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Government Spending, Intrinsic Motivation And Fertility

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Abstract

Naturally, the decision of having a certain number of children is a family matter. However, regardless of the factors that would affect the decision, if happened that all parents in the country, decided to have children below the replacement level, then this become a national matter. We examine the impact of government spending on child cash allowances and spending on child care and early education in order to promote fertility. We consider an overlapping generation model with endogenous fertility and human capital formation with Total Intrinsic Motivation. The results show that in addition to the effect of government spending on child care and early education, the Total Intrinsic Motivation also plays an important role to promote fertility decision. On the other hand, child cash allowances are ineffective in promoting fertility.

Key words: Government spending, fertility, intrinsic motivation
JEL Classification: H52; J13; Z13

1. Introduction

Naturally, the decision of having a certain number of children is a personal family matter. When a man and a woman got married, they have the right to decide on the number of children to have in the future. There are many factors that would affect the decision of having children. However, regardless of the factors that would affect their decision, if all parents in a country, decide to have children below the replacement level, then this becomes a national matter.

Under a critical condition, where the fertility rate decreases sharply and goes below the replacement level, then it is the responsibility of the government to draw some policies to control it. Otherwise, it can create another problem that could destroy the country in the long run. In several

advanced countries, the government introduces several reforms on public policies in order to encourage young couples to increase their number of children.

As mentioned earlier in the introduction paper, in order to reverse fertility decline, the government can introduce two types of policies: (1) cash benefit policies (family and child cash allowances, tax credits, and tax reduction) and (2) non-cash benefit policies (childcare provision, subsidized services for children and families, and maternity and parental leave). Some country such as Australia, has introduced an incentive so-called Baby Bonus in July 2004, in order to boost the fertility rate among the Australian women (Langridge et al., 2012). Sweden has also put an effort in encouraging fertility boost by reducing the childcare cost (Mork et al., 2013). However, Whittington et al. (1990) reported that, a few studies claim that these policies may have some effect on the fertility rates, but with regards to the magnitude of the impact of the policies on the fertility is still an issue. In addition, based on the empirical evidences, Gauthier (2007) reported that the impacts of the policies on the fertility provide mixed conclusions, and Chen (2011) states that the effectiveness of these policies remains an open question. In a nutshell, we can say that there is no certainty in effectiveness of the family policies introduced by the government as an instrument to encourage fertility to increase. Thus, it is crucial to examine the effectiveness of the said family policies.

As a contribution to the above discussed strand of literatures, and to counter the aforementioned problem statement, the objective of this paper is to examine theoretically whether cash benefit policies and non-cash benefit policies affect fertility decision. In principle, we adopt the similar model setting as constructed in Luciano and Luca (2011). In particular, Luciano and Luca (2010) set up two types of different government tax to finance the public education and child allowance. In order to see the different, we modified the tax setting into a lump sum income tax. Moreover, we also incorporate the concept of Total Intrinsic Motivation in human capital formation in order to see how intrinsic motivation affects the fertility decision. We also study the stability of the dynamics which is very important but was ignored by Luciano and Luca (2011). In addition to that, we provide several data analyses based on our model in order to show the significant impact of the Total Intrinsic Motivation on fertility decision.

The remainder of this paper is organized as follows: In Section 2, we briefly elaborate the related literature review. In Section 3, we set up the overlapping generation model with endogeneous fertility and human capital formation with intrinsic motivation, hence deduce several important propositions. Section 4 provides parametrization and discussion, and finally Section 5 gives a concluding remark.

2. Related Literature Review

Again, as we mentioned it earlier in introduction of this paper, in general, family policies can be divided into two as discussed by Gauthier (2007): (1) cash benefit policies (family and child allowances, tax credit, and tax reduction, (2) non-cash benefit policies (child care provision, subsidized services for children and family, and maternity and parental leaves). In this section, we will see thoroughly the progress of the related literature with regards to the family policies as intrument to encourage fertility to increase.

To begin with, let us see how much cash benefit policies can affect the fertility decision and later on followed by the discussion on non-cash benefit policies. Cash benefit policies have the ability to increase the income of the parents. The income effect of these earnings increases the demand for all normal goods. If the children are considered as a normal good, then high net income promotes an increase in fertility. Baughman and Dickert-Conlin (2009) study the linkage between the US Earning Income Tax Credit (EITC) and the fertility. It is obvious that EITC creates both substitution and income effects that have potential to influence fertility. As a result he find that EITC affect the fertility, but the size is not significant. Azmat and Gonzalez (2010) conduct a research to evaluate the effect of 2003 reform in Spanish income tax on fertility and find that the reform increased fertility about 5%. However, the similar research also was conducted by Brewer et al. (2012) in UK to study the relationship between Working Families Tax Credit (WFTC) that was introduced in 1999. They find that the WFTC are able to promote fertility to increase about a quarter.

In 1988, Quebec introduced a program to encourage population growth by offering cash benefit policies in term of cash payments to families that have children. Hyatt and Milne (1991) then study

the effect of the Quebec's cash payments program on fertility and find that the impact is small. However, using France data, Laroque and Salanie (2008) find that fertility is quite sensitive to financial incentives in France for the first and third birth, but they find that it is hardly responds to the second birth. They find that by introducing the financial incentives, the fertility increase around 14%.

Ermish (1988) for example argued that more generous child allowances will increase the chance of having three to four children, and the policy also will encourage early motherhood. Besides that, there were a lot of empirical researches had been done on seeking the relationship between fertility and cash benefits, and most of them agreed that cash benefits increase the probability of having more children (see Cigno and Ermisch (1989), Gauthier and Hatzius (1997), and Milligan (2005)).

As discussed above, several empirical evidences showed that cash benefits have some impacts on the fertility decision, but the magnitude of the impacts on the fertility decision are mixed. As a matter of facts, Gauthier (2007) also reviews the literatures on the impact of family policies on fertility in industrialized countries and concludes that the magnitude of the impacts on the fertility decision is mixed and the reason remains puzzling.

With regards to the non-cash policies, let us first see the effect of maternity and parental leave on fertility decision. Here, there is a positive responds between the length of the maternity and parental leave and fertility rate. Rafael and Zweimuller (2009) find that Austrian reform by increasing the duration of parental leave from one year to two years has encourages the mothers to have a second child. In addition to that, Geber and Parelli-Harris (2012) find that maternity leave could help the women to secure their foothold in the labor market and elevated rates of second conceptions.

While the maternity and parental leave has a positive impact on fertility, it seems that childcare costs are negatively related to fertility. Rithcer et al. (1994) study the impact of child care on fertility in urban Thailand and conclude that the type of child care of the first child would affect the decision of having the second child. Those women who are having difficulty in raising the first child are less likely preferred to have a second child. Meanwhile, a research conducted by Amanda et al. (2013) on 16 Chinese-Singaporean women finds that lower-skilled women strongly express the financial consideration in having child. Amanda et al. (2013) suggest that the government should increase the magnitude of the current S$300 subsidy for the child-care so that it would encourage financially tight couples to take up parenthood.

However, in contrary to several aforementioned empirical findings, Enache (2012) conducts an empirical study on a sample of 28 European countries in a panel framework, and he finds that non-cash benefit policies are ineffective and thus concludes that only cash benefits proved to be an effective instrument for boosting birth rate. This finding is contradicts to the theoretical results of Patricia and Ray (2004) that claim countries which support the families with non-cash benefit policies rather than cash benefits policies are likely to have higher fertility. This theoretical result is in line with the result by Luciano and Luca (2011). Motivated by the recent decrease in the number of children in several developed countries, they show that, in the long run, child cash allowances do not affect the fertility decision. In contrast, they claim that enlargement the public education system could encourage the fertility to increase.

In particular our results are most related to Luciano and Luca (2011). We adopt the similar overlapping generation model with endogeneous fertility. However, we make some modification on the model particularly in the setting of government taxes and in addition; we incorporate intrinsic motivation in human capital formation. Basically, there are two types of taxes introduced in Luciano and Luca (2011), i.e. wage income tax and special tax to finance the child cash allowance. Meanwhile, in the present context, we introduce lump sum wage income tax and the child cash allowances will be financed from part of wage income tax. Moreover, we use the similar logarithmic utility function with the exception that we ignore the probability of surviving at the end of the working period as we viewed it as unnecessary for this context. The details of the results are presented in the next section.

3. The Basic Model

Now consider an overlapping generation model with endogenous fertility. At each time *t*, the new generation will be populated by a number N_t of identical individuals. The number of population of generation $t+1$ is therefore equal to

$$N_{t+1} = n_t N_t \tag{1}$$

3.1. Firm

In this paper we consider a small open economy with perfect capital mobility. Therefore the rate of return r is given exogenously by the rest of the world. In this small open economy the firms produce goods and services according to a standard neoclassical constant-return-to-scale technology. Since capital is perfectly mobile, both the capital-labor ratio and the wage per unit of human capital w are fixed and constant.

3.2. Government

At time t , the government raises a constant wage income tax at rate $0 < z < 1$ from the young workers and runs two distinct balanced budget policies: (1) a free child care and childhood educational plan to support the expenditure of child care and education for every child in the economy. The expenditure is entirely financed by a portion of the income tax, let say b . We represent the expenditure as

$$k_t = bzwh_t \tag{2}$$

where the left hand side represents the public education expenditure for a child, and the right hand side shows the portion of the income tax used to finance the free child care and childhood education per child, and w is the working income of the young adult and h_t represents the endowment of human capital level of each young adult.

(2) A child allowance policy in order to encourage the young worker to bear a number of children. This allowance also entirely financed by $1-b$ of the income tax by giving cash to each young worker depending on the number of children they have. We write the child allowance as follows:

$$\phi n_t = (1-b)zwh_t \tag{3}$$

where $\phi > 0$ is the benefit per child, n_t is the number of children at time t . The left-hand side shows the child allowance for each worker, and the right-hand side represents the per worker tax receipts.

3.3. Individuals

Individuals are assumed to have identical preferences and their life can be divided into three parts: childhood, adulthood, and old age. The children do not make any economic decisions, and once they enter the adulthood period, each individual starts working and supplying inelastically one unit of labor to the labor market and will be paid based on their human capital level. The existences of the capital market enable us to assume that the agent saves some of the income for future consumption in later life after retirement.

The representative individual entering the working period at t and faces the following lifetime logarithmic utility function preference:[1]

$$U_t = \ln c_{1,t} + \frac{1}{1+\rho}\ln c_{2,t+1} + \theta_1 \ln n_t \tag{4}$$

and subject to the following budget constraint

$$c_{1,t} + s_t + (p-\phi)n_t = (1-z)wh_t \tag{5}$$

$$c_{2,t+1} = (1+r)s_t \tag{6}$$

where $p > 0$ is the cost of child rearing, ρ is the discount factor, $\theta_1 > 0$ measure the degree of preference of having children.

We use the Lagrangian method to solve this optimization problem as follows:

$$L = \ln c_{1,t} + \frac{1}{1+\rho}\ln c_{2,t+1} + \theta_1 \ln n_t + \lambda\left[(1-z)wh_t - c_{1,t} - \frac{c_{2,t+1}}{1+r} - (p-\phi)n_t\right] \tag{7}$$

[1] Luciano and Luca(2011) incorporate the probability of surviving at the end of the working period in his utility function. Since it is irrelevant in our context, we ignore it.

and the first order conditions for an interior solution are as follows:

$$\frac{c_{2,t+1}}{c_{1,t}} = \frac{1+r}{1+\rho} \tag{8}$$

$$\frac{\theta_1 c_{1,t}}{n_t} = p - \phi \ . \tag{9}$$

Equation (8) is an arbitrage condition for shifting consumption from one generation to the next. This equation expresses the familiar result that the utility rate of substitution between consumption in period t and $t+1$ depends on the discount factor and rate of return. Decreasing in discount rate, and increasing in rate of return increase $c_{2,t+1}$ relative to $c_{1,t}$.

Equation (9) says that, if the degree of preference of having children less than one, then the current consumption is relatively higher compare to the expenditure on child-rearing. The equation (9) also implies that $\phi < p$ must hold to ensure the number of children is positive. By combining equations (2), (4), (5), (7), and (8), we obtain the demand for children as follows:

$$n_t = \frac{(1-b)wh_t}{(1-b)(p-\phi)q + \phi} \tag{10}$$

$$\text{where } q = \frac{1}{\theta_1} + \frac{1}{\theta_1}\frac{1}{1+\rho} + 1.$$

This equation also could be expressed in the following manner:

$$n_t = \frac{(1-b)wh_t}{[1-(1-b)q]\phi + (1-b)qp} \tag{11}$$

Equation (11) shows that the optimal number of children is positively

3.4. Human Capital with Intrinsic Motivation

In this paper, similar to Luciano and Luca(2011), we assume that human capital evolves according to Cobb-Douglas learning technology as follows:

$$H_{t+1} = DH_t^{\mu} G_t^{1-\mu} \tag{12}$$

where H_t represents the aggregate level of human capital of the parent and G_t represents the aggregate expenditure of child care and childhood education at time *t*.

However, in contrast to Luciano and Luca (2011), in this human capital formation, we incorporate the concept of intrinsic motivation of the children as a motivation that driven the children to achieve high human capital level. In general, self-motivation can be divided into two types based on Deci and Ryan (2000): (1) extrinsic motivation, and (2) intrinsic motivation. Extrinsic motivation is defined as doing some task because of the extrinsic incentives and not because of enjoyment of doing that task. In contrast, intrinsic motivation is defined as doing some task because of the enjoyment of doing that task and the incentives coming from within the individual. By incorporating intrinsic motivation in the human capital formation, one would able to explain why in some country with multiracial population will behave differently towards some matters. For example, in Singapore, among Chinese, Malay, and Indian, the Malay women have the tendency to bear more children. Yap (2003) argues that in the eyes of Malays, children are the gifts from God and not a burden as viewed by the Singaporean Chinese. Nevertheless, the intrinsic motivation incorporated in our human capital formation does not reflect only religion and believes, but it reflects the universal definition of intrinsic motivation. In order to incorporate intrinsic motivation, we set up the Total Intrinsic Motivation as a function $D = xy^T = \sum_{i,j=1}^{n} x_i y_j$, where $x = (x_1, x_2, x_3, \cdots, x_n)$ is a possible set of partial intrinsic motivation within the individual towards the features of the task and the value is either 0 or 1. On the other hand, we define $y = (y_1, y_2, \cdots, y_n)$ be the possible weightage of the enjoyment of the task. The value of intrinsic motivation are then set to be $0 \le D \le M$. The value M is the maximum value of the intrinsic motivation. The value will always keep moving between this two extreme.

For example, if the individual do not have any intrinsic motivation towards a task, say, drawing a picture, then the value of $x=(0,0,0)$. Now assume that for any weightage of the enjoyment of the task of drawing a picture, say, $y=(5,2,7)$ where the enjoyment of playing with color 5 points, the enjoyment of touching the paper is 2 points, and the enjoyment of drawing the figure itself is 7 points. Thus, the Total Intrinsic Motivation towards drawing a picture is equal to zero, that is $D=0$. However, if the corresponding partial intrinsic motivation is $x=(1,1,1)$, then the Total Intrinsic Motivation is equal to $D=14$ which is the highest. In the case of 3 types of enjoyment, there eight possible choices one can behave intrinsically towards drawing a picture with $y=(5,2,7)$ level of enjoyments: (0,0,1), (0,0,0), (0,1,0), (0,1,1), (1,0,0), (1,0,1), (1,1,0), (1,1,1). In general there are 2^n choices of partial intrinsic motivation for a corresponding weightage of enjoyment of a task. Thus, one has many choices to choose.

In addition, the value of μ is set to be $0<\mu<1$. This restriction on μ guarantees that the children human capital level increases, but at diminishing rate, with the level of parental human capital and government free child care and childhood education spending.

By using the equation (1) and (11), the evolution of human capital per capita can be described as follows:

$$h_{t+1}=\frac{Dh_t^{\mu}k_t^{1-\mu}}{n_t} \tag{13}$$

3.5. Dynamics of the model

In order to work out the full equilibrium, we analyze equation (11) and equation (13). By doing some manipulation on both equations, we obtain the following discrete non-linear dynamical system with two variables:

$$n_{t+1}=\frac{Dw(1-b)(bzw)^{1-\mu}}{[1-(1-b)q]\phi+(1-b)qp}\frac{h_t}{n_t} \tag{14}$$

$$h_{t+1}=\frac{D(bzw)^{1-\mu}h_t}{n_t} \tag{15}$$

For the sake of simplicity, let $E=D(bzw)^{1-\mu}$ and $A=\dfrac{w(1-b)}{[1-(1-b)q]\phi+(1-b)qp}$. Therefore, the equation (12), and (13) can be rewritten into the following simple non-linear dynamical system:

$$n_{t+1}=EA\frac{h_t}{n_t} \tag{16}$$

$$h_{t+1}=E\frac{h_t}{n_t} \tag{17}$$

Proposition 4.1: *The fixed point of the system is* $n=E$, $h=E/A$, *and the system is locally stable at the fixed point and it is a sink.*

Proof: The equation (16) and (17) describe the dynamical evolution of $\{n_t,h_t\}$, and the fixed point of this system at the steady state can be obtained easily by setting $n_{t+1}=n_t=n$, and $h_{t+1}=h_t=h$. Thus it yields that $n=E$ and $h=\dfrac{E}{A}$ be the fixed point. By plugging the value of *A* and *E* into the fixed point, one obtains

$$\{n^*,h^*\}=\left\{D(bzw)^{1-\mu},\frac{D(bz)^{1-\mu}\{[1-(1-b)q]\phi+(1-b)qp\}}{w^{\mu}(1-b)}\right\} \tag{18}$$

Now we proceed to linearize equation (16) and (17) at the neighborhood of fixed point given by equation (18) and to analyze local dynamics. This analysis will allow us to understand the behavior of the local dynamics near to this point and will enable us to specify either the steady state is a sink, a source, or a saddle. Let *J* be the Jacobian matrix of partial derivatives for this system:

$$J = \begin{bmatrix} \frac{\partial n_{t+1}}{\partial n_t} & \frac{\partial n_{t+1}}{\partial h_t} \\ \frac{\partial h_{t+1}}{\partial n_t} & \frac{\partial h_{t+1}}{\partial h_t} \end{bmatrix} \quad (19)$$

It is straightforward to verify that, evaluated at any steady state, the Jacobian matrix thus yields:

$$J = \begin{bmatrix} \frac{-EAh_t}{n_t^2} & \frac{EA}{n_t} \\ \frac{-Eh_t}{n^2{}_t} & \frac{E}{n_t} \end{bmatrix} \quad (20)$$

and particularly at fixed point given by equation (18) the Jacobian matrix will be as follows:

$$J = \begin{bmatrix} -1 & A \\ -1/A & 1 \end{bmatrix} \quad (21)$$

Furthermore, using equation (21), one calculates the eigenvalue of this matrix and easily could be obtained that the eigenvalues are repeated zero and thus it implies that the system is locally stable at the steady state and is a sink. Q.E.D

Proposition 4.1 implies that any changes in parameters do not change the behavior of the steady state. The changes in parameter only change the level of the steady state.

Proposition 4.2: *Any increase in expenditure in child care and early education will definitely increase the fertility, and any decrease in lump sum income tax will decrease the fertility.*

Proof: The proof is direct from equation (18). $\frac{dn}{dz} = \frac{(1-\mu)Dbw}{(bzw)^{\mu}} > 0$,and $\frac{d^2n}{dz^2} = \frac{-\mu(1-\mu)b^2w^2}{(bzw)^{1-\mu}} < 0$ .Similarly, $\frac{dn}{db} = \frac{(1-\mu)Dzw}{(bzw)^{\mu}} > 0$ and $\frac{d^2n}{db^2} = \frac{-\mu(1-\mu)z^2w^2}{(bzw)^{1-\mu}} < 0$. Thus the function is increasing and concave down.

This proposition implies that, any increase in spending on child care and early education will increase the fertility, and any increase in income tax also will increase the fertility rate. In reality, it is possible to increase the spending on child care and early education, but to increase income tax would be politically difficult and it makes no sense because it will put a heavy burden on the shoulder of the agents. Therefore, using income tax as an instrument to boost fertility would be absurd.

From equation (18) in the proof of the proposition 4.1, we can deduce our important lemma as follows:

Lemma 4.1: *At the steady state, for any value of parameters, the system is locally stable, and the level of human capital and fertility rate at steady state are depend on the Total Intrinsic Motivation. Moreover, fertility rate depend on value of* b *and* z *but does not depend on the value of* ϕ .

Proof: The stability of the system is already proven by the proposition 4.1, and the rest is obvious from equation (18).

Lemma 4.1 implies that at the steady state, the cash benefit is not effective in encouraging the fertility to increase. Moreover, expansion in financing the non-cash benefit such as free good nursery would help the parent to increase the number of children. However, since the government also has the budget constraint, there is a financial limit on increasing the budget on provision totally free nursery and totally free early education. Therefore, here, the intrinsic motivation of the parents will play the role.

4. Parameterization and Data Analysis

In the previous section, as a main objective of this paper, we studied the dynamic of the model and analyze the behavior of the steady state at the fixed point and it yields some results summarized by the Proposition 4.1. Subsequently, in Lemma 4.1 we arrive to the conclusions that the government intervention by giving generous child cash allowances is not an effective way to increase fertility in

the long run. This generous program however will probably increase the fertility in the short run, but the magnitude of the increment is difficult to measure. In contrast, child allowances are likely to promote the increment in human capital level. It seems that expanding the expenditure on free child care and childhood education would probably increase both fertility and human capital level. Moreover, the results also show that the intrinsic motivation not only affects the human capital evolution, but it also gives impact on choice of fertility. Since intrinsic motivation also plays a big role in fertility decision, it seems interesting to do some analyses on how does intrinsic motivation affect the fertility decision using real data.

Therefore, in this section, using real data from several developed countries, we conduct a few analyses on how intrinsic motivation affects the fertility decision along with other parameters such as government spending, and income tax rate. The Table 4.1 presents the result of the analysis.

From Table 4.1, the range of Total Intrinsic Motivation in France, Norway, United States and United Kingdom are almost similar, with United States having the highest Total Intrinsic Motivation amongst the four. The Total Intrinsic Motivation of Australia and Israel, is 41.64 units, and 46.75 units respectively. On the other hand, Japan and South Korea have by far the lowest Total Intrinsic Motivation with South Korea is the lowest amongst two. The Total Intrinsic Motivation towards having children in Singapore is extremely high and abnormal compared to other developed countries.

Singapore exhibits special attention with regards to Total Intrinsic Motivation towards having children despite of having low fertility rate. If we review the expenditure on child care and early education services, Singapore only spends 0.01 per cent of her GDP, but the Total Intrinsic Motivation of hers citizens is extremely high. Therefore, under the same Total Intrinsic Motivation of Singaporean, we conduct a simulation in order to see the effect of Singapore government spending on child care and early education on fertility decision. In this simulation, we use the following constellation of parameters: GDP, and tax revenue per cent of GDP are USD 1.85 billion, 13.3% respectively based on fiscal year 2009; $\mu = 0.3$; $z = 0.2$; $D = 570.06$;,and $w = 1$.

Table 4.2 shows that when we increase the spending on child care and early education per cent of GDP, then it significantly increases the fertility rate. If Singapore increases up to 0.03 per cent of GDP on child care and early education expenditure, Singapore will witness that the fertility rate will cross the replacement rate from 1.2 to 2.63. However, if Singapore highly increases the expenditure on this purpose, then it is feared that the population will increase dramatically and it could harm the economic growth of that island-state in the future, and hence creates another new problem.

Now, let move to Japan and Korea. These two east countries have the lowest Total Intrinsic Motivation based on Table 4.1. We conduct the same analysis on Japan and Korea and the results are displayed in Table 4.3 and Table 4.4. In contrast to Korea, Japan only spends 0.4 per cent of her GDP on child care and early education, where Korea spends about 0.8 per cent of her GDP. In the case of Japan, even though the Total Intrinsic Motivation for having children is low, Japan is able to achieve the replacement rate by increasing the expenditure on child care and early education. Thus, Japan may use this method as an instrument to encourage young generation to produce more children and sustain her normal population pyramid.

In contrast to Japan, in the case of Korea, there is no hope in increasing the child care and early education expenditure to achieve the replacement rate. The only hope for Korea is to encourage her people to increase the Total Intrinsic Motivation to a higher level at least to 35 units. However, to increase the Total Intrinsic Motivation is not an easy task, and perhaps this not the job of economist.

5. Summary and Conclusions

The main contribution of this paper is the development of theoretical framework that relates how government spending on child care and early education gives impact on fertility decision. The model was originated from the works of Luciano and Luca (2011), and his work was focusing mainly on the effectiveness of child cash allowances on fertility and the importance of public education. The present model however introduces a new concept that is Total Intrinsic Motivation into human capital formation and instead of general public education, the present model focus only on child care and early education spending.

Consistent with the finding in Luciano and Luca (2011), analysis on our model also agree that child cash allowances are not effective in the long run. From the analysis of the present model, there are three possible ways to increase fertility rate: (1) increase income tax rate; (2) increase spending on child care and early education; (3) increase the Total Intrinsic Motivation. Amongst these three ways, it is not advisable to increase the income tax rate. Therefore, the most reasonable recommendation is to choose the second or/and the third method as an instrument to encourage fertility.

As an illustration to understand this model and its implications on the fertility decision, several developed countries were chosen and we conducted several analyses based on the real data. Singapore exhibits a special existence because the Total Intrinsic Motivation of the Singaporean is extremely high compared to the others developed countries. Meanwhile, Japan and Korea show the lowest country regarding the Total Intrinsic Motivation level. In the case of Singapore, since the Total Intrinsic Motivation is already high, then it is advisable to increase the volume of spending on child care and early education in order to promote fertility to increase. In the case of Japan, even though the Total Intrinsic Motivation of having children is relatively low, an increase in percentage of spending on child care and early education would help her to encourage the young couple to increase the number of children.

However, in the case of Korea, increasing the spending on child care and early education will not give much hope. The only way to do is encourage her people to increase the level of Total Intrinsic Motivation a bit higher. However, increasing the level of Total Intrinsic Motivation is not an easy task.

In a nutshell, in promoting fertility to increase, government may opt to choose amongst three ways as we discussed above. However, amongst three ways, only two are advisable, that is to increase spending on child care and early education or/and to increase the level of Total Intrinsic Motivation. But, in some cases, only by increasing the level of Total Intrinsic Motivation then the fertility rate will increase significantly.

Table-4.1. Total Intrinsic Motivation of Several Developed Countries

Country	GDP (2009) In Billion	Tax Revenue 2009 (%of GDP)	Child care and early education spending 2009 (%of GDP)	Child care and early education spending rate of 2009 tax revenue	Tax rate (2009)	Total fertility rate	Total intrinsic motivation
Australia	992,244	22.2	0.6	0.027	0.45	1.9	41.64
France	2,626,537	19.8	1.0	0.050	0.40	2.0	30.92
Israel	194,865	23.3	1.0	0.043	0.46	3.0	46.75
Japan	5,035,141	8.7	0.4	0.046	0.50	1.4	19.63
Korea	834,060	15.4	0.8	0.052	0.35	1.1	18.17
Norway	374,757	26.3	1.2	0.046	0.40	2.0	32.78
Singapore	185,638	13.3	0.01	0.00075	0.20	1.2	**570.06**
United Kingdom	2,193,184	25.8	1.2	0.047	0.40	1.9	30.68
United States	13,973,650	8.5	0.4	0.047	0.35	2.0	35.46

Source of data:

1. Data on public expenditure on child care and early education services, per cent of GDP 2009 are taken from OECD Family database.
2. Data of GDP 2009 are taken from International Monetary Fund's World Economic Outlook (WEO) Database, April 2013 edition.
3. Data of Tax Revenue, per cent of GDP 2009, total fertility rate 2009 are taken from World Bank Database.
4. Data of income tax rate was taken from KPMG's Individual Income Tax and Social Security Rate Survey 2011.
5. Data on public expenditure on child care and early education services, per cent of GDP 2009 for Singapore was taken from the Southeast Asian Economic Outlook 2011/2012.

Table-4.2. Simulation of the Effect of Singapore Child Care and Early Education Spending on Total Fertility Rate with High Total Intrinsic Motivation.

Child care and early education spending (%of GDP)	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1
Child care and early education spending rate of tax revenue	0.00075	0.0015	0.0023	0.003	0.004	0.005	0.005	0.006	0.007	0.008
Total fertility rate	1.2	1.95	2.63	3.17	3.87	4.53	4.53	5.14	5.73	6.29

Table-4.3. Simulation of the Effect of Japanese Child Care and Early Education Spending on Total Fertility Rate with Low Total Intrinsic Motivation based on 2009 Fiscal Year Data

Child care and early education spending (%of GDP)	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	1.00
Child care and early education spending rate of tax revenue	0.046	0.052	0.057	0.063	0.069	0.075	0.080	0.086	0.092	0.115
Total fertility rate	1.40	1.53	1.63	1.74	1.86	1.97	2.06	2.17	2.27	2.65

Table-4.4. Simulation of the Effect of Korean Child Care and Early Education Spending on Total Fertility Rate with Low Total Intrinsic Motivation based on 2009 Fiscal Year Data

Child care and early education spending (%of GDP)	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25
Child care and early education spending rate of tax revenue	0.052	0.055	0.058	0.062	0.065	0.068	0.071	0.075	0.078	0.081
Total fertility rate	1.10	1.14	1.19	1.24	1.28	1.33	1.37	1.42	1.46	1.50

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