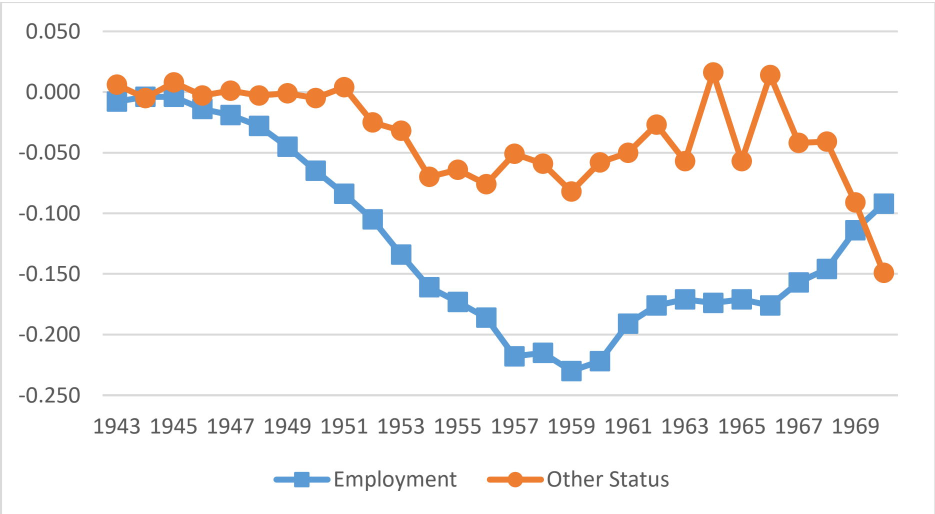


Table 1.10: Probability of having a second child by Employment status

Birth Cohort	Employment		Other Status	
Post-Treatment				
1943	-0.008	(0.003)**	0.006	(0.009)
1944	-0.004	(0.003)	-0.005	(0.008)
1945	-0.004	(0.003)	0.008	(0.009)
1946	-0.014	(0.003)***	-0.003	(0.009)
1947	-0.019	(0.003)***	0.001	(0.009)
1948	-0.028	(0.003)***	-0.003	(0.009)
1949	-0.045	(0.003)***	-0.001	(0.008)
1950	-0.065	(0.003)***	-0.005	(0.008)
1951	-0.084	(0.004)***	0.004	(0.009)
1952	-0.105	(0.003)***	-0.025	(0.008)***
1953	-0.134	(0.004)***	-0.032	(0.009)***
1954	-0.161	(0.004)***	-0.070	(0.008)***
1955	-0.173	(0.004)***	-0.064	(0.008)***
1956	-0.186	(0.004)***	-0.076	(0.008)***
1957	-0.218	(0.004)***	-0.051	(0.009)***
1958	-0.215	(0.004)***	-0.059	(0.009)***
1959	-0.230	(0.004)***	-0.082	(0.009)***
1960	-0.222	(0.004)***	-0.058	(0.009)***
1961	-0.191	(0.004)***	-0.050	(0.011)***
1962	-0.176	(0.004)***	-0.027	(0.008)***
1963	-0.171	(0.004)***	-0.057	(0.008)***
1964	-0.174	(0.004)***	0.016	(0.009)***
1965	-0.171	(0.004)***	-0.057	(0.009)***
1966	-0.176	(0.004)***	0.014	(0.009)
1967	-0.157	(0.004)***	-0.042	(0.011)***
1968	-0.146	(0.004)***	-0.041	(0.012)***
1969	-0.114	(0.005)***	-0.091	(0.015)***
1970	-0.092	(0.006)***	-0.149	(0.020)***
1943-1970	-0.120	(0.003)***	-0.017	(0.004)***

Notes: Standard errors are in parentheses. The employment status variable is a dummy variable; it equals 1 cohort woman is employed, and 0 otherwise. *p<.10; **p<.05; ***p<.01

In Figure 1.6, the one-child policy is seen to act on different occupation groups, including unemployed. Meanwhile the employed status cohort presents less fluctuation than the other group. Employment people during that period suffered more directly by heavy punishments associated with violating the one-child policy. In government departments, public institutions and state-owned enterprise, there are many reasons for which women and their husbands can be penalized and the most common one is having one more child without birth permission. A direct financial penalty can be treated as a powerful measure to restrict childbearing. The amount of the penalty varies according to the severity of the violation. According to Feng and Hao (1992), without permission to have an above quota-birth, the financial penalties can typically range from 10 to 50 per cent of the annual income of both husband and wife, and the penalties would be imposed each year for a period ranging from 5 to 14 years. For those having a third or higher-parity child without a permit, more severe penalties are carried out.

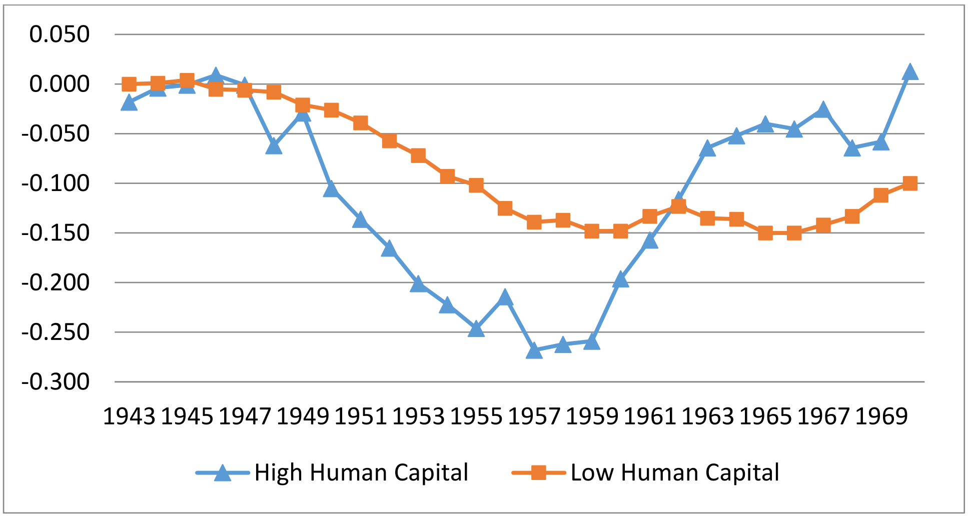
Apart from the typically financial penalties, other kinds of punishment depend on one's type of household registration. In contrast to those with rural hukou, individuals with urban hukou are guaranteed employment, labour insurance, food rations and an old-age pension. Additionally, governments also provide other benefits such as housing, medical services, maternity leave, children's day-care and education, commuting subsidies, and access to recreational facilities, which are directly controlled through the individual's work unit (Guo & Liu, 1990; Walder, 1986).

As Potter (1983) mentioned, with these opportunities and material benefits, urban hukou registration becomes a symbol of higher social status, envied and sought by people with rural hukou registration. Meanwhile, people with urban hukou registration are directly under the government's control and with risk suffering more severe punishment which may go beyond penalty fines. People who violate the rules risk being denied some or all of the aforementioned benefits. Urban hukou holders can also incur such administrative disciplinary sanctions as loss of membership in the ruling Communist Party, demotion from their current positions, deduction of salary, exclusion from such opportunities as job promotion and political advancement, discharge from public employment (kaichu gongzhi), or even withdrawal of worker registration. Although rural hukou holders can also be expelled from the Party, denied a private plot of land or housing tract, or excluded from such opportunities as employment in township enterprises, however, those kinds of penalties are less severe than those urban hukou holders. Under the risk of punishment by both financial penalties and withdrawal of benefits, employed women who have worker registration naturally are more compliant than other women. The average probability of having a second child for employed women reduces by 12 percent, while for other status it is only 1.7 percent.

1.5.4.4. High and Low Human Capital Requirement

Since the Census data has detailed information about different types of occupation, we can also separate it by different human capital requirement[8]. Usually, those jobs with high human capital requirement are accompanied by high intention, high pressure and high return. In particular, women who reached such a position during that period, needed somehow to contribute more than male colleagues in order to keep that position or to get promotion. Therefore we expect a larger negative coefficient of the interaction term than for those women whose jobs require less human capital.

Figure 1.7: Probability of having a second child by Different Human Capital



Our DD analysis indicates that the one-child policy indeed has a larger effect for women with a higher occupation. Figure 1.7 clearly shows that the probability of having a second child dereases more for women in an occupation requiring high human capital, while the impact for women in jobs requiring low human capital is much more gradual. The DD estimations between Han and No-Han for those in high positions falls from -2 per cent to a mere -26.8 per cent for the 1957 cohort, while for those in low occupations the reduction is only half, falling to -15 per cent in the 1965 and 1966 cohort. The average is -11.7 per cent and -7.6 per cent respectively. One thing worth noting is that the gap between Han and minorities for the high human capital requirement cohort keeps reducing and they even exceed the low requirement group after 1962. One important event is that one-child policy experienced an

[8] High human capital includes legislators, senior officials and managers; Professionals; Technicians and associate professionals; Part of Clerks; Crafts and related trades workers; Plant and machine operators and assemblers. Low human capital includes service workers; shop and market sales staff; agricultural and fishery workers and those in elementary occupations.

adjustment allowing parents who were both the only child in the family to have two chidren instead of one. Women born after 1962 were aged 22 or under in 1984. They were in their peak childbearing years, some of them have only their first child yet, and their careers were just beginning. The restriction and pressure from their occupation would therefore not influence their wish to have a second child much.

Table 1.11: Probability of having a second child by human capital requirement

Birth Cohort	High Human Capital		Low Human Capital	
Post-Treatment				
1943	-0.018	(0.018)	0.000	(0.003)
1944	-0.004	(0.017)	0.001	(0.003)
1945	-0.001	(0.016)	0.004	(0.003)
1946	0.009	(0.018)	-0.005	(0.003)*
1947	-0.001	(0.017)	-0.006	(0.003)**
1948	-0.062	(0.016)***	-0.008	(0.003)***
1949	-0.029	(0.017)*	-0.021	(0.003)***
1950	-0.105	(0.018)***	-0.026	(0.003)***
1951	-0.136	(0.019)***	-0.039	(0.003)***
1952	-0.165	(0.017)***	-0.057	(0.003)***
1953	-0.201	(0.017)***	-0.072	(0.003)***
1954	-0.222	(0.016)***	-0.093	(0.003)***
1955	-0.246	(0.016)***	-0.102	(0.003)***
1956	-0.214	(0.015)***	-0.125	(0.003)***
1957	-0.268	(0.015)***	-0.139	(0.003)***
1958	-0.262	(0.014)***	-0.137	(0.003)***
1959	-0.259	(0.015)***	-0.148	(0.004)***
1960	-0.196	(0.014)***	-0.148	(0.003)***
1961	-0.157	(0.015)***	-0.133	(0.004)***
1962	-0.116	(0.013)***	-0.123	(0.003)***
1963	-0.064	(0.012)***	-0.135	(0.003)***
1964	-0.052	(0.013)***	-0.136	(0.003)***
1965	-0.040	(0.014)***	-0.150	(0.003)***
1966	-0.045	(0.017)***	-0.150	(0.004)***
1967	-0.025	(0.022)	-0.142	(0.004)***
1968	-0.064	(0.029)**	-0.133	(0.004)***
1969	-0.058	(0.039)	-0.112	(0.005)***
1970	0.013	(0.074)	-0.100	(0.006)***
1943-1970	-0.117	(0.013)***	-0.076	(0.002)***

Notes: Standard errors are in parentheses. *p<.10; **p<.05; ***p<.01.

1.5.4.5. *Relatively High and Low GDP per Capita*

After education and occupation analysis, wage income is the next issue of interest. Unfortunately, there is no variable of income per person or per family in the 1990 census data. Therefore, we slightly stretch our variable from wage income per person to GDP per capita of different provinces and now the issue is whether the effect of the policy varies with the economic and social development of provinces.

There are two advantage of using the GDP per capita by provinces to reflect the areas of economic and social development, instead of the wage income per person. The first is that the one-child policy focuses on the individual or family, so we should apply GDP per capita instead of GDP in order to capture the same target as the family control policy. The Second is that, population density varies in different provinces in China, therefore, by using GDP per capita instead of GDP can avoid the population factor of province level.

There are in total 30 regions, including 22 provinces (without Taiwan), 3 municipalities (without Chongqing[9]) and 5 autonomous regions in our child policy analysis.

In order to make the GDP level analysis more reasonable, we choose 1978 as the starting year and the duration cover the one-child policy implementation year (1979) to build the link between child policy change and economic development. We then get 12 years' GDP per capita for all 30 regions from 1978 to 1990, calculate the average GDP per capita and separate them into half. The High GDP per capita regions include most of the east coast provinces except Xinjiang and Qinghai, while the low GDP per capita group contains part of the midland and south west areas and also the four autonomous regions.

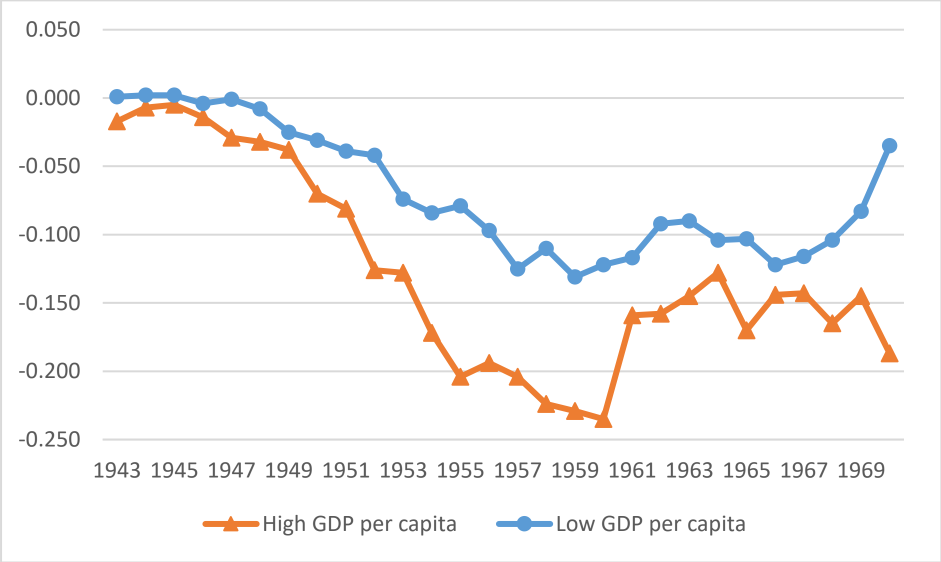
9 Since Chongqing became a municipality and separated from Sichuan province after June 1997, therefore, most of the analysis in this chapter still treats Chongqing as one of the city in Sichuan province.

Table 1.12: Probability of having a second child by level of development

Birth Cohort	High GDP per capita		Low GDP per capita	
Post-Treatment				
1943	-0.017	(0.006)***	0.001	(0.004)
1944	-0.007	(0.005)	0.002	(0.003)
1945	-0.005	(0.005)	0.002	(0.003)
1946	-0.014	(0.005)**	-0.004	(0.003)
1947	-0.029	(0.006)***	-0.001	(0.003)
1948	-0.032	(0.005)***	-0.008	(0.003)**
1949	-0.038	(0.005)***	-0.025	(0.003)***
1950	-0.070	(0.005)***	-0.031	(0.003)***
1951	-0.081	(0.006)***	-0.039	(0.004)***
1952	-0.126	(0.005)***	-0.042	(0.003)***
1953	-0.128	(0.006)***	-0.074	(0.004)***
1954	-0.172	(0.006)***	-0.084	(0.003)***
1955	-0.204	(0.006)***	-0.079	(0.004)***
1956	-0.194	(0.006)***	-0.097	(0.004)***
1957	-0.204	(0.006)***	-0.125	(0.004)***
1958	-0.224	(0.006)***	-0.110	(0.004)***
1959	-0.229	(0.006)***	-0.131	(0.004)***
1960	-0.235	(0.006)***	-0.122	(0.004)***
1961	-0.159	(0.007)***	-0.117	(0.005)***
1962	-0.158	(0.006)***	-0.092	(0.004)***
1963	-0.145	(0.006)***	-0.090	(0.004)***
1964	-0.128	(0.006)***	-0.104	(0.004)***
1965	-0.170	(0.005)***	-0.103	(0.004)***
1966	-0.144	(0.006)***	-0.122	(0.004)***
1967	-0.143	(0.006)**	-0.116	(0.005)***
1968	-0.165	(0.007)***	-0.104	(0.005)***
1969	-0.145	(0.009)***	-0.083	(0.006)***
1970	-0.187	(0.010)***	-0.035	(0.008)***
1943-1970	-0.108	(0.004)***	-0.067	(0.003)***
N	1277657		1073426	

Notes: Standard errors are in parentheses. *p<.10; **p<.05; ***p<.01.

Figure 1.8: Probability of having a second child (GDP level)



As Figure 1.8 illustrates, based on the GDP per capita level classification, the one-child policy has an effect for the all areas of China. The probability of having a second child for high and low GDP per capita regions shows the same tendency. The difference is that high GDP areas reveals more influence then low GDP regions. The average probability of having a second child is -10.8 per cent in highly developed provinces and -6.7 for the less developed areas.

We assume high GDP per capita implies high wage income, so for our women cohort, when their wage income increase, it will reduces fertility by raising the cost of children relatively more than household income (Galor & David, 1993). Hence, for most Han individuals, we can deduce that higher income is associated with lower fertility. This tendency would successfully boost wealth accumulation and result in fewer people to share it. Thus, for the whole country, the reduction of population as a result of the country's population control policy has indeed helped the growth of the Chinese economy and achievement of the so called "Asian Miracle" (Bloom et al., 1998 2000 2003). Combining this information with Table 1.12, we could conclude that more highly developed regions are adhere more strictly to the one child limitation, while less developed regions display stronger son preference, leading to sex ratio imbalance as we mentioned before.

Table 1.13: Summary of Sub-sample Test

	DD Estimator (%)	Change Rate
Benchmark	-10.9	1.0
Urban Women	-17.7	1.6
Rural Women	-7.3	0.7
Illiterate	-3.2	0.3
Primary	-9.6	0.9
Secondary	-13.9	1.3
Higher Education	-14.9	1.4
Employment	-12.0	1.1
Unemployment and others	-1.7	0.2
High Human Capital	-11.7	1.1
Low Human Capital	-7.6	0.7
High GDP per capita	-10.8	1.0
Low GDP per capita	-6.7	0.6

So far, we have discussed many "catalysts" above including two types of registration, different education level, employment status, occupations with relative high and low human capital requirement and GDP per capita in different areas, as shown in Table 1.13. To some degree, all these factors increase the difference between the Han and ethnic minorities.

For type of registration, the one-child policy has had much less effect on fertility for those with rural type of registration which is only -7.3 percentage points compared with -17.7 for those cohorts with urban type of hukou. Higher education is a factor that postpones the time of women getting married and starting their career. The absolute value of the estimator increases significantly from 3.2 to 14.9 with education level. Higher education usually brings a better or at least a relatively stable working position. Women with a stable job show 1.1 times difference-in-difference in suffering from the one-child policy, and those highly skilled women shows the same result.

To sum up, higher education and higher family income also play an important role to widen the difference in the effect by the family control policy between Han and minorities, urban and rural, rich and poor. Although a two-child policy was implemented in the early 2017, especially for Han and those with urban type of registration, women of the new generation may still be restricted by child rising cost compared with their own education level, occupation and relatively high income level making it hard to follow the two-child policy.

1.6. Conclusions

In this chapter, we estimate the impact of the one-child policy in China on both fertility and sex ratio. Since the policy was applied only to the Han group, we constructed a difference-in-differences estimator to identify the causal relationship with fertility and sex ratio imbalance that resulted from the enactment of the policy. Based on the 1990 Chinese population census, the estimated effect of the one-child policy on fertility is large. The average effect on the post-treatment groups (1943-1970) is as large as -10.9 percentage points. The DD estimators are statistically significant for those cohorts after 1946, the women who were aged below 33 when the family control plan policy was introduced in 1979.

For the sex ratio test, the probability of being a girl was as large as -10.6 percentage points in the 1980s. This also indicates that the one-child policy has increased the sex ratio by 4.4 and 93.62 per cent of the rise in sex ratio for Han Chinese throughout the 1980s. Also, those families willing to take the risk of exceeding the birth quota indicate much stronger son preference, the likelihood of being a girl keeps decreasing as the birth order increase.

As for the sex ratio in the provincial level, the disparity between Han and ethnicities performs more clearly in the autonomous regions than rest of provinces. For these five autonomous regions, even it is statistically insignificant; Tibet is the only region reveals a positive DD estimation which may imply a less strong son preference with socioeconomic development. For the rest of provinces, only Heilongjiang with the positive estimator and statistically significant at 5% level as well.

Moreover, our robustness test indicates that our DD estimates of the effect of the one-child policy are not likely to be confounded by other factors, such as other policy shocks or socioeconomic changes that have changed the breeding willingness and gender preference differently for the Han and the ethnic minorities.

By applying sub-sample estimation, we also find that the one-child policy has had much more effect on the fertility of the urban hukou group, those with high education level, women with stable and high human capital requiring occupations and relatively high wage income, in better developed areas. In summary, those Han women with urban registration who have a high education level and high income level have suffered most influence from the one-child policy. Hence, one reason why the one-child policy has maintained its effectiveness and persistence is that it successfully controls and reduces the female population in combination with son preference as a cultural background factor in most ordinary Chinese families, along with higher pressure in the modern society especially for women.

In general, the empirical findings have two main policy implications. Firstly, the shortage of women may have increased mental health problems and socially disruptive behaviour among men and has left some men unable to marry and have a family. The scarcity of females has resulted in kidnapping and trafficking of women for marriage and increased numbers of commercial sex workers, with a potential resultant rise in human immunodeficiency virus infection and other sexually transmitted diseases. These consequences might be a real threat to China's stability in the future. The recent relaxation of the child policy may not be enough to remedy the shortage after more than 35 years of one-child policy implementation. Some related incentive policies for having female children and penalties rule to prevent sex-selection abortion are needed.

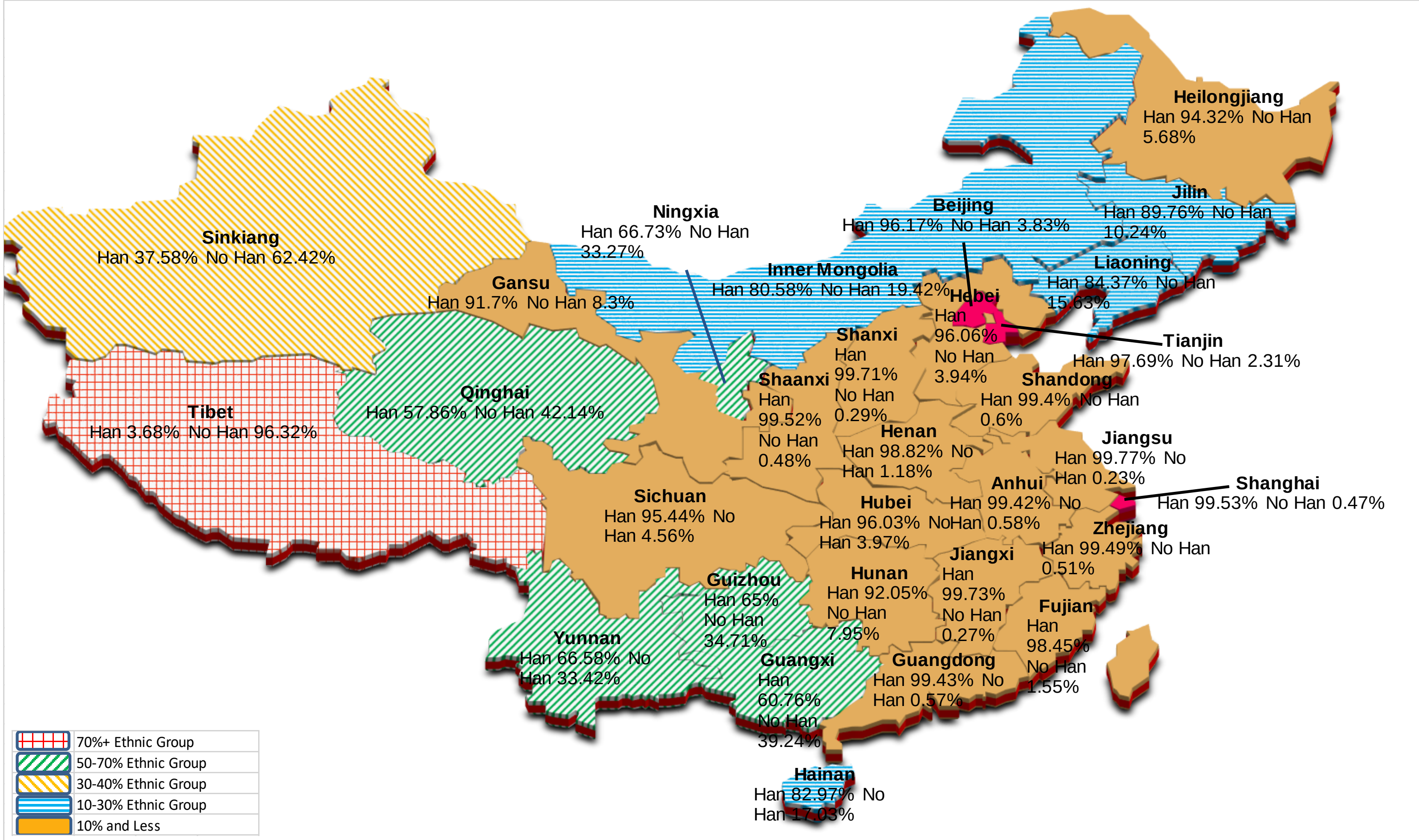
Meanwhile, for those women who have higher education level and higher human capital, some appropriate subsidies should be suggested to encourage them to have at least two children. Second, the policy has had much less effect on rural residents, the less educated, unemployed women and so on. We consider them the less well-off group. The purpose of family planning policy is to promote the economic growth and increase per capita income, but ironically, the imposition of the family control policy may not only perpetuate inequality, but also exacerbate it. Since the poor families have more children, the life quality of those children is low and they will also grow up to be poor (Li et al., 2005). Thus, the step to remedy the inequality is to abolish the two types of registration as soon as possible, and allow free migration across the country.

By combining two major estimations, the probability of being a girl and the probability of having a second child, we conclude that more highly developed regions show less probability of having a second child, while less developed regions report less probability of being a girl. In more highly developed areas, like most of the east coast of China, the Han population constitutes around 90 per cent and above. This factor gives the local government more convenience and valid to implement the one-child policy for each family. The family control policy in these regions is more strictly as well. Compared with less developed regions such as the whole west area and the central south of China, which including most of the rural areas, those occupied by minorities and wilderness. Since agriculture is the main sector in these regions, the requirement of physical labour especially male is stronger than urban areas and the son preference among Han families in these areas appears more intense than in more highly developed regions.

In a very restricted way, our difference-in-differences test can only be accurately applied before 1984. Since the family control policy offered exemption for ethnic groups, the minorities can be treated as a perfect control group. However, after April 1984, the government also required ethnic minorities to follow the birth control policy. The fertility and sex ratio of minorities also show decreases in our estimation. The probability of having a second child shrank by more than half. As a control group, this change may have some influence on our Difference-in-differences estimation. Some suitable adjustment should be made to avoid the bias. Also factors that can lead to fertility reduction for minorities without being subject to the one-child policy should be investigated in the further research. Also, this chapter has paid less attention to the husband's side. Since in most Chinese families, the husband has the major role as the source of family income, their income level or education level may play a key role on fertility choice as well. Therefore, more studies are badly needed.

Appendix

Figure 1.9a: Han and No-Han in 1990 Census Report



Data definition and STATA programme

birthyr: birth year;

ethncn: ethnicity;

CN90A_HHTYA: hukou type of registration (urban=2; rural=1)

chborn: child ever born

edattan: education level

relate: relationship to the household head

provcn: provinces in China

empstat: employment status

occisco: occupation

Table 1.1

```
//Sample 1

preserve

gen S2=1 if sex==2

replace S2=0 if S2==.

gen M=1 if relate<3 & chborn>=1

replace M=0 if M==.

gen M_age=(birthyr<=1970 & birthyr>=1926)&!missing(birthyr)

replace M_age=0 if M_age==.

gen Sample_2=(S2*M*M_age==1)&!missing(S2*M*M_age)

drop if Sample_2==0

gen gender=(sex==1)&!missing(sex)

gen Han_dummy= (ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)
```

```
gen time= (birthyr>1942)&!missing(birthyr)

gen S_two=(chborn>1)&!missing(chborn)

gen child1=(chborn==1)&!missing(chborn)

gen child2=(chborn==2)&!missing(chborn)

gen child3=(chborn==3)&!missing(chborn)

gen edu1=(edattan==1)&!missing(edattan)

gen edu2=(edattan==2)&!missing(edattan)

gen edu3=(edattan==3)&!missing(edattan)

gen edu4=(edattan==4)&!missing(edattan)

mean Han_dummy urban time chborn child1 child2 child3 edu1 edu2 edu3 edu4

restore

// Sample 2

preserve

drop if birthyr<=1972

gen gender=(sex==1)&!missing(sex)

gen Han_dummy=(ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1979)&!missing(birthyr)

mean gender Han_dummy urban time

restore
```

Table 1.2

```
gen S2=1 if sex==2

replace S2=0 if S2==.

gen M=1 if relate<3 & chborn>=1
```

```
replace M=0 if M==.

gen M_age=(birthyr<=1970 & birthyr>=1926)&!missing(birthyr)

replace M_age=0 if M_age==.

gen Sample_2=(S2*M*M_age==1)&!missing(S2*M*M_age)

drop if Sample_2==0

gen gender=(sex==1)&!missing(sex)

gen Han_dummy= (ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1942)&!missing(birthyr)

gen S_two=(chborn>1)&!missing(chborn)

ssc install diff

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1942

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 &
birthyr!=1943

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 &
birthyr!=1943 & birthyr!=1944

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

```
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967 & birthyr!=1968
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970
```

Table 1.3

```
gen S2=1 if sex==2

replace S2=0 if S2==.

gen M=1 if relate<3 & chborn>=1

replace M=0 if M==.

gen M_age=(birthyr<=1970 & birthyr>=1926)&!missing(birthyr)

replace M_age=0 if M_age==.

gen Sample_2=(S2*M*M_age==1)&!missing(S2*M*M_age)

drop if Sample_2==0

gen gender=(sex==1)&!missing(sex)
```

```
gen Han_dummy= (ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1942)&!missing(birthyr)

gen S_two=(chborn>1)&!missing(chborn)


ssc install diff

//No control

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1942

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 &
birthyr!=1943

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 &
birthyr!=1943 & birthyr!=1944

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &

birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970

//Women's hukou

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1943

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1944 & birthyr!=1943

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

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& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969

reg S_two Han_dummy##time urban if birthyr>=1926 & birthyr<=1970

//Women's education

gen W_edu=(edattan>=2)&!missing(edattan)

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1943

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1944 & birthyr!=1943

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946
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reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955

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reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961
```

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966

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reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969

reg S_two Han_dummy##time W_edu if birthyr>=1926 & birthyr<=1970
```

Table 1.4

```
drop if birthyr<=1972

gen gender=(sex==2)&!missing(sex)

gen Han_dummy=(ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1979)&!missing(birthyr)

ssc install diff
```

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1979

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1979 //in order to get more decimal

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1980

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1981 & birthyr!=1980

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988

```
reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989

reg gender Han_dummy##time if 1973<=birthyr & birthyr<=1990

//Controlling province

gen auto = (provcn==15 | provcn==45 | provcn==54 | provcn==64 | provcn==65)&!missing(provcn)

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1980


reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1981 & birthyr!=1980

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987
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reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989

reg gender Han_dummy##time auto if 1973<=birthyr & birthyr<=1990


//Province and Hukou

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1980

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1981 & birthyr!=1980

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986
```

```
reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989

reg gender Han_dummy##time auto urban if 1973<=birthyr & birthyr<=1990
```

Table 1.5

```
sort serial

gen C1=(chborn>1 & sex==2 & birthyr>=1952 & birthyr<=1970 & relate<3)&!missing(chborn & sex & birthyr & relate)

gen C2=(relate==3 & birthyr>=1973 & birthyr<=1990)&!missing(relate & birthyr)

by serial: egen C3=sum(C1+C2)

by serial: gen C4=1 if C3>=2

drop if C4==.

drop if birthyr<1972

gen gender=(sex==2)&!missing(sex)

gen Han_dummy= (ethncn==1)&!missing(ethncn)

gen time= (birthyr>1979)&!missing(birthyr)

by serial: gen od=_n //create birth order

ssc install diff

//By birth order
```

```
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==1

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==2

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od>2

//By family size and order

by serial: egen fam_s=sum(age<18)

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==1 &
fam_s==2

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==2 &
fam_s==2

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==1 &
fam_s>2

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od==2 &
fam_s>2

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & od>2 &
fam_s>2

//By sibling's sex

gen sec=(od==2)&!missing(od)

by serial: gen B1=(od==1 & sex==1)&!missing(od & sex)

by serial: gen G1=(od==1 & sex==2)&!missing(od & sex)

by serial: egen Brother=sum(B1+sec)

by serial: egen Sister=sum(G1+sec)

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 &
Brother==2 & od==2  //One boy

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & Sister==2
& od==2   //One girl

gen third=(od>2)&!missing(od)
```

```
by serial: gen B2=(od==2 & sex==1)&!missing(od & sex)

by serial: gen G2=(od==2 & sex==2)&!missing(od & sex)

by serial: egen Two_Brother=sum(B1+B2+third)

by serial: egen Two_Sister=sum(G1+G2+third)

by serial: egen B1_G2=sum(B1+G2+third)

by serial: egen G1_B2=sum(G1+B2+third)


diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & Two_Brother>=3  //Two boys

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & Two_Sister>=3   //Two girls

by serial: gen Child3=(B1_G2>=3 | G1_B2>=3)&!missing(B1_G2 | G1_B2)

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & Child3==1 & od>2 //one boy and one girl
```

Table 1.6

```
drop if birthyr<=1972

gen gender=(sex==2)&!missing(sex)

gen Han_dummy=(ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1979)&!missing(birthyr)

gen North_China=(provcn==11 | provcn==12 | provcn==13 | provcn==14 | provcn==15)&!missing(provcn)

gen Northeast_China=(provcn==21 | provcn==22 | provcn==23)&!missing(provcn)

gen East_China=(provcn==31 | provcn==32 | provcn==33 | provcn==34 | provcn==35 | provcn==36 | provcn==37)&!missing(provcn)
```

gen Central_south_China=(provcn==41 | provcn==42 | provcn==43 | provcn==44 | provcn==45 | provcn==46)&!missing(provcn)

gen Southwest_China=(provcn==51 | provcn==52 | provcn==53 | provcn==54)&!missing(provcn)

gen Northwest_China=(provcn==61 | provcn==62 | provcn==63 | provcn==64 | provcn==65)&!missing(provcn)

ssc install diff

//North China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & North_China==1 diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & North_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & North_China==1

//Northeast China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & Northeast_China==1

```
diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & Northeast_China==1


diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & Northeast_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & Northeast_China==1

//East China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & East_China==1
```

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & East_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & East_China==1

//Central South China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & Central_south_China==1 diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & Central_south_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & Central_south_China==1

//Southwest China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & Southwest_China==1 diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & Southwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & Southwest_China==1

//Northwest China

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1980 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1981 & birthyr!=1980 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1982 & birthyr!=1980 & birthyr!=1981 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1983 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1984 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1985 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & Northwest_China==1 diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1986 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1987 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1988 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1989 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & birthyr!=1980 & birthyr!=1981 & birthyr!=1982 & birthyr!=1983 & birthyr!=1984 & birthyr!=1985 & birthyr!=1986 & birthyr!=1987 & birthyr!=1988 & birthyr!=1989 & Northwest_China==1

diff gender, t(Han_dummy) p(time), if 1973<=birthyr & birthyr<=1990 & Northwest_China==1

Table 1.7

drop if birthyr<=1972

gen gender=(sex==2)&!missing(sex)

gen Han_dummy=(ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1979)&!missing(birthyr)

gen auto = (provcn==15 | provcn==45 | provcn==54 | provcn==64 | provcn==65)&!missing(provcn)

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & auto==1

```
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & auto!=1
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==11
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==12
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==13
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==14
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==15
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==21
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==22
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==23
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==31
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==32
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==33
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==34
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==35
```

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==36

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==37

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==41

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==42

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==43

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==44

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==45

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==46

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==51

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==52

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==53

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==54

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==61

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==62

```
diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==63

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==64

diff gender, t(Han_dummy) p(time) ,if 1973<=birthyr & birthyr<=1990 & provcn==65
```

Table 1.8-1.10

```
gen S2=1 if sex==2

replace S2=0 if S2==.

gen M=1 if relate<3 & chborn>=1

replace M=0 if M==.

gen M_age=(birthyr<=1970 & birthyr>=1926)&!missing(birthyr)

replace M_age=0 if M_age==.

gen Sample_2=(S2*M*M_age==1)&!missing(S2*M*M_age)

drop if Sample_2==0

gen gender=(sex==1)&!missing(sex)

gen Han_dummy= (ethncn==1)&!missing(ethncn)

gen urban=(CN90A_HHTYA==2)&!missing(CN90A_HHTYA)

gen time= (birthyr>1942)&!missing(birthyr)

gen S_two=(chborn>1)&!missing(chborn)

//Urban

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & urban==1
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & urban==1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & urban==1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & urban==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & urban==1

//Rural

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & urban==0 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & urban==0

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & urban==0
```

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & urban==0
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & urban==0
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & urban==0
```

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & urban==0
```

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
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& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &

birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & urban==0

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & urban==0

//Illiterate

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & edattan<=1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & edattan<=1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &

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birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & edattan<=1
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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & edattan<=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & edattan<=1

//Primary

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & edattan==2
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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
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birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
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& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & edattan==2

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & edattan==2

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & edattan==2

//Secondary

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & edattan==3
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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & edattan==3

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & edattan==3

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & edattan==3

//Higher Edu

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & edattan==4
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & edattan==4 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & edattan==4 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & edattan==4

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & edattan==4

//Employed

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & empstat==1

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
```

birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & empstat==1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & empstat==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & empstat==1

//Other status

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & empstat!=1

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
```

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & empstat!=1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &

birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & empstat!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & empstat!=1

//Human capital requirement

gen H_capital_R=(occisco==1 | occisco==2 | occisco==3 | occisco==4 | occisco==7 | occisco==8)&!missing(occisco)

//High Human capital

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & H_capital_R==1

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 &
H_capital_R==1
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &

birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & H_capital_R==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & H_capital_R==1

//Low Human captial

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & H_capital_R!=1

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & H_capital_R!=1
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &

birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & H_capital_R!=1

```
diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &
birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956
& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 &
birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965
& birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 &
H_capital_R!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 &
H_capital_R!=1

//Regional development

gen H_gdp=(provcn==32 | provcn==37 | provcn==44 | provcn==51 | provcn==21 |
provcn==31 | provcn==41 | provcn==33 | provcn==13 |
provcn==42)&!missing(provcn)

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 &
birthyr!=1943 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 &
birthyr!=1943 & birthyr!=1944 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1946 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1947 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1948 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1949 &
birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947
& birthyr!=1948 & H_gdp==1
```

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1952 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1953 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & H_gdp==1 diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 &

birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & birthyr!=1969 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & H_gdp==1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1943 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1944 & birthyr!=1943 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1945 & birthyr!=1943 & birthyr!=1944 & H_gdp!=1

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1950 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1951 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & H_gdp!=1

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1954 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1955 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1956 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947

& birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1957 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1958 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1959 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1960 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1961 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1962 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1963 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1964 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1965 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1966 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1967 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956

& birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1968 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & H_gdp!=1

diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1969 & birthyr!=1943 & birthyr!=1944 & birthyr!=1945 & birthyr!=1946 & birthyr!=1947 & birthyr!=1948 & birthyr!=1949 & birthyr!=1950 & birthyr!=1951 & birthyr!=1952 & birthyr!=1953 & birthyr!=1954 & birthyr!=1955 & birthyr!=1956 & birthyr!=1957 & birthyr!=1958 & birthyr!=1959 & birthyr!=1960 & birthyr!=1961 & birthyr!=1962 & birthyr!=1963 & birthyr!=1964 & birthyr!=1965 & birthyr!=1966 & birthyr!=1967 & birthyr!=1968 & H_gdp!=1

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diff S_two, t(Han_dummy) p(time) ,if birthyr>=1926 & birthyr<=1970 & H_gdp!=1

Chapter Two

Estimating the Effect of the Migration Policy on Interprovincial Migration in China

Abstract

Using China's Population Census data for 1990 and 2000, this chapter examines the effect of migration policy on the migration decisions of rural-to-urban migrants. The unique two types of hukou registration system in China simply separate people into rural hukou and urban hukou. The migration policy in 1992 is the first official policy that supports and guides rural hukou holders' migration into urban areas to search the jobs. By applying a difference-in-differences (DD) method this chapter estimates the effect of the migration policy on disparity between migrants with the types of hukou with particular attention to the roles of regional economic development and the effects of age and education on spatial patterns of migration. We point out that, for most rural migrants, the effect of the migration policy is relatively weak and depends on regional development and individual factors. The analysis of age- and education-specific migration flows indicates that most rural migrants have a longer status of migration than urban migrants, while a large number of rural migrants during 1990s were less educated. The study also finds that Guangdong was the most popular rural migration destination for all age groups and all education levels. One thing worth notice that not all the inland provinces were donors of rural migrants. Those provinces which highly depend on mining industries, such as Shanxi, Xinjiang and Ningxia were large recipients of older- and less-educated rural migrants.

Keywords: Migration policy, Interprovincial migration, Urban/rural hukou migrant, Difference-in-differences

2.1. Introduction

China has faced an unprecedented surge of internal migration over the past three decades, which has resulted in an unparalleled growth of its urban population. In 2016, the National Bureau of Statistics (NBS) of China reported that the aggregate amount of migrant workers was 281.7 million, including a total number of 169.3 million migrant workers who left their hometowns and 112.4 million migrant workers within the province (NBS, 2016). If China is the world's factory, then migrants have clearly been the factory hands manning the factory floor. As well as dominating manufacturing, migrants are heavily represented in the mining, retail and construction industries. The migration process has helped the Chinese economy develop quickly and cheaply.

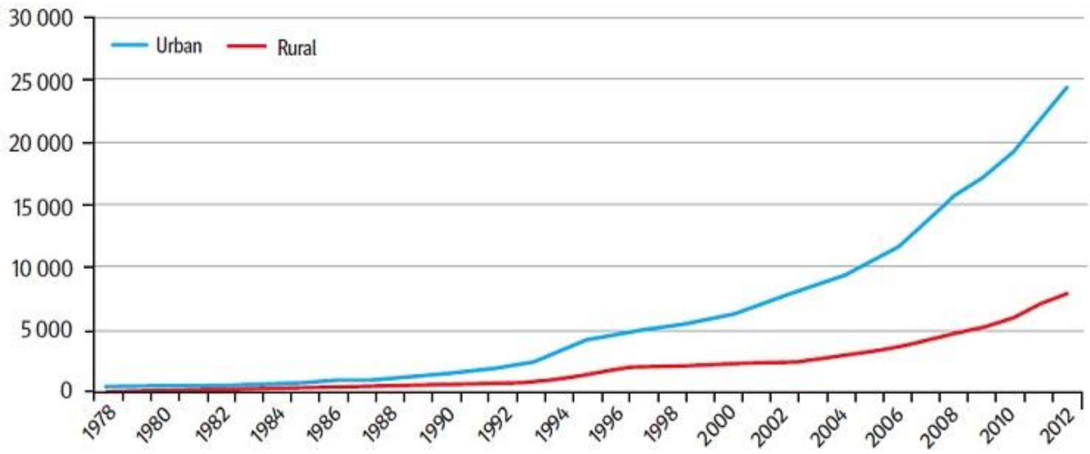
Figure 2.1: Migration Direction and Population Density in China 2015

Source: State Grid; Centre for International Earth Science Information Network.

Even after more than two decades, the population density still prove strong evidences for the great domesic migration from west to east, and from inland to coast areas (Figure 2.1). Despite the large numbers of migrants currently working in the urban areas, with a significant contribution to economic growth, most rural-to-urban migrant workers can only register as temporary residents (rural hukou or non-hukou) in the cities and are denied access to many of the social benefits available to their urban counterparts. With the hukou system restrictions, there is no social safety net for rural hukou workers. They do not have equal access to five social insurances with one housing fund programme in China. Specifically, compared with urban peers, rural migrants have unequal access to health care facilities and pension rights, and their children do not have the same right to receive education in cities.

Interestingly, those unfair barriers and institutional restrictions did not fully stop or ease the large flow of rural-to-urban migration in China. Therefore, many researchers were interested to analyse what kind of factors can drive migration decision making, and even off-set inequalities when migrants who hold a rural hukou work in the cities.

Figure 2.2: Urban and Rural Income per capita (1978-2012, Nominal income, CNY)



Note: per capita disposable income for urban households as defined by NBS; and per capita disposable income for rural households as defined by NBS as well.

Source: OECD Urban Policy Reviews: China

Existing research on migration decision making in China largely follows the path of explaining rural-urban migration in terms of economic factors at the individual level. Hare (1999), Zhao (1999a) and Zhu (2002) find that stronger demand for labour in the agricultural sector reduces the probability of migration, while a widening of the rural-urban income gap increases it. Evidence from figure 2.2 strongly indicates that the gap of income per capita between rural and urban continuously expand after 1978 and even fast in recent years. Empirically, young, single, male workers from families with higher numbers of working-aged members and a lower per capita land endowment are more likely to migrate.

As for education, Zhao (1999a) collected sample data from Sichuan province and found that junior high school graduates are marginally more likely to migrate than primary school graduates, and both groups are more likely to migrate than senior high school graduates. While considering children's education, Zhao (1999a) looked at the number of preschool-aged children in the family but found that it was not significant in the decision to migrate. Later, Kong and Meng (2010) applied relatively large-scale data from surveys conducted in China as part of the Rural-Urban Migration in China and Indonesia project. The economic result showed that migration has a negative effect on children's education, especially those left-behind children while there was no obvious difference for health outcome. It implies that children's education and health may have little effect on peasants' decision to work in the cities. It also reflects the Chinese tradition that grandparents usually help to raise the children.

While focusing on the individual level, the existing literature has also stressed the importance of social networks in migration, as peer migrants may help improve job information, policy announcement and reduce moving costs. Chen et al (2010) applied part of provincial data in China, and found a large, positive, and significant effect of social interactions within a village. However, they also reported that the snowball effect not only helps transfer agricultural labour to non-agricultural activities, but it could also lead to a number of socio-economic implications including a dramatic demographic change in the migration villages, transportation congestion, and increased vulnerability to potential macroeconomic shocks.

Macroeconomic shocks such as a change of migration policy should have a powerful effect on the migration decision. Policy, whether to block or boost migration, is likely to directly affect the future migration flow. Surprisingly, there is very little research that focuses on the migration policy itself, even at the whole country level. To fill this gap, we employ a Difference-in-differences method (Angrist & Krueger, 1999) to estimate the effect of the first policy to support large scale migration policy on the migrants, especially the rural-to-urban cluster which, instead of being forbidden and controlled, were encouraged and guided in an orderly migration flow in 1992. Considering there is no migration record in the 1982 Census, only Census data from

1990 and 2000 can be applied. Combing data from the two censuses into one would be a useful way to apply DD estimation by setting 1992 as the cut-off time.

We find that the 1992 migration policy had weak impact on rural migrants' migration decision. Geographic factors and individual factors are easy to disturb the DD estimator. The probability of rural hukou holders migrating after 1992 is still 14.9 per cent lower than that of urban registration owners. Old age and lower education can reduce the difference significantly. The most popular destination for rural migrants was Guangdong during that time.

The structure of this chapter is as follows. The next section introduces the background of the migration history with the evolution of rural-to-urban migration policies. The unique two types of hukou registration in China is explored, especially the unequal treatment between these two types of registration, and the history of regional development, which has led to the regional gap until today. In sections three and four, we display the data of the Population Census of China in 1990 and 2000 and specify our empirical methodology. In Section five we report our DD estimates of the effect of the migration policy on migration decisions, differentiating between the two types of hukou migrants in the whole country, as well as at the provincial level and perform a robustness test. The last section concludes.

2.2. Background

2.2.1. Migration History

During 1979 to 1983, rural migration was almost forbidden in most of China. The central government explicitly stipulated to local government three restrictions, "strictly control rural labours' entry into cities"; "strictly restrict employment of rural labour force" and "strictly limit the transfer of rural population to non-agriculture population". The reasons were as follows. First of all, the household contract responsibility system in rural areas had just begun during that time. The remuneration of every rural household was linked to output. Therefore, the government needed to ensure there were enough peasants in farming to reach the target. Second, agricultural products were controlled procurement and distribution in a unified way during that time. Rural-to-urban migration could cause uneven distribution. Last, after the Chinese economic reform, a large number of school graduates and young labour returned to cities and increase the pressure of employment in most urban areas. Thus, local government in urban areas did not want to offer scarce opportunity to those rural hukou holders.

In 1984, the government began to allow part of rural workers to move out of farming and engage in small business in nearby cities. During that time, the rural surplus labour was absorbed by town firms with less technical business. Although the government did not officially announce the relaxation of restrictions on rural-urban migration, in practice the controls were gradually eased. Until the late 1980s and early 1990s, the huge flows of foreign direct investment (FDI) into China led to higher demand for labour and the food coupon programme was abolished, prompting the first large scale rural-to-urban migrations. The surge of rural migrants created a chaotic situation in the urban labour market; neither urban nor rural labour could find jobs easily. In 1990, the State Council of China abolished the policy and allowed rural labour to search jobs in cities to control the blind flow of surplus labour in the rural areas. The government policy started to guide the migration flow from 1992. It eliminated the restrictions on interprovincial migration and aimed to help Chinese labour market redistribution. However, the priority for local government was still to solve the urban hukou unemployment. Later in 1997, the State Council officially allowed the rural type of registration holders to change to urban registration if they already lived in the cities and had been employed there for a certain period.

Table 2.1: Evolution of rural-to-urban migration policy

1979-1983	Government forbids rural-to-urban migration
1984	Government allows rural hukou labour to work in nearby urban area
1989-1991	Government strictly controls blind migrantion
1992	The government policy shifts to encourage and guide an orderly migration flow
1997	Government begins hukou reform in small cities
2000 until now	Government promotes rural-urban migration

Source: Author's summary based on Sheng (2008).

Although rural-urban migration is one of the most important forces driving economic growth and urbanization in China, migrants continue to encounter widespread hostility and discrimination from local governments, employers and urban residents. The hukou barrier has the effect of controlling the rural-urban migration and forces those rural hukou workers into a guest worker system. Even now, most migrants still do not envisage a future for themselves in the cities. Instead, they only hope to earn as much as they can in the city before returning home with a nest egg that will support their whole family's future in the countryside.

2.2.2. Hukou System with Inequity

During the pre-reform period (before 1978), the rural-urban divide was also perpetuated by China's very generous social welfare system, which included full employment, lifetime employment and cradle-to-grave social welfare. However, the system cost too much to cover all the population, so the government decided to restrict coverage to urban residents only. In order to maintain the viability of such a system, it was necessary to prevent rural households from migrating to the cities (Meng 2000).

The restriction on rural-urban and self-initiated migration was implemented through the hukou system in which every citizen in China was required to register as a resident of his/her usual place of residence, and the system obliged individuals to live and work in the areas in which they were born (Chan & Zhang 1999). This system classified people into two groups: agricultural hukou holders and non-agricultural hukou holders. During the pre-reform era, jobs, food, housing and other daily necessities in urban areas were purchased by coupons and assigned by the government, and only those with non-agricultural hukou had access to these resources and services. Thus, even if peasants had moved to the cities, their rural hukou would have given them no means to survive (Meng & Chris 2010). Only a small number of people were eligible to convert their hukou status from agricultural to non-agricultural. Under such circumstances, rural-urban migration was strictly constrained for the next 40 years (Chan & Zhang 1999).

Despite the restrictions on rural-to-urban migration, many rural hukou holders came to the cities to work illegally as domestic servants, physical labours and street vendors. Urban governments periodically expelled these workers back to their hometowns, but that did not stop them from returning (Wang & Wang 1995; Xiang 1996; Zhao 2000). In essence, the hukou system in the pre-reform era functioned as a de facto internal passport mechanism.

Under the hukou system, most of this discrimination was institutionalized, even after the reform years. For example, rural hukou labour are largely confined to temporary or '3D' (dirty, difficult and dangerous) jobs that are shunned by most urbanites (Zhao 2000). Even if rural hukou holders doing the same job as an urban hukou holder, they were not entitled to employer contributions to various insurance schemes such as pension contribution and housing subsidies. If they were sick or injured, they had no health cover. If they lost their jobs, they were not eligible for unemployment subsidies. Moreover, children of migrant workers were not allowed to enrol in normal city schools without paying extra fees (Meng 2000; Meng & Zhang 2001), which is one of the reason for the so-called "left behind" issue, that most non-hokou workers have no choice but to leave their children in the rural areas with grandparents.

The official announcement that government remains separating social benefits for urban hukou and non-hukou holder (rural residents) in terms of social benefits is that, when farmers migrated, their families were permitted to keep their land. If rural-urban migrant workers lost their jobs, they could always back to their hometown and work on the family farm. Similarly, if they fell sick, they could be cared for by other family members when they return to the countryside, where the cost of living was much lower than in the urban areas. However, as Du et al. (2006) mentioned, the quality of health care in most rural areas was worse and its cost still substantial. There are also many other differences between urban hukou holder and rural hukou holder. We summarise some features of this social and economic dichotomy in Table 2.2.

Table 2.2: Comparison between urban hukou and rural hukou migrants

Characteristics	Urban hukou migrants	Rural hukou migrants
Household type of registration	Non-agricultural and local	Agricultural and non-local
Entitlements and social benefits	Full	From nil to temporary
Legal urban residency status	Full status	Illegal or temporary
Employment type	Mostly permanent jobs	Temporary or semi-permanent jobs in non-state enterprises; or self-employment
Stability of moves	Permanent	Seasonal or semi-permanent

Skill level	Skilled and low-skilled workers	Mostly unskilled or low-skilled labours
Housing	Same as other urban residents	Low-cost shelters or homeless

Source: Author summarise

2.2.3. Regional development

Having recognized the low economic efficiency caused by the centrally planned economy, the Chinese Communist Party leader Deng XiaoPing adopted the concept of a 'socialist market economy' to boost economic development. Under the associated uneven development strategy, some coastal areas were selected to be developed first, as they were superior to interior areas in terms of their location advantages, external linkages and industrial bases (Fan 1995). Experimental economic reforms were initially tested in a few selected coastal sites (e.g. four special economic zones[10] in 1979, fourteen open coastal cities[11] in 1984 and open economic areas in 1985), and then were extended to the whole country in 1994 (Liu et al., 2014).

As a consequence of state preferential policies and massive inflows of foreign investment, the economies in the coastal areas have taken off since the early 1980s (Fan 1995; Fan and Sun 2008). According to Liu et al., (2014) three growth poles emerged in different time periods during the thirty years of reforms: in the 1980s, the Pearl River Delta (PRD, located in Guangdong); in the 1990s, the Yangtze River Delta (YRD straddling Shanghai, Jiangsu and Zhejiang) and in the 2000s, the Bohai Economic Rim (BER, centred on Beijing and Tianjin). In the coastal provinces, fast-growing export-oriented manufacturing sectors along with booming urban construction and service sectors generated expanding demand for cheap labour. By contrast, interior provinces experienced relatively slow economic growth, and their urban labour markets had difficulties in absorbing a large amount of surplus rural labour. It became gradually obvious that the extant strict migration controls were incompatible with the rapid industrialization of the coastal areas.

[10] Four special economic zones are Shenzhen, Zhuhai, Shantou and Xiamen.
[11] Fourteen open coastal cities are Tianjin, Shanghai, Dalian, Qinhuangdao, Yantai, Qingdao, Lianyungang, Nantong, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang and Beihai.

2.3. Data

Data comes from a 1% sample of the 1990 and 0.9% sample of the 2000 Chinese Population Censuses which were collected by IPUMS International. In the 1990 Census, migrants were defined as those aged five years and above who had a different place of birth place or regular residence on 1 July 1985. Those who did not have a local hukou in the destination (non-hukou migrants), had to have been in the destination for at least one year, or have been away from their place of registration for at least one year (State Council and SSB, 1993). In the 2000 Census, the definition of migrants still referred to those aged five years and above who had a different place of birth or regular residence from 1995, but the duration of stay was reduced from at least one year to half a year. According to Chan (1994) and Solinger (1995), by the definition of migrants in the census tried to avoid short-term 'floating population', a good portion of whom are not truly migrants (such as visitors, tourists, and people on business trips). This can improve the reliability of our estimation result.

It is worth noting that the 1990 Census asked for not only the province but also the county or city where household had lived five years ago, whereas the 2000 one only asked about the province. Hence, in this chapter, we only consider interprovincial migration, to ensure that migration data from different censuses are comparable.

Then we abstract the interprovincial migration subsample of both the 1990 Census and the 2000 Census, which contain 363,695 and 1,212,076 individual records respectively. At first glance, there was a four times increase in migration from the 1990 to the 2000 census. Therefore, our main goal is to estimate whether the policy of encouraging and guiding migration flow boosted rural-to-urban migration in China.

The definition of urban hukou migration and rural hukou migration is that, for urban hukou migration, a change in registration should occur along with the change in residence; then the movement is considered migration in both censuses. However, for rural hukou (also called non-hukou) migration, a change in registration does not accompany the change in residence; a person is recorded as a migrant only if he or she has been away from the place of registration for half a year or one year, depending on which census year.

Unfortunately, there are no details of registration and residence information in the IPUMS data. The data only contain the two basic types of registration, agricultural and non-agricultural as a dummy variable for each individual and the migrant status during the last five years. Therefore, the definition of urban hukou migration and rural hukou migration in this chapter is adjusted accordingly. In particular, all individuals who match the criteria of migration in the census data, as long as their type of registration is urban or non-agricultural are treated as hukou migration; whereas those who still hold the rural or agricultural registration, we consider them as rural hukou, also known as non-hukou migration. Considering the enormous advantage of having a non-agricultural registration, there is no need to consider whether someone changed an urban type of registration into a rural one in China during that time. The only limitation of this definition is that, it may contain some peasants who changed from one rural village to another due to marriage or other reason and their rural type of registration was unchanged.

Last but not least, the IPUMS data do not have specific data on in-out migration flow for each household in each province. A DD estimator of the probability of migration is relatively simple and less meaningful. The estimation combined with the in-out status of each province would present a more dimensional result. Therefore, we also apply data from Fan (2005) based on the State Statistical Bureau (1992) and the National Bureau of Statistics (2002) for part of the analysis, and the Tabulations of China 1% Population Sample Survey in 1987 (SSB, 1988) in order to indicate whether urban and rural hukou migrants were in the same relative condition before 1992.

2.3.1. Descriptive Analysis

2.3.1.1. 1990 Census Data

Table 3.3 summarises the socioeconomic characteristic of the two types of interprovincial migrants, urban hukou and rural hukou. Generally, both types of migrants were dominated by males and those aged 20-29. As with migrants in many other countries, this is the age cohort most likely to make life cycle decisions related to residential changes (Skeldon, 1990).

For urban migrants, almost 60 per cent are male and the proportion was even higher among interprovincial migrants. It seems that in most rural areas; both male and female may have the same strong motivation for migration. Regarding marital status, more than half of rural hukou migrants are married; in other words, most rural migrants are couples when they migrate. Further evidence comes from the fact that marriage or union is the second major motivation for migration of those rural migrants. This is consistence with the "left-behind" issue in most rural areas in China, whereby children have to live with their grandparents while their parents work in the urban area. Even recently, in 2016, the interprovincial migrant workers who were married still accounted for 64.8 per cent. In such case, families can only reunite during the Spring Festival, but some families may not gather until the children grow up. On the contrary, single or unmarried status is more common among hukou migrants when they decide to migrate.

Table 2.3: Social and Demographic Characteristics of Interprovincial Migrants, 1985-1990 (%)

	All migration			Interprovincial migration	
Migrant characteristic	Total	Urban	Rural	Urban	Rural
Sex					
Male	55.9	59.7	51.0	61.8	55.7
Female	44.1	40.3	49.0	38.2	44.3
Age (years)					
5-14	8.7	9.4	7.8	10.2	7.4
15-19	16.1	18.0	13.5	14.4	14.8
20-29	49.0	45.5	53.6	43.8	53.4
30-39	12.9	12.5	13.5	14.4	14.1
40-49	6.4	7.1	5.3	8.8	5.1
50-59	3.7	3.9	3.5	4.4	2.8
60+	3.2	3.5	2.8	4.1	2.5
Marital status					
Unmarried	49.2	58.6	36.9	54.8	38.8
Married	48.6	39.0	61.1	42.6	59.2
Reasons for move					
Job relocation	12.0	19.2	2.7	25.5	3.4
Job assignment	6.8	10.8	1.7	10.8	0.5
Other work	23.7	9.2	42.7	10.6	47.7
Family move	11.0	14.3	6.7	16.2	6.2
Study	12.5	21.5	0.8	15.7	0.3
Marriage or union	13.9	4.1	26.7	3.0	23.3
Retirement	1.6	1.8	1.4	2.3	0.9
Visiting	9.8	9.7	9.9	11.6	10.7
Other reasons	8.6	9.5	7.4	4.5	7.0
Education					
No schooling	19.9	15.0	26.3	14.4	26.1
Primary completed	54.2	44.9	66.2	40.9	66.8
Secondary completed	23.3	35.6	7.4	36.4	6.8
University completed	2.6	4.5	0.2	8.3	0.2
Employed status					
Unemployed	0.9	1.6	0.1	1.7	0.1
Professional	8.5	13.1	2.4	15.9	1.93

Administrative	1.5	2.2	0.5	2.8	0.4
Clerks	2.7	4.1	1.0	5.1	1.0
Service	7.1	6.4	8.1	7.7	7.5
Skilled agriculture[12]	15.7	2.9	32.4	1.5	30.3
Industrial workers	27.8	22.1	35.1	24.0	40.2
N	363,695	205,748	157,947	58,680	59,424

Source: 1990 Census 1% Sample.

Rural hukou migrants are heavily concentrated in the educational levels of primary school, and illiteracy, which accounts for the second large proportion. However, for hukou migrants, although primary school education still accounts for a large part of migrants, the secondary educated category is almost five times higher than that of rural hukou migrants both in overall migration and interprovincial migration.

Regarding the occupational status of workforce, hukou migrants moving to urban destinations are highly concentrated in the industrial workers and professional categories (about 22-24% and 13-16% respectively). This clearly attests to the high skill selectivity of hukou migration, especially when combined with education level as above. In contrast, 76-78% of the rural hukou migrants were employmed in the service level or lower. As Yang (1994) reports, common jobs for rural hukou migrant labour were as manufacturing frontline workers, construction workers, nannies, and sales and service workers. Apart from those common jobs, skilled agricultural labour in towns or areas near the urban regions and fishery workers in the coast areas also account for large proportions of rural hukou migrants (30-32%).

The channels of migration, however, are different between the two categories of hukou. Considering the advantage of lower barriers to move by having an urban type of registration, 'Job relocation', 'Job assignment', 'Family move' and 'Study' are the four major channels of migration for hukou migrants. Companies, especially state-owned enterprises can more easily help their employees to change hukou to another province as long as it is for the companies' business. And then, once the head of the family has migrated, the whole family follows, and their children enrol into a new school. All these welfare are available or at least negotiable in most SOEs in China during that time. In contrast, rural hukou migrants citing a job as the motivation for migration, were close to 43 per cent. According to Chan et al. (1999), these rural migrants found jobs and migrated using labour market channels, typically through the

[12] Skilled agricultural and fishery workers.

help of relatives and friends, jobs ads, or recruitment agents. The driving of co-villagers' help was also mentioned as the most influential factor later in 2010 by Chen et al. As for the government, it only accounted for a tiny proportion, about 12 per cent, of job-related rural-to-urban migration (Chan et al., 1999).

2.3.1.2. 2000 Census Data

In the 2000 Census data, there is only information about interprovincial migration. Rural hukou migrants were still dominated by males while the range of age increases ten years from 20 to 39 instead of 29 in 1990. It indicates that the period of life cycle decision had expanded during this ten years.

Hukou migrants had an equal sex ratio in the 2000 Census, where female migration increased by 11.8 per cent. This suggests that, after ten years, both male and female urban hukou holders have the same strong motivation for migration. The gap of sex ratio between male and female of rural hukou migrants had also shrunk. Couples' migration still accounted for around one and half times than of single people for both urban hukou and rural hukou migrants.

The situation of different educational level remained almost unchanged after ten years. The primary level was still dominant especially for rural migrants, and hukou migrants were heavily concentrated in the primary and secondary education categories.

Regarding the occupational status in the 2000 Census, hukou migrants except industrial labours and professional categories, the service sector is also significant increase from 7.7% more than double to 16.8%. Meanwhile, rural hukou migrants were still stuck in farming-related and industrial sectors. Moreover, around 30 per cent of unrecorded rural migrants who may occupied in the '3D' (dirty, difficult and dangerous) jobs as we mention before. Because the hukou regime did not change much from 1990 to 2000, the moving barrier for rural-to-urban migration keep restricting rural hukou workers through the two main channels, 'Work' and 'Marriage'. One more piece of information available in the 2000 Census only is the source of livelihood. As shown in Table 2.5, it describes the ways migrants lived in the new places. Wage income dominates the sources of livelihood for both urban and rural hukou migrants. Traditional family support, unsurprisingly, is the second major source of livelihood for all migrants. As for other social support indicating benefits from the local governments, urban hukou migrants clearly gained more than rural hukou migrants.

Table 2.4: Social and Demographic Characteristics of Interprovincial Migrants, 1995-2000 (%)

	Interprovincial migration		
Migrant characteristic	Total	Urban	Rural
Sex			
Male	47.6	50.0	51.4
Female	52.4	50.0	48.6
Age (years)			
5-14	17.9	12.6	19.6
15-19	8.0	9.1	7.6
20-29	16.0	18.9	15.1
30-39	18.8	20.4	18.3
40-49	13.8	15.2	13.3
50-59	9.1	8.8	9.2
60+	10.9	10.5	10.9
Marital status			
Unmarried	39.0	36.7	39.7
Married	56.0	58.8	55.2
Reasons for move			
Job relocation	4.4	3.7	5.4
Job assignment	3.2	2.7	3.8
Other work	31.7	29.8	34.6
Family move	16.1	15.7	16.7
Study	12.0	15.2	7.1
Marriage or union	12.3	6.0	22.1
Housing problems	14.7	21.2	4.7
Other reasons	5.7	5.8	5.6
Education			
No schooling	11.5	10.3	13.4
Primary completed	57.6	50.9	67.9
Secondary completed	27.7	34.1	17.8
University completed	3.2	4.7	1.0
Employed status			
Professional	8.3	9.2	6.9
Administrative	2.0	2.5	1.2
Clerks	3.3	4.1	2.1
Service	14.0	16.8	9.8
Farmers	10.0	1.7	22.6
Industrial workers	24.9	22.8	28.2
N	1,212,076	733,768	478,308

Source: 2000 Census 1% Sample.

Table 2.5: Source of livelihood for Migrants in 2000 Census

Source of livelihood	Total	Urban	Rural
work	62.4	57.0	70.7
property income	0.2	0.2	0.1
pension	3.7	5.0	1.6
other social support	0.7	1.0	0.3
household support (dep)	31.3	34.8	25.9
other	1.7	1.9	1.4

Source: 2000 Census 1% Sample.

2.4. Methodology

First of all, there is no record of information about migration in Census data before 1990. Thus, any migration policies decreed before 1985 cannot be treated as a time effect dummy since there are no pre-treatment and pre-control groups available for the DD method. The same issue applies for policies implemented after 2000.

Also, since there are no exact time records for every migration in the Census data, it is very difficult to define the pre-group and post-group for if policies applied in 1989 and 1997 by using data from one census only. Some migration occurred before 1989 when using the 1990 Census with migration record from 1985-1990, and before 1997 for the 2000 Census with migration record available from 1995-2000.

Considering the timeline of rural labour transfer to non-agriculture from 1984 until now, since there was no other official migration policy (especially support for rural-to-urban migration) decreed during that time, the migration policy in 1992, while the government shifted from controlling to encouraging and guiding the orderly migration flow is the most reasonable cut-off time for the DD estimation, especially when combining the 1990 and 2000 Census data into one. Although there are 2-years and 3-years gaps for the 1990 Census and 2000 Census respectively, 1992 should still be treated as the optimal cut-off time for our research. Later, we can also apply migration policy in 1997 in comparison with 1992.

Last but not least, usually when combining two sets of Census data into one, the duplication is inevitable. A proportion of the sample information in the 1990 Census may be recorded again in the 2000 Census. Fortunately, our research cohort is composed of those households with migration records during five years, from 1985 to 1990 and from 1995 to 2000. This type of migration record can avoid most of the duplication problem in our research, because those who have migration information in 1990 Census data may will not appear in 2000, unless the migrant worker kept changing his or her places of residence during these two periods.

Another critical criterion to apply DD estimation is that the treatment states should have similar trends to the control states before the time effect. Although it seems there were some limitations by the government to restrict rural-to-urban migration during that time, however, after 1984, the government had begun to allow rural hukou holders to migrate to nearby cities. Whether the rate of increase of both urban and rural migration was similar or not would need earlier data to demonstrate. The first record that contains migration information is the 1% Population Sample Survey in 1987 with a five year duration from 1982 to 1987. Therefore, one way to prove the similarity of trends is to figure out the number of the two types of hukou migrants during these five years. Unfortunately, the sample survey in 1987 did not provide migration information summarized according to the hukou system and the original data of each household is unavailable as well. Hence, we have to apply an approximate method to test the pre-treatment status of the two types of migration. The 1987 1% Sample Survey does provide the migration records divided by regions; city, town and county[13]. Considering that the hukou reform occurred only in small cities until 1997, it is reasonable to treat those migrant from cities as urban hukou migrators and those from counties and towns as rural migrators before 1990. Table 2.6 summarizes the total numbers of migrators from cities, towns and counties in 1987 and 1990. The rate of increase for migrants from cities (urban hukou) is 1.15 (from 547 to 629), and 1.10 for those from counties and towns migrators (rural hukou) ((2118+637)/(2070+428)).

Table 2.6: In-out Migration by Regions

		Total	County	Town	City
1987 1% Population Sample	Total migrators (10 thousand)	3044	2070	428	547
	Migrators from %	100.0	68.0	14.1	18.0
	To city	36.6	33.2	23.6	59.8

[13] A town is a small unit which is contained in a county.

Survey (1982-1987)	To town	39.8	41.3	49.8	26.1
	To county	23.6	25.6	26.6	14.0
	Total	100	100	100	100
1990 Population Census Survey (1985-1990)	Total migrators (10 thousand)	3384	2118	637	629
	Migrators from %	100.0	62.6	18.8	18.6
	To city	61.7	58.8	65.3	67.8
	To town	20.1	18.7	24.9	19.8
	To county	18.2	22.5	9.7	12.5
	Total	100	100	100	100

Source: 1987 1% Population Sample Survey (1988), 1990 Population Census data and Yan (1998).

Thus, this evidence suggests that there were similar trends between rural hukou and urban hukou migration during the pre-treatment period and the Difference-in-differences method could be applied in our research to estimate the policy effect on the migration decision in the rest of chapter. Our Difference-in-differences strategy is as follows. The treatment group consists of agricultural hukou holders and the control group is non-agricultural hukou holders. We use H as a dummy for the hukou status, which equals 1 for a rural hukou holder, and 0 for an urban hukou owner. Since the cut-off time is 1992, we set a time effect dummy T, which equals 0 for those in the 1990 Census and 1 for those in the 2000 Census.

	Rural Hukou	Urban Hukou
Before 1992 (Census 1990)	$E(Y_i\|H = 1, T = 0)$	$E(Y_i\|H = 0, T = 0)$
After 1992 (Census 2000)	$E(Y_i\|H = 1, T = 1)$	$E(Y_i\|H = 0, T = 1)$

$$DD = [E(Y_i|H = 1, T = 1) - E(Y_i|H = 1, T = 0)] - [E(Y_i|H = 0, T = 1) - E(Y_i|H = 0, T = 0)] \quad (2.1)$$

In this equation, the DD estimation captures the causal impact of the migration policy of 1992. Specifically, the time-invariant and registration-specific factor can be eliminated in the two differences of $E(Y_i|H = 1, T = 1) - E(Y_i|H = 1, T = 0)$ and$E(Y_i|H = 0, T = 1) - E(Y_i|H = 0, T = 0)$, respectively. Then, in the second step, any changes not resulting from the implementation of the hukou reform policy, while common to both urban hukou and rural hukou, are eliminated in the difference of $\Delta E(Y_i|H=1)-\Delta E(Y_i|H=0)$. In other words, our DD estimate nets out the effect of transfer of rural labour to non-agriculture activities and reflects only the effect of the reformed policy of rural labour migration in 1992.

In practice, the following regression-adjusted DD model is used to identify the effect of the migration policy in 1992 on the probability of migration. Consider

$$Y_i = \alpha_0 + \alpha_1 H_i + \alpha_2 T_i + \alpha_3 H_i T_i + X_i \beta + \varepsilon_i \tag{2.2}$$

where H_i and T_i, reflect the two types of registration and time effects, respectively. The coefficient of the interaction term of $H_i T_i$, or α_3 captures the causal effect of the migration policy on the migration decision of a rural hukou holder. The probabilities of domestic migration for the four groups are as follows:

	Rural hukou	Urban hukou	Difference
Before 1992	$\alpha_0+\alpha_1$	α_0	α_1
After 1992	$\alpha_0+\alpha_1+\alpha_2+\alpha_3$	$\alpha_0+\alpha_2$	$\alpha_1+\alpha_3$
Difference	$\alpha_2+\alpha_3$	α_2	α_3

Thus, the policy effect on the probability of migration for a rural hukou holder is α_3. Assuming that without the migration policy, the tendency of migration of rural hukou holders and urban hukou holders would have been the same, the interaction term picks up the effect of the migration policy migration decision. In other words, the interaction term measures the migration gap between rural and urban hukou holders that is attributable to the affirmative migration policy. If the coefficient of the interaction term is negative, it means that either the migration policy was not implemented well or it did not influence rural households' decision of migration. In contrast, if it is positive, it indicates that the migration policy promoted rural-to urban migration and the migration gap between rural hukou holders and urban hukou holders was reduced.

Also note that we add a vector of variables X_i in the equation to control for some demographic and geographic characteristics that may also be correlated with the migration decision. Vector X_i changes the estimate of α_3 only if $H_i T_i$ and X_i are correlated, conditional on the two main effects of rural hukou holders (non-hukou in the cities) and the migration policy. In this chapter we carry out both regressions (with and without X_i) to test the robustness of our result.

2.5. Empirical Results

2.5.1. Estimation of the Effect on Migration Policy in 1992

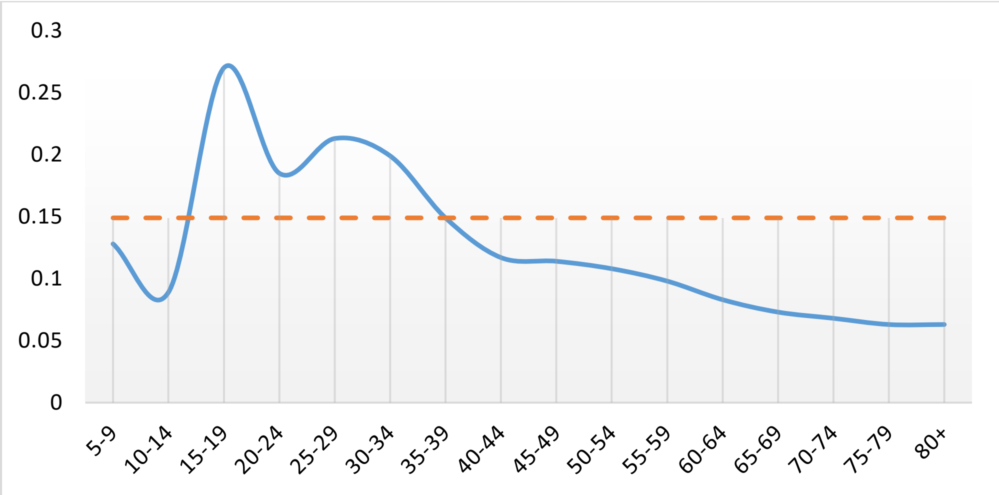
As Table 2.7 illustrates, the migration gap between urban hukou and rural hukou migrants after the government policy shift to encourage and guide orderly migration flow in 1992 is -0.149. It means that the probability of a rural hukou holder migrating after 1992 was still 14.9 per cent lower than that of urban registration owners. Setting 0.149 as the absolute benchmark value, we then add other control variables as a robustness test to estimate if there are other characteristics that impact the change on the gap of urban-rural migration. If the change is small, it means that other socio-economic sectors may not be the driving factors to impact our DD estimation of the effect of the migration policy between rural and the urban differently. However, if the value is small, it indicates the characteristic can also enhance the willingness of rural hukou holders to migrate.

Table 2.7: Difference-in-differences Estimates of the Effect of Migration Policy in 1992 on the Change of Migration Decision Making for Rural Population

DD	-0.149	(0.000)***		50-59	-0.104	(0.001)***
				60+	-0.074	(0.001)***
Male	-0.143	(0.000)***				
Female	-0.156	(0.000)***		Married	-0.147	(0.000)***
				Single	-0.168	(0.000)***
<15	-0.082	(0.000)***				
15-19	-0.270	(0.001)***		Han	-0.147	(0.000)***
20-24	-0.185	(0.001)***		No Han	-0.195	(0.001)***
25-29	-0.213	(0.001)***				
30-34	-0.199	(0.001)***		Illiteratie	-0.080	(0.000)***
35-39	-0.149	(0.001)***		Primary	-0.159	(0.000)***
40-44	-0.117	(0.001)***		Secondary	-0.117	(0.001)***
45-49	-0.114	(0.001)***		Higher Ed	-0.267	(0.019)***

As Table 2.7 illustrates, being male, married and from the Han group are not important determining factors to affect the gap between urban hukou holders and rural hukou migrants. Single female in rural areas may not follow the migration flow, they usually stay in the home village to take care of farming business or to take care of elderly parents and their siblings' children as well. Most rural women will migrate with their husbands, so they can take care of each other in the cities. Most ethnic minorities in China are located in remote regions with relatively low openness. Therefore, minorities' migration during 1990s was quite rare compared with the Han group.

Figure 2.3: DD Estimator of Age Specific



As Figure 2.3 reflects above, the DD estimators are smaller than the benchmark in the age group less than 15 and above 40 as well. Considering the advantage of living conditions in the urban areas, rural migrants were more willing to offer their children and their elderly parents a better environment for study and retirement care and those things usually were not need to consider for most urban hukou households. Therefore, the urban-rural migration gap shrinks for those age groups. As for the golden working age group (15-35), the urban-rural migration gap is larger even under the migration policy change. The absolute value reaches a peak of 0.27 at the age between 15 and 19. Thereafter, it falls dramatically to 0.185 at age around 25, because at this age an increasing number of people are normally to have got married and may have settled down as urban hukou holders, while the married status of rural hukou migrants are continuous to increase during this period, and it continues to decline steadily after age 30. It is worth noting that the reduction of the gap between rural and urban hukou migration in the 25-45 age group is for children rearing times that of the 5-15 age group, which provides further evidence that a large number of rural migrant labour moved to urban areas to earn their living, leaving sizable numbers of so-call 'left-behind children' in the countryside, as mentioned before.

With education as a control variable, we can clearly see that higher education level is associated with a larger urban-rural migration gap. This is because the average education level in rural areas is commonly lower than in urban areas, while most of education resources are centralized in the urban areas as well.

Table 2.8: Difference-in-differences Estimates in 1992 and 1997 (working-age group)

	1992		1997	
DD	-0.120	(0.000)***	-0.178	(0.000)***
Male	-0.116	(0.000)***	-0.170	(0.000)***
Female	-0.125	(0.000)***	-0.188	(0.001)***
15-19	-	-	-0.269	(0.001)***
20-24	-0.109	(0.001)***	-0.185	(0.001)***
25-29	-0.213	(0.001)***	-0.213	(0.001)***
30-34	-0.199	(0.001)***	-0.199	(0.001)***
35-39	-0.149	(0.001)***	-0.149	(0.001)***
40-44	-0.117	(0.001)***	-0.117	(0.001)***
45-49	-0.114	(0.001)***	-0.114	(0.001)***
50-59	-0.108	(0.001)***	-0.111	(0.002)***
Married	-0.122	(0.001)***	-0.166	(0.000)***
Single	-0.150	(0.000)***	-0.199	(0.001)***
Han	-0.119	(0.000)***	-0.175	(0.000)***
No Han	-0.145	(0.001)***	-0.229	(0.001)***
Illiteratie	-0.098	(0.001)***	-0.174	(0.001)***
Primary	-0.122	(0.000)***	-0.189	(0.000)***
Secondary	-0.077	(0.001)***	-0.123	(0.001)***
Higher Ed	-0.294	(0.021)***	-0.305	(0.022)***

Considering that those aged 5-14 (young children) and 60+ (retirees) have relatively low migration rates, we then focus on those whose migration decisions were for work only, by adding one more control variable to reduce our sample. In detail, we assuming that when the migration policy was decreed, migrants were in the range from age 15 to 59 only. Another reason to consider working age for DD estimation is that the migration policies in 1997 is very difficult to separate clearly as a cut-off time effect. It occurred during the 2000 Census investigation. An approximate way to set cut-off time effect for our DD estimation is to apply a suitable range of working age for the implementation of the migration policies. We then put both policy events in Table 2.8.

Although the difference between the two migrations of the two types of hukou holders is still large, when we reduce the sample size and focus on the working-age cohort only, the absolute value of the DD estimator decreases to 0.12 instead of the benchmark 0.149. It indicates that more rural hukou migrants decided to migrate at their working age compared with the whole life estimation.

Before we go further, in order to prove that redistribution of population occurred during 1985-2000, we apply the system-wide migration efficiency (ME) which is defined following Bell at al. (2002) and Plane (1984) as:

$$\mathrm{ME} = 100 * \frac{|I_i - O_i|}{I_i + O_i} \tag{2.3}$$

where O_i and I_i are the outflow and the corresponding inflow from province i. Whilst high values denote that net migration is an efficient mechanism for redistribution of population, low values closer to zero indicate that migration flows are more closely balanced (Liu et al., 2014). Table 2.8 shows a substantial increase of ME, from 28.36 in 1985-1990 to 64.79 in 1995-2000, indicating that net migration became an increasingly efficient mechanism for redistributing the population in the 1990s.

Table 2.9: Interprovincial In-Out Migration (thousand) with Migration Efficiency (ME)

Interprovincial Migration (thousand)								
	1985-1990				1995-2000			
Province	In	Out	Net	ME	In	Out	Net	ME
Bejing	663	123	539	68.70	1888	174	1714	83.12
Tianjing	312	86	225	56.78	491	104	387	65.04
Hebei	468	665	-197	17.39	769	872	-103	6.28
Shanxi	269	227	42	8.47	382	333	49	6.85
Inner-Monglia	226	277	-52	10.14	235	2680	-2445	83.88
Liaoning	517	272	245	31.05	754	380	375	32.98
Jilin	254	346	-92	15.33	254	529	-275	35.12
Heilongjiang	332	594	-262	28.29	301	940	-639	51.49
Shanghai	655	150	505	62.73	2167	163	2004	86.01
Jiangsu	837	588	248	17.47	1907	1240	667	21.19
Zhejiang	321	626	-305	32.21	2714	968	1746	47.42
Anhui	343	538	-195	22.13	313	2892	-2579	80.47
Fujian	294	228	67	12.64	1346	624	722	36.65
Jiangxi	226	277	-52	10.14	235	2680	-2445	83.88
Shandong	609	523	86	7.60	903	878	26	1.40
Henan	493	578	-85	7.94	468	2306	-1838	66.26
Hubei	411	348	62	8.30	605	2209	-1604	57.00
Hunan	248	504	-256	34.04	362	3260	-2898	80.01
Guangdong	1162	250	911	64.59	11500	438	11062	92.66
Guangxi	157	549	-391	55.52	287	1838	-1551	72.99
Hainan	133	112	22	8.57	218	130	88	25.29
Sichuan*	410	1287	-877	51.68	660	5091	-4432	77.05
Guizhou	198	309	-111	21.89	261	1231	-971	65.01
Yunnan	232	272	-40	7.94	731	397	334	29.61
Shaanxi	301	332	-31	4.90	420	716	-296	26.06
Gansu	159	269	-110	25.70	203	555	-353	46.44
Qinghai	104	98	5	2.97	76	120	-44	22.45
Ningxia	78	56	22	16.42	129	87	41	19.44
Xinjiang	336	273	63	10.34	1142	216	926	68.19
Total ME	28.36				64.79			

Note: Tibet is omitted. Sichuan*: Chongqing is combined with Sichuan in this chapter.

Source: Fan (2005) and author's calculation.

2.5.2. Spatial analysis at the provincial scale

The second part of the analysis is to examine the DD estimation at the provincial level. In this way, by the change of the DD estimators, we can identify the major flows of the rural hukou holders in interprovincial migration and place our study in the context of China's geography[14].

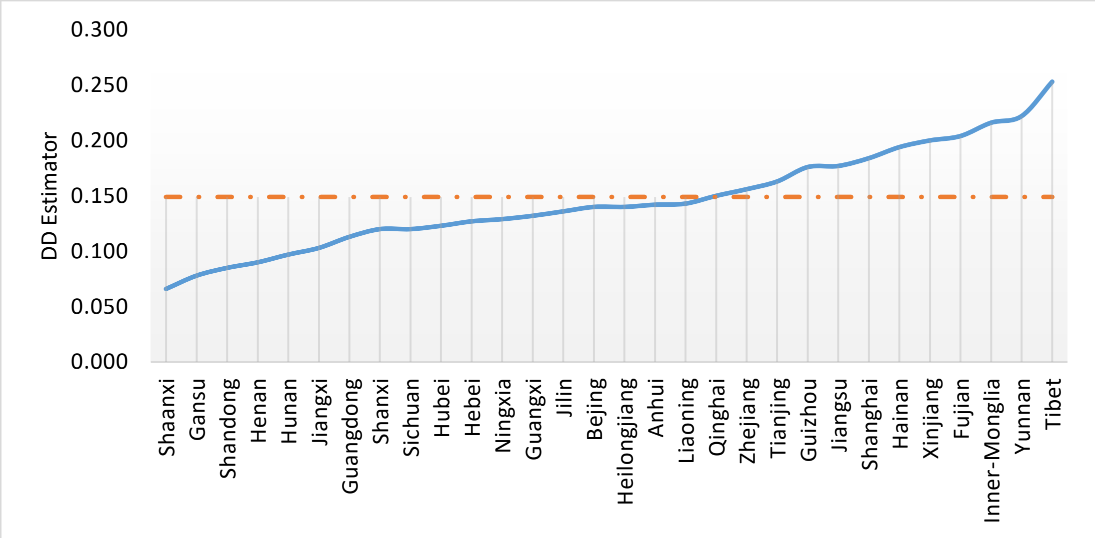
Table 2.10: DD Estimators at Provincial Level

All 30 provincial regions					
Beijing(1)	-0.140	(0.003)***	Henan	-0.090	(0.001)***
	245025			1765614	
Tianjin(1)	-0.163	(0.003)***	Hubei	-0.123	(0.001)***
	211113			1078378	
Hebei	-0.127	(0.001)***	Hunan	-0.097	(0.001)***
	1257993			1200519	
Shanxi	-0.120	(0.001)***	Guangdong	-0.113	(0.001)***
	619576			1433053	
Inner-Mongolia(2)	-0.216	(0.002)***	Guangxi(2)	-0.132	(0.001)***
	481278			861666	
Liaoning	-0.143	(0.001)***	Hainan	-0.194	(0.003)***
	832990			144558	
Jilin	-0.136	(0.001)***	Sichuan	-0.120	(0.001)***
	514313			2068040	
Heilongjiang	-0.140	(0.001)***	Guizhou	-0.176	(0.001)***
	721664			650725	
Shanghai(1)	-0.184	(0.003)***	Yunnan	-0.222	(0.001)***
	312930			780337	
Jiangsu	-0.177	(0.001)***	Shaanxi	-0.066	(0.001)***
	1397092			680455	
Zhejiang	-0.156	(0.001)***	Gansu	-0.078	(0.002)***
	881704			487026	
Anhui	-0.142	(0.001)***	Qinghai	-0.150	(0.004)***
	1239849			104806	
Fujian	-0.204	(0.002)***	Ningxia(2)	-0.129	(0.004)***
	661601			93042	
Jiangxi	-0.103	(0.001)***	Xinjiang(2)	-0.200	(0.002)***
	801023			347156	
Shandong	-0.085	(0.001)***	Tibet(2)	-0.253	(0.005)***
	1718292			48473	

Notes: (1) represents three municipalities and (2) denotes five autonomous regions in China. Standard errors are in parentheses. *$p<.10$; **$p<.05$; ***$p<.01$

[14] For detail geographic information of China, please see Figure 2.4a in appendix

Figure 2.4: DD Estimators at Provincial Level



As Figure 2.4 above illustrates, the dashed line is the benchmark of the migration policy estimator (0.149). When the DD estimation is based on the provincial level, the absolute values of DD estimators are various, while, for the value of the interaction term, more than half of the provinces are below the benchmark. Interestingly, these including more highly developed areas in the eastern coastal region and central areas as well as less developed areas in the western region simultaneously.

Table 2.11: The Average Provincial Per Capita Income from 1985 to 2000 in Ascending Order (Yuan)

	1985-2000		1985-2000
Guizhou	1378	Hubei	3172
Gansu	1922	Hebei	3333
Tibet	2072	Jilin	3340
Shaanxi	2208	Xinjiang	3434
Guangxi	2221	Hainan	3473
Sichuan	2276	Heilongjiang	4027
Yunnan	2289	Shandong	4154
Jiangxi	2303	Fujian	4821
Anhui	2385	Jiangsu	5176
Henan	2423	Liaoning	5273
Ningxia	2473	Zhejiang	5674
Hunan	2560	Guangdong	5835
Qinghai	2570	Tianjing	7792
Shanxi	2718	Bejing	10056
Inner-Monglia	2834	Shanghai	14188

Source: Chinese Statistic Year Book and author calculates.

Table 2.12: Provincial Nominal GDP and Rank from 1985-2000 (100 million)

Province	1985		1990		1995		2000	
Bejing	257.1	14	500.8	15	1507.7	15	3161.7	13
Tianjing	175.78	21	310.95	23	931.97	22	1701.88	22
Hebei	396.75	9	896.33	7	2849.52	6	5043.96	6
Shanxi	218.99	15	429.27	18	1076.03	20	1868.08	20
Inner-Monglia	168.83	22	319.31	22	857.06	23	1539.12	23
Liaoning	518.6	4	1062.7	4	2793.4	7	4669.1	8
Jilin	200.44	18	425.28	20	1137.23	19	1951.51	19
Heilongjiang	355	11	715.2	12	1991.4	14	3154.4	14
Shanghai	466.75	5	781.66	10	2499.43	8	4771.17	7
Jiangsu	651.82	2	1416.5	3	5155.25	2	8553.69	2
Zhejiang	429.16	7	904.69	6	3557.55	4	6141.03	4
Anhui	331.24	13	658	13	2003.6	13	2902.09	15
Fujian	200.48	17	522.28	14	2094.9	12	3764.54	10
Jiangxi	207.89	16	428.62	19	1169.73	18	2003.07	18
Shandong	680.46	1	1511.19	2	4953.35	3	8337.47	3
Henan	451.74	6	934.65	5	2988.37	5	5052.99	5
Hubei	396.26	10	824.38	9	2109.38	11	3545.39	12
Hunan	349.95	12	744.44	11	2132.13	10	3551.49	11
Guangdong	577.38	3	1559.03	1	5933.05	1	10741.25	1
Guangxi	180.97	19	449.06	17	1497.56	16	2080.04	16
Hainan	43.26	27	102.42	27	363.25	27	526.82	27
Sichuan	421.15	8	890.95	8	2443.21	9	3928.2	9
Guizhou	123.92	24	260.14	25	636.21	25	1029.92	26
Yunnan	164.96	23	451.67	16	1222.15	17	2011.19	17
Tibet	17.76	30	27.7	30	56.11	30	117.8	30
Shaanxi	180.87	20	404.3	21	1036.85	21	1804	21
Gansu	123.39	25	242.8	26	557.76	26	1052.88	25
Qinghai	33.01	28	69.94	28	167.8	29	263.68	29
Ningxia	30.27	29	64.84	29	175.19	28	295.02	28
Xinjiang	112.24	26	261.44	24	814.85	24	1363.56	24

Source: Chinese Statistic Year Book

By combining both the GDP and per capita income of each provinces (Tables 2.10 and 2.11), the provinces of Shandong, Guangdong, Beijing and Liaoning are the top four with high economic growth that attracted rural hukou migrants for interprovincial migration. Shanxi and Ningxia are another two provinces with relative low rank of GDP and per capita income but also attracting rural hukou migration. The reason is probably because of their mining industries, characterized by '3D' (dirty, difficult and dangerous) jobs in which most urban hukou households will not be willing to work. [15]

[15]Shanxi accounts for 1/3 of coal mining in China, even today.

Although the provinces of Hubei, Hebei, Jilin and Heilongjiang also ranked in relatively high in per capita income during 1985 to 2000, these provinces were less attractive for rural migrants.

Furthermore, most western regions and a small part of the central areas were the major exporter of rural hukou migrants. The poor live conditions forced local households to leave their places of origin and migrate to more developed regions. Among them, Shaanxi and Gansu are the two most significant provinces with the lowest DD estimators (0.066 and 0.078 respectively).

In order to identify what kind of rural hukou migrants those provinces lost or gained, we then apply age-specific and education-specific analyses as follows:

2.5.2.1. Changing Migration Patterns by Age Groups

In this section, we explore the changing patterns of migration by focusing the age-specific flows by adding four age groups (15-19, 20-29, 30-44, and 45-59) as a control variable for DD estimation of each province. The stage of leaving home to finish higher education or for a first job normally occur in the aged 15-19; and then young adults will move in their early stages of their career and start a young family between 20 to 29 and next the ages 30-44 are the family rearing years; while the age group 45-59 indicates middle-aged and older migrants whose children have gone to work or university. As for those aged 5-14 (young children) and 60 and above (retirees), they have relatively low migration motivations as indicated in the DD estimator presented earlier and are less likely to be influenced by regional economic disparity and national migration policy, because they are not completely economically independent during these two periods, especially based on traditional Chinese family culture.

As Table 2.13 shows, except for Guangdong province, the difference between rural and urban hukou migration is larger for all the provinces among those aged 15-19. The absolute values are all larger than the benchmark estimator. Therefore, Guangdong became the most desirable destination for the youngest rural migrants after the government shift to encourage rural-to-urban migration. The absolute estimator is only 0.089 and is statistically significant at 1%. Since there was no barrier for most urban hukou holders, urban migrants aged 15-19 had much more freedom and were willing to search for job or access a better education in other highly developed provinces.

Table 2.13: DD Estimators in Provinces with Different Age Group

Province	15-19		20-29		30-44		45-59	
Bejing	-0.160	(0.013)***	-0.127	(0.009)***	-0.152	(0.006)***	-0.126	(0.006)***
Tianjing	-0.002	(0.013)	-0.162	(0.009)***	-0.218	(0.005)***	-0.179	(0.006)***
Hebei	-0.284	(0.004)***	-0.199	(0.003)***	-0.109	(0.002)***	-0.093	(0.002)***
Shanxi	-0.350	(0.005)***	-0.171	(0.004)***	-0.106	(0.003)***	-0.064	(0.003)***
Inner-Monglia	-0.339	(0.006)***	-0.279	(0.005)***	-0.239	(0.003)***	-0.173	(0.004)***
Liaoning	-0.238	(0.005)***	-0.202	(0.004)***	-0.152	(0.002)***	-0.123	(0.003)***
Jilin	-0.258	(0.005)***	-0.208	(0.004)***	-0.126	(0.003)***	-0.109	(0.003)***
Heilongjiang	-0.257	(0.004)***	-0.205	(0.003)***	-0.148	(0.002)***	-0.114	(0.003)***
Shanghai	0.013	(0.015)	-0.190	(0.009)***	-0.206	(0.005)***	-0.232	(0.007)***
Jiangsu	-0.349	(0.004)***	-0.255	(0.003)***	-0.170	(0.002)***	-0.105	(0.002)***
Zhejiang	-0.243	(0.006)***	-0.178	(0.004)***	-0.155	(0.003)***	-0.098	(0.003)***
Anhui	-0.305	(0.004)***	-0.199	(0.003)***	-0.145	(0.002)***	-0.101	(0.002)***
Fujian	-0.291	(0.006)***	-0.281	(0.005)***	-0.204	(0.003)***	-0.120	(0.003)***
Jiangxi	-0.310	(0.005)***	-0.065	(0.004)***	-0.102	(0.003)***	-0.084	(0.003)***
Shandong	-0.211	(0.004)***	-0.106	(0.003)***	-0.097	(0.002)***	-0.065	(0.002)***
Henan	-0.179	(0.003)***	-0.141	(0.003)***	-0.105	(0.002)***	-0.081	(0.002)***
Hubei	-0.288	(0.004)***	-0.165	(0.003)***	-0.127	(0.002)***	-0.082	(0.002)***
Hunan	-0.337	(0.004)***	-0.088	(0.003)***	-0.102	(0.002)***	-0.064	(0.002)***
Guangdong	-0.089	(0.005)***	0.035	(0.003)***	-0.176	(0.003)***	-0.104	(0.003)***
Guangxi	-0.236	(0.004)***	-0.116	(0.004)***	-0.163	(0.003)***	-0.083	(0.002)***
Hainan	-0.344	(0.010)***	-0.316	(0.009)***	-0.192	(0.007)***	-0.111	(0.006)***
Sichuan	-0.273	(0.003)***	-0.156	(0.003)***	-0.121	(0.002)***	-0.084	(0.002)***
Guizhou	-0.332	(0.005)***	-0.235	(0.005)***	-0.199	(0.003)***	-0.133	(0.003)***
Yunnan	-0.463	(0.005)***	-0.299	(0.004)***	-0.216	(0.003)***	-0.138	(0.003)***
Tibet	-0.367	(0.018)***	-0.354	(0.016)***	-0.258	(0.012)***	-0.166	(0.014)***
Shaanxi	-0.205	(0.005)***	-0.154	(0.004)***	-0.045	(0.003)***	-0.029	(0.003)***
Gansu	-0.166	(0.006)***	-0.190	(0.005)***	-0.101	(0.003)***	-0.080	(0.003)***
Qinghai	-0.281	(0.013)***	-0.194	(0.011)***	-0.187	(0.008)***	-0.153	(0.008)***
Ningxia	-0.312	(0.014)***	-0.156	(0.013)***	-0.109	(0.009)***	-0.097	(0.009)***
Xinjiang	-0.502	(0.006)***	-0.312	(0.006)***	-0.166	(0.005)***	-0.121	(0.005)***

Notes: Standard errors are in parentheses. **p*<.10; ***p*<.05; ****p*<.01

For the next relatively young working-age migrants (aged 20-29), Guangdong again, remained the leading destination for young working-age migrants with rural type hukou registration. The estimator of Guangdong is positive 0.035 and is statistically significant at 1%. Also Beijing became another gainer of young working-age rural population after the change in migration policy. As for exporters of the young working-age rural migrants, Jiangxi, Hunan and Guangxi were the top three provinces, which experienced the largest migration losses after the policy change, with estimators of 0.065, 0.088 and 0.116 respectively and is statistically significant at 1%.

Migration of the mid-working age group (aged 30-44) had a quite different situation than the previous two age groups. Guangdong and Beijing both dropped out of the top recipients of migration for those aged 30-44. Instead, the central area Shanxi and western regions Ningxia and Xinjiang turned out to be the major importers of middle working-age population, especially rural migrants. Considering the high stocks of natural resource in this three provinces, labour-intensive industry would be a prominent opportunity for a large number of middle-aged, laid-off rural migrants during 1985-2000. Two other recipients, Jiangsu and Zhejiang belong to the YRD economic region, which was established in the 1990s, so those cohorts may have been entering middle age when they found another opportunity. Now, Shaanxi province is the largest exporter of rural labour of mid-working age, with an absolute value 0.045 and is statistically significant at 1%.

The gap between rural and urban hukou migration of the older working-age group (aged 45-59) dramatically shrank throughout all 24 provinces in China during 1985-2000. The Pearl River Delta (PRD, located in Guangdong), the Yangtze River Delta (YRD straddling Jiangsu and Zhejiang) and the Bohai Economic Rim (BER, centred on Beijing) all became major recipients of older working-age rural migrants. Other recipient provinces like Shanxi, Liaoning, Ningxia and Xinjiang with high stocks of natural resources and need for heavy physical labour, as mentioned above, were still the important consideration for the older rural migrants. Other coastal provinces, like Fujian and Hainan, also became recipients of those older rural migrants.

Many provinces that exported older working-age of rural migrants can be found through the Table 2.13. The heavy-industry provinces such as Heibei, Jilin and Heilongjiang (Liu et al, 2014) became exporters of older working-age of rural migrants, probably because the period of economic reforms led to a large number of laid-off workers emerging from the stagnant heavy-industry-based economies. The three most populous agricultural provinces, Anhui, Sichuan and Henan, suffered prominent losses of older working-age rural people, whereas Hubei, Hunan, Jiangxi, Guizhou and Guangxi were all donors of older working-age rural labour.

Overall, most of the coastal provinces, from Liaoning to Guangdong, became the leading destinations for all age groups, especially rural hukou migrants. Apart from some provinces based on natural resource-industry, the provinces in the central and western regions were large donors of rural migrants, especially the middle and above working-age groups. The story behind the analysis of age-specific estimation is that, usually, households aged 40 or above are already settled down and stable. However, because of the hukou system with its inequity, unlike urban hukou holders, most rural hukou holders still needed to migrate far from their home villages and look for any job with a higher salary to support their relations in the hometown, as well as themselves after retirement.

2.5.2.2. Changing Migration Patterns by Education Groups

In this section, we investigate how the migration gap between two types of hukou registration of different educational cohorts changed over time.

As the table 2.14 illustrates, when adding illiterate as another control variable, it significantly reduces the absolute value of the DD estimator for all the provinces except Beijing. Gansu and Shaanxi are the two provinces in which even the number of rural hukou migrants exceeded the urban for all the illiterate cohort, especially Gansu with a value of 0.072 and is statistically significant at 1%. Combining with Table 2.8, the net in-out migration flows from 1985 to 2000 for Gansu and Shaanxi are both negative, which means that, the two provinces exported many low-educated migrants, and which in a sense may be good news for Gansu and Shaanxi provinces.

Primary educated migrants do not boost the gap reduction as much as the illiterate cohort, except in Gansu and Shaanxi, two west region provinces that transported more relatively low-educated rural migrants; the migration gap between the two types of hukou holders shrank only in central provinces like Henan and Jiangxi; eastern regions like Hebei and Jiangsu and three north east provinces (Liaoning, Jilin and Heilongjiang). The highest absolute value of estimator is 0.045 in Shaanxi provinces and is statistically significant at 1%.

After the migration policy change in 1992, the provinces of Guangdong, Beijing and Tianjin enjoyed net gains of not only less-educated rural migrants but also highly educated rural migrants (secondary school and above). In particular, Guangdong remained the leading destination for less-skilled as well as highly-skilled migrants. The DD estimator of Guangdong is the highest at 0.072 and is statistically significant at 1%. Other provinces such as Shandong, Yunnan, Ningxia and Xinjiang also gained a small scale of highly educated rural migration flow. As for the top five migration losers in 1985-2000, Sichuan and Guizhou experienced the largest net losses of highly educated rural hukou migrants. Among them, Sichuan was the largest exporter of rural migrants with senior secondary education and other provinces like Hubei and Jiangxi suffered the most from the out-migration of the highly educated as well.

Table 2.14: DD Estimators in Provinces with Different Education Level

Province	Illiterate		Primary		Secondary		Higher education	
Bejing	-0.152	(0.005)***	-0.209	(0.004)***	-0.027	(0.010)***	-0.392	(0.109)***
Tianjing	-0.150	(0.005)***	-0.221	(0.004)***	-0.031	(0.012)**	-0.298	(0.195)
Hebei	-0.067	(0.001)***	-0.116	(0.001)***	-0.145	(0.004)***	-0.335	(0.099)***
Shanxi	-0.078	(0.002)***	-0.122	(0.002)***	-0.130	(0.005)***	-0.024	(0.103)
Inner-Monglia	-0.205	(0.003)***	-0.225	(0.003)***	-0.243	(0.006)***	-0.040	(0.127)
Liaoning	-0.122	(0.002)***	-0.122	(0.002)***	-0.167	(0.005)***	-0.303	(0.109)***
Jilin	-0.105	(0.002)***	-0.124	(0.002)***	-0.157	(0.006)***	-0.035	(0.167)
Heilongjiang	-0.110	(0.002)***	-0.129	(0.002)***	-0.178	(0.005)***	-0.280	(0.054)***
Shanghai	-0.168	(0.005)***	-0.194	(0.004)***	-0.188	(0.010)***	-0.359	(0.156)**
Jiangsu	-0.118	(0.001)***	-0.171	(0.001)***	-0.201	(0.004)***	-0.239	(0.071)***
Zhejiang	-0.108	(0.002)***	-0.162	(0.002)***	-0.173	(0.006)***	-0.465	(0.060)***
Anhui	-0.099	(0.001)***	-0.150	(0.002)***	-0.142	(0.005)***	-0.355	(0.094)***
Fujian	-0.150	(0.002)***	-0.225	(0.003)***	-0.167	(0.007)***	-0.069	(0.116)
Jiangxi	-0.074	(0.002)***	-0.097	(0.002)***	-0.087	(0.006)***	-0.167	(0.139)
Shandong	-0.043	(0.001)***	-0.096	(0.001)***	-0.055	(0.004)***	-0.477	(0.067)***
Henan	-0.067	(0.001)***	-0.053	(0.001)***	-0.136	(0.003)***	-0.010	(0.103)
Hubei	-0.084	(0.001)***	-0.141	(0.002)***	-0.095	(0.004)***	-0.192	(0.104)*
Hunan	-0.056	(0.002)***	-0.108	(0.001)***	-0.063	(0.004)***	-0.476	(0.081)***
Guangdong	-0.109	(0.002)***	-0.179	(0.002)***	0.072	(0.005)***	0.081	(0.089)
Guangxi	-0.114	(0.002)***	-0.130	(0.002)***	-0.094	(0.006)***	0.055	(0.124)
Hainan	-0.127	(0.004)***	-0.233	(0.005)***	-0.186	(0.011)***	0.282	(0.487)
Sichuan	-0.083	(0.001)***	-0.129	(0.001)***	-0.050	(0.004)***	-0.115	(0.115)
Guizhou	-0.154	(0.002)***	-0.191	(0.003)***	-0.117	(0.010)***	-0.089	(0.178)
Yunnan	-0.159	(0.002)***	-0.264	(0.003)***	-0.145	(0.009)***	-0.032	(0.172)
Tibet	-0.213	(0.005)***	-0.271	(0.022)***	0.041	(0.110)	0.000	-
Shaanxi	0.002	(0.002)	-0.045	(0.002)***	-0.084	(0.006)***	-0.392	(0.101)***
Gansu	0.072	(0.003)***	-0.071	(0.003)***	-0.147	(0.007)***	-0.090	(0.186)
Qinghai	-0.145	(0.006)***	-0.174	(0.007)***	-0.155	(0.020)***	0.097	(0.314)
Ningxia	-0.121	(0.007)***	-0.139	(0.007)***	-0.081	(0.022)***	0.126	(0.429)
Xinjiang	-0.151	(0.004)***	-0.260	(0.003)***	-0.180	(0.008)***	-0.116	(0.071)

Notes: Standard errors are in parentheses. **p*<.10; ***p*<.05; ****p*<.01

For the university level and above, as we discuss above, the education resources in less developed regions were extremely limited. Rural type of hukou holders could only access university education in urban areas. Therefore, the gap between urban and rural hukou migration at higher education level appears either even larger or statistically insignificant due to the very small number of observations (especially in Tibet).

Overall, after the migration policy change in 1992, when the government shifted to encourage and guide orderly migration flow, it is clear that most coastal provinces became major recipients of less-educated migrant with rural type hukou, but only a few of them such as Guangdong province also benefited from the influx of highly educated migrant labours from rural areas. On the other hand, the whole interior increasingly experienced losses of all education group of rural hukou migrants. Being less-skilled was an important driving factor for rural migrants to make their migration decision, especially in Gansu and Shaanxi provinces, while provinces like Sichuan and Guizhou in the western region and Hunan, Jiangxi and Hubei in the central area suffered more than other provinces from this brain drain. The western and central provinces Ningxia and Shanxi also displayed gains of less-educated rural migrants, probably because their mining industries did not require a higher education level.

2.6. Conclusion

In the second chapter, we explore the effect of China's migration policy. Since the policy was applied to transfer rural labour to non-agricultured activities, in other word for rural hukou holders only, we constructed a difference-in-differences estimator to identify the causal migration gap between rural and urban hukou that resulted from the enactment of the migration policy.

By combining the 1990 and 2000 Chinese population censuses, the estimator of effect of the 1992 migration policy on migration is -0.149 percentage points, which implies that the degree of freedom as an urban hukou migrant for migration was still much higher than that of the rural hukou cohort, even under the encouragement of the migration policy. However, our robustness test reflects that our DD estimates of the effect of the migration policy are very likely confounded by other factors, such as regional economic development and the variations of the changing migration patterns by age and education for rural and urban hukou migrants. We found some factors that can increase rural migration to reduce the migration gap between rural and urban hukou holders. Couples migration was very common for rural migrants because they could take care of each other when they living far from their home villages. On the other side, this also reflects the sizable numbers of so-call 'left-behind children' in most of countryside of China. Although there is no limitation on the age at which the rural migrants can decide to migrate, the disparity only decreases for the age below 15 and the middle and above age-group. Another feature of rural migrants is low education. The disparity between rural and urban migrants reduces significantly for the illiterate cohorts.

Application of migration efficiencies suggested that, increasing role played by migration in redistributing the population during 1985 to 2000, which included the first official policy to encourage interprovincial migration in 1992. This indicates the widening economic disparities among provinces during the 1980s and 1990s.

Analyses at the provinces level have shown that migration flows from the interior to the coastal areas have surged over time and that economic growth poles emerged as major migration destinations at different stages of economic reforms. Thus, the migration gap between rural and urban hukou migrants reduced in both the highly developed regions as recipients and the less developed as donors.

The Bohai Economic Rim (BER) such as the capital city, Beijing, as well as Shandong province and Liaoning province[16], which have experienced rapid economic growth since the inception of the economic reforms were major rural migration destinations in the southern part of the eastern region. The nearby provinces like Hebei, Heilongjiang and Jilin all present smaller absolute value of disparity between two types of hukou migrants compared with benchmark. As the first province to launch economic reforms, Guangdong consistently led the nation as a migration destination in 1990s. It exerted a strong pull on people from the whole country, especially the two adjacent provinces of Guangxi and Hunan. As for YRD (Shanghai, Jiangsu and Zhenjiang), although it absorbed more urban migrants than rural hukou migrants, the rural migrants in nearby provinces such as Jiangxi and Anhui became more active for migration. Other provinces in the central and west regions such as Sichuan, Henan, Hubei Gansu and Shaanxi all reflected an 'auxo-action' for rural hukou outflows.

[16] Qingdao and Jinan in Shandong province and Dalian and Shenyang in Liaoning province are the major cities of Bohai Economic Rim (BER).

Among them Shaanxi province shows the smallest estimator at the provincial level estimation. However, one central province, Shanxi, displayed net gains of migration with a relatively small estimator, probably because of its high risk of mining industries with large requirement of physical labour.

Overall, most interior provinces suffered from massive rural hukou out-migration due to their relatively poor economic performance. Those less developed provinces, which were located in most of the western regions, part of the central areas, and Northeast China, bore the brunt of considerable rural population outflows diffusing from provinces near the coastal regions to remote inland provinces.

Furthermore, analyses of age-specific migration have shown that, for urban hukou holders, the young working-age group was larger than that of the older age population, which reflects that young adults were more mobile and more sensitive than older cohorts to interregional differentials in employment opportunity. In contrast, the rural type of hukou migrants, remained much longer duration of mobility through all age groups. Therefore, the disparity of migration between the two types of hukou becomes smaller as the age groups rise.

Guangdong was the largest recipient of rural migrants for all age groups. Rural hukou holders under aged 15 to 19, at the stage of leaving home for higher education or a first job, favoured Guangdong as their first migration destination. Also, Guangdong is the only province that shows a positive estimator in the age group estimation. It simply means that for those young working-age group (20-29), there were more rural migrants who decided to start the early stages of their career in Guangdong province than urban migrants who could more easily migrate to Beijing or Shanghai with their urban type of hukou registration.

Nearly the whole interior faced massive outflows of rural households from young labour migrants to older working-age population. The only exceptions were those provinces which heavily depended on natural resources industry, such as Shanxi, Xinjiang and Ningxia. Unlike other donors of inland provinces, they were major recipients of rural migrants of mid-working age group and above. It is reasonable that mid-age and laid-off rural migrants would search for jobs in these labour-intensive industries. Since most of them were low-skilled and could not find a job in the coastal provinces when younger, a ‘3D’ job like mining may have been the only hope for them.

Education-specific analysis shows that education level is a very important factor for most of rural hukou holder when they decide to migrate. Illiteracy helps to decrease the value of gap in most provinces of China. In other words, less educated, higher motivation to migrate. Most of coastal provinces became major recipients of less-educated migrants, but only a few of them including Guangdong and Beijing benefited greatly from regional competition for educated rural migrants.

By contrast, the central and western regions suffered from losses of both its highly-educated and less-educated rural labours such as Sichuan province, one of the most populous and agricultural provinces in China. Two other agricultural provinces, Anhui and Henan only lost large numbers of less-educated rural people, whereas Hubei and Hunan, two provinces which had many higher education institutions but relatively few employment opportunities for educated people compared to their neighbouring coastal provinces, suffered a significant brain drain.

Our findings suggest that, unlike the one-child policy in 1979, the effect of the 1992 migration policy to guide rural-to-urban migration is relatively weak because it is very likely confounded by other factors. The theoretical decision-making factors of migration, such as regional gap in development, education level and migrants' age, all affect the disparity of rural and urban hukou migration. Although the policy required local hukou registration offices and the Ministry of Labour to relax restrictions on hukou management, the mobility of urban hukou holders was still much higher than that of rural migrants in most of China and the State's recent efforts to alleviate regional inequalities were far from achieving equilibrium in the migration system.

The reasons for the low impact of the rural-to-urban migration policy are as follows. First of all, the hukou system remained a relatively powerful institution in structuring migration in the late 1980s. For example, Beijing, Shanghai and Guangdong (short for 'Bei Shang Guang') are the three largest and the most popular migration destinations in China. However, our DD estimation implies that Shanghai absorbed more urban hukou migrants than rural ones in all age-groups and education levels. The hukou system in China was the major barrier to the implementation of the migration policy in 1992, and also the reason why rural migrants had a longer migration period through their life than urban hukou holders due to the inequality of social benefits and economic development.

Secondly, due to the inadequate management mechanism and ability, some local governments only succeeded in the short-term in responding to the central migration policy. For most relatively highly developed regions, rural migrants, especially the low-skilled could bring few benefits while imposing large burdens both in the short-term and the long-run. The same applies for the firms, because training rural migrants and providing them with social benefits are all costly, and since the benefit of hiring a rural migrant is quite low, few companies will be willing to do so.

Last but not least, the problem may also come from rural migrants themselves. When adding illiteracy as another condition, it significantly reduces the disparity between rural and urban migration throughout most provinces in China. This evidence implies that, there were large numbers of less-educated (less-skilled as well) rural migrants during the 1990s. Considering these illiterate cohorts, as long as the local government did not inform and explain the policy to them, they would have no way to understand or even access the migration policy. Instead, the wage gap between the hometown and the migration destination and the information from older migrants in the same village may have been a much more intuitive way for them to make their migration decision.

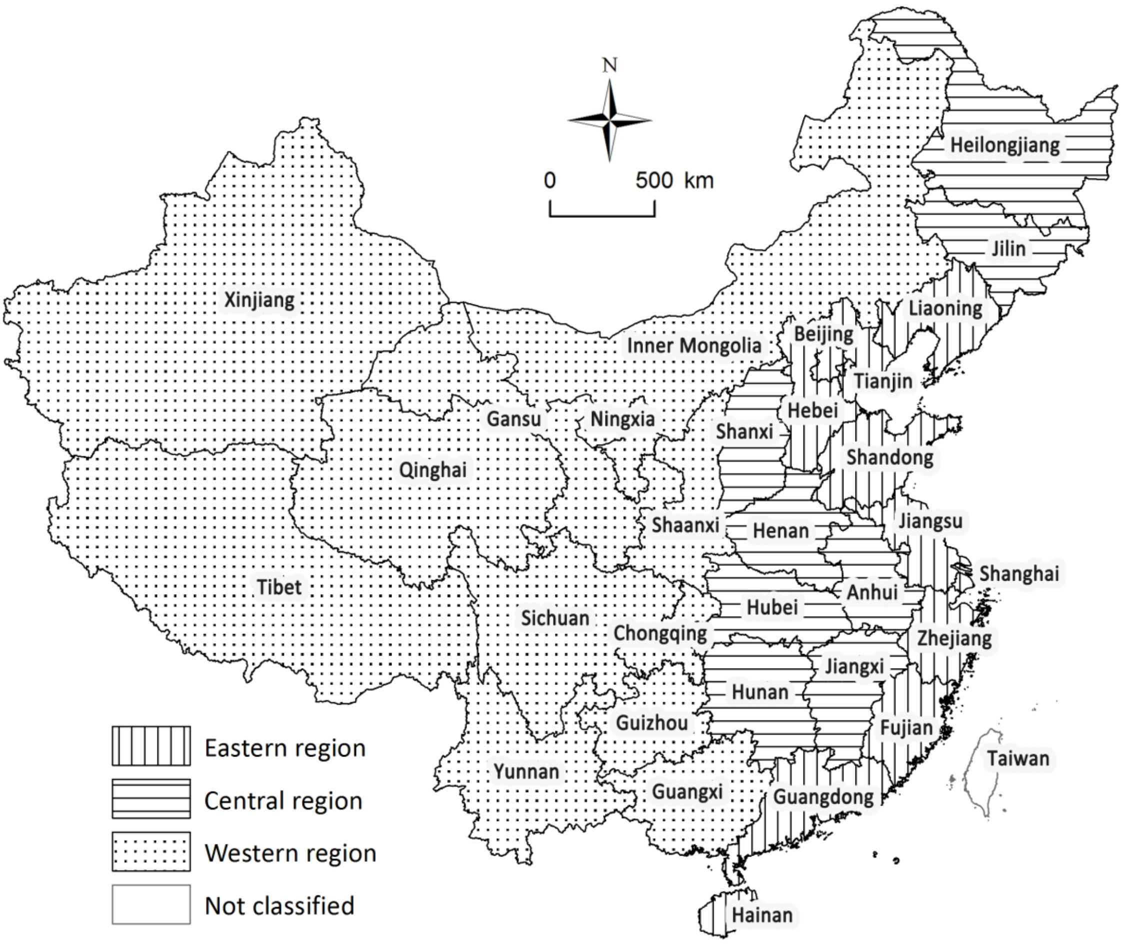
After two more decades, today the hukou regime still exists with the standard two types of registration, rural and urban. Although many hukou reforms have been implemented to reduce inequality, as long as the two types of hukou system remain unchanged, there is still a long way to go to eliminate barriers to rural-to-urban migration and achieve the urban and rural integration. Meanwhile, the governments should put their attention to improve the education and offer more training opportunities in rural areas. Only in this way, can rural migrants not only improve their self-protection awareness but also become high-skilled labours so they can grasp more opportunities in the highly developed regions and increase their chances of transferring their rural hukou to an urban one.

Although the 1% Population Sample Survey in 1987 is the first survey to record the migration information for the sample households, unfortunately there is no migration record summarize by types of hukou. Also there is no migration record summarized by types of hukou. The evidence we use to prove that the Difference-in-differences strategy is appropriate in this chapter is an approximate way. If the data of each household's information in the 1987 sample survey had been available from the State

Council and State Statistical Bureau (SSB), our result would have been more reliable, and a longer estimation duration could have been applied as well.

Appendix

Figure 2.4a: The Provinces and Regions in China



Data definition and STATA programme

MGRATE5: migration status during last five years in 1990 census

migrate5: migration status during last five years in 2000 census

age2: age group

mgcause: reason of migration 1990; migcause: reason of migration 2000

marst: marital status

incsrc: source of livehood

Table 2.3

```
gen Mag=(MGRATE5==20 | MGRATE5==12)&!missing(MGRATE5)

//Sex

tab sex if Mag==1

tab sex if Mag==1 & CN90A_HHTYA==1

tab sex if Mag==1 & CN90A_HHTYA==2

tab sex if MGRATE5==20 & CN90A_HHTYA==1

tab sex if MGRATE5==20 & CN90A_HHTYA==2

//Age

tab AGE2 if Mag==1

tab AGE2 if Mag==1 & CN90A_HHTYA==1

tab AGE2 if Mag==1 & CN90A_HHTYA==2

tab AGE2 if MGRATE5==20 & CN90A_HHTYA==1

tab AGE2 if MGRATE5==20 & CN90A_HHTYA==2

//Marital Status

tab marst if Mag==1

tab marst if Mag==1 & CN90A_HHTYA==1

tab marst if Mag==1 & CN90A_HHTYA==2

tab marst if MGRATE5==20 & CN90A_HHTYA==1

tab marst if MGRATE5==20 & CN90A_HHTYA==2

//Reason for moving

tab mgcause if Mag==1

tab mgcause if Mag==1 & CN90A_HHTYA==1
```

tab mgcause if Mag==1 & CN90A_HHTYA==2

tab mgcause if MGRATE5==20 & CN90A_HHTYA==1

tab mgcause if MGRATE5==20 & CN90A_HHTYA==2

//Education

tab eddatan if Mag==1

tab eddatan if Mag==1 & CN90A_HHTYA==1

tab eddatan if Mag==1 & CN90A_HHTYA==2

tab eddatan if MGRATE5==20 & CN90A_HHTYA==1

tab eddatan if MGRATE5==20 & CN90A_HHTYA==2

//Employment status

tab empstat if Mag==1

tab empstat if Mag==1 & CN90A_HHTYA==1

tab empstat if Mag==1 & CN90A_HHTYA==2

tab empstat if MGRATE5==20 & CN90A_HHTYA==1

tab empstat if MGRATE5==20 & CN90A_HHTYA==2

tab empstatd if Mag==1

tab empstatd if Mag==1 & CN90A_HHTYA==1

tab empstatd if Mag==1 & CN90A_HHTYA==2

tab empstatd if MGRATE5==20 & CN90A_HHTYA==1

tab empstatd if MGRATE5==20 & CN90A_HHTYA==2

Table 2.4

tab sex if migrate5==20

tab sex if migrate5==20 & urban==1

tab sex if migrate5==20 & urban==2

```
//Age

tab age2 if migrate5==20

tab age2 if migrate5==20 & urban==1

tab age2 if migrate5==20 & urban==2

//Marital

tab marst if migrate5==20

tab marst if migrate5==20 & urban==1

tab marst if migrate5==20 & urban==2

//Reason for moving

tab migcause if migrate5==20

tab migcause if migrate5==20 & urban==1

tab migcause if migrate5==20 & urban==2

//Education

tab educcn if migrate5==20

tab educcn if migrate5==20 & urban==1

tab educcn if migrate5==20 & urban==2

//Employment status

tab occisco if migrate5==20

tab occisco if migrate5==20 & urban==1

tab occisco if migrate5==20 & urban==2

//livelihood

tab incsrc if migrate5==20

tab incsrc if migrate5==20 & urban==1

tab incsrc if migrate5==20 & urban==2
```

Table 2.7

```
gen Hukou=(CN90A_HHTYA==1)&!missing(CN90A_HHTYA)

gen time=(sample!=1562)&!missing(sample)

gen Migration=(MGRATE5==20 | MGRATE5==12)&!missing(MGRATE5)

ssc install diff

diff Migration, t(Hukou) p(time)

diff Migration, t(Hukou) p(time), if sex==2

diff Migration, t(Hukou) p(time), if sex==1

diff Migration, t(Hukou) p(time), if AGE2<=3  //(less than 3 represents <15)

diff Migration, t(Hukou) p(time), if AGE2==4  //(4 represents 15-19)

diff Migration, t(Hukou) p(time), if AGE2==8  //(8 represents 20-24)

diff Migration, t(Hukou) p(time), if AGE2==9  //(9 represents 25-29)

diff Migration, t(Hukou) p(time), if AGE2==10 //(10 represents 30-34)

diff Migration, t(Hukou) p(time), if AGE2==11 //(11 represents 35-39)

diff Migration, t(Hukou) p(time), if AGE2==12 //(12 represents 40-44)

diff Migration, t(Hukou) p(time), if AGE2==13 //(13 represents 45-49)

diff Migration, t(Hukou) p(time), if AGE2==14 | AGE2==15 //(14 represents 50-54;
15 represents 55-59)

diff Migration, t(Hukou) p(time), if AGE2>=16 //(>16 represents 60+)

diff Migration, t(Hukou) p(time), if marst==2

diff Migration, t(Hukou) p(time), if marst!=2

diff Migration, t(Hukou) p(time), if ethncn==1

diff Migration, t(Hukou) p(time), if ethncn!=1
```

diff Migration, t(Hukou) p(time), if edattan<2

diff Migration, t(Hukou) p(time), if edattan==2

diff Migration, t(Hukou) p(time), if edattan==3

diff Migration, t(Hukou) p(time), if edattan>3

Table 2.10

diff Migration, t(Hukou) p(time), if provcn==11

diff Migration, t(Hukou) p(time), if provcn==12

diff Migration, t(Hukou) p(time), if provcn==13

diff Migration, t(Hukou) p(time), if provcn==14

diff Migration, t(Hukou) p(time), if provcn==15

diff Migration, t(Hukou) p(time), if provcn==21

diff Migration, t(Hukou) p(time), if provcn==22

diff Migration, t(Hukou) p(time), if provcn==23

diff Migration, t(Hukou) p(time), if provcn==31

diff Migration, t(Hukou) p(time), if provcn==32

diff Migration, t(Hukou) p(time), if provcn==33

diff Migration, t(Hukou) p(time), if provcn==34

diff Migration, t(Hukou) p(time), if provcn==35

diff Migration, t(Hukou) p(time), if provcn==36

diff Migration, t(Hukou) p(time), if provcn==37

diff Migration, t(Hukou) p(time), if provcn==41

diff Migration, t(Hukou) p(time), if provcn==42

diff Migration, t(Hukou) p(time), if provcn==43

diff Migration, t(Hukou) p(time), if provcn==44

```
diff Migration, t(Hukou) p(time), if provcn==45

diff Migration, t(Hukou) p(time), if provcn==46

diff Migration, t(Hukou) p(time), if provcn==50 | provcn==51

diff Migration, t(Hukou) p(time), if provcn==52

diff Migration, t(Hukou) p(time), if provcn==53

diff Migration, t(Hukou) p(time), if provcn==54

diff Migration, t(Hukou) p(time), if provcn==61

diff Migration, t(Hukou) p(time), if provcn==62

diff Migration, t(Hukou) p(time), if provcn==63

diff Migration, t(Hukou) p(time), if provcn==64

diff Migration, t(Hukou) p(time), if provcn==65
```

Table 13

```
gen age1=(AGE2==05 | AGE2==06)&!missing(AGE2)

gen age2=(AGE2==08 | AGE2==09)&!missing(AGE2)

gen age3=(AGE2==10 | AGE2==11 | AGE2==12)&!missing(AGE2)

gen age4=(AGE2==13 | AGE2==14 | AGE2==15)&!missing(AGE2)

diff Migration, t(Hukou) p(time), if provcn==11 & age1=1

diff Migration, t(Hukou) p(time), if provcn==11 & age2=1

diff Migration, t(Hukou) p(time), if provcn==11 & age3=1

diff Migration, t(Hukou) p(time), if provcn==11 & age4=1

//each province get 4 age groups like above

diff Migration, t(Hukou) p(time), if provcn==12

diff Migration, t(Hukou) p(time), if provcn==13

diff Migration, t(Hukou) p(time), if provcn==14
```

```
diff Migration, t(Hukou) p(time), if provcn==15

diff Migration, t(Hukou) p(time), if provcn==21

diff Migration, t(Hukou) p(time), if provcn==22

diff Migration, t(Hukou) p(time), if provcn==23

diff Migration, t(Hukou) p(time), if provcn==31

diff Migration, t(Hukou) p(time), if provcn==32

diff Migration, t(Hukou) p(time), if provcn==33

diff Migration, t(Hukou) p(time), if provcn==34

diff Migration, t(Hukou) p(time), if provcn==35

diff Migration, t(Hukou) p(time), if provcn==36

diff Migration, t(Hukou) p(time), if provcn==37

diff Migration, t(Hukou) p(time), if provcn==41

diff Migration, t(Hukou) p(time), if provcn==42

diff Migration, t(Hukou) p(time), if provcn==43

diff Migration, t(Hukou) p(time), if provcn==44

diff Migration, t(Hukou) p(time), if provcn==45

diff Migration, t(Hukou) p(time), if provcn==46

diff Migration, t(Hukou) p(time), if provcn==50 | provcn==51

diff Migration, t(Hukou) p(time), if provcn==52

diff Migration, t(Hukou) p(time), if provcn==53

diff Migration, t(Hukou) p(time), if provcn==54

diff Migration, t(Hukou) p(time), if provcn==61

diff Migration, t(Hukou) p(time), if provcn==62

diff Migration, t(Hukou) p(time), if provcn==63
```

diff Migration, t(Hukou) p(time), if provcn==64

diff Migration, t(Hukou) p(time), if provcn==65

Table 2.14

diff Migration, t(Hukou) p(time), if provcn==11 & edattan==1

diff Migration, t(Hukou) p(time), if provcn==11 & edattan==2

diff Migration, t(Hukou) p(time), if provcn==11 & edattan==3

diff Migration, t(Hukou) p(time), if provcn==11 & edattan>3

//each province get 4 education groups like above

diff Migration, t(Hukou) p(time), if provcn==12

diff Migration, t(Hukou) p(time), if provcn==13

diff Migration, t(Hukou) p(time), if provcn==14

diff Migration, t(Hukou) p(time), if provcn==15

diff Migration, t(Hukou) p(time), if provcn==21

diff Migration, t(Hukou) p(time), if provcn==22

diff Migration, t(Hukou) p(time), if provcn==23

diff Migration, t(Hukou) p(time), if provcn==31

diff Migration, t(Hukou) p(time), if provcn==32

diff Migration, t(Hukou) p(time), if provcn==33

diff Migration, t(Hukou) p(time), if provcn==34

diff Migration, t(Hukou) p(time), if provcn==35

diff Migration, t(Hukou) p(time), if provcn==36

diff Migration, t(Hukou) p(time), if provcn==37

diff Migration, t(Hukou) p(time), if provcn==41

diff Migration, t(Hukou) p(time), if provcn==42

diff Migration, t(Hukou) p(time), if provcn==43

diff Migration, t(Hukou) p(time), if provcn==44

diff Migration, t(Hukou) p(time), if provcn==45

diff Migration, t(Hukou) p(time), if provcn==46

diff Migration, t(Hukou) p(time), if provcn==50 | provcn==51

diff Migration, t(Hukou) p(time), if provcn==52

diff Migration, t(Hukou) p(time), if provcn==53

diff Migration, t(Hukou) p(time), if provcn==54

diff Migration, t(Hukou) p(time), if provcn==61

diff Migration, t(Hukou) p(time), if provcn==62

diff Migration, t(Hukou) p(time), if provcn==63

diff Migration, t(Hukou) p(time), if provcn==64

diff Migration, t(Hukou) p(time), if provcn==65

Chapter Three

Chinese PAYG Pension System under a New Child Policy

Abstract

Established in 1979, China's one child policy now has been proved too effective as the country experiences a rapidly aging population and a scarcity of workers. In order to mitigate the adverse demographic trend plaguing China's pension security system, from 2016, China adopted the two-child policy instead of one. Employing a calibrated overlapping generation general equilibrium model, this chapter investigates the impact of child policy changes and the choice of China's current pension system on individual choices and macroeconomic variables. Our result suggest that if the two child policy is implemented well, and the pension coverage rate is expanded as well, the PAYG pension system will still loss about 3 per cent even under a much better situation in the long-run. Larger transfers from workers to retirees by increasing the individual pension tax rate may even become an obstacle for two-child policy implementation. Including more migrant workers into the pension system to expand the number of pension contributors is only a medium run measure, since this cohort will become pension beneficiaries when they retire. Apart from these issues, slower economic growth in present day China may drive everything even more severely.

Keyword: One-Child policy, Two-Child policy, Pay-As-You-Go (PAYG) pension system, Overlapping Generation Model

2.7. Introduction

Population aging is a worldwide phenomenon. According to the United Nations 2015 World Population Prospects, there are 901 million people aged 60 or over, comprising 12 percent of the global population in 2015. The population aged 60 or above is growing at a rate of 3.26 per cent per year; the number is projected to be 1.4 billion by 2030 and 2.1 billion by 2050 and could rise to 3.2 billion in 2100. In China, the proportion of the population aged 60 and over in 2015 was 16.7 per cent and the prediction is that by 2050 it will have more than double to 36.5 per cent.

Population aging is one of the major concerns in many countries for three reasons. First of all, the elderly population in general produce less compared with the working age population, so the economic growth rate of economies with a high proportion of older people would seem likely to slow. Secondly, the proportion of elderly people is relatively larger than in the past which means they will have to be supported by a relatively smaller group of economically active younger population. A typical example is the 'one-two-four' family structure in most of urban China, with one child, two parents and four grandparents. Thirdly, the increasing size of the elderly population will impose a substantial burden on economies as a whole, because the elderly require more resources, especially medical care than younger people.

However, for developing countries especially China, this issue will be more serious. China experienced baby boom in the 1960s; in that period, nearly half of the population was under 20. Then in the 1970s, the Chinese government began to implement a one child policy, especially for citizens. During this time, the birth rate dropped from nearly 6 children per woman to just under 3, and after three decades, the fertility rate declined to 1.5, compared with the natural demographic transition which took nearly a century in most OECD countries (World Bank, 1997). Today, life expectancy has risen from around 43 years in 1950 to 72 years. Population growth has slowed significantly from a peak of 2.4 per cent a year in the late 1960s, to 0.66 per cent a year, and also less than 25 per cent of the population is under 20. Both the trends will continue to decline in the foreseeable future.

3.1.1. Literature Review on China's Pension Programme

By decreeing the one-child policy, China brought forward the demographic dividend and built the Asian Miracle of unprecedented economic growth. However, behind the glory, the price of the one child policy has been huge. Compared to other countries' experience, China's population is aging at a much faster rate and at a much earlier stage of economic development. In other words, China is getting old before it has got rich (Beard et al., 2012, Bloom et al., 2010). The multiple effect of lower fertility, longer life expectation and postpone retirement age is forcing public pension systems, especially Pay-As-You-Go, under increasing strain (Cigno, 2007).

Bloom et al. (2003) emphasized that policymakers in developing countries must plan and prepare for future health care and pension income needs of the baby boom generation when it ages once opening the demographic window. Otherwise, these elderly will become beneficiaries, and the likely cooling down economic growth as the labour force declines. Obviously, and unfortunately, Chinese policy makers have not planned well in time. What is worse, there are additional challenges for developing countries. The current situation in China is a very serious challenge for both individual lifecycle planning and for aggregate economic analysis. For individuals, it implies a potentially longer retirement spans or longer working lives need to plan for, and as well as adjusting saving plans accordingly. For the Chinese economy at large, it means rising social burdens as a result of fewer contributors and more beneficiaries in the system. Thus, adequate attention should be paid to the current pension situation, since it is facing both labour shortage and population aging at the same time. Carrying out suitable policies is a matter of urgency.

Meanwhile, there is a fierce debate as to what is the best approach of pension reform for emerging economies when facing population aging. For example, Feldstein (1999), Feldstein & Liebman (2006) and Dunaway & Arora (2007) argue that the best option for China is applying pre-funded individual accounts. Since the rate of return of the PAYG social security account depends on the growth rate of population and the growth rate of productivity while the rate of return on personal accounts depends on the rate of return on capital, investment in personal accounts will yield much higher returns than contributions to the PAYG accounts (Li & Lin, 2016). On the contrary, an unfunded defined benefit PAYG social security system is the Pareto improvement, because the initial old generation is better off while the current young and future generations will not be worse off in an Overlapping Generation (OLG) model with constant population growth (Samuelson, 1958). In 2001, Orszag & Stiglitz pointed out that the pre-funded reform may not achieve the expectation premium because of asymmetric information and transaction cost. Also Barr & Diamond (2006, 2008) argued against a direction of pre-funded individual accounts for reforming the pension system, because China suffers from severe financial market underdevelopment. Unfortunately, according to Allen et al. (2005), China has poor investor protection, weak accounting standards, and a large share of nonperforming loans relative to its level of development. Thus pre-funded individual accounts as a reform will harm current generations, with small gains to future generations.

In 2015, Song et al. evaluated three alternative reforms of the Chinese pension system. One of their reform is fully funded system, a fully funded individual account system instead of the defined benefit pension. The advantage of the fully funded reform is that it reduces tax distortions on labour supply. However, a fully funded system will only be optimal in a mature economy with steady wage growth and developed capital markets Barr & Diamond (2008).

Feldstein & Liebman (2006) criticized the notional defined contribution PAYG system for China for the following reasons. First, workers and enterprises are unwilling to participate the system under the empty personal account and facing uncertain future benefits. Second, workers' confidence are vulnerable when the government misused the short term surplus of the system. Third, the contribution rate under investment based and defined contribution system would be much lower than under the notional defined contribution PAYG system, according to Feldstein (1999). Fourth, the notional defined contribution PAYG system reduces the saving rate and China's savings rate may not be high in the long run. Various reforms are considered under the current situation, however, which will be the best solution is still uncertain. For example, as Li & Lin (2016) shows, if the rate of return on government assets is lower than the rate of return on private assets, switching from a PAYG system to a funded system using government assets to pay the implicit social security debt may be a better improvement. A changing mandatory policy from one-child to two-child might be an important factor determining the future reform process, because this change will have influence on both the return of private and government assets, as discussed above.

3.1.2. Literature Review on an Overlapping Generation Model

The concept of an OLG framework was devised by Allais (1947), and was standardlised by Samuelson (1958) and popularised by Diamond (1965). Samuelson (1985) considered a pure exchange economy with single goods but no production), and constructed a two-period lifecycle model to examine the determination of the market interest rates and social insurance issue. Later, based on Samuelson's model, Dimand (1965) developed an OLG model with physical capital and a public sector, which become the benchmark for OLG models.

In a neo-classical economic growth theory the central questions are an effect of division of a householder's income between consumption and saving on capital accumulation and its impact on economic growth, Solow-Swan (1956), as a starting reseach tool for economic growth, assume that saving over household's income is exogenous and constant, and conclude that capital accumulation can not account for the economic growth. Although the Solow-Swan model considers the income division between consumption and saving and examines its effect on the capital accumulation and economic growth, the householder in the Solow-Swan model does not optimize his-her economic behaivour rather than being automata (mechanically saving a constant fraction of their income). Consequently, Solow-Swan's model is limited in its explanation of economic growth.

On the other hand, theoretical models in the tradition of Ramsey (1928), Cass (1965) and Koopmans (1965), as well as Diamond's (1965) OLG formulation relax the assumption of the saving rate being an exogenous and constant. The household optimally determines saving/investment and consumption in each time period. In fact, both Diamond's model and Ramsey-Cass-Koopmans'model capture the invidiual's optimal determination between saving and consumption as well as working and leisure time, and the relationship between micro-choices and marco-outcomes.

The critical difference between Ramsey-Cass-Koopmans' (infinite-horizon) model and Diamond's (OLG) model is that in Diamond's model there is continual entry of new generations into the economic system while Ramsey-Cass-Koopmans' model contains a fix number of infinitely lived individuals. In Ramsey-Cass-Koopmans' model the householder's behavior has no difference between each age he-she does not undergo a life cycle with low-income youth, high-income middle ages and low-income retirement. To examine economic issue such as the effects of saving and consumption on capital accumulation and economic growth, one needs Diamond's OLG model, in which the household covers different ages and there are more than one generation living at the same time-period. This is why an OLG model is widely used to study topics of pension reform.

There are also strong evidence about researhers who applied OLG model for Asian economies. Shimasawa (2004) computes responses to three policy scenario and finds that the pension reform and fiscal consolidation in Japan promote human capital accumulation and thus accelerate economic growth. Shimasawa and Hosoyama (2004) use an OLG model to evaluate the effects of a demographic transition in five Asian economies-Japan, China, Korea, Taiwan and Singapore. By undertaking simulations for two scenarios (benchmark and policy change) they find that population ageing could heavily impact on saving rate and economic welfare, and more importantly could result to the end of high economic growth rates in these five economies.

As a starting point, literature review above has provided fundamental insight for this study. The motivation of this chapter is that when a new child policy implemented, it will affect the economy in many ways. The pension system is one such area, because it depends heavily on contributors and beneficiaries from every generation. The fluctuation of future fertility rate is a critical element to estimate the sustainability of the current PAYG pension system in China, according to Stauvermann & Kumar (2016); their theoretical investigation shows that, in a small open economy, a pure PAYG pension system will not fall into any solvency issue due to a decreasing fertility rate or aging. However, for China, since the universal two-child policy officially replaced the one child policy from the first of January 2016, whether PAYG pension system is sustainable with an uncertain future fertility rate should be reconsidered. Because the policy has only been implemented for a year, there is very little research to study the effect of child policy change on the PAYG pension system in China. Most of the current papers focus on maternity care (Cheng & Duan, 2016) and social security and health assistance to women and family units (Sun et al., 2016). Another study of the two-child policy in China comes from Belloni (2016), who applies overlapping generation model and also considers health care service goods as part of consumption, to estimate whether policy change can help in re-balancing the economy.

However, the model, assumes children will support their parents, instead of considering pension support. Thus, the major contribution of this chapter is presenting a general idea about the influence on China's pension system after the new child policy, and estimating whether the PAYG pension system is sustainable or not, in the face of this change.

Since the new child policy will impact on demographic change, an OLG structure model would be a considerable model be applied. As early as in 1989, Auerbach et al. (1989) used the model to analyze the effects of demographic change for four OECD countries. Hviding & Me´rette (1998) extended the work of Auerbach et al. (1989) for seven OECD countries. And later, this approach also be applied for the case of population ageing and pension system reform in China by Li and Me´rette (2006). As for the how many periods of individual in the model, Auerbach et al. (1989) set up a 75 generations – 250 year demographic simulation model. And Li and Me´rette (2006) assume new adults has 13 periods to live, with each period corresponding to 5 years of life. However, consider children are not economic independent and do not need to contribute any to the pension system. We decide to even further simplify our model to two periods only, which is young and old. Adults earn in the young phase and retire and enjoy rest of life in old phase. It follows the idea of Fanti & Gori (2012) in order to analyze how long run PAYG public pensions react to a change in fertility.

This chapter, however, has three main differences from theirs. First, we focus on the pension itself as the main way to support the retired cohort rather than considering other supporting measures. Moreover, we consider that there will still be a limit number of children after the change in the child policy; therefore, we treat the number of descendants as an exogenous variable. Thirdly, in considering the coverage of the current Chinese PAYG pension system, we separate the number of children and pension labour growth rate as two different variables. Estimation based on this adjustment will be more reliable. Last, instead of assuming the growth rate is zero for steady state, we adopt a normalization approach and apply GDP growth rate as the growth rate of our variables for steady state, which is close to the real economy.

The chapter 1 is structured as follows. Section 2 presents a general background, including child policy; demographic issues and the pension programme in China.

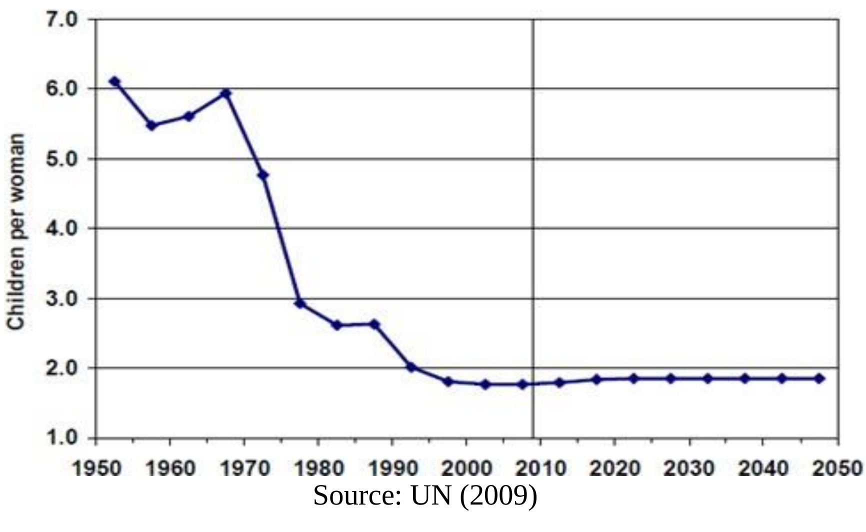
Section 3 describes the model and the presents the economic results, and section 4 contains a discussion and conclusion.

2.8. Brief Background of China

2.8.1. Child Policy

China's population exceeded 800 million in 1970. Later, in 1975 the Chinese government adopted the campaign with the slogan, late, long and few, aiming at encouraging couples towards later marriage and age at first birth, to have one child, and urging them to have no more than two. Established in 1979, China's one-child policy was introduced by the Communist Party amid fears of the impact of exponential population growth and food shortages as China's population was growing by 1.9% annually. Couples were restricted to having only one child with education, childcare, and healthcare allowance, with those contravening the rules subject to fines (up to ten times a family's annual income) and forced abortions. Second children born in violation of the one-child policy were denied a residence permit from the registered residence department, leaving them without an official identity. Indeed, a large portion of the decline took place by 1975-1980. China's population growth rate has dropped dramatically as a result.

Figure 0.1: Fertility Rate in China



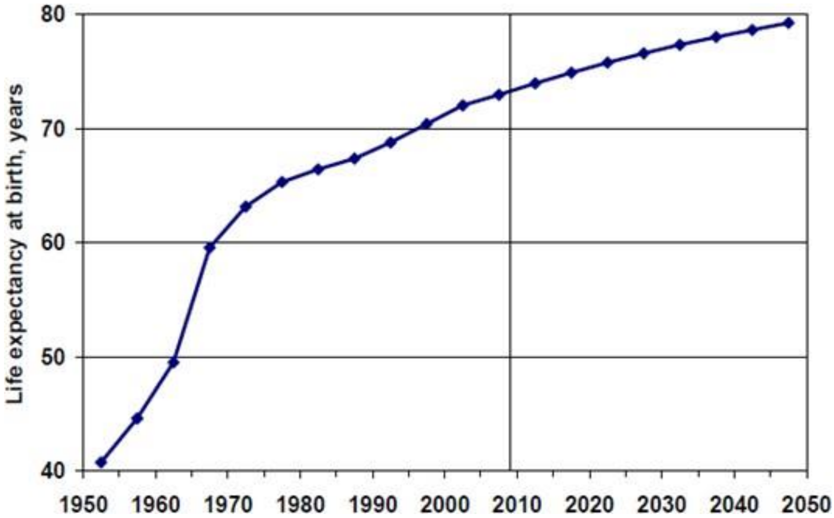
Source: UN (2009)

After more than 30 years, the single children born under the one-child policy are now being left with having to provide support for his or her two parents and four grandparents. In response to this issue, by 2009 all provinces allowed couples to have two children if both parents were only children themselves. After a policy change of the Chinese government in late 2013, most Chinese provinces further relaxed the policy in 2014 by allowing families to have two children if one of the parents is an only child. In late 2015, China officially passed historic legislation that ended the one-child policy and allowed all couples to have two children.

2.8.2. Demographic Issue

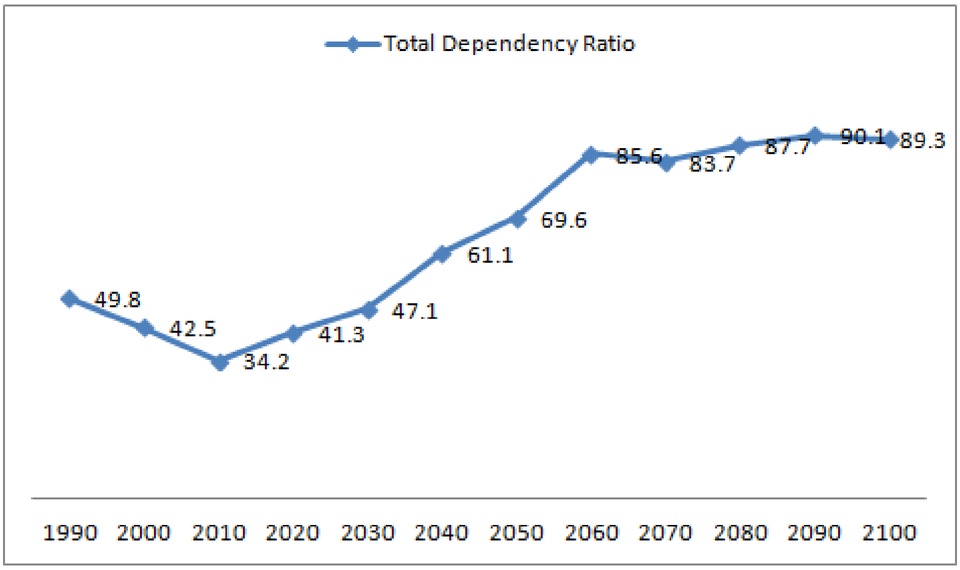
Life expectancy has been rising rapidly in China, alongside with significant decrease in the fertility rate. Starting at 40 years mid-century, life expectancy increased steeply in the 1950s and 1960s; it is now approximately 73, and is predicted to be nearly 80 by 2050.

Figure 0.2: Life Expectancy in China



Source: UN (2009)

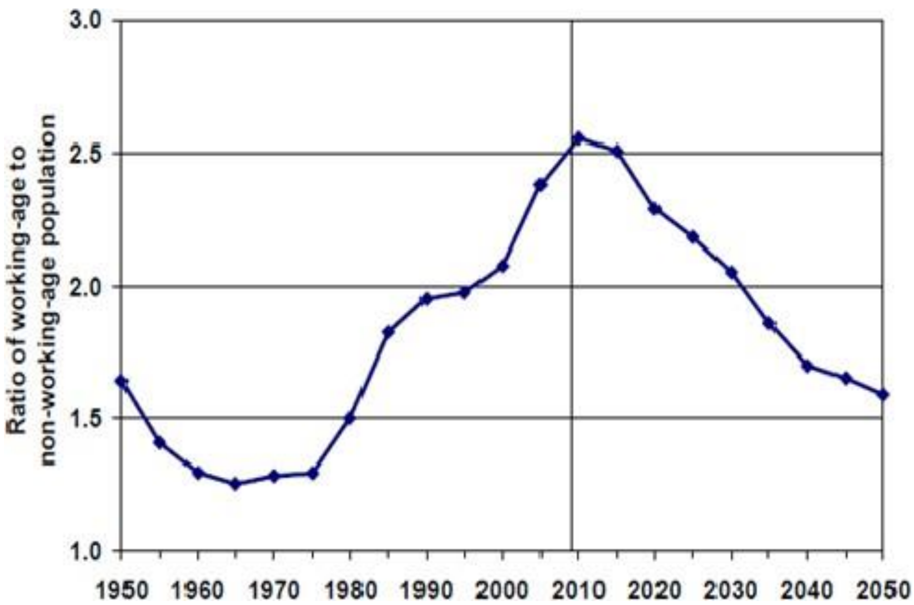
Figure 0.3: Total Dependency Ratio in China



Source: Calculated by the author based on the Statistics Portal. Children and old age dependency ratio in China from 1990 to 2100. Accessed 05 Dec 2016. https://www.statista.com/statistics/251535/child-and-old-age-dependency- ratio-in-china/

Combined with longer life expectancy and the recent release relaxation of the child policy in China, the total dependency ratio will continuously grow up in the future.

Under the trends in both fertility and longevity, the elderly share of China's population has been increasing, and those aged 60 and over are set to form a rapidly growing share of the population. Today, about 15.1% of China's population are aged 60[17]. By 2080, it is projected that the population aged 60+ will close to 40% of the total



[17] Based on Chinese Statistical Yearbook 2015.

population. With the non-working-age population expanding, this will definitely compress the size of the working age population. The phenomena of labour shortage has become more and more critical across the region and especially in coastal cities.

Figure 0.4: China's Ratio of Working-Age to Non-Working-Age Population

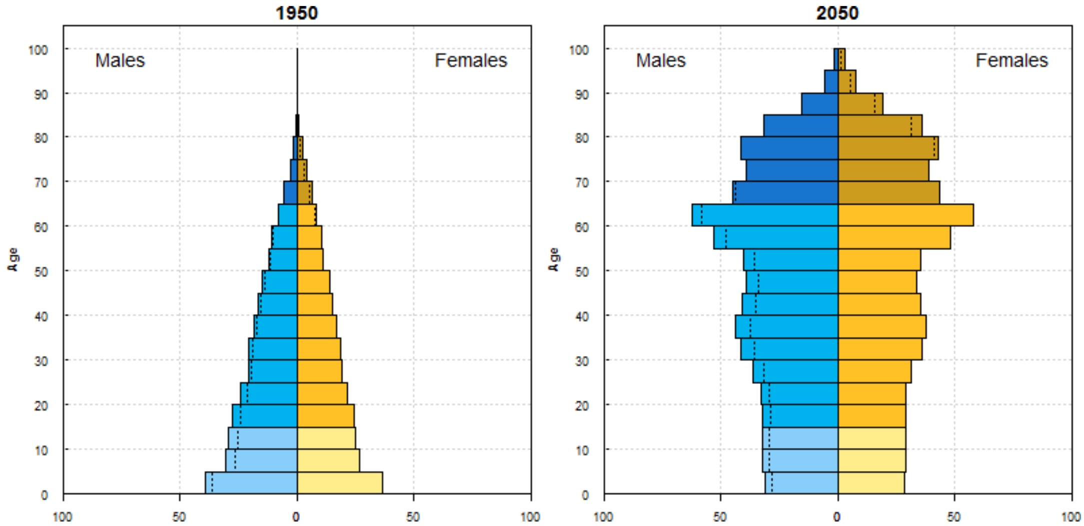
Source: UN (2009)

After the one child policy was implemented, the ratio of the working-age (15-64) to non-working-age population grew rapidly, starting in the late 1970s (see Figure 3.4). It has reached its peak and began to decline. Based on UN projections, the growth of working age population in China has slowed and will turn negative after 2020. As industry employees are predominantly young (Garnaut & Song, 2006), the core cohort of industrial workers (age 25-39, born at the time the one-child policy was first implemented) will shrink even faster. This prediction potentially implies a labour deficit in the coming years. Since most workers are also contributors, the labour reduction will directly decrease the amount of social security tax payment.

The shrinking labour force, in other words; shows that after China's population witnessed a period of demographic dividend, the dependency ratio, those aged under 14 and above 64 years of age, will rise again, and reaching nearly 50 per cent after 2035 and continue to rise until 2090 (see Figure 3.4). Meanwhile, for current working year cohorts, the support ratio (workers per retiree) has declined from 9 to 7 since 1970 and forecast to fall below 3 by 2032 (Curtis et al. 2015). The low support ratio results in the so-called 4-2-1 problem in China, which refers to the situation where only children (under the one-child policy) may need to support four grandparents and two parents. Since the fertility rate is still low, there will be an imminent severely burden for pension reform, because most of the old aged are also beneficiaries.

Overall, combining the figures above, the population pyramid in Figure 3.5 traces out a visual picture of the demographics of China. The transition power is not only has an influence on the pool of labour but also changes the demographic structure and leaves a severely challenge to China's vulnerable pension system.

Figure 0.5: Population Pyramid in China, 1950 and 2050



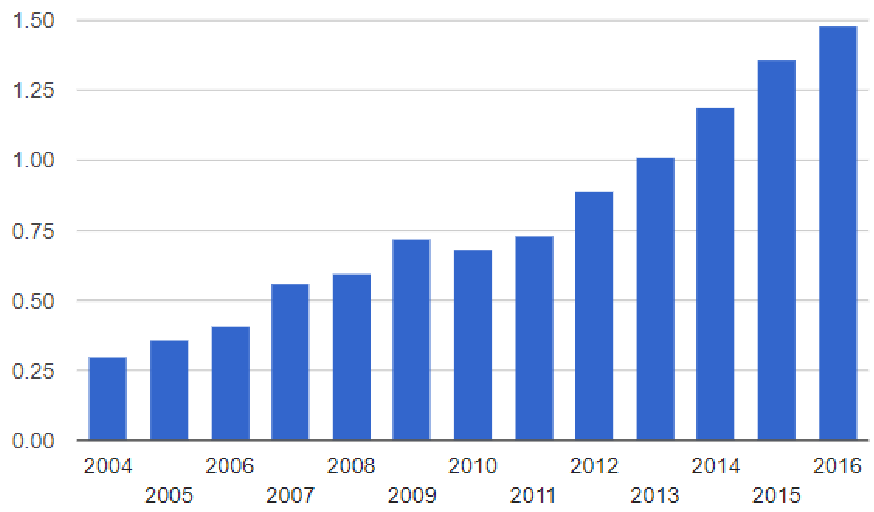
Source: UN (2015)

Therefore, to summarize, as an increasing life expectancy in conjunction with declining fertility rates distort the proportion of the population of working age and increase the proportion of the economically dependent old. Persons older than 64 may still well contribute in many ways, including economically, to a family and to China's overall economy, but the most critical issue of many people have expressed concern is still the future ability of China's working-age population to support the large, primarily older, dependent population.

In China, on the one hand, most of urban labour are the pension contributors. Pensions now are made even more important by smaller families and the mobility that urbanization brings. In the current pension system, the individual account is one portion of the whole pension insurance, paid from 8 per cent of the worker's wage income. Shortage of the labour force directly shrinks the amount of social security tax paid by workers. On the other hand, the current pension system is not financially sustainable, and the demographic transition will keep increasing the old-age dependency ratio in the future. More and more old-aged are becoming beneficiaries, which also increases the burden of current pension insurance. As figure 3.6 indicates, the pension fund assets to GDP in China continuous increase from 2004 with 0.3

percent to a maximum of 1.48 percent in 2016, and the average value during that period was 0.79 percent.

Figure 0.6: Pension Fund assets to GDP in China (%), 2004 to 2016



Source: The World Bank (2017)

Pension system reform in China will definitely be a serious challenge because it has to consider labour shortage, the old-aged pension guarantee and many other factors simultaneously.

2.8.3. Pension System in China

Current urban pension system in China features a large unfunded defined-benefit social pooling account, which is PAYG in nature, and a small funded defined-contribution individual account (Li & Lin, 2016). The second part, according to Barr & Diamond (2006) is called a notional defined-contribution PAYG system. Under this system, a worker contributes a certain percentage of income to his/her personal account over time. The funds in the account accumulate according to an interest rate determined by the government, and the worker receives a pension according to the accumulated funds when retired. In this system, there are no actual funds in the account. Thus, the account is just notional. In detail, by abstracting from Cai & Du (2015), for most urban residents and public servants and staff in public financed agencies, their contributions of funds to this pension programme are from both individuals and the enterprises. The current policy is that the individual contributes 8% of the total payroll to the pension fund and the employer contributes 20% to the social pooling account. The social account is pooled at the provincial level. If the wage of an employee is higher than 300% of the average wage of the city or region, the contribution base is 300% of the average wage. If the wage of an employee is lower than 60% of the average wage of the city or region, the contribution base is 60% of the average wage. The self-employed are required to contribute around 20% of their income to the social security accounts (about 12% to the social pooling account and about 8% to their personal account) (Li & Lin, 2016). The benefits for retirees consist of two components, which are the parts from the social pooling account and individual account, respectively. The monthly payment to retirees from the social pooling account is 20% of the average wages of all workers in the previous year, and from the individual account is the total saving in the individual account divided by expectancy of the rest months. For example, 195 months for those aged 50, 170 months for 55 and 139 months for 60.

2.8.3.1. Challenges to China’s Pension System

The challenges to China's pension system are both internal and external. On the one hand, there is address the challenge of demographic and economic transition from the external environment. China is in the midst of a major demographic and economic transition, including population aging, shrinkage in the family size, urbanization, labour mobility, reduction of the labour force, and high income inequality. China’s dramatic aging process and demographic transition have resulted in part from the one-child policy implemented in the late 1970s, combined with significant increases in longevity. Old-age dependency ratios are predicted to rise from 13.5 per cent and 9.0 per cent in 2008 in rural and urban areas, to 34.4 per cent and 21.1 per cent by 2030 respectively. Especially in the urban area, as old-age dependency ratios are increasing, the so-called 1-2-4 family pattern (1 child-2 parents-4 grandparents) has contributed to declining family resources to support the elderly.

The country’s rapid growth and economic transformation have increased the demand for a dynamic labour force that can effectively adjust to the pace of change. Fragmented pension provisions create a barrier to labour mobility. Moreover, low urban retirement ages discourage the participation of older workers in the labour force, thereby leading to severe issues in the face of growing labour demand. On the one hand, China’s urban retirement ages, 60 for men and 50 or 55 for women, have remained unchanged since the 1950s, while during that time, the proportion of the population represented by the elderly, as well as life expectancy at the time of retirement, have both increased. This has caused the working-age population to be stagnant, and while demands on the labour force still increase.

On the other hand, the current programme also has many systemic flaws itself. Except from the retirement age mentioned above, the current system has other flaws. First of all, the low coverage of pension system[18] cause pension capital accumulation to fall year by year. Moreover, the pensions of the rural population add hardly nothing to pension accumulation, because fewer than 30 per cent of all employees are covered and most of the rural elderly receive no pension (Oksanen, 2010).

Additionally, compared to industrialized countries, China's pension contribution rate is relatively high. A total 28% contribution rate with 20% employers' contribution from wage income to the social pooling account, and 8% individual contribution from their salary to a personal account. In 2013, the pension contribution rate was 12.4% of gross earnings in the US, 9.8% in Switzerland, 9.9% in Canada, 15.4% in Japan, 16.7% in France, 19.9% in Germany, 21.6% in Finland, 9% in Korea, 12.17% in India, 20% in Russia, and 27.65% in Brazil. It means the opportunity to further increase the pension contribution rate is limited.

What is worse, the current three pillar pension system for urban employees is fragmented; it does not fully work as initially intended. The designed system was supposed to introduce individual fully funded accounts to top up the basic pension (20 per cent of average urban wage income). For many years, however, due to problems in implementation (including fraud), China's social pooling accounts have suffered deficits (Sin, 2005, Li & Lin, 2016). There are two ways to resolve the deficits: by using the funds in the individual accounts or by fiscal subsidies. The government has mainly used the individual accounts to finance the deficits in the social pooling account, resulting in almost empty in the individual accounts. Li & Lin (2016) showed that the vacancy ratio of individual accounts was 34% in 2011, and the shortage of funds in individual accounts was 2.1% of GDP in 2011. More precisely, in each province, for example, the ratio of personal account debt to regional GDP was 7.4%

[18] For pension coverage rate, it is only 50 per cent in the pension funds online report, while Chinese government highlights the pension coverage rate in recent year is already reach 80 even to 85 per cent.

in Shanghai, 5.2% in Heilongjiang, and 4.3% in Liaoning. This raise a question of how to cope with the accrued pension rights, in other words, whether to refill the individual accounts or to accept that the system has de facto become close to an unfunded PAYG system and set up modified rules from now onward.

The adequacy and financial sustainability of the social pension are in doubt. Employers are reluctant to provide retirement schemes at the workplace in view of the high cost pressure from social pension contributions. On the contrary, there are strong motives not only for individual retired savings but also for the young aged, in spite of less efficient vehicles in place.

As regards eligibility requirements, individuals need to make contributions for a minimum of 15 accumulative years before claiming the pension. The retirement ages differ for particular industries but mostly lie at 55 years for men and 50 years for women (in the case of blue-collar worker) or 60 years for men and 55 years for women (in the case of white-collar workers). The amount of retirement benefit depends on local regulations. The ages are likely to change soon, due to China's demographic problem.

However, this system is very sensitive to the changing demographic structure. If the replacement rate stays unchanged, with the rapidly increasing dependency ratio, the contribution rate will have to be decreased quickly. China's population is aging rapidly, due to a combination of the implementation of the one-child policy, which has markedly decreased the number of children being born, and rapidly medical improvements that have prolonged life for the old.

2.9. The Model

Our goal is to build a framework to study the link between the change of child policy and the PAYG pension system. The type of model is developed from Diamond (1965) and Acemoglu (2009). The model economy is based on a two-period (young and old) overlapping generations model. The first period lasts 40 years: from age 20 when cohorts become economic independent until age 60, when they retire. The second period lasts 15 years.

According to China National Bureau of Statistics (2012), China's life expectancy at birth is 77.37 for women and 72.38 for men in 2015. Meanwhile, the retirement age in China depends on professions, positions and gender: the retirement age is 55 for male workers and 50 for female workers in manufacturing and service sectors; 60 for men and 55 for women for civil servants. Based on the two information above, assume each individual lives for 75 years, working and accumulating capital from 21 to 60, retiring at age 61, and passing away at 75. For simplicity, during individuals' lives, in childhood, they are treated as economically inactive, make no choices, and do not derive any utility. Thus, there are 40 years as the working period and 15 years for retirement. The ratio of the retirement period to the working period is 37.5%. This kind of model setting is in line with Li & Lin (2016). Another reason is that due to the expansion of higher education, persons who aged between 16 and 20 have a very low labour participation rate (Du & Lu, 2013).

This economy has agents of three types: households, firms and government. Next, we describe each of them in details.

2.9.1. Households

Households live for two periods: young and old. Agents before they become adult are treated as economically dependent and not considered in the model. A new born individual in his/her own generation g chooses consumption during young and old life $c_{1,t}^{g}$ and $c_{2,t+1}^{g}$, to maximize lifetime utility. Thus, a household's utility function is given as follows:

$$Max\ U_t = ln\,(c_{1,t}^{g}) + \beta ln\,(c_{2,t+1}^{g}) \qquad (3.1)$$

where *t* represents the different period; the parameter β is the time preference rate ($0< \beta <1$). Higher β implies household are more willing to consume when they retired than during their working years.

Assume all agents will enter the labour market and start to work during the first period of their working year, before that, agents are economically inactive, make no choices, and do not derive any utility. For simplicity, we consider that China has a mandatory retirement policy; to ignore an endogenous choice of retirement seems reasonable. An agent thus retires when entering into the second period of life. Agents work and earn wages during the first period of life, while the government imposes income taxation in order to transfer funds for older people. The total net income will be used for consumption, saving and child-care cost for a number of descendants *d*. Therefore, the first period budget constraint is:

$$(1 - \tau)w_t = c^g_{1,t} + s_{1,t} + w_t q(d) \tag{3.2}$$

where τ is the PAYG pension tax ratio paid by the individual, *w* denotes wage income, *s* is saving during the first period of life, and *q*(*d*) is a child-rearing cost function that depends on the number of descendants. It gives the fraction of income used to support children.

During the second period, agents are all retired; all income comes from their pension benefits and saving. There is no other income except pension during second period. The second period budget constraint is:

$$p_{t+1} + (1 + r_{t+1})s_{1,t} = c^g_{2,t+1} \tag{3.3}$$

where *p* stands for pension benefit for older people who collect it after they retire, *r* is the gross interest rate.

Each household allocates its labour income between child-rearing and consumption. Maximizing equation (3.1) and subject to equations (3.2) and (3.3), gives the Euler equation:

$$c^g_{2,t+1} = \beta(1 + r_{t+1})c^g_{1,t} \tag{3.4}$$

Thus the second period's consumption depends on the first year consumption along with agent's preference, in other words, saving behaviour. We can combine the Euler equation (3.4) with the budget constraints (3.2) and (3.3) to obtain the following implicit function that determines savings per person:

$$s_{1,t} = \frac{\beta(1 - \tau - q(d)\,)w_t}{1 + \beta} - \frac{p_{t+1}}{(1 + \beta)(1 + r_{t+1})} \tag{3.5}$$

The aggregate agent's saving equals a fraction of time preference of their first period net wage income, excludes pension tax payment and excludes expenditure for their children as well. The pension tax paid by agents in the first period will become pension benefit from local government during the second period. Therefore, pension benefit can be treated as an additional retirement funding support. Higher amount of pension that individual can get, less willing or even sense of crisis of saving they have. It is true in the real economy that for each individual, once they join the pension programme, only government policy can change the amount of pension they get. However, once they know their pension benefit will be reduced in the future, they will enhance their saving behaviour or at least protest at the beginning. The recent University strike in the UK since lecturers' pension was cut by the government is a very clear example of that.

2.9.2. Firms

The goods market is perfectly competitive. Firms produce output with a Cobb-Douglas production function, in particular,

$$Y_t = A_t\, L_t^{1-\alpha} K_t^{\alpha} \tag{3.6}$$

where Y_t, A_t , L_t and K_t represent aggregate output, the productivity parameter, aggregate labour and capital, respectively; and $\alpha \in (0,1)$ is the income share of capital. For the productivity parameter, we assume that it grows exogenously at rate g. In our research one period is equal to 40 working years, so we assume that the depreciation rate equals 1 after use, i.e. $\delta = 1$.

Thus, FOCs implies:

$$MPL_t = w_t = (1-\alpha) A_t k_t^{\alpha} \tag{3.7}$$

and the rental rate of capital is given by:

$$MPK_t = 1 + r_t = \alpha A_t k_t^{\alpha-1} \tag{3.8}$$

Where $k_t = K_t / L_t$.

2.9.3. The Government

We assume a balanced budget in each period following Van Groezen et al. (2003). Then the government budget constraint for pensions can be described as follows: the government imposes labour income taxation at a tax rate τ to provide a pension benefit. Total government spending equals pension payment to the old generation, and total government revenues equals a fraction of labour income[19].

$$E_t = L_{t-1} p_t \tag{3.9}$$

[19] Agents retired at time *t* were became working labour at period *t*-1.

$$T_t = \pi L_t w_t \quad (3.10)$$

Where E_t implies government expenditure in the pension program, T_t implys government's pension public spending, π is the total pension tax rate that government requires from both employees and employers. Thus, τ is just a small part of π from individual contribution.

As for government pension expenditure, it equals all the retired cohort who had already joined the PAYG pension system and the amount of their pension capital the government should pay based on their working years. In current pension scheme, workers have to pay part of their wage income to local government as their pension revenue. In a healthy pension programme, the pension revenue should equal the pension expenditure; thus, for the government, their ultimate target should always be:

$$L_{t-1} p_t = \pi L_t w_t \quad (3.11)$$

Here, before going further, we need to highlight that there exists a relationship between n and d. The aggregate pension labour in the next period L_t should equal the number of current pension workers divided by two times the total fertility rate when this system is closed ($L_t = \frac{L_{t-1}}{2} d$). The reason is that, when we consider a standard family structure, there are two adults, both as parents and pension workers in the system and they have only one child, due to the limitation of one-child policy. Nevertheless, since there is free entrance to the pension system, the aggregate amount of pension labour can be influenced by multiple factors as well. So the link between the two periods of pension workers is that $L_t = \frac{L_{t-1}}{2} d + N_t$. Factors that can change the aggregate amount of pension workers in the next period, such as an expanding pension coverage rate, more migrant workers entering into the pension system, and people moving in and out of the labour market are all represented by N_t.

The per capita pension expenditure in the next period is constrained by:

$$p_t = \pi n \, w_t \quad (3.12)$$

where $n = \frac{L_t}{L_{t-1}} = \frac{d}{2} + \frac{N_t}{L_{t-1}}$, denotes the aggregate pension labour growth rate.

Inserting the one period forward pension accounting Eq. (3.12) into Eq. (3.5), the saving rate is:

$$s_{1t} = \frac{\beta[1-\tau-q(d)\,]w_t}{1+\beta} - \frac{\pi n\, w_{t+1}}{(1+\beta)(1+r_{t+1})} \tag{3.13}$$

Consider a fully depreciated during working period where all new savings are invested in the only productive asset of economy–capital–the law of motion of the capital stock is given by:

$$nk_{t+1} = s_{1t} \tag{3.14}$$

Combination of Eq.(3.13) and (3.14) yields:

$$k_{t+1} = \frac{\beta[1-\tau-q(d)\,]w_t}{(1+\beta)n} - \frac{\pi w_{t+1}}{(1+\beta)(1+r_{t+1})} \tag{3.15}$$

Exploiting Eq. (3.7), (3.8) and (3.15) and assuming individuals have perfect foresight, the dynamics of capital becomes:

$$k_{t+1} = \frac{\beta\alpha[1-\tau-q(d)\,]A_t(1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]}k_t^{\alpha} \tag{3.16}$$

Clearly, the per capita capital in the next period is associated with the previous one. Meanwhile, with the number of children rising, the per capita capital will be reduced in response.

2.9.4. Steady State

This section presents the main results of the model. Specifically. It studies how the fertility rate change, in turn, affects the PAYG pension system.

In order to get a more general model with technological progress, we should not look for a steady state where income per capita is constant, but for a balanced growth path, where income per capita grows at a constant rate. Based on our Cobb-Douglas production function, equation (3.6), it implies that output growth will be determined by the effective per unit of human capital growth rate. Since all the variables are already in per capita level, thus, the appropriate normalization factor for these variables is $A_t^{1/(1-\alpha)}$, which denotes normalized variable is $\widehat{D}_t = D_t/\,A_t^{1/(1-\alpha)}$.

We now write the system in terms of normalized variables that achieve dynamic equilibrium. Define $\hat{k}_{t+1} = k_{t+1}/A_{t+1}^{1/(1-\alpha)}$,

$$\hat{k}_{t+1} = \left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]}\right\} G^{1/(\alpha-1)}\hat{k}_t^{\alpha} \tag{3.17}$$

Where $(A_{t+1}/A_t)^{1/(1-\alpha)} = G^{1/(1-\alpha)} = (1+g)^{1/(1-\alpha)}$. To simplify, we treat g the technology growth rate as approximately equal to the annual GDP growth rate. From Eq. (3.17), as long as $q(d) < (1-\tau)$ to make sure $\hat{k}_{t+1} > 0$, in the long run, an increase in *n* or *d* has a negative influence on the per capita stock of capital.

In order to figure out how long-run PAYG pension system reacts to a change in fertility rate, recall Eq. (3.7), (3.12) and (3.17) to obtain the PAYG pension formula:

$$\hat{p}_{t+1} = \pi(1-\alpha)\left\{\left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]}\right\} G^{1/(\alpha-1)}\hat{k}_t^{\alpha}\right\}^{\alpha} \tag{3.18}$$

Child-rearing cost has a negative impact on pension capital accumulation, since to support one more child is necessary to squeeze out more disposable income from the individual's net wage income, saving, and their own consumption and in other ways. The number of contributors and the level of productivity can boost the increase of pension capital. When more pension workers join the system as contributors, pension capital per person decreases. Also, high productivity growth in the whole economy will improve the aggregate output and lead to higher overall wage income. Thus, even if the pension tax ratio is unchanged, pension capital can still be higher than before, under prosperous conditions.

2.9.5. Calibration

Although we know the relationship between different variables in our model, we still need to manipulate the input to the changes and give a clear picture of some probable future. Therefore, before coding the model, we need to calibrate the parameters in order to get a more reliable simulated result[20].

[20] Simulation software in this chapter is the Matlab, and the code is available by author for applying.

Table 3.1: Parameters of the Model

Parameter	Definition	Value
α	The capital share of output	0.51
β	Time preference	0.95
τ	Personal pension tax rate	0.08
π	Total pension tax rate	0.28
$q(d)$	Child-rearing cost rate	0.19 for *d*=1.69; 0.22 for *d*=2.1
n	Pension labour growth rate	1.08
d	Fertility rate	1.69
g	GDP growth rate	0.098

The average fertility rate during one-child policy implementation, from 1989 to 2015 is around 1.69 based on World Bank Data[21]. However, the two-child policy, allowing Chinese couples to have two children, it is not a compulsive policy as before, as long as they do not exceed two children. Therefore, the range of predicted fertility rate in this chapter will be from zero to two. Since households in our research still do not have full freedom of choice to decide the optimal number of children, it helps us simplify our issue and consider fertility rate as an exogenous factor. In the end, supposing the two child policy implemented well, the target fertility rate we set is 2.1, equal to the natural replacement rate.

The pension labour growth rate is based on the amount of pension participants in the recent five years between 2010 and 2015 from the Chinese Statistic of Year Book 2015 and calculated as 1.08.

For child-rearing expenditure data, unfortunately, so far we cannot find any relatively official data report in China. Therefore, we apply data from the United States and assume Chinese families have the same expenditure shares on children. We cannot deny that there exist some differences since these two countries have different levels of development. However, at least we still can find the tendency after change in child-rearing cost, even applying U.S. data. According to a recent report from USDA (2013), “Expenditures on Children by Families”, for one child, it estimates 27 per cent of household expenditure is spent on the child; for two children, 41 per cent. However,

[21] One-child policy implemented in 1979, we lag around 20 years so the effect of the policy can be better estimated.

those data still need adjustment in order to be applied in this chapter. As we assume above, the total number of working years is 40, while child rearing years are only half that 20 years. After that, the young generation are regarded as economically independent. Thus, only half of working year wage income is dedicated to the next generation. So now we have child-rearing cost $q(d)$ is 0.14 and 0.21 for d=1 and d=2 respectively. Since we have two points of value, we have enough conditions to figure out the function of $q(d)$[22]. Thus, we can get the value of child-rearing cost when $q(d=1.69)$ is 0.19, and $q(d=2.1)$ is 0.22 as the target fertility rate that we assume is a signal that denotes the two-child policy is implemented well.

In production function Eq. (1.6), factor shares are constant; α represents the capital share of income. We assume that α =0.4 based on the following literature: a classic Solow growth model with a Cobb-Douglas production function, 1/3 is widely accepted for capital share of income for the worldwide production function. However, the output of the Solow model is composed of physical capital, labour and human capital, but in this case, we do not consider human capital in our model so far. Therefore, the capital share of output α should be higher than 1/3. Fan et al. (1999) incorporates the contribution to aggregate growth of the reallocation of resources across sectors during the Chinese Economic Reform (since 1978). The results suggest that shifting resources from lower to higher productivity sectors leads to an increasing capital share of income in the production function, where for the urban industry, capital share is 0.49 and for the urban service sector it is 0.38. We therefore choose α =0.4 as our calibration target. Our assumption is also in line with the labour share report in G20 Economies (2015)[23], according to which labour share in G20 countries had declined to roughly 0.49, in other words, capital share of output would around 0.51.

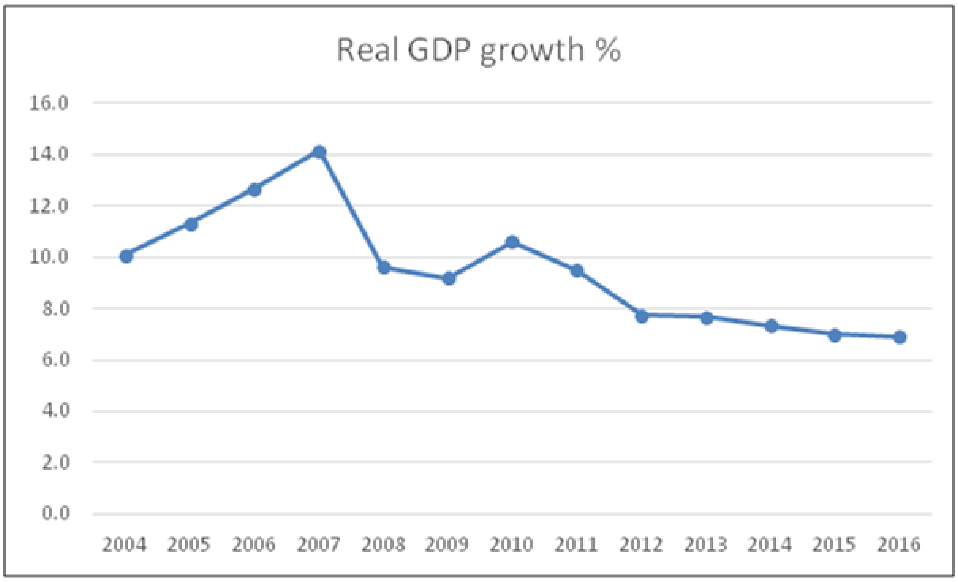
As mentioned before, in China's PAYG pension programme, employers contribute 20 per cent of wage income to the social pooling account, and each individual contributes 8 per cent of their wage to the personal account. The total contribution rate is 28 per cent of gross earnings. Clearly, for every household, the pension tax ratio τ equals 0.08.

[22] $q(d) = aln(d) + b$.

[23] See link: https://www.oecd.org/g20/topics/employment-and-social-policy/The-Labour- Share-in-G20-Economies.pdf

From OECD Economic Surveys, the average real GDP growth rate during this period in China is 0.098.

Figure 0.7: Real GDP Growth in China, 2004-2016



Source: OECD Economic Surveys: China 2015-© OECD (2015)

The time preference in this model had been calculated through the average household saving share of GDP. The 40 year discount rate β is 0.95[24].

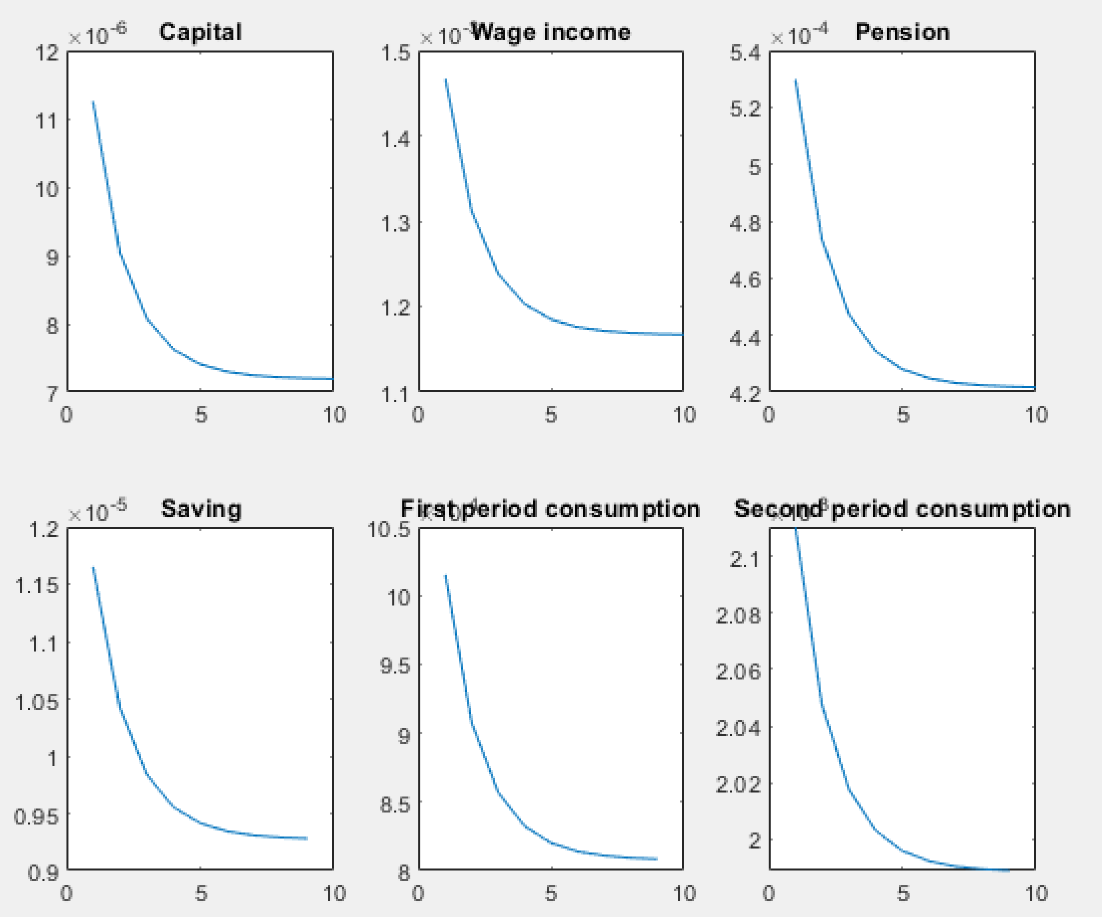
2.9.6. Results

2.9.6.1. When Fertility Rate Changed

When the fertility rate is increased from 1.69 to around 2.1, all variables decrease in varying degrees as shown in Figure 1.8 below. The half-life for this change before everything becomes steady state is roughly one and half generations in our model, which is about 60 years. The estimation results imply that more new born children becoming adults and entering into the pension programme as contributors, and the increase in pension labour participation rate by absorbing rural-urban migrant workers into the PAYG pension system, can both boost the pension capital accumulation at the beginning. However, in the long run, there is a declining tendency, because those contributors will become pension beneficiaries when they retire. The change in child policy may halve of individual wealth after 40 to 60 years compared to the beginning.

[24] See Appendix A.3. for details

Figure 0.8: The Paths when Fertility Rate Increase



Based on our simulation, only doom and gloom pictures will be the outcome of two child policy under current PAYG pension system. Even consider policy shocks the overall trend of per capita capital, individual wage income, individual pension capital, savings and first period concumption are still declining in the furture (Figure 3.9).

Figure 0.9: The Paths when Fertility Rate Increase with stochastic shocks

Table 3.2: Steady State Value When Fertility Rate/Pension Labour Growth Rate Changed[25]

	k^*	p^*	s^*	w^*	c_1^*	c_2^*
Benchmark: d=1.69 ; n=1.08 ;	1	1	1	1	1	1
Scenario one: d'=2.1 ; n'=1.29;	0.64	0.95	0.76	0.80	0.76	0.95
Scenario two: d=2.1 ; n'=1.05 ;	0.97	0.96	0.95	0.80	0.95	0.96
Scenario three: d=1.69 ; n'=1.29;	0.70	0.99	0.83	0.83	0.83	0.99
Scenario four: d=1.69 ; n'=0.85;	1.63	1.01	1.28	1.28	1.28	1.01

Compared with the current situation, for scenario one, if the two child policy is implemented well and reaches the 2.1 replacement rate, ceteris paribus, the pension labour growth rate should increase from 1.08 to 1.29. Under this circumstance, the per capita capital will suffer quite a large decrease by 36 per cent. With more labour force

[25] Original simulated values are available at appendix.

sharing the capital in the market, the individual wage income will shrink by 20 per cent. Because one more child needs to be raised, while adults can earn less wage income, individuals who decide to have more than one child now have to cut down their individual saving and also their first period self-consumption by around 24 per cent each in order to support their children compared as before. Finally, with decreasing saving during individual's first period, without considering any family support, their second period consumption falls by 5 per cent.

Nevertheless, we suggest that, since pension capital in the PAYG programme is highly depends on personal incomes, with more working-age population as pension labour join the pension system and become contributors, even combined with per capita capital decrease, the pension capital should rise. However, with the average wage income decrease, it brings negative effect than positive (i.e. more pension labour) in the system and force pension capital per person reduces 5 per percent as well. This result may implies that absorption of rural-urban migrant workers into the PAYG pension system may not relieve part of pressure on the current generation. Since most of migrant workers in China are less educated. The social value they can generate might be less than others.

In scenario two, we assume the pension coverage rate in China expands to a much close, to one hundred percent, all the working age population (including migrant workers) are all included in the urban PAYG pension system, and also the labour market is perfectly matched, in other words, N_t is close to 0. Therefore, when total fertility rate reach 2.1, because there is no other external labour support, pension labour growth rate is 1.05 compared with benchmark one. Under this assumption, child policy change has much less influence in the perfect economy than scenario one, The per capita capital, which decreases by 3 per cent only compared with 36 per cent decrease in scenario one. Wage income has 1 per cent decrease, and 5 per cent for individual saving. Since pension capital now is fully dependent on labours' capital and their own salary, 3 per cent per capita capital decrease with 1 per cent wage reduction leads to about 4 per cent loss pension capital in the system. Also, the first period and second period consumption both slightly suffered by 5 per cent and 4 per cent decrease respectively. Scenario two here can be treated as an optimal boundary in the very long-run for two-child case. Nonetheless, since the model does not include another realistic factor – life expectancy, the real situation maybe even worse than our estimation in scenario two. This is because with longer life expectancy, the number of beneficiaries will continuously grow, leading to the pension system becoming more unbalanced in the future.

Scenarios three and four can be treated as the sensitivity tests for our model. In the scenario three, if we only alter the ratio of pension labour and leave fertility rate unchanged, this means that the changed in child policy does not go through well; instead, all the additional pension labour are from migrant workers, the pension coverage rate expands to a new high level while the labour market unemployment rate is close to zero. As scenario three illustrates, if government keeps expanding the pension coverage rate and households still prefer to have only one child, their own per capita capital will reduce by 30 per cent. Their saving accumulation and the first period consumption will become sighlty better than the scenario one. Meanwhile a larger amount of external labour is covered in the system, pension capital and the second period consumption only suffering 1 per cent lost compared as secenario one.

For scenario four, we even assume a better situation based on scenario three. That is a perfect pension coverage rate in China with fertility rate unchanged. So the pension labour growth rate should directly from the fertility rate which is 0.85 in this case. Surprisely, every variables become even higher than the benchmark value for this scenario. In details, if the current pension system has had covered the whole country, with current fertility rate unchanged, per capita capital will increase 63 per cent, wage income 28 per cent, individual savings and first period comsuption both 28 per cent and the pension capital per pension and second period comsuption both 1 per cent increase.

Thus, combining scenarios one and two, if we only consider the short-run solution, absorbing rural-urban migrants into the PAYG pension programme can relieve part of burden from the current urban pension labour, since each family, has to support four retired at the same time. However, the solution can be treated as short to medium-term only; besides, in the very long-run, without a healthy pension system, simply expanding the amount of pension labour is harmful to every individual who has been covered by PAYG pension security so far. Although per capita capital decrease less by more contributors in scenario two, the pension capital also stay below the benchmark level. This result is consistent with the reality, because most of the migrant workers in China are manual labour with less human capital compared with the urban cohort, so their participation will have less positive influence on the aggregate output compared to their significant effect on the amount of the total labour in the system[26].

On the contrary, we can get some better result from scenario four. Since the two-child policy is not a mandatory one as before, household can make their own decision to follow or not. If the fertility rate unchanged, wihle the pension coverage rate expand to the whole country level, individual can accumulate more capital by following the one-child policy, and each household will gain more saving by only one child need to foster. Thus, individual's first and second period comsuption also benefit from it. The PAYG pension system will be sustainable if and only if its pension coverage rate can close to hundred percent.

2.9.6.2. *Larger Total Transfers from Workers to Retirees*

Table 3.3: Raising Individual Pension Tax Rate

	k^*	w^*	p^*	s^*	c_1^*	c_2^*
τ =0.08, $\pi = 0.28$	1	1	1	1	1	1
τ =0.05; $\pi = 0.28$	0.70	0.83	0.99	0.83	0.83	0.99
τ =0.1; $\pi = 0.28$	0.60	0.77	0.92	0.72	0.72	0.92
τ =0.1; $\pi = 0.3$	0.59	0.77	0.98	0.71	0.71	0.93
τ =0.05; $\pi = 0.3$	0.68	0.82	1.05	0.82	0.82	1.00

In table 3.3, first we assume two-child policy implement well, then compare with the individual part of pension tax rate increase and decrease, and the overall pension tax rate unchanged, we found that increase individual pension payment rate does not release the burden that two-child policy brings on current generation. Less per capita capital, wage income, saving and consumption, even the pension capital decrease. This is because two-child policy already squeezing individual's first period living condition. Increasing the individual pension payment rate will directly lead to unwilling to participate the pension system. People may put their hope to their children to support them when they retired instead of pension support. On the other hand, increasing the

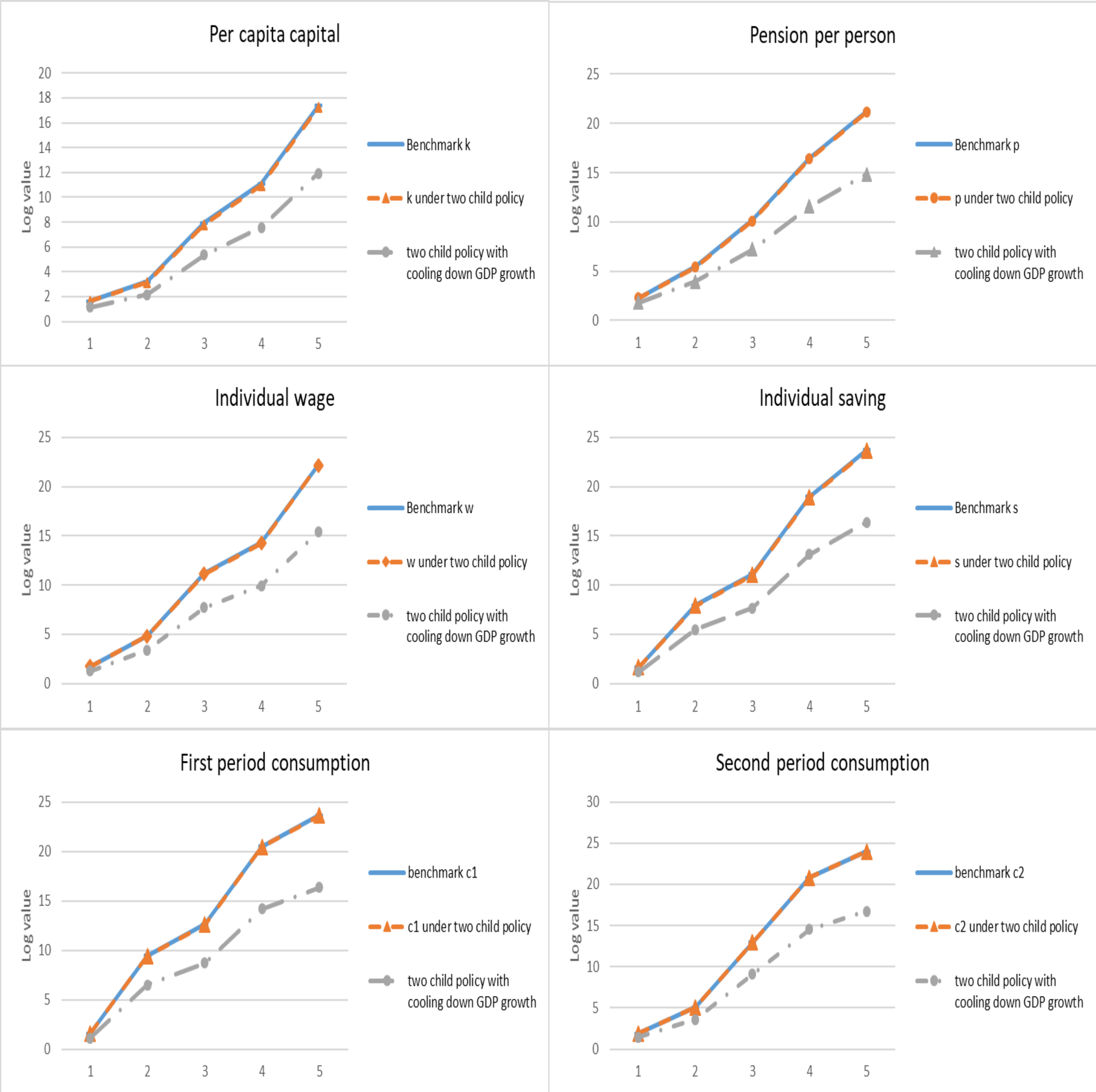
[26] Some migrant workers' wage may even below the minimum tax requirement.

pension payment rate from employers while decreasing the individual part seems a better solution under the two-child policy. This will boost people’s willing to join the pension system since they can pay less pension tax druing their working period and later can even get slightly more pension funding after retirement. With 5 per cent individual pension tax rate and employers contribution expand to 25 per cent (currently is 20 per cent), the total pension tax rate increase from 28 per cent to 30 per cent, pension capital per person rise 5 per cent compared with current situation and the second period consumption remain the same level even now one more child need to foster.

Because double cost for one more child is already a huge burden for the current generation and lowers their own living standard in every way. With undoubtedly, a higher pension tax ratio focus on individual part of pension payment after the two child policy, will be a huge harm to current householders, even including those families who decide to have only one child. On the one hand, it may also offset the willingness to have one more child, if there is no subsidy available for it. On the other hand, it may acts as a negative incentive factor that reduce the enthusiasm of labour and consequently leads to so called deadweight loss by distorting people's decision. Hereby, without considering pension reform, the optimal solution in order to cooperate with two child policy is that increasing the total pension tax ratio by decreaing the individual part while increasing the contribution rate from companies.

2.9.6.3. Under the Cooling Down Economic Growth

Figure 0.10: Prediction of Future Change under Different Condition



As Figure 3.10 denotes, compared with the change in economic growth rate, the increasing fertility rate has much less negative influence on current living standard, especially along with the higher independent ratio after the child policy changed. However, the more serious situation we should consider is that economic growth rate gradually cooled down, from 11.9 per cent in 2007 to 6.9 per cent in 2016. In the fifth session of the 12th National People's Congress in February 2017, the Chinese Prime Minister Li Keqiang reported that the target economic growth rate from 2017 to 2018 was 6.5 per cent. Here, based on this report, and we set 6.5 per cent as our estimation value in our model, and as a result, all six values significantly decline, with slower growth rate compared with fertility rate which increases as the only changing factor.

In China, the economic growth rate has already gradually slowed down since 2007, compared with the breakneck pace of economic development from 1978 in the past, because the elderly are in general less economically productive than younger people. The ratio of individuals aged 15-64 to those younger and older, which grew rapidly during the last few economic boom decade, has reached its peak and is expected to decline rapidly in coming decades. Because a labour force that is large in size relative to the dependent population is plausibly crucial to rapid economic growth, the decline of this ratio could conceivably herald economic difficulties. Therefore, the current pension system cannot be sustainable under both a higher independent ratio and cooling down of growth of the economy.

2.9.6.4. Full-Funded System

After discuss the situations under PAYG system, we now look at another possible pension scheme, a full-funded system to estimate whether it can present better outcome when facing the two child policy.

Under a full-funded system, government at date *t* raises some amount p_t from the young, funds are invested in capital stock, and pays workers when old as $(1+r_t)p_t$.

So now we rewrite Eq 3.2 and 3.3 as followed:

$$(1-\tau)w_t = c_{1,t}^{g} + s_{1,t} + p_{1,t} + w_t q(d) \tag{3.19}$$

$$(1+r_{t+1})(s_{1,t} + p_{1,t}) = c_{2,t+1}^{g} \tag{3.20}$$

And notice that now the total amount invested in capital accumulation is

$$nk_{t+1} = s_{1,t} + p_{1,t} \tag{3.21}$$

And the dynamics of capital will change to

$$k_{t+1} = \frac{\beta[1-\tau-q(d)]A_t(1-\alpha)}{n(1+\beta)} k_t^{\alpha} \tag{3.22}$$

with its dynamic equilibrium as followed[27]:

[27] For more detail processes, see Appendix A.5.

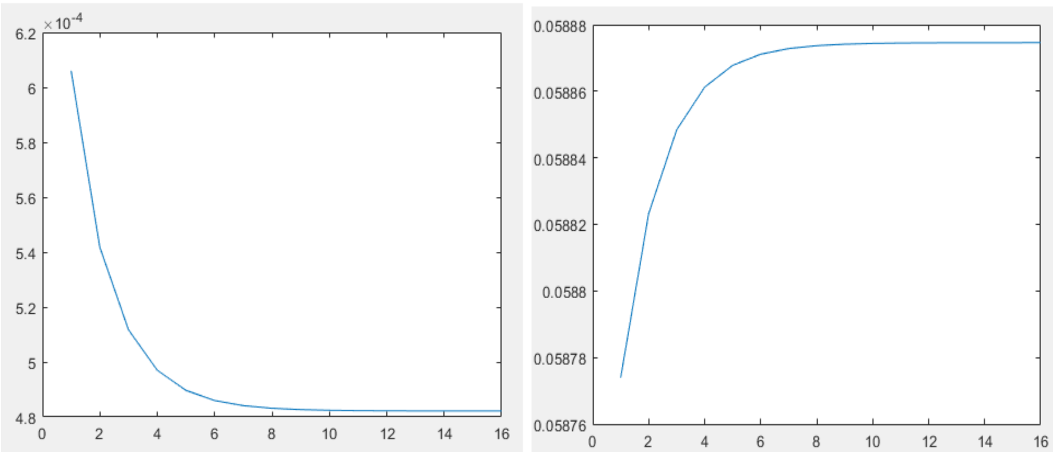
$$\hat{k}_{t+1} = \left\{\frac{\beta[1-\tau-q(d)](1-\alpha)}{n(1+\beta)}\right\} G^{1/(\alpha-1)}\hat{k}_t^{\alpha} \qquad (3.23)$$

Equation 3.23 suggests that higher pension labour growth rate, lesser capital accumulation in the system.

Without surprise, fully funded system also present the same issue as the PAYG under the two child policy. As figure 3.11a illustrated, pension accumulation decrease fast when there are more pension labour join the system, while postpone the two-child policy and expand the pension coverage rate will brings more benefit to the current generation (figure 3.11b).

Figure 0.11: Fully Funded Pension Capital per Person with and without Child Policy Changed

(a) (b)



Generally, if there is only one target that prevents deficit for the public pension budget in China in the short-run, the most direct method is absorbing all the rest of the work force who had not been covered in the system yet, instead of two-child policy implementation. However, one more child will help increase pension capital when the new generation comes of age, but it diminishes individual's physical welfare after they are born. And moreover, it would not produce significant benefit to individuals, but for the pension system as a whole. Unfortunately, the benefit will eventually become a burden after the new generation retires both for PAYG and full-funded system. Above all, the overall deceleration of Chinese economic growth will be the most important factor that will cause everything slacks. As for increasing the individual pension tax rate, it should be the last solution that government should apply, if they also hope the two-child policy will be implemented well.

2.10. Discussion and Conclusion

The PAYG pension programme has been operated for around 20 years after since its first implementation in 1997. It has experienced some reforms as many internal issues emerged, combined with various external factors that continuous to challenge the sustainability of the current pension system. After the one-child policy was changed to a two-child policy, the demographic structure, total dependency ratio and the amount of pension labour in the future will all more or less suffer the effect. Intuitively, for individuals, since one more child cost much more than before, it lowers both saving rate and stock of capital, leading to first period consumption dipping to squeeze out a little bit more saving to support their retirement during the second period. As for the government side, even though higher fertility will provide more pension workers and more pension capital from contributors in the future, the large amount of labour, still, will retire and become pension beneficiaries in the long-run. Based on scenario two, we assume the two child policy is implemented well and the pension coverage rate reaches a hundred percent in China. Nevertheless, the PAYG pension system will still lose about 4 per cent even under a much better situation. Thus, the current PAYG pension system may not be sustainable in the face of another baby boom. While information from scenario four may provide an effective policy suggestion that the central government do need to enhance the PAYG pension coverage rate as soon as possible so that even the two-child policy does implement well in the short-term, the current generation who already participate into the pension system will not suffer the negative effect from child policy changed and even gains more capital accumulation with a more wealth two periods lives status.

It may too early to evaluate whether the change in child policy in China will lead to the baby boom that the country needs or not. In fact, the policy had already been relaxed in recent years on a piecemeal basis; it is estimated that in the last 10 years only one third of the population has been limited to one child. Ethnic minorities were permitted to have more than one child, as were those whose first child was a girl, or disabled. However, reactions to the relaxations have been lackluster. Since 2013, citizens who had grown up as only children were announced to be eligible to have two children, but of the 11 million eligible citizens, only 1.5 million applied for the privilege and fewer than 0.5 million babies were born as a result. These evidences may present a less optimistic picture of the increasing fertility rate in the future. Compared with the uncertain trend of future fertility rate, the reduction of economic growth rate in China seems more visible, with a drop from 11.9 per cent in 2007 to 6.9 per cent in 2016, and was set to even lower to 6.5 per cent, in the last National People's Congress in 2017. Our estimated result highlights that, fertility rate increase will shrink the pension capital for the current system. Nonetheless, compared with the reduction through the cooling down of the economy, the influence of fertility increment is much smaller.

Since the economic growth rate continuous to cool down, 6.5 per cent might not be the last target and remain unchanged. Increase in the amount of pension labour should be highly rewarding way in the short to medium term. Besides, 63.8 per cent of migrant workers were working without a legal contract in 2015, according to the Migrant Worker Monitoring Report in National Bureau of Statistics of the People's Republic of China. The total number of migrant workers in 2015 was 277 million, which means there are 177 million workers who are working without any social security including pension. This large number of migrant workers cannot be neglected. The contributions from newly migrant workers will directly support previous pension labour and can share part of the responsibility for the current pension labour. However, this solution poses two potential issues that need to be faced. On the one hand, migrant workers working in the urban areas without social security have existed for quite a long time. Local government needs to improve self-protection awareness of migrant workers, while strengthening the supervision of their employers. On the other hand, absorbing migrant workers into the pension system without considering the situation when they retire cannot be a sustainable solution in the long-run.

Unfortunately, the suggestions mentioned above all need sacrifice of the current generation, and particularly pension labour who have already participated in the pension system. Since vast amount of both time and capital need to be invested today to prepare for the future, it leaves a difficult question for government, how to invest the money in the best way without sacrificing the current generation. However, a rapidly imposed compulsory policy, like the one-child policy has already left a "demographic time bomb" for the Chinese government. As our research indicates, the increment of the current PAYG pension system will become even slower under both a higher dependency ratio for young and old and a decelerating economic growth rate, since there are fewer economically productive young people in the country. A soft and slow two-child policy combined with expansion of the pension participation rate by covering migrant workers would be a better way to give the government sufficient time for pension reform and to reach the country's needs in the long-run. Increasing the total PAYG pension payment rate by reducing the individual pension payment ratio while increasing the companies' part and expanding the pension coverage rate should the priority measure that must accompanying with the two-child policy. However, this chapter did not discuss any other pension reforms; changing the PAYG pension system to a fully funded system in order to cooperate with the two-child policy would be a significant topic for further research.

Appendix

A.1. FOCs

Combine (3.2) and (3.3):

$$(1 - \tau)w_t = c_{1t} + \frac{c_{2t+1} - p_{t+1}}{1 + r_{t+1}} + w_t q(d)$$

$$(1 + r_{t+1})(1 - \tau)w_t = (1 + r_{t+1})c_{1t} + c_{2t+1} - p_{t+1} + (1 + r_{t+1})w_t q(d)$$

Taking Lagrange:

$$\mathcal{L} = ln\,(c_{1t}) + \beta ln\,(c_{2t+1}) - \lambda[(1 + r_{t+1})(1 - \tau)w_t - (1 + r_{t+1})c_{1t} - c_{2t+1} + p_{t+1} - (1 + r_{t+1})w_t q(d)]$$

FOCs:

$$\frac{\partial \mathcal{L}}{\partial c_{1t}} = \frac{1}{c_{1t}} + \lambda(1 + r_{t+1}) = 0 \qquad (A)$$

$$\frac{\partial \mathcal{L}}{\partial c_{2t+1}} = \frac{\beta}{c_{2t+1}} + \lambda = 0 \qquad (B)$$

Substitute (A) into (B)

$$-\frac{1}{c_{1t}} + \frac{\beta(1 + r_{t+1})}{c_{2t+1}} = 0$$

Thus, the Euler Equation is:

$$c_{2t+1} = \beta(1 + r_{t+1})c_{1t}$$

A.2. Normalization

For wage income:

$$\hat{w}_t = \frac{w_t}{A_t^{\frac{1}{1-\alpha}}} = \frac{(1-\alpha)A_t k_t^{\alpha}}{A_t^{\frac{1}{1-\alpha}}} = (1-\alpha)\hat{k}_t^{\alpha}$$

$$= (1-\alpha)\left\{\frac{\beta\alpha[1 - \tau - q(d)\,](1-\alpha)}{n[(1+\beta)\alpha + \pi(1-\alpha)]G^{1/(1-\alpha)}}\right\}^{\frac{\alpha}{1-\alpha}}$$

For the first and second period consumption:

$$\hat{c}_{1t} = (1-\alpha)[1-\tau-q(d)]\left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]G^{\frac{1}{1-\alpha}}}\right\}^{\frac{\alpha}{1-\alpha}}$$

$$-\,n\left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]G^{1/(1-\alpha)}}\right\}^{\frac{1}{1-\alpha}}$$

$$\hat{c}_{2t+1} = \tau(1-\alpha)\left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]}\right\}^{\frac{\alpha}{1-\alpha}} n^{\frac{(1-2\alpha)}{(1-\alpha)}} + (1$$

$$+\,r_{t+1})\left\{\frac{\beta\alpha[1-\tau-q(d)\,](1-\alpha)}{n[(1+\beta)\alpha+\pi(1-\alpha)]G^{1/(1-\alpha)}}\right\}^{\frac{1}{1-\alpha}} n^{\frac{\alpha}{\alpha-1}}$$

A.3. Numerical Approximation method

From Eq. (1.7) and Eq. (1.13):

$$\hat{s}_{1t} = \frac{s_{1t}}{A_t^{\frac{1}{1-\alpha}}} = \frac{\beta[1-\tau-q(d)\,]\widehat{w}_t}{1+\beta} - \frac{\pi n\widehat{w}_{t+1}}{(1+\beta)(1+r_{t+1})}G^{\frac{1}{1-\alpha}}$$

$$= \frac{\beta[1-\tau-q(d)\,](1-\alpha)\hat{k}_t^{\alpha}}{1+\beta} - \frac{\tau n(1-\alpha)\hat{k}_{t+1}^{\alpha}}{(1+\beta)(1+r_{t+1})}G^{\frac{1}{1-\alpha}}$$

Thus, the saving share of output is:

$$\frac{\hat{s}_{1t}}{\hat{y}_t} = \frac{\beta[1-\tau-q(d)\,](1-\alpha)}{1+\beta} - \frac{\pi n(1-\alpha)}{(1+\beta)(1+r_{t+1})}G^{\frac{\alpha}{1-\alpha}}$$

Table 0.4a: Household saving share of GDP (%)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
(%)	20.8	21.6	22.6	23.4	23.6	24.6	25.5	24.7	25.2

From the National Bureau of Statistics, we then collected recent year average household saving share of GDP from 2004 to 2012, see table above, which is around 23.6%. However, since we only consider urban residents, and we also assume the saving behaviour only in the first period, we need to roughly adjust the data to those population who matched our requirements. According to the Chinese Statistic Year Book, in the last ten years, population from aged 15-64 accounted for about 73% of the total population in China. Since our setting of the first period is age 20-60, this number will bigger than we need. Meanwhile, our research focuses on those who saving for their retirement, and excludes saving for other purposes; such as a car, property or others. However this part is very difficult to achieve; therefore we robustly use 73% to adjust, and get the urban household share of GDP, whose age are between 20 to 60, and their saving especially for retirement is roughly 17%.

Numerically:

$$\frac{\hat{s}_{1t}}{\hat{y}_t} = 0.17 = \frac{\beta(1-0.08-0.19)(1-0.4)}{1+\beta} - \frac{0.28 * 1.08 * (1-0.4)}{(1+\beta)(1+0.05)^{40}} * 1.095^{0.4*40}$$

$$\beta = 0.95$$

Thus, the 40 year discount rate in our model is 0.95, and the discount rate in one year is 0.99, which is in line with the most common setting.

A.4. 6 values at new steady state under two child policy

k	p	w	s	c1	c2
1.13E-05	0.00053	0.001467	1.22E-05	0.001058	0.002178
kss	pss	wss	sss	c1ss	c2ss
7.83E-06	0.00044	0.001219	1.01E-05	0.00088	0.002077

The change rate of scenario one in Table 3.2 are row 4 over row 1 and same for other scenarios.

A.5 Fully-Funded system

Combine (3.19) and (3.20):

$$(1-\tau)w_t = c_{1t} + \frac{c_{2t+1}}{1+r_{t+1}} + w_t q(d)$$

$$(1+r_{t+1})(1-\tau)w_t = (1+r_{t+1})c_{1t} + c_{2t+1} + (1+r_{t+1})w_t q(d)$$

Taking Lagrange:

$$\mathcal{L} = ln\,(c_{1t}) + \beta ln\,(c_{2t+1}) - \lambda[(1+r_{t+1})(1-\tau)w_t - (1+r_{t+1})c_{1t} - c_{2t+1} - (1+r_{t+1})w_t q(d)]$$

FOCs:

$$\frac{\partial \mathcal{L}}{\partial c_{1t}} = \frac{1}{c_{1t}} + \lambda(1 + r_{t+1}) = 0 \qquad (C)$$

$$\frac{\partial \mathcal{L}}{\partial c_{2t+1}} = \frac{\beta}{c_{2t+1}} + \lambda = 0 \qquad (D)$$

Substitute (C) into (D)

$$-\frac{1}{c_{1t}} + \frac{\beta(1 + r_{t+1})}{c_{2t+1}} = 0$$

Thus, the Euler Equation is:

$$c_{2t+1} = \beta(1 + r_{t+1})c_{1t}$$

Thus

$$s_{1,t} + p_{1,t} = \frac{\beta(1 - \tau - q(d)\,)w_t}{1 + \beta}$$

While the capital accumulation change to

$$nk_{t+1} = s_{1,t} + p_{1,t}$$

Then we can get the dynamic of capital as followed:

$$k_{t+1} = \frac{\beta[1 - \tau - q(d)\,]A_t(1 - \alpha)}{n(1 + \beta)} k_t^{\alpha}$$

A.6. Programme:

PAYG without shock:

```
clc;
clear;
%Value
a=0.51;
b=0.95;
tao=0.08;
pai=0.28;
nL=1.29; %pension labour replace population
% nL=1.29; %1.05, 1.29, 1.08
q=0.19; %d=1.69
% q=0.22; %d=2.1
k0=[1.12514124350140e-05]; %from d=1.69 when k reach SS
% k0=0.0001;
```

```
G=1.095^40;
% G=1.08^40;
N=16;
%Setting array for variables
K=zeros(1,N);
T=zeros(1,N);
W=zeros(1,N);
R=zeros(1,N);
P=zeros(1,N);
S=zeros(1,N-1);
C1=zeros(1,N-1);
C2=zeros(1,N-1);

%For variables in same period
for t=1:N-1
%     for j = 1:N-1
   T(t)=t;
   M=(b*a*(1-tao-q)*(1-a))/(G*nL*((1+b)*a+pai*(1-a)));
   K(t)=k0;
   k0=M*k0^a;
   W(t)=(1-a)*(K(t))^a;
   R(t)=(a*(K(t))^(a-1))-1;
   P(t)=pai*nL*W(t);
%  end
end
%For variables in different period
for t=1:N-1
S(t)=nL*K(t+1);
C1(t)=(1-tao-q)*W(t)-S(t);
C2(t)=P(t)+(1+R(t))*S(t);
end

%Final value
K(N)=k0;
T(N)=N;
W(N)=(1-a)*(K(N))^a;
R(N)=(a*(K(N))^(a-1))-1;
P(N)=pai*nL*W(N);
S(N-1)=nL*K(N);
C1(N-1)=(1-tao-q)*W(N-1)-S(N-1);
C2(N-1)=P(N-1)+(1+R(N-1))*S(N-1);

%Figure
figure(4)
subplot(2,3,1);
plot(T,K);
title('Capital');
subplot(2,3,2);
```

```
plot(T,W);
title('Wage income');
subplot(2,3,3);
plot(T,P);
title('Pension');
subplot(2,3,4);
plot(T(1:end-1),S);
title('Saving');
subplot(2,3,5);
plot(T(1:end-1),C1);
title('First period consumption');
subplot(2,3,6);
plot(T(1:end-1),C2);
title('Second period consumption');
figure(5)
plot(T,R);
```

PAYG with policy shock:

```
clc;
clear;
%Value
% a1 = rand(1, 0.2);
a=0.51;
b=0.95;
tao=0.08;
pai=0.28;
% nL=1.08; %pension labour replace population
nL=1.29;
% d = 1.69;%fertility rate
d=2.1;
% q=0.19;
q=0.21;
% r=0.05;
k0=[7.51214487505905e-06]; %from d=1.69 when k reach SS
% k0=0.0001;
G=1.095^40;
% G=1.08^40;
N=30;

%Setting array for variables
K=zeros(1,N);
T=zeros(1,N);
W=zeros(1,N);
R=zeros(1,N);
P=zeros(1,N);
S=zeros(1,N-1);
C1=zeros(1,N-1);
C2=zeros(1,N-1);
a1=zeros(1,N);
```

```
% n = linspace(1.69,2,N);
%For variables in same period
for t=1:N-1
%     for j = 1:N-1
    T(t)=t;
    a1= rand(1,5,30);
    M=(b*a*(1-tao-q*d)*(1-a))/(G*nL*((1+b)*a+pai*(1-a)));
    K(t)=a1(t)*k0;
    k0=M*k0^a;
    W(t)=(1-a)*(K(t))^a;
    R(t)=(a*(K(t))^(a-1))-1;
    P(t)=pai*nL*W(t);
%     end
end
%For variables in different period
for t=1:N-1
S(t)=nL*K(t+1);
C1(t)=(1-tao-q*d)*W(t)-S(t);
C2(t)=P(t)+(1+R(t))*S(t);

end

%Final value

K(N)=k0;
T(N)=N;
W(N)=(1-a)*(K(N))^a;
R(N)=(a*(K(N))^(a-1))-1;
P(N)=pai*nL*W(N);
S(N-1)=nL*K(N);
C1(N-1)=(1-tao-q*d)*W(N-1)-S(N-1);
C2(N-1)=P(N-1)+(1+R(N-1))*S(N-1);

%Figure
figure(4)
subplot(2,3,1);
plot(T,K);
title('Capital');
subplot(2,3,2);
plot(T,W);
title('Wage income');
subplot(2,3,3);
plot(T,P);
title('Pension');
subplot(2,3,4);
plot(T(1:end-1),S);
title('Saving');
subplot(2,3,5);
plot(T(1:end-1),C1);
```

```
title('First period consumption');
subplot(2,3,6);
plot(T(1:end-1),C2);
title('Second period consumption');
```

Fully-Funded system:

```
clc;
clear;
%Value
a=0.51;
b=0.95;
tao=0.08;
pai=0.28;
% nL=1.08; %pension labour replace population
nL=1.25; %1.05, 1.29, 1.08
% q=0.19; %d=1.69
q=0.22; %d=2.1
k0=[1.42417525584199e-05]; %from d=1.69 when k reach SS
% k0=0.0001;
G=1.095^40;
% G=1.08^40;
N=16;

%Setting array for variables
K=zeros(1,N);
T=zeros(1,N);
W=zeros(1,N);
R=zeros(1,N);
P=zeros(1,N);
S=zeros(1,N-1);
C1=zeros(1,N-1);
C2=zeros(1,N-1);

%For variables in same period
for t=1:N-1

    T(t)=t;
    M=(b*(1-tao-q)*(1-a))/(G*nL*(1+b));
    K(t)=k0;
    k0=M*k0^a;
    W(t)=(1-a)*(K(t))^a;
    R(t)=(a*(K(t))^(a-1))-1;
    P(t)= (1+R(t))*pai*nL*W(t);

end
%For variables in different period
for t=1:N-1
```

```
S(t)=nL*K(t+1)-P(t);
C1(t)=(1-tao-q)*W(t)-S(t)-P(t);
C2(t)=(1+R(t))*(S(t)+P(t));
end

%Final value

K(N)=k0;
T(N)=N;
W(N)=(1-a)*(K(N))^a;
R(N)=(a*(K(N))^(a-1))-1;
P(N)=(1+R(N))*pai*nL*W(N);
S(N-1)=nL*K(N)-P(N);
C1(N-1)=(1-tao-q)*W(N-1)-S(N-1)-P(N-1);
C2(N-1)=(1+R(N-1))*(S(N-1)+P(N-1));

%Figure
figure(4)
subplot(2,3,1);
plot(T,K);
title('Capital');
subplot(2,3,2);
plot(T,W);
title('Wage income');
subplot(2,3,3);
plot(T,P);
title('Pension');
subplot(2,3,4);
plot(T(1:end-1),S);
title('Saving');
subplot(2,3,5);
plot(T(1:end-1),C1);
title('First period consumption');
subplot(2,3,6);
plot(T(1:end-1),C2);
title('Second period consumption');
figure(5)
plot(T,R);
```

Conclusion

It has been 40 years long since Chinese government started the reform and opening-up in 1978. There were many significant and even world-wide policy that had been implemented. We choose three reprentativeness policies in this thesis and focus on the influence and the effect of those demographic policy changed on the China's society.

In the first chapter, we estimate the one-child policy in China and its effect of changing the fertility rate and sex ratio for nearly 30 years. The natural demographic transition in those developed countries which take hundreds year to complete while only decades for China to finish and generate the demographic dividend with a dramatically economic boost. However, the price of an artificial demographic transition is huge, the fertility rate in China decreasing too fast and lead to a country-wide '4-2-1' family structure and a very unstable reverse demographic triangle in current society. And the sex ratio in China also being distorted which the shortage of women may have increased mental health problems and socially disruptive behaviour among men and has left some men unable to marry and have a family. The scarcity of females has resulted in kidnapping and trafficking of women for marriage and increased numbers of commercial sex workers, with a potential resultant rise in human immunodeficiency virus infection and other sexually transmitted diseases. These consequences might be a real threat to China's stability in the future.

Another potential threat comes from the unbalanced development between coast-east areas and the central and west part of China. In the second chapter, we discuss about the 1992 migration policy which aims at transfering rural labour to non-agricultured activities. Unlike the one-child policy in 1979, the effect of the 1992 migration policy is relatively weak. The hukou system in China is a major barrier to block the rural-to-urban migration even until today it still exists with the standard two types of registration, rural and urban. During that time, the quality of rural migrants were far behind the requirement of urban firms. Low-skilled can only bring few benefits while imposing large burdens both in the short-term and the long-term. Thus, frims and urban local government were not willing to accept them and applied measures such as hukou regime in order to block those rural migrants into urban areas. Only high-educated and young-low-skilled rural labours can be benefited by the migration policy and stay in the urban areas. Among these young-low-skilled rural workers, part of them may have chances to take some training but most of them can only accept the dirty, difficult and dangerous jobs that urban residents would not take. Therefore, the migration policy did not play well while the central and western regions suffered from both brain drain and young-phycial drain. The gap of economic performance between East coastal areas and the interior provinces in China become more enlarge and more inequality.

Under nearly 40 years' demographic structure and social structure changed, Chinese society now facing a new critical issue that 'China gets old before it gets rich'. More elderly become beneficiaries while less working generation to support them. Thus, our third chapter focuses on the current two-child policy and estimate whether it can fix the PAYG pension shortage in recent year in China. Our prediction suggest that for individuals, since one more child need to rearing up, it will lowers household's capital accumulation, shrinking the first period consumption to support their retirement duration. Even more pension labour will join the system, the PAYG will still lose about 4 per cent based on our predicted model. Thus, the current pension programme may not suffered from another baby boom. Meanwhile, postpone the two-child policy while expand the pension coverage rate as the priority task may release burdens of current generation and more capital accumulation household can get more willing they will to have a second child.

The lesson of previous two policy is that policy is a double-edged sword, its positive and negative effect can not be seperated. A rapidly imposed compulsory one-child policy has already left a "demographic time bomb" to the Chinese soeicty. And an unprepared and eyeless migration policy has distorted the distribution of regional economic development in China as well. Hence, a soft and slow two-child policy would be a better way to give the government sufficient time to predict as much as possible of two-child policy with its corresponding measure as backup plan in order to reach the country's needs in the long-run.

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