The one-child policy: A macroeconomic analysis ☆

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ABSTRACT

This paper studies the effects of China's one-child policy. Using a calibrated general-equilibrium model, a benchmark with a fertility constraint in place is compared to a counterfactual experiment without the fertility constraint. The results indicate that the implementation of the one-child policy promotes the accumulation of human capital and increases per capita output. In addition, the policy leads to different welfare effects across generations and skill groups. The initial generation would benefit from relaxing the one-child policy, but the following generations would be hurt. A redistribution effect between skilled and unskilled workers is also observed. These findings demonstrate that focusing solely on GDP per capita as a measure of economic well-being paints an incomplete picture of the welfare consequences of population policies.

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1. Introduction

China's central government introduced the one-child family policy in 1979 with the aim of controlling rapid population growth. The merits and demerits of this policy are still discussed three decades after it was first implemented. On the positive side, the policy has resulted in a reduction in fertility rates, which has contributed to economic growth and an improved standard of living for many families in China.[1] However, Bongaarts and Greenhalgh (1985) discuss the possible social and economic consequences of the policy, such as the detrimental effects on the age composition of the population and the effects on the support of elderly people.

Previous studies explore the effects of the policy from an empirical perspective. In contrast to the existing literature, this paper takes the lead in studying the effects of the one-child policy using a theoretical approach: a general equilibrium overlapping-generations model with a fertility constraint is employed to discuss the impacts of the policy on fertility, age composition, human-capital accumulation, and per capita output. Changes in welfare resulting from the one-child policy are also quantified. In addition, this paper considers heterogeneous individuals. Different groups in an economy will react differently to the policy. To this end, this paper examines how the one-child policy affects skilled versus unskilled workers.

China's one-child policy restricts a couple to only one child. Parents who adhere to the policy will be rewarded with additional benefits, such as government subsidies, and will be given priority in schooling, housing, health care, and work. The policy also incorporates penalties. For example, government workers will be punished for having a second child with a twenty percent cut in their basic salary for seven consecutive years. Section 2 discusses the specific details of China's one-child per family policy. For simplicity's sake, the one-child policy is treated as a fertility constraint in this paper: a couple is allowed to have at most $\bar{n}$ children when the policy is imposed. Subsidies and punishments are not considered here.

The framework is a three-period overlapping generations economy with a fertility constraint, which represents the one-child policy. In the model, children do not work but depend on their parents for support. If they survive, children become adults. Adults make decisions and supply labor to the production sector. Subsequently, subject to a survival probability, adults become the elderly and start to consume their own savings. Adults choose consumption, asset holdings, the

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[1] McElroy and Yang (2000) suggest that China's population policies have played an important role in lowering China's total fertility rate. Li et al. (2005) also find similar results. In addition, Li and Zhang (2007) show that the birth rate has had a negative impact on economic growth, suggesting that China's birth control policy is growth enhancing.

number of children they want, and the education level of their children. Education is discrete, either skilled or unskilled. The production sector is perfectly competitive. There exists a representative firm using skilled labor, unskilled labor, and physical capital as inputs. To capture the elements of a command economy, price distortions are included in our model.

Two numerical analyses are provided. First we do a steady-state comparison. The model is calibrated to data from China in 1977 and 2005.[2] In 1977, China was a command economy and the one-child policy had not yet been imposed. Thus, a model with price distortions only is calibrated. In contrast, twenty-five years after its economic reform in 1980, China became a market economy with the one-child policy. Therefore, we calibrate a market model (no price distortions) with a fertility constraint to China in 2005.

Second, based on the calibrated results, further experiments are explored in this paper. The benchmark represents China's demographic change during the period 1977–2005. Then, a counterfactual experiment without the one-child policy is carried out in comparison to the benchmark. The purpose of this experiment is to study what would have happened in China if the one-child policy had not been imposed in 1979.

The results suggest that introducing the one-child policy promotes the accumulation of human capital and increases per capita output. These findings are consistent with the suggestions in the literature.[3] See, for example, Bloom et al. (2000) and Li and Zhang (2007). Unsurprisingly, introducing the policy also results in an older population. The fraction of elderly as a percentage of the total population in the benchmark is higher than that in the counterfactual experiment. This result is consistent with the actual experience in China. China will undoubtedly be burdened with a rapidly aging population in the next few decades. As Table 1 shows, the fraction of the population aged 65 and above in China will double over the next twenty years. Specifically, China will have more people over the age of 65 than below 15 by the year 2035.

Our analysis also gives rise to two interesting novel results that go beyond the existing literature. First, we find that, counterintuitively, some parents actually choose to have fewer children when the one-child policy is removed. This is because without the policy other people have more children, which changes wage rates. In particular, the ratio of skilled labor to total labor decreases, thereby increasing the skill premium and making children more expensive for skilled parents. Second, removing the one-child policy leads to different welfare effects across generations and skill groups. For the initial generation, the initial conditions are fixed. Here the results confirm the intuition that people benefit from having the one-child policy relaxed. However, future generations suffer from removing the one-child policy due to capital dilution.[4] Physical capital is determined by the past generation, but the past generation faces a trade-off between having children and savings. In addition, children born in the past period become workers in this period. Therefore, a lower physical capital–labor ratio results in lower welfare for future generations when the one-child policy is removed.[5]

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[2] Both are calibrated as steady states. Because the data of 2005 is more abundant, we calibrate 2005 first and then change some parameters so that we can also match the moments in 1977. See Section 4.1 for the details.

[3] However, Rosenzweig and Zhang (2009) suggest that the contribution of the one-child policy in China to the development of its human capital is modest. The policy results in an increase in schooling attainment by 4% at most, the probability of attending college by less than 9%, and school grades by 1%.

[4] This paper compares the benchmark to outcomes without the implementation of the one-child policy. Alternatively, we could follow the approach suggested by Eckstein and Wolpin (1985) to find "optimal steady states". Optimal steady states are defined as stationary allocations for which there is no alternative stationary allocation that makes one agent better off without making the other worse off. Once optimal steady states are explored, one could test if the one-child policy delivers an optimal allocation.

[5] Golosov et al. (2007) propose two notions of efficiency (P-efficiency and A-efficiency) to make the concept of Pareto efficiency applicable to models with endogenous fertility. They show that a generalization of Barro and Becker's recursive equilibrium is both P-efficient and A-efficient. However, our analysis shows that there are winners and losers for removing the one-child policy.

Table 1
Age composition in China.
Source: *World Population Prospects*, the 2008 revision, Population Division of the Department of Economic and Social Affairs, UN. http://esa.un.org/unpp.

	1970	1990	2005	2010	2030	2050
Age 0–14	39.7	28.4	22.0	19.9	16.9	15.3
Age 15–64	56.0	66.1	70.4	71.9	67.2	61.4
Age 65 and above	4.3	5.5	7.6	8.2	15.9	23.3

Note: Percentage of total population.

We further examine the impacts of implementing the one-child policy in a simplified framework: a two-period overlapping generations model without physical capital. There is no old generation and no savings. The influence of capital dilution disappears, so almost every generation is better off when the one-child policy is removed. In addition, we observe that future unskilled workers are slightly hurt if the one-child policy is removed, while skilled workers are always better off. Because children's education is determined by parents, there exists an implicit redistribution between skilled and unskilled workers. However, the redistribution effect is smaller than the impact of capital dilution.

This paper provides a framework for analyzing the effects of the one-child policy. Our experiments show that removing the one-child policy results in winners and losers, both across generations and skill groups. These findings demonstrate the importance of considering group-specific welfare changes when discussing population policies. If only GDP per capita is considered as a measure of economic well-being, as in Young (2005), those people who are worse off will be ignored in the analysis.

The rest of this paper is organized as follows. Section 2 summarizes the implementation of China's one-child policy. Section 3 describes the model. Section 4 discusses the calibration. The experiments and results are provided in Section 5. Finally, Section 6 concludes this paper.

2. China's one-child policy

In the early 1970s, China's central government began to control its rapid population growth with the "Later, Longer, and Fewer" family planning program (later marriage, longer intervals between births, and fewer children). As shown in Fig. 1, the total fertility rates sharply declined during the 1970s. However, these policies did not successfully reach the ideal population growth rate. Therefore, in 1979 the government moved to directly target the number of children per family and the one-child policy was officially formalized. The one-child policy further lowered the total fertility rates to be less than two.

The one-child policy, which stated that each couple is allowed to have only one child, was initiated by the central government. However, the implementation of the policy, including benefits and penalties, was formalized by local governments. Thus, local policies inevitably varied between provinces, regions (urban and rural), and ethnic groups (*Han* people and ethnic minorities).

Overall, single-child families can obtain benefits and financial rewards, including a child allowance that continues until the child reaches age 14, priority access to schools, college admission, employment, health care, and housing. In rural areas, single-child families are allowed to pay lower taxes and can obtain a larger area of land. The penalties on above-quota births in cities include 10–20% of both parents' wages lasting for 3–14 years. Parents who violate the policy will be demoted or will not eligible for promotion if they work in government sectors. Furthermore, the "above-quota" children are not allowed to attend public schools. However, in rural areas, the most common punishment is a large one-time fine, which may account for a large percentage of a worker's annual income. Demotions in