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China's Family Planning Policy and Contraceptive Using

by

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# Abstract

Under the Family Planning Policy, the contraceptive use in China is not only the outcome of personal choice but highly influenced by the policy regulations. Using provincial level data, this study aims in finding to what extent does Family Planning Policy have its impact on the contraceptive use of married Chinese women aged 15-49 years from year 1992 to 2017. Controls for social economic status (SES) as educational level, consumption along with urbanization rate, OLS Model and Fixed Effects Model are used to find out the association between policy strength and contraceptive use both across and within province. Results show that across provinces over time, the general trend in using contraceptive is the decrease of sterilization and the increase of using reversible and short-term contraceptives. As policy goes tighter, the rate of accept sterilization is going to increase significantly while the rate change of using IUD remains gentle. Condom using is highly associated with both policy and social economic status. Also, the practicing of oral contraception and injections is also highly influenced by policy and SES. Meanwhile, the Fixed Effects Model shows that within provinces, the policy strength remains a highly significant factor behind contraceptive use, but the SES factors are not as significant as across provinces. Also, because the omittance of domestic migration which is a time-varying factor, the result of Fixed Effects Model could be biased.



*To my parents*

*To Jesper*



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# 1 Introduction

## 1.1 Background

China has the biggest population in the world. By the end of 2017, the total population of the world is 7.53 billion, in which 1.386 billion are Chinese (World Bank 2018). But this is not the only unique fact that China has regarding the population issue. This vast country is also special because it has, and for a few more years at least, will still have a detailed family planning system. As a policy system that regulates people's fertility behavior, the Family Planning Policy also has its impact on the contraceptive use in China. The aim of this thesis is to find out, to what extent does the contraceptive use being influenced.

As one of the not many countries ever had or still have family planning policy, China's Family Planning System is the most famous and efficient one. By the year 1978, after the end of Cultural Revolution, the Chinese government realized the country was facing a serious problem --- the near a billion population, which is the legacy of the fertility encouragement from early 1950s to late 1960s (National Statistics Agency, 2018). Taking the path of Malthusian theory, the central government considered the huge population as the reason causing the low living standard at that time (Attane, 2002; Wang, 2012). With the transformation of economy, the Family Planning Policy is also launched. Not taking too long, the gentle suggestion of "Later, longer fewer" proposed in 1973 which means married couples are better to have children later than 25 years old with longer birth interval and plan for fewer children, became a very strict system in early 1980s (Wang, 2012:1; Feng et al., 2012). The strict Family Planning System regulated that married couples should only have one child (Wang, 2012:1). Women who already have one child should use IUD and for those who already have multiple children, either part of the couple have to receive sterilization as preventing them to have further reproducing plan (Wang 2012:2); Li et al., 2013; Zheng et al. 2012; Wu 2010). This is also the time that massive induced abortions happened, as couple need to apply to local Family Planning Office for the permission to get pregnant, and those without the birth permission suffered compulsory abortions along with financial punishment (Wang 2014)).

Under this circumstance, the practicing rate of long-term contraceptive in China is extremely high since over 90% of married couple using IUD or accepting sterilization (National Statistics Agency, 2018). And the policy effects are also clear and strong. Only more than one decade after the strict policy launched, by the year 1993, the total fertility rate of China dropped below replacement level and not long after that, it stays stably around 1.5 (World Bank, 2018).

But since the massive induced abortion and using of long-term contraceptive are free of charge, government need to use a good part of the annual financial budget to cover the expense (Scharping, 2013; Wang, 2012:1), meanwhile the discussion of population ageing started, since late 1980s to early 1990s, the strict Family Planning Policy has been through several rounds of deregulations (Scharping, 2013; Wang, 2012:1). First by allowing part of the rural couples to have two children (Schultz & Zeng, 1995; Ding & Hesketh 2006), then by the year 1995 China started contraceptive education initiative for married couples to choose their own preferred

contraceptive methods (Wang, 2012:2), usually between sterilization and IUD or implant. The practicing rate of sterilization started to decrease (National Statistics Agency, 2018).

As mentioned above, the policy deregulation is not thoroughly over the whole Chinese population. Rural areas have relatively loose regulations comparing to their urban counterparts, and couples in five regions, regardless of their household status is rural or urban, could only have one child (Lee & Feng, 1999). Furthermore, after year 2002, most of the provinces started a new round of deregulation as couples who are both only-child could have a second child (Ebenstein, 2010; Ding & Hesketh 2006). This round of deregulation further increased the imbalance of policy within and between regions, also the using rate of different contraceptive methods have changed.

Between 2002-2010, the total rate of using contraceptive within married couples decreased to 90%, which is lower than the practicing rate of long-term contraceptive in the late 1980s (Wang 2012:2). Even though, China still maintained the world's highest level of using long-term contraceptive methods which is around 81% nationally (National Statistics Agency, 2018). After the start of intensive deregulation since 2014, the rate of using long-term contraceptive again dropped dramatically while the using of condoms increased significantly. As a short-term contraceptive method, condom was never on the top of suggestions by the Family Planning Officers but now it is recommended as central government started encouraging married couples to have two children, as coping the population ageing (Padmadas, 2016).

## 1.2 Research Problem and Thesis Scope

Being different from the vast majority of the whole world, the contraceptive practicing level in China is not only the outcome of individuals' free will but more likely also being regulated by the Family Planning Policy and regulations central or local government set.

The available researches about contraceptive preference in China are mostly using individual level data collected from questionnaire survey, conducted by universities or research institutions (Hong et al., 2012; Sudhinaraset et al. 2012; Wang, 2012:2; Zhang et al., 2009; Wang et al., 2007; Zheng et al., 2006). It could not be denied that those researches provide us with an inspiring perspective to view the trend of contraceptive using among Chinese people, but there are three major problems could not be ignored. 1. The sample size and location. Being limited by research budget, the surveys usually are conducted with in one city or one part of the city. Only very limited studies using national survey data which provides sample with around 40000 individuals but still only covers few of different provinces and municipalities. 2. The target groups are not always married couples, which means part of the interviewees are not covered by the current Family Planning Policy System, means the sample is not fit for studying the impact from the policy system. 3. Not many questions are asked regarding the Family Planning Policy since the survey location is fixed and the policy is usually consistent within one city or neighbor cities, which means the previous research failed to take different policy strength into account.

As we know the social economic status are related with one's choice of contraceptive, this thesis will further study how the family planning policy affect the use of contraceptive by using provincial level data of all the 31 regions of mainland China, use social economic factors such as economic growth, education level and urbanization as control variable.

**The research problem of this thesis is to figure out: apart from the social economic status, to what extent does the different Family Planning Policy strength levels effects on people's contraceptive choice.**

Apart from this introduction chapter, the rest of the thesis will be structure as follow: the second chapter will review the previous studies and base on the research problem and previous studies, two hypotheses will be put forward. The third chapter is the data description and introduction of research models. In the fourth chapter results of different models will be analyzed, firstly descriptive analysis showing the trend in the process of changing contraceptive choices and secondly analyzing the results from regression model to explain the impact from different factors in a quantitative way. The fifth chapter will be the conclusion drawn from this research and also with some possibilities for further study.

## 2 Theory and Previous Research

### 2.1 Theory

#### 2.1.1 Social Economic Status and Contraceptive Preference

In the famous article Gary Becker published in 1960, he first proposed the term of “quality of children” and introduced economic theory to explain people’s fertility behavior (Becker, 1960). In his theory and a lot of followed research, Becker and other scholars explained the fertility decline as an outcome of rational choice between quality and quantity of children, provided us the important “Q-Q” model (Becker, 1960; Barro & Becker, 1989). As part of the fertility choice, contraceptive use is highly researched since it is the most efficient way to achieve the goal of trading quantity of children to their quality. Modern contraception is considered the best way to fulfill the family planning (Cleland et al., 2006).

In the dissertation in year 1984, Norwegian demographer Helge Brunborg introduced a model of measuring the probability of unintended pregnancy, which is:

Probability of unintended pregnancy = the probability of getting pregnant without contraceptive (r) \* frequency of sex intercourse (S) \* (1-e)

in which e is the effectiveness of contraceptive (Brunborg 1984), which means within every 100 women who use certain contraceptive method, the number of pregnancies within a year (Leridon 1977). From the model we could see that the more efficient the contraceptive is, the smaller the probability of unintended pregnancy will happen. If we assume people only use contraceptive they know how to practice, while different contraceptive methods have different price, the decision making of choosing contraceptive will become the combination of 1. Economic status and 2. Knowledge of contraceptive, for the economic status decides what contraceptive the couple could afford, the knowledge decides within the methods they could afford, which one or ones they will actually use, or the other way around ---- within the contraceptive methods couples know, which one or ones they could afford.

Mavranzouli (2008) proposed a cost-effective model to exam the long-term contraceptive methods, which suggests that the choice of contraceptive is affected by the cost-effectiveness, in another word, under same amount of cost, people choose the most efficient contraceptive method to avoid unintended pregnancy (Mavranzouli 2008). The test reveals that for long-term contraceptive need over 6 years, sterilization is the most cost-effective method, but for women who only plan to have a long birth interval, sterilization should not be their choice. Among long-term reversable contraceptive methods, for women who plan for continuous use under 6 years, IUD is the cheapest choice while implant is the most effective (Mavranzouli

2008). Only for women who are planning to get pregnant soon or do not care for pregnancy, condom is considered as a cost-effective contraceptive method.

Rosenzweig and Schultz developed a model of schooling and contraceptive use in their article published in 1989, where they found that, if the fecundity of a couple is set, then their number of children is a decreasing function of their resource of birth control (Rosenzweig & Schultz 1989). Moreover, their resource is an increasing function of their education years and stock of information. It means the increase of education years will enhance people's ability of understanding information which improve the chance of successfully using contraceptive and thus reduce the chance of unintended pregnancy.

After exam the data, Rosenzweig and Schultz (1989) find that there is a positive relation between women's educational level and their understanding of "allegedly ineffective methods" such as rhythm and withdrawal, which means they have better health and reproductive knowledge to perform complicated contraceptive methods which based on the understanding of menstrual cycle and measure/interpreting body temperature (Rosenzweig & Schultz 1989). The positive relation between women's educational level and use of modern contraceptive is weaker, especially the relation between education and IUD or other long-term contraceptives which doesn't require monthly or even daily trail (Rosenzweig & Schultz 1989).

### 2.1.2 Family Planning Policy and Contraceptive Use

Tabbarah (1964) published a model of effectiveness of birth control and population policy, which suggested the outcome of the population policy which intends in reduce birth rate depends on two parts, first is the ideal number of children of couples the second is the effectiveness of contraceptive. Under the Chinese Family Planning Policy system, the number of children is strictly regulated, so this part does not affect the outcome of policy. As Tabbarah (1964) suggests, if the willingness of fertility is consistent and the family planning policy introduce modern contraceptive to replace the old contraceptive, the reduction of fertility rate depends on the effectiveness of contraceptive. Which is:

Reduction of fertility rate = fertility rate under old contraceptive – fertility rate under new contraceptive

Since the fecundity of married couples are usually consistent, the natural birth interval is also consistent (Tabbarah 1964), the number of births under contraceptive is decided by the 1. Fertility willingness and 2. Unintended pregnancy. As China's Family Planning Policy regulated the fertility choice, to further achieve the goal of reducing fertility rate, unintended pregnancy should also be under control, this is the theoretical reason behind the high rate of using long-term and highly effective contraceptive in China.

In general, an efficient family planning policy is crucial for distributing the knowledge and material of contraceptives, which seems to many people it means going to the family planning service station, but there are already several steps behind, including training the medical staff and planning in how many stations to set, etc. (Health Policy Plus, 2018). An efficiently functioning family planning service station is the support for women to get appropriate

contraceptive service thus prevent unintended pregnancies. As we mentioned, the lower income and educated group could not afford or get access to and understand the use of contraceptives, this is the time when family planning policy system kicks in.

To achieve the best result of policy, long-term contraceptive methods are induced to the vast majority of couples with child/children since those methods, as sterilization and IUD, could not be practiced or removed without help from doctors, it is easy for the Family Planning Officers to record, supervise and keep track on (Li & Cooney, 1993). The characteristics of the long-term contraceptive methods make them the most efficient way of achieving the goal of birth control. For women who already have more than one child, the Family Planning Policy regulates them to accept sterilization since they are not allowed to have more children (Wang, 2012:2; Short et al., 2000), only a small part of them could apply for reproducing again. For women with one child, they can choose between sterilization and IUD, between which most of them choose to use IUD (Wang, 2012:2). Only for those couples who have no child, condoms or oral contraception are suggested to use for them to postpone the child-bearing age.

## 2.2 Previous Research

Many scholars did a lot of researches regarding the contraceptive preference and family planning policy. They could roughly be divided into two different categories. The first one is the studies focusing on the social economic factors to analyze how do they affect the individuals' contraceptive choice. And the second one is the studies tried to explain the Family Planning Policy in China and how did it regulate the fertility level along with contraceptive practice. These two parts of literature will be reviewed separately.

### 2.2.1 Social Economic Status and Contraceptive Preference

Education and income level are two major factors of the individual social economic status. Studies carried out by a lot of scholars also showed those are two significant factors behind the contraceptive choice. Using survey data from Turkey, Koc (2000) found that the educational level of both the spouses is highly related with the using of contraceptive, especially the education of women is a stronger prediction of what contraceptive method they will choose. It is also confirmed by the survey data from Zimbabwe (Demography and Health Survey 2015) that the more educated women are more likely to combine different contraceptive methods together to achieve the better outcome of family planning, the unintended pregnancy rate for higher educated women is lower while the birth interval is longer.

Achana et al. (2015) using survey data from Upper East region of Ghana also found that the contraceptive using rate increased from 12% to 21% with the change of education from elementary school to middle/high school, while the wealth status also affects the using rate of contraceptive clearly. Same study (Achana et al. 2015) also showed that by improving the economic status from poor to better status, the using rate of contraceptive increased over 4%. Islam et al. (2016) also came out with same conclusion while studying how the employment status affects the contraceptive choice for women in Bangladesh, found that the employed women are more likely to use contraceptive since they have the better odd to be more educated and with a better financial situation. The education level again found significant in one's



contraceptive preference, along with the number of children, region and residence area. More educated women are capable to understand their period cycle so they could use modern contraceptive more efficiently.

Suggested by several scholars, the distance from contraceptive service station is another very important factor that related to the chance of practicing contraceptive (Magadi & Curtis 2003; Njogu 1991). Living within 2 kilometers from places where people could get contraceptive service is crucial (Islam et al. 2016; Degraff et al. 1997) which increase the chance of using modern contraceptives by 4% (Achana et al. 2015). Thus, it is highly related with the urbanization rate since it is usually easy to set services stations in the city or even in the communities, rather than in the vast rural area.

Using data from early 1990s and recent, Pradhan and Dwivedi (2019) found that the determinants of contraceptive preference have not been changed in India, as education, number of living son and household financial status along with region played a significant role. Mentioning the number of living son as a determinant of contraceptive use, it is also clear that it is related with son preference. As the economic development level goes higher, the son preference will decrease (Gupta et al. 2003). Urbanization rate again is related since there are more office jobs in city area that doesn't require manual labor, increasing the level of gender equality.

Not only internationally, but also Chinese scholars have drawn similar conclusions from studies conducted in different regions. Wang Cuntong (2016) using individual level data from China's National Family Planning and Reproductive Health Survey found that women with college and above education will show a preference for short-term contraceptive, and more likely to use more than one contraceptive method at the same time. Meanwhile, since women who live in urban area have better access to both contraceptive knowledge and service, they have the higher rate of using IUD, oral contraception or condoms (Wang 2016). The same trend also showed up in rural area. Women with higher level of education or have the experience of living in urban areas have a better rate of using shorter-term contraceptives while their lower-educated counterpart have a higher rate of accepting sterilization (Cai et al. 2010).

### 2.2.2 Family Planning Policy and Contraceptive Use

Since the main goal of launching Family Planning Policy is to control the fast increasing of Chinese population, as the most efficient way to achieve that, contraceptive has been very much promoted by the government along with the restrained number of children. In the early 1970s, central government has already come up with the suggestion of couples are encouraged to have fewer children with a longer birth interval, at that time the contraceptive medication and tools are free for collection at local health center or community offices (Wang 2016). But as the population growth did not show a clear trend of slowing down, in the 1980s, the most strict Family Planning Policy and contraceptive regulation has been put into effect, for women with one child they could choose to use IUD or get sterilized but in fact a lot of them are forced or at least strongly suggested to get sterilized. For couples with more than one child, one of them has to accept sterilization (Zhang 2016; Kane 1999; Wang et al. 1998; Lapham 1995). For those years, the contraceptive married couple get are most likely decided by the Family Planning Officers. On top of that, couples do not accept long-term contraceptive will facing a series of punishment, including financial fees, interrupted career, sometimes even not able to have their child enrolled for elementary school (Zhu 2003; Hardee-Cleaveland & Banister 1988). With this

high pressure regulation, the contraceptive practicing rate of China reached a very high level by over 90%, and even higher in some regions.

As China is with a huge population and 31 provinces and municipalities which all have their own regional jurisdiction, the general and national Family Planning Policy is just the big frame and functions as a guiding role (Wang, 2012:1). Different regions all have their own regional policies under the national guideline, which lead to the imbalance of the policy strength over the mainland China. As mentioned by other scholars, the vast rural area of China has fairly loose regulations comparing to their urban counterparts, and also the northwest China has less regulations restraining the number of children couples should have comparing to the southeast coastal regions (Lee & Feng, 1999).

After China participated in the Cairo Conference of Population and Development, started with 11 cities/counties, the contraceptive education initiative launched in 1995, by offering the married couples the knowledge of different contraceptive methods, including the efficiency and usual complications (Bai et al. 2003; Gu et al. 2002). Wang (2012:2) also suggested that this is the beginning of China's real "contraceptive preference".

It is already clear that the Family Planning Policy has its strong impact on people's contraceptive practice. Some scholars also tried to include the strength of policy system into the analysis of contraceptive preference of Chinese women. By divided the national policy system by time into three stages – tight, moderate and loose – Wang (2012:2) applied individual level national survey data into regression model, using policy strength as categorical variable, found that the tighter policy will lead to higher rate of long-term contraceptive use. Lapham and Mauldin (1995) also created a grading system which scale from 1-120 to analyze the policy strength for countries with population larger than 50 million, and China scored the highest result as 101.1 points.

But as we see here, on the perspective of viewing the whole policy system as a whole, there is not enough research on how to code policy issues and value the policy strength. In fact, China's Family Planning Policy is quite imbalanced for different regions. The two major signatures of the policy system are, first, the policy is always tighter for urban areas, and second, the eastern regions have tighter regulations than the western (Gu et al. 2007; White 1992). When it comes to the implement in difference regions, the diversity of Family Planning Policy becomes more and more complicated.

To draw a brief summary of the literature review, first, it is clear that with both proof from China and other countries, the social economic factors have their impact on the contraceptive preference. Secondly, the Chinese Family Planning Policy System also has a rather stronger effect on contraceptive choice, but since the policies are all in Chinese and varies from different regions, current research methods are limited with questionnaire survey, it is yet to be analyzed that how the policy system along with other factors are going to work on Chinese people's contraceptive practice.

## 2.3 Hypothesis

Though it created unfairness for Chinese people as a whole, the inconsistency of the regional policy and regulations give us two opportunities to study the contraceptive determinants in China.

The first one is from the dimension that to view the Family Planning Policy as a general framework, using regional data to analyze the general effect the Family Planning Policy has on contraceptive practice. As we know, the overall trend of Chinese Family Planning Policy is, despite the regional differences, started strictly and moving toward deregulation. There rarely is example of reinforcement of regulations after 1990. Meanwhile as the previous researches suggest, the social economic factors also have effects on individuals' contraceptive choice, to follow this line we could also assume the economic and social factors work the same way in the regional level.

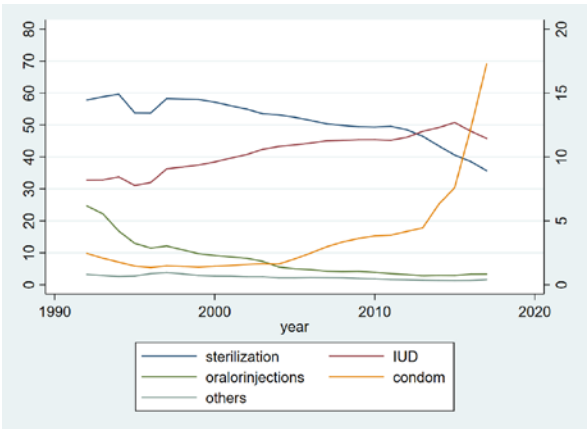
Besides all the factors mentioned before, this research is able to be finalized is thanks to the Hukou, also known as residence registration, system. It regulates that no matter where people move to domestically, their marriage and fertility status are counted in the province they are originally from. It is very difficult to change the registration location, also the marriage registration has to be taken place at either of the couples' Hukou locations. This enhances the reliability for the regional data by making sure the vast majority is counted only once in Family Planning surveys.

Adding all the preconditions together, it comes the first hypothesis, which is:

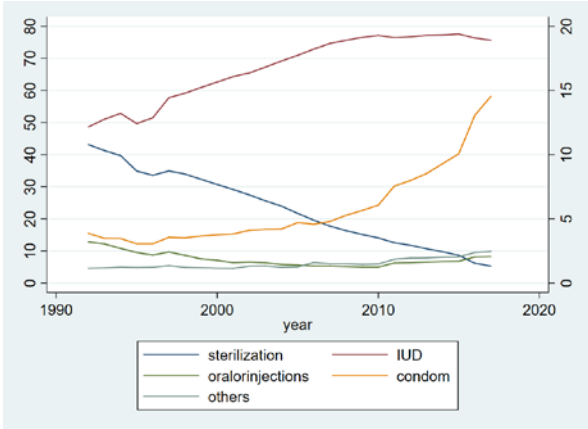
**The practice of contraceptive is not only affected by social economic factors such as education, consumption and urbanization, but also by the Family Planning Policy. People are going to choose reversible methods over irreversible, short-term instead of long-term contraceptive methods with deregulations.**

Figure 1 Using of Contraceptive Methods

1. Anhui



2. Sichuan



Data: National Statistics Agency of People's Republic of China

*Note: The left y-axis is for the rate of taking sterilization and using IUD, the right y-axis is for the rate of using oral contraceptive or injections, condom and other methods.*

The second one is from the dimension that divides the provinces by policy strength. In previous research, Wang (2012) used individual level survey data to exam the determinants of contraceptive preference, divided the Family Planning Policy by three different strength degrees timewise. Unlike Wang's research using national survey data, this research is using the regional data, which gives the chance of dividing the strength levels of Family Planning Policy geographically. As Figure 1 showed, the trend of practicing same contraceptive is consistent but not a straight line, it is usually with different slopes as policy changes. Follow the policy scale, this study groups the observations into three categories, which are tight, moderate and loose. This gives us chance to exam the reason behind the turning point of the curve of contraceptive choice. Then here comes the second hypothesis, which is:

**Different contraceptive methods have different sensitivity to same factors under different policy strength. Contraceptive preferences are more sensitive under loose regulations while tight regulation gives much less space for choosing contraceptive methods.**

# 3 Data

## 3.1 Dataset

As sexual relationship outside marriage considered to be immoral and shameful by conservative Chinese culture also not counted as legal relationship by any law, the official statistics reports do not contain information about the contraceptive practice of unmarried people. This study focuses on provincial level data of mainland China focusing on the contraceptive practice and preference of married couples, using the rate of practicing contraceptive methods as dependent variable. The rate is calculated based on the 1% level survey, using the formula:

Rate of practicing certain contraceptive method = (the number of married women aged between 15-49 (or their spouse) using certain contraceptive method / total number of married women aged between 15-49) \*100%

By using, it is defined as typical use.

For example, the rate of accepted sterilization is having the number of married women aged between 15-49 who or whose husband accept sterilization divided by the total number of women aged 15-49.

The author created panel dataset for all the 31 provinces and municipalities from year 1992 to 2017 (26 years), using the Yearbook of China's Population and Family Planning, published by the National Population and Family Planning Commission (NPFPC); China Population and Employment Statistics Yearbook, published by China's National Statistics Agency Department of Population and Employment Statistics; China Statistical Yearbook by China's National Statistics Agency.

*Table 1 Data Description*

Variable	Obs	Mean	Std.Dev.	Min	Max
Region				1	31
Year				1992	2017
Sterilization	802	36.93	19.87	0.45	72.53
IUD	802	48.60	16.26	14.38	82.37
Oral and injection	802	3.25	5.96	0.03	47.21
Condom	802	9.05	10.59	0.63	80.77
Others	802	1.36	2.63	0.00	28.90
Policy Scale	802	5.15	1.56	1.00	8.00
Education Year	802	7.86	1.40	2.92	12.67
Consumption (1000 Yuan)	802	8.20	8.20	0.60	53.62
Urbanization	802	0.43	0.18	0.13	0.90

Data: National Statistics Agency of People's Republic of China

### 3.1.1 Dependent Variables

This study uses the percentage points of contraceptive methods practicing as dependent variables, including sterilization, IUD, oral contraceptive and injection, condom and other methods.

The practicing rate of sterilization is the sum of both male and female rate of sterilization use. On top of that, the author also calculated the sum of sterilization and IUD practicing rates as the preference for long-term contraceptive. By the characteristics of the IUD, it is considered to be the long-active reversible contraception (LARC) (Sundstrom et al., 2016) since it requires replacement about every 5 years. According to China Statistical Yearbook (China's National Statistics Agency, 2010), there are over 0.286 billion IUDs being used during 1980-2009, which is over 65% of the whole world's using. But most of the women do not know it need to be replaced every 5 to 10 years depends on the type of IUD, the group of IUD-using women who regularly visit gynecologists is not much bigger. So, for most of the Chinese married women, IUD is a long-term contraceptive method which only being taken out when they consider having another child or after menopause. Meanwhile, the enforcement regulation of Family Planning Policy indicates that sterilization and IUD are the two options for women with child/children, which makes those two methods covered over 90% of the total contraceptive practicing rate before 2010 (China's National Statistics Agency, 2017).

The rate of using oral contraceptive and injection is collected and combined together by the statistical agency. In China, oral contraceptive and injections are sometimes used as alternative methods for those who could not adapt to long-term methods, such as being allergic to IUD, having gynecological or other diseases. Meanwhile the willingness and knowledge of using or how to use condom among married men in China is relatively low (Fang et al., 2007), to avoid unwanted pregnancy, part of the married women would choose oral contraceptive or injection as they are reliable and efficient (Rosenberg et al., 1995).

Though condom is the only contraceptive method that preventing both unintended pregnancy and STDs, it is not very popularly used in China especially among the married couples. Even though the percentage rate of using condoms is usually lower among the married people than the unmarried, it is particularly low in China majorly because Chinese people have a fairly high willingness of reproducing, the percentage rate of newly married couples practicing contraceptive is lower. After childbirth most women are suggested to use long-term contraceptives so there is no need to condoms anymore. But we could also see a trend in the condom using that it changed most dramatically in the study's time interval. The national level of using contraceptive increased from 3.88% in 1992 to 18.04% in 2017 (National Statistics Agency, 2018).

All the other contraceptive methods are all counted in as "other methods". It is calculated by the author using data of "implant", "diaphragm" and "others" from the China's Population and Employment Statistics Yearbook. The group practicing other methods is the smallest among all the groups, the national level of using other methods is 1.2% from year 1992 on and the percentage rate keeps dropping (National Statistics Agency, 2018).

### 3.1.2 Independent Variables

There are five independent variables being analyzed in this study, including the scale of Family Planning Policy, education level, consumption level, urbanization rate and year as variable to control time.

Unlike the research of Wang (2006) which divided the strength degree of national Family Planning Policy by time, in this study the author code the policy and regulation issues with different points for calculating the total points for every region every year. For example, the policy issues directly indicate of the number of children a couple should have counted as 3 points, and on top of that, items related to special case scenarios are counted as 1-point addition or deduction. Finally, the points fit into a 1-10 scale, in which 1 point indicates no restrictions on fertility while 10 point indicates strict Family Planning Policy under which every couple in this region could have only one child without exceptions. Most of the provinces landed on 5-6 points which is the 1.5-child policy as mentioned before, which means after year 1992, most of the Chinese provinces have relatively moderate Family Planning Policy, couples, especially couples from rural area could have another child if they fulfill some certain conditions such as they only have one daughter or one of the couple is only-child him/herself. The loosest policy appears in Tibet, the grade varies only from 2 to 1 in the 26 years studied. The strictest policy appears in some heavily populated provinces such as Henan. Averagely, the grade of Family Planning Policy lands at 5.15. Since 2016 the Family Planning Policy has a large scale of deregulation by encouraging married couples to have 2 children, all the provinces are graded with 3 or lower points.

To further analyze the effect policy scale has on contraceptive choice and preference, the author further divide the 1-10 scale into 3 categories. With grade equals to or above 7, the Family Planning Policy is viewed as tight, while grade within 4-6 is moderate and below 4 is loose.

Education is also a very important factor that directly affects the choice of contraceptive. As scholars suggested, more educated people are more capable to choose the right and suitable contraceptive methods thus could efficiently decrease the chance of having unintended pregnancy and STDs. Case in Tibet also proves it as the Family Planning workers send out condoms for couples who do not want more children in Tibet, but a large part of them could not understand how to use and the rate of unintended pregnancy among those people are still very high. Tibet is the region in China that with the lowest education and literacy level, the lack of common knowledge limited the ability of correctly practicing contraceptives of people there.

The average education year is also calculated as an indicator of the education level. The author used data from China's Statistical Yearbook under title "population by educational level of difference regions", "population over 6 years old of different regions" and the length of schooling in Chinese educational system, get the weighted average number of education year for every province every year.

Apart from Tibet, the lowest average length of education appears in Qinghai in year 1992 while the highest that year is Beijing with 7.95. It did not change over time that Qinghai still has the lowest average year of education by 7.97 and Beijing is still on the top with 12.67 years.

For the indicator of economic growth, the author chose the consumption. Usually the GDP growth is also considered to be an indicator of economic growth but it is more in the macro-economic level. Also, the disposable income is another economic indicator widely used especially in the research of individual social economic status. But in this study the author chose

real consumption for mainly two reasons. First, Chinese people have a high preference of savings, which means a good part of their earning goes into the saving account but not being spent, it is not easy to control for different regions. Second, the contraceptive materials are after all consumer goods and the more money people actually spend the more likely they will actually consume contraceptive materials. The change of real consumption is also a reflection of the change in the concept of consumption of Chinese people. Also, since the figure of consumption shows an obvious curve, the squared consumption is also added to simulate the curve in regression.

Along with the launch of Family Planning Policy, the transformation of Chinese economy also began in late 1970s. One of the trends is the fast urbanization. By the end of year 2011, the urbanization rate of China reached 50% and with the central government still promoting urbanization, the rate in the most developed regions are reaching 80%. Even though it is still difficult for the domestic migrants to re-register their residence permanently, the process of urbanization brings rural residents into the city life and there they are better exposed in the modern culture and have better chance to get information about modern contraceptive.

Beside from all the variables, the author chose to use year as the control variable for time. As information need time to spread so does the knowledge of contraceptive, experience could be passed within family line, to add a time control variable could except this effect apart from all the independent variables mentioned above.

## 3.2 Model

Using STATA 15.0 to manage and analyze the data, there are two different paths could be applied to the current dataset. The first one is the OLS model and the second one is using Fixed Effects (FE) model.

$$\text{Contraceptive method} = \alpha + \beta_1 \text{ Policy Strength} + \beta_2 \text{ Education year} + \beta_3 \text{ Consumption} + \beta_4 \text{ Consumption}^2 + \beta_5 \text{ Urbanization rate} + \beta_6 \text{ Year} + \epsilon_i$$

Following the first path, in the linear regression model, the dependent variable is the using rate (%) of different contraceptive methods. Independent variables include the policy strength categorical variable, which is the main variable of the research, adding average education years, annual consumption (1000 Yuan), urbanization rate (%) and year as control. Within the control variables, the squared consumption is also introduced to simulate the curve of consumption change over time.

Also, for the “sterilization”, “oral contraceptive and injection” and “condom”, there will be three more regressions run by controlling the strength degree of Family Planning Policy to exam the sensitivity of contraceptive methods to same factors under different policy strength level.

The second path is the FE model, by setting provinces and municipalities as panels, there are in total 31 groups. Using Fixed Effects command in STATA, the same regression formula is used but to particularly exam the association between changes of independent variable and dependent variable within groups. Unlike the OLS model which exams the overall effects across all the provinces, the FE model is focusing on the effects within provinces. The results of the regressions are going to be displayed and discussed in the next chapter.



# 4 Result and Discussion

## 4.1 Descriptive Statistical Analysis

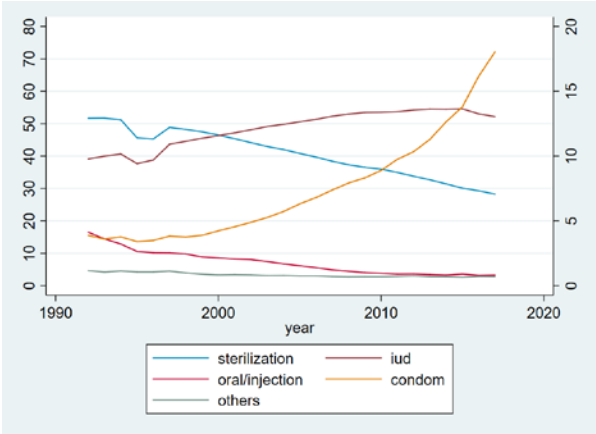
As mentioned above, to fulfill the most important and original goal of Family Planning Policy, the population control, contraceptive methods are practiced massively within the married couples, some of them are free of charge and mandatory. Especially the large amount uses of sterilization and IUD created the largest population in the world that practicing those long- and mid- term contraceptives.

### 4.1.1 Trend in practicing

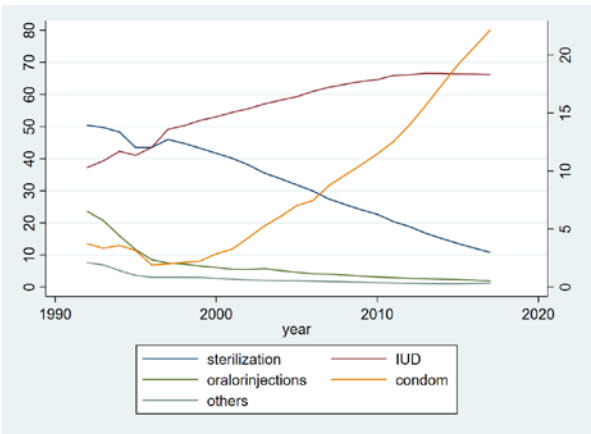
#### 1. Overall

Figure 2 Overall Contraceptive Preference

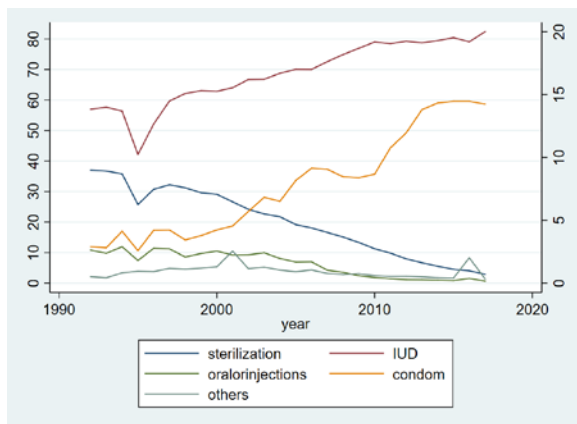
#### 1. National



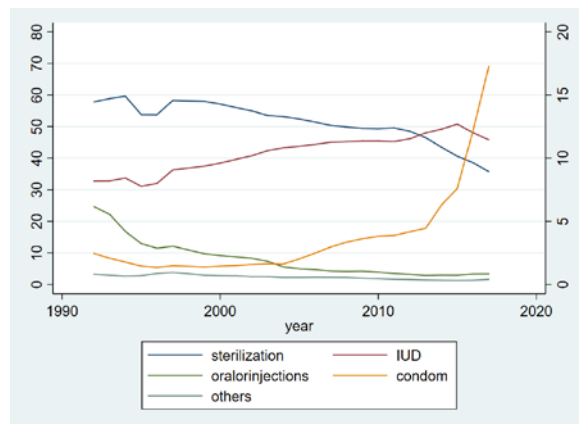
#### 2. Inner Mongolia



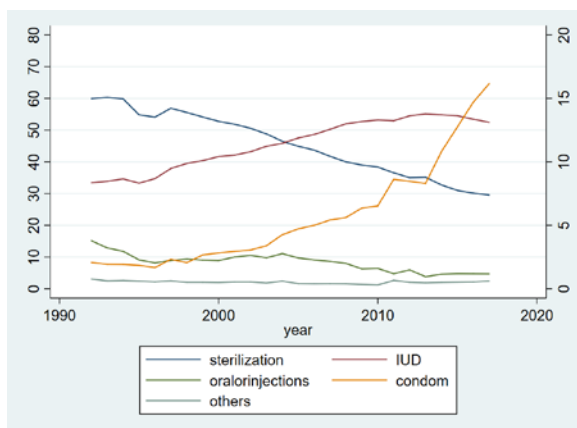
### 3. Jilin



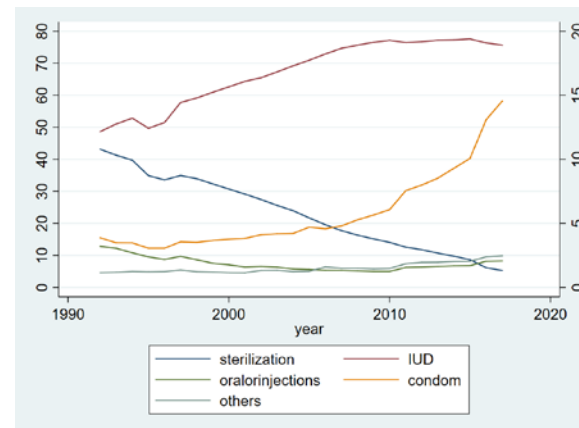
### 4. Anhui



### 5. Hubei



### 6. Sichuan



Data: National Statistics Agency of People's Republic of China

Figure 2 showed the trend of different contraceptive practicing for national level and 5 different provinces, from year 1992 to 2017. To make the trend clearer, the author plotted the data into two y-axes, the left one is for sterilization and IUD since they are the most used contraceptive methods in China and the percentage rate of practicing is much higher than the others. For the right y-axis, the rate of using oral contraceptive and injection, using condom and using other methods are plotted in.

The overall contraceptive practicing rate of China did not change much over the 26 years, but the rate of using different methods changed rather dramatically. Except condom and other methods which are quite stable, all the other methods saw a dip during year 1995 and 1996. This is majorly because that China participated the International Conference of Population and Development that held in Cairo in September 1994. The joint agreement made emphasized on the reproducing health and gentle family planning. From year 1995 on, China started to launch the more humanistic Family Planning Policy by providing education about different contraceptive methods to married women and open the window for personally choosing preferred method. Before that, the contraceptive method couple should use was basically decided by local Family Planning Officers and a large scale of couples do not get educated with the different characteristics of methods.

But unfortunately, because of the officers' evaluation system did not change along with the policy, total long-term contraceptive practicing rate is still a crucial indicator of assess the performance of Family Planning Officers, the lowered long-term contraceptive using did not last long. But as sterilization is no longer mandatory for most couples with child/children, IUD gradually became the first choice, seeing a significant growth, while the percentage rate of accepting sterilization decreases constantly. By the year 2017, only 28.26% of the married couple are sterilized, and using rate of IUD reached 52.18%.

Let's now move to the right y-axis to see what happen to the relatively shorter-term contraceptive methods. The most eye-catching change happened with condom. The practicing rate of condom among married couples raised from 3.88% in 1992 to 18.04% in year 2017 and the group of using condom grow even faster after 2001, seeing 0.5-1% increase every year. It is not randomly happened but also comes along with the policy change. During year 2002-2005, most of the provinces revised local laws and regulations of Family Planning Policy, added new deregulations such as couples who are both only-child are allowed to apply for having a second child. Unlike the former deregulations usually focus on only rural or urban area, this round of revise covered both rural and urban population. Feeling the hope for further deregulation, which actually did not happen soon, the attention for reproducing came back to the vast land of China. As preparing for the second child, some couple who fit in the new deregulation started to choose short-term contraceptive. Meanwhile, as part of the new Family Planning method, convenient condom vending machines are placed in the cities especially in the more developed cities such as Suzhou installed over 1700 condom vending machines in 2005 (Sohu News, 2016), encouraged people using condoms by displaying the choice in front of them.

Unlike most of the western countries, oral contraception is not well known and used in China. A large part of women still see oral contraception equals to emergency contraception, so the practicing rate among married couples are even lower.

As we could tell from the national level data, the rate of accepting sterilization has been through a three-stages change over the 26 years between 1992 and 2017. Firstly, it saw a dip before 1997, followed by a slight arise in year 1997 and 1998, finally has been ever-decreasing from year 1999 on.

To be more specific about the trend of using contraceptive and the control variables, 5 provinces are picked and data is also plotted into figures. Those 5 provinces are Inner Mongolia, Jilin, Anhui, Hubei and Sichuan, representing the north, northeast, east, inner and west China. Within those 5 provinces we can see even though they have different absolute rate of using different contraceptive methods, the trend is quite similar, for sterilization sees a decreasing in the 26 years while condom using sees a dramatic increase since mid-2010s. Within these 5 provinces, the data of Hubei is going to be specifically analyzed while using other provinces as reference. The first reason is the trend of contraceptive using is highly consistent with national and a lot of other provinces, which makes it a proper representative. The second reason is the family planning policy has been through a three-step change with the 26 years studied, the policy strength sees a change from tight to moderate to loosen, which also makes Hubei a epitome of the change of China's Family Planning Policy.

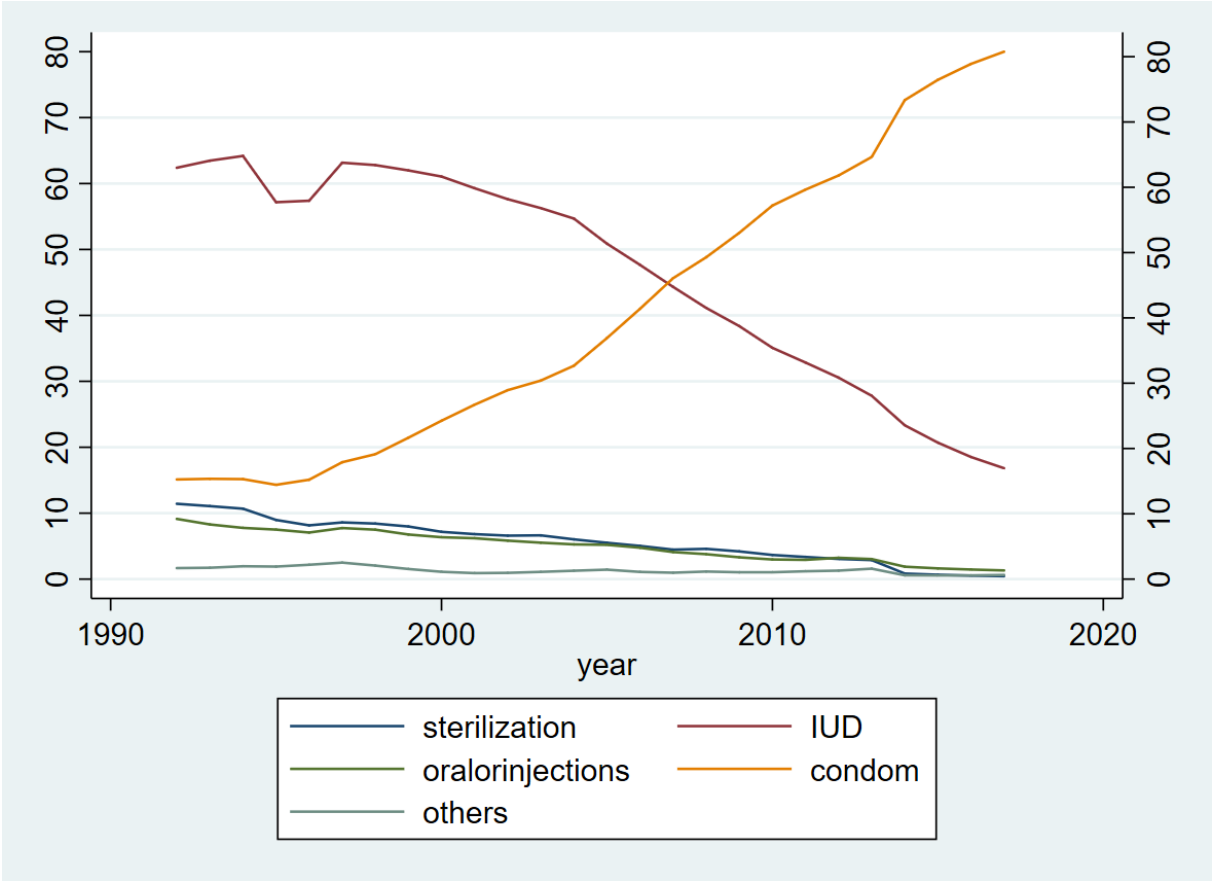
Hubei is a medium sized province in middle China, the total population in 1992 is 55.7 million and 59 million in year 2017, as it started with less than 26 million population in 1949 (China's National Statistic Agency, 2018), we could see the increasing rate was very high before the Family Planning Policy. Now the population of Hunan is ranking the 9th among provinces and municipalities of mainland China (China's National Statistic Agency, 2018).

The general trend of using contraceptive is consistent with national level data, as sterilization and IUD are combined as long-term contraceptive here, it is clearer that the long-term contraceptive practicing maintained a stable level between 1997 and 2002, started to drop since 2003, exactly the time that the provincial regulation of Family Planning was revised.

As Hubei is a populated province with high level of population growth rate averagely reached 2% (Statistics Agency of Hubei Province, 2018), after the launching of Family Planning Policy, the strength level of the policy kept in a relatively high level, by the year 2017 the growth rate of population in Hubei is 0.56%. The high-level practicing of long-term contraceptive especially the sterilization contributed a lot. As we could see from the figure, the rate of accepting sterilization is as high as 60% by year 1992, and though the rate dropped to 29.57% in 2017, the total percentage rate of using long-term contraceptive is still higher than 80%.

For all the other 4 provinces, though the rate of using different methods varies, the general trend is the rate of accepting long-term contraceptive is much higher than condom and other methods. But there are some of the outliers. For example, Tibet has a dramatically high rate of using oral contraception and injections, while Beijing has a very low rate of sterilization but the condom using reached 80% in mid-2010s.

Figure 3 Contraceptive Preference of Beijing



Data: National Statistics Agency of People’s Republic of China

If we see the figure of Beijing, it is dramatically different from the ones above. As the capital city of People’s Republic of China, Beijing’s population is very small comparing to a lot of other provinces and the education level of Beijing stayed at the top after the founding of PR

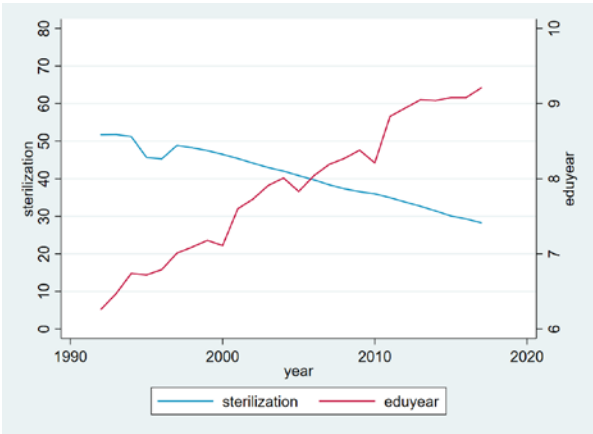
China. Different from other regions, Beijing has a very unique pattern of practicing contraceptive, which is extinctic with very low level of accepting sterilization and the proportion of population using condom is very large, started with 15.26% in 1992 which is even higher than some other provinces in 2017, ends up with 80.77% of married couples using condom as their main or only way of contraception.

From the contraceptive practice of Hubei and Beijing, it is clear that the regional Family Planning policy and regulations varies significantly for both stipulation and operation. It is necessary to exam to what extend that regional Family Planning Policy affects the contraceptive choice and preference.

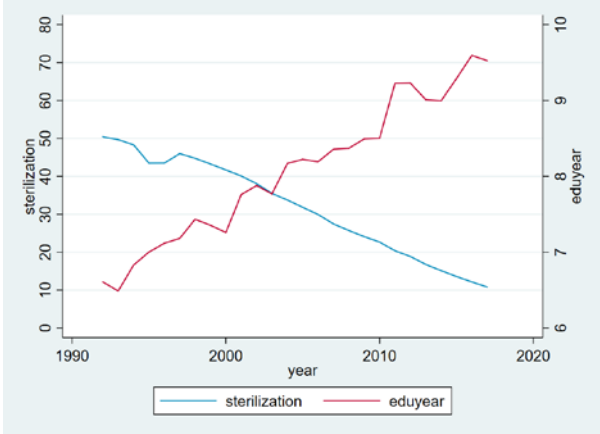
2. Sterilization

Figure 4 Sterilization and Education Level

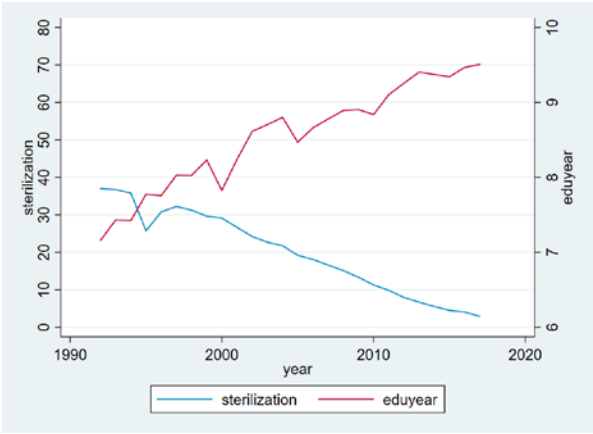
1. National



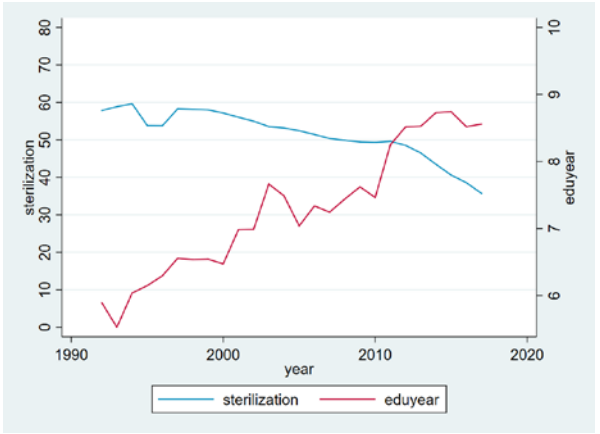
2. Inner Mongolia



3. Jilin



4. Anhui



5. Hubei

6. Sichuan



Data: National Statistics Agency of People’s Republic of China

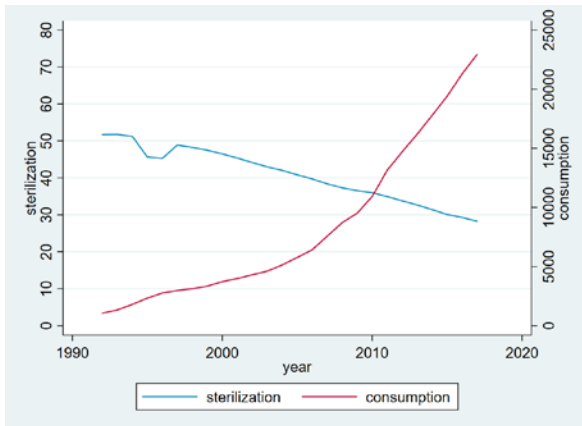
It could be told from the figure 4, the sterilization rate and education years showed in two curves presented in an X shape for both national level and provincial level. As analyzed before, the sterilization rate dropped dramatically in the 26 years that studied. Sterilization was the most practiced contraceptive method in year 1992 and it exchanged position with IUD in 2017. Meanwhile, the average years of education saw a growth from over 6 to over 9 years, which means by the year 1992, the average level of education is elementary school and by the end of 2017 it popped up to middle school.

The current nine years compulsory education system has been induced in year 1986. By the Compulsory Education Law of People’s Republic of China, most regions should have the system launched by the end of 1990s. As education system always needs economic development to back up, all the coastal and more developed regions have the system efficiently working while the inner land regions have some trouble to perfectly induce the system.

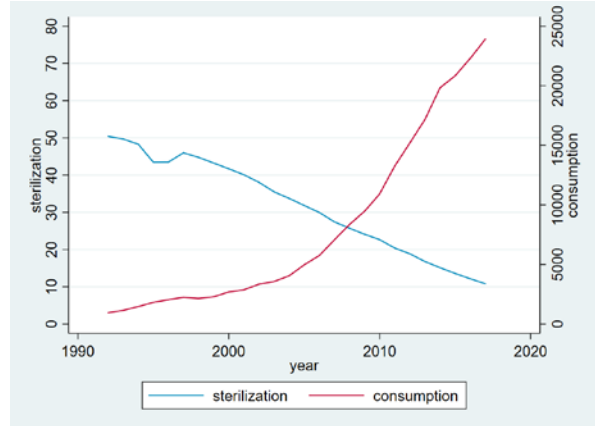
Economic-wise, Hubei is ranking around the 7th in the 2010s but as the level of development being quite imbalanced, the remote and poor areas still have difficulty to fulfill the requirement of nine years compulsory education, so it leads to the situation that the average education level is about middle school while the average level of Beijing and Shanghai, Jiangsu are reaching 12 years. As the ability of understanding the pros and cons of different contraceptive method is growing with education years, the increase of education level should lead to the increase of average level of practicing contraceptive corrected in Hubei Province during these 26 years.

Figure 5 Sterilization and Consumption

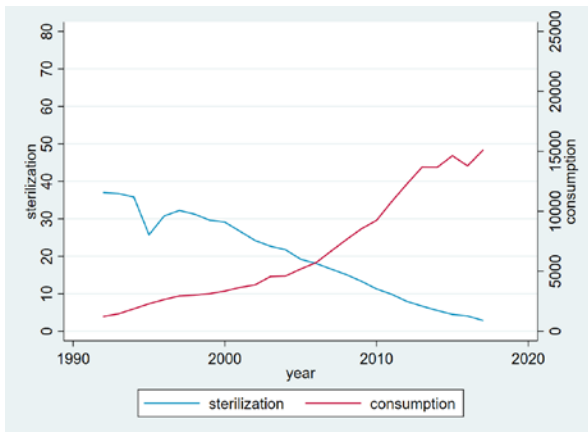
1. National



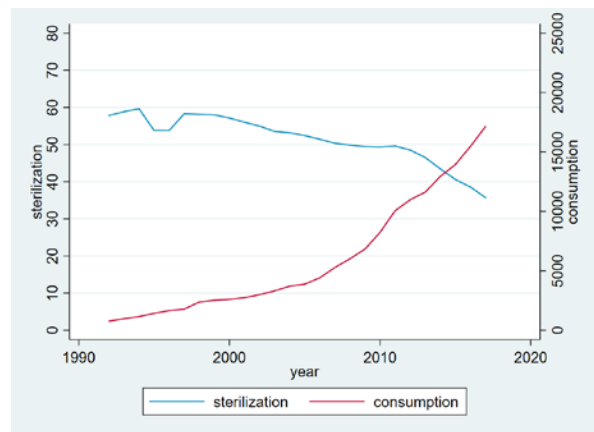
2. Inner Mongolia



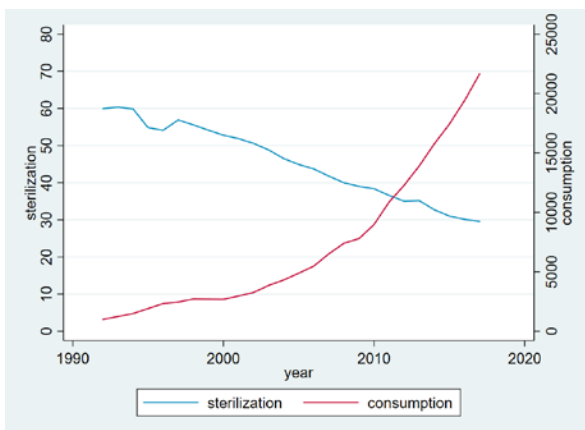
3. Jilin



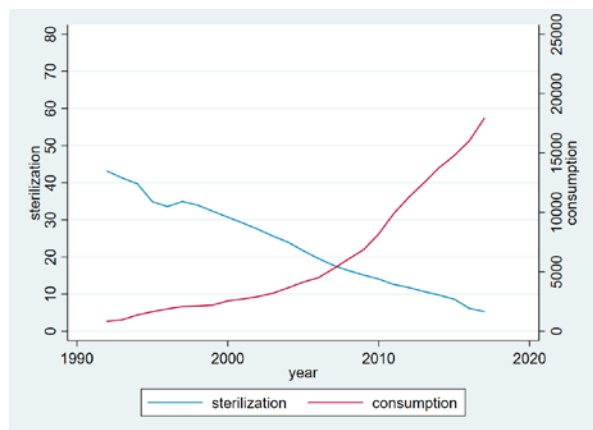
4. Anhui



5. Hubei



6. Sichuan



Data: National Statistics Agency of People's Republic of China

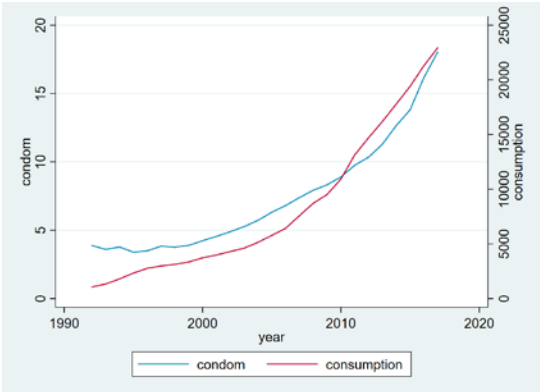
Similar to the figure of sterilization and education, figure 5 also showed the same trend of real consumptions. As mentioned before, means of contraceptive is one kind of consumption goods, so the consumption level should have an effect on the contraceptive choice. In China, married couples could get the long-term contraceptive in local hospital and Family Planning Service

Station for free while they also have their own choice to use the brand that is not covered by the Family Planning Budget, which are often imported from western countries and more advanced. As the consumption level increase, couples will be more capable to afford the more modern type of contraceptive which are also with less complications and more efficient.

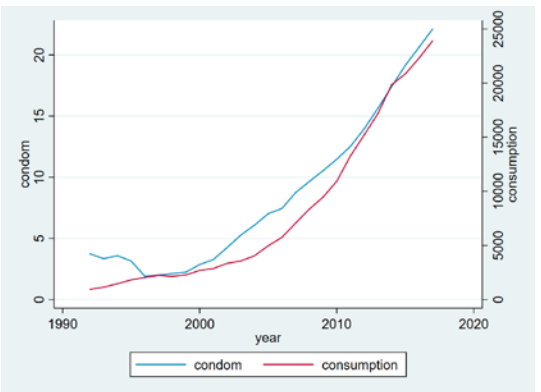
3. Condoms

Figure 6 Condom Use and Consumption

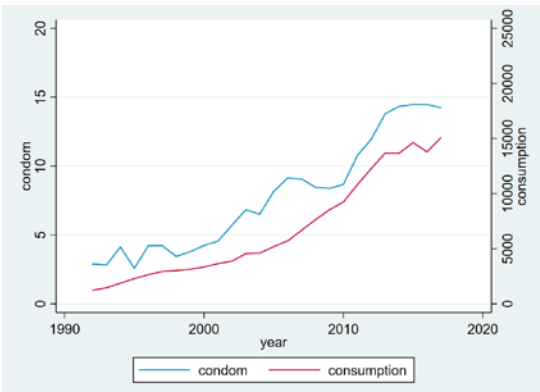
1. National



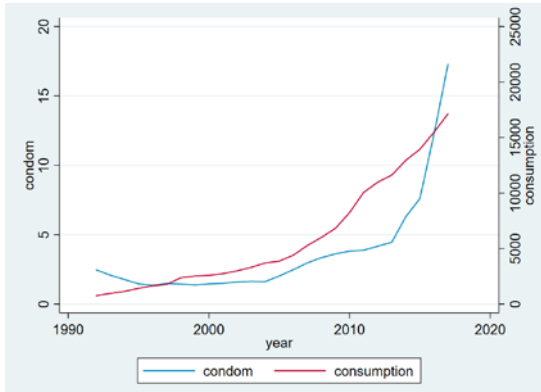
2. Inner Mongolia



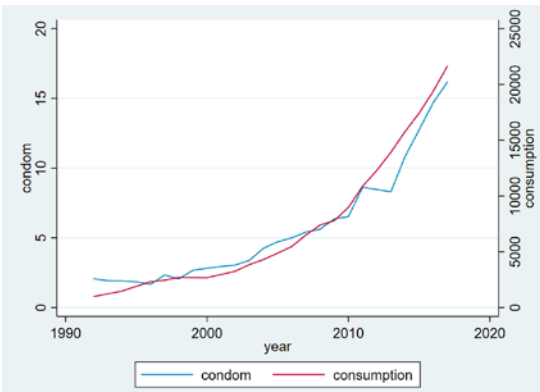
3. Jilin



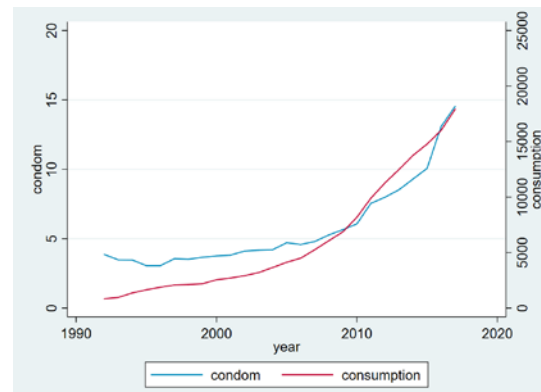
4. Anhui



5. Hubei



6. Sichuan



Data: National Statistics Agency of People’s Republic of China



Unlike the sterilization and IUD, which people do not need to change the device for a long time after practicing, condoms are more consumable. Though couples could get them for free from the Family Planning Service Station, most of them feel uncomfortable visiting regularly. This leads to the fact that most of the couples buy their own condoms at grocery store or pharmacy, which means this part of expenditure is not covered by the budget of Family Planning Policy, and it is highly related to the couples' consumption rate. As we could see from figure 6, the curves of condom practicing and real consumption level are highly coincident, except Inner Mongolia which sees a sharp increase in condom using since early 2000s, other provinces and also the national data shows a slow growth before 2010 but fast afterwards.

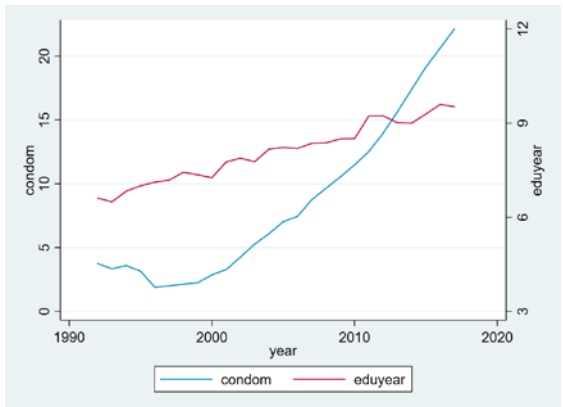
From year 1992 to 2002, the practicing rate of condom in Hubei Province is very low, stays between 2-3%, but since 2003, this rate increases fast by averagely 0.5% per year until it takes off in year 2011 by an over 2% increase. With the same trend we can see from the figure, year 2003 is also the time for real consumption level in Hubei to increase much faster than before. It stayed below 3200 RMB personally per year until it reaches 3800 RMB in 2003, by the end of 2017, the personally annual consumption reaches 21000 RMB.

Figure 7 Condom Use and Education Level

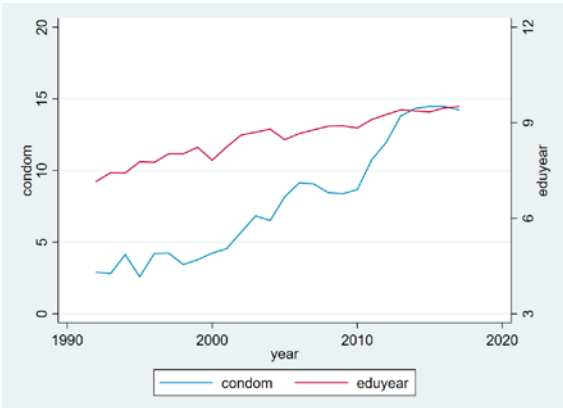
1. National



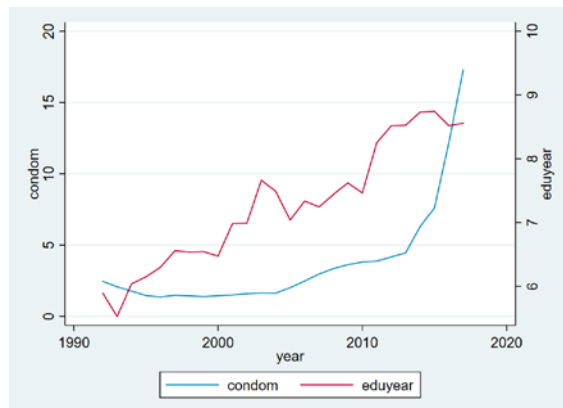
2. Inner Mongolia



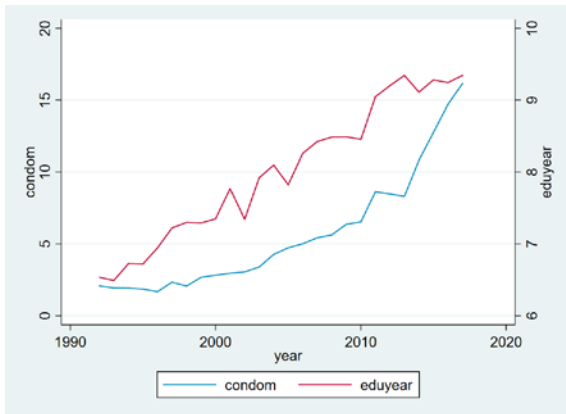
3. Jilin



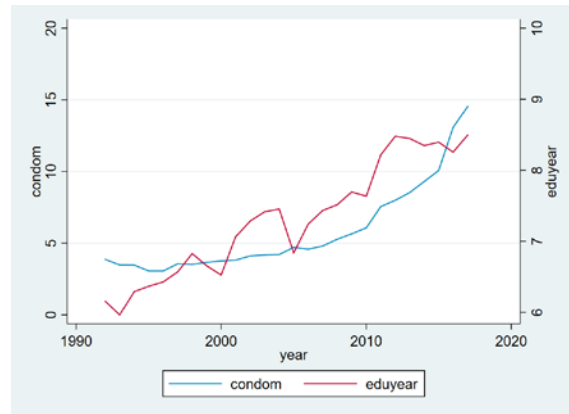
4. Anhui



## 5. Hubei



## 6. Sichuan



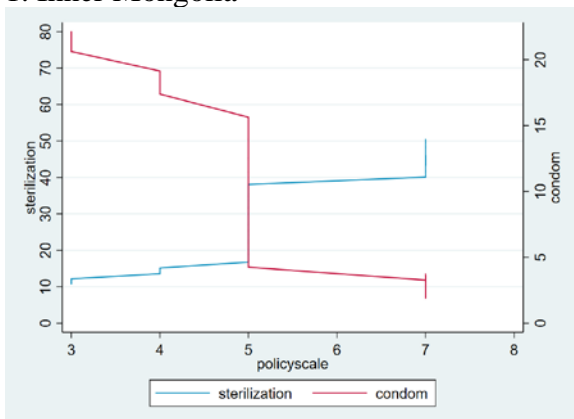
Data: National Statistics Agency of People's Republic of China

As the figure shows, the curves of condom using and average education years has a similar increasing trend. Unlike the education years grows in a fairly consistent rate, the using of condoms saw a more curved trend of increasing. Also, it could be told from the figure that except Sichuan Province, for the other figures, the two curves create a gap, a reasonable explanation could be there is a time lag between the increasing of education level and condom using. It is much clearer if we divide the 26 years into several smaller intervals. For example, in Hubei Province, from year 1992 to 1997, the average education years increase about 0.8 year, while the rate of condom using stayed stable around 1.8%. Then the education level entered a period of fluctuating but relatively stable period which stayed around 7.5 years until 2003, where the using rate of condom increased 1%. This trend is repeated after 2010 while the education rate increases more significantly the rate of using condom stays stable, and when the education level stays stable after 2013, the rate of married couples using condom increased dramatically.

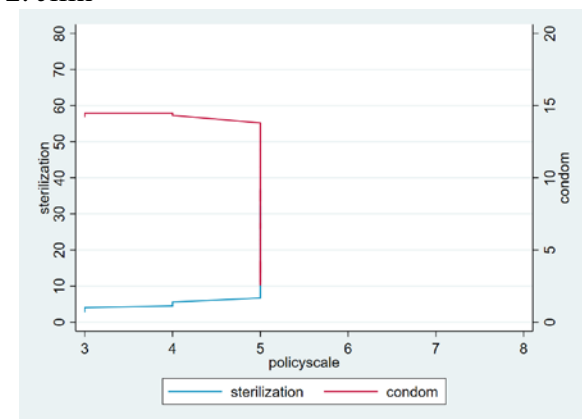
## 4. Policy and Contraceptive

Figure 8 Sterilization, Condoms and Policy Scale

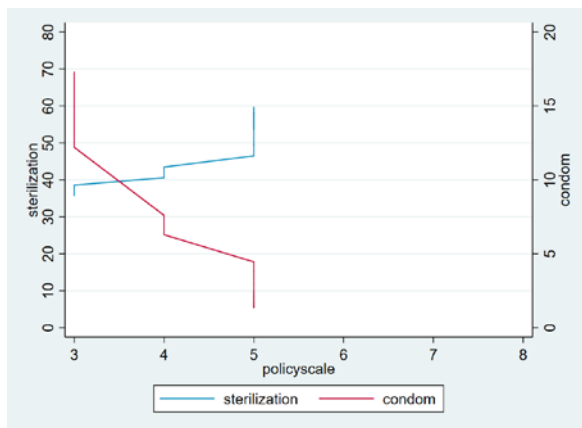
### 1. Inner Mongolia



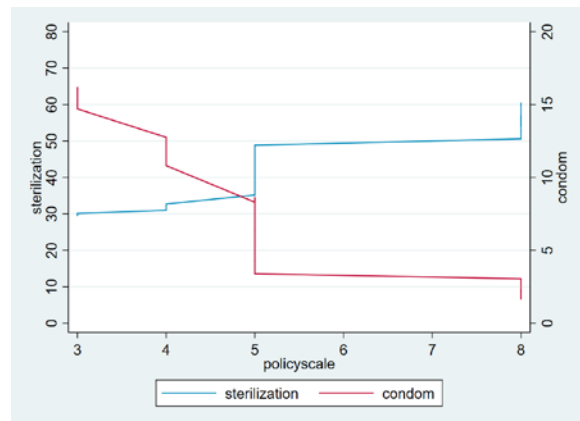
### 2. Jilin



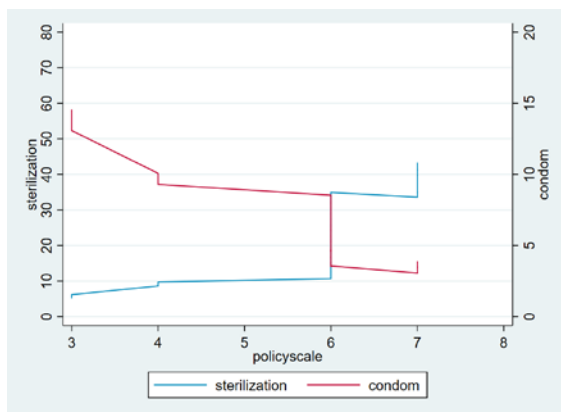
### 3. Anhui



### 4. Hubei



### 5. Sichuan



Data: National Statistics Agency of People’s Republic of China

Figure 8 is showing the trend of sterilization and condom use under different policy strength. The left axis is the percentage rate of accepting sterilization among married couples while the right axis is the rate of using condom. The x-axis is the policy scale from 3 points to 8 point, indicating the policy strength from loose (3 points) to moderate (4-6 points) and tight (7 points and above).

It is very clear that as examples of long-term and short-term contraceptive methods respectively, sterilization and condom show very different trends regarding the policy scale, as they showed a X shaped curve in the figure except for Jilin Province. As the policy goes tighter, the rate of sterilization goes in an increasing trend, means the control of number of children will increase the using of sterilization or long-term contraceptive method since people are not going to have more children, long-term contraceptive is the more convenient and efficient choice. If we see the policy scale in a reversed direction, the short-term contraceptive, represented by condom, is going in an increase trend with deregulations since people are more likely to plan for more children, or would rather “wait and see”. It is much easier to stop using condom and prepare for pregnancy than using any long-term contraceptive, as it is usually suggested to wait for at least 3 months after removing long-term contraceptive before getting pregnant.

The figures also show that the policy strength varies a lot for different provinces as Hubei sees a policy strength from 8 to 3 while for Jilin it is from 5 to 3 within the same 26 years.

## 4.2 Regression Result

### 4.2.1 Results of overall linear regression

Since the Family Planning Policy has been through several rounds of deregulations both nationally and regionally, and the social economic factors also kept changing, it is not easy to tell to what extent the practicing of different methods are affected by the policy or other factors as education, especially the economic development level along with the strength of Family Planning Policy are different and imbalanced between those regions.

As introduced above, in most of the countries there is no Family Planning Policy, the contraceptive preference is majorly under the effects of social economic status of individuals. To exam how the policy strength and other social economic factors are relating to the practicing of different contraceptive methods, a linear regression is run to find that out.

*Table 2 Result of OLS Regression*

	Sterilization	IUD	Oral and injections	Condom	Others
Policy Strength					
Moderate	16.11***	-4.58***	-5.09***	-3.75***	-2.05***
Tight	19.43***	-4.38**	-6.87***	-4.74***	-2.55***
Education Year	-0.15	4.93***	-4.21***	1.13***	-1.34***
Consumption	-1.25***	0.27	0.16*	0.58***	-0.10
Consumption <sup>2</sup>	0.02***	-0.03***	0.001	0.001***	0.001
Urbanization Rate	-0.58***	0.25***	0.17***	0.14***	0.40***
Year	0.78***	-0.02	-0.12***	-0.47***	0.04*
Constant	-1516.86	43.49	247.69	941.86	-75.68
R-squared	0.43	0.31	0.53	0.71	0.33
Adj R-squared	0.43	0.30	0.52	0.70	0.33
F-statistic	86.43	50.27	126.70	273.15	56.22
Prob>(F-statistic)	0.0001	0.0001	0.0001	0.0001	0.0001

Note: N=802, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

First of all, the results of the regression model are highly significant, as we can tell from the table. As the results show, policy scale has a very significant effect on almost all the contraceptive methods, except the IUD. The reason could be that under the Family Planning Policy, couple with 2 children have to accept sterilization no matter if they want or not, but for couples with only 1 child, they could choose between sterilization and IUD and after 1995, the new regulation gave couples some certain freedom to choose the contraceptive they prefer if they have only one child. So, the practicing of sterilization is more under the adjustment of policy.

If the policy strength increases from loose to moderate, it will lead to 16.11% increase in accepting sterilization and 19.43% increase while it goes from loose to tight. Meanwhile, with a tighter family planning policy strength, the rate of using oral contraception or injections will decrease. For policy goes from loose to moderate, the using of oral contraception and injections will drop by 5.09%, and if it goes to tight, this decrease will be 6.87%

While moving to education years, the effect on sterilization is not significant but one-year additional education will lead to an almost 5% increase in IUD using which is the largest among all the methods. It means when people have the freedom to choose between sterilization, IUD and other contraceptive methods, people with better knowledge are more likely to choose or have better understanding of IUD, which is one of the most efficient contraceptive methods. Also, the increasing in education years will help people to have better use of condoms.

The real consumption has negative effect on long-term contraceptive and being positive in encouraging condom using. Every 1000 Yuan increase in personal annual consumption will decrease the using of sterilization by 1.25% and increase the use of condom by 0.58%. This confirmed our assumption that as a consumption good, the use of condom is related to the consumption level. Since the long-term contraception is mostly free of charge, when people's consumption level is low, they will be more willing to accept long-term contraceptive.

What is also consistent with the assumption from the previous part is the urbanization rate has a slight effect on both long-term and short-term contraceptive methods' practicing. With 1% increase of urbanization, the percentage rate of accepting sterilization will decrease by 0.58%, but it is worth noting that it will increase the use of IUD. Meanwhile the use of condom will also increase by 0.14%. The result suggests that the urbanization rate has a slight but sure effect on preference of different contraceptive methods. As the household register system made it hard to change the location of registration for people, the modern lifestyle still has its own impact when it comes to decide the contraceptive method one prefer.

This regression results confirm the first hypothesis that when the policy is tight, people are more likely to use long-term and probably irreversible contraceptive since they are the most efficient way of family planning, especially to control the fertility rate. And with loose policy, the fertility willingness will drive people to choose reversible or shorter-term contraceptive methods to be ready for reproducing.

Another point that is noteworthy is the regression result of other methods. Unlike the others, there is an outlier in the dataset for using implant which is included in the category of "other

methods”, this region is Tibet. As a remote and under-developed province, it has very distinctive rate of using implant as well as oral contraception and injections.

The data of Tibet begins in year 1996 when the rate of using implant is 1.62 while the other provinces are at the level of 0.3%. When it comes to 2014 the rate reached its peak at 19.92% (National Statistics Agency, 2018). Unlike the rate of using oral contraception and injection, which in Tibet the rate of using is also extremely high as it stays stable around 40% after 2000 (National Statistics Agency, 2018), the implant is one of the longer-term contraceptive method which is used for women in Tibet who has a willingness not to have more children. As there is basically no Family Planning Policy for Tibet, the women there suffer from the continuous pregnancy, which makes them have a higher willingness of accept long-term contraceptive. It is also because of the natural geographical characteristic of Tibet, as it is located in plateau mountain area, it is not convenient for Family Planning Officers to visit counties as regularly, and also because of the very low education level, people could not understand how to correctly use most of the short-term contraceptives, so waiting for implant or injections from Family Planning Officers are the normal situation for women there.

There of course will be questions about why they don’t use IUD or sterilization. The reason could be found in the report of Family Planning Officers. First, the conservative idea that people, especially men have in Tibet makes them not willing to accept sterilization or have their wives do. Meanwhile, because of the natural reason, water is very much under supplied in Tibet which means most of the women have serious gynecological diseases which makes them not suitable for using IUD either, so the implant would be the best relatively long-term method they could use.

4.2.2 Result of linear regressions under different policy strength level

Table 3 Average Using Rate of Contraceptives under Different Policy Strength

	Strength of family planning policy		
	Tight	Moderate	Loose
Sterilization	46.46	37.33	23.07
IUD	44.65	49.75	49.39
Oral and injection	2.01	2.30	8.39
Condom	4.79	9.03	14.63
Others	0.76	0.95	3.66
Obs	171	499	132

Data: National Statistics Agency of People’s Republic of China

As the first hypothesis is confirmed by the regression using overall data, now this part will focus on the second hypothesis that assume different contraceptive methods have different sensitivity to same factor under different policy strength level. For example, it could be assumed that the long-term contraceptive methods will be more sensitive to policy scale when the policy is loose. In another word, one point of policy scale increase will increase the use of long-term contraceptive more than when the policy is tight. Basically, this part of regressions will exam

the space left for different contraceptive to react on the change of independent variables under different policy strength.

Table 4 shows the average level of different contraceptive use under different policy strength level. When the policy is tight, the average level of using sterilization and IUD are quite similar, which is around 45%. And the rate of using oral contraception and injection is very low as 2%. The condom using is more popular with the rate being 4.79%. When it's under the moderate policy, which major part of the observations are, the practicing of sterilization dropped about 10% to 37.33% and with loose policy the rate dropped ever more to 23.07%. But the situation is different with IUD, as the policy going from tight to moderate then to loose, the percentage rate of using IUD is only slightly changed.

Suggested by the rate of using oral contraception and injection, we could find that, even though the regressions above showed that oral and injection methods have a negative relation with increase of education level and policy scale, but the positive effect from real consumption and urbanization rate worked out as they both increased dramatically during the 26 years studied, so the national rate of using oral contraception and injection actually increased from 1.99% to 3.29%. The rate of using condom again confirmed with the regression above that this short-term contraceptive method is very sensitive to policy scale, as the policy goes loose the rate of using condom clearly increases very fast from 4.83% to 15.07%.

Table 4 OLS Regression Results under Different Policy Strength

	Sterilization			Oral and injection			Condom		
	Tight	Moderate	Loose	Tight	Moderate	Loose	Tight	Moderate	Loose
Policy Scale	4.79**	1.12	19.46***	0.17	-0.93***	-1.29	-0.59**	-0.01	-7.70***
Education Year	-11.29***	-2.92***	-7.06***	0.15	-0.81***	-1.85***	0.93***	3.28***	2.98***
Consumption	-2.51	-2.30***	1.22	0.22**	0.20***	0.29*	1.02***	0.62***	-0.79*
Consumption <sup>2</sup>	0.03	0.04***	-0.02	-0.004	-0.003***	-0.003	-0.20*	0.01***	0.03***
Urbanization	-0.31***	-0.43***	-0.20	0.02**	0.06***	0.07	0.01	0.08***	0.10
Year	2.07***	1.31***	0.39	-0.29***	-0.29***	-0.59***	-0.25***	-0.69***	0.16
Constant	-4030.36	-2538.87	-773.73	577.05	583.1	1206.13	503.35	1369.34	-304.62
R-Squared	0.54	0.49	0.32	0.6	0.49	0.80	0.68	0.77	0.75
Adj R-Squared	0.53	0.49	0.29	0.59	0.48	0.79	0.66	0.77	0.74
F-Statistic	32.62	79.65	9.72	41.72	78.86	69.97	57.07	277.82	62.31
Prob>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Obs	171	499	132	171	499	132	171	499	132

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5 is showing the regression result of how three types of contraceptive methods “react” to same independent variables under different policy strength level. The three types of contraceptive are sterilization, oral contraception and injection and condom.

As assumed before, the policy scale has a bigger effect on all the contraceptive methods when the policy strength is loose. In another word, when the policy is loose, there is more space for policy to adjust the contraceptive preference. When the policy is already tight, the contraceptive is tightly regulated, there is no more space for increasing the long-term method practicing rate

by adjusting policy. For sterilization, when the policy is loose, every one-point increase in policy scale will lead to an over 19% increase. As for the government in practical application, if the fertility rate in, for example, Xinjiang Province needs to get controlled, the most efficient way is to tighten the policy.

For sterilization, education year is significant, one more year of education will reduce the rate of accepting sterilization by 2.92%. Meanwhile it is highly significant with condom using. When the policy is tight, one more year increase in average education will increase almost 1% of condom using, and with deregulation to moderate level, the increase will be 3.28%. With loose policy, one more year of education will increase the using rate of condoms for 2.98%.

For all the three types of contraceptive methods each under three different policy strength levels, consumption stayed as a highly significant factor that has not huge but sure effects on people's choice of contraceptive. With tight policy, every one thousand Yuan increase in personal annual consumption will reduce the using of long-term methods by around 2.5%, but increase the use of oral and injecting contraception and condom. When the Family Planning Policy deregulated to moderate level, the consumption increases in every thousand Yuan will reduce the using of sterilization by 2.3%, while the increased rate of oral and injection and condom is quite slight.

Even though the coefficients of real consumption are small, not as dramatic as policy scale under loose strength, but as China saw a huge economic development from the early 1990s, the actually change made is big. It is the same for urbanization rate. The big cities in China such as Beijing and Shanghai, the urbanization rate reaches 80% level nowadays, comparing to the urbanization rate in 1992, we could say there are a large number of domestic migrants moved to those more developed areas and their lifestyle has been affected by the modern life, so does their view on contraceptive and reproducing.

The regression results above confirm the second hypothesis that the same factor indeed has different impact on same contraceptive method under different policy strength level. But the result for condom using need to be noticed, as the policy could barely adjust condom using when the general strength stays moderate, while under the loose policy strength, the education increase shows a weaker effect than under moderate policy. Also, the consumption increase failed to increase the condom using under loose policy strength. This could be because of when it's under loose policy, the strength of family planning service also sees a decrease, the amount of information and education regarding contraceptive use decrease which leads to the insensitivity of short-term contraceptive. As mentioned in the theory part, people need more information to understand and achieve successful use of short-term contraceptives.



### 4.2.3 Result of Fixed Effects Model

Table 5 Result of Fixed Effects Model

	Sterilization	IUD	oral or injections	condom	others
Policy Strength					
Moderate	2.05***	-2.98***	-1.05***	2.58***	-0.32
Tight	6.34***	-6.77***	-2.06***	3.13***	-0.40
Education Year	2.33***	-2.42	-0.53*	0.60	0.17
Consumption	-0.97***	-0.14	0.24***	0.50***	-0.04
Consumption <sup>2</sup>	0.02***	-0.02	0.01***	0.01***	0.001
Urbanization Rate	0.03	0.03	0.04***	-0.07***	-0.02**
Year	-0.69**	1.33***	-0.33**	0.03	0.001
Constant	1410.38	-2582.46	674.54	-57.62	3.95
Groups	31	31	31	31	31
Obs	802	802	802	802	802
R <sup>2</sup> (within group)	0.79	0.72	0.39	0.78	0.03
F-Statistics	418.84	284.63	68.87	381.27	3.11
Prob>F	0.0001	0.0001	0.0001	0.0001	0.003

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The Fixed Effects Model exams the association between independent variables and contraceptive use within provinces over time, while the OLS model reflects the variation across the provinces. With the results also being significant for sterilization, oral contraceptive and injections and condom, there are some points worth noting.

First of all, policy strength continues playing a significant role of affecting people's contraceptive use. For the first three columns, which are sterilization, IUD and oral contraceptive and injections, the policy strength shows a consistent result with OLS regression. With tighter family planning policy, the using of sterilization will increase while the using of IUD and oral contracepting along with injection are going to decrease. This means a good part of people will or have to choose irreversible contraceptive to stop the reproducing process under tight policies.

Second, the education showed a significant impact on sterilization, instead of the insignificant result in OLS model. For every year of education increase, the using of sterilization is going to increase by 2.33%. This could be explained by the Q-Q model of Becker (1960). When parents' education level increase, the ideal number of children decrease, also it is easier for them to achieve the ideal number of children because parents with higher education also have a lower rate of infant or child mortality. So, after reaching the ideal family size, people also could choose to use irreversible contraceptive methods.

Third, the increasing consumption shows a consistent impact by reducing sterilization but increase the use of oral contraception and injections along with condoms. This confirmed the result of statistical analysis and also the OLS model.

Fourth, it could not be ignored that there are some inconsistencies. The condom using showed a very different variation with policy strength change in Fixed Effects Model, so does the

urbanization rate. There could be two explanations. 1. There are omitted independent variables in OLS model which lead to a bias of coefficients, such as the culture of different regions. 2. Domestic migration is omitted in the Fixed Effect Model. China has a huge domestic migration flow during the past 3 decades. Because of the unique characteristics of the Hukou (Household Registration) system, people could easily move to other cities and provinces for study or career, but very difficult to change the locate they registered in. This leads to a situation that those domestic migrants, their fertility level is controlled by home province, but their education, income level and knowledge of contraceptive are affected by the destination province. Since the migration group is growing bigger within past 30 years which is not time-fixed, the missing independent variable measuring it could lead to the bias of result for Fixed Effect Model.

## 5 Conclusion

Differently from most people's impression of China's Family Planning Policy, even though the general goal of the system is to control the fast increasing of population nationally, the actually policy items varies a lot with different regions. By coding the policy and regulation items into numerical values and finally plot the result into a 1 to 10 grade scale, it could easily be told that the Family Planning Policy is highly imbalanced and inconsistent between or within regions.

The means to reach the goal of Family Planning Policy is the practicing of contraceptive for married couples, to achieve the best outcome, the compulsory using of long-term contraceptive left China with hundreds of millions of women sterilized or used IUD for the rest of their lives, not to mention a lot of them have also been through compulsory induced abortions. With the strong policy regulations, the total fertility rate of China decreased dramatically during the past 40 years, bringing China new demographic problems such as population ageing and the low fertility trap. Even though the Family Planning Policy has been through several deregulations, and from year 2016 on the central government started encouraging married to have two children, the total fertility rate still stayed around 1.6, which is far below the replacement level, means the deregulation failed and China are still facing the next few decades with more serious problems incoming.

As the policy is different for regions and in general it went through a trend from tight to loose, this thesis study the practicing rate of different contraceptives and the factors behind which affect the contraceptive preference. The descriptive analysis showed, the general trend of using contraceptive is the decrease of irreversible or long-term methods and the increase of using reversible and short-term methods, such as IUD or condoms. And the further regression confirmed that when the Family Planning Policy is tight, the rate of accepting sterilization is high. It is because that firstly, people do not have choice but most of them have to accept the method as regulated, secondly, it is objectively more efficient and convenient to accept long-term contraceptive if reproducing is not planned anymore. But with deregulations, the using of long-term contraceptive methods is going to decrease as the practicing rate of short-term methods such as condom increases significantly, as the loosened policy makes more couples fit for having one additional child and brings the reproducing plan back to their life.

The second part of the regression model is to test the sensitivity of different contraceptive methods when they are under different policy strength to same factors. The result showed that the policy scale has the biggest effect on contraceptive choice when the general policy strength is loose. And also, even though we know the education level has a positive effect on short-term and reversible contraceptive, the effect is most significant under the loose policy strength. It is because the loose policy leaves more space for factors to affect, other than under the very tight policy, the using of contraceptives for married couple are mostly regulated, so the factors as education and real consumption will not be as efficient.

The third part of regression model is the Fixed Effects Model. With sterilization, IUD and oral contraceptive and injections, policy strength shows a significant impact and is consistent with the previous result. Within provinces over time, as the policy goes tight, the using of sterilization will increase while the reversible IUD and oral contraceptive use will decrease. There is also some inconsistent result, which could be because of the omitted variable of domestic migration.

As the using rate of short-term contraceptive increases with education and real consumption, the reasons behind could be noteworthy for policy makers. First of all, if people are more educated and wealthier, they might understand the usage of contraceptive better, so the methods are more likely to be efficiently or even perfectly used, that would avoid a lot of unintended pregnancy and induced abortion. Meanwhile, it could also be viewed as wealthier people have a relatively stronger desire of reproducing since nowadays the biggest reason couples do not want to have more children is the expense of raising a child is very high. So, if the government would like to see the increase in fertility level, improve the general living standard of people is essential.

Of course, this study and the regression model is not perfect, there are still factors not included, such as the percentage rate of ethnic minority of regional population, which would directly affect the policy scale, since most of the ethnic minority population is not regulated by the Family Planning Policy, or at least under lower policy strength. Also, real consumption is only one indicator that could measure the economic growth, and it would be more efficient to apply more specific data into the models by separating rural and urban areas, as they have quite different social economic patterns as well as life style and value conception systems. Moreover, the domestic migration flow is not measured. As OLS model reflects the association between contraceptive methods and independent variables across the whole country, it might lead to a big bias. But for the Fixed Effects Model which reflects the variation within province over time, the missing of this time-varying variable could lead to a big bias in estimation.

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