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# The One Child Policy and Family Formation in Urban China

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# The One Child Policy and Family Formation in Urban China

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**Abstract**

In 1979 the Chinese government implemented the One Child Policy in an attempt to ameliorate the potential negative economic implications of population explosion on their fledgling economy. This article examines the consequences of this policy on marital matching and family size decisions. Using a simple General Equilibrium model, we first show how constraining marital output on the quantity of children raises the marginal benefit of increased positive assortative matching, and greater investment in children. The theoretical prediction on increased positive assortative matching is examined and affirmed using a Distributional Overlap Test which involves comparison of the joint density of spousal educational attainment and was applied to the urban population of six Chinese provinces. To examine if the policy was indeed binding, Poisson regressions were employed and provided evidence that the One Child Policy principally affected the quantity of children decision and suppressed parental preferences over their child's gender, suggesting that births beyond the first child are to a considerable degree accidental among younger mothers who were younger than 25 years of age when One Child Policy was legislated.

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# 1 Introduction

One of the most controversial and far reaching population control policies in recent history is China's One Child Policy (OCP). Introduced in 1979 the OCP represented a considerable intervention in the household choice process, implemented with fines and various other forms of coercion it encouraged families to limit production of offspring. Such an intervention could have changed fundamentally the nature of both existing and anticipated marriage arrangements and can be expected to have influenced family formation decisions in many dimensions, for instance in the choice of partner, the family size and investments in children. As such it provides a natural pseudo experiment within which the nature of family formation choices can be examined. Our examination will be studied within the context in which the policy was engendered.

Firstly, there is a sense in which the desired outcome of the policy was not at odds with the background against which it was introduced. Fertility (number of live births per married woman aged 20-44) was already in considerable decline prior to the OCP having fallen to 2.2 in 1980 from 6.4 in 1965. This phenomenon could be rationalized as a result of urbanization[1] which reduced the preference for larger families (Therborn 2004), and consequently imply that the policy might not be binding among the urban populace, which we will verify.

Granted that prior work had found that the OCP had enforced a binding constraint on family size (Zhang 2002), the policy was introduced in tandem with the Economic Reforms of 1979 with the ensuing well documented increase in wealth to the populace. Should this increase in wealth have the propensity to bring about a similar change in observed matches, we would not be able to discern between the effects from these two policies. Further, within the premise of a binding policy we would also have to contend with the apparent preference for sons in China the expression of which, facilitated by the development of fetus gender detection and selective abortion, have generated a somewhat skewed sex ratio at birth (Therborn 2004)[2]. An argument for this preference is that within a patriarchal society, patrilocal residence of married sons is much more common

[1] In 1949 7.3% of the population was urbanized, however by 1990 20.1% was urbanized (Anderson 2004)

[2] Therborn (2004) suggests that the decline was related to the increasing possibility of the number (and gender) of children being a matter of choice with the development and spread of contraceptive and fetus gender detection techniques. Usually boy/girl sex ratios at birth are around 105/100, in China in 1995 the ratio was 117/100 (Peng and Guo 2000)

than matrilocal residence, implying hence that sons provide considerable old age security benefits for their parents as opposed to daughters. This gender bias in the sex ratio would have implications on the types of matches observed as well.

With regard to the decline in family size prior to the OCP the demographer J.C. Caldwell developed a theory which has a distinctly economic flavor (Caldwell 1982). His view was that fertility was high when children are an asset to their parents and low when they become a liability, although empirical verification of the idea encountered difficulties "...the marginal value of each extra child is impossible to determine..." (Caldwell et al. 1982). Becker (1993) formalized this in developing models where both number of and quality of children and the quality of partners feature as part of the household decision process. Becker's model can be used to rationalize the effect of urbanization and the preference for sons at birth. An important feature of Becker's analysis is that "quantity" and "quality" choices are to some degree simultaneous, with each influencing the other to an extent[3]. He demonstrates that while quantity and quality are likely to be substitutes they cannot be close substitutes (because the budget constraint between quantity and type is convex, equilibrium would not exist if the indifference curve between quantity and type were in some sense "less" convex).

We provide in this paper a simple static general equilibrium model of marital matching, where choice of a spousal match is dependent on the individual's measurable continuously distributed attribute or quality as well as the consequent choices in child quality and quantity should the marriage take place. This approach allows us to examine how a binding constraint on child quantity(Neary and Roberts (1980); Deaton (1981)) or family size decision affects spousal choice endogenously. Intuitively, if individuals on both sides of the marriage market are forward looking, the policy will affect the choice of partner decision by rendering the owner of childrearing attributes less of a comparative advantage relative to someone with income generating attributes all other things equal. Put another

[3]Family formation has most frequently been discussed in the economics literature as an adjunct to the study of female labor supply, the issue being whether fertility should or should not be an argument in the labor supply equation. To some extent this hinges upon the nature of the planning horizon. One culture in developing female labor supply models is to assume that lifetime fertility decisions are made early in life, "at marriage is the most popular choice" observes Browning (1992). An alternative culture is to assume a simultaneous model where attempting to have more children and supplying more female labor supply decision. Here we abstract from the labor supply decision and focus on the realized family outcomes of child quantity and quality.

way, if all women have the same capacity for childrearing, the individuals may become more inclined towards being careful with regards to the potential spouse's attribute(s).

The empirical approach in this paper differ from recent work in the empirical matching literature (such as was adopted by Choo and Siow (2006) who used a dynamic transferable utility model and as suggested by Dagsvik (2000)) but builds on the empirical literature in mobility measures (See Dardanoni (1993), Maasoumi (1996), Quah (1996), Shorrocks (1976), and Shorrocks (1978)) and stochastic dominance measures (See Anderson (1996), Atkinson (1970), Bourguignon and Fields (1997), Davidson and Duclos (2000)). This paper provides a simple and easily applied statistic with which to measure the proximity between an empirical joint density in the matched individual's attribute and that generated by a hypothesized matching scheme, such as positive or negative assortative matching. Further, the statistic is mean invariant and asymptotically normally distributed, which facilitates inferences.

The data is drawn from an urban survey of six provinces in China over 1989 and 1991 to 2001; Shaanxi, Jilin, Hubei, Sichuan, Guangdong and Shandong[4]. The spousal choice is considered in terms of the cohort of males and females by year of birth. Specifically, we divide the sample into 3 cohorts, the first with couples whose oldest spouse in the marriage was born between 1940 and 1949, the second cohort from 1950 to 1959, and the last from 1960 to 1969. In the sample, the first child was born to families when the mother was about 25 years of age, thus the first cohort would consists of families whose spousal choice would have been made prior to the OCP, while the latter cohorts would have made it's spousal choice after the OCP. Sorting is considered to take place over the educational attainment of partners where attainment is integer indexed from 1 to 5 with 5 being college graduates and above, 4 being individuals who obtained technical education, 3 being high school, 2 being middle school, and 1 being primary school and lower. We find that there is significant suggestive evidence of a tendency towards increased positive assortative matching in the latter cohorts which is not explained by matching trends.

To show that the quantity of children decision is due to the OCP and not a natural tendency resulting from urbanization and economic growth we performed Poisson regressions. Since the objective is to study those households which had completed their family

[4]These data were obtained from the National Bureau of Statistics as part of the project on Income Inequality during China's Transition organized by Dwayne Benjamin, Loren Brandt, John Giles and Sangui Wang.

size decisions, we focused on households whose mother's are over the age of 25. To examine choice differentials induced by the OCP, the sample was segmented into mothers who were 25 and younger when OCP was legislated and mothers who were older than 25 in 1979. Corroborating with the evidence from matching, we found that births beyond the first child among young mothers when the OCP was implemented were purely accidental.

In the following, Section 2 formulates a simple model and develops some comparative statics for the various family formation decisions. Partner choice decisions are examined empirically in section 3, and child quantity and gender decisions are examined in section 4. This paper ends with a brief discussion and conclusion in section 5.

## 2 A Simple Model

The objective of the model is to provide us with some comparative statics with which we can understand how the OCP and Economic Reforms might have *directly* affected matching within the marriage market through individual preferences in their potential spouse. As will be observed, the empirical techniques used, which compares how the joint density of spousal characteristic concur with a hypothesized joint density under positive assortative matching, is mean and variance invariant. Consequently, the model examines how the bounds on an individuals preferred set of spouses tighten or slacken as a result of the OCP and Economic Reforms.

Consider a model where an individual lives for 2 periods, one as a child, and one as an adult. At the beginning of the adult period, agents choose to marry or remain single (there is no divorce in this model)[5]. The rate at which an adult meets someone of the opposite gender is random. Marriage is dependent on the type of male and that of their potential spouse and utility is assumed transferable. Let the subscript $h$ denote a husband or a male, and $w$ denote the wife or female. Let the agent's type be $t$, continuous on a support $\left[\underline{t}, \overline{t}\right]$, and distributed with density $f(.)$ and distribution $F(.)$ for both men and women. If they find a match, they will then choose the number of children to have and

[5]The focus is on gains from marriage and how it affects matching and child investment decisions thus without loss of generality we solve the problem from the perspective of men, apportioning all the rents from marriage to them. The imposition of other sharing rules will not affect the essence of the results presented below.

the amount of investment in each child. The aspect of utility derived from children is described by a function $q$ dependent on the type of parents, the number of children, and the amount of investment per child, $q \equiv q(t_h, t_w, k, n)$, where $q \in 0 + \mathbb{R}_+$ is increasing and concave in all it's inputs. The other aspect of a married individual's utility is derived from personal consumption. We assume that utility derived from child consumption and own consumption to be multiplicatively separable, $u_h = q(t_w, n, k|t_h)\, c_h$ . If instead the individual chooses to remain single, utility will only be derived from personal consumption which in turn is dependent on his/her own type as well, $s_i = \max_{c_i} c_i$, $i \in \{h, w\}$.

Income realization of the family or individual is assumed to be dependent on the type of match and the individual's type respectively. Specifically, family income is assumed to be $yx(t_h, t_w)$, and income for a single individual to be $yv(t_i)$, $i \in \{h, w\}$, where $y$ is the average income within the economy, $x : (t_h, t_w) \mapsto \{0\} + \mathbb{R}_+$ and $v : t_i \mapsto \{0\} + \mathbb{R}_+$. This setup thus abstracts from redistributive concerns arising from policy. Further, this formulation of income together with the range of $q$ ensures that for some matches and individual types, the choice to remain single will be made. That is the set of single individuals by type is non-empty.

The following functional assumptions are also made,

**Assumption 1** *: Investment in children, $k$, and the choice of the number of children, $n$, are substitutes in the function $q(.)$, which parents derive from having children in their marriage. That is $q_{k,n}(t_w, n, k|t_h) \leq 0$.*

**Assumption 2** *: $u_{t_i} \geq 0$, $u_{t_i,t_i} \leq 0$, for $t_i \in \left[\underline{t}, \overline{t}\right]$, $i \in \{h, w\}$.*

**Assumption 3** *: (**Complementarity of Types**) $u_{t_i,t_j} \geq 0$, $i \neq j$, $i, j \in \{h, w\}$. Further, let $t^* = \arg\max_{t_w \in \left[\underline{t}, \overline{t}\right]} u(t_w, n, k|t_h) \Leftrightarrow t^* = t_h = t_w$, for $t_h, t_w \in \{\underline{t}, \overline{t}\}$ .*

**Assumption 4** *: (**Convex in Types When Single**): $v_{t_i} \geq 0$, $v_{t_i,t_i} \geq 0$, $i \in \{h, w\}$.*

**Assumption 5** *: (**Single Crossing with respect to Average Income**): $\frac{\partial u_h}{\partial y}, \frac{\partial s_h}{\partial y} > 0$, $u_h(y = 0) \leq s_h(y = 0)$, and that $\frac{\partial u_h}{\partial y} \geq \frac{\partial s_h}{\partial y}$.*

Assumption 1 creates the tradeoff between the choice of investment per child, and the number of children in a family. Assumption 2 ensures that $u_i(.)$ $i \in \{h, w\}$ is well behaved on the support of the agents' type. Assumption 3 says that given an agent's type, they would prefer to be matched with someone of the same type or better. Together with assumption 4, this ensures that agents would always prefer to match with someone closer to their own type, since the concavity of $u_i(.)$ $i \in \{h, w\}$ in own type and the type of spouse, and the convexity of $v(.)$ in own type ensures that gross marital output attains a maxima for agents of a sufficiently low type on the support. An example of a function that would meet these assumptions is when $q(.)$ and $x(.)$ are quadratic functions with respect to $(t_h - t_w)$ on $t_h, t_w \in [0, 1]$[6].

On the other hand, assumption 5 pertains to the effect of income on preferences in the marriage and single state and its implication is depicted in figure 1. It ensures that utility gained from marriage increases at a faster rate with respect to income than in the single state. Put another way, it says that once an individual finds marriage desirable at his current income realization, an increase in his permanent income will not reduce his desire to be married. This assumption negates the possibility of the existence of a upper income threshold where the individual reverts to a preference for remaining single at higher income realizations, or in other words the utility from marriage and being single can intersect at most once.

Abstracting from intra-household bargaining and focusing on the total value of marital output, without loss of generality the solution to the individual's problem will be solved from the perspective of the man choosing a prospective wife.

## 2.1 Single Man

If an individual of type $t_i$, chooses to remain single, he solves the following problem,

$$\max_{c_i} c_i$$

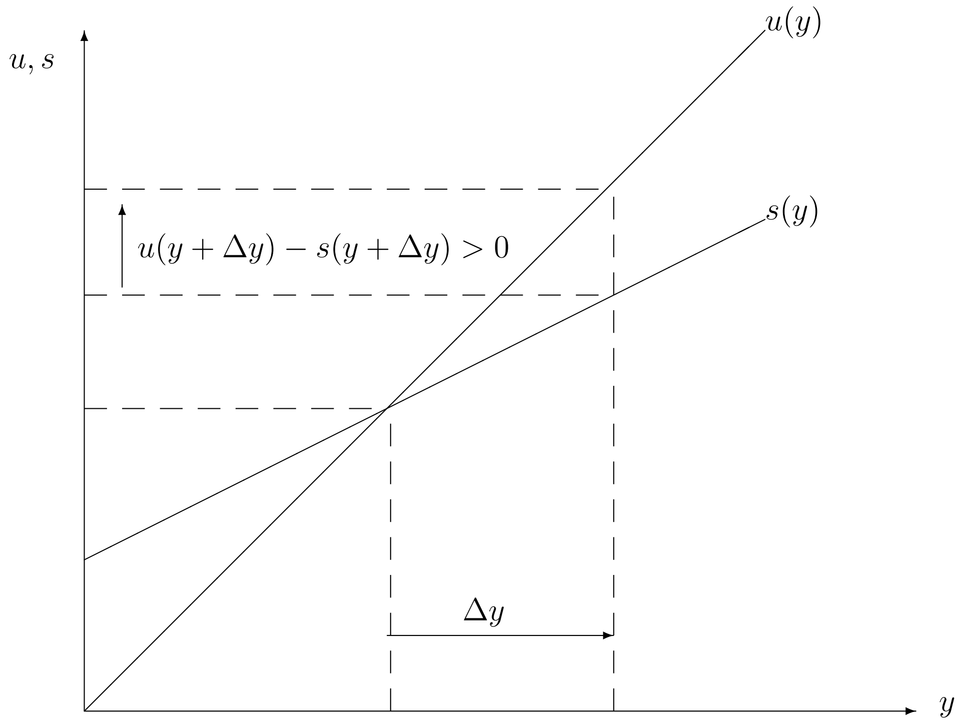
subject to

$$yv(t_i) \geq c_i$$

where $y$ is the average income of all individuals within the economy, and $v : t_i \mapsto 0 + \mathbb{R}_+, i \in \{h, w\}$. Then an individual $i$'s income is described by the product of $v(t_i)$, $i \in \{h, w\}$ and $y$, which means that his income is a proportion of the average income,

[6]We suspect a model with search costs that fall as agent types rises may generate similar results we present below.

Figure 1: Attractiveness of Marriage




dependent ultimately on the his type. The optimal consumption choice is that the individual spends all his income on herself $c_i = yv(t_i)$. Let the utility of this single individual be.

$$\widehat{s}_i = yv(t_i)$$

## 2.2 Married Man

If the individual finds a suitable match and chooses marriage, he solves the following problem subject to his budget constraint and the participation constraint in order for his prospective spouse to enter into matrimony with him.

$$\max_{n, c_h, c_w, k} q(t_w, n, k|t_h)c_h$$

subject to

$$\begin{aligned} c_h + c_w + nk &\leq yx(t_h, t_w) \\ q(t_w, n, k|t_h)c_w &\geq yv(t_w) \end{aligned}$$

where $c_h$, and $c_w$, are the consumption choices, and $t_h$ and $t_w$ are the types for the husband and wife respectively.

By the usual non-satiation argument, the budget constraint holds with equality, and since the husband can always make himself better off by just meeting the participation constraint, the participation constraint holds with equality as well. Thus

$$\begin{aligned} c_w &= \frac{yv(t_w)}{q(t_w, n, k|t_h)} \\ \Rightarrow c_h &= yx(t_h, t_w) - nk - \frac{yv(t_w)}{q(t_w, n, k|t_h)} \end{aligned}$$

and he solves,

$$\max_{n,k} q(t_w, n, k|t_h)(yx(t_h, t_w) - nk) - yv(t_w)$$

The first order conditions are,

$$q_n(t_w, n^*, k^*|t_h)(yx(t_h, t_w) - n^*k^*) = q(t_w, n^*, k^*|t_h)k^* \quad (1)$$

$$q_k(t_w, n^*, k^*|t_h)(yx(t_h, t_w) - n^*k^*) = q(t_w, n^*, k^*|t_h)n^* \quad (2)$$

where $k^*$ and $n^*$ are the optimal values for investment per child, and number of children respectively. In equilibrium, the following condition will hold,

$$\frac{q_n(t_w, n^*, k^*|t_h)}{k^*} = \frac{q_k(t_w, n^*, k^*|t_h)}{n^*}$$

However, under a situation where $n$ is no longer a choice variable, only (2) would prevail hence changes in $n$ on the optimal choice of $k$ can be examined as if $n$ is a parameter. For the rest of the paper, let $n = \widetilde{n}$ be for cases where the number of children is exogenously determined and let the respective optimal choice of investment for each child be $k'$ there.

## 2.3 Comparative Statics

The OCP in China coincided with the Chinese Economic Reforms in 1979 which precipitated considerable economic growth. Should the impact of economic growth on familial choices yield similar outcomes to the OCP, it would not be possible to identify the separate policy effects. This section examines the impact derived from both policies on quantity and quality of children, followed by spousal matching decisions. The following four propositions relate to how the OCP and economic growth might have affected spousal and family size choices (proofs are supplied in an appendix).

First, let $\widehat{u}_h = \max_{n,k} q(t_w, n, k|t_h)(yx(t_h, t_w) - nk) - yv(t_w)$ and $\widehat{s}_h = yv(t_h)$, then a type $t_h$ man's second period utility is,

$$U_h = \max\{\widehat{u}_h, \widehat{s}_h\}$$

The reservation type of his potential spouse is determined by

$$\begin{aligned} \widehat{u}_h &= \widehat{s}_h \\ \Rightarrow q(\underline{t_w^R}, \underline{n}, \underline{k}|t_h)(yx(t_h, \underline{t_w^R}) - \underline{nk}) - yv(\underline{t_w^R}) &= yv(t_h) \end{aligned} \quad (3)$$

where $\underline{n}$ and $\underline{k}$ are the optimal values for a match between a man of type $t_h$ and woman of type $\underline{t_w^R}$. Letting $\underline{t_w^R} \equiv \underline{t_w^R}(t_h)$, from figure 2 it may be observed that (3) determines only the lower bound of the reservation at point A. For spousal types below $\underline{t_w^R}$, although he may be collecting all the rents, he obtains no net benefit from marriage. It is only above $\underline{t_w^R}$ that marital utility would exceed his utility from remaining single.

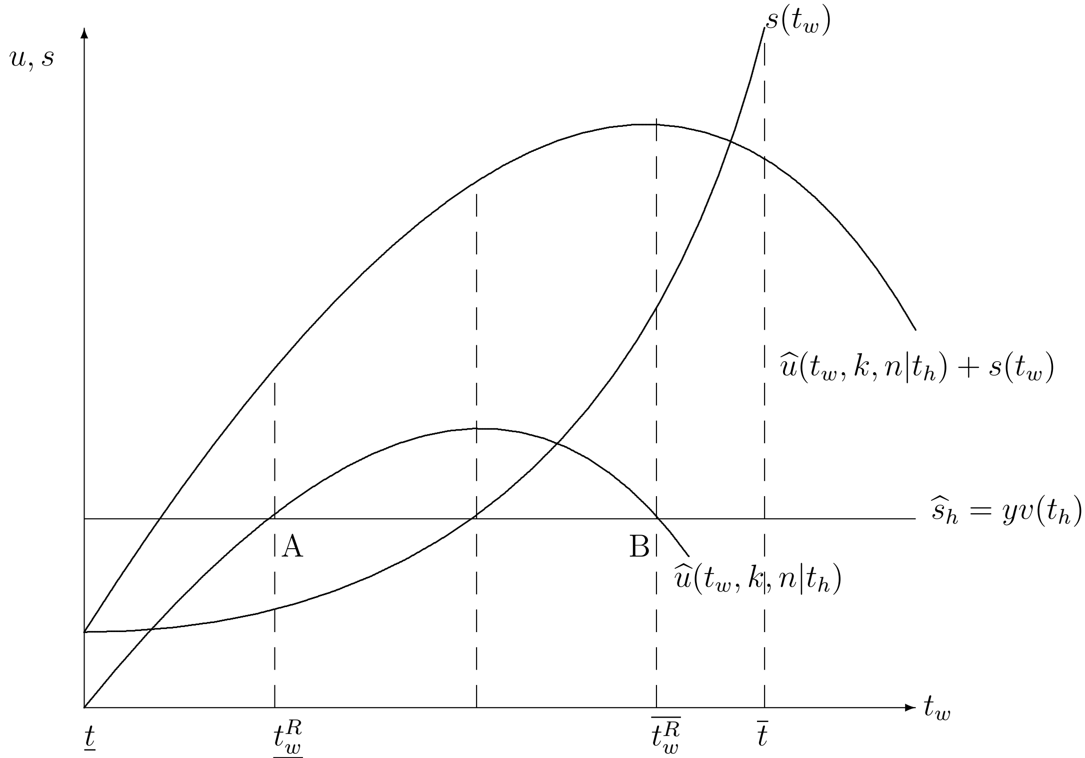
Men of a sufficiently low type may have an upper bound on the type of his spouse, $\overline{t_w^R}$, beyond which the marital gains from the match may not be sufficient for him to she obtains at least $s(\overline{t_w^R})$, in other words the utility she would otherwise get from remaining single. This upper threshold is determined by

$$q(\overline{t_w^R}, \overline{n}, \overline{k}|t_h)(yx(t_h, \overline{t_w^R}) - \overline{n}\overline{k}) - s(\overline{t_w^R}) = \widehat{s}_h = yv(t_h) \quad (4)$$

The upper bound is point B in figure 2. The type of woman that would present as the optimal spousal type occurs when the marginal gain in gross marital utility from choosing a higher type spouse equates with the marginal increase in cost he would have to pay to meet her participation constraint. This is depicted on the diagram where the slope of the gross utility and $yv(t_w)$ equates. Beyond this optimal type, his own marital gains start decreasing, and fall below his value of remaining single eventually. Note that by construction, $\underline{t_w^R} \leq t_h \leq \overline{t_w^R}$.

Intuitively, given that quantity and quality of children are substitutable, a binding policy that impinges on a family's choice in one dimension should yield an increase in the remaining dimension which is stated in the following proposition.

Figure 2: Reservation Values given Type




**Proposition 1** : *An exogenously enforced reduction in the number of children raises equilibrium investment in children.*

Yet the success of the Economic Reform of 1979, which raised the income, and consequently the quality of lives among the Chinese populace, should similarly raise familial investments in children, assuming children are "normal goods". That the reform came at the same time as the OCP, would accentuate the increase in investments (holding the nominal cost of investments constant), and consequently child quality.

**Proposition 2** : *An exogenous increase in income would increase the number of children born into the family and the level of investment per child.*

Propositions 1 and 2 implies that the OCP and Economic Reform of 1979 would have reinforced each other, preventing identification of the true cause of changes in investment in children if any, should the impact of the OCP be considered solely from the perspective of child outcome. However the manner either policy could have effected spousal choices can also be examined. Intuitively, spousal choice remains a venue through which individuals could adjust to the enactment of the OCP to maintain the gains to marriage. Child outcomes are dependent on both ongoing investment as well as genetically endowed qualities from their parents. Thus the exogenous imposition or rationing of child quantity via the OCP could have also accentuated the importance of good spousal match, assuming positive assortative matching is the norm. It should be noted that we are not disputing the existence of positive assortative matching, but posit that the *degree* of positive assortative matching may have been altered.

**Proposition 3** *: When the number of children is fixed below the optimal choice that a married couple would have chosen given their types then:*

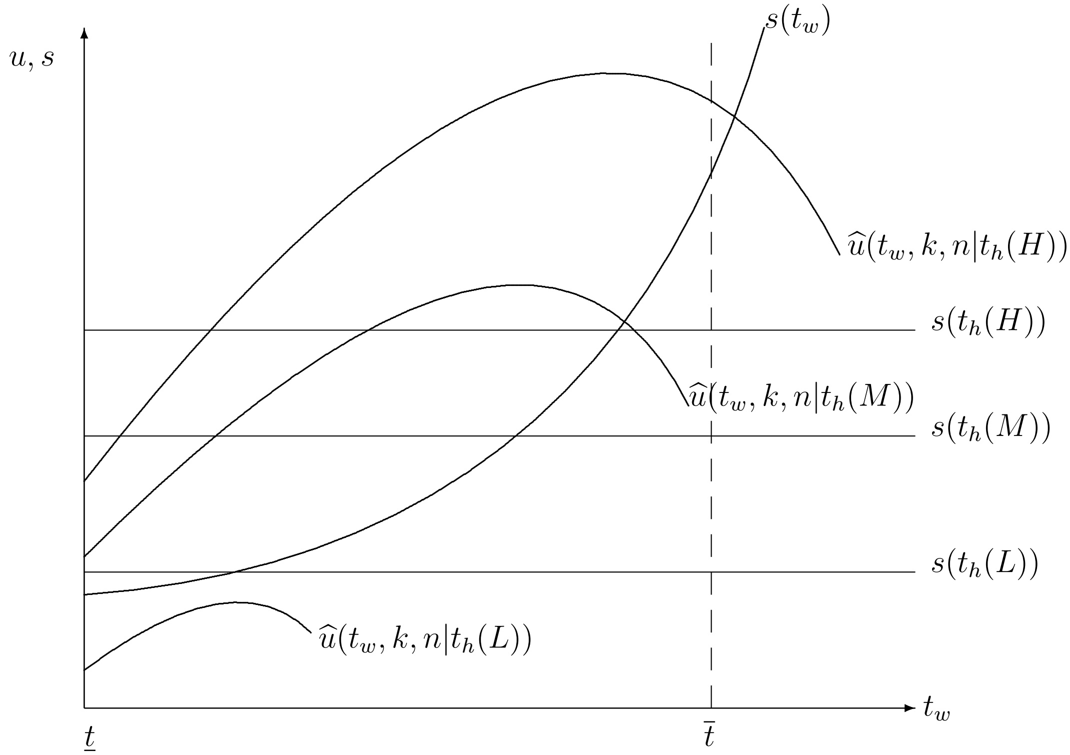
1. *for all men, the lower bound on the reservation type of a prospective spouse would rise, while the upper bound would fall, and*
2. *agents who choose to marry would exhibit increased assortative matching.*

Intuitively we may partition the types of men into three broad groups, those who would always prefer not to marry $(L)$, those who benefit from marriage, but who would never be able to attract high type spouses relative to their own type $(M)$, and those who are coveted by all spousal types $(H)$. Each of these is depicted in figure 3.

Figure 4 shows how a binding family size policy might affect choice of spousal type. Intuitively, with a binding family size policy, matches with lower type women yield lower marital output in the post policy regime, consequently shifting the lower bound on the reservation type closer to one's own type. On the other hand, a match with a higher type does not yield sufficient gains to marriage for the man to offer the minimum utility to attract the potential spouse. This process is depicted as a fall in $u\left(t_w, k, n | t_h(H)\right)$ for a man of type $t_h(H)$ from a situation where he was capable of attracting spouses of higher types, to one where he would not be able to do so under the new regime. For a sufficiently low type agent, this may even mean a complete withdrawal from the marriage market as shown in figure 4, in the fall of $u\left(t_w, k, n | t_h(M)\right)$ for a man of type $t_h(M)$. The latter observation is reflected in the following corollary.

**Corollary 1** *: A binding Family Size Policy which reduces the number of children born into a family reduces the marriage rate for all types of men.*

Figure 3: Three Differing Groups of Men




On the other hand economic growth, by raising disposable income, could potentially slacken the need for a good spousal match. However, at the same time, economic growth may have also raised the gains to remaining single, thereby reducing the merits of marriage. These possibilities are examined in the following propositions.

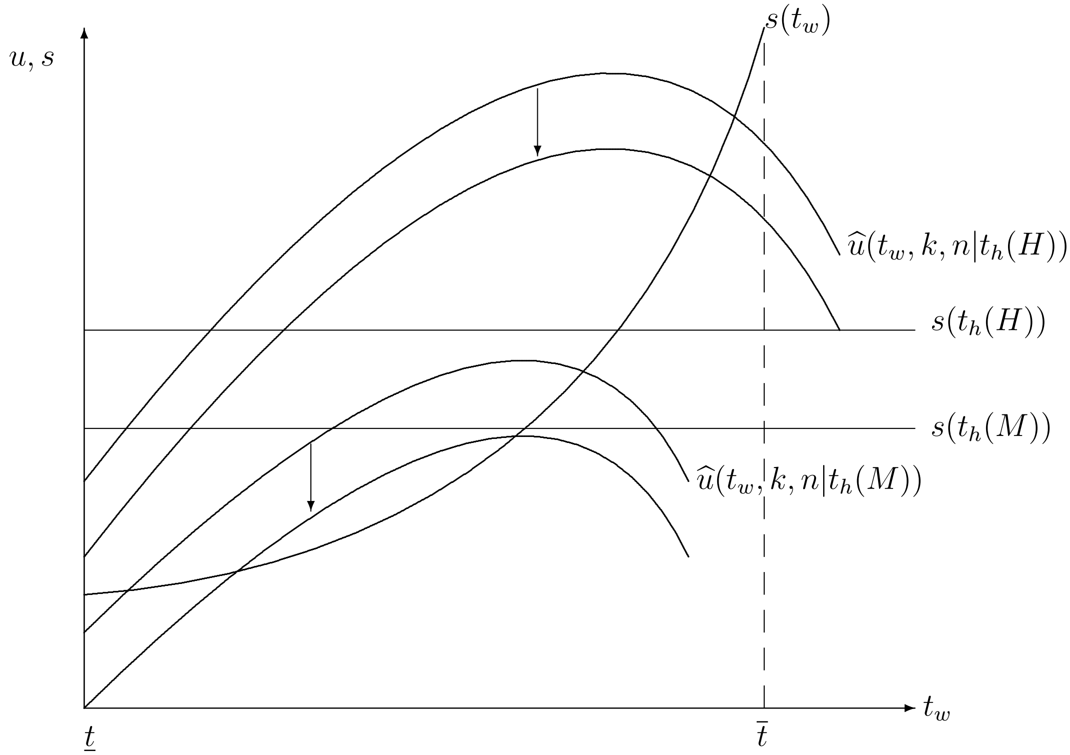
**Proposition 4** *: An increase in y, the average (real) income in the economy, leads to the following:*

1. *for all men, the lower bound on the reservation type of a prospective spouse would fall, while the upper bound would rise and,*

2. *agents who choose to marry would exhibit decreased assortative matching.*

The intuition to proposition 4 is as follows; if at the status quo on the margin of spousal type, the man is indifferent to marrying or remaining single, an increase in income available to him cannot make his potential spouse any less attractive. However, if it makes her more attractive, by increasing his utility, the marginal prospective spousal type at the lower

Figure 4: Impact of Binding Family Size Policy on Spousal Type




bound must fall, while the upper bound must increase. (This outcome is facilitated by the assumption that an increased average income within the economy has no redistributive effects, so growth results in a shift of the entire distribution to a new mean income level, while maintaining its shape). The corollary below follows:

**Corollary 2** *An increase in average income increases marriage rates.*

Assume that each individual meets one and only one potential spouse, in their lifetime, so that if a man meets a women within the bounds of a potential spouse, he will marry her. Therefore the probability of marriage for a man of type $t_h$ is $P$ such that,

$$P = \Pr(\underline{t_w^R} \leq t_w \leq \overline{t_w^R}) = \int_{\underline{t_w^R}}^{\overline{t_w^R}} f(t_w) dt_w = F(\overline{t_w^R}) - F(\underline{t_w^R}) \tag{5}$$

It is clear that $P \in [0, 1]$. Let there be a unit mass of male and female agents. Then the marriage rate in the marriage market $M$ is,

$$
\begin{aligned}
M &= \int_{\underline{t}}^{\bar{t}} \left\{ F(\overline{t_w^R}(t_h)) - F(\underline{t_w^R}(t_h)) \right\} f(t_h) dt_h \\
&< \left\{ F(\overline{t_w^R}(\bar{t})) - F(\underline{t_w^R}(\bar{t})) \right\} \int_{\underline{t}}^{\bar{t}} f(t_h) dt_h \\
&= \left\{ F(\overline{t_w^R}(\bar{t})) - F(\underline{t_w^R}(\bar{t})) \right\} < 1
\end{aligned}
$$

Since it is clear that $M \in [0, 1]$, the market clears.

The model has explicitly argued that the two venues through which matching in the marriage market could have been *directly* affected were through the constraining of family size due to the OCP and the increase in income as a result of the Economic Reforms of 1979. It is worth discussing the other possible venues through which both policies might affect matching, at least conceptually.

A possible *indirect* effect that may affect matching in China via the Economic Reforms is through the altering of the returns to education. Essentially as the gains to human capital investment increases, the marriage market would see changes in the composition at various educational attainment levels, that is the marginal distribution of educational attainment for both sides of the marriage market will be altered. This would necessarily alter the *probability* of an individual meeting her potential spouse over the *entire range of potential spouses* in the marriage market but *not the choice set itself* which is what this paper examines and attempts to measure. Put another way, effects on returns to education (which is typically measured by monetary gains) does not affect the marital utility from matching with a particular spousal type, but the probability of matching with that spousal type. Further, it can be said that the OCP has a similar effect as well. Consider the following argument, with the implementation of the OCP, parents would be cognizant of the binding constraint that a binding family policy would have on the gains to marriage. Given that a "good" marriage entered into by their children would raise their utility, it is in their interest to ensure that the gains to marriage does not suffer (See Peters and Siow (2002) for a model on premarital investments in children). This would then raise their premarital investment in their children, giving rise consequently to a stochastic dominant shift in the educational attainment of child outcomes in the post

OCP cohorts. However, like before this process affects the marginal distribution of types across both sides of the marriage market, but not the preferences of individuals.

Granted that the above effects are themselves of interest for a complete understanding of the effects of the OCP and other policies in the intervening periods, they do not fall within the stated objective of this paper which is to examine the change in matching preference through the examination of empirical joint density with that generated by a null hypothesis of positive assortative matching.

# 3 The Overlap Measure and Empirical Strategey

We will next describe the overlap measure which will be used to examine the degree of overlap between the empirical joint density of spousal attributes against that which would be generated by positive and negative assortative matching. This will be followed by a description of the dataset and the identification strategy.

## 3.1 Measuring the Degree of Assortative Matching

### 3.1.1 The Elements of a Matching Matrix

To assess the change in matching behavior via the relationship between the respective attributes of a pairing, the joint density of the attributes of spouses are compared with what could have emerged under a perfect positive (negative) assortative scenario. Anderson et al. (2008) provide a matching index which makes such a comparison.

To illustrate the use of the measure, suppose the type space of both husbands and wives can be partitioned into five mutually exclusive types as in our data such that $t_i \in \{t_i^1, t_i^2, ..., t_i^5\}$ where $i \in \{h, w\}$ and $t_i^1 < t_h^2 < ... < t_h^5$. If this type partitions are matched such that $\Pr(t_h = t_h^k) = \Pr(t_w = t_w^k)$ for all $k \in \{1, 2, ..., 5\}$, letting the row index denote the male type partitions and the columns denote the female type partitions, then the joint density under a null of perfect assortative matching is of the form,

$$\mathbf{J}_p = \begin{bmatrix} \Pr(t_i = t_i^1) & 0 & ... & 0 \\ 0 & \Pr(t_i = t_i^2) & ... & 0 \\ \vdots & \vdots & ::: & \vdots \\ 0 & 0 & ... & \Pr(t_i = t_i^5) \end{bmatrix} \tag{6}$$

On the other hand, it may not always be possible to partition the support of types such that the above joint density matrix is derived (particularly when the realizations of types are discrete as in the data set used). Suppose that the partition is not matched such that $\sum_{k=1}^{m} \Pr(t_h = t_h^k) \leq \sum_{k=1}^{m} \Pr(t_w = t_w^k)$ for $m \in \{1, 2, .., 5\}$, that is men stochastically dominate women in the type measure. Then a possible realization of the joint density matrix assuming offers are made by men, and that higher type men can always outbid lower type men for a potential match (as in the model) could be of the form,

$$\mathbf{J}_p = \begin{bmatrix} \Pr(t_h = t_h^1) & 0 & ... & 0 & 0 \\ \Pr(t_h \geq t_h^2) - \Pr(t_w \geq t_w^2) & \Pr(t_w \geq t_w^2) - \Pr(t_h \geq t_h^3) & ... & 0 & 0 \\ 0 & \Pr(t_h \geq t_h^3) - \Pr(t_w \geq t_w^3) & ... & 0 & 0 \\ . & . & ... & . & . \\ 0 & 0 & ... & \Pr(t_h = t_h^5) - \Pr(t_w = t_w^5) & \Pr(t_w = t_w^5) \end{bmatrix} \tag{7}$$

Although we report only the results using the above estimated matrix, there are other methods of arriving at the positive and negative assortative matching matrix which were examined as well, namely when the offers are made by women to men and when the preference for own type is strongest (that is matching clears the diagonal first)[7]. We found that the method suggested by the model, where offers are made by men to women, and that higher type men can always make higher transfers to women of all types, yields the greatest overlap measure with the empirical joint density, and consequently allows us to better examine how matching on the dimension of educational attainment has changed.

### 3.1.2 The Overlap Measure and its Asymptotic Distribution

The idea is that the matrix consistent with positive assortative matching should exhibit concentration of mass in the cells along the diagonal. This implies that the examination of proximity to complete positive assortative matching can be performed by comparing the degree of concurrence of the joint density matrices of $\mathbf{J}_p$ constructed from the marginal densities under the null against the empirical joint density, just as in the case of independence or contingency table tests. Specifically, let the elements of the joint density matrix generated by the null hypothesis be $j^p_{i,k}$, and that for the empirical joint density by $j^e_{i,k}$, where $i, k \in \{1, 2, ..., n\}$, $n$ being the number of mutually exclusive type realizations for

[7] This results are available upon request from the authors

both *married* men and women. The measure of the overlap between theoretical and empirical joint density then provides an index of the *degree* of positive assortative matching[8]. Specifically,

$$OV_p = \sum_{i=1}^{I} \sum_{k=1}^{K} \min\left(j_{i,k}^{p}, j_{i,k}^{e}\right) \tag{8}$$

This overlap measure is asymptotically normally distributed and changes in the measure provide evidence of changes in the incidence of positive assortative matching. To see this, define

$$\mathbf{V} = \sqrt{n}\begin{bmatrix} \frac{j_{1,1}-\pi_{1,1}}{\sqrt{\pi_{1,1}}} & \frac{j_{1,2}-\pi_{1,2}}{\sqrt{\pi_{1,2}}} & \cdots & \frac{j_{1,N}-\pi_{1,N}}{\sqrt{\pi_{1,N}}} \\ \frac{j_{2,1}-\pi_{2,1}}{\sqrt{\pi_{2,1}}} & \frac{j_{2,2}-\pi_{2,2}}{\sqrt{\pi_{2,2}}} & \cdots & \frac{j_{2,N}-\pi_{2,N}}{\sqrt{\pi_{2,N}}} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{j_{M,1}-\pi_{M,1}}{\sqrt{\pi_{M,1}}} & \frac{j_{M,2}-\pi_{M,2}}{\sqrt{\pi_{M,2}}} & \cdots & \frac{j_{M,N}-\pi_{M,N}}{\sqrt{\pi_{M,N}}} \end{bmatrix} \tag{9}$$

where $\pi_{m,n}$, $m \in \{1, 2, ..., M\}$ and $n \in \{1, 2, ..., N\}$, is the true probability of event $m, n$ occurring, and is the typical element of $\Pi$. Then denote $\mathbb{V} = \text{vec}\mathbf{V}$. Next define

$$\mathbb{v}' = \left(\sqrt{\pi_{1,1}}, ..., \sqrt{\pi_{1,N}}, \sqrt{\pi_{2,1}}, ..., \sqrt{\pi_{2,N}}, \sqrt{\pi_{3,1}}, ..., \sqrt{\pi_{M,N}}\right) \tag{10}$$

and

$$\Omega = \mathbf{I} - \mathbb{v}\mathbb{v}' \tag{11}$$

Then by the results in Rao (1973) pages 383 and 391, Anderson and Leo (2008) and Anderson et al. (2008), we have

$$\mathbb{V} \xrightarrow{a} N_{MN}\left(\mathbf{0}, \Omega\right) \tag{12}$$

[8]For complete negative assortative matching, we work in a similar fashion, where the joint density matrix $\mathbf{J}_n$ under the null hypothesis of negative assortative matching is a counter-diagonal matrix, where the highest type individuals match with the lowest type from the other gender. In the perfectly matched marginal density case we have,

$$\mathbf{J}_n = \begin{bmatrix} 0 & \cdots & 0 & \Pr(t_i = t_i^1) \\ 0 & \cdots & \Pr(t_i = t_i^2) & 0 \\ \vdots & \ddots & \vdots & \vdots \\ \Pr(t_i = t_i^5) & \cdots & 0 & 0 \end{bmatrix}$$

Define the matrix of estimated probabilities as $\mathbf{J}$, and let $\mathbf{j} = \text{vec}\mathbf{J}$ and $\pi = \text{vec}\mathbf{\Pi}$ where vec is the vec-operator. Then,

$$\mathbf{j} \xrightarrow{a} N_{MN}\left(\pi, \frac{1}{j}(\text{dg}(\mathbb{v}))\Omega(\text{dg}(\mathbb{v}))'\right) \tag{13}$$

$$\Rightarrow \mathbf{i}'\mathbf{j} \xrightarrow{a} N\left(\mathbf{i}'\pi, \frac{1}{n}\mathbf{i}'(\text{dg}(\mathbb{v}))\Omega(\text{dg}(\mathbb{v}))'\mathbf{i}\right) \tag{14}$$

where $\mathbf{i}$ is a vector of ones. Let $\mathbf{j}^p$ and $\mathbf{j}^e$ be the vectorized joint density under positive assortative matching and the empirical counterpart respectively. Define $\mathbf{j}^{\min} = \min\{\mathbf{j}^o, \mathbf{j}^e\}$. Likewise, let $\pi^p$ and $\pi^e$ be the corresponding vectorized true probabilities (from $\text{vec}\Pi^p$ and $\text{vec}\Pi^e$ respectively), and let $\pi^{\min} = \min\{\pi^p, \pi^e\}$. Then the Overlap Index is $\mathbf{OV}_p = \mathbf{i}'\mathbf{j}^{\min}$. It is clear then asymptotically by equation (14),

$$\mathbf{OV}_p := \mathbf{i}'\mathbf{j}^{\min} \xrightarrow{a} N\left(\mathbf{i}'\pi^{\min}, \frac{1}{n}\mathbf{i}'(\text{dg}(\mathbb{v}^{\min}))\Omega^{\min}(\text{dg}(\mathbb{v}^{\min}))'\mathbf{i}\right) \tag{15}$$

where $\Omega^{\min} = \mathbf{I} - \mathbb{v}^{\min}\mathbb{v}^{\min\prime}$ and

$$\mathbb{v}^{\min\prime} = \left(\sqrt{\pi_{1,1}^{\min\prime}}, ..., \sqrt{\pi_{1,N}^{\min\prime}}, \sqrt{\pi_{2,1}^{\min\prime}}, ..., \sqrt{\pi_{2,N}^{\min\prime}}, \sqrt{\pi_{3,1}^{\min\prime}}, ..., \sqrt{\pi_{M,N}^{\min\prime}}\right) \tag{16}$$

Note that the variance-covariance matrix can be estimated by replacing $\mathbb{v}^{\min}$ with $\mathbf{j}^{\min}$.

The attractive feature of these indices is that they can be readily applied when the transition matrices are not square and can be implemented in multivariate domains. Further, since they are asymptotically normally distributed, they facilitate inferences about trends toward different matching patterns.

## 3.2 Empirical Strategy and Data Summary

The samples that will be used includes all years, including 1989, 1991 to 2001. The pooled sample is divided into three cohorts of individuals based on the birth year of the men, so that a couple is classified as belonging to the 1940s cohort if the husband is born between 1940 to 1949, likewise for the 1950s and 1960s cohort. This classification follows from our assumption that offers are from men.

Table 1 summarizes some of the characteristics of married couples within our sample. First note the unanimous fall in the number of children over the decades, and particularly among the 1960s cohort. In addition, note the increase in educational attainment over the decades which may be due to increased returns to education with the economic reforms, or it could be from increased investments in children by parents as discussed prior, or simply due to the regime shift from pre- to post cultural revolution China. What is interesting is that the deflated income (following (Brandt and Holz 2006)) fell between the 1950s and 1960s cohort in all provinces with the exception of Guangdong, and Sichuan (Noting the large income disparity between Guangdong residents and those in the other provinces.). In so far as a fall in income implies increased positive assortative matching, the key province to understanding how matching is affected by the family size intervention due to the OCP is principally with the matching outcome in Sichuan province. What occurs in Guangdong is an empirical question dependent on how strong the effect due to the OCP is relative to the effect of increased negative assortative matching with increased income. It is not possible to identify if the increased assortative matching in the other provinces is a result of the OCP or the Economic Reforms. All we will be able to ascertain for those provinces is whether there is a rise of fall in positive assortative matching.

Table 2 reports the results for a simple pure Poisson regression performed on the couples in our sample. The primary rationale of separating the sample into the three cohorts is that the first two would provide information on the trends in spousal matching across time, while the third cohort of the 1960s is the sample most likely to be affected by the OCP. The first order effect of the OCP is to reduce the demand of children, consequently it may be conjectured that the choice of whether to have any additional children after the first child is likely an accident, which underlies the Poisson model. The first three columns are for the three cohorts without discerning between whether the first child in the family had a male or a female child. The second three records the results when the first child is a male, while the final three columns are for when the first child is a female.

Note that we cannot reject the pure Poisson model in the general case for Shandong, Hubei and Sichuan, implying that in general the birth of a second child among the 1960s cohort are "accidents". What is interesting is that with the exception of Shandong and Shaanxi, all subsequent births after the first male child are likewise "accidents", but that this is no longer true when the first child is a female unanimously [9]. Overall, the results

[9] The question of gender selection is a question the authors are currently examining

suggests that the latest cohort of the 1960s are subject to the OCP, and justifies our subsequent interpretation that any change in the 1960s cohort is due to either the effects of the OCP or the Economic Reforms.

The extent to which the OCP influenced partner choice decisions depends upon the degree to which positive or negative assortative pairing was the prevailing mode prior to the inception of the policy and how it changed after the policy. The comparative statics predict an increase in the incidence of positive assortative matching (decrease in negative assortative matching) with the onset of the OCP, in the sense that the range of values of a particular characteristic one is willing to entertain in a partner has narrowed around his own characteristic. It also predicts a drop in the marriage rate. However these predictions need qualification in terms of the supply and demand conditions the matchers confront in the sense that they are always predicated on the availability of partners with whom the agents wish to match.

Table 3 summarizes the distribution of types by gender and province for married individuals in the three birth cohorts. Together their spousal choices would straddle the implementation of the OCP, permitting an examination of changes in spousal choice as suggested by the model in section 2. Specifically, the 1940s cohort would be the strictly pre-policy cohort, while the 1960s cohort would be the strictly post-policy cohort, with the 1950s cohort straddling the policy period[10]. The empirical analysis will be performed by province, that is we assume that each marriage market is closed within provincial boundaries[11].

[10]Since the age of individuals born in the 1950s would be between the ages of 20 to 29 when the OCP was implemented.

[11]We are however unable to control for the specific urban centers within which the individuals reside, given that this information is not available to us.

Table 1: Summary of Parental Characteristics

| Province | Variable | 1940s Cohort | | 1950s Cohort | | 1960s Cohort | |
|---|---|---|---|---|---|---|---|
| | | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Jilin | Number of Children | 1.3547 | 0.8333 | 1.1550 | 0.4618 | 0.9904 | 0.2753 |
| | Father's Education | 3.1818 | 1.3794 | 3.1741 | 1.1636 | 3.4738 | 1.1559 |
| | Mother's Education | 2.7004 | 1.2614 | 3.0165 | 1.0724 | 3.3311 | 1.0927 |
| | Father's Deflated Income | 3.3699 | 1.7024 | 3.3078 | 1.9084 | 3.2119 | 2.0461 |
| | Mother's Deflated Income | 2.1289 | 1.6142 | 2.2913 | 1.4792 | 2.2849 | 1.6536 |
| | Observations | 1342 | | 2723 | | 1661 | |
| Shandong | Number of Children | 1.4867 | 0.7726 | 1.1478 | 0.3971 | 1.0182 | 0.2585 |
| | Father's Education | 3.1128 | 1.3216 | 3.3286 | 1.2541 | 3.8288 | 1.1336 |
| | Mother's Education | 2.5531 | 1.2518 | 2.9259 | 1.1048 | 3.3512 | 1.0745 |
| | Father's Deflated Income | 3.5644 | 1.6691 | 3.5727 | 1.7539 | 3.5542 | 1.7107 |
| | Mother's Deflated Income | 2.6945 | 1.5580 | 2.9859 | 1.6184 | 2.9939 | 1.6225 |
| | Observations | 1206 | | 2970 | | 1922 | |
| Hubei | Number of Children | 1.4012 | 0.7608 | 1.1157 | 0.4023 | 0.9927 | 0.2229 |
| | Father's Education | 3.1812 | 1.3377 | 3.2202 | 1.2133 | 3.7847 | 1.1258 |
| | Mother's Education | 2.5248 | 1.2449 | 2.8931 | 1.0500 | 3.3681 | 1.0865 |
| | Father's Deflated Income | 3.2900 | 1.7657 | 3.2999 | 1.8086 | 3.2164 | 1.7962 |
| | Mother's Deflated Income | 2.5619 | 1.3983 | 2.8155 | 1.5873 | 2.7784 | 1.6565 |
| | Observations | 1649 | | 3397 | | 1649 | |
| Guangdong | Number of Children | 1.5875 | 0.7460 | 1.1696 | 0.4427 | 1.0152 | 0.3327 |
| | Father's Education | 3.0413 | 1.4145 | 3.2011 | 1.2509 | 3.6340 | 1.0717 |
| | Mother's Education | 2.4732 | 1.2586 | 2.9261 | 1.0687 | 3.3612 | 1.0666 |
| | Father's Deflated Income | 8.8553 | 6.5393 | 8.7790 | 5.7751 | 10.4256 | 6.9291 |
| | Mother's Deflated Income | 5.9568 | 4.1463 | 7.5356 | 5.5621 | 8.4583 | 6.5500 |
| | Observations | 1549 | | 2760 | | 1254 | |
| Sichuan | Number of Children | 1.0647 | 0.7603 | 1.0133 | 0.3501 | 0.9744 | 0.2563 |
| | Father's Education | 3.1247 | 1.3725 | 2.9652 | 1.3065 | 3.6205 | 1.1736 |
| | Mother's Education | 2.5109 | 1.2525 | 2.7036 | 1.0942 | 3.3821 | 1.1050 |
| | Father's Deflated Income | 3.3728 | 1.6817 | 3.1531 | 1.6387 | 3.2847 | 1.9944 |
| | Mother's Deflated Income | 2.3651 | 1.5338 | 2.5850 | 1.5302 | 2.8064 | 1.6850 |
| | Observations | 2165 | | 4514 | | 2308 | |
| Shaanxi | Number of Children | 1.3491 | 0.8425 | 1.1680 | 0.4827 | 1.0118 | 0.3199 |
| | Father's Education | 3.2498 | 1.2991 | 3.2704 | 1.2642 | 3.6171 | 1.1439 |
| | Mother's Education | 2.6821 | 1.1480 | 2.8971 | 1.0208 | 3.1988 | 1.0151 |
| | Father's Deflated Income | 3.0547 | 1.5524 | 2.7700 | 1.4807 | 2.7042 | 1.7256 |
| | Mother's Deflated Income | 1.9925 | 1.3553 | 2.1742 | 1.3066 | 2.0294 | 1.4101 |
| | Observations | 1249 | | 1827 | | 1016 | |

1=Elementary School & Lower, 2=Middle School, 3=High School, 4=Technical Education, 5=College

Table 2: Pure Poisson Model $\chi^2$ Goodness of Fit Tests and Upper Tail Probabilities by Cohort & Province

| Province | Sample with Children | | | Sample with First Child Male | | | Sample with First Child Female | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1940-1949 | 1950-1959 | 1960-1969 | 1940-1949 | 1950-1959 | 1960-1969 | 1940-1949 | 1950-1959 | 1960-1969 |
| Jilin | 93.6160 | 10.3780 | 0.6654 | 50.9660 | 10.2570 | 0.1746 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0000] | [0.0156] | [0.8813] | [0.0000] | [0.0165] | [0.9816] | [0.0000] | [0.5989] | [0.7386] |
| Shandong | 83.8070 | 6.8097 | 0.3350 | 40.1020 | 6.8786 | 0.8844 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0000] | [0.0782] | [0.9533] | [0.0000] | [0.0759] | [0.8292] | [0.0000] | [0.5989] | [0.7386] |
| Hubei | 160.4400 | 3.9586 | 0.3216 | 85.7050 | 0.4048 | 0.2199 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0000] | [0.2660] | [0.9559] | [0.0000] | [0.9393] | [0.9743] | [0.0000] | [0.5989] | [0.7386] |
| Guangdong | 62.1030 | 14.7550 | 0.7909 | 50.1570 | 17.0430 | 0.1743 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0000] | [0.0020] | [0.8516] | [0.0000] | [0.0007] | [0.9816] | [0.0000] | [0.5989] | [0.7386] |
| Sichuan | 19.5340 | 1.9515 | 0.1060 | 4.2455 | 1.4128 | 0.0147 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0002] | [0.5825] | [0.9911] | [0.2361] | [0.7025] | [0.9995] | [0.0000] | [0.5989] | [0.7386] |
| Shaanxi | 35.4280 | 3.5457 | 15.4910 | 14.0700 | 2.4533 | 46.5000 | 183.0400 | 1.8743 | 1.2604 |
| | [0.0000] | [0.3149] | [0.0014] | [0.0028] | [0.4838] | [0.0000] | [0.0000] | [0.5989] | [0.7386] |

$\Pr(X \leq x)$ are reported in brackets.

As observed in table 3, the marginal distributions reveal that the educational attainment of men dominate that of women as it was in table 1. It is then to be expected that if marriage is indeed beneficial, well educated men in the earlier birth cohorts may adapt through lower incidences of positive assortative matching choices[12]. As educational attainment rose among the general populace, the possibility of increase positive assortative matching would have increased among men with higher educational attainment. This upward trend in educational attainment is however quite separate from the effect of the OCP on familial investments in children, nor can it be attributed to the economic reforms since the agents were born of parents in an era prior to 1979. Nonetheless to account for the changes across time, the relative changes amongst these three cohorts of individuals is examined to ascertain the effect of the OCP. It should also be noted that since both the OCP and Economic Reforms had differential impact provincially, it would not be surprising to see differential in matching patterns, since it would largely depend upon the relative strengths of the policies (the OCP or Economic Reforms).

For each province, comparisons of the change in matching between the cohorts (1940s versus 1960s, 1940s versus 1950s and 1950s versus 1960s) allows us to examine the trends in matching. This is done through the examination of the overlap between the empirical density matrix to that expected under positive (negative) assortative matching. The overlap provides a scalar measure (which is asympototically normally distributed) and it is the difference between these measures for each cohort which will allow us to understand how matching has evolved. A detailed description of the measures utilized will be described in detail in the following section. In the absence of any trends towards positive assortative matching (possibly as a result of preference for smaller family sizes due to urbanization), changes in the matching pattern could be due to either the OCP or Economic Reforms. However, should there be a "linear" trend towards positive assortative matching, the effect that is due to the OCP or the economic reform can be gleaned from examining the difference in the measures from two comparisons, 1940s versus 1960s, and 1950s versus 1960s, which is similar to a difference-in-difference analysis. As was noted in the introduction, the sorting attribute we examine is educational attainment whose classification is based on the pre-1986 eight year compulsory educational system since the youngest set of individuals in our sample, those born in 1969 would have completed their

[12]Due to a lack of data, we are also unable to discern if the individuals were married in rural towns prior to being observed within the urban context.

compulsory education prior to the institution of the new educational laws [13].

Overlap amongst the male and female attainment distributions (the sum of the minimums of the male and female proportions in each attainment category) is a measure of the degree to which exact positive assortative matching that is *feasible* (i.e. all males of type 1 matches with female of type 1, all males of type 2 match with female of type 2, etc.). Examining this stylized measure yields an indication of the *degree* of positive assortative matching that is *feasible*. Such a overlap measure for each province and the three cohorts are respectively; Jilin was 0.8146, 0.9204 and 0.9320; Shandong was 0.8333, 0.8494 and 0.7907; Hubei was 0.8069, 0.8775 and 0.8210; Guangdong was 0.8447, 0.8740 and 0.8403; Sichuan was 0.8278, 0.8865 and 0.8705; and Shaanxi was 0.8241, 0.8149 and 0.8109. Comparing the potential for assortative pairing between the cohorts born in the 1940s and 1950s, there was an increase with the exception being Shaanxi. On the other hand, when comparing between 1950s and 1960s, there is infact a decrease in potential with the exception of Jilin. This suggests that should we find a significant increase in assortative pairing between the 1950s versus the 1960s cohorts, it is very possible that it is a result of the OCP, without regard to trends towards positive assortative matching.

[13] China implemented a nine year compulsory educational system, divided into primary (five to six years) and junior secondary (3 to 4 years). Upon completion, the children may then attend senior secondary lasting for 3 years. China Education and Research Network.

Table 3: Marginals of Married Individuals

| | | Shaanxi | | Jilin | | Hubei | | Sichuan | | Guangdong | | Shandong | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| 40s Cohort | 1 | 0.0625 | 0.1124 | 0.0848 | 0.1317 | 0.0718 | 0.1893 | 0.1134 | 0.2065 | 0.1397 | 0.2210 | 0.0843 | 0.1917 |
| | 2 | 0.3239 | 0.4438 | 0.3336 | 0.4359 | 0.3448 | 0.4136 | 0.3113 | 0.3868 | 0.2995 | 0.3683 | 0.3363 | 0.4005 |
| | 3 | 0.1720 | 0.1713 | 0.1668 | 0.1374 | 0.1698 | 0.1467 | 0.1491 | 0.1393 | 0.1757 | 0.1811 | 0.1730 | 0.1469 |
| | 4 | 0.1899 | 0.1929 | 0.1275 | 0.1577 | 0.1519 | 0.1560 | 0.1923 | 0.1803 | 0.1364 | 0.1255 | 0.1745 | 0.1603 |
| | 5 | 0.2517 | 0.0797 | 0.2873 | 0.1374 | 0.2617 | 0.0944 | 0.2340 | 0.0871 | 0.2488 | 0.1042 | 0.2319 | 0.1007 |
| Number of Obs. | | 1343 | 1343 | 1427 | 1427 | 1949 | 1949 | 2663 | 2663 | 1833 | 1833 | 1341 | 1341 |
| 50s Cohort | 1 | 0.0307 | 0.0449 | 0.0123 | 0.0235 | 0.0279 | 0.0370 | 0.0764 | 0.0823 | 0.0589 | 0.0644 | 0.0269 | 0.0441 |
| | 2 | 0.3120 | 0.2994 | 0.3371 | 0.3427 | 0.3086 | 0.3435 | 0.4040 | 0.4058 | 0.2430 | 0.2593 | 0.3081 | 0.3727 |
| | 3 | 0.2852 | 0.4559 | 0.3356 | 0.3591 | 0.3053 | 0.3843 | 0.1978 | 0.2878 | 0.3548 | 0.4344 | 0.2421 | 0.2997 |
| | 4 | 0.0947 | 0.0870 | 0.0907 | 0.1295 | 0.1258 | 0.1164 | 0.1157 | 0.1322 | 0.1007 | 0.1252 | 0.1519 | 0.1633 |
| | 5 | 0.2775 | 0.1128 | 0.2243 | 0.1452 | 0.2324 | 0.1188 | 0.2062 | 0.0919 | 0.2426 | 0.1167 | 0.2710 | 0.1202 |
| Number of Obs. | | 1827 | 1827 | 2679 | 2679 | 3266 | 3266 | 4409 | 4409 | 2700 | 2700 | 2970 | 2970 |
| 60s Cohort | 1 | 0.0074 | 0.0180 | 0.0117 | 0.0098 | 0.0045 | 0.0103 | 0.0174 | 0.0106 | 0.0019 | 0.0140 | 0.0027 | 0.0060 |
| | 2 | 0.1605 | 0.2302 | 0.2227 | 0.2411 | 0.1207 | 0.2187 | 0.1522 | 0.2256 | 0.1043 | 0.1909 | 0.1388 | 0.2358 |
| | 3 | 0.3538 | 0.4234 | 0.3454 | 0.3822 | 0.3252 | 0.3736 | 0.3164 | 0.3512 | 0.4535 | 0.4218 | 0.2699 | 0.3382 |
| | 4 | 0.1288 | 0.1668 | 0.1380 | 0.1515 | 0.1271 | 0.1536 | 0.1324 | 0.1551 | 0.0847 | 0.1462 | 0.1599 | 0.2033 |
| | 5 | 0.3495 | 0.1616 | 0.2822 | 0.2153 | 0.4226 | 0.2439 | 0.3816 | 0.2575 | 0.3557 | 0.2272 | 0.4287 | 0.2168 |
| Number of Obs. | | 947 | 947 | 1630 | 1630 | 1550 | 1550 | 2070 | 2070 | 1074 | 1074 | 1845 | 1845 |

1=Elementary School & Lower, 2=Middle School, 3=High School, 4=Technical Education, 5=College

# 4 Empirical Analysis of Matching

The empirical joint densities of the data are reported in Table 4, from which we can glean some information on matching patterns over the various cohorts by province of residence. Note that the diagonal probabilities of the joint density provide some evidence of increased assortative pairing between the cohorts born in the 1940s and 1950s which is not surprising given the capacity for assortative matching has increased between the two cohorts (In other words, the comparison between this two cohorts is akin to examining the marital effects due to the cultural revolution between 1966 and 1969.). What is interesting is that this was also true among provinces where capacity for positive assortative pairing for the 1960s cohort decreased. Closer inspection of the marginal densities in table 3 reveals that the fall in capacity is largely due to a decreased proportion of low educational attainment individuals, while the increases in positive asortative pairing among the 1960s cohorts are among individuals with higher educational attainment realizations. Further, note that as predicted by the model, the lower rates of matching among individuals of low attainment, that is individuals with elementary, and middle school education. Nonetheless, this evidence is suggestive, and will serve only as a guide in our subsequent analysis.

The corresponding indices and tests for positive and negative assortative matching using the overlap measure are reported in Table 5. It must be noted that because the 1950s cohort consists of mainly individuals who made their spousal choice prior to the implementation of the OCP, while the 1960s cohort were those most likely affected, the identification of the impact of the OCP hinges on the increase in assortative pairing by the 1960s cohort over the other two cohort.

We test for the increase in positive assortative matching by testing first,

$$vs. \begin{array}{ll} H_0 : & \Delta \mathbf{OV}_p > 0 \\ H_1 : & \Delta \mathbf{OV}_p \leq 0 \end{array}$$

and decreased negative assortative matching,

$$vs. \begin{array}{ll} H_0 : & \Delta \mathbf{OV}_n < 0 \\ H_1 : & \Delta \mathbf{OV}_n \geq 0 \end{array}$$

As noted before, since $\mathbf{OV}_p$ and $\mathbf{OV}_n$ are asymptotically normal, this inferences can be easily performed.

Table 4: Empirical Joint Density of Matching by Province, and Cohort

| | | | Jilin Females 1 | 2 | 3 | 4 | 5 | Shandong Females 1 | 2 | 3 | 4 | 5 | Hubei Females 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40s Cohort | Males | 1 | 0.0545 | 0.0255 | 0.0021 | 0.0021 | 0.0000 | 0.0545 | 0.0174 | 0.0076 | 0.0061 | 0.0000 | 0.0384 | 0.0254 | 0.0036 | 0.0047 | 0.0005 |
| | | 2 | 0.0326 | 0.2258 | 0.0290 | 0.0333 | 0.0064 | 0.0742 | 0.1591 | 0.0409 | 0.0500 | 0.0136 | 0.0737 | 0.1755 | 0.0337 | 0.0472 | 0.0099 |
| | | 3 | 0.0198 | 0.0651 | 0.0566 | 0.0149 | 0.0149 | 0.0212 | 0.0826 | 0.0318 | 0.0242 | 0.0136 | 0.0213 | 0.0722 | 0.0389 | 0.0270 | 0.0093 |
| | | 4 | 0.0205 | 0.0453 | 0.0212 | 0.0283 | 0.0149 | 0.0273 | 0.0803 | 0.0265 | 0.0318 | 0.0053 | 0.0332 | 0.0592 | 0.0213 | 0.0244 | 0.0161 |
| | | 5 | 0.0113 | 0.0679 | 0.0276 | 0.0800 | 0.1005 | 0.0167 | 0.0568 | 0.0402 | 0.0492 | 0.0689 | 0.0270 | 0.0774 | 0.0462 | 0.0535 | 0.0602 |
| 50s Cohort | Males | 1 | 0.0033 | 0.0056 | 0.0033 | 0.0011 | 0.0000 | 0.0131 | 0.0104 | 0.0027 | 0.0010 | 0.0007 | 0.0076 | 0.0152 | 0.0052 | 0.0000 | 0.0000 |
| | | 2 | 0.0115 | 0.2514 | 0.0502 | 0.0152 | 0.0115 | 0.0138 | 0.1806 | 0.0642 | 0.0316 | 0.0171 | 0.0137 | 0.1868 | 0.0844 | 0.0213 | 0.0064 |
| | | 3 | 0.0048 | 0.0536 | 0.2157 | 0.0379 | 0.0216 | 0.0067 | 0.0854 | 0.1100 | 0.0279 | 0.0108 | 0.0079 | 0.0719 | 0.1780 | 0.0244 | 0.0213 |
| | | 4 | 0.0007 | 0.0205 | 0.0320 | 0.0253 | 0.0130 | 0.0034 | 0.0501 | 0.0370 | 0.0427 | 0.0215 | 0.0034 | 0.0369 | 0.0491 | 0.0277 | 0.0085 |
| | | 5 | 0.0037 | 0.0167 | 0.0558 | 0.0495 | 0.0959 | 0.0084 | 0.0491 | 0.0837 | 0.0595 | 0.0686 | 0.0040 | 0.0360 | 0.0667 | 0.0415 | 0.0820 |
| 60s Cohort | Males | 1 | 0.0055 | 0.0049 | 0.0012 | 0.0000 | 0.0000 | 0.0000 | 0.0011 | 0.0011 | 0.0000 | 0.0005 | 0.0000 | 0.0019 | 0.0025 | 0.0000 | 0.0000 |
| | | 2 | 0.0036 | 0.1518 | 0.0559 | 0.0055 | 0.0030 | 0.0027 | 0.0726 | 0.0409 | 0.0178 | 0.0086 | 0.0051 | 0.0682 | 0.0331 | 0.0057 | 0.0083 |
| | | 3 | 0.0012 | 0.0625 | 0.2198 | 0.0273 | 0.0346 | 0.0027 | 0.0850 | 0.1318 | 0.0360 | 0.0151 | 0.0064 | 0.0860 | 0.1739 | 0.0325 | 0.0280 |
| | | 4 | 0.0000 | 0.0079 | 0.0474 | 0.0589 | 0.0237 | 0.0011 | 0.0328 | 0.0425 | 0.0597 | 0.0194 | 0.0000 | 0.0287 | 0.0433 | 0.0325 | 0.0223 |
| | | 5 | 0.0000 | 0.0115 | 0.0577 | 0.0589 | 0.1573 | 0.0000 | 0.0446 | 0.1216 | 0.0866 | 0.1759 | 0.0000 | 0.0350 | 0.1178 | 0.0847 | 0.1841 |

| | | | Guangdong Females 1 | 2 | 3 | 4 | 5 | Sichuan Females 1 | 2 | 3 | 4 | 5 | Shaanxi Females 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40s Cohort | Males | 1 | 0.0703 | 0.0463 | 0.0153 | 0.0060 | 0.0005 | 0.0561 | 0.0455 | 0.0046 | 0.0076 | 0.0008 | 0.0178 | 0.0304 | 0.0037 | 0.0074 | 0.0015 |
| | | 2 | 0.0785 | 0.1417 | 0.0327 | 0.0365 | 0.0098 | 0.0751 | 0.1495 | 0.0319 | 0.0406 | 0.0102 | 0.0475 | 0.1930 | 0.0386 | 0.0319 | 0.0134 |
| | | 3 | 0.0283 | 0.0703 | 0.0507 | 0.0147 | 0.0114 | 0.0209 | 0.0649 | 0.0383 | 0.0209 | 0.0046 | 0.0148 | 0.0594 | 0.0572 | 0.0327 | 0.0082 |
| | | 4 | 0.0251 | 0.0490 | 0.0278 | 0.0256 | 0.0098 | 0.0341 | 0.0653 | 0.0277 | 0.0542 | 0.0118 | 0.0163 | 0.0742 | 0.0275 | 0.0690 | 0.0022 |
| | | 5 | 0.0191 | 0.0605 | 0.0529 | 0.0431 | 0.0741 | 0.0247 | 0.0580 | 0.0357 | 0.0588 | 0.0584 | 0.0178 | 0.0869 | 0.0431 | 0.0512 | 0.0542 |
| 50s Cohort | Males | 1 | 0.0178 | 0.0271 | 0.0134 | 0.0007 | 0.0004 | 0.0298 | 0.0356 | 0.0081 | 0.0009 | 0.0020 | 0.0144 | 0.0083 | 0.0094 | 0.0000 | 0.0000 |
| | | 2 | 0.0271 | 0.1060 | 0.0833 | 0.0227 | 0.0048 | 0.0327 | 0.2301 | 0.0984 | 0.0363 | 0.0081 | 0.0211 | 0.1713 | 0.1048 | 0.0133 | 0.0033 |
| | | 3 | 0.0175 | 0.0781 | 0.2052 | 0.0331 | 0.0186 | 0.0102 | 0.0541 | 0.0979 | 0.0174 | 0.0160 | 0.0067 | 0.0543 | 0.1951 | 0.0094 | 0.0161 |
| | | 4 | 0.0015 | 0.0212 | 0.0424 | 0.0216 | 0.0141 | 0.0059 | 0.0408 | 0.0305 | 0.0300 | 0.0092 | 0.0000 | 0.0249 | 0.0394 | 0.0266 | 0.0055 |
| | | 5 | 0.0019 | 0.0279 | 0.0870 | 0.0472 | 0.0796 | 0.0032 | 0.0469 | 0.0512 | 0.0476 | 0.0571 | 0.0050 | 0.0438 | 0.1031 | 0.0371 | 0.0870 |
| 60s Cohort | Males | 1 | 0.0000 | 0.0009 | 0.0000 | 0.0000 | 0.0000 | 0.0034 | 0.0120 | 0.0010 | 0.0000 | 0.0000 | 0.0041 | 0.0031 | 0.0000 | 0.0000 | 0.0000 |
| | | 2 | 0.0046 | 0.0557 | 0.0399 | 0.0056 | 0.0000 | 0.0034 | 0.0814 | 0.0457 | 0.0096 | 0.0116 | 0.0041 | 0.0966 | 0.0586 | 0.0021 | 0.0010 |
| | | 3 | 0.0093 | 0.0984 | 0.2674 | 0.0427 | 0.0418 | 0.0024 | 0.0948 | 0.1680 | 0.0299 | 0.0231 | 0.0072 | 0.0771 | 0.2148 | 0.0360 | 0.0195 |
| | | 4 | 0.0000 | 0.0167 | 0.0325 | 0.0232 | 0.0130 | 0.0005 | 0.0169 | 0.0380 | 0.0448 | 0.0323 | 0.0000 | 0.0164 | 0.0524 | 0.0432 | 0.0134 |
| | | 5 | 0.0000 | 0.0186 | 0.0901 | 0.0761 | 0.1634 | 0.0019 | 0.0202 | 0.0997 | 0.0698 | 0.1897 | 0.0021 | 0.0298 | 0.1069 | 0.0843 | 0.1274 |

1=Elementary School & Lower, 2=Middle School, 3=High School, 4=Technical Education, 5=College

Table 5: Matching by Birth Cohort (All Years: 1989, 1991 to 2001)

| | Province | Jilin | | Shandong | | Hubei | | Guangdong | | Sichuan | | Shaanxi | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Positive | Negative | Positive | Negative | Positive | Negative | Positive | Negative | Positive | Negative | Positive | Negative |
| 40s Cohort | Overlap Statistic | 0.6645 | 0.3149 | 0.5788 | 0.5000 | 0.6002 | 0.5026 | 0.6093 | 0.4164 | 0.6100 | 0.4431 | 0.5939 | 0.3809 |
| | | (0.0126) | (0.0124) | (0.0136) | (0.0138) | (0.0112) | (0.0114) | (0.0114) | (0.0115) | (0.0095) | (0.0097) | (0.0134) | (0.0132) |
| | Number of Obs. | 1413 | 1413 | 1320 | 1320 | 1926 | 1926 | 1835 | 1835 | 2636 | 2636 | 1347 | 1347 |
| 50s Cohort | Overlap Statistic | 0.7382 | 0.3871 | 0.6106 | 0.3682 | 0.6583 | 0.4389 | 0.6903 | 0.4097 | 0.6098 | 0.3878 | 0.7228 | 0.4296 |
| | | (0.0085) | (0.0094) | (0.0089) | (0.0088) | (0.0083) | (0.0087) | (0.0089) | (0.0095) | (0.0073) | (0.0073) | (0.0105) | (0.0117) |
| | Number of Obs. | 2689 | 2689 | 2974 | 2974 | 3281 | 3281 | 2690 | 2690 | 4433 | 4433 | 1804 | 1804 |
| 60 Cohort | Overlap Statistic | 0.7669 | 0.3722 | 0.7187 | 0.3287 | 0.7631 | 0.4389 | 0.7215 | 0.4930 | 0.7020 | 0.3924 | 0.7677 | 0.4450 |
| | | (0.0104) | (0.0119) | (0.0104) | (0.0109) | (0.0107) | (0.0125) | (0.0137) | (0.0152) | (0.0100) | (0.0107) | (0.0135) | (0.0159) |
| | Number of Obs. | 1647 | 1647 | 1859 | 1859 | 1570 | 1570 | 1077 | 1077 | 2077 | 2077 | 973 | 973 |
| Change in Assortative Mating | 50s - 40s | 0.0737 | 0.0722 | 0.0318 | -0.1318 | 0.0581 | -0.0637 | 0.0811 | -0.0067 | -0.0003 | -0.0553 | 0.1289 | 0.0488 |
| | | (0.0152) | (0.0155) | (0.0163) | (0.0164) | (0.0139) | (0.0143) | (0.0145) | (0.0149) | (0.0120) | (0.0121) | (0.0170) | (0.0176) |
| | | [1.0000] | [1.0000] | [0.9748] | [0.0000] | [1.0000] | [0.0000] | [1.0000] | [0.3271] | [0.4910] | [0.0000] | [1.0000] | [0.9972] |
| | 60s - 40s | 0.1023 | 0.0573 | 0.1399 | -0.1713 | 0.1629 | -0.0638 | 0.1122 | 0.0767 | 0.0920 | -0.0507 | 0.1738 | 0.0642 |
| | | (0.0163) | (0.0172) | (0.0171) | (0.0176) | (0.0155) | (0.0169) | (0.0178) | (0.0191) | (0.0138) | (0.0144) | (0.0190) | (0.0207) |
| | | [1.0000] | [0.9996] | [1.0000] | [0.0000] | [1.0000] | [0.0001] | [1.0000] | [1.0000] | [1.0000] | [0.0002] | [1.0000] | [0.9990] |
| | 60s - 50s | 0.0287 | -0.0149 | 0.1080 | -0.0395 | 0.1047 | 0.0000 | 0.0311 | 0.0834 | 0.0922 | 0.0046 | 0.0449 | 0.0154 |
| | | (0.0134) | (0.0152) | (0.0137) | (0.0140) | (0.0136) | (0.0152) | (0.0163) | (0.0179) | (0.0124) | (0.0130) | (0.0172) | (0.0197) |
| | | [0.9836] | [0.1623] | [1.0000] | [0.0024] | [1.0000] | [0.4990] | [0.9718] | [1.0000] | [1.0000] | [0.6391] | [0.9956] | [0.7826] |
| Difference-in-Difference | (50s-40s)-(60s-50s) | 0.0450 | 0.0871 | -0.0762 | -0.0923 | -0.0466 | -0.0637 | 0.0500 | -0.0901 | -0.0925 | -0.0599 | 0.0840 | 0.0333 |
| | | (0.0203) | (0.0217) | (0.0213) | (0.0216) | (0.0194) | (0.0209) | (0.0218) | (0.0233) | (0.0173) | (0.0178) | (0.0242) | (0.0265) |
| | | [0.9868] | [1.0000] | [0.0002] | [0.0000] | [0.0082] | [0.0012] | [0.9890] | [0.0001] | [0.0000] | [0.0004] | [0.9997] | [0.8960] |
| | (60s-40s)-(60s-50s) | 0.0737 | 0.0722 | 0.0318 | -0.1318 | 0.0581 | -0.0637 | 0.0811 | -0.0067 | -0.0003 | -0.0553 | 0.1289 | 0.0488 |
| | | (0.0211) | (0.0229) | (0.0220) | (0.0225) | (0.0206) | (0.0228) | (0.0241) | (0.0262) | (0.0186) | (0.0194) | (0.0256) | (0.0286) |
| | | [0.9998] | [0.9992] | [0.9265] | [0.0000] | [0.9976] | [0.0026] | [0.9996] | [0.3994] | [0.4942] | [0.0022] | [1.0000] | [0.9558] |
| | (50s-40s)-(60s-40s) | 0.0287 | -0.0149 | 0.1080 | -0.0395 | 0.1047 | 0.0000 | 0.0311 | 0.0834 | 0.0922 | 0.0046 | 0.0449 | 0.0154 |
| | | (0.0223) | (0.0231) | (0.0236) | (0.0240) | (0.0208) | (0.0222) | (0.0229) | (0.0242) | (0.0183) | (0.0189) | (0.0255) | (0.0272) |
| | | [0.9009] | [0.2593] | [1.0000] | [0.0498] | [1.0000] | [0.4993] | [0.9127] | [0.9997] | [1.0000] | [0.5968] | [0.9606] | [0.7146] |

Standard errors are in parenthesis and $\Pr(X \leq x)$ are in brackets.

From table 5 note that in all instances, the overlap measures are all statistically significantly different from complete overlap, and that the empirical joint density is a closer match to the positive assortative joint density matrix than that generated by negative assortative matching. Next, examining the change in assortative matching between the 1940s and 1950s cohort, note that the hypothesis of increased positive assortative matching, and decreased negative assortative matching cannot be rejected for Shandong, Hubei, Guangdong, and Sichuan. For Jilin and Shaanxi, it seems there is an increase in both positive and negative assortative matching, noting that the empirical joint density is closer to positive than negative assortative matching. Considering the fact that the capacity for positive assortative matching rose between the two cohorts, the outcomes are not surprising and can easily be explained as the effects of increased educational attainment in the general populace, and a trend towards increased positive assortative matching. However, comparing the 1950s and 1960s cohorts, note the significant increase in positive assortative matching but statistically insignificant change in negative assortative matching for Jilin, Hubei, Sichuan and Shaanxi. For Shandong, there is a significant increase in positive assortative matching and a significant decrease in negative assortative matching, while Guangdong recorded a significant increase in both positive and negative assortative matching, with the overlap with positive assortative matching joint density being higher. Similar conclusions can be made when comparing the 1960s and 1940s cohorts. This then suggests that there was indeed a significant increase in positive assortative matching in the 1960s which, negating considerations of trends, coupled with the decreased capacity for positive assortative matching suggests that this is a consequence of the OCP (or that the OCP effects dominate that due to the Economics Reforms).

To control for the effects of trends from increased preference for positive assortative matching in urban China, we perform a difference-in-difference analysis which is done by examining the relative change in overlap measure between two comparisons which are reported in table 5 as well. Given that with the exception of Shaanxi, all other provinces had experienced an increase in capacity for positive assortative matching from the 1940s to the 1950s cohort, we can test whether the increase in positive assortative matching between the 1950s and 1960s cohort is significantly greater than that between the 1940s and 1950s which would control for trends towards increased preference for positive assortative matching. This comparison is reported in the first comparison of the final panel of *Difference-in-Difference.* Note that in this comparison, Shandong, Hubei and Sichuan all experienced a significantly higher rate of increase in positive assortative matching between the 1950s and 1960s cohorts. In terms of the change in negative assortative matching, these three provinces' fall are significantly less than that exhibited between the 1940s and 1950s cohorts. Nonetheless, realizing that the change a negative assortative matching for Hubei and Sichuan between the 1950s and 1960s is not statistically significant, the results thus suggests that the increase in positive assortative matching is a result of the OCP. The conclusion is further enforced by noting that the average deflated income (summarized in table 1) over the three cohorts has not seen significant variation for this three provinces.

On the other hand, the results for Guangdong and Shaanxi suggests that positive assortative matching has slowed down significantly. One possible reason is principally due to the lower capacity for positive assortative matching for Guangdong and Shaanxi among the 1960s cohort. For Guangdong, with reference to table 1, there is the added evidence of increase in income (a fifth of a standard deviation) between the 1950s and 1960s cohorts, suggesting that the fall in positive assortative matching there might also be tempered by the income effect suggested in the model of section 2. For Jilin, the only province in our sample that exhibited continued increase in positive assortative matching capacity, much of the increase in positive assortative matching seem to have been exhausted by the arrival of the 1950s cohort such that the increase in positive assortative matching is lower than that observed between the 1940s and 1950s cohort. This suggests that for Shaanxi and Jilin, the dominating effect that drove the change in positive assortative matching is simply due to trends (in post cultural revolution China), or urbanization.

It is of interest to compare the difference in overlap between the 1960s versus the 1940s cohort, and 1960s versus the 1950s cohort. We know that for Shandong, Guangdong, and Shaanxi there was a decline in capacity for positive assortative matching between the 1940s and 1960s cohort. While Jilin, Sichuan and Hubei saw in increase in capacity for positive assortative matching, the change in capacity was far smaller than the difference between the 1960s and 1950s cohort. This means that we should expect the rate of change in positive assortative matching should be greater for all the province in the 1940s versus 1960s comparison than the 1960s versus the 1950s comparison. This result is the second comparison of the final panel. Note that for all the provinces unanimously, the increase in positive assortative matching over 1940s and 1960s was instead larger than that exhibited between the 1950s and 1960s.

The final comparison of the final panel reports the difference between the change between the 1950s versus 1940s, and that of the 1960s versus the 1940s. Given the change in capacity, there is little to be gleaned regarding trends, and the results accords with expectations that the latter difference in overlap is greater since the effect is dominated by the change in capacity over the 1940s and 1950s. Note however that the difference is not significant at the 5% level for Jilin, Guangdong, and Shaanxi, further suggesting the likelihood that the change in matching behavior in the 1960s cohort is in fact dominated by the effects of the OCP. On the aggregate, the evidence substantially supports the hypothesis that the OCP altered individual's spousal choice.

# 5 Stochastic Dominance Test

The model of section 2 suggests that for the OCP would induce an increase in positive assortative matching. For the higher type individuals, this increase occurs with a reduction in the likelihood of the individual choosing the "lowest" type individuals as partners, which in turn implies that there may be a stochastic dominant shift in the cumulative distribution of spouses (Appendix A.2 discusses this in greater detail). For the lower educational attainment realizations, the stochastic dominance relationship is a empirical question. This section examines the relationship of the cumulative distribution of spouses for each educational attainment men, and compares these cumulative distributions across cohorts for each province as before.

Let $F(.)$ and $G(.)$ be the conditional distribution of spousal type of husbands before and after the OCP respectively, and similarly let $f(.)$ and $g(.)$ be their conditional density respectively. Further, denote the individual's educational attainment realization be $t_i^f$ and $t_i^g$ for pre- and post-OCP, where $i \in \{h, w\}$ as before. We wish to test whether,

$$\begin{aligned} \int_{\underline{t}}^{t} f(t_w|t_h)dt_w &\geq \int_{\underline{t}}^{t} g(t_w|t_h)dt_w \\ \Rightarrow \qquad F(t_w|t_h) &\geq G(t_w|t_h) \end{aligned} \tag{17}$$

If the above inequality is true for $t_w \in [\underline{t}, t]$, we say that $F$ first order stochastically dominate $G$ up to $t$, and we can write this as $f \overset{1}{\succ} g$, and more generally for the $i$'th order of stochastic dominance, we write $f \overset{i}{\succ} g$ for $t_w \in [\underline{t}, t]$ when

$$F^i(t_w|t_h) - G^i(t_w|t_h) \geq 0 \Rightarrow \int_{\underline{t}}^{t} \left\{F^{i-1}(t_w|t_h) - G^{i-1}(t_w|t_h)dt_w\right\} \geq 0 \tag{18}$$

Relating to the discrete educational attainment realizations (see Dardanoni and Forcina (1999)), let $t \in \{t_1, t_2, ..., t_K\}$, where $t_i \in [\underline{t}, \overline{t}]$ and with loss of generality $t_1 < t_2 < ... < t_K$. Then $f \overset{1}{\succ} g$ when

$$F(t_w = t_k|t_h) - G(t_w = t_k|t_h) = \sum_{i=0}^{k} (f(t_w = t_i|t_h) - g(t_w = t_i|t_h)) \leq 0 \tag{19}$$

First order dominance simply means that the cumulative density of $f$ is everywhere to the right of the cumulative density of $g$. In the present context, the first order dominance of $F$ over $G$ implies that the proportion of wives at or below attainment level $t_w = t_k$ is always greater than or equal to the corresponding proportion of wives of husbands after the OCP.

Unlike comparisons of means an essential feature of dominance comparisons is that they compare the whole distribution of attainments. However unlike indices, which provide complete orderings, stochastic dominance orderings are not complete in that distributions cannot always be ranked at a particular order (because the inequality cannot be maintained for all $k$ or the distributions are not significantly different from one another). One feature of stochastic dominance rankings is that $f \overset{i}{\succ} g$ implies $f \overset{j}{\succ} g$ for all $j > i$.

As noted prior, since we are concerned with the general trend towards increased positive matching, we need to discern between the effect due to the OCP and that of urbanization. In other words, we would also wish not only to test for $i$th order stochastic dominance, but also difference in dominance as in the last section[14]. Since the measure is asymptotically normally distributed as well (Davidson and Duclos 2000).

[14]From the model of section 2, it may be discerned that for sufficiently high type individuals, the distribution of spousal type of the higher type individual should likewise stochastically dominate their lower type peers. In which case the $i$th order stochastic dominance relationship can be written as,

$$F^i(t_w = t_k|t_h) - G^i(t_w = t_k|t'_h) = \sum_{i=0}^{k} \left(F^{i-1}(t_w = t_i|t_h) - G^{i-1}(t_w = t_i|t'_h)\right) \leq 0$$

for $t_h > t'_h$, and where $F(.)$ and $G(.)$ are the respective conditional distributions of men of type $t_h$ and $t'_h$. The comparison of the evolution of this relationship across cohort is however not predicted by the model since it is dependent on the rate of the tendency towards positive assortative matching by each type. Nonetheless, this empirical exercise was likewise performed and the results are available from the authors upon request. This test examines the dominance of differences ($\Delta \overset{i}{\succ}$) testing whether the gap between two types is closing or widening across cohorts/time. Alternatively put, it is a test of whether

Table 6 presents the conditional cumulative density ($F(.)$ is the first item for each wives' educational attainment), and cumulative distribution ($F^2(.)$ is the second item for each educational attainment) of spousal educational attainment conditional on husbands' attainment level for each of the three cohorts and province (attainment level 5 for wives is omitted since it would sum to the same value regardless). Table 7 presents the first and second order stochastic dominance tests of the later over the earlier cohorts, for the dominance of the wives' attainment distribution given husbands' attainment level at each of the wives' educational attainment realization. The first two elements reported for each of the wives' attainment is the difference and p-values (in brackets) for the first order dominance test, while the third and fourth element reports that for the second order dominance test. Negative differences support the hypothesis of dominance of later over earlier cohorts, so for a dominance conclusion at least one significantly negative statistic is sought with no significantly positive entries in a given row.

The first interesting result is that according with expectations, for men of the two highest attainment levels (university and technical education), there is indeed a first order stochastic dominance relationship for all provinces of later over earlier cohorts with the sole exception of Shandong (with the distribution of the 1960s and 1950s cohort intersecting at the attainment level of technical education. For the other male attainment levels the relationship of dominance cannot is true not for all realizations of spousal attainment levels which accords with expectations. Intuitively, although the lower reservation type for males in all attainment levels is higher, but so too is the upper reservation type lower. For lower type males, there is in effect a shrinkage in prospective spouses, and the dominance relationship realized is dependent on whether the effect of the higher lower reservation is greater than the lower upper reservation spousal type, and the respective marginal distribution of desirable spousal types, and the competition of men of higher type. In addition, note that this conclusion is true for both first and second order dominance tests.

the two groups are converging or polarizing (Anderson 2004) and may be contemplated as:

$$f \Delta \overset{i}{\succ} g \Rightarrow \left(F_2^i(t_w = t_k|t_h) - G_2^i(t_w = t_k|t'_h)\right) - \left(F_1^i(t_w = t_k|t_h) - G_1^i(t_w = t_k|t'_h)\right) \leq 0$$

$\forall t_k \in \{t_1, t_2, .., , t_K\}$, and where $f$ and $g$ are the respective density functions of men of type $t_h$ and $t'_h$, and the subscript 1 and 2 denote two differing time periods or cohort. Test statistics and their distributions for these comparisons are readily available and easily calculated (Anderson (2004); Dardanoni and Forcina (1999)).

Table 6: Conditional Cumulative Densities of Partner's Attainments

| Province | Wife's | Type 1 Men | | | Type 2 Men | | | Type 3 Men | | | Type 4 Men | | | Type 5 Men | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Attainment | 60s | 50s | 40s | 60s | 50s | 40s | 60s | 50s | 40s | 60s | 50s | 40s | 60s | 50s | 40s |
| Jilin | Attainment 1 | 0.4737 | 0.2500 | 0.6471 | 0.0166 | 0.0339 | 0.0996 | 0.0035 | 0.0145 | 0.1157 | 0.0000 | 0.0081 | 0.1576 | 0.0000 | 0.0168 | 0.0394 |
| | | 0.4737 | 0.2500 | 0.6471 | 0.0166 | 0.0339 | 0.0996 | 0.0035 | 0.0145 | 0.1157 | 0.0000 | 0.0081 | 0.1576 | 0.0000 | 0.0168 | 0.0394 |
| | Attainment 2 | 0.8947 | 0.6667 | 0.9496 | 0.7072 | 0.7735 | 0.7900 | 0.1845 | 0.1750 | 0.4959 | 0.0573 | 0.2317 | 0.5054 | 0.0404 | 0.0923 | 0.2759 |
| | | 4.4737 | 3.3333 | 4.7479 | 3.5359 | 3.8676 | 3.9502 | 0.9227 | 0.8751 | 2.4793 | 0.2863 | 1.1585 | 2.5272 | 0.2021 | 0.4614 | 1.3793 |
| | Attainment 3 | 1.0000 | 0.9167 | 0.9748 | 0.9613 | 0.9212 | 0.8788 | 0.8207 | 0.8216 | 0.8265 | 0.4009 | 0.5813 | 0.6685 | 0.2426 | 0.3440 | 0.3719 |
| | | 14.0000 | 12.8330 | 13.6470 | 13.4590 | 12.8970 | 12.3030 | 11.4900 | 11.5030 | 11.5700 | 5.6123 | 8.1382 | 9.3587 | 3.3957 | 4.8154 | 5.2069 |
| | Attainment 4 | 1.0000 | 1.0000 | 1.0000 | 0.9862 | 0.9661 | 0.9805 | 0.8998 | 0.9353 | 0.9132 | 0.8282 | 0.8577 | 0.8859 | 0.4489 | 0.5671 | 0.6503 |
| | | 30.0000 | 30.0000 | 30.0000 | 29.5860 | 28.9820 | 29.4160 | 26.9950 | 28.0600 | 27.3970 | 24.8460 | 25.7320 | 26.5760 | 13.4680 | 17.0130 | 19.5070 |
| Shandong | Attainment 1 | 0.0000 | 0.4699 | 0.6372 | 0.0189 | 0.0449 | 0.2197 | 0.0099 | 0.0279 | 0.1223 | 0.0069 | 0.0217 | 0.1593 | 0.0000 | 0.0312 | 0.0719 |
| | | 0.0000 | 0.4699 | 0.6372 | 0.0189 | 0.0449 | 0.2197 | 0.0099 | 0.0279 | 0.1223 | 0.0069 | 0.0217 | 0.1593 | 0.0000 | 0.0312 | 0.0719 |
| | Attainment 2 | 0.4000 | 0.8434 | 0.8407 | 0.5283 | 0.6324 | 0.6906 | 0.3241 | 0.3827 | 0.5983 | 0.2180 | 0.3457 | 0.6283 | 0.1041 | 0.2135 | 0.3170 |
| | | 2.0000 | 4.2169 | 4.2035 | 2.6415 | 3.1619 | 3.4529 | 1.6203 | 1.9134 | 2.9913 | 1.0900 | 1.7283 | 3.1416 | 0.5207 | 1.0674 | 1.5850 |
| | Attainment 3 | 0.8000 | 0.9398 | 0.9292 | 0.8151 | 0.8414 | 0.8117 | 0.8111 | 0.8394 | 0.7817 | 0.4914 | 0.5848 | 0.7832 | 0.3877 | 0.5243 | 0.4902 |
| | | 11.2000 | 13.1570 | 13.0090 | 11.4110 | 11.7790 | 11.3630 | 11.3560 | 11.7510 | 10.9430 | 6.8789 | 8.1870 | 10.9650 | 5.4279 | 7.3408 | 6.8627 |
| | Attainment 4 | 0.8000 | 0.9759 | 1.0000 | 0.9396 | 0.9442 | 0.9596 | 0.9443 | 0.9553 | 0.9214 | 0.8754 | 0.8609 | 0.9690 | 0.5897 | 0.7453 | 0.7026 |
| | | 24.0000 | 29.2770 | 30.0000 | 28.1890 | 28.3260 | 28.7890 | 28.3300 | 28.6590 | 27.6420 | 26.2630 | 25.8260 | 29.0710 | 17.6910 | 22.3600 | 21.0780 |
| Hubei | Attainment 1 | 0.0000 | 0.2717 | 0.5286 | 0.0423 | 0.0439 | 0.2168 | 0.0195 | 0.0261 | 0.1262 | 0.0000 | 0.0267 | 0.2155 | 0.0000 | 0.0172 | 0.1022 |
| | | 0.0000 | 0.2717 | 0.5286 | 0.0423 | 0.0439 | 0.2168 | 0.0195 | 0.0261 | 0.1262 | 0.0000 | 0.0267 | 0.2155 | 0.0000 | 0.0172 | 0.1022 |
| | Attainment 2 | 0.4286 | 0.8152 | 0.8786 | 0.6085 | 0.6413 | 0.7328 | 0.2827 | 0.2631 | 0.5539 | 0.2261 | 0.3204 | 0.5993 | 0.0831 | 0.1735 | 0.3949 |
| | | 2.1429 | 4.0761 | 4.3929 | 3.0423 | 3.2066 | 3.6641 | 1.4133 | 1.3153 | 2.7692 | 1.1307 | 1.6019 | 2.9966 | 0.4154 | 0.8676 | 1.9745 |
| | Attainment 3 | 1.0000 | 1.0000 | 0.9286 | 0.8836 | 0.9113 | 0.8321 | 0.8148 | 0.8494 | 0.7846 | 0.5678 | 0.7112 | 0.7374 | 0.3625 | 0.4636 | 0.5697 |
| | | 14.0000 | 14.0000 | 13.0000 | 12.3700 | 12.7580 | 11.6490 | 11.4070 | 11.8920 | 10.9850 | 7.9497 | 9.9563 | 10.3230 | 5.0755 | 6.4901 | 7.9764 |
| | Attainment 4 | 1.0000 | 1.0000 | 0.9929 | 0.9312 | 0.9795 | 0.9710 | 0.9142 | 0.9297 | 0.9446 | 0.8241 | 0.9320 | 0.8956 | 0.5634 | 0.6437 | 0.7721 |
| | | 30.0000 | 30.0000 | 29.7860 | 27.9370 | 29.3860 | 29.1300 | 27.4270 | 27.8920 | 28.3380 | 24.7240 | 27.9610 | 26.8690 | 16.9030 | 19.3110 | 23.1630 |
| Guangdong | Attainment 1 | 0.0000 | 0.3000 | 0.5079 | 0.0439 | 0.1113 | 0.2623 | 0.0202 | 0.0496 | 0.1615 | 0.0000 | 0.0148 | 0.1825 | 0.0000 | 0.0076 | 0.0764 |
| | | 0.0000 | 0.3000 | 0.5079 | 0.0439 | 0.1113 | 0.2623 | 0.0202 | 0.0496 | 0.1615 | 0.0000 | 0.0148 | 0.1825 | 0.0000 | 0.0076 | 0.0764 |
| | Attainment 2 | 1.0000 | 0.7563 | 0.8425 | 0.5702 | 0.5457 | 0.7359 | 0.2343 | 0.2711 | 0.5621 | 0.1957 | 0.2251 | 0.5397 | 0.0533 | 0.1221 | 0.3188 |
| | | 5.0000 | 3.7813 | 4.2126 | 2.8509 | 2.7287 | 3.6794 | 1.1717 | 1.3555 | 2.8106 | 0.9783 | 1.1255 | 2.6984 | 0.2667 | 0.6107 | 1.5939 |
| | Attainment 3 | 1.0000 | 0.9813 | 0.9528 | 0.9474 | 0.8872 | 0.8452 | 0.8162 | 0.8534 | 0.8509 | 0.5761 | 0.6458 | 0.7421 | 0.3120 | 0.4794 | 0.5306 |
| | | 14.0000 | 13.7370 | 13.3390 | 13.2630 | 12.4210 | 11.8320 | 11.4260 | 11.9470 | 11.9130 | 8.0652 | 9.0406 | 10.3890 | 4.3680 | 6.7115 | 7.4279 |
| | Attainment 4 | 1.0000 | 0.9938 | 0.9961 | 1.0000 | 0.9802 | 0.9672 | 0.9091 | 0.9473 | 0.9348 | 0.8478 | 0.8598 | 0.9286 | 0.5307 | 0.6733 | 0.7031 |
| | | 30.0000 | 29.8130 | 29.8820 | 30.0000 | 29.4050 | 29.0160 | 27.2730 | 28.4180 | 28.0430 | 25.4350 | 25.7930 | 27.8570 | 15.9200 | 20.1980 | 21.0920 |
| Sichuan | Attainment 1 | 0.2059 | 0.3894 | 0.4901 | 0.0222 | 0.0806 | 0.2444 | 0.0076 | 0.0519 | 0.1396 | 0.0036 | 0.0504 | 0.1768 | 0.0051 | 0.0153 | 0.1047 |
| | | 0.2059 | 0.3894 | 0.4901 | 0.0222 | 0.0806 | 0.2444 | 0.0076 | 0.0519 | 0.1396 | 0.0036 | 0.0504 | 0.1768 | 0.0051 | 0.0153 | 0.1047 |
| | Attainment 2 | 0.9412 | 0.8555 | 0.8874 | 0.5587 | 0.6479 | 0.7309 | 0.3056 | 0.3287 | 0.5736 | 0.1309 | 0.4012 | 0.5147 | 0.0581 | 0.2432 | 0.3511 |
| | | 4.7059 | 4.2773 | 4.4371 | 2.7937 | 3.2397 | 3.6543 | 1.5280 | 1.6436 | 2.8680 | 0.6546 | 2.0058 | 2.5737 | 0.2904 | 1.2158 | 1.7552 |
| | Attainment 3 | 1.0000 | 0.9617 | 0.9272 | 0.8603 | 0.8904 | 0.8346 | 0.8336 | 0.8293 | 0.8300 | 0.4182 | 0.6628 | 0.6582 | 0.3194 | 0.4918 | 0.5024 |
| | | 14.0000 | 13.4630 | 12.9800 | 12.0440 | 12.4660 | 11.6840 | 11.6700 | 11.6100 | 11.6190 | 5.8545 | 9.2791 | 9.2141 | 4.4722 | 6.8850 | 7.0338 |
| | Attainment 4 | 1.0000 | 0.9735 | 0.9934 | 0.9238 | 0.9800 | 0.9667 | 0.9274 | 0.9181 | 0.9695 | 0.7564 | 0.9205 | 0.9391 | 0.5025 | 0.7229 | 0.7520 |
| | | 30.0000 | 29.2040 | 29.8010 | 27.7140 | 29.3990 | 29.0000 | 27.8210 | 27.5430 | 29.0860 | 22.6910 | 27.6160 | 28.1730 | 15.0760 | 21.6870 | 22.5600 |
| Shaanxi | Attainment 1 | 0.5714 | 0.4483 | 0.2927 | 0.0253 | 0.0671 | 0.1465 | 0.0203 | 0.0236 | 0.0862 | 0.0000 | 0.0000 | 0.0863 | 0.0059 | 0.0181 | 0.0704 |
| | | 0.5714 | 0.4483 | 0.2927 | 0.0253 | 0.0671 | 0.1465 | 0.0203 | 0.0236 | 0.0862 | 0.0000 | 0.0000 | 0.0863 | 0.0059 | 0.0181 | 0.0704 |
| | Attainment 2 | 1.0000 | 0.7069 | 0.7927 | 0.6203 | 0.6131 | 0.7414 | 0.2377 | 0.2165 | 0.4310 | 0.1312 | 0.2586 | 0.4784 | 0.0909 | 0.1767 | 0.4135 |
| | | 5.0000 | 3.5345 | 3.9634 | 3.1013 | 3.0654 | 3.7071 | 1.1884 | 1.0827 | 2.1552 | 0.6557 | 1.2931 | 2.3922 | 0.4546 | 0.8835 | 2.0674 |
| | Attainment 3 | 1.0000 | 1.0000 | 0.8537 | 0.9810 | 0.9470 | 0.8604 | 0.8435 | 0.9095 | 0.7629 | 0.5492 | 0.6667 | 0.6235 | 0.3959 | 0.5502 | 0.5836 |
| | | 14.0000 | 14.0000 | 11.9510 | 13.7340 | 13.2580 | 12.0460 | 11.8090 | 12.7320 | 10.6810 | 7.6885 | 9.3333 | 8.7294 | 5.5425 | 7.7028 | 8.1701 |
| | Attainment 4 | 1.0000 | 1.0000 | 0.9756 | 0.9937 | 0.9894 | 0.9588 | 0.9449 | 0.9429 | 0.9526 | 0.8934 | 0.9425 | 0.9882 | 0.6364 | 0.6847 | 0.7859 |
| | | 30.0000 | 30.0000 | 29.2680 | 29.8100 | 29.6820 | 28.7640 | 28.3480 | 28.2870 | 28.5780 | 26.8030 | 28.2760 | 29.6470 | 19.0910 | 20.5420 | 23.5780 |

# Table 7: Difference Across Cohort

| Province | Wife's | Type 1 Men | | | Type 2 Men | | | Type 3 Men | | | Type 4 Men | | | Type 5 Men | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Attainment | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s |
| Jilin | Attainment 1 | 0.2237 | -0.1734 | -0.3971 | -0.0173 | -0.0830 | -0.0657 | -0.0110 | -0.1122 | -0.1012 | -0.0081 | -0.1576 | -0.1495 | -0.0168 | -0.0394 | -0.0226 |
| | | [0.9507] | [0.0787] | [0.0000] | [0.0269] | [0.0000] | [0.0000] | [0.0097] | [0.0000] | [0.0000] | [0.0778] | [0.0000] | [0.0000] | [0.0007] | [0.0000] | [0.0198] |
| | | 0.2237 | -0.1734 | -0.3971 | -0.0173 | -0.0830 | -0.0657 | -0.0110 | -0.1122 | -0.1012 | -0.0081 | -0.1576 | -0.1495 | -0.0168 | -0.0394 | -0.0226 |
| | | [0.9507] | [0.0787] | [0.0000] | [0.0269] | [0.0000] | [0.0000] | [0.0097] | [0.0000] | [0.0000] | [0.0778] | [0.0000] | [0.0000] | [0.0007] | [0.0000] | [0.0198] |
| | Attainment 2 | 0.2281 | -0.0548 | -0.2829 | -0.0663 | -0.0829 | -0.0165 | 0.0095 | -0.3113 | -0.3208 | -0.1744 | -0.4482 | -0.2737 | -0.0519 | -0.2354 | -0.1836 |
| | | [0.9847] | [0.2269] | [0.0002] | [0.0082] | [0.0033] | [0.2407] | [0.6776] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0003] | [0.0000] | [0.0000] |
| | | 1.1404 | -0.2742 | -1.4146 | -0.3317 | -0.4143 | -0.0826 | 0.0475 | -1.5567 | -1.6042 | -0.8722 | -2.2408 | -1.3686 | -0.2593 | -1.1772 | -0.9179 |
| | | [1.0000] | [0.1055] | [0.0000] | [0.0000] | [0.0000] | [0.0542] | [0.8689] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | 0.0833 | 0.0252 | -0.0581 | 0.0401 | 0.0825 | 0.0424 | -0.0009 | -0.0057 | -0.0048 | -0.1804 | -0.2676 | -0.0872 | -0.1014 | -0.1294 | -0.0280 |
| | | [0.9648] | [0.9603] | [0.1142] | [0.9985] | [1.0000] | [0.9920] | [0.4827] | [0.4224] | [0.4304] | [0.0000] | [0.0000] | [0.0314] | [0.0001] | [0.0000] | [0.1827] |
| | | 1.1667 | 0.3529 | -0.8137 | 0.5614 | 1.1555 | 0.5941 | -0.0125 | -0.0799 | -0.0675 | -2.5259 | -3.7464 | -1.2205 | -1.4197 | -1.8112 | -0.3915 |
| | | [0.9995] | [0.9371] | [0.0033] | [1.0000] | [1.0000] | [1.0000] | [0.4397] | [0.2847] | [0.3087] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0020] |
| | Attainment 4 | 0.0000 | 0.0000 | 0.0000 | 0.0201 | 0.0057 | -0.0144 | -0.0355 | -0.0134 | 0.0221 | -0.0295 | -0.0577 | -0.0281 | -0.1182 | -0.2013 | -0.0831 |
| | | [0.5000] | [0.5000] | [0.5000] | [0.9905] | [0.7382] | [0.0502] | [0.0091] | [0.2716] | [0.8671] | [0.1891] | [0.0463] | [0.1920] | [0.0001] | [0.0000] | [0.0038] |
| | | 0.0000 | 0.0000 | 0.0000 | 0.6031 | 0.1701 | -0.4331 | -1.0655 | -0.4020 | 0.6635 | -0.8859 | -1.7303 | -0.8444 | -3.5453 | -6.0393 | -2.4940 |
| | | [0.5000] | [0.5000] | [0.5000] | [1.0000] | [0.9189] | [0.0001] | [0.0000] | [0.0246] | [0.9997] | [0.0003] | [0.0000] | [0.0025] | [0.0000] | [0.0000] | [0.0000] |
| Shandong | Attainment 1 | -0.4699 | -0.6372 | -0.1673 | -0.0260 | -0.2009 | -0.1749 | -0.0180 | -0.1123 | -0.0943 | -0.0148 | -0.1524 | -0.1376 | -0.0312 | -0.0719 | -0.0407 |
| | | [0.0000] | [0.0000] | [0.0093] | [0.0081] | [0.0000] | [0.0000] | [0.0088] | [0.0000] | [0.0000] | [0.0383] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0055] |
| | | -0.4699 | -0.6372 | -0.1673 | -0.0260 | -0.2009 | -0.1749 | -0.0180 | -0.1123 | -0.0943 | -0.0148 | -0.1524 | -0.1376 | -0.0312 | -0.0719 | -0.0407 |
| | | [0.0000] | [0.0000] | [0.0093] | [0.0081] | [0.0000] | [0.0000] | [0.0088] | [0.0000] | [0.0000] | [0.0383] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0055] |
| | Attainment 2 | -0.4434 | -0.4407 | 0.0027 | -0.1041 | -0.1623 | -0.0582 | -0.0586 | -0.2742 | -0.2156 | -0.1277 | -0.4103 | -0.2827 | -0.1093 | -0.2129 | -0.1035 |
| | | [0.0232] | [0.0235] | [0.5202] | [0.0013] | [0.0000] | [0.0158] | [0.0170] | [0.0000] | [0.0000] | [0.0001] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0003] |
| | | -2.2169 | -2.2035 | 0.0133 | -0.5204 | -0.8114 | -0.2910 | -0.2931 | -1.3710 | -1.0779 | -0.6383 | -2.0516 | -1.4133 | -0.5467 | -1.0643 | -0.5176 |
| | | [0.0000] | [0.0000] | [0.5348] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | -0.1398 | -0.1292 | 0.0106 | -0.0263 | 0.0034 | 0.0297 | -0.0283 | 0.0295 | 0.0577 | -0.0934 | -0.2918 | -0.1984 | -0.1366 | -0.1025 | 0.0341 |
| | | [0.2197] | [0.2371] | [0.6167] | [0.1630] | [0.5453] | [0.9104] | [0.1016] | [0.8185] | [0.9706] | [0.0061] | [0.0000] | [0.0000] | [0.0000] | [0.0011] | [0.8454] |
| | | -1.9566 | -1.8088 | 0.1478 | -0.3677 | 0.0481 | 0.4158 | -0.3955 | 0.4126 | 0.8082 | -1.3081 | -4.0857 | -2.7776 | -1.9130 | -1.4349 | 0.4781 |
| | | [0.0097] | [0.0151] | [0.7400] | [0.0027] | [0.6228] | [0.9998] | [0.0000] | [0.9949] | [1.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.9991] |
| | Attainment 4 | -0.1759 | -0.2000 | -0.0241 | -0.0046 | -0.0200 | -0.0154 | -0.0110 | 0.0229 | 0.0339 | 0.0146 | -0.0936 | -0.1082 | -0.1556 | -0.1129 | 0.0427 |
| | | [0.1638] | [0.1318] | [0.0761] | [0.3906] | [0.1242] | [0.0995] | [0.1959] | [0.8683] | [0.9599] | [0.7179] | [0.0000] | [0.0000] | [0.0000] | [0.0002] | [0.9204] |
| | | -5.2771 | -6.0000 | -0.7229 | -0.1374 | -0.6006 | -0.4632 | -0.3292 | 0.6881 | 1.0173 | 0.4369 | -2.8078 | -3.2447 | -4.6682 | -3.3871 | 1.2811 |
| | | [0.0002] | [0.0000] | [0.0029] | [0.2140] | [0.0010] | [0.0007] | [0.0061] | [0.9994] | [1.0000] | [0.9764] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [1.0000] |
| Hubei | Attainment 1 | -0.2717 | -0.5286 | -0.2568 | -0.0015 | -0.1745 | -0.1729 | -0.0066 | -0.1067 | -0.1001 | -0.0267 | -0.2155 | -0.1888 | -0.0172 | -0.1022 | -0.0849 |
| | | [0.0000] | [0.0000] | [0.0000] | [0.4618] | [0.0000] | [0.0000] | [0.2020] | [0.0000] | [0.0000] | [0.0004] | [0.0000] | [0.0000] | [0.0001] | [0.0000] | [0.0000] |
| | | -0.2717 | -0.5286 | -0.2568 | -0.0015 | -0.1745 | -0.1729 | -0.0066 | -0.1067 | -0.1001 | -0.0267 | -0.2155 | -0.1888 | -0.0172 | -0.1022 | -0.0849 |
| | | [0.0000] | [0.0000] | [0.0000] | [0.4618] | [0.0000] | [0.0000] | [0.2020] | [0.0000] | [0.0000] | [0.0004] | [0.0000] | [0.0000] | [0.0001] | [0.0000] | [0.0000] |
| | Attainment 2 | -0.3867 | -0.4500 | -0.0634 | -0.0329 | -0.1244 | -0.0915 | 0.0196 | -0.2712 | -0.2908 | -0.0943 | -0.3732 | -0.2789 | -0.0904 | -0.3118 | -0.2214 |
| | | [0.0217] | [0.0087] | [0.0979] | [0.1969] | [0.0008] | [0.0000] | [0.7902] | [0.0000] | [0.0000] | [0.0060] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | | -1.9332 | -2.2500 | -0.3168 | -0.1643 | -0.6218 | -0.4575 | 0.0980 | -1.3560 | -1.4540 | -0.4713 | -1.8660 | -1.3947 | -0.4521 | -1.5591 | -1.1069 |
| | | [0.0000] | [0.0000] | [0.0084] | [0.0216] | [0.0000] | [0.0000] | [0.9725] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | 0.0000 | 0.0714 | 0.0714 | -0.0277 | 0.0515 | 0.0792 | -0.0346 | 0.0302 | 0.0648 | -0.1433 | -0.1695 | -0.0262 | -0.1010 | -0.2072 | -0.1062 |
| | | [0.5000] | [0.9995] | [0.9995] | [0.1335] | [0.9694] | [1.0000] | [0.0463] | [0.8551] | [0.9945] | [0.0003] | [0.0000] | [0.2199] | [0.0001] | [0.0000] | [0.0001] |
| | | 0.0000 | 1.0000 | 1.0000 | -0.3879 | 0.7215 | 1.1094 | -0.4842 | 0.4228 | 0.9070 | -2.0066 | -2.3735 | -0.3669 | -1.4145 | -2.9009 | -1.4864 |
| | | [0.5000] | [0.9941] | [1.0000] | [0.0017] | [1.0000] | [1.0000] | [0.0000] | [0.9988] | [1.0000] | [0.0000] | [0.0000] | [0.0141] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0000 | 0.0071 | 0.0071 | -0.0483 | -0.0398 | 0.0085 | -0.0155 | -0.0304 | -0.0149 | -0.1079 | -0.0715 | 0.0364 | -0.0803 | -0.2087 | -0.1284 |
| | | [0.5000] | [0.8422] | [0.8422] | [0.0054] | [0.0209] | [0.8599] | [0.1473] | [0.0432] | [0.1612] | [0.0001] | [0.0134] | [0.9538] | [0.0010] | [0.0000] | [0.0000] |
| | | 0.0000 | 0.2143 | 0.2143 | -1.4495 | -1.1933 | 0.2562 | -0.4647 | -0.9116 | -0.4469 | -3.2375 | -2.1451 | 1.0925 | -2.4079 | -6.2597 | -3.8518 |
| | | [0.5000] | [0.7035] | [0.8857] | [0.0000] | [0.0000] | [0.9907] | [0.0002] | [0.0000] | [0.0030] | [0.0000] | [0.0000] | [1.0000] | [0.0000] | [0.0000] | [0.0000] |

$\Pr(X \leq x)$ are reported in brackets.

Table 7 Cont'd: Difference Across Cohort

| Province | Wife's | Type 1 Men | | | Type 2 Men | | | Type 3 Men | | | Type 4 Men | | | Type 5 Men | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Attainment | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s | 60s-50s | 60s-40s | 50s-40s |
| Guangdong | Attainment 1 | -0.3000 | -0.5079 | -0.2079 | -0.0674 | -0.2184 | -0.1510 | -0.0294 | -0.1413 | -0.1119 | -0.0148 | -0.1825 | -0.1678 | -0.0076 | -0.0764 | -0.0688 |
| | | [0.0000] | [0.0000] | [0.0000] | [0.0015] | [0.0000] | [0.0000] | [0.0010] | [0.0000] | [0.0000] | [0.0220] | [0.0000] | [0.0000] | [0.0124] | [0.0000] | [0.0000] |
| | | -0.3000 | -0.5079 | -0.2079 | -0.0674 | -0.2184 | -0.1510 | -0.0294 | -0.1413 | -0.1119 | -0.0148 | -0.1825 | -0.1678 | -0.0076 | -0.0764 | -0.0688 |
| | | [0.0000] | [0.0000] | [0.0000] | [0.0015] | [0.0000] | [0.0000] | [0.0010] | [0.0000] | [0.0000] | [0.0220] | [0.0000] | [0.0000] | [0.0124] | [0.0000] | [0.0000] |
| | Attainment 2 | 0.2438 | 0.1575 | -0.0863 | 0.0244 | -0.1657 | -0.1902 | -0.0368 | -0.3278 | -0.2910 | -0.0294 | -0.3440 | -0.3146 | -0.0688 | -0.2654 | -0.1966 |
| | | [1.0000] | [1.0000] | [0.0175] | [0.6866] | [0.0005] | [0.0000] | [0.0620] | [0.0000] | [0.0000] | [0.2720] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | | 1.2188 | 0.7874 | -0.4314 | 0.1222 | -0.8285 | -0.9508 | -0.1838 | -1.6388 | -1.4551 | -0.1472 | -1.7202 | -1.5730 | -0.3440 | -1.3272 | -0.9832 |
| | | [1.0000] | [1.0000] | [0.0000] | [0.8718] | [0.0000] | [0.0000] | [0.0002] | [0.0000] | [0.0000] | [0.0669] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | 0.0188 | 0.0472 | 0.0285 | 0.0602 | 0.1022 | 0.0420 | -0.0372 | -0.0348 | 0.0024 | -0.0697 | -0.1660 | -0.0963 | -0.1674 | -0.2186 | -0.0512 |
| | | [0.9598] | [0.9998] | [0.9522] | [0.9934] | [1.0000] | [0.9832] | [0.0372] | [0.0939] | [0.5424] | [0.1194] | [0.0023] | [0.0081] | [0.0000] | [0.0000] | [0.0462] |
| | | 0.2625 | 0.6614 | 0.3989 | 0.8424 | 1.4307 | 0.5883 | -0.5210 | -0.4868 | 0.0342 | -0.9754 | -2.3237 | -1.3483 | -2.3435 | -3.0599 | -0.7165 |
| | | [0.9956] | [1.0000] | [0.9983] | [1.0000] | [1.0000] | [1.0000] | [0.0000] | [0.0001] | [0.6128] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0063 | 0.0039 | -0.0023 | 0.0198 | 0.0328 | 0.0130 | -0.0382 | -0.0257 | 0.0125 | -0.0120 | -0.0807 | -0.0688 | -0.1426 | -0.1724 | -0.0298 |
| | | [0.8421] | [0.8418] | [0.3768] | [0.9999] | [1.0000] | [0.9174] | [0.0050] | [0.0867] | [0.7887] | [0.3905] | [0.0239] | [0.0049] | [0.0000] | [0.0000] | [0.1450] |
| | | 0.1875 | 0.1181 | -0.0694 | 0.5945 | 0.9836 | 0.3891 | -1.1450 | -0.7708 | 0.3742 | -0.3586 | -2.4224 | -2.0638 | -4.2785 | -5.1717 | -0.8932 |
| | | [0.9554] | [0.8903] | [0.3177] | [1.0000] | [1.0000] | [0.9988] | [0.0000] | [0.0000] | [0.9902] | [0.1534] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| Sichuan | Attainment 1 | -0.1835 | -0.2842 | -0.1007 | -0.0584 | -0.2222 | -0.1638 | -0.0443 | -0.1320 | -0.0877 | -0.0468 | -0.1732 | -0.1264 | -0.0103 | -0.0996 | -0.0893 |
| | | [0.0067] | [0.0001] | [0.0050] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0158] | [0.0000] | [0.0000] |
| | | -0.1835 | -0.2842 | -0.1007 | -0.0584 | -0.2222 | -0.1638 | -0.0443 | -0.1320 | -0.0877 | -0.0468 | -0.1732 | -0.1264 | -0.0103 | -0.0996 | -0.0893 |
| | | [0.0067] | [0.0001] | [0.0050] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0158] | [0.0000] | [0.0000] |
| | Attainment 2 | 0.0857 | 0.0538 | -0.0320 | -0.0892 | -0.1721 | -0.0829 | -0.0231 | -0.2680 | -0.2449 | -0.2703 | -0.3838 | -0.1136 | -0.1851 | -0.2930 | -0.1079 |
| | | [0.9726] | [0.8877] | [0.1128] | [0.0015] | [0.0000] | [0.0000] | [0.1676] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0001] | [0.0000] | [0.0000] | [0.0000] |
| | | 0.4286 | 0.2688 | -0.1598 | -0.4461 | -0.8607 | -0.4146 | -0.1156 | -1.3400 | -1.2244 | -1.3513 | -1.9191 | -0.5679 | -0.9254 | -1.4648 | -0.5395 |
| | | [0.9997] | [0.9842] | [0.0172] | [0.0000] | [0.0000] | [0.0000] | [0.0112] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | 0.0383 | 0.0728 | 0.0345 | -0.0301 | 0.0258 | 0.0559 | 0.0043 | 0.0036 | -0.0007 | -0.2446 | -0.2400 | 0.0046 | -0.1723 | -0.1830 | -0.0106 |
| | | [0.9999] | [1.0000] | [0.9708] | [0.0746] | [0.8635] | [0.9999] | [0.5879] | [0.5606] | [0.4886] | [0.0000] | [0.0000] | [0.5623] | [0.0000] | [0.0000] | [0.3414] |
| | | 0.5369 | 1.0199 | 0.4830 | -0.4216 | 0.3605 | 0.7821 | 0.0600 | 0.0509 | -0.0091 | -3.4245 | -3.3596 | 0.0649 | -2.4128 | -2.5616 | -0.1488 |
| | | [1.0000] | [1.0000] | [1.0000] | [0.0000] | [0.9984] | [1.0000] | [0.7532] | [0.6659] | [0.4686] | [0.0000] | [0.0000] | [0.6722] | [0.0000] | [0.0000] | [0.1088] |
| | Attainment 4 | 0.0265 | 0.0066 | -0.0199 | -0.0562 | -0.0429 | 0.0133 | 0.0093 | -0.0422 | -0.0514 | -0.1642 | -0.1827 | -0.0186 | -0.2204 | -0.2495 | -0.0291 |
| | | [0.9988] | [0.9220] | [0.0221] | [0.0001] | [0.0041] | [0.9692] | [0.7503] | [0.0008] | [0.0000] | [0.0000] | [0.0000] | [0.1222] | [0.0000] | [0.0000] | [0.1007] |
| | | 0.7965 | 0.1987 | -0.5978 | -1.6850 | -1.2857 | 0.3993 | 0.2782 | -1.2648 | -1.5430 | -4.9254 | -5.4820 | -0.5566 | -6.6110 | -7.4846 | -0.8736 |
| | | [1.0000] | [0.9090] | [0.0000] | [0.0000] | [0.0000] | [1.0000] | [0.9864] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0009] | [0.0000] | [0.0000] | [0.0000] |
| Shaanxi | Attainment 1 | 0.1232 | 0.2788 | 0.1556 | -0.0418 | -0.1211 | -0.0793 | -0.0033 | -0.0659 | -0.0626 | 0.0000 | -0.0863 | -0.0863 | -0.0122 | -0.0645 | -0.0523 |
| | | [0.7329] | [0.9250] | [0.9705] | [0.0052] | [0.0000] | [0.0000] | [0.3713] | [0.0005] | [0.0007] | | [0.0000] | [0.0000] | [0.0464] | [0.0000] | [0.0003] |
| | | 0.1232 | 0.2788 | 0.1556 | -0.0418 | -0.1211 | -0.0793 | -0.0033 | -0.0659 | -0.0626 | 0.0000 | -0.0863 | -0.0863 | -0.0122 | -0.0645 | -0.0523 |
| | | [0.7329] | [0.9250] | [0.9705] | [0.0052] | [0.0000] | [0.0000] | [0.3713] | [0.0005] | [0.0007] | | [0.0000] | [0.0000] | [0.0464] | [0.0000] | [0.0003] |
| | Attainment 2 | 0.2931 | 0.2073 | -0.0858 | 0.0072 | -0.1212 | -0.1283 | 0.0211 | -0.1934 | -0.2145 | -0.1275 | -0.3473 | -0.2198 | -0.0858 | -0.3226 | -0.2368 |
| | | [1.0000] | [1.0000] | [0.1253] | [0.5652] | [0.0029] | [0.0000] | [0.7647] | [0.0000] | [0.0000] | [0.0024] | [0.0000] | [0.0000] | [0.0001] | [0.0000] | [0.0000] |
| | | 1.4655 | 1.0366 | -0.4289 | 0.0359 | -0.6058 | -0.6417 | 0.1057 | -0.9668 | -1.0725 | -0.6374 | -1.7364 | -1.0991 | -0.4290 | -1.6129 | -1.1839 |
| | | [1.0000] | [1.0000] | [0.0172] | [0.6529] | [0.0000] | [0.0000] | [0.9555] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | 0.0000 | 0.1463 | 0.1463 | 0.0340 | 0.1206 | 0.0866 | -0.0660 | 0.0805 | 0.1465 | -0.1175 | -0.0743 | 0.0431 | -0.1543 | -0.1877 | -0.0334 |
| | | [0.5000] | [0.9999] | [0.9999] | [0.9910] | [1.0000] | [1.0000] | [0.0024] | [0.9909] | [1.0000] | [0.0205] | [0.0855] | [0.8213] | [0.0000] | [0.0000] | [0.1686] |
| | | 0.0000 | 2.0488 | 2.0488 | 0.4762 | 1.6884 | 1.2122 | -0.9236 | 1.1277 | 2.0512 | -1.6448 | -1.0409 | 0.6039 | -2.1603 | -2.6276 | -0.4673 |
| | | [0.5000] | [1.0000] | [1.0000] | [1.0000] | [1.0000] | [1.0000] | [0.0000] | [1.0000] | [1.0000] | [0.0000] | [0.0000] | [0.9979] | [0.0000] | [0.0000] | [0.0014] |
| | Attainment 4 | 0.0000 | 0.0244 | 0.0244 | 0.0043 | 0.0349 | 0.0306 | 0.0020 | -0.0077 | -0.0097 | -0.0491 | -0.0948 | -0.0457 | -0.0484 | -0.1496 | -0.1012 |
| | | [0.5000] | [0.9239] | [0.9239] | [0.7120] | [0.9989] | [0.9983] | [0.5500] | [0.3402] | [0.2885] | [0.0687] | [0.0005] | [0.0078] | [0.0734] | [0.0000] | [0.0004] |
| | | 0.0000 | 0.7317 | 0.7317 | 0.1282 | 1.0458 | 0.9177 | 0.0604 | -0.2298 | -0.2902 | -1.4726 | -2.8438 | -1.3712 | -1.4513 | -4.4868 | -3.0355 |
| | | [0.5000] | [0.9904] | [0.9926] | [0.8545] | [1.0000] | [1.0000] | [0.6601] | [0.1255] | [0.0596] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] | [0.0000] |

$\Pr(X \leq x)$ are reported in brackets.

## Table 8: Difference-in-Difference Across Cohort

| Province | Spousal Attainment | Type 1 Men 1 | Type 1 Men 2 | Type 1 Men 3 | Type 2 Men 1 | Type 2 Men 2 | Type 2 Men 3 | Type 3 Men 1 | Type 3 Men 2 | Type 3 Men 3 | Type 4 Men 1 | Type 4 Men 2 | Type 4 Men 3 | Type 5 Men 1 | Type 5 Men 2 | Type 5 Men 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jilin | Attainment 1 | 0.3971 | 0.6207 | 0.2237 | 0.0657 | 0.0483 | -0.0173 | 0.1012 | 0.0902 | -0.0110 | 0.1495 | 0.1413 | -0.0081 | 0.0226 | 0.0059 | -0.0168 |
| | | [0.9851] | [0.9999] | [0.9335] | [0.9999] | [0.9969] | [0.2116] | [1.0000] | [1.0000] | [0.3547] | [1.0000] | [1.0000] | [0.4162] | [0.9802] | [0.6844] | [0.1258] |
| | | 0.3971 | 0.6207 | 0.2237 | 0.0657 | 0.0483 | -0.0173 | 0.1012 | 0.0902 | -0.0110 | 0.1495 | 0.1413 | -0.0081 | 0.0226 | 0.0059 | -0.0168 |
| | | [0.9851] | [0.9999] | [0.9335] | [0.9999] | [0.9969] | [0.2116] | [1.0000] | [1.0000] | [0.3547] | [1.0000] | [1.0000] | [0.4162] | [0.9802] | [0.6844] | [0.1258] |
| | Attainment 2 | 0.2829 | 0.5110 | 0.2281 | 0.0165 | -0.0498 | -0.0663 | 0.3208 | 0.3303 | 0.0095 | 0.2737 | 0.0993 | -0.1744 | 0.1836 | 0.1317 | -0.0519 |
| | | [0.9862] | [0.9999] | [0.9816] | [0.6559] | [0.0847] | [0.0424] | [1.0000] | [1.0000] | [0.5756] | [1.0000] | [0.9640] | [0.0020] | [1.0000] | [1.0000] | [0.0678] |
| | | 1.4146 | 2.5550 | 1.1404 | 0.0826 | -0.2491 | -0.3317 | 1.6042 | 1.6517 | 0.0475 | 1.3686 | 0.4964 | -0.8722 | 0.9179 | 0.6586 | -0.2593 |
| | | [1.0000] | [1.0000] | [0.9999] | [0.8312] | [0.0006] | [0.0000] | [1.0000] | [1.0000] | [0.6625] | [1.0000] | [1.0000] | [0.0000] | [1.0000] | [1.0000] | [0.0003] |
| | Attainment 3 | 0.0581 | 0.1415 | 0.0833 | -0.0424 | -0.0023 | 0.0401 | 0.0048 | 0.0039 | -0.0009 | 0.0872 | -0.0932 | -0.1804 | 0.0280 | -0.0734 | -0.1014 |
| | | [0.8858] | [0.9830] | [0.9511] | [0.0308] | [0.4580] | [0.9431] | [0.5537] | [0.5456] | [0.4911] | [0.9079] | [0.0761] | [0.0034] | [0.7489] | [0.0384] | [0.0103] |
| | | 0.8138 | 1.9804 | 1.1667 | -0.5941 | -0.0327 | 0.5614 | 0.0675 | 0.0550 | -0.0125 | 1.2205 | -1.3054 | -2.5259 | 0.3915 | -1.0282 | -1.4197 |
| | | [0.9735] | [1.0000] | [0.9990] | [0.0000] | [0.3963] | [1.0000] | [0.6608] | [0.6361] | [0.4745] | [1.0000] | [0.0000] | [0.0000] | [0.9907] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0000 | 0.0000 | 0.0000 | 0.0144 | 0.0345 | 0.0201 | -0.0221 | -0.0576 | -0.0355 | 0.0281 | -0.0014 | -0.0295 | 0.0831 | -0.0350 | -0.1182 |
| | | [0.5000] | [0.5000] | [0.5000] | [0.8788] | [0.9976] | [0.9462] | [0.2035] | [0.0104] | [0.1157] | [0.7214] | [0.4881] | [0.2655] | [0.9677] | [0.2113] | [0.0046] |
| | | 0.0000 | 0.0000 | 0.0000 | 0.4331 | 1.0362 | 0.6031 | -0.6635 | -1.7290 | -1.0655 | 0.8444 | -0.0415 | -0.8859 | 2.4940 | -1.0513 | -3.5453 |
| | | [0.5000] | [0.5000] | [0.5000] | [0.9968] | [1.0000] | [0.9999] | [0.0029] | [0.0000] | [0.0001] | [0.9850] | [0.4582] | [0.0176] | [1.0000] | [0.0003] | [0.0000] |
| Shandong | Attainment 1 | 0.1673 | -0.3026 | -0.4699 | 0.1749 | 0.1489 | -0.0260 | 0.0943 | 0.0763 | -0.0180 | 0.1376 | 0.1227 | -0.0148 | 0.0407 | 0.0095 | -0.0312 |
| | | [0.9907] | [0.0004] | [0.0000] | [1.0000] | [1.0000] | [0.1912] | [1.0000] | [0.9993] | [0.2842] | [1.0000] | [1.0000] | [0.3379] | [0.9945] | [0.7098] | [0.0758] |
| | | 0.1673 | -0.3026 | -0.4699 | 0.1749 | 0.1489 | -0.0260 | 0.0943 | 0.0763 | -0.0180 | 0.1376 | 0.1227 | -0.0148 | 0.0407 | 0.0095 | -0.0312 |
| | | [0.9907] | [0.0004] | [0.0000] | [1.0000] | [1.0000] | [0.1912] | [1.0000] | [0.9993] | [0.2842] | [1.0000] | [1.0000] | [0.3379] | [0.9945] | [0.7098] | [0.0758] |
| | Attainment 2 | -0.0027 | -0.4460 | -0.4434 | 0.0582 | -0.0459 | -0.1041 | 0.2156 | 0.1569 | -0.0586 | 0.2827 | 0.1550 | -0.1277 | 0.1035 | -0.0058 | -0.1093 |
| | | [0.4966] | [0.0256] | [0.0259] | [0.8725] | [0.1480] | [0.0124] | [1.0000] | [0.9996] | [0.1367] | [1.0000] | [0.9988] | [0.0114] | [0.9989] | [0.4344] | [0.0044] |
| | | -0.0134 | -2.2302 | -2.2168 | 0.2910 | -0.2294 | -0.5204 | 1.0779 | 0.7848 | -0.2931 | 1.4133 | 0.7750 | -0.6383 | 0.5176 | -0.0292 | -0.5468 |
| | | [0.4916] | [0.0000] | [0.0000] | [0.9961] | [0.0082] | [0.0000] | [1.0000] | [1.0000] | [0.0072] | [1.0000] | [1.0000] | [0.0000] | [1.0000] | [0.3551] | [0.0000] |
| | Attainment 3 | -0.0106 | -0.1503 | -0.1398 | -0.0297 | -0.0560 | -0.0263 | -0.0577 | -0.0860 | -0.0283 | 0.1984 | 0.1050 | -0.0934 | -0.0342 | -0.1708 | -0.1366 |
| | | [0.4835] | [0.2073] | [0.2237] | [0.2307] | [0.0534] | [0.2414] | [0.0708] | [0.0114] | [0.2629] | [0.9999] | [0.9789] | [0.0412] | [0.2054] | [0.0000] | [0.0020] |
| | | -0.1478 | -2.1044 | -1.9566 | -0.4158 | -0.7834 | -0.3677 | -0.8082 | -1.2037 | -0.3955 | 2.7776 | 1.4695 | -1.3081 | -0.4781 | -2.3911 | -1.9130 |
| | | [0.4502] | [0.0077] | [0.0119] | [0.0201] | [0.0000] | [0.0288] | [0.0000] | [0.0000] | [0.0382] | [1.0000] | [1.0000] | [0.0000] | [0.0036] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0241 | -0.1518 | -0.1759 | 0.0154 | 0.0109 | -0.0046 | -0.0339 | -0.0449 | -0.0110 | 0.1082 | 0.1227 | 0.0146 | -0.0427 | -0.1983 | -0.1556 |
| | | [0.5379] | [0.2001] | [0.1638] | [0.7406] | [0.7028] | [0.4141] | [0.0804] | [0.0267] | [0.3487] | [0.9993] | [0.9999] | [0.6860] | [0.1372] | [0.0000] | [0.0002] |
| | | 0.7229 | -4.5542 | -5.2771 | 0.4632 | 0.3258 | -0.1374 | -1.0173 | -1.3465 | -0.3292 | 3.2447 | 3.6816 | 0.4369 | -1.2811 | -5.9493 | -4.6682 |
| | | [0.6336] | [0.0014] | [0.0003] | [0.9623] | [0.9254] | [0.2855] | [0.0000] | [0.0000] | [0.1323] | [1.0000] | [1.0000] | [0.9140] | [0.0000] | [0.0000] | [0.0000] |
| Hubei | Attainment 1 | 0.2568 | -0.0149 | -0.2717 | 0.1729 | 0.1714 | -0.0015 | 0.1000 | 0.0934 | -0.0066 | 0.1888 | 0.1621 | -0.0267 | 0.0849 | 0.0677 | -0.0172 |
| | | [1.0000] | [0.4242] | [0.0002] | [1.0000] | [1.0000] | [0.4779] | [1.0000] | [1.0000] | [0.4041] | [1.0000] | [1.0000] | [0.2206] | [1.0000] | [1.0000] | [0.1894] |
| | | 0.2568 | -0.0149 | -0.2717 | 0.1729 | 0.1714 | -0.0015 | 0.1000 | 0.0934 | -0.0066 | 0.1888 | 0.1621 | -0.0267 | 0.0849 | 0.0677 | -0.0172 |
| | | [1.0000] | [0.4242] | [0.0002] | [1.0000] | [1.0000] | [0.4779] | [1.0000] | [1.0000] | [0.4041] | [1.0000] | [1.0000] | [0.2206] | [1.0000] | [1.0000] | [0.1894] |
| | Attainment 2 | 0.0634 | -0.3233 | -0.3866 | 0.0915 | 0.0586 | -0.0329 | 0.2908 | 0.3104 | 0.0196 | 0.2789 | 0.1847 | -0.0943 | 0.2214 | 0.1310 | -0.0904 |
| | | [0.5931] | [0.0509] | [0.0239] | [0.9514] | [0.9047] | [0.2357] | [1.0000] | [1.0000] | [0.6651] | [1.0000] | [0.9998] | [0.0433] | [1.0000] | [1.0000] | [0.0052] |
| | | 0.3168 | -1.6164 | -1.9332 | 0.4575 | 0.2932 | -0.1643 | 1.4540 | 1.5520 | 0.0980 | 1.3947 | 0.9234 | -0.4713 | 1.1070 | 0.6548 | -0.4522 |
| | | [0.7193] | [0.0000] | [0.0000] | [0.9999] | [0.9987] | [0.0521] | [1.0000] | [1.0000] | [0.8277] | [1.0000] | [1.0000] | [0.0001] | [1.0000] | [1.0000] | [0.0000] |
| | Attainment 3 | -0.0714 | -0.0714 | 0.0000 | -0.0792 | -0.1070 | -0.0277 | -0.0648 | -0.0994 | -0.0346 | 0.0262 | -0.1171 | -0.1433 | 0.1062 | 0.0051 | -0.1010 |
| | | [0.0005] | [0.0005] | [0.5000] | [0.0165] | [0.0002] | [0.1962] | [0.0327] | [0.0012] | [0.1829] | [0.6685] | [0.0146] | [0.0046] | [0.9969] | [0.5529] | [0.0063] |
| | | -1.0000 | -1.0000 | 0.0000 | -1.1094 | -1.4973 | -0.3879 | -0.9070 | -1.3911 | -0.4842 | 0.3669 | -1.6397 | -2.0066 | 1.4864 | 0.0719 | -1.4145 |
| | | [0.0359] | [0.0092] | [0.5000] | [0.0000] | [0.0000] | [0.0128] | [0.0000] | [0.0000] | [0.0051] | [0.9188] | [0.0000] | [0.0000] | [1.0000] | [0.6700] | [0.0000] |
| | Attainment 4 | -0.0071 | -0.0071 | 0.0000 | -0.0085 | -0.0569 | -0.0483 | 0.0149 | -0.0006 | -0.0155 | -0.0364 | -0.1443 | -0.1079 | 0.1284 | 0.0481 | -0.0803 |
| | | [0.1578] | [0.1578] | [0.5000] | [0.3768] | [0.0028] | [0.0110] | [0.7408] | [0.4888] | [0.2526] | [0.2033] | [0.0000] | [0.0028] | [0.9997] | [0.9069] | [0.0150] |
| | | -0.2143 | -0.2143 | 0.0000 | -0.2562 | -1.7057 | -1.4495 | 0.4469 | -0.0178 | -0.4647 | -1.0924 | -4.3300 | -3.2376 | 3.8518 | 1.4439 | -2.4079 |
| | | [0.3505] | [0.3080] | [0.5000] | [0.1760] | [0.0000] | [0.0000] | [0.9764] | [0.4662] | [0.0286] | [0.0020] | [0.0000] | [0.0000] | [1.0000] | [1.0000] | [0.0000] |

For each of the men's educational attainment, the first column is the difference (60s-50s)-(60s-40s), second column is for the difference (60s-50s)-(50s-40s), and the last column is for the difference (60s-40s)-(50s-40s).
$\Pr(X \leq x)$ are reported in brackets.

## Table 8 Cont'd: Difference-in-Difference Across Cohort

| Province | Spousal Attainment | Type 1 Men 1 | Type 1 Men 2 | Type 1 Men 3 | Type 2 Men 1 | Type 2 Men 2 | Type 2 Men 3 | Type 3 Men 1 | Type 3 Men 2 | Type 3 Men 3 | Type 4 Men 1 | Type 4 Men 2 | Type 4 Men 3 | Type 5 Men 1 | Type 5 Men 2 | Type 5 Men 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Guangdong | Attainment 1 | 0.2079 | -0.0921 | -0.3000 | 0.1510 | 0.0836 | -0.0674 | 0.1119 | 0.0825 | -0.0294 | 0.1678 | 0.1530 | -0.0148 | 0.0688 | 0.0612 | -0.0076 |
| | | [1.0000] | [0.0626] | [0.0000] | [1.0000] | [0.9955] | [0.0269] | [1.0000] | [0.9998] | [0.1678] | [1.0000] | [1.0000] | [0.3374] | [1.0000] | [1.0000] | [0.3347] |
| | | 0.2079 | -0.0921 | -0.3000 | 0.1510 | 0.0836 | -0.0674 | 0.1119 | 0.0825 | -0.0294 | 0.1678 | 0.1530 | -0.0148 | 0.0688 | 0.0612 | -0.0076 |
| | | [1.0000] | [0.0626] | [0.0000] | [1.0000] | [0.9955] | [0.0269] | [1.0000] | [0.9998] | [0.1678] | [1.0000] | [1.0000] | [0.3374] | [1.0000] | [1.0000] | [0.3347] |
| | Attainment 2 | 0.0863 | 0.3300 | 0.2438 | 0.1902 | 0.2146 | 0.0244 | 0.2910 | 0.2543 | -0.0368 | 0.3146 | 0.2852 | -0.0294 | 0.1966 | 0.1278 | -0.0688 |
| | | [0.9825] | [1.0000] | [1.0000] | [0.9963] | [0.9999] | [0.6663] | [1.0000] | [1.0000] | [0.2112] | [1.0000] | [1.0000] | [0.3272] | [1.0000] | [1.0000] | [0.0257] |
| | | 0.4314 | 1.6502 | 1.2188 | 0.9508 | 1.0730 | 0.1222 | 1.4550 | 1.2713 | -0.1837 | 1.5730 | 1.4258 | -0.1472 | 0.9832 | 0.6392 | -0.3440 |
| | | [1.0000] | [1.0000] | [1.0000] | [1.0000] | [1.0000] | [0.8319] | [1.0000] | [1.0000] | [0.0424] | [1.0000] | [1.0000] | [0.1570] | [1.0000] | [1.0000] | [0.0000] |
| | Attainment 3 | -0.0285 | -0.0097 | 0.0188 | -0.0420 | 0.0182 | 0.0602 | -0.0024 | -0.0397 | -0.0372 | 0.0963 | 0.0266 | -0.0697 | 0.0512 | -0.1162 | -0.1674 |
| | | [0.0478] | [0.3146] | [0.8066] | [0.1187] | [0.7189] | [0.9673] | [0.4710] | [0.1004] | [0.1436] | [0.8766] | [0.6454] | [0.1627] | [0.8697] | [0.0037] | [0.0001] |
| | | -0.3989 | -0.1364 | 0.2625 | -0.5883 | 0.2541 | 0.8424 | -0.0342 | -0.5552 | -0.5210 | 1.3483 | 0.3729 | -0.9754 | 0.7164 | -1.6270 | -2.3434 |
| | | [0.0017] | [0.2095] | [0.9456] | [0.0029] | [0.9179] | [1.0000] | [0.4145] | [0.0001] | [0.0016] | [1.0000] | [0.8930] | [0.0008] | [1.0000] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0023 | 0.0086 | 0.0063 | -0.0130 | 0.0068 | 0.0198 | -0.0125 | -0.0506 | -0.0382 | 0.0688 | 0.0568 | -0.0120 | 0.0298 | -0.1128 | -0.1426 |
| | | [0.6232] | [0.8126] | [0.7730] | [0.0826] | [0.7366] | [0.9500] | [0.3016] | [0.0092] | [0.0593] | [0.8771] | [0.8696] | [0.4031] | [0.7410] | [0.0038] | [0.0006] |
| | | 0.0694 | 0.2569 | 0.1875 | -0.3891 | 0.2054 | 0.5945 | -0.3743 | -1.5192 | -1.1450 | 2.0638 | 1.7052 | -0.3586 | 0.8932 | -3.3853 | -4.2785 |
| | | [0.6823] | [0.9195] | [0.8579] | [0.0409] | [0.8504] | [0.9978] | [0.0480] | [0.0000] | [0.0000] | [1.0000] | [1.0000] | [0.2043] | [0.9972] | [0.0000] | [0.0000] |
| Sichuan | Attainment 1 | 0.1007 | -0.0828 | -0.1835 | 0.1638 | 0.1054 | -0.0584 | 0.0877 | 0.0434 | -0.0443 | 0.1264 | 0.0797 | -0.0468 | 0.0893 | 0.0791 | -0.0103 |
| | | [0.8299] | [0.1618] | [0.0151] | [1.0000] | [1.0000] | [0.0070] | [1.0000] | [0.9817] | [0.0443] | [1.0000] | [0.9999] | [0.0363] | [1.0000] | [1.0000] | [0.2841] |
| | | 0.1007 | -0.0828 | -0.1835 | 0.1638 | 0.1054 | -0.0584 | 0.0877 | 0.0434 | -0.0443 | 0.1264 | 0.0797 | -0.0468 | 0.0893 | 0.0791 | -0.0103 |
| | | [0.8299] | [0.1618] | [0.0151] | [1.0000] | [1.0000] | [0.0070] | [1.0000] | [0.9817] | [0.0443] | [1.0000] | [0.9999] | [0.0363] | [1.0000] | [1.0000] | [0.2841] |
| | Attainment 2 | 0.0320 | 0.1177 | 0.0857 | 0.0829 | -0.0063 | -0.0892 | 0.2449 | 0.2218 | -0.0231 | 0.1136 | -0.1567 | -0.2703 | 0.1079 | -0.0772 | -0.1851 |
| | | [0.6944] | [0.9884] | [0.9519] | [0.9703] | [0.4302] | [0.0085] | [1.0000] | [1.0000] | [0.2937] | [0.9964] | [0.0001] | [0.0000] | [1.0000] | [0.0039] | [0.0000] |
| | | 0.1598 | 0.5884 | 0.4286 | 0.4146 | -0.0315 | -0.4461 | 1.2244 | 1.1088 | -0.1156 | 0.5678 | -0.7834 | -1.3512 | 0.5394 | -0.3859 | -0.9253 |
| | | [0.8172] | [1.0000] | [0.9983] | [1.0000] | [0.3433] | [0.0000] | [1.0000] | [1.0000] | [0.1159] | [1.0000] | [0.0000] | [0.0000] | [1.0000] | [0.0000] | [0.0000] |
| | Attainment 3 | -0.0345 | 0.0038 | 0.0383 | -0.0559 | -0.0860 | -0.0301 | 0.0007 | 0.0049 | 0.0043 | -0.0046 | -0.2492 | -0.2446 | 0.0106 | -0.1617 | -0.1723 |
| | | [0.0292] | [0.5727] | [0.9480] | [0.0377] | [0.0004] | [0.1399] | [0.5085] | [0.5656] | [0.5517] | [0.4641] | [0.0000] | [0.0000] | [0.6193] | [0.0000] | [0.0000] |
| | | -0.4830 | 0.0539 | 0.5369 | -0.7821 | -1.2038 | -0.4216 | 0.0091 | 0.0692 | 0.0600 | -0.0649 | -3.4894 | -3.4245 | 0.1488 | -2.2640 | -2.4128 |
| | | [0.0072] | [0.6195] | [0.9981] | [0.0000] | [0.0000] | [0.0021] | [0.5247] | [0.6827] | [0.6411] | [0.3827] | [0.0000] | [0.0000] | [0.8456] | [0.0000] | [0.0000] |
| | Attainment 4 | 0.0199 | 0.0465 | 0.0265 | -0.0133 | -0.0695 | -0.0562 | 0.0514 | 0.0607 | 0.0093 | 0.0186 | -0.1456 | -0.1642 | 0.0291 | -0.1912 | -0.2204 |
| | | [0.9779] | [0.9998] | [0.9924] | [0.2753] | [0.0000] | [0.0008] | [0.9964] | [0.9994] | [0.6929] | [0.6789] | [0.0000] | [0.0000] | [0.8046] | [0.0000] | [0.0000] |
| | | 0.5978 | 1.3942 | 0.7965 | -0.3993 | -2.0843 | -1.6850 | 1.5430 | 1.8212 | 0.2782 | 0.5566 | -4.3688 | -4.9254 | 0.8736 | -5.7374 | -6.6110 |
| | | [0.9977] | [1.0000] | [1.0000] | [0.0377] | [0.0000] | [0.0000] | [1.0000] | [1.0000] | [0.9106] | [0.9601] | [0.0000] | [0.0000] | [0.9998] | [0.0000] | [0.0000] |
| Shaanxi | Attainment 1 | -0.1556 | -0.0324 | 0.1232 | 0.0793 | 0.0375 | -0.0418 | 0.0626 | 0.0593 | -0.0033 | 0.0863 | 0.0863 | 0.0000 | 0.0523 | 0.0401 | -0.0122 |
| | | [0.2872] | [0.4399] | [0.7208] | [0.9986] | [0.9272] | [0.0744] | [0.9974] | [0.9963] | [0.4526] | [1.0000] | [1.0000] | [0.5000] | [0.9994] | [0.9917] | [0.2795] |
| | | -0.1556 | -0.0324 | 0.1232 | 0.0793 | 0.0375 | -0.0418 | 0.0626 | 0.0593 | -0.0033 | 0.0863 | 0.0863 | 0.0000 | 0.0523 | 0.0401 | -0.0122 |
| | | [0.2872] | [0.4399] | [0.7208] | [0.9986] | [0.9272] | [0.0744] | [0.9974] | [0.9963] | [0.4526] | [1.0000] | [1.0000] | [0.5000] | [0.9994] | [0.9917] | [0.2795] |
| | Attainment 2 | 0.0858 | 0.3789 | 0.2931 | 0.1283 | 0.1355 | 0.0072 | 0.2145 | 0.2356 | 0.0212 | 0.2198 | 0.0923 | -0.1275 | 0.2368 | 0.1510 | -0.0858 |
| | | [0.8747] | [1.0000] | [0.9996] | [0.9808] | [0.9950] | [0.5540] | [1.0000] | [1.0000] | [0.6509] | [0.9998] | [0.9250] | [0.0218] | [1.0000] | [0.9999] | [0.0262] |
| | | 0.4289 | 1.8944 | 1.4655 | 0.6417 | 0.6776 | 0.0359 | 1.0725 | 1.1782 | 0.1057 | 1.0990 | 0.4617 | -0.6373 | 1.1839 | 0.7549 | -0.4290 |
| | | [0.9009] | [1.0000] | [1.0000] | [1.0000] | [1.0000] | [0.6230] | [1.0000] | [1.0000] | [0.8085] | [1.0000] | [0.9998] | [0.0000] | [1.0000] | [1.0000] | [0.0000] |
| | Attainment 3 | -0.1463 | -0.1463 | 0.0000 | -0.0866 | -0.0526 | 0.0340 | -0.1465 | -0.2125 | -0.0660 | -0.0431 | -0.1606 | -0.1175 | 0.0334 | -0.1209 | -0.1543 |
| | | [0.0001] | [0.0001] | [0.5000] | [0.0002] | [0.0138] | [0.8919] | [0.0002] | [0.0000] | [0.0752] | [0.2927] | [0.0152] | [0.0508] | [0.7431] | [0.0069] | [0.0013] |
| | | -2.0488 | -2.0488 | 0.0000 | -1.2122 | -0.7360 | 0.4762 | -2.0513 | -2.9748 | -0.9235 | -0.6039 | -2.2487 | -1.6448 | 0.4673 | -1.6930 | -2.1603 |
| | | [0.0000] | [0.0000] | [0.5000] | [0.0000] | [0.0000] | [0.9979] | [0.0000] | [0.0000] | [0.0000] | [0.0280] | [0.0000] | [0.0000] | [0.9879] | [0.0000] | [0.0000] |
| | Attainment 4 | -0.0244 | -0.0244 | 0.0000 | -0.0306 | -0.0263 | 0.0043 | 0.0097 | 0.0117 | 0.0020 | 0.0457 | -0.0034 | -0.0491 | 0.1012 | 0.0528 | -0.0484 |
| | | [0.0761] | [0.0761] | [0.5000] | [0.0129] | [0.0209] | [0.6088] | [0.6533] | [0.6897] | [0.5316] | [0.8517] | [0.4646] | [0.0768] | [0.9829] | [0.8789] | [0.1455] |
| | | -0.7317 | -0.7317 | 0.0000 | -0.9177 | -0.7895 | 0.1281 | 0.2902 | 0.3506 | 0.0604 | 1.3712 | -0.1014 | -1.4726 | 3.0355 | 1.5842 | -1.4513 |
| | | [0.0337] | [0.0306] | [0.5000] | [0.0000] | [0.0000] | [0.7393] | [0.8790] | [0.9305] | [0.5875] | [0.9996] | [0.3950] | [0.0000] | [1.0000] | [1.0000] | [0.0000] |

For each of the men's educational attainment, the first column is the difference (60s-50s)-(60s-40s), second column is for the difference (60s-50s)-(50s-40s), and the last column is for the difference (60s-40s)-(50s-40s).

$\Pr(X \leq x)$ are reported in brackets.

As in the examination of the overlap in joint densities it is informative to examine the degree of change between the differences across cohorts to discern between the effects due to the general trend towards greater positive assortative matching versus that due genuinely to the OCP. Table 8 presents tests of the difference across cohorts, in other words it is a difference-in-difference examination. Of interest particularly is the the result for the higher attainment levels. The first column for each male attainment is for (60s-50s)-(60s-40s), the second column is for the difference (60s-50s)-(50s-40s), and the last column is (60s-40s)-(50s-40s). If the linear trend is the change exhibited between the 1960s and the 1940s, then the reference column is the first, while if the trend is that between the 1950s and 1940s cohort, then it is the second column that is of interest. The objective is to then examine if the change between the 1960s and 1950s cohort is larger then that of the trend.

Examining the result for the first column, a definitive conclusion can only be made for the spousal distribution of the highest type males where if the linear trend is the change in stochastic dominance relationship between the 1960s and 1940s cohort, the results suggests that there is a significant change in the behavior of males in the 1960s vis-*à*-vis their 1950s peers (with the exception of Shandong). However, the sign of the change implies that the stochastic dominance shift in spousal choice for the highest type males have slowed down. This is not surprising since as we have found in the previous section, there is a decline in capacity for positive assortative matching over the decades for all the provinces with the exception of Jilin. Next observe that if instead we examine column two, the change in stochastic dominance relationship is not particularly clear with the exception of Shandong where it reveals that the stochastic dominance shift is significantly greater than the trend suggested by the difference in distribution of the 1950s and 1940s cohort. Similarly, for all the other male attainment levels, the change in dominance relationship is vague according with expectations. The principal reason for the ambiguity of results here is that by comparing the conditional distributions we do not gain a complete picture of what is occurring across the entire market. Nonetheless, the key prediction from the model regarding the change in the marginal distribution of spousal educational attainment for men of the highest level is affirmed.

# 6 Conclusion

It is well known that contributions to total marital output have several dimensions, and when one dimension is exogenously constrained below the private optimal choice, couples may circumvent those restrictions by changing choices in other dimensions. Here the consequences of the imposition of the One Child Policy on the general Chinese populace in 1979 have been examined in the context of a simple model of family formation. The model predicts that a binding constraint on the number of children a family can have increases the incidence of positive assortative matching and investment in child quality since the constraint raises the marginal benefit from both.

The matching predictions were examined via a Overlap Measure by comparing married individuals by birth cohort, where the older cohorts would be constituted by individuals unaffected by the OCP, and the younger cohorts are more likely to be affected. The separation of the sample into the the three cohorts from the 1940s, 1950s and 1960s, and the interpretation of the 1960s cohort as the OCP cohort is also supported by the fact that their family size choice was significantly different from their predecessors. The results indicate that given an individual's type, here proxied by educational attainment or training, individuals are more likely to match with another of similar attainment as a consequence of the OCP. The robustness of the result was examined across the cohorts where it was determined that the increase in positive assortative matching among individuals in the 1960s cohort were the stronger than would have been predicted by trends created by the Economic Reform of 1979 and that due to urbanization. Further, the result was in the face of declining capacity among the populace for positive assortative matching among the 1960s cohort.

We also examined the change in the distribution of the distribution of the educational attainment of wives'. As suggested by the model, it was found that for the highest attainment men, the distribution of their wives' attainment stochastically dominated their predecessors from the earlier cohorts even after controlling for trends towards increased positive assortative matching. As predicted by the model, there is no discernible systematic change in the distribution of wives' attainment among men of lower attainment levels. This is due to the fact that the comparison of the distribution ignores the effect that other men's choices have on each other in the marriage market, and is not surprising.

The model also predicted that if the OCP was binding, there would be an increase in the investments in children. This then suggests diminishing intergenerational mobility in China which was found to be true in a companion paper. Taken together, the results suggests that the OCP has had a strong familial effect within the urban context. We have also found indications of gender preference among some parents, as noted in section 3. It is of interest next to understand how the spousal choice might have affected investments in children endogenously, and the prevalence of gender selection in urban China, which is the subject of our future research.

# A Appendix

## A.1 Proof of Propositions

**Proof.** Proof of Proposition 1: Let $k'$ be the optimal level of investment per child with $\widetilde{n}$ children in the family. Differentiating $k'$ with respect to $\widetilde{n}$ from (2),

$$\frac{\partial k'}{\partial \widetilde{n}} = \frac{q_n \widetilde{n} + q + q_n k' - q_{kn} (yx - \widetilde{n}k')}{q_{kk} (yx - \widetilde{n}k' - q_k \widetilde{n} - q_n \widetilde{n})} \leq 0 \tag{A-1}$$

Given assumption 1, a binding constraint on the number of children, i.e. one that is lower than what the parents would have chosen, would increase investments in children. ■

**Proof.** Proof of Proposition 2: Differentiating (1) and (2) with respect to y respectively gives,

$$\frac{\partial n^*}{\partial y} = -\frac{q_n x}{(q_{nn} (yx - n^* k^*) - 2q_n k^*)} \geq 0 \tag{A-2}$$

$$\frac{\partial k^*}{\partial y} = -\frac{q_k x}{(q_{kk} (yx - n^* k^*) - 2q_k k^*)} \geq 0 \tag{A-3}$$

Therefore, an increase in income would increase the number of children in the family, and the level of investment per child. ■

**Proof.** Proof of Proposition 3: For the proof of point 1, differentiating $\underline{t_w^R}$ in (3) with respect to the number of children $\widetilde{n}$,

$$\frac{\partial \underline{t_w^R}}{\partial \widetilde{n}} = \frac{qk' - q_{\widetilde{n}}(yx - \widetilde{n}k')}{q_{\underline{t_w^R}} (yx - \widetilde{n}k') + qyx_{\underline{t_w^R}} - yv_{\underline{t_w^R}}} \leq 0 \tag{A-4}$$

Where $k'$ is the optimal choice of $k$ given $t_w = \underline{t_w^R}$, $t_h$ and $\widetilde{n}$. Since $\widetilde{n}$ is binding from below, by revealed preference the marginal benefit would be greater than the marginal cost, and the numerator is non-positive. By assumption 3, and $\underline{t_w^R} \leq t_h$, the greater the type of an individual, the greater the gains to marriage, so the denominator is positive.

For the upper bound on the reservation value, we differentiate $\overline{t_w^R}$ in (4) with respect to $\widetilde{n}$ as above.

$$\frac{\partial \overline{t_w^R}}{\partial \widetilde{n}} = \frac{qk'' - q_{\widetilde{n}} (yx - \widetilde{n}k'')}{q_{\overline{t_w^R}} (yx - \widetilde{n}k'') + qyx_{\overline{t_w^R}} - yv_{\overline{t_w^R}}} \geq 0 \tag{A-5}$$

Where $k''$ is the optimal choice of $k$ given $t_w = \overline{t_w^R}$, $t_h$ and $\widetilde{n}$. The numerator as before is non-positive. By assumption 3, and $\overline{t_w^R} \geq t_h$, the denominator is negative, and point 1 follows.

Since there is a narrowing in the range of potential matches around the agents type, incidences of assortative matches rise. Formally, let a man of type $t_h$ be matched with and married to a woman of type $t_w^*$. Then

$$\Pr(\underline{t_w} \leq t_w^* \leq \overline{t_w}) = 1 \tag{A-6}$$

It follows that,

$$\int_{\underline{t_w^*}}^{\overline{t_w^*}} f(t_w^*|t_h)dt_w^* = \frac{1}{f(t_h)} \int_{\underline{t_w^*}}^{\overline{t_w^*}} f(t_w^*, t_h) = \frac{1}{f(t_h)} \left[ F(\overline{t_w^*}, t_h) - F(\underline{t_w^*}, t_h) \right] = 1 \tag{A-7}$$

The total differential with respect to may be written as,

$$\frac{1}{f(t_h)} \left[ \frac{\partial F(\overline{t_w}, t_h)}{\partial \overline{t_w}} \frac{\partial \overline{t_w}}{\partial \widetilde{n}} - \frac{\partial F(\underline{t_w}, t_h)}{\partial \underline{t_w}} \frac{\partial \underline{t_w}}{\partial \widetilde{n}} \right] d\widetilde{n} + \frac{1}{f(t_h)} \frac{\partial \left[ F(\overline{t_w}, t_h) - F(\underline{t_w}, t_h) \right]}{\partial \widetilde{n}} d\widetilde{n} = 0 \tag{A-8}$$

Since

$$\frac{1}{f(t_h)} > 0, \frac{\partial F(t_w, t_h)}{\partial \overline{t_w}} > 0, \frac{\partial \overline{t_w}}{\partial \widetilde{n}} > 0, \frac{\partial \underline{t_w}}{\partial \widetilde{n}} < 0 \tag{A-9}$$

It may be observed that

$$\frac{\partial \left[ F(\overline{t_w}, t_h) - F(\underline{t_w}, t_h) \right]}{\partial \widetilde{n}} < 0 \tag{A-10}$$

■

**Proof.** Proof of Proposition 4: As in the proof of proposition 3, differentiate $\underline{t_w^R}$ and $\overline{t_w^R}$ in (3) and (4) with respect to the $y$ respectively.

$$\frac{\partial \underline{t_w^R}}{\partial y} = \frac{-qx + v(\underline{t_w^R}) + v(t_h)}{q_{\underline{t_w^R}}(yx - \underline{n}k) + qyx_{\underline{t_w^R}} - yv_{\underline{t_w^R}}} \leq 0 \tag{A-11}$$

First note that by assumption 3, and $\underline{t_w^R} \leq t_h$, the greater the type of an individual, the greater the gains to marriage, so the denominator is positive. Secondly, by assumption 5, the numerator is negative, and the inequality follows.

$$\frac{\partial \overline{t_w^R}}{\partial y} = \frac{-qx + v(\overline{t_w^R}) + v(t_h)}{q_{\overline{t_w^R}}(yx - \overline{n}k) + qyx_{\overline{t_w^R}} - yv_{\overline{t_w^R}}} \geq 0 \tag{A-12}$$

By assumption 3, and $\overline{t_w^R} \geq t_h$, the denominator is negative. By assumption 5, the numerator is negative, and the inequality follows. The rest of the arguments are similar to proposition 3. ■

## A.2 Discussion of Stochastic Dominance Comparative Statics

Let $j(t_h, t_w)$ be the joint density function of a man of type $t_h$ and a woman of type $t_w$ being matched with each other. Further, let the density function of married men and women be $m(.)$ and $w(.)$ respectively. Then the conditional density of women matched with men of type $t_h$ is $\frac{j(t_h,t_w)}{m(t_h)} = f(t_w|t_h)$. By our previous discussion, the joint probability function of the match changes with the OCP. Denote the pre- and post-policy conditional joint probability by $f(t_w|t_h)$ and $g(t_w|t_h)$ respectively.

Next note that by proposition 3, for $t_h = \bar{t}$, assuming $M > 0$, that is probability of marriage is non-zero, and since the gains to marriage is greatest amongst men of type $\bar{t}$,

$$\int_{\underline{t_w^{R_f}}}^{\underline{t_w^{R_g}}} \big(f(t_w|t_h = \bar{t}) - g(t_w|t_h = \bar{t})\big)\, dt_w \quad \geq \quad 0 \tag{A-13}$$

$$\Rightarrow \int_{\underline{t_w^{R_g}}}^{\bar{t}} \big(f(t_w|t_h = \bar{t}) - g(t_w|t_h = \bar{t})\big)\, dt_w \quad \leq \quad 0 \tag{A-14}$$

$$\Rightarrow \int_{\underline{t_w^{R_f}}}^{\bar{t}} \big(f(t_w|t_h = \bar{t}) - g(t_w|t_h = \bar{t})\big)\, dt_w \quad \geq \quad 0 \tag{A-15}$$

where $\underline{t_w^{R_f}}$ and $\underline{t_w^{R_g}}$ are the lower reservation type of spouses for men of type $\bar{t}$ pre- and post-policy. The inequality implies that for men of type $t_h = \bar{t}$, the OCP leads to a first order stochastic dominance shift in the distribution of spousal type. This is true in fact for a larger set of male types.

With the assumption that the marriage market clears with $M > 0$, by continuity of types for $t_h \in [\underline{t}, \bar{t}]$, there exists a $\widetilde{t_h} = \min\{t_h \in [\underline{t}, \bar{t}] : \bar{t} = \min\{\overline{t_w^R}(t_h), \bar{t}\}\}$. Let $\widetilde{t_f}$ and $\widetilde{t_g}$ be the threshold of types for men pre- and post-policy, then by proposition 3, $\widetilde{t_f} \leq \widetilde{t_g}$, which implies that the set of individuals for which the OCP leads to a stochastic dominance includes at least men of type $t_h \in [\widetilde{t_g}, \bar{t}]$. Finally, note that first order stochastic dominance implies higher order stochastic dominance.

However, the first stochastic dominance relationship pre- and post-policy for all other types of men is ambiguous. To see this consider a men whose upper bound for his reservation type falls from $\bar{t}$ to $\overline{t_w^{R_g}}$, which in turn implies his lower bound reservation value rises from $\underline{t_w^{R_f}}$ to $\underline{t_w^{R_g}}$. This implies that,

$$\int_{\underline{t_w^{R_f}}}^{\overline{t_w^{R_g}}} g(t_w|t_h)dt_w \quad = 1 \geq \int_{\underline{t_w^{R_f}}}^{\overline{t_w^{R_g}}} f(t_w|t_h)dt_w$$

We also know that as a result of the change in the lower bound on the reservation type that

$$\int_{\underline{t_w^{R_f}}}^{\underline{t_w^{R_g}}} \left(f(t_w|t_h) - g(t_w|t_h)\right) dt_w \quad \geq 0 \tag{A-16}$$

Together, the above two inequalities implies that the distribution pre- and post-policy intersects at least once. This means that by continuity, there would exist $t_w^* \in [\underline{t}, \overline{t}]$ or more precisely $t_w^* \in [\underline{t_w^{R_g}}, \overline{t_w^{R_g}}]$ where the first order stochastic dominance of the post-policy distribution over that of the pre-policy reverses its dominance relationship. That is we will not be able to establish a dominance relationship for the entire range of $t_w$. In fact this is the case for all $t_h \in [\underline{t}, \widetilde{t_g}]$. This same problem arises when we compare the distribution of spousal type across husbands' type within a cohort or year.

The same issue occurs even if we attempt to establish a second order dominance relationship. If the post-policy distribution of spousal type second order dominates that of the pre-policy distribution, then

$$\int_{\underline{t}}^{t_1} \int_{\underline{t}}^{t} \left(g(t_w|t_h) - f(t_w|t_h)\right) dt_w dt_1 \leq 0$$

$$\Rightarrow \quad \int_{\underline{t}}^{t} \left(G(t_w|t_h) - F(t_w|t_h)\right) dt_w \leq 0 \tag{A-17}$$

for $\forall t_1, t \in [\underline{t}, \overline{t}]$, and where $F(.)$ and $G(.)$ are the pre- and post-policy distribution functions respectively. Let $\delta(t_w|t_h) = f(t_w|t_h) - g(t_w|t_h)$ and note that

$$\int_{\underline{t_w^{R_f}}}^{\underline{t_w^{R_g}}} \delta(t_w|t_h)dt_w + \int_{\overline{t_w^{R_g}}}^{\overline{t_w^{R_f}}} \delta(t_w|t_h)dt_w = \int_{\underline{t_w^{R_g}}}^{\overline{t_w^{R_g}}} \delta(t_w|t_h)dt_w \tag{A-18}$$

Note that the first term on the left hand side of equation (A-18) is positive, while the second term is negative. Then the change that occurs within $[\underline{t_w^{R_g}}, \overline{t_w^{R_g}}]$ will affect whether we see second order dominance for $t_h \in [\underline{t}, \widetilde{t_g}]$. Particularly, we know that the two distribution will intersect at least once. Without loss of generality, suppose the pre- and post-policy distribution intersects once at $t'$, then we have second order stochastic dominance if and only if,

$$\begin{aligned}
\int_{\underline{t_w^{R_f}}}^{t'} \int_{\underline{t_w^{R_f}}}^{t} \delta(t_w|t_h) dt_w dt &\geq \int_{t'}^{\overline{t_w^{R_f}}} \int_{t}^{\overline{t_w^{R_f}}} \delta(t_w|t_h) dt_w dt \\
\Rightarrow \int_{\underline{t_w^{R_f}}}^{t'} \Delta(t|t_h) dt &\geq -\int_{t'}^{\overline{t_w^{R_f}}} \Delta(t|t_h) dt
\end{aligned}$$

where $\Delta(t_w|t_h) = F(t_w|t_h) - G(t_w|t_h)$. It should be clear that what occurs would be dependent on the relative demand and supply of spouses at every type realization. Intuitively, if the change in density at the upper bound of the reservation spousal type leads to an increased density towards the right tail of the new density, it would be more likely to find higher order stochastic dominance. However, if the supply of potential partners is low, this would be unlikely, reducing the likelihood of seeing higher order stochastic dominance.

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