Economic implications of relaxation of China's one-child policy - a dynamic general equilibrium analysis

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Abstract

Applying a dynamic general equilibrium modelling approach, this paper explores the macro economic impacts of China's new two-child policy which was implemented in the early of 2016. To do so we first conduced two sets of population projections with the estimated total fertility rate under the two policy scenarios: old one-child policy and new two-child policy. The population projections show that by the end of 2050, the new-child policy will bring China 77.8 million more people and among which nearly 40 million are working age population. Despite that the numbers of older people will stay the same in both of the scenarios, its share among the total population would differ. The percentage of older people at age 65 and above will be 1.7 percentage points lower in 2050 under the two-child policy. Both changes in the age structure and the sizes of total population and working age population will have wide ranging implication for China's economy. Using a dynamic general equilibrium model of the Chinese economy –CHINAGEM, we explored the macroeconomic implications of the new two-child policy. The simulation results show that more liberal population policy will bring faster growth of the aggregate economy for a given productivity growth rate with a slightly erosion of per capita material living standards of households.

1 Introduction

China has experienced rapid fertility decline since 1970 in response to various social, economic and policy factors. The total fertility rate (TFR) plummeted from 5.71 children per woman in 1970 to just 2.24 in 1980. The TFR continued to decline to 1.8 in 2000 and further to 1.60 in 2010. The fast fertility decline combining with the increase in the life expectancy (Life expectancy at birth has increased from 36.3 years in 1960 to 74.7 years in 2010) has created a dramatic change in China's population age structure. According to UN's medium variant population projection, the proportion of population aged 65 and over will increase from 6.9% in 2000 to 11.7% in 2020 and further to 23.9% in 2050. Meanwhile its working age population aged 15 to 64 started to decline from 2015 and will continue to decline (United Nations, 2015).

To respond to anxieties regarding to labour shortage and rapid population ageing, the Chinese government finally eased its unpopular and decades-old one child policy in the early 2014. Couples who are either from one-child families are allowed to have a second child. This policy has been further relaxed in the early 2016. Any couples who currently have one child can have second child. Any such policy change will affect the fertility rate with implications for the future demographic structure and population size. Both changes in population structure and in population size have wide-ranging economic implications. This paper will explore the economic implications of this new population control policy.

2 Fertility rates under new population control policy

How will China's fertility respond to this new policy? Some scholars worry that the new policy may create an unprecedented baby boom in the world's most populated country (Davis, 2013). However, other scholars argue that there will be no explosion of births once the one child policy is phased out because "experience from other countries shows that raising fertility is probably an even more challenging task than reducing it" (Frijka, et. al., 2010, Goldstein, et. al. 2009 and Wang, et. al. 2012) . In fact, 2016 saw an increase of 1.3 million or more births in China. According the National Bureau of Statistics of China (NBS), the number of births in 2016 stood at 17.86 million compared to the 16.55 million births in 2015. The 2016 number of births was even higher (18.46 million) from the data based on the

hospitalized-delivery collected by the National Population and Family Planning Commission of China (NPFPC). These numbers of births could be translated into a TFR close to 1.7.

We expect that the immediate consequence of the new two-child policy would be a sudden increase in fertility, or a baby boom in the next few years, because women at all ages in the reproductive span who have only one child could produce the second birth, even at the same time, if they wanted to do so. 2016 is the first year of implementing the two-child policy, and we expect the policy effect would be larger in the next few years. We estimate the future fertility effect of the two-child policy according to the information of fertility intention of reproductive women collected by the NBS in 2014 in its annual population sample survey (one-per-thousand sample survey). The survey results show that among the couples who already had the first child, 43% stated they want to have a second birth and will do so in the next five years after the new fertility policy is implemented. The NPFPC also conducted a nation-wide sample survey on fertility preferences in 2014 yielding similar results. The NPFPC survey shows that the ideal number of children is 1.93 for all couples, and 1.83 for couples who have only one child. How do we estimate the temporary baby boom in the next few years? The amount of this fertility effect is determined by the size of different female cohorts having only one child and their fertility intention for having the second birth. Multiplying these two quantities produces an estimate of the scale of the coming baby boom. However, women would not be giving second birth in just one or two years following the implementation of the two-child policy. When taking into account the timing of the second birth, we could produce estimate of annual number of births in the next few years.

The three parameters, namely, number of women having only one child, percentage of these women who are planning to have the second birth and the timing of their second birth, are drawn from the NBS 2014 survey. In this survey, questions are specifically asked to couples who have only one child whether or not they are planning to have the second child, and in which year having the second birth. As for the first parameter, estimate is based on the question on the number of children ever born for women by age. However, numbers of all women at ages 15-49 with only one child are not the accurate value of the first parameter, because China did have a selective two-child policy which is as old as the one-child policy. Thus women who have only one child but are covered by the selective two-child policy need

to be excluded from the estimate of the women covered by the current universal two-child policy.

The above estimates suggest that in 2016, roughly 90 million women with one child are eligible to have the second child under the current two-child policy. We use the age-specific number of those 90 million women, to be multiplied by the age-specific data of the proportion of intending to have the second birth (this proportion ranges from nearly 70% at age 20-24 to less than 10% at age 45-49). The result is 17.20 million second births. This is again split into a five-year distribution according to the timing of the second birth reported by the women in the NBS survey. The annual number of births could be easily translated into annual total fertility rates. The following table shows the fertility estimates for 2017 to 2021.

Table 1: Fertility estimates from 2017 to 2021

Year	Extra second births (million)	Total births (million)	Total fertility rate (births per woman)
2017	3.40	21.10	1.97
2018	4.63	21.88	2.09
2019	4.02	20.77	2.04
2020	3.52	19.36	1.96
2021	1.60	16.89	1.77

China's TFR could rise from 1.6 in 2015 to 2.1 in 2018, followed by again a long-term decline to around 1.7 by 2050. In fact, implementation of the two-child policy is a temporary transition from the one-child policy to no fertility limitation policy in China. Since the ideal number of children in China is now below the fertility replacement level, even the removal of any fertility limitation policy in the near future following the two-child policy would not produce a baby boom like the one that is occurring. Future long-term fertility in China is assumed to level off at around 1.7.

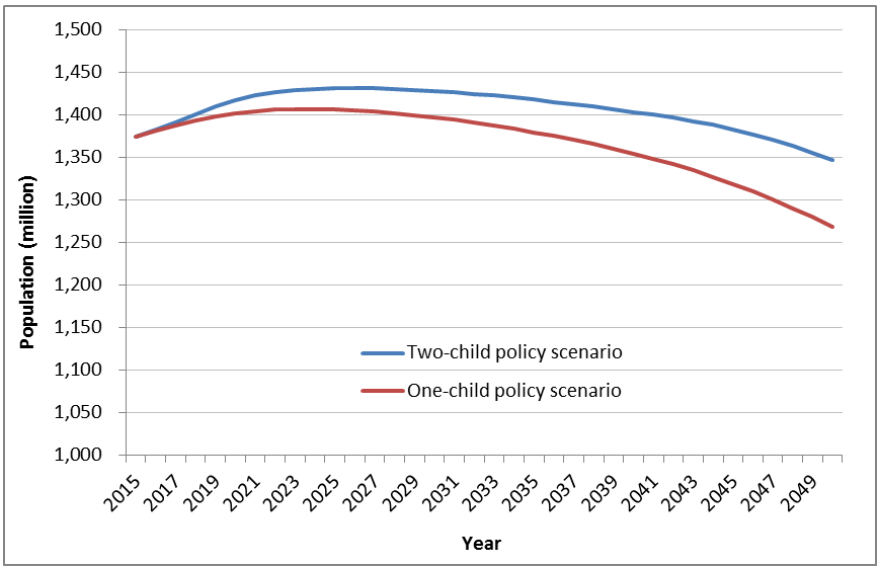
3 Population projections from 2015 to 2050

In this part, two sets of population projections will be conducted: Scenario one - population projection with old one-child policy; and scenario two – population projection with new two-child policy. Future fertility changes under the two-child policy are elaborated in the last section. For the one-child policy scenario, we simply assume China’s fertility would remain stable at the current level and decline slightly to 1.5 by 2050. There is only one mortality

scenario in our population projections. The NBS estimates show that China's life expectancy at birth was 76.34 years in 2015, 73.64 years for males and 79.43 years for females. We assume the future trends of China's life expectancy at birth to be following the UN model of medium pace increment. Thus, male life expectancy at birth would increase to 78.29 years and female life expectancy at birth to 83.63 years by 2050. We just disregard international migration in our population projections simply because China is largely closed to international migration. Following Mai, Peng and Chen (2013), the cohort-component method combined with Brass logit transformation method will be used to conduct the projections. The 2015 China's one-percent population sample survey data will be used as the base year data. The projections will provide population size by gender and by single age cohort under two scenarios from 2016 to 2050.

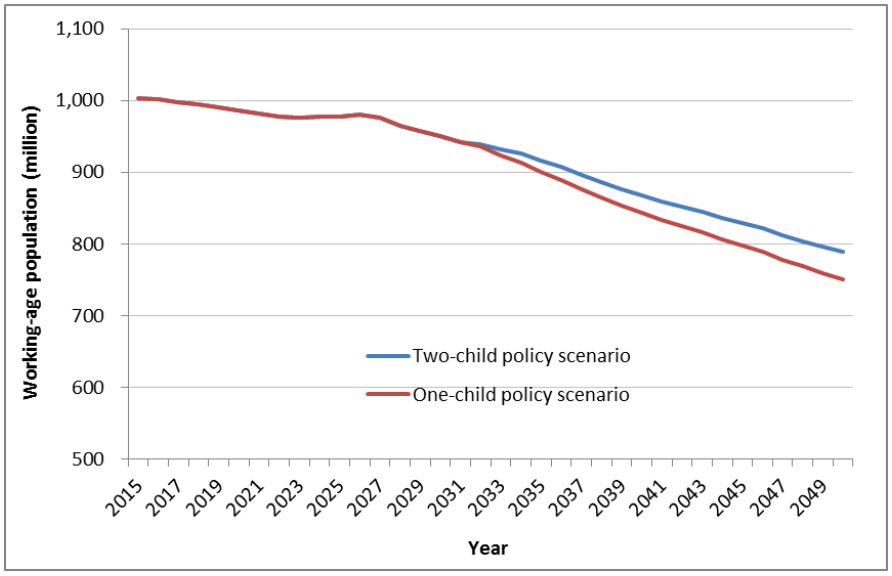
According to the NBS estimate based on the 2015 one-percent population sample survey, China's total population stood at 1374.6 million in 2015. As Figure 1 shows, under the new two-child policy, China's population is projected to be likely to increase to a maximum of 1431.1 million in 2026, and then decrease to 1346.5 million by 2050. If China were to stick to the one-child policy, China would have the maximum population of 1406.8 million in 2024, which is 24.3 million less than that under the two-child policy. The population by 2050 under the one-child policy (1268.7 million) would be 77.8 million less than that under the two-child policy, or 100 million less than the current population in 2015.

Figure 1: Future Trends in China's Total Population, 2015-2050



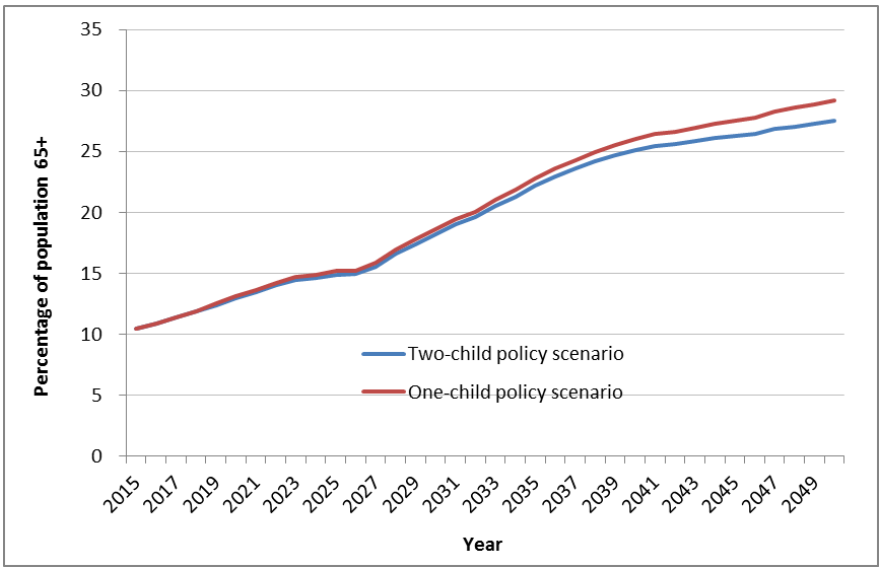
One of the major economic implications of China's fertility policy adjustment is that it would bring about millions of extra labour force. Currently China has 1 billion working-age population at age 15-64. The long-term decline in China's working-age population would be similar in both of the population projection scenarios. Roughly China's working-age population would decrease to 900 million in around 2035 and further to 800 million in around 2045. However, as shown in Figure 2, the gap of the two scenario curves start to emerge in 2031 and become increasly large afterwards. By 2050 China would have nearly 40 million extra labours under the two-child policy (788.6 million) compared to the situation under the one-child policy (750.1 million).

Figure 2: Future Trends in China's Working Age Population, 2015-2050



China's fertility policy adjustment would also have some impact on population ageing (Figure 3). Despite that the numbers of older people will stay the same in both of the scenarios, its percentage among the total population would differ because of the change in the denominator—total population, which becomes larger under the two-child policy. The population projection results suggest that the two-child policy scenario would reduce the percentage of older people at age 65+ by 0.5, 1.0 and 1.7 percentage points in 2033, 2042 and 2050. Nearly 30 percent of China's population would be older people at age 65+ under the one-child policy by 2050, while the share of older people woud be 27.5 percent by that time under the two-child policy scenarios. This effect is trivial.

Figure 3: Future Trends in China's Population Ageing, 2015-2050



4 CHINAGEM model and simulations

4.1 CHINGEM model

In this part, CHINAGEM - a dynamic general equilibrium model of the Chinese economy will be used to simulate the effects of the new population control policy on China's economic growth. CHINAGEM model includes 137 sectors and its base data reflects the 2012 input-output structure of the Chinese economy. The core CGE structure is based on ORANI, a static CGE model of the Australian economy (Dixon et al 1982). The dynamic mechanism of CHINAGEM is based on the MONASH model of the Australian economy (Dixon and Rimmer 2002). The CHINAGEM model captures three types of dynamic links: physical capital accumulation; financial asset/liability accumulation; and lagged adjustment processes in the labour market.

In CHINGEM, production is modelled using nested constant elasticity of substitution (CES) and Leontief production functions which allow substitution between domestic and imported sources of produced inputs and between labour, capital and land. The production functions are subject to constant returns to scale. Household demand is modelled by the linear expenditure system (ELES). Trade is modelled using the Armington assumption for import demand and a constant elasticity of transformation (CET) for export supply. Exports are demanded according to constant-elasticity demand curves for most of commodities. In the model, capital stock is accumulated through investment activities (net of depreciation). Investors respond to changes in expected rate of return.

To analyse the economic effects of the relaxation of one-child policy, we first develop a base case forecast, a business-as-usual scenario without the implementation of the policy change, that is the scenario with the old one-child policy. Then we conduct a policy simulation, an alternative forecast with the policy change in place – new population control policy. The effects of the policy change are measured by deviations of variables in the alternative forecast from their baseline levels.

4.2 Baseline development

To develop the baseline scenario, we first update model's database from 2013 to 2015. Then for the forecast period of 2016 to 2050 we assume that the growth pattern of the Chinese economy will follow its historical trend but will grow at a lower rate. For example, the average annual growth rate of real GDP between 2013 and 2015 is 7.3 per cent while we assume that the average growth rate of real GDP is 6.3 per cent from 2017 to 2025, 6.0 per cent from 2026 to 2030, 5.5 per cent from 2031 to 2035, 5.0 percent from 2036 to 2040, 4.5 percent from 2041 to 2045, and 4.0 percent from 2046 to 2050. The growth rate of total labour force is calculated based on the growth rate of working age population (which is from

Table 2: Summary of baseline calibration*

	2016	**2020**	**2025**	**2030**	**2040**	**2050**
Exogenously specified variables						
Annual growth rate (%)						
Investment	6.31	6.38	6.10	4.50	4.0	3.50
Real GDP	6.22	6.35	6.20	5.70	4.70	4.0
Labour force	-0.075	-0.39	0	-0.82	-1.19	-1.25
Total population	0.51	0.26	-0.04	-0.19	-0.41	-0.86
Calibrated results						
Annual growth rate (%)						
Capital stock	9.19	8.03	7.22	6.50	4.92	3.99
Real wage rate	8.64	8.09	6.70	7.02	6.11	5.36
Household consumption	6.59	6.86	6.93	6.38	4.78	4.06
Government consumption	6.59	6.86	6.93	6.38	4.78	4.06
Export	4.78	4.61	4.09	4.90	4.52	3.76
Import	4.57	4.63	4.55	3.64	2.96	2.55
Productivity improvement	4.3	5.25	5.18	5.7	5.43	4,95

Source: Baseline simulation results. ***** Only selected years results are displayed in this table.

our population projection scenario one – population projection with old one-child policy) and aggregate labour force participation rate (which is assumed to remain its 2015 level of 76.98 percent during the forecast period). The growth rate of total population is based on the population projection with old-one child policy. Table 2 summarizes the growth rates of macroeconomic variables in China from 2017 to 2050.

4.3 Policy simulation - economic effect of the two-child policy

As we discussed in Section three, the two-child policy will bring China not only more labour force and population, but also reduce the share of the older population aged 65 and over. Both changes in population size and in population structure have wide-ranging economic implications. In the present paper we will only investigate the economic implications of the changes in the sizes of population and labour force.

Table 3 shows the differences, relative to the baseline scenario, of the growth rates of labour supply and population in the two-child policy. These differences are fed into the model as shocks in the policy simulations. The deviations of the policy simulation results from the baseline results are the effects of the two-child policy.

4.3.1 Real GDP and other macroeconomic indicators

A higher fertility regime supports a higher growth rate of real GDP for identical rates of productivity improvement. Figure 4 shows that by the end of 2050, real GDP will be 4.7 per cent higher than in the baseline scenario. The reason is quite straightforward: a higher fertility rate supports a larger supply of labour; growth of labour supply raises growth rate of capital stock; both combine to create a higher growth rate of GDP. Figure 4 shows that by the end of 2050, the labour input will be 5.04 per cent higher than in the baseline scenario. And the total capital stock will be 1.9 per cent higher. We notice that the deviation of the capital stock from baseline scenario is lower than that of labour input. The reason is that the increase in labour supply will reduce the growth rate of real wages. By the end of the simulation period, the real wage will be 0.85 per cent lower than in the baseline scenario. The declining growth rate of real wages compared with the baseline scenario implies that labour is becoming cheaper and employers will have intention to substitute labour for capital, which will reduce the capital – labour ratio of the economy in the long run. The substitution between capital and labour will slow down the growth rate of the capital stock.

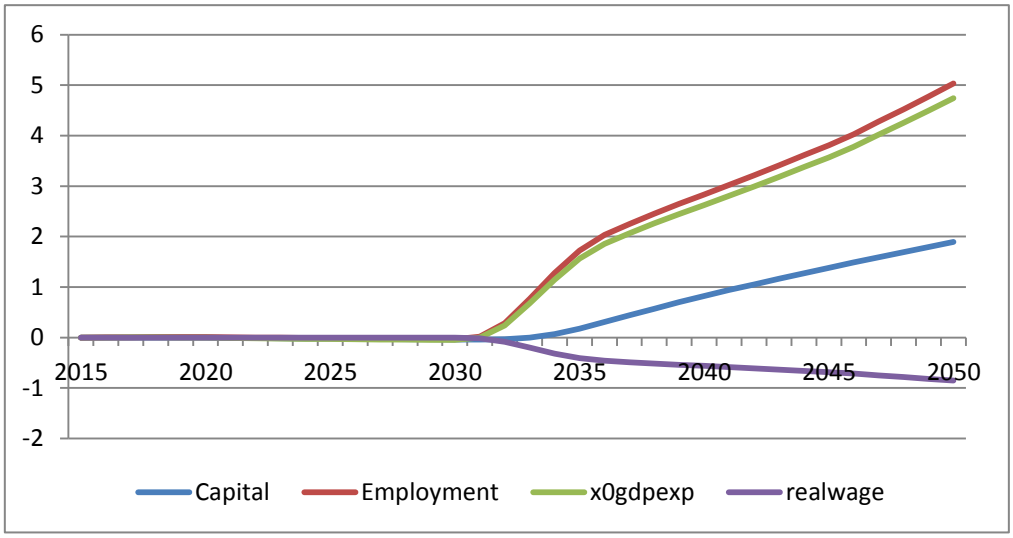
Table 3: Growth rates of total and working age population (%)

Year	Old one-child policy (1)	New two-child policy (2)	*Difference (2)-(1)*	Old one-child policy (4)	New two-child policy (5)	*Difference (5)-(4)*
2016	0.51	0.54	***0.03***	-0.07	-0.07	***0***
2017	0.45	0.63	***0.18***	-0.39	-0.39	***0***
2018	0.39	0.71	***0.33***	-0.42	-0.42	***0***
2019	0.33	0.66	***0.33***	-0.43	-0.43	***0***
2020	0.26	0.53	***0.27***	-0.39	-0.39	***0***
2021	0.19	0.37	***0.18***	-0.35	-0.35	***0***
2022	0.12	0.24	***0.12***	-0.46	-0.46	***0***
2023	0.06	0.17	***0.11***	-0.22	-0.22	***0***
2024	0.01	0.11	***0.10***	0.15	0.15	***0***
2025	-0.04	0.05	***0.09***	0.00	0.00	***0***
2026	-0.08	0.02	***0.09***	0.32	0.32	***0***
2027	-0.11	-0.01	***0.10***	-0.46	-0.46	***0***
2028	-0.14	-0.04	***0.10***	-1.13	-1.13	***0***
2029	-0.17	-0.07	***0.10***	-0.74	-0.74	***0***
2030	-0.19	-0.09	***0.09***	-0.82	-0.82	***0***
2031	-0.21	-0.11	***0.10***	-0.87	-0.82	***0.05***
2032	-0.23	-0.12	***0.11***	-0.65	-0.38	***0.26***
2033	-0.25	-0.14	***0.11***	-1.24	-0.76	***0.48***
2034	-0.27	-0.16	***0.11***	-1.13	-0.62	***0.51***
2035	-0.29	-0.18	***0.12***	-1.41	-0.97	***0.44***
2036	-0.31	-0.19	***0.12***	-1.33	-1.03	***0.31***
2037	-0.33	-0.20	***0.13***	-1.36	-1.14	***0.21***
2038	-0.36	-0.21	***0.14***	-1.35	-1.15	***0.20***
2039	-0.38	-0.22	***0.16***	-1.30	-1.11	***0.19***
2040	-0.41	-0.22	***0.19***	-1.19	-1.01	***0.18***
2041	-0.45	-0.23	***0.22***	-1.18	-1.00	***0.18***
2042	-0.49	-0.25	***0.24***	-0.95	-0.76	***0.19***
2043	-0.53	-0.28	***0.25***	-1.10	-0.91	***0.19***
2044	-0.58	-0.32	***0.26***	-1.17	-0.98	***0.19***
2045	-0.63	-0.38	***0.25***	-1.05	-0.86	***0.19***
2046	-0.68	-0.43	***0.25***	-1.13	-0.93	***0.21***
2047	-0.72	-0.48	***0.24***	-1.49	-1.25	***0.24***
2048	-0.77	-0.53	***0.24***	-1.15	-0.91	***0.24***
2049	-0.81	-0.58	***0.23***	-1.17	-0.93	***0.24***
2050	-0.86	-0.63	***0.23***	-1.25	-1.00	***0.25***

We just mentioned that in the two-child policy scenario, real wage is lower than in the baseline scenario. There are two reasons for the lower real wage rate in the two-child policy scenario: first the higher labour supply reduces the growth rate of the real wage. Secondly, the increase of population and labour force in the higher fertility regimes reduces the relative availability of fixed resource, specifically land, and drives up its price (Figure 7). The increasing scarcity of land is associated with an increase in the labour intensity of production which in turn reduces the productivity of labour and, thus, depresses the wage rage. Thirdly,

Figure 4: Policy simulation results: real GDP, factor inputs and real wage

(Cumulative deviation from baseline %)



4.3.2 GDP Expenditures and household income

Higher growth rates of population and labour force imply higher demand for investment. These demands include investment both for capital formation to equip new employers and for infrastructures, such as housing, transportation, utilities. As Figure 5 shows, at the end of 2050, the level of investment in the two policy scenarios exceeds the baseline case by 2.86 percent.

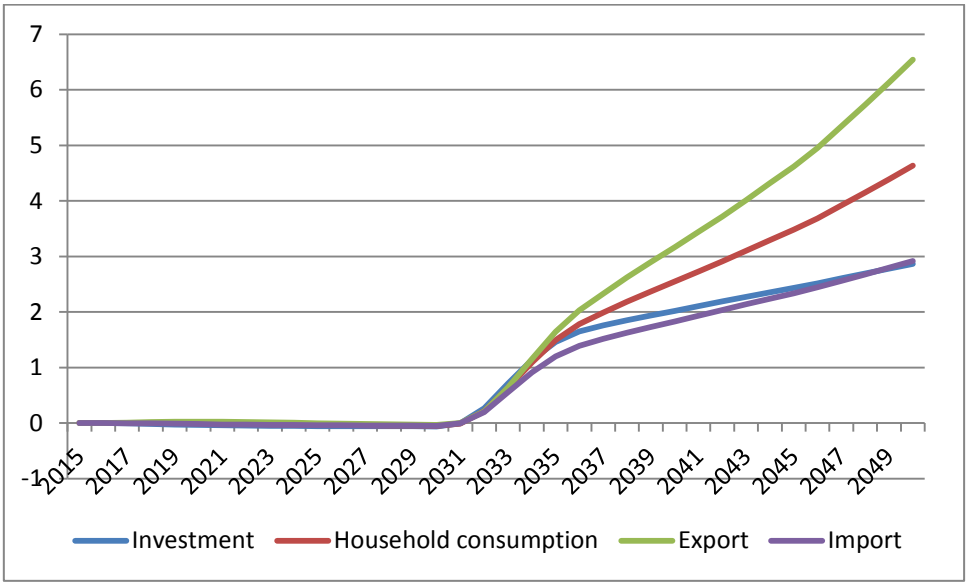
In the long run increase in labour supply stimulates the growth of China's exports. As Figure 5 shows, exports will be 6.54 per cent higher than in the baseline scenario. The reason is that with the slower growth of the wage rates of workers, labour cost in export sectors, especially in manufacturing, is reduced. This further increases the competitiveness of Chinese exports in the world market. As a result Chinese exports expand. The expansion of exports implies more employment opportunities which may further stimulate the development of export-oriented sectors in China.

Higher population growth also implies higher growth rate of aggregate real household consumption. Figure 5 shows that by the end of 2050 the real household consumption in the two-child policy scenario is 4.64 per cent higher than in the baseline scenario.

The higher investment and household consumption demand require higher import. Figure 5 shows that by the end of 2050 the import in the two-child policy scenario is 2.92 per cent higher than in the baseline scenario.

Figure 5: Policy simulation results: Expenditure-side of GDP

(Cumulative deviation from baseline %)

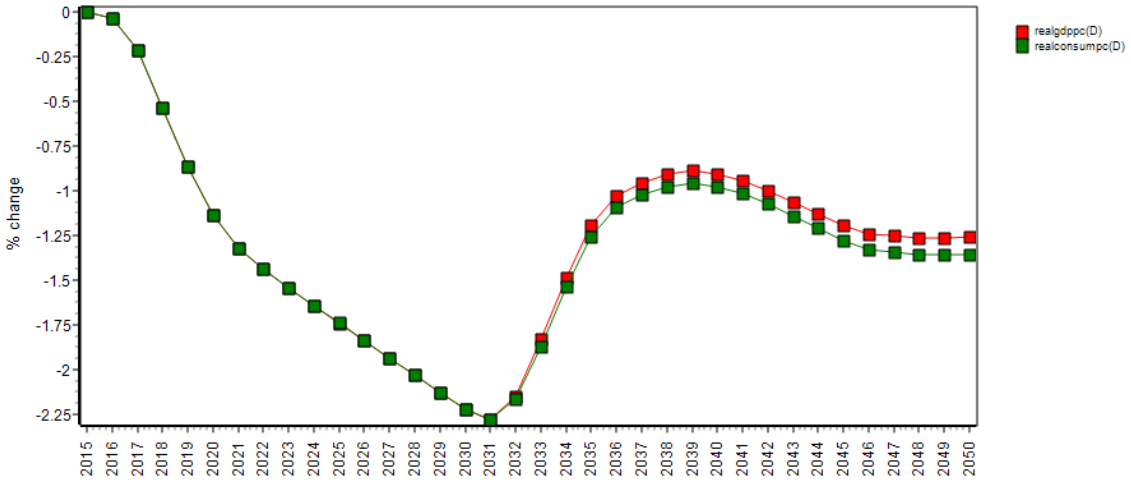


4.3.3 Per capita real GDP and household real consumption

While two children policy may support higher growth rates of total output, this does not translate into corresponding improvements in per capita terms. Figure 6 shows that per capita income is consistently lower than in the baseline case. The cumulative effect is that by the end of the mid-century per capita real GDP is approximately 1.26 percent lower in the two-child policy scenario compared to the baseline case. In the case of per capita real consumption, Figure 6 shows that per capita real consumption also falls behind the baseline scenario (1.36 percent lower in the two-child policy scenario at the end of the mid-century). This means that under the current setting of the CHINAGEM model, households' material living standards slightly deteriorate with higher fertility rates.

Figure 6: Policy simulation results: Per capita real GDP and consumption

(Cumulative deviation from baseline %)

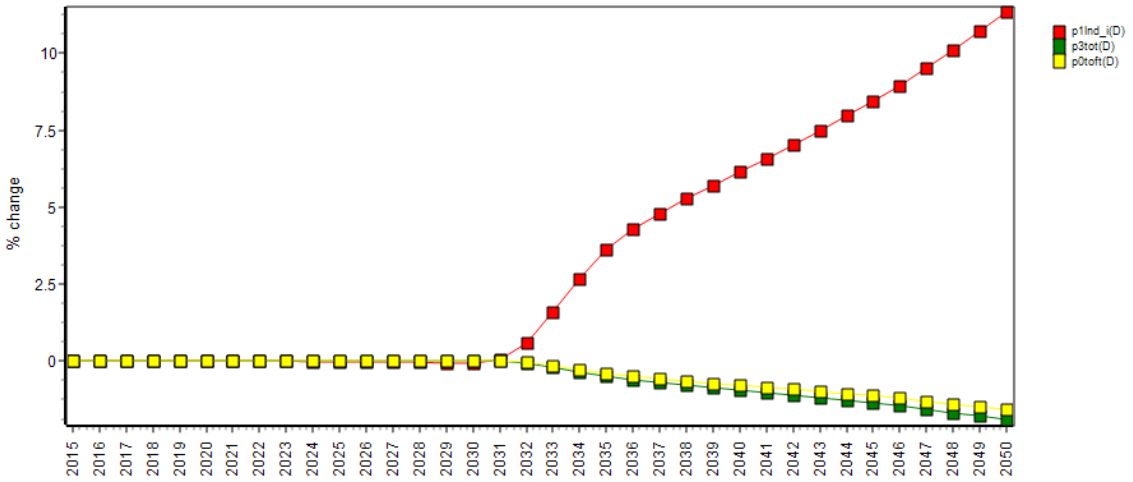


We also notice that decline of per capita real consumption is even worse than that of per capita real GDP under the two- child policy scenario**.** Reasons for the failure of living standards, measured by per capita consumption, to improve with output include:

1) As we just discussed in the section 4.3.2 China's exports will expand under the new two-child policy scenario. The increase in exports drives the terms of trade down because China is a "large country" in her export markets. The price of imports remains unaffected because we assume in the CHINAGEM model that China does not exert noticeable market power in her import markets. Figure 7 shows at the end of the mid-century, the terms of trade is 1.58 per cent lower compared with the baseline case. The decline of the terms of trade affects the gains from a given volume of trade adversely and therefore drags the aggregate real household consumption down.
2) The higher fertility regime impinges negatively on per capita output and consumption by reducing the per capita availability of the fixed factor (land). As population growth increases, land becomes more scarce and expensive. Figure 7 illustrates that the payments to land is 11.34 percent higher in two-child policy scenario than in the baseline scenario. The dramatic increase in the price of land indicates that there is diminishing return to the extra labour and capital. This subdues per capita income and consumption.
3) The higher demand for investment in housing, transportation and other living infrastructure to accommodate the increased rate of population growth under higher fertility regimes crowds out consumption.

Figure 7: Policy simulation results: Terms of trade, consumer price index and land price

(Cumulative deviation from baseline %)



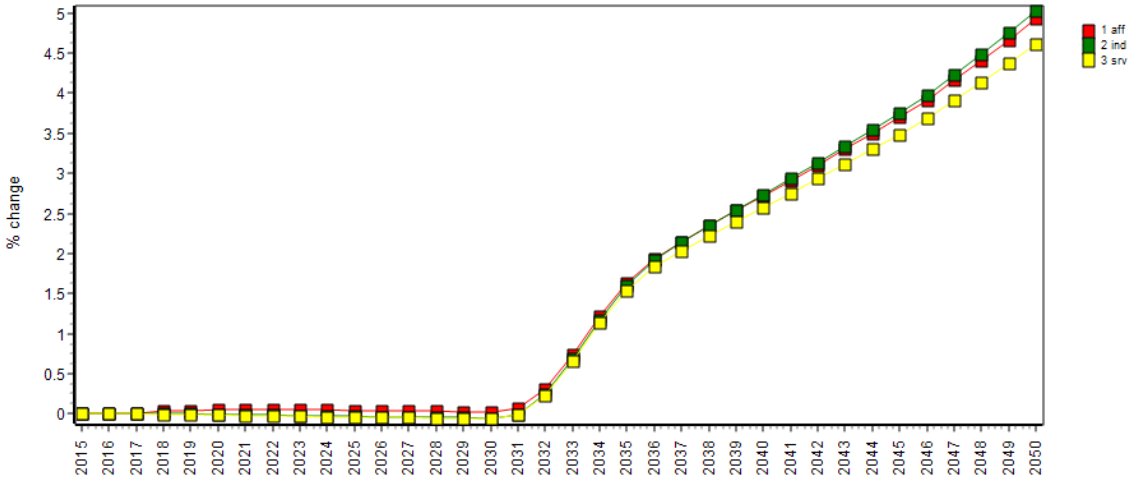
However we also notice that difference between the decline of per capita real consumption in the year 2050 (-1.36%) and real GDP (-1.26%) is very small - only 0.1 percentage points. The reason is that the price of consumer goods is lower in the new two-child policy scenario. The lower price of consumer goods helps to improve per capita real household consumption.

Figure 7 shows that the consumer price index is 1.9 per cent lower in the policy scenario than in the baseline scenario. Why is the consumer price index lower in the policy scenario? The reason is that the increase in the labour supply boosts the growth of outputs of not only industrial and services products but also the output of agricultural products. Figure 8 shows that outputs of agriculture, industry and service are 4.93, 5.03 and 4.61 percent higher, respectively, than in the baseline scenario. The growth of agricultural output will reduce food prices and therefore the consumer price index in the policy scenario compared to the baseline scenario.

As a summary, change of household real consumption in the policy scenario is the combined results of the declined terms of trade, higher land price, investment crowding out effect and lower consumer price index. The deterioration of terms of trade, higher land price and investment crowding out effect drag the household real consumption down while the decline of consumer price index pushes the household real consumption up.

Figure 8: Policy simulation results: outputs of three aggregate sectors

(Cumulative deviation from baseline %)

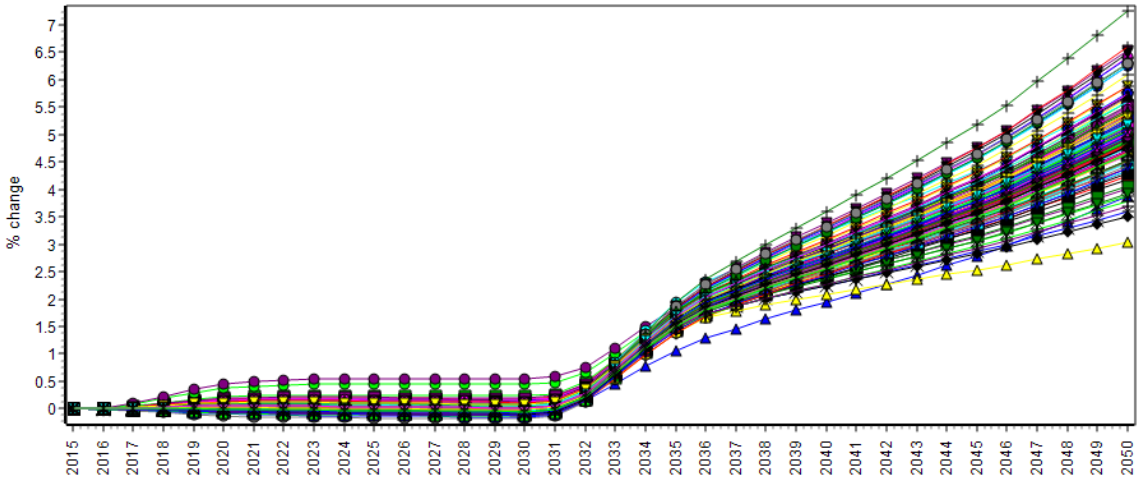


4.3.4 Output of sectors

With increased labour supply and capital stock, the productions of all industries increase (Figure 9). The labour intensive and export oriented sectors such as clothing and textile sectors benefits more than the capital intensive sectors such as machinery, crude oil and gas sectors.

Figure 9: Policy simulation results: outputs of sectors

(Cumulative deviation from baseline %)



5 Conclusions and research limitations

5.1 Conclusions

Applying a dynamic general equilibrium modelling approach, this paper explores the macro economic impacts of China's new two-child policy which was implemented in the early of 2016. To do so we first conduced two sets of population projections with the estimated total fertility rate under the two policy scenarios: Scenario one - old one-child policy and scenario two –new two-child policy. The population projections show that by the end of 2050, the new-child policy will bring China 77.8 million more people and among which nearly 40 million are working age population. Despite that the numbers of older people will stay the same in both of the scenarios, its share among the total population would differ because of the change in the denominator—total population, which becomes larger under the two-child policy. The percentage of older people at age 65 and above will be 1.7 percentage points lower in 2050 under the two-child policy than that in the old one-child policy. Both changes in the age structure and the sizes of total population and working age population will have wide ranging implication for China's economy. Using a dynamic general equilibrium model of the Chinese economy –CHINAGEM, we explored the macroeconomic implications of the new two-child policy. The simulation results show that more liberal population policy imply:

- Faster growth of the aggregate economy for a given productivity growth rate. The reason is that the higher growth of labour force combined with higher growth of capital formation creates higher growth of aggregate output.
- Slightly erosion of per capita material living standards of households. The reasons include the deterioration of the terms of trade generated by higher export requirements and reductions of per capita limited natural resources. The third reason is the crowding out effect of the higher demand for investment in housing, transportation and other living infrastructures to accommodate the increased rate of population growth under higher fertility regime.
- Reduction in real wage rates. The first reason is that increased labour supply put downward pressure on the real wage rate. The second reason is the reduction in per capita fixed resource – land. The increasing scarcity of land which is associated with an increase in the labour intensity of production reduces the productivity of labour and, thus, depresses the wage rage. The above two reasons combine to cause the capital labour ratio to fall below the baseline scenario.

5.2 Research limitations

In this paper we didn't consider the contribution of the increased working age population under new two-child policy on the pension funds therefore on the public finance and government consumption. The increase working age population will increase the contribution on the pension fund and reduce the public financial burden which will impose further effects on the macro economy. Currently we are introducing a detailed pension module in the CHINAGEM model. With the pension module incorporated, the negative effect of higher population growth under the new two- child on the per capita household consumption might disappear. Secondly, the consumption demands vary between age groups. The current paper does not consider the demand-side effects of the changed age structure under the new two-child policy on domestic consumption.

References:

Davies, H. (2013) "China's one-child policy to change in the new year", *Independent* http://www.independent.co.uk/life-style/health-and-families/health-news/chinas-onechild-policy-to-change-in-the-new-year-9028601.html

Dixon P, Parmenter B. R, Sutton J, Vincent P (1982) *ORANI: A multisectoral model of the Australian economy*. North-Holland, Amsterdam

Dixon P, Rimmer M (2002) *Dynamic general equilibrium modelling for forecasting and policy: A practical guide and documentation of MONASH*. North-Holland, Amsterdam

Frejka, T., Jones, G. W. and Sardon. J. (2010) "East Asian childbearing patterns and policy developments," Population and Development Review 36(3): 579–606.

Goldstein, Joshua R., Sobotka, T.and Jasilioniene, A. (2009) "The end of 'lowest-low' fertility?," Population and Development Review 35(4): 663–699.

Mai, Y. Peng, X. and Wei, C. (2013) "How fast is the population ageing in china?", Asian Population Studies, DOI:10.1080/17441730.2013.797295.

Wang, F., Yong, C. and Gu, B. (2012) "Population, policy, and politics: how will history judge China's One-Child Policy?" Population and Development Review 38 (Supplement): 115–129.

United Nations (2015) *World Population Prospects: The 2015 Revision*, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, http://esa.un.org/unpd/wpp/index.htm.