รายงานวิจัยฉบับสมบูรณ์

โครงการ กับดักความยากจน: กรณีศึกษาเกษตรกรไทย
(Poverty Trap: A Case Study of Thai Farmers)

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คณะบริหารธุรกิจ สถาบันบัณฑิตพัฒนบริหารศาสตร์

(ความเห็นในรายงานนี้เป็นของผู้วิจัย สกอ และ สกว ไม่จำเป็นต้องเห็นด้วย
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Acknowledgements

Abstract

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This article theoretically proves poverty trap problem as a result of endogenous fertility behaviors. The theoretical results were supported by empirical evidence from the Thai farmer census data and the socio-economic survey. Thai farmers tend to have larger family size because they are not covered under the social security program; and thus, have to rely more on inter-generational transfer from their children during their retirement years. They are thus fall under the poverty trap because the consumption level of household increases as the number of children increase. Current government policies for Thai farmer assistance only focus on providing more easy access to capital for farmers without a saving incentive for farmers. As a result, the farmers' debt levels have become worsen and they have to rely more on the government budget to other ad hoc assistance program like farmers' debt suspension program, which can have a long term distortion effect on prudent agricultural lending activities. The poverty trap problem and distortion effect on lending activities can be alleviated though a policy revision to bridge the gap of current farmer assistance program with saving incentive and risk management scheme with the objective of providing not only an income stabilization solution but also encourage farmers to create their own safety net. In the long run, the farmers should be able to rely more on their own built safety net than on the government supports.

Keyword: poverty, fertility, social security

บทคัดย่อ

งานวิจัยนี้พิสูจน์ทางทฤษฎีว่าปัญหากับดักความยากจนเป็นผลมาจากพฤติ
กรรมการมีบุตรที่ได้รับผลกระทบจากปัจจัยภายใน ผลทางทฤษฎีได้รับการสนับสนุน
ด้วยผลทดสอบด้วยข้อมูลสำมะโนเกษตรกรและข้อมูลการสำรวจทางเศรษฐศาสตร์และ
สังคม เกษตรกรไทยมีแนวโน้มที่จะมีครอบครัวขนาดใหญ่กว่าครอบครัวอาชีพอื่นส่วน
หนึ่งเป็นเพราะเกษตรกรไทยไม่ได้รับความคุ้มครองภายใต้โครงการประกันสังคม เป็น
ผลให้เกษตรกรไทยต้องพึ่งพิงรายได้การเลี้ยงดูที่รับจากบุตรในยามเกษียณอายุ ด้วย
เหตุนี้เกษตรกรไทยจึงมักมีบุตรมากเป็นเครื่องประกันรายได้ยามเกษียณอายุ ฉะนั้น
เกษตรกรไทยจึงตกอยู่ภายใต้กับดับความยากจนเพราะการมีบุตรจำนวนมากนำมาซึ่ง
ค่าใช้จ่ายที่มากขึ้นในช่วงวัยทำงาน นโยบายรัฐบาลสำหรับช่วยเหลือเกษตรกรใน
ปัจจุบันมุ่งเน้นไปที่การเพิ่มช่องทางการกู้ยืมให้กับเกษตรกรโดยไม่มีส่วนของการสร้าง
แรงจูงใจด้านการออม ซึ่งเป็นผลให้ภาะหนี้สินของเกษตรกรเพิ่มสูงขึ้นและการพึ่งพิงเงิน
ช่วยเหลือจากรัฐบาลยิ่งเพิ่มมากขึ้น อย่างเช่นเงินช่วยเหลือจาหรัฐบาลภายใต้โครงการ
พักชำระหนี้เกษตรกร ซึ่งโครงการเช่นนี้อาจส่งผลในทางลบระยะยาวในการบิดเบือน
พฤติกรรมการกู้ยืมเงินและการชำระหนี้ของเกษตรกร ปัญหากับดักความยากจนและ
พฤติกรรมการชำระหนี้ที่บิดเบือนข้างต้นสามารถบรรเทาเบาบางลงได้ด้วยการปรับแก้
นโยบายรัฐบาลสำหรับเกษตรกรให้มีส่วนของการสร้างแรงจูงใจสำหรับการออมและเพิ่ม
ทางเลือกในการบริหารความเสี่ยงให้กับเกษตรกร ด้วยวัตถุประสงค์หลักที่ไม่เพียงแค่
สร้างโครงการที่ช่วยเพิ่มความคงที่ของรายได้ให้กับเกษตรกรและส่งเสริมให้เกษตรกร
สร้างเครื่องป้องกันความเสี่ยงผ่านการพึ่งพาตนเอง ในระยะยาว เกษตรกรไทยควรจะ
สามารถพึ่งพิงตนเองได้มากขึ้นและลดปริมาณการพึ่งพิงเงินช่วยเหลือจากรัฐบาลลง
คำหลัก: กับดักความยากจน, การมีบุตร, การประกันสังคม

1. Introduction

The cause of poverty is believed to be high fertility level due to a negative relationship between income and fertility (Becker (1960) and Hemmi (2003).) That is, having more children makes people poorer. People in poorer areas have been observed to have higher fertility level. Economically, having more children certainly increases consumption in terms of child care and educational costs, resulting in a lower level of wealth in a consumption path. Many have suggested that contraception is therefore a key to get people out of poverty.   However, the effort to lower fertility rate could get more complicated if children are the only effective source of retirement income. Specifically, if people can make their choices among other saving or investment alternatives; capital markets and social security, they may find children less attractive. Indeed, a parents' decision on quantity and quality of children could come a mixture of psychological and economic reasons. The magnitude of such psychological reason is not tangible and changes very slowly over time. As the country or an economy becomes more industrialized, an economic reason should move much faster than a psychological reason. In a pure economic sense, lack of access to capital market and social security benefits may induce people to have more children. In other words, people may have more children to substitute for other saving and investment options which are not available to them. As a result, it is not only high fertility level that traps people in poverty, but the lack of access to other saving and investment options also distorts fertility behaviors and leads people into poverty trap. This is not to say that contraception would not solve a problem of poverty. Instead, the efficacy of a plan to lower fertility by using contraceptive program to help people reach out of the poverty may be hindered by the distortion effect on fertility behaviors as long as "children" are in part treated as economic

saving or investment substitutes. In conclusion, if the distortion effect on fertility behaviors exists, contraception alone could not totally solve a poverty trap problem. Therefore, this research will analyzes theoretically and empirically what other features are needed, besides contraception, to construct a plan to help the poor reach out of poverty

Ideally, lower fertility and making all saving and investment options available to the poor is the first best solution to poverty trap. However, such first best solution may not be achieved in practice because making complicated investment options available may not practically work for the poor since poor people tend to have lower level of education. An alternative is to achieve the second best solution by lowering fertility level as well as making social security program available to the poor in hoping that children will become less attractive; thereby reducing the distortion effect on fertility behavior.

2. Literature Review

The existing literature on fertility behaviors have very little to say about the distortion effect from economic constraint on investment and saving options.   In contrast to our research, most articles attempt to explain fertility behavior by treating it as an exogenous variable.

Becker (1960) assumes that the representative household behaves rationally on the basis of unchanging tastes, and that the prices of commodities desired by the representative household are unaffected by that household's consumption decisions. He finds that fertility is positively related with income. Easterlin (1966) rejects the notion that tastes should always be treated as immutable and replaces it with a mechanism through which tastes change systematically according to one's

upbringing. He introduces the Relative Income Theory, where relative income is the ratio of recent income of the male to the past income of the male's parents. Females are assumed to play a passive role in his model. As the relative income increases, there is less economic pressure on the couple and hence they are freer to marry and have children.

Macunovich (1998) finds the support for the relative income theory. She asserts that the primary effect of cohort size is in the relative earnings of younger men to older men in the labor force. She also adds two additional factors influencing male wages in the post-war period: the size of the military (removing males from the labor force), and the size of the United States Trade Deficit (showing that imports replace the skills of less experienced younger workers). She recognizes the active role of young women by including female college entrants and increased participation in the labor force. She concludes that while an increase in the male's relative income will cause a rise in fertility, an increase in female wages will produce downward pressure on fertility. Butz and Ward (1979) disagree with Easterlin's theory and claim that fertility actually moves in counter cyclical patterns relative to economic growth. Their main argument is that enhanced economy brings high income to people and results in a high cost in terms of the female's time away from work. Their model takes into account two additional variables: family income and the opportunity cost of women's time. This is opposed to Easterlin's theory that ignores the importance of female roles. Similar to this idea, Ermisch (1983) finds that the major influence on a couple's family size is whether one or both partners work, not movements in relative income as suggested by Easterlin. For two earner families, both spouses have to contribute to the childrearing. Thus, an increase in their expected earnings will raise the value of leisure and work time and increase the opportunity cost of children,

reducing the couple's desired family size. In families where the husband is the only earner, most child-care will be the responsibility of the wife. An increase in the husband's salary will increase the family income, resulting in an increase in the demand for children. Therefore, Ermisch concludes that economic growth has the effect of increasing the desired family size of single earner families, while it will continue to exert a depressing effect on fertility of two-earner couples, as proposed by the Butz and Ward model.

Easterlin (1975) proposes that fertility patterns follow forty-year cycles: changes in the number of births between generations will correspond to changes seen twenty years later in the number of labor force entrants. In other words, he believes that large birth cohorts produce small cohorts and vice versa in a complete cycle of forty years. However, comparison with the actual Total Fertility Rate values experienced from the late 1980s until now shows Easterlin to be incorrect in his predictions thus far.

Sanderson (1976) discusses the distinction between the Easterlin and Becker models of fertility. Becker's model focuses on the effect of differences in the cost of children on cross-sectional fertility differentials, whereas Easterlin's model focuses on taste formation influence on secular fertility. In other words, while Becker analyses fertility behaviors based on pure economic theory, Easterlin applies the socialization concept into economic model building by acknowledging a positive covariance between fertility rates and intergenerational relative income. In the early 1970s, the gap between these two theories narrowed. Both models assume that, keeping enough things constant, the underlying relation between fertility and income is positive. However, the Easterlin group held that the force, which offsets the underlying positive income effect, is related to parents' aspirations for their own material standard of

living whereas the Becker group held that it is related to parents' aspiration for their children's material standard of living. By 1976, the two groups had demonstrated clearly the emerging consensus. Indeed, the basic ideas of the Easterlin group and the Becker group are similar and complementary. However, the argument that the observed relation between income and fertility ought to be positive is now no longer maintained by either group.

Cochrane (1975) reviews four microeconomic models of fertility. In the first model, children themselves are not desired but are seen purely as a zero-utility by-product of sexual activity. Therefore, the cost of enjoying sexual activity is the reduction in the standard of living caused by the support of the resulting children. However, this model is unrealistic in that children are not simply by-products of sexual activity, even where no contraception exists. The second model considers children as investment goods. Parents determine family size so as to have an optimum combination of current and future consumption. Cochrane shows that families who have sons first will be more likely to have smaller completed family size than those who have daughters. His first two models based on the assumption that children are not objects of utility in themselves, which is arguable given the existence of contraception. This leads to the third model, in which children yield satisfaction directly by being viewed as consumer goods. The fertility behavior is affected by choices between the number of children and other consumption goods. In this model, children yield no utility until the minimum living standard is obtained. Mortality is introduced in the model in that it can affect the price of children. On the one hand, a decline in mortality rate of children will lower the cost of children and lead to larger expected family size if children are not inferior goods. On the other hand, as child mortality declines, parents contribute more energy to each child and thus can only

afford a small number of children. In fact, parents do not face fixed prices of children, but they do adjust their money or emotional energy devoted to the child as the child survival rate changes. In the final model, parents face the choice between child quantity and quality as consumer goods. The number of children a couple will have depends on the quality of children they choose to have, which in turn determines the expenditure per child. Only if the price of a given quality of child increased could one explain fertility declines in terms of price changes. Otherwise, changes in the desired number of children accompanied by increased expenditures on children must be explained by changes in preference or income elasticities of child quality relative to child quantity. Since the quantity elasticity is usually smaller than the quality elasticity, most of the increased expenditure on children would consist of an increase in the quality of children. Therefore, the higher expenditures on children may not necessarily lead to a lower family size.

Romaniuc (1984) develops a fertility model to include several possible factors explaining the decline in fertility. Those are changes in women's role; changes in the status of children; increased number of young couples intentionally choosing childlessness; decreased number of marriages; and increased divorce rates. The results show that the effects of the last two reasons outweigh those of increased out-of-wedlock births. In addition, Tsui, Bogue, and Hogan (1978) believe that the decrease in fertility rates on the 1970s is due to changes in fertility within marriages, changes in extramarital fertility, and changes in the number of marriages. They conclude that couples' demographic variables should be included and controlled in any fertility analysis. Moreover, Keyfitz (1971) proposes that abortion does not prevent a birth in the population. Instead, it could actually have the effect of reducing the time until the female's next pregnancy.

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Fertility behaviors also have been studied to explain the motives for intergenerational wealth transfer. Barro (1974) proves that if the intergenerational transfer is mostly due to altruistic reasons, government deficits and related fiscal policies may have no real effects on the economy. Exogenous redistributions of resources from an altruist to her beneficiaries (or vice versa) may not affect the welfare of anyone because the altruist would try to reduce her gifts by the amounts redistributed. Similar to Barro's (1974) argument, Becker (1993) claims that under certain conditions, budget deficits and social security payments to the elderly have no real effects because parents simply offset the bigger taxes in the future on their children through larger bequests. He argues that altruistic parents can indirectly save for old age by investing in children, and then adjusting bequests to the efficient level of investment. On the other hand, non-altruistic parents would underinvest in their children's education and other care because they cannot compensate themselves for greater spending by reducing bequests since they do not plan on leaving any. Becker points out that the most effective way to obtain from children a commitment returning wealth is for the parents to anticipate the effect of what happens to children on their attitudes and behaviors when adults and manipulate the experiences of their children through the kind of care they provide to influence their later preferences. He concludes that social security programs that significantly help the elderly would encourage family members to drift apart emotionally, not by accident but as maximizing responses to those policies. Other changes through the process of economic modernization also weaken the personal relations within families, partly by reducing the incentives to invest in creating closer relations.

Hohm (1975) performs a cross-country analysis to study the association between the emergence of social security programs and levels of fertility, controlling

for an additional indirect effect of economic development. He analyzes the data of 67 countries and finds that social security programs appear to have a measurable negative effect on subsequent levels of fertility.

Becker and Barro (1986) construct a dynamic analysis of fertility behaviors under the assumption that parents are altruistic toward children in the sense that the utility of parents depends positively on the utility of their children. They ignore uncertainty, marriage, the spacing of births, and capital market restraints over life cycles and across generations. They found that fertility in generation j falls with costs of producing children in that generation. The surprising result is that fertility in generation j+1 rises, and by an amount that exactly offsets the fall in generation j. Any change in the net cost of producing descendants in one generation causes enough substitution from the fertility in the succeeding generation to leave unchanged number of descendants in subsequent generations. However, the decline in fertility in one generation alone has lasting effects because the number of descendants in all later generations also decline.

Becker (1988) summarizes the main distinction between Malthusian and neoclassical models. The Malthusian mechanism works through the response of fertility and other components of population growth to changes in economy, while the neoclassicists emphasize endogenous capital accumulation and utility maximization but assume that fertility is fixed. Becker modifies a model that explores the contribution of family economics to macroeconomics by considering the interaction between economic changes and family choices. The most important factor in his model is parental altruism toward children. The cost of rearing children is also important and is positively related to the value of parents' time. Parents maximize their own utility through their own consumption, the number of children, and capital

transferred to each child while taking into account the cost of rearing children and the dependence of their utility on the children's utility. Becker finds that an extended decline in productivity can permanently lower aggregate income because birth rates may fall when productivity, wages, and interest rates fall. He also discusses an implication for public policy in that a Social Security system that replaces a child's support for parents with public support raises the net cost of having children to parents since they are no longer as useful to elderly parents. Therefore, social security benefits are predicted to be negatively related to the demand for children. However, a lower demand for children may raise the investment in each child therefore raise wage rates and the capital-labor ratio in the next generation. As a result, fertility would fall if the positive effect on fertility of an increase in income were weaker than the negative effect due to the rise in costs of having children. The substitution effect often dominates the income effect in rich countries. Family economics is critical to the analysis since choices about number of children and investments in each child's human capital helps determine whether the economy ends up at a "good" equilibrium or at a "bad" equilibrium. Family behavior may play more than a negligible role even in generation ordinary business cycles.

Becker and Barro (1988) develop an economic analysis of the linkages in fertility rates and capital accumulation across generations. Their main assumption is, again, that parents are altruistic toward their children, creating a dynastic utility function that depends on the consumption and number of descendants in all generations. They find that fertility in any generation depends positively on the real interest rate, the degree of altruism, the growth of child mortality and negatively on the rate of growth in per capita consumption from one generation to the next and the growth of social security benefits. If fertility were unchanged, altruistic parents

would raise their bequests sufficiently so that their children could pay these taxes without cutting back on their consumption. This is widely known as "Ricardian Equivalence Theorem." However, a permanent increase in the level of social security benefits raises the cost of children and thus tends to reduce fertility temporarily even when children do not support elderly parents. Finally, Becker and Barro also find that consumption of each descendant depends positively on the net child-rearing cost.

Barro and Becker (1989) work out the dynamics and comparative static of a model that combines a neoclassical production function with fertility choices based on parental altruism. They extend the analysis to a closed economy, where the holding of assets equals the stock of productive capitals in order to allow for optimizing choices of fertility and intergenerational transfers while interest rates and wage rates depend on economy's stock of productive capital. They assume a fixed amount of leisure and that child rearing involves household production that partly entails an input of time and input of goods. When the net cost of creating a descendant increases, it is optimal to endow each person produced with a higher level of consumption. Hence, descendents have the same consumption if they are equally costly to produce. In conclusion, Becker and Barro find that fertility rises with increases in the interest rate or the rate of altruism.

Unlike Malthusian or neoclassical model of economic growth, Becker, Murphy, and Tamura (1990) focus their interest on investments in human capital. Their crucial assumption is that rates of returns on investments in human capital rise as the stock of human capital increases and fertility is endogenous. These lead to multiple steady states: an undeveloped steady state with high fertility and low levels of human capital and a developed steady state with much lower birth rates and large stocks of human and physical capital. Such steady states are reached when the amount

invested in human capital is sufficiently large. On the one hand, higher fertility discourages investments in both human and physical capital. On the other hand, higher stocks of capital reduce the demand for children because they raise the cost of time spent on rearing children.

Felderer (1992) develops a life-cycle model to examine the effects of a compulsory public pension system on birth rates and private savings. His model includes altruism transfer and treats children as both investment and consumption goods. Since children are normal consumption goods, the demand for children will not decline to zero. Felderer shows that the effects of an introduction of a public pension system on fertility depend on institutional conditions. A Pay-As-You-Go pension system does not necessarily reduce the birth rates. It will reduce the fertility rates only in an economy in which there is no capital market and the only way to secure retirement is through intergenerational transfers within the family. This is the case in developing countries in which capital markets do not exist. However, the impact of the Pay-As-You-Go pension system in industrialized countries is not clear. Felderer also holds that the fully funded pension systems have no impact on fertility. Regarding saving rates, he shows that the Pay-As-You-Go pension system does not necessarily reduce the saving rates in a society where both individual savings and intergenerational transfers provide income during retirement. This result depends on the condition that the existence of a capital market is accessible to the large part of the population.

Nishimura and Zhang (1992) generalize the Veall and Verbon models by introducing endogenous fertility and child rearing costs to analyze the relationship between public pensions and fertility rates. They show that an optimal allocation is not necessarily sustainable if fertility is endogenous because each individual will re-

optimize his/her utility, taking social security as a given constraint by changing fertility, savings, or gifts to the retirees or any combination of the three. Thus, the optimal outcome that the government wishes to achieve, as proposed by Veall (1986), will not be realized in practice. Indeed, the introduction of the public pension decreases population growth. As the cost of having children increases, population growth declines with an increase in the gifts to the retired. This result contrasts with Becker's (1973) conclusion that as the number of children decreases (due to an increase in cost of having children); each child obtains a higher quality of life. Moreover, the other result is that gifts to the retired are always positive, supporting a notion of Nash equilibrium even though it is inefficient.

In contrast, Cigno (1993) examines the relationship between capital markets and fertility using a life-cycle model where income is not transferred among generations by altruism. The assumption of no altruism means that income transfer will cease if more profitable alternatives become available. Cigno argues that the enforceability of family rules is possible by giving an incentive to punish anyone who deviates from the rules. The set of family rules is then a Nash equilibrium, which is perfect in the sub-games because it is in a person's interest not to pay back a loan when that can be done without fear of punishment. Cigno considers the capital market rate of return and accessibility as substitute for intra-family transfer. He proves that for the family transfer system to survive; the rate of return from having children must be at least as high as the capital market rate. Otherwise, the middle age at time *t* (generation *t-1*) will lend to the market, default on the loan to their old-aged parents, and have no children; and thus, there will be no generation *t*. Generation *t-2* could foresee this consequence and prevent the outcome by the same strategy; and thus, there will be no generation *t-1*, and so on. Thus, the family system would

become extinct after the first generation. This result conflicts with that concluded from the altruism model of Becker and Barro (1988), where fertility increases monotonically with the market rate of interest. Cigno extends his analysis to consider the relationship between the public pension system and intergenerational transfers. His Pareto-optimal solution is that the government program must prescribe how much the middle-aged have to pay not only to the old, but also to the young to effectively replace the family's allocative roles. Moreover, the public pension entitlement should be set proportional to the number of children raised to avoid the externality that will result in an inefficient life-cycle allocation.

Rosati (1996) develops a non-altruistic model of intergenerational transfer to analyze the effect of social security on fertility and savings by including not only the desire to transfer to old age, but also the existence of uncertainty. He also assumes that adults can buy a risk-free asset from the capital markets that is competing with children as a vehicle for the intertemporal transfer of resources. He considers a three-period overlapping generations model. He assumes that a self-enforcing family constitution is in place and argues that a Nash equilibrium exists such that the best strategy for any person in the second period of life is to comply with the family rules, i.e. repay his debt at the family interest rate when middle aged if, and only if, his parents repaid their own debt. For uncertainty, he treats the risk of default with respect to the probability that a child survives from youth to middle age, but ignores the uncertainty concerns over level of income to be obtained by the future generation. Rosati finds that a reduction in child mortality will have permanent but ambiguous effects on the number of children. This result contrasts with Becker (1991), where a decrease in mortality has only temporary but negative effects on fertility. Considering uncertainty, Rosati also finds that social security reduces fertility rates only if the

degree of risk aversion of the parents is large enough. He further identifies the asymmetric effects of the social security program under an unbalanced budget on fertility and savings. The effects depend on whether the deficit is generated by a tax cut or by a benefit increase. Rosati demonstrates that a tax cut with constant future benefits will result in fertility increases with savings reduction. If the deficit is generated by a benefit rise, however holding current taxes constant, fertility will decline, while the savings will rise.

Cox, Eser, and Jimenez (1998) study two motives for private income transfer, altruism and exchange, within the life-cycle model framework. The understanding of private transfer is important because it can influence the effects of public income transfers on the distribution of income. The altruism model is a strong form of the altruism hypothesis, which contains the crucial assumption that an increase in the recipient's pre-transfer income is always met with a reduction in transfers received. The exchange model is developed under the lending-repayment pattern, in that the parents lend to the child in the first period and the child repays in the second. Such intergenerational lending is determined by the Nash bargaining concept. Unlike the strong form of the altruism model, the exchange model allows a positive relationship between the re-transfer income of recipients and transfer amounts. The authors separate transfer decisions into the decision (Probit model) and the amount (Tobit model). Both the altruism and exchange models predict that increases in the income of potential recipients should reduce the probability of transfer receipt. The altruism model predicts the negative relationship between current pre-private transfer income and transfer amount receipts, while the exchange model predicts that an increase in pre-transfer income can increase transfer amounts. Using the result of the Peruvian Living Standards Survey (PLSS) done between June 1985 and July 1986, they find

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that private transfers respond to capital market imperfections and that the empirical results support the bargaining model and cast doubt on the strong form of the altruism hypothesis.

Most recently, Panopoulou and Tsakloglou (1999) performed a cross-country analysis of the relationship between fertility and a number of socioeconomic factors associated with the process of economic development. They estimated the effects of 9 explanatory variables for the all countries sample, as well as the developing countries sample separately. They find that fertility is negatively related with female education, urbanization, and family planning and positively related with the levels of infant mortality and economic development. They pointed out the important point that the fertility transition occurs when the net flow of wealth changes direction; and thus, the old age security hypothesis follows the same lines as the wealth-flow hypothesis.

In the context of a poverty trap, Banerjee and Newman (1994) argued that the poor are closer to their lower bound of their utility than others in the population and thus, the poor behaves differently because they face limited borrowing and insurance. They showed also that the American poor behave almost similar to the Indian poor even though the American poor are much richer than the Indian poor.

Kremer and Chen (1999) argued that women with higher education face higher opportunity cost of having children and thus fertility rates decline with education. They also showed the evidence of endogenous fertility through labor market by investigating the relationship between income and fertility rates and the likelihood that children of unskilled workers will also be unskilled. In contrast, Hemmi (2003) used overlapping generation model to study endogenous fertility through differential qualities of education across generation. He argued that higher fertility rates cause higher educational costs. Together with low income, higher

educational costs reduce future income children face in the next period. As a result, fertility rates are high due to lower opportunity cost of having children. Hemmi summarized that poverty trap is a result of a negative relationship between fertility and income and the influence of educational costs. Hemmi's overlapping generations model is actually similar to that of Glomm and Ravikumar (1992) in that they both treat human capital investment through formal schooling as the engine of growth However, Glomm and Ravikumar assume an exogenous population size while Hemmi assumes that fertility rate is endogenous.

Kenworthy (1999) analyzes the effect of social-welfare program on poverty using the data of fifteen industrialized countries from 1960 to 1991. She finds a strong support that social welfare program does indeed reduce poverty.

3. Model

We apply life cycle model by assuming that people live for three periods: dependent child (period 1), middle-age adult (period 2), and retired adult (period 3). Each child, borne in period 1, consumes an exogenous amount of x units of non-educational consumption and h units of educational consumptions. Agents become independent economic actors in period 2, making economics choices for periods 2 and 3. A parent, in period 2, make the decision on the number of children, N, to have and, in addition to spending x per child, how much to invest, h, in the human capital of each child. Wage income of agents in period *2*, $w_2 = w_2(h_1)$ is the function of human capital invested in them by their parents in period t, and it is increasing in the level of human capital at a decreasing rate, i.e., $w' > 0$, $w'' < 0$. If the time cost of raising each child is λ, having N children will result in the opportunity cost of λN. Thus, each agent will be able to spend only (1-λN) on working and earn $(1 - \lambda N)w_2$ in period

2. An agent in period may receive from their parents an unintended bequest $b, b \geq 0$. Agents in period 2 also make the decision on the amount of assets, a, to be invested in capital in the second period that pays a net real rate of return, r, in period 3. Each agent face a social security tax rate equal to τ that pays a net internal rate of return equal to g in period 3. In addition, children make intra-familial transfers to their parents equal to $\tilde{\tau}$ fraction of their second-period income. In the period 3, each retired agents receives principal and interest from investing asset a and paying tax τ in period 2. Each retired agent receives also intra-familial transfers from each child equal to $\tilde{\tau}$ fraction of the child's second-period income. The amount of wealth left over in this period is counted as unintended bequest, b, leaving for each child.

Budget constraints in period two and three are as follows:

$$C_2 = \left(1 - \lambda N_2\right) w_2\left(h_1\right) + b - a_2 - \left(\tilde{\tau}_2 + \tau_2\right)\left(1 - \lambda N_2\right) w_2\left(h_1\right) - \left(x + h_2\right) \cdot N_2$$

$$= \left(1 - \lambda N_2\right) w_2\left(h_1\right)\left(1 - \tilde{\tau}_2 - \tau_2\right) + b - a_2 - \left(x + h_2\right) \cdot N_2 \qquad (1)$$

$$C_3 = \tau_2\left(1 - \lambda N_2\right) w_2\left(h_1\right)\left(1 + g\right) + a_2\left(1 + r\right) + \tilde{\tau}_2\left(1 - \lambda N_2^c\right) w_2^c\left(h_2\right) N_2 - b N_2 \qquad (2)$$

An agent in the second period, therefore, chooses a, h, and N as follows:

$$\max_{a_2, N_2, h_2} U = u_2\left(C_2\right) + u_3\left(C_3\right) \qquad (3)$$

First order conditions with respect to a, h, and N are therefore:

$$u_2' = (1 + r) u_3' \qquad (4)$$

$$\left[\lambda w_2\left(h_1\right)\left(1 - \tau_2 - \tilde{\tau}_2\right) + \left(x + h_2\right)\right] u_2'$$

$$= \left[-\lambda \tau_2 w_2\left(h_1\right)\left(1 + g\right) + \tilde{\tau}_2\left(1 - \lambda N_2^c\right) w_2^c\left(h_2\right) - b\right] u_3' \qquad (5)$$

$$u_2' = \left[\tilde{\tau}_2 w_2^c{}'\left(h_2\right)\right] u_{t+2}' \qquad (6)$$

Equation (4) can be rewritten as $\dfrac{u_2'}{u_3} = 1+r$, which can be substituted in (5) to

obtain:

$$\frac{-\lambda \tau_2 w_2\left(h_1\right)\left(1+g\right)+\tilde{\tau}_2\left(1-\lambda N_2^c\right) w_2^c\left(h_2\right)-b}{\lambda w_2\left(h_1\right)\left(1-\tau_2-\tilde{\tau}_2\right)+\left(x+h_2\right)}=1+r$$

and thus,

$$\tilde{\tau}_2 = \frac{\left(\lambda w_2\left(h_1\right)+x+h_2\right)\left(1+r\right)-\lambda \tau_2 w_2\left(h_1\right)\left(r-g\right)+b}{\left(1-\lambda N_2^c\right) w_2^c\left(h_2\right)+\lambda w_2\left(h_1\right)\left(1+r\right)} \qquad (7)$$

If the net real rate of return on a, r, is larger than the internal rate of return

from social security tax, g, then the intra-familial transfer, $\tilde{\tau}_2$, will be smaller than it

would otherwise. That is, if $r > g$, individuals will tend to invest more in capital

market and rely less on intra-familial transfer from their children. In contrast, if $r < g$,

individuals cannot earn higher return from self-investment in the capital market and

will need to rely on positive intra-familial transfer from their children in period 3.

If r = -1, then a = 0 and thus, agents facing r = -1 will have no access to an

investment in capital market. Then, retired adults in period 3 will rely on the positive

intra-familial transfer, $\tilde{\tau}_2$, from their children and social security benefits that pays

net internal rate of return g. If we assume also that agents face zero social security tax

rate, they will have no access to either investment in the capital market or security

benefits. As a result, retired adults will have to rely on positive intra-familial transfer

from their children in period 3. Note that the amount of intra-familial transfer, $\tilde{\tau}_2$,

has a positive relationship with the number of children that their children decides to

have in period 3, N_2^c. That is, those who make a larger intra-familial transfer to their

parents are more likely to have more children, resulting in larger total opportunity cost

of raising children, λN. As a result, agents can spend less time working in the labor

market, 1- *λN*, and receive smaller income, *(1- λN)w(h)*. Then, the total social security tax paid in second period is smaller and lead to smaller amount of social security benefits to be received in the next period. In addition, agents having more children face larger total cost of raising children, *(x+h)N* and thus, they will have smaller wealth left to be invested in the capital market even if they do have an access to such investment. In conclusion, people who have no access to investment in capital market and social security benefits face the poverty trap problem, in which they will have more children and smaller residual wealth. Smaller residual wealth reduces the chance that individuals can access to investment in capital market and in turn, they will tend to have more children.

Moreover, combining equation (4) and (6), we obtain that

$$\frac{u_2^{'}}{u_3^{'}} = \tilde{\tau}_2 w_2^c{}'(h_2) = 1+r$$

$$w_2^c{}'(h_2) = \frac{1+r}{\tilde{\tau}_2} \qquad (8)$$

This implies that if $r = -1$ and $\tilde{\tau}_2 \neq 0$, the optimal investment in children education in the second period is indefinite because $w_2^{'}(\infty) = 0$. That is, if individuals do not have an access to investment in the capital market, the best strategy for them is to invest as much as possible in children human capital. However, due to the budget constraint, the optimal amount of investment in children human capital will have to be balanced against the optimal number of children. Larger number of children would result in a smaller amount of investment in human capital of each child.

4. Data and Summary Statistics

The Thai farmer census data (2003) by National Statistical Office of Thailand is used to demonstrate the demographic and economic characteristics of Thai farmers. The data from 2004 Socio-economic Survey is also drawn for the analysis. Table 1 represents a comparison of family size between farmers and non-farmer household in 76 provinces. Table 2 shows summary statistics of family size for both farmers and non-farmers.

Table 1 Family Size per Household

	Province	Farmers	Non-farmers	Difference
	Central Region	**3.9**	**3.4**	**0.5**
1	Bangkok	4.4	3.3	1.1
2	Samutprakarn	4.2	3.4	0.8
3	Nontaburi	4.7	3.4	1.3
4	Patumthani	3.7	3.3	0.4
5	Ayudhaya	4.1	3.4	0.7
6	Angthong	3.3	3.5	-0.2
7	Lopburi	3.6	3.2	0.4
8	Singburi	3.5	3.5	0.0
9	Chainat	3.5	3.1	0.4
10	Saraburi	3.7	3.3	0.4
11	Chonburi	4.3	3.2	1.1
12	Rayong	3.2	3.3	-0.1
13	Chantaburi	4.0	3.4	0.6
14	Trat	3.4	3.2	0.2
15	Chachuengsao	4.1	3.8	0.3
16	Prajinburi	3.7	3.7	0.0
17	Nakornnayok	3.7	3.7	0.0
18	Sakaew	3.8	3.3	0.5
19	Ratchburi	4.2	3.7	0.5
20	Kanchanaburi	4.0	3.5	0.5
21	Supanburi	4.0	3.1	0.9
22	Nakornpatom	4.1	3.1	1.0
23	Samutsakorn	4.6	3.1	1.5
24	Samutsongkram	3.1	3.5	-0.4
25	Petchburi	4.0	3.4	0.6
26	Prachuabkirikun	3.5	3.3	0.2
	Northern Region	**3.6**	**3.1**	**0.5**
27	Chiangmai	3.4	2.8	0.6
28	Lampoon	3.3	3.1	0.2
29	Lampang	3.4	3.2	0.2
30	Utaradit	3.4	3.0	0.4
31	Prae	2.8	3.2	-0.4
32	Nan	3.9	3.1	0.8

33	Payao	3.5	3.0	0.5
34	Chaingrai	3.6	3.1	0.5
35	Maehongson	4.0	2.8	1.2
36	Nakornsawan	3.2	3.2	0.0
37	Uthaitani	4.0	3.0	1.0
38	Kampangpetch	3.6	3.3	0.3
39	Tak	4.1	3.1	1.0
40	Sukothai	3.6	3.0	0.6
41	Pitsanulok	3.5	2.9	0.6
42	Pichit	3.6	3.1	0.5
43	Petchaboon	4.0	3.2	0.8
North-eastern Region		**4.1**	**3.5**	**0.6**
44	Nakornratchasima	4.2	3.5	0.7
45	Buriram	4.1	3.6	0.5
46	Surin	3.9	3.3	0.6
47	Srisaket	4.1	3.5	0.6
48	Ubonratchatani	4.2	3.8	0.4
49	Yasothorn	3.7	3.1	0.6
50	Chaiyapoom	3.9	3.1	0.8
51	Amnajjareon	4.9	3.3	1.6
52	Nongbualampoo	4.2	3.8	0.4
53	Konkaen	4.0	3.4	0.6
54	Udornthani	4.2	3.7	0.5
55	Luey	3.9	3.9	0.0
56	Nongkai	4.1	3.8	0.3
57	Mahasarakam	4.4	3.5	0.9
58	Roi-ed	3.9	3.6	0.3
59	Kalasin	4.2	3.6	0.6
60	Sakonnakorn	4.3	3.7	0.6
61	Nakornpanom	3.9	3.6	0.3
62	Mukdahan	4.2	3.4	0.8
Southern Region		**3.9**	**3.7**	**0.2**
63	Nakornsritammarat	3.8	3.8	0.0
64	Krabi	4.3	3.5	0.8
65	Pang-nga	4.1	3.6	0.5
66	Phuket	3.5	3.3	0.2
67	Surattani	3.8	3.5	0.3
68	Ranong	3.8	3.4	0.4
69	Chumporn	3.2	3.4	-0.2
70	Songkla	4.4	3.2	1.2
71	Satool	4.3	3.9	0.4
72	Trang	3.8	4.0	-0.2
73	Pattalung	3.5	3.5	0.0
74	Pattani	4.5	4.2	0.3
75	Yala	4.4	4.0	0.4
76	Narathiwat	3.6	4.4	-0.8

Table 2 Family Size per Household: Summary Statistics

	Farmers	*Non-farmers*	*Difference*
Mean	3.876	3.406	0.471
Median	3.900	3.378	0.474
Standard Deviation	0.403	0.313	0.433
Minimum	2.800	2.779	-0.802
Maximum	4.900	4.402	1.562
Count	76	76	76

According to table 1 and 2 family size of farmers is larger than that of non-farmer on average. There are seven provinces that farmers have larger family size than non-farmers. These include Angthong, Rayong, Samutsongkram, Prae, Chumporn, Trang, and Narathiwat. Provinces in northeastern region has the largest difference in family size between farmers and non-farmers among all other regions. Farmers in Amnajjaroen have the largest family size of 4.9 persons per household while farmer in Prae has the smallest family size of 2.8 persons per households. The smallest family size for non-farmers is among households in Chiangmai, where the family size is 2.78 persons per household on average. Amnajjaroen has the largest difference in family size between farmers and non-farmers, 1.56 persons per household, among all other provinces in Thailand.

Proportions of farmers and non-farmers population in each province are shown in table 3 and the summary statistics are shown in table 4. The region that has the largest farmer proportion of the population is north-eastern region, where farmers are counted for 35.5% of the population on average. Provinces in central regions have the smallest farmer proportion of 15.33%. Population in the northern and southern regions of Thailand have about the same farmer proportion of 28.4%. Bangkok has the smallest farmer proportion of 0.20% while Srisaket has the largest farmer proportion of 53.2%.

Table 3 Proportions of Population (%): Farmers and Non-farmers

	Province	Farmers	Non-farmers	Total
Central Region		**15.33**	**84.67**	**100.00**
1	Bangkok	0.2	99.8	100.00
2	Samutprakarn	1.7	98.3	100.00
3	Nontaburi	2.9	97.1	100.00
4	Patumthani	2.6	97.4	100.00
5	Ayudhaya	4.4	95.6	100.00
6	Angthong	13.6	86.4	100.00
7	Lopburi	18.7	81.3	100.00
8	Singburi	19.6	80.4	100.00
9	Chainat	33.1	66.9	100.00
10	Saraburi	9.3	90.7	100.00
11	Chonburi	4.0	96.0	100.00
12	Rayong	17.2	82.8	100.00
13	Chantaburi	29.0	71.0	100.00
14	Trat	18.5	81.5	100.00
15	Chachuengsao	12.1	87.9	100.00
16	Prajinburi	15.5	84.5	100.00
17	Nakornnayok	19.1	80.9	100.00
18	Sakaew	33.0	67.0	100.00
19	Ratchburi	14.8	85.2	100.00
20	Kanchanaburi	25.8	74.2	100.00
21	Supanburi	35.9	64.1	100.00
22	Nakornpatom	12.9	87.1	100.00
23	Samutsakorn	4.8	95.2	100.00
24	Samutsongkram	13.9	86.1	100.00
25	Petchburi	17.7	82.3	100.00
26	Prachuabkirikun	18.2	81.8	100.00
Northern Region		**28.4**	**71.6**	**100.00**
27	Chiangmai	13.9	86.1	100.00
28	Lampoon	20.8	79.2	100.00
29	Lampang	14.0	86.0	100.00
30	Utaradit	21.6	78.4	100.00
31	Prae	9.6	90.4	100.00
32	Nan	31.6	68.4	100.00
33	Payao	30.7	69.3	100.00
34	Chaingrai	18.6	81.4	100.00
35	Maehongson	48.8	51.2	100.00
36	Nakornsawan	25.0	75.0	100.00
37	Uthaitani	42.0	58.0	100.00
38	Kampangpetch	38.0	62.0	100.00
39	Tak	26.5	73.5	100.00
40	Sukothai	40.8	59.2	100.00
41	Pitsanulok	27.5	72.5	100.00
42	Pichit	36.3	63.7	100.00
43	Petchaboon	37.2	62.8	100.00
North-eastern Region		**35.5**	**64.5**	**100.00**
44	Nakornratchasima	21.5	78.5	100.00
45	Buriram	19.9	80.1	100.00
46	Surin	37.3	62.7	100.00

47	Srisaket	53.2	46.8	100.00
48	Ubonratchatani	47.8	52.2	100.00
49	Yasothorn	51.2	48.8	100.00
50	Chaiyapoom	32.6	67.4	100.00
51	Amnajjareon	38.2	61.8	100.00
52	Nongbualampoo	37.1	62.9	100.00
53	Konkaen	24.5	75.5	100.00
54	Udornthani	23.8	76.2	100.00
55	Luey	34.2	65.8	100.00
56	Nongkai	19.1	80.9	100.00
57	Mahasarakam	35.0	65.0	100.00
58	Roi-ed	40.3	59.7	100.00
59	Kalasin	36.6	63.4	100.00
60	Sakonnakorn	43.2	56.8	100.00
61	Nakornpanom	34.7	65.3	100.00
62	Mukdahan	43.5	56.5	100.00
Southern Region		**28.4**	**71.6**	**100.00**
63	Nakornsritammarat	27.5	72.5	100.00
64	Krabi	35.8	64.2	100.00
65	Pang-nga	30.8	69.2	100.00
66	Phuket	3.1	96.9	100.00
67	Surattani	40.8	59.2	100.00
68	Ranong	29.8	70.2	100.00
69	Chumporn	46.9	53.1	100.00
70	Songkla	30.4	69.6	100.00
71	Satool	34.3	65.7	100.00
72	Trang	30.8	69.2	100.00
73	Pattalung	33.4	66.6	100.00
74	Pattani	14.5	85.5	100.00
75	Yala	27.3	72.7	100.00
76	Narathiwat	11.8	88.2	100.00

Table 4 Proportions of Population (%): Summary Statistics

Statistics	*Farmers*	*Non-farmers*
Mean	25.69	74.31
Median	26.90	73.10
Standard Deviation	13.15	13.15
Minimum	0.20	46.80
Maximum	53.20	99.80
Count	76	76

Financial and economic indicators—income, expense, net residual income—are shown in the following tables. Table 5 represents total monthly income per household by province and region. Table 6 shows total monthly expense per

household by province and region. Net monthly residual income per household, representing the amount of wealth available for investment, is shown in table 7.

Table 5 Total Monthly Income per Household (Baht)

	Province	Farmers	Non-farmers	Difference
Central Region		**14,991.15**	**15,345.22**	**(354.06)**
1	Bangkok	16,643.00	29,619.06	(12,976.06)
2	Samutprakarn	15,340.00	19,755.28	(4,415.28)
3	Nontaburi	12,559.00	29,611.05	(17,052.05)
4	Patumthani	25,701.00	22,771.60	2,929.40
5	Ayudhaya	12,735.00	13,347.61	(612.61)
6	Angthong	10,994.00	11,758.01	(764.01)
7	Lopburi	11,415.00	10,919.35	495.65
8	Singburi	13,390.00	14,685.84	(1,295.84)
9	Chainat	12,807.00	10,282.44	2,524.56
10	Saraburi	17,846.00	14,356.52	3,489.48
11	Chonburi	15,251.00	16,860.64	(1,609.64)
12	Rayong	15,490.00	12,788.26	2,701.74
13	Chantaburi	20,050.00	14,283.94	5,766.06
14	Trat	16,676.00	13,174.40	3,501.60
15	Chachuengsao	12,096.00	15,202.14	(3,106.14)
16	Prajinburi	9,861.00	13,240.98	(3,379.98)
17	Nakornnayok	8,432.00	11,263.87	(2,831.87)
18	Sakaew	7,912.00	10,947.81	(3,035.81)
19	Ratchburi	13,560.00	14,886.13	(1,326.13)
20	Kanchanaburi	22,551.00	12,880.63	9,670.37
21	Supanburi	16,695.00	10,900.80	5,794.20
22	Nakornpatom	17,667.00	18,822.79	(1,155.79)
23	Samutsakorn	16,507.00	16,441.35	65.65
24	Samutsongkram	12,992.00	14,023.56	(1,031.56)
25	Petchburi	20,207.00	15,092.36	5,114.64
26	Prachuabkirikun	14,393.00	11,059.23	3,333.77
Northern Region		**7,225.53**	**9,747.76**	**(2,522.23)**
27	Chiangmai	6,579.00	10,063.59	(3,484.59)
28	Lampoon	7,829.00	12,245.03	(4,416.03)
29	Lampang	6,770.00	10,245.94	(3,475.94)
30	Utaradit	9,979.00	8,194.87	1,784.13
31	Prae	5,225.00	10,559.20	(5,334.20)
32	Nan	768.00	9,352.19	(8,584.19)
33	Payao	5,778.00	11,174.78	(5,396.78)
34	Chaingrai	5,584.00	9,003.98	(3,419.98)
35	Maehongson	5,375.00	7,961.99	(2,586.99)
36	Nakornsawan	8,520.00	10,038.87	(1,518.87)
37	Uthaitani	5,573.00	7,140.69	(1,567.69)
38	Kampangpetch	14,046.00	11,685.08	2,360.92
39	Tak	4,547.00	8,923.99	(4,376.99)
40	Sukothai	7,012.00	8,627.73	(1,615.73)
41	Pitsanulok	7,883.00	11,578.71	(3,695.71)
42	Pichit	11,200.00	10,710.87	489.13
43	Petchaboon	10,166.00	8,204.43	1,961.57

North-eastern Region		**6,522.47**	**9,639.99**	**(3,117.52)**
44	Nakornratchasima	7,036.00	9,270.85	(2,234.85)
45	Buriram	5,204.00	8,308.51	(3,104.51)
46	Surin	4,735.00	7,454.47	(2,719.47)
47	Srisaket	6,291.00	7,951.06	(1,660.06)
48	Ubonratchatani	7,469.00	13,189.45	(5,720.45)
49	Yasothorn	3,998.00	8,097.53	(4,099.53)
50	Chaiyapoom	7,295.00	8,871.42	(1,576.42)
51	Amnajjareon	6,416.00	10,163.65	(3,747.65)
52	Nongbualampoo	5,437.00	7,406.68	(1,969.68)
53	Konkaen	8,857.00	10,842.38	(1,985.38)
54	Udornthani	5,939.00	9,767.78	(3,828.78)
55	Luey	6,492.00	9,954.52	(3,462.52)
56	Nongkai	7,836.00	10,509.22	(2,673.22)
57	Mahasarakam	7,834.00	10,442.43	(2,608.43)
58	Roi-ed	7,562.00	10,070.23	(2,508.23)
59	Kalasin	6,465.00	9,608.37	(3,143.37)
60	Sakonnakorn	8,813.00	11,307.59	(2,494.59)
61	Nakornpanom	5,071.00	8,689.79	(3,618.79)
62	Mukdahan	5,177.00	11,253.98	(6,076.98)
Southern Region		**18,374.21**	**12,976.69**	**5,397.52**
63	Nakornsritammarat	11,459.00	13,481.38	(2,022.38)
64	Krabi	12,732.00	13,898.02	(1,166.02)
65	Pang-nga	9,679.00	13,683.60	(4,004.60)
66	Phuket	122,073.00	20,697.90	101,375.10
67	Surattani	13,894.00	13,702.03	191.97
68	Ranong	10,872.00	11,633.59	(761.59)
69	Chumporn	10,578.00	11,536.32	(958.32)
70	Songkla	10,817.00	15,026.50	(4,209.50)
71	Satool	12,385.00	12,618.77	(233.77)
72	Trang	13,437.00	14,055.78	(618.78)
73	Pattalung	9,420.00	11,324.06	(1,904.06)
74	Pattani	9,048.00	9,933.16	(885.16)
75	Yala	5,474.00	12,085.93	(6,611.93)
76	Narathiwat	5,371.00	7,996.64	(2,625.64)

The most extreme case in table 5 is Phuket where farmers have an average monthly income of 122,073 Baht per household. This makes farmers in the southern region has the highest average monthly income per household, which is higher than non-farmers' average monthly income in this region. In other regions, average monthly income of farmers is less than that of non-farmers. If Phuket is removed, average farmer's monthly income and average non-farmers' monthly income in southern region are 10,397.38 and 12,382.75 baht per household, respectively.

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Farmers in Nan has the lowest average monthly income of 768 baht per household. Without Phuket, farmers in central region have the highest average month income of 14,991.15 baht per household. Non-farmers in central region also have the highest average monthly income of 15,345.22 per household. Among all 76 provinces non-farmers in Bangkok has the highest average monthly income of 29,619.06 baht per household while non-farmers in Utaithani have the lowest average month income of 7,140.69 per household. Both farmers and non-farmers in the north-eastern region have the lowest average monthly income of 6,522.47 and 9,639.99 baht per household, respectively.

Average monthly expense is largest among farmers and non-farmers in central region. Farmers in northeastern region have the lowest average monthly expense of 6,088.95 baht per household while non-farmers in northern region have the lowest average monthly expense of 7,976.98 baht per household. Among all 76 provinces, non-farmers in Nontaburi have the highest monthly expense of 22,903.75 per household. Non-farmers in Utaithani that appear to have the lowest average monthly income per household (shown in table 5) also have the lowest average monthly expense of 6,293.27 baht per household. Farmers in Bangkok have the higher average monthly expense of 18,084 baht per household while farmers in Tak have the smallest average monthly expense of 4,188 baht per household.

Table 6 Total Monthly Expense per Household (Baht)

Province		Farmers	Non-farmers	Difference
Central Region		**11,202.77**	**12,286.89**	**(1,084.12)**
1	Bangkok	18,084.00	21,927.14	**(3,843.14)**
2	Samutprakarn	14,127.00	14,849.05	**(722.05)**
3	Nontaburi	15,908.00	22,903.75	**(6,995.75)**
4	Patumthani	16,510.00	17,873.65	**(1,363.65)**
5	Ayudhaya	10,376.00	11,378.95	**(1,002.95)**
6	Angthong	7,613.00	9,027.11	**(1,414.11)**
7	Lopburi	7,768.00	9,069.85	**(1,301.85)**
8	Singburi	11,153.00	11,845.37	**(692.37)**

9	Chainat	9,951.00	9,888.69	**62.31**
10	Saraburi	8,137.00	11,090.97	**(2,953.97)**
11	Chonburi	12,848.00	13,668.59	**(820.59)**
12	Rayong	9,081.00	10,149.63	**(1,068.63)**
13	Chantaburi	16,323.00	12,014.47	**4,308.53**
14	Trat	9,721.00	10,060.74	**(339.74)**
15	Chachuengsao	10,483.00	13,522.70	**(3,039.70)**
16	Prajinburi	8,679.00	11,541.04	**(2,862.04)**
17	Nakornnayok	7,953.00	9,563.59	**(1,610.59)**
18	Sakaew	5,475.00	7,553.50	**(2,078.50)**
19	Ratchburi	13,315.00	13,182.98	**132.02**
20	Kanchanaburi	9,759.00	9,679.70	**79.30**
21	Supanburi	11,537.00	8,796.77	**2,740.23**
22	Nakornpatom	12,992.00	15,801.96	**(2,809.96)**
23	Samutsakorn	16,335.00	12,989.19	**3,345.81**
24	Samutsongkram	9,211.00	11,860.62	**(2,649.62)**
25	Petchburi	9,037.00	10,215.67	**(1,178.67)**
26	Prachuabkirikun	8,896.00	9,003.45	**(107.45)**
Northern Region		**6,132.59**	**7,976.98**	**(1,844.39)**
27	Chiangmai	4,958.00	9,030.81	**(4,072.81)**
28	Lampoon	7,086.00	9,660.62	**(2,574.62)**
29	Lampang	4,368.00	7,342.11	**(2,974.11)**
30	Utaradit	6,528.00	6,757.25	**(229.25)**
31	Prae	4,650.00	8,361.31	**(3,711.31)**
32	Nan	5,256.00	7,820.52	**(2,564.52)**
33	Payao	5,494.00	8,221.78	**(2,727.78)**
34	Chaingrai	6,532.00	7,936.43	**(1,404.43)**
35	Maehongson	4,585.00	7,125.45	**(2,540.45)**
36	Nakornsawan	7,230.00	8,063.30	**(833.30)**
37	Uthaitani	4,958.00	6,293.27	**(1,335.27)**
38	Kampangpetch	11,238.00	9,943.69	**1,294.31**
39	Tak	4,188.00	7,228.45	**(3,040.45)**
40	Sukothai	5,634.00	6,809.21	**(1,175.21)**
41	Pitsanulok	6,515.00	9,699.24	**(3,184.24)**
42	Pichit	9,102.00	8,977.75	**124.25**
43	Petchaboon	5,932.00	6,337.41	**(405.41)**
North-eastern Region		**6,088.95**	**8,360.77**	**(2,271.82)**
44	Nakornratchasima	6,058.00	7,775.20	**(1,717.20)**
45	Buriram	5,987.00	6,848.46	**(861.46)**
46	Surin	5,042.00	6,613.29	**(1,571.29)**
47	Srisaket	5,506.00	7,380.49	**(1,874.49)**
48	Ubonratchatani	5,874.00	10,050.84	**(4,176.84)**
49	Yasothorn	4,936.00	6,588.77	**(1,652.77)**
50	Chaiyapoom	6,762.00	7,507.87	**(745.87)**
51	Amnajjareon	5,844.00	8,258.49	**(2,414.49)**
52	Nongbualampoo	5,038.00	6,665.20	**(1,627.20)**
53	Konkaen	6,239.00	8,858.72	**(2,619.72)**
54	Udornthani	5,378.00	8,637.42	**(3,259.42)**
55	Luey	6,461.00	8,023.21	**(1,562.21)**
56	Nongkai	6,879.00	9,549.33	**(2,670.33)**
57	Mahasarakam	6,470.00	8,787.78	**(2,317.78)**
58	Roi-ed	6,473.00	9,184.28	**(2,711.28)**

59	Kalasin	7,488.00	9,568.19	(2,080.19)
60	Sakonnakorn	7,647.00	10,028.88	(2,381.88)
61	Nakornpanom	5,672.00	7,845.43	(2,173.43)
62	Mukdahan	5,936.00	10,682.80	(4,746.80)
Southern Region		**9,514.14**	**11,082.34**	**(1,568.20)**
63	Nakornsritammarat	12,448.00	10,959.34	**1,488.66**
64	Krabi	13,721.00	12,276.09	**1,444.91**
65	Pang-nga	8,186.00	10,564.57	(2,378.57)
66	Phuket	11,989.00	18,904.39	(6,915.39)
67	Surattani	10,521.00	11,943.30	(1,422.30)
68	Ranong	8,986.00	10,049.84	(1,063.84)
69	Chumporn	8,453.00	9,020.09	(567.09)
70	Songkla	10,193.00	12,213.35	(2,020.35)
71	Satool	8,425.00	9,650.27	(1,225.27)
72	Trang	10,472.00	11,537.71	(1,065.71)
73	Pattalung	8,491.00	10,557.94	(2,066.94)
74	Pattani	7,742.00	9,793.81	(2,051.81)
75	Yala	7,600.00	10,328.52	(2,728.52)
76	Narathiwat	5,971.00	7,353.54	(1,382.54)

Table 7 Net Monthly Residual Income per Household (Baht)

	Province	Farmers	Non-farmers	Difference
Central Region		**3,788.38**	**3,058.33**	**730.06**
1	Bangkok	(1,441.00)	7,691.91	(9,132.91)
2	Samutprakarn	1,213.00	4,906.23	(3,693.23)
3	Nontaburi	(3,349.00)	6,707.31	(10,056.31)
4	Patumthani	9,191.00	4,897.95	4,293.05
5	Ayudhaya	2,359.00	1,968.66	390.34
6	Angthong	3,381.00	2,730.91	650.09
7	Lopburi	3,647.00	1,849.50	1,797.50
8	Singburi	2,237.00	2,840.48	(603.48)
9	Chainat	2,856.00	393.75	2,462.25
10	Saraburi	9,709.00	3,265.55	6,443.45
11	Chonburi	2,403.00	3,192.04	(789.04)
12	Rayong	6,409.00	2,638.64	3,770.36
13	Chantaburi	3,727.00	2,269.47	1,457.53
14	Trat	6,955.00	3,113.66	3,841.34
15	Chachuengsao	1,613.00	1,679.45	(66.45)
16	Prajinburi	1,182.00	1,699.93	(517.93)
17	Nakornnayok	479.00	1,700.28	(1,221.28)
18	Sakaew	2,437.00	3,394.31	(957.31)
19	Ratchburi	245.00	1,703.15	(1,458.15)
20	Kanchanaburi	12,792.00	3,200.93	9,591.07
21	Supanburi	5,158.00	2,104.02	3,053.98
22	Nakornpatom	4,675.00	3,020.83	1,654.17
23	Samutsakorn	172.00	3,452.16	(3,280.16)
24	Samutsongkram	3,781.00	2,162.93	1,618.07
25	Petchburi	11,170.00	4,876.69	6,293.31
26	Prachuabkirikun	5,497.00	2,055.78	3,441.22
Northern Region		**1,092.94**	**1,770.79**	**(677.84)**

27	Chiangmai	1,621.00	1,032.78	**588.22**
28	Lampoon	743.00	2,584.42	**(1,841.42)**
29	Lampang	2,402.00	2,903.83	**(501.83)**
30	Utaradit	3,451.00	1,437.62	**2,013.38**
31	Prae	575.00	2,197.89	**(1,622.89)**
32	Nan	(4,488.00)	1,531.67	**(6,019.67)**
33	Payao	284.00	2,953.00	**(2,669.00)**
34	Chaingrai	(948.00)	1,067.55	**(2,015.55)**
35	Maehongson	790.00	836.54	**(46.54)**
36	Nakornsawan	1,290.00	1,975.57	**(685.57)**
37	Uthaitani	615.00	847.42	**(232.42)**
38	Kampangpetch	2,808.00	1,741.39	**1,066.61**
39	Tak	359.00	1,695.54	**(1,336.54)**
40	Sukothai	1,378.00	1,818.52	**(440.52)**
41	Pitsanulok	1,368.00	1,879.47	**(511.47)**
42	Pichit	2,098.00	1,733.12	**364.88**
43	Petchaboon	4,234.00	1,867.02	**2,366.98**
North-eastern Region		**433.53**	**1,279.22**	**(845.70)**
44	Nakornratchasima	978.00	1,495.65	**(517.65)**
45	Buriram	(783.00)	1,460.04	**(2,243.04)**
46	Surin	(307.00)	841.18	**(1,148.18)**
47	Srisaket	785.00	570.57	**214.43**
48	Ubonratchatani	1,595.00	3,138.61	**(1,543.61)**
49	Yasothorn	(938.00)	1,508.76	**(2,446.76)**
50	Chaiyapoom	533.00	1,363.55	**(830.55)**
51	Amnajjareon	572.00	1,905.16	**(1,333.16)**
52	Nongbualampoo	399.00	741.48	**(342.48)**
53	Konkaen	2,618.00	1,983.67	**634.33**
54	Udornthani	561.00	1,130.36	**(569.36)**
55	Luey	31.00	1,931.31	**(1,900.31)**
56	Nongkai	957.00	959.89	**(2.89)**
57	Mahasarakam	1,364.00	1,654.64	**(290.64)**
58	Roi-ed	1,089.00	885.96	**203.04**
59	Kalasin	(1,023.00)	40.18	**(1,063.18)**
60	Sakonnakorn	1,166.00	1,278.71	**(112.71)**
61	Nakornpanom	(601.00)	844.36	**(1,445.36)**
62	Mukdahan	(759.00)	571.17	**(1,330.17)**
Southern Region		**8,860.07**	**1,894.35**	**6,965.72**
63	Nakornsritammarat	(989.00)	2,522.04	**(3,511.04)**
64	Krabi	(989.00)	1,621.93	**(2,610.93)**
65	Pang-nga	1,493.00	3,119.03	**(1,626.03)**
66	Phuket	110,084.00	1,793.51	**108,290.49**
67	Surattani	3,373.00	1,758.73	**1,614.27**
68	Ranong	1,886.00	1,583.74	**302.26**
69	Chumporn	2,125.00	2,516.23	**(391.23)**
70	Songkla	624.00	2,813.16	**(2,189.16)**
71	Satool	3,960.00	2,968.50	**991.50**
72	Trang	2,965.00	2,518.08	**446.92**
73	Pattalung	929.00	766.12	**162.88**
74	Pattani	1,306.00	139.35	**1,166.65**
75	Yala	(2,126.00)	1,757.41	**(3,883.41)**
76	Narathiwat	(600.00)	643.11	**(1,243.11)**

Net monthly residual income in table 7 is the difference between total monthly income per household in table 5 and total monthly expense in table 6. Net monthly residual income represents the amount of money each household has available for investment each month. Interestingly, farmers in central region have higher net monthly residual income than non-farmers in central region. Without Phuket, net monthly residual income of farmers in Phuket is larger than that of non-farmers, similar to what we observe for farmers and non-farmers in northern and north-eastern part of Thailand. Non-farmers in all 76 provinces have positive net monthly residual income per household, while farmers in 14 provinces appear to have negative net monthly residual income per household, 6 of them are in north-eastern region of Thailand. These 14 provinces include Bangkok, Nontaburi, Nan, Ciangrai, Buriram, Surin, Yasothorn, Kalasin, Nakornpanom, Mukdahan, Nakornsritammarat, Krabi, Yala, and Narathiwat. Non-farmers in Kalasin have the smallest net monthly residual income of 40.18 baht per household. The largest net monthly residual income is among non-farmers in Bangkok: 7,691.91 baht per household.

An investment in human capital of children is represented by monthly educational expense per household shown in table 8 and table 9. Table 8 shows total monthly educational expense (baht per household) and table 9 shows total monthly educational expense as a percentage of total monthly income per household.

Among four regions, both farmers and non-farmers in central region have the largest total monthly education expense: 215.81 and 234.99 baht per household. However, when monthly educational expense is considered in terms of percentage of total monthly income, both farmers and non-farmers in northern region have the largest percentage of total monthly expense spent for education: 1.80% and 1.64%. Bother farmers and non-farmers in northeastern region have the smallest monthly

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educational expense: 81.16 and 132.73 baht per household. Farmers in Narathiwat spent the least monthly educational expense of 16 baht per household. The least monthly educational expense among non-farmers from 76 provinces is in Yasothorn: 50.67 baht per household. Both farmers and non-farmers in Bangkok have the largest monthly educational expense per household: 1,268.00 and 798.05 baht.

Table 8 Total Monthly Educational Expense per Household (Baht)

	Province	Farmers	Non-farmers	Difference
	Central Region	**215.81**	**234.99**	**(19.18)**
1	Bangkok	1,268.00	798.05	**469.95**
2	Samutprakarn	352.00	409.27	**(57.27)**
3	Nontaburi	460.00	697.25	**(237.25)**
4	Patumthani	206.00	497.89	**(291.89)**
5	Ayudhaya	37.00	180.55	**(143.55)**
6	Angthong	166.00	118.25	**47.75**
7	Lopburi	97.00	164.47	**(67.47)**
8	Singburi	125.00	133.68	**(8.68)**
9	Chainat	77.00	110.03	**(33.03)**
10	Saraburi	120.00	129.54	**(9.54)**
11	Chonburi	414.00	299.76	**114.24**
12	Rayong	105.00	157.92	**(52.92)**
13	Chantaburi	246.00	208.16	**37.84**
14	Trat	56.00	112.57	**(56.57)**
15	Chachuengsao	65.00	282.66	**(217.66)**
16	Prajinburi	192.00	125.01	**66.99**
17	Nakornnayok	116.00	82.52	**33.48**
18	Sakaew	50.00	103.79	**(53.79)**
19	Ratchburi	221.00	285.39	**(64.39)**
20	Kanchanaburi	90.00	142.09	**(52.09)**
21	Supanburi	134.00	115.32	**18.68**
22	Nakornpatom	186.00	309.11	**(123.11)**
23	Samutsakorn	511.00	165.40	**345.60**
24	Samutsongkram	105.00	130.04	**(25.04)**
25	Petchburi	137.00	245.20	**(108.20)**
26	Prachuabkirikun	75.00	105.79	**(30.79)**
	Northern Region	**97.35**	**161.83**	**(64.48)**
27	Chiangmai	165.00	613.27	**(448.27)**
28	Lampoon	174.00	279.96	**(105.96)**
29	Lampang	85.00	200.98	**(115.98)**
30	Utaradit	74.00	96.07	**(22.07)**
31	Prae	118.00	138.79	**(20.79)**
32	Nan	63.00	102.18	**(39.18)**
33	Payao	138.00	155.51	**(17.51)**
34	Chaingrai	88.00	131.62	**(43.62)**
35	Maehongson	45.00	79.62	**(34.62)**

36	Nakornsawan	112.00	99.31	**12.69**
37	Uthaitani	75.00	109.40	**(34.40)**
38	Kampangpetch	97.00	123.84	**(26.84)**
39	Tak	52.00	96.23	**(44.23)**
40	Sukothai	74.00	89.71	**(15.71)**
41	Pitsanulok	75.00	170.48	**(95.48)**
42	Pichit	106.00	115.54	**(9.54)**
43	Petchaboon	114.00	148.66	**(34.66)**
North-eastern Region		**81.16**	**132.73**	**(51.57)**
44	Nakornratchasima	92.00	176.37	**(84.37)**
45	Buriram	93.00	94.52	**(1.52)**
46	Surin	79.00	162.71	**(83.71)**
47	Srisaket	56.00	93.91	**(37.91)**
48	Ubonratchatani	47.00	183.22	**(136.22)**
49	Yasothorn	67.00	50.67	**16.33**
50	Chaiyapoom	81.00	81.19	**(0.19)**
51	Amnajjareon	50.00	116.91	**(66.91)**
52	Nongbualampoo	72.00	87.25	**(15.25)**
53	Konkaen	175.00	208.50	**(33.50)**
54	Udornthani	70.00	196.76	**(126.76)**
55	Luey	62.00	114.14	**(52.14)**
56	Nongkai	63.00	117.55	**(54.55)**
57	Mahasarakam	55.00	119.93	**(64.93)**
58	Roi-ed	76.00	177.03	**(101.03)**
59	Kalasin	111.00	124.51	**(13.51)**
60	Sakonnakorn	160.00	218.00	**(58.00)**
61	Nakornpanom	51.00	95.31	**(44.31)**
62	Mukdahan	82.00	103.38	**(21.38)**
Southern Region		**136.79**	**185.94**	**(49.15)**
63	Nakornsritammarat	146.00	216.96	**(70.96)**
64	Krabi	133.00	165.79	**(32.79)**
65	Pang-nga	198.00	146.09	**51.91**
66	Phuket	118.00	339.33	**(221.33)**
67	Surattani	162.00	214.18	**(52.18)**
68	Ranong	75.00	90.28	**(15.28)**
69	Chumporn	104.00	111.88	**(7.88)**
70	Songkla	321.00	432.96	**(111.96)**
71	Satool	90.00	91.77	**(1.77)**
72	Trang	212.00	198.66	**13.34**
73	Pattalung	120.00	165.94	**(45.94)**
74	Pattani	112.00	225.64	**(113.64)**
75	Yala	108.00	133.71	**(25.71)**
76	Narathiwat	16.00	69.93	**(53.93)**

Table 9 Total Monthly Educational Expense per Household (% of Total Monthly Income)

	Province	Farmers	Non-farmers	Difference
Central Region		**1.45**	**1.39**	**0.06**
1	Bangkok	7.62	2.69	**4.92**
2	Samutprakarn	2.29	2.07	**0.22**
3	Nontaburi	3.66	2.35	**1.31**
4	Patumthani	0.80	2.19	**(1.38)**
5	Ayudhaya	0.29	1.35	**(1.06)**
6	Angthong	1.51	1.01	**0.50**
7	Lopburi	0.85	1.51	**(0.66)**
8	Singburi	0.93	0.91	**0.02**
9	Chainat	0.60	1.07	**(0.47)**
10	Saraburi	0.67	0.90	**(0.23)**
11	Chonburi	2.71	1.78	**0.94**
12	Rayong	0.68	1.23	**(0.56)**
13	Chantaburi	1.23	1.46	**(0.23)**
14	Trat	0.34	0.85	**(0.52)**
15	Chachuengsao	0.54	1.86	**(1.32)**
16	Prajinburi	1.95	0.94	**1.00**
17	Nakornnayok	1.38	0.73	**0.64**
18	Sakaew	0.63	0.95	**(0.32)**
19	Ratchburi	1.63	1.92	**(0.29)**
20	Kanchanaburi	0.40	1.10	**(0.70)**
21	Supanburi	0.80	1.06	**(0.26)**
22	Nakornpatom	1.05	1.64	**(0.59)**
23	Samutsakorn	3.10	1.01	**2.09**
24	Samutsongkram	0.81	0.93	**(0.12)**
25	Petchburi	0.68	1.62	**(0.95)**
26	Prachuabkirikun	0.52	0.96	**(0.44)**
Northern Region		**1.80**	**1.64**	**0.16**
27	Chiangmai	2.51	6.09	**(3.59)**
28	Lampoon	2.22	2.29	**(0.06)**
29	Lampang	1.26	1.96	**(0.71)**
30	Utaradit	0.74	1.17	**(0.43)**
31	Prae	2.26	1.31	**0.94**
32	Nan	8.20	1.09	**7.11**
33	Payao	2.39	1.39	**1.00**
34	Chaingrai	1.58	1.46	**0.11**
35	Maehongson	0.84	1.00	**(0.16)**
36	Nakornsawan	1.31	0.99	**0.33**
37	Uthaitani	1.35	1.53	**(0.19)**
38	Kampangpetch	0.69	1.06	**(0.37)**
39	Tak	1.14	1.08	**0.07**
40	Sukothai	1.06	1.04	**0.02**
41	Pitsanulok	0.95	1.47	**(0.52)**
42	Pichit	0.95	1.08	**(0.13)**
43	Petchaboon	1.12	1.81	**(0.69)**
North-eastern Region		**1.26**	**1.37**	**(0.11)**
44	Nakornratchasima	1.31	1.90	**(0.59)**
45	Buriram	1.79	1.14	**0.65**
46	Surin	1.67	2.18	**(0.51)**

47	Srisaket	0.89	1.18	**(0.29)**
48	Ubonratchatani	0.63	1.39	**(0.76)**
49	Yasothorn	1.68	0.63	**1.05**
50	Chaiyapoom	1.11	0.92	**0.20**
51	Amnajjareon	0.78	1.15	**(0.37)**
52	Nongbualampoo	1.32	1.18	**0.15**
53	Konkaen	1.98	1.92	**0.05**
54	Udornthani	1.18	2.01	**(0.84)**
55	Luey	0.96	1.15	**(0.19)**
56	Nongkai	0.80	1.12	**(0.31)**
57	Mahasarakam	0.70	1.15	**(0.45)**
58	Roi-ed	1.01	1.76	**(0.75)**
59	Kalasin	1.72	1.30	**0.42**
60	Sakonnakorn	1.82	1.93	**(0.11)**
61	Nakornpanom	1.01	1.10	**(0.09)**
62	Mukdahan	1.58	0.92	**0.67**
Southern Region		**1.24**	**1.40**	**(0.16)**
63	Nakornsritammarat	1.27	1.61	**(0.34)**
64	Krabi	1.04	1.19	**(0.15)**
65	Pang-nga	2.05	1.07	**0.98**
66	Phuket	0.10	1.64	**(1.54)**
67	Surattani	1.17	1.56	**(0.40)**
68	Ranong	0.69	0.78	**(0.09)**
69	Chumporn	0.98	0.97	**0.01**
70	Songkla	2.97	2.88	**0.09**
71	Satool	0.73	0.73	**(0.00)**
72	Trang	1.58	1.41	**0.16**
73	Pattalung	1.27	1.47	**(0.19)**
74	Pattani	1.24	2.27	**(1.03)**
75	Yala	1.97	1.11	**0.87**
76	Narathiwat	0.30	0.87	**(0.58)**

5. Data Analysis

This paper focuses on whether or not fertility behaviors are influenced by the level of financial development and social security program. Family size is used as a proxy for fertility behavior. Household-level data from 2004 Socio-economic survey is used to perform a cross-sectional analysis. There are 34,843 households from five regions in the data. After dropping missing values of interested variable the sample size is down to 31,865 households. There are ten categories of socio-economic data for each household in this survey:

1. Household characteristics, household economic status, and welfare & benefits.

2. Household member characteristics and getting welfare & benefits.

3. Average monthly income from other sources.

4. Change of asset/liabilities and household debt.

5. Household characteristics, using IT's equipment.

6. Consumption on goods and services.

7. Seven-day food consumption.

8. Household income.

9. Household expenditure.

10. Village fund scheme

We first define the household to be farmer-household if the occupation of the head of the family is farm operator owning or renting the land, or farm worker. The second column in table 10 represents average family size of farmer and non-farmer households. The average family size of farmer household is larger than that of the non-farmer household. The average family size of the whole sample data is 3.34.

Table 10 Household Characteristics by Occupation

Occupation	Family Size	Income	Education
Non-farmer	3.16	6,854.42	3.59
Farmer	3.73	3,122.89	2.32
Total	3.34	5,686.33	3.19

Per capita household monthly income is used as a proxy for financial status level of the household. From table 10, average per capita income of non-farmer households is more than twice that of farmer households. That is, each person in the farmer household earns much lower monthly income.

Educational attainment level of the household head is separated into nine categories:

0 = no educational attainment

1 = Kindergarten

2 = Elementary-lower

3 = Elementary-upper

4 = Secondary-lower

5 = Secondary-upper

6 = Vocational Training

7 = Bachelor

8 = Master

9 = Ph.D.

The educational attainment data in table 10 shows that the farmer household head has, on average, attained at least elementary-lower level of education while the non-farmer household head has, on average, attained at least elementary-upper level of education. The average educational level of the total sample data is higher than elementary-upper level.

In conclusion, farmer household has larger family size than average household, smaller monthly income than average household, and lower educational level than the head of average household. On the other hand, non-farmer household has smaller family size than average household, larger monthly income than average household, and higher educational level than the head of average household.

Corresponding to our theoretical model in the previous section, we are also interested in other socio-economic variables of each household. These include the amount monthly income in terms of pension and welfare that the household receives

from the government and employers and the amount of investment each household

has. The pension and welfare variable is the summation of monthly income in terms

of: a) pension, annuities, or welfare, b) worker compensation or terminated payment,

c) assistance from other persons outside the household, d) social pension for the

elderly, and e) assistance from government and other agencies. The amount of

investment is used to control for the ability to access to other investment in capital

markets. This variable is named investment and includes: a) income from renting real

estate property, b) interest income from bank and other financial institutions, c)

interest income from government bonds, and d) dividend from stocks and other

investments. We also control for the investment in human capital, which we use the

educational expense for each child of the household. The mean of all these socio-

economic variables for farmer and non-farmer households are presented in table 11.

Table 11 Socio-economic Variables by Occupation

Occupation	Pension & Welfare	Investment	Educational Expense
Non-farmer	1,931.55	138.15	318.78
Farmer	1,097.88	33.67	123.46
Total	1,670.59	104.22	257.64

From table 11, non-farmer households received almost twice as much

pension and welfare income than farmer household. The farmer household receives

smaller income in terms of pension and welfare compared to the average household.

The farmer household also generates smaller income from investment in the capital

markets than non-farmer household and average household.

Table 12 shows the correlation of all aforementioned household characteristics

variables and socio-economic variables for this sample data.

Table 12 Correlation Analysis

	Family Size	Occupation	Income	Education	Pension & Welfare	Investment	Educational Expense
Family Size	1						
Occupation	0.1602	1					
Income	-0.2326	-0.2166	1				
Education	-0.1339	-0.2972	0.4174	1			
Pension & Welfare	-0.0176	-0.0727	0.2548	0.1241	1		
Investment	-0.0037	-0.0385	0.1738	0.1025	0.0614	1	
Educational Expense	-0.171	-0.1139	0.1046	0.2019	0.0993	0.06	1

Occupation is defined as 1 if the household head is defined as farmer, and as 0 if the household head is defined as non-farmer. The occupation has a positive correlation with the family size, corresponding to the average data that the farmer household has larger family size on average. Income, educational level, pension&welfare, investment, and educational expense variables are all negatively correlated with the family size. Thus, households with higher income, higher educational level, larger pension&welfare income, larger investment, and larger educational expense, tend to have smaller family size.

We perform regression analysis on this sample data and attain the following regression result:

Table 13 Regression Result

Source	SS	df	MS		Number of obs	31865
					F(6, 31858)	4189.38
Model	39248.7376	6	6541.4562		Prob > F	0
Residual	49744.277	31858	1.56143753		R-squared	0.4410
					Adj R-squared	0.4409
Total	88993.014	31864	2.79290152		Root MSE	1.2496
Family Size	Coefficient	Std. Err.	t	P>t	[95% Confidence interval]	
Occupation	0.2154	.0163778	13.15	<0.0001	0.1833	0.2475
Income	-0.1045	.0113992	-9.16	<0.0001	-0.1268	-0.0821
Education	-0.0386	.0045824	-8.43	<0.0001	-0.0476	-0.0297
Pension&welfare	-0.0186	.0020263	-9.19	<0.0001	-0.0226	-0.0146
Educational Expense	-0.3071	.0023753	-129.29	<0.0001	-0.3024	-0.3118
Investment	-0.1030	.0041257	-24.97	<0.0001	-0.1111	-0.0949
Constant	5.2626	.0852442	61.74	<0.0001	5.0956	5.4297

The family size is the dependent variable in this regression model. All six independent variables—occupation, income, education, pension & welfare, educational expense, and investment—are statistically significant at lower than 0.01% significance level and can explain the dependent variable with the explanatory power of 44%. Only occupation variable has a positive parameter estimate, which is consistent with our assumption and the average data that the farmer household tends to have larger family size. Income variable has a negative parameter estimate, meaning that household with larger monthly income tend to have smaller family size. Educational attainment of the household head also has a negative parameter estimate, which support our theoretical model that an individual with higher education level will tend to have smaller number of children. The positive coefficient of pension and welfare variable also confirms our theoretical result that household with larger amount of pension and welfare income will tend to have smaller number of children because they have a source of retirement protection other than relying on their own children at retirement. The evidence of investment accessibility is also found in support of our theoretical model conclusion by the negative parameter estimate of investment variable. This means that household with larger investment income, or

those who have better access to an investment in the capital markets tend to have smaller family size. Moreover, the result of educational expense variable confirms our theoretical model result that the household that spends more in human capital investment in children will tend to have smaller number of children, which is the tradeoff between quantity and quality of children.

6. Policy Implications: Poverty Reduction Programs in Thailand

The theoretical results and empirical evidence that support the endogenous fertility behavior of Thai farmers reveals the other dimension for the Thai government regarding the effort in poverty reduction programs for Thai farmers. In Thailand, it has been long believed that the contraceptive programs that lead to lower fertility level among Thai farmers could partly reduces poverty problem among Thai farmers by lowering the child support expense for farmer household. However, the statistics in our data section shows that family size of farmers is larger than that of non-farmer on average. Furthermore, average monthly income of farmers is less than that of non-farmers. That is, the effort to reduce family size alone may not be effective enough to reduce poverty level among Thai farmers. The Thai government has launched other poverty reduction programs for Thai farmers; for example, the Farmers Assistance program, the One Tambon One Product (OTOP) program, Thai Village Fund Program, and Asset Capitalization Program.

6.1. Farmers' Debt Suspension Program

With the Bank for Agriculture and Agricultural Cooperatives' (BAAC) cooperation, the government launched a three-year moratorium on farmers' debt with the intention to reform the debt structure and maturity profile of the agricultural sector to match the crop production cycle. The debt relief or suspension program allowed

Thai farmers to stop loan principal and interest repayment for a period of three year. Farmers who are eligible under this program must have the outstanding loan amount lower than 100,000 baht (USD 2,500) and must never have had a legal action taken against them. The Thai government agreed to compensate BAAC for all lost interest payments during the three-year period. Farmers who choose to participate in the farmer's debt suspension program are now allowed to take out new loans from BAAC. Also, farmers who pay off the loan during the three-year period will be upgraded to a better credit rating category.

6.2. One Tambon One Product Program

Farmers, the majority of Thai people suffer from farmers' product price fluctuation. Most Thai farmers borrow money from non-bank lender at high interest rates that they cannot afford to repay and are trapped in a lifelong cycle of indebtness. Some farmers traditionally supplement their income by producing local crafts, but because their local markets were limited, so were the growth prospects for these local craft products. For decades, Her Majesty has arranged for instructors to help villagers improve the quality of their products. Having achieved the necessary skill levels to produce qualified products, the villagers were then able to sell their products to Her Majesty. The project has continued to expand and later became the Supplementary Occupations and Related Techniques (SUPPORT) Foundation. Inspired by the Queen's SUPPORT Foundation project and the One Village One Product program that originated in Japan, the OTOP program was set up in 2001. The main objective is to draw upon the existing local knowledge and ingenuity of Thai villages, regions, and the nations at large. The program makes sure that entrepreneurs receive technical assistance and advice to enable them to produce products more efficiently

and at higher quality. The program also assists them in marketing their products throughout the country and around the world.

6.3 Thai Village Fund Program

Microcredit or microfinance program has been proved to be a successful scheme in providing capital for sustainable career development for the poor. An example of the success stores is Bangladesh Grameen Bank that was originated as the microcredit facility for the poor who have no access to bank loan. The Thai Village Fund was founded in February 2001 as one of the poverty reduction programs supported by the Thai government with the main objective of providing sources of financing to farmers to be used for developing new occupational activities and generating income. The Thai government set out the budget of 1 million baht (USD 25,000) for each village participating in the program. There were about 76,000 targeted villages, resulting in the total fund of 76,000 million baht (USD 1.9 billion).

6.4 Asset Capitalization Program

The asset capitalization program was set up in 2003 to expand channels for the poor to access to capital through formalizing lesser forms of property rights used by the marginalized economic group in the rural sector. The types of assets covered under the this program and can be used as collateral for loan application are land and property, leasing and hire-purchasing contracts, permits to utilize public lands and other licenses or permits, intellectual property, and machines. For example, under the asset capitalization scheme, the SME bank would accept intellectual properties as collateral for loans of 50,000-5,000,000 baht per borrower.

All of these program aim to provide the poor, including farmers, with additional financing resources to be used for career development and generate additional income. Although these programs have partly helped the poor to have

better access to capital, they were criticized to either distort the saving and spending behaviors or worsen the indebtness of farmers. The farmers' debt suspension program has been criticized the most for the potential distortion consequence on farmers' behaviors. When the government interferes the loan payments from farmers to the bank, even with good intention, it is highly likely to distort prudent agricultural lending activities. Not only that the banks' willingness to approve new loans to farmers will be lower, but the farmers' willingness to repay the loan will also be lower. The market distortions may have a long-term effect on financial services market for farmers. Other programs are also blamed to be a reason of increasing debt levels among Thai farmers. The article published by the Bank of Thailand in 2005 has described that the lending activities among the poor have been distorted through the government poverty reduction programs. The statistics shows that the issued farmers' loan of Bank for Agriculture and Agricultural Cooperatives (BAAC) increased from 169.6 billion baht in 1996 to 356.7 billion baht in 2004[1]. Moreover, the amount of issued loan by specialized financial institutions, as a percentage of GDP, also increased from 12.2 percent in 1996 to 18.1 percent in 2004[2]. The specialized financial institutions include the Government Savings Bank, the Government Housing Bank, Bank for Agriculture and Agricultural Cooperatives, the Export-Import Bank of Thailand, and SME Bank. Ever since the economic crisis in 1997, commercial banks, which was the main source of financing in Thailand, have suffered a huge increase in non-performing loan (NPL) and have reduced their credit exposures. As a result, the government has strongly supported the existing specialized financial institution and the establishment of new specialized financial

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[1] Data Bank, the Bank of Thailand

[2] Special Report on Specialized Financial Institutions in Thailand (2005)

institutions to act as supplemental creditors for the poor and farmers in the rural areas. However, an easy access to capital and a farmers' debt suspension program provided under the government policy together lead to a misunderstanding among farmers that it is the government, not the borrower, who has to be responsible to the improper loan repayments. This misunderstanding may lead to a long-term effect of increasing debt level among farmers, increasing percentage of non-performing loan among specialized financial institutions, and lowering the stability of financial markets in the country.

One important aspect from all these poverty reduction programs under the government policy is that they all tend to accelerate borrowing and spending activities among farmers, without a saving incentive element. This means that none of the existing poverty reduction program takes into account the longevity risk, the risk of outliving resources during retirement years, among farmers. The theoretical results in section 3 and supporting empirical evidence in section 5 show that without retirement program, the farmer households tend to have more children as a retirement protection scheme. Consequently, family households tend to fall into poverty trap. Thus, the poverty reduction programs under the current effort of the government may not lead to an effective result as long as there is no retirement program for farmers.

7. Policy Alternatives: Farmers' Retirement or Saving Programs in Other Countries

The main objective of farmers' retirement programs is to encourage farmers to save during the working years for retirement years. Since farmers' incomes vary with market conditions, some farmer assistance programs also include an incentive for farmers to save for low production years. This section explores into alternatives for

farmers' retirement and saving programs that could possibly be implemented as retirement and saving schemes for Thai farmers.

7.1 Canadian Agricultural Income Stabilization (CAIS) program

The most cited retirement program for farmers is the Canadian National Stabilization Individual Account (NISA), which was later replaced by the Canadian Agricultural Income Stabilization (CAIS) program in 2003. The NISA program was implemented in Canada in 1991. The government matched up the deposits by farmers up to 3 percent of eligible net sales, which is the gross sales of qualifying commodities less purchases of seeds, plants, and livestock. In addition, the government pays a 3 percent interest rate bonus over local bank rates on all farmers' deposits. Withdrawals from NISA account can be made under two conditions: when current year gross margin falls below the farmer's average for up to previous five years or when farmer's current net income from all sources falls below a threshold level plus a matchable deposit. Account balances may not exceed 150 percent of the farm's five year average sales. Unlike social security program, NISA is not a mandatory program. Farmers can voluntarily leave or rejoin the program, but are required to leave the program if they quit farming or retire. More than half of Canadian farmers participate in NISA program. Most farmers deposit only enough money to earn maximum matching government contribution. Moreover, some farmers do not withdraw as much money as expected during low income years because they prefer to manage income variability by other means than cutting off government matching benefits on accumulated account balances.

Nevertheless, Canada still needed to provide other farmers' income support program like subsidized insurance and supplemental disaster assistance program. In 2003, Canada replaced NISA program with CAIS program. With an additional

provision of disaster assistance, CAIS program contains both income stabilization and risk management features. However, unlike NISA program, CAIS is not an accumulation program. Instead, CAIS is a five year program that pays benefits to farmers if farming is worse compared to a benchmark from previous years, called reference margin. Therefore, CAIS program is more like a risk management scheme, protecting farmers against variation in farm income in a given year. The amount of benefits depends on the level of protection a farmer chooses.

7.2 US Farm and Ranch Risk Management (FARRM) Account

The US Farm and Ranch Risk Management (FARRM) account allows farmers to spread above-average income to prior tax years and avoid being pushed into a higher tax bracket. The objective of the FARRM account is to encourage farmers to save during high income years as a reserve to be drawn on during low income years. Withdrawals from FARRM accounts are made at the farmer's discretion and are taxable in years. The FARRM Act allows farmers to deposit up to 20% of their annual farming income into taxed-deferred account. The money can be left in the account for up to five years without being taxed until it is withdrawn. Unlike Canadian NISA program, there are no price or income triggers. Farmers can make withdrawals whenever they want. Thus, there is no assurance that farmer withdrawals will be used as the farmer's safety net during bad years. Since FARRM scheme uses tax deferral incentives, high tax bracket farmers receive greater benefits and incentives to save.

7.3 European Union Early Retirement Scheme

The Early retirement scheme in European Union countries started in 2000 as a scheme to encourage farmers aged between 55 to 66 to retire from farming and transfer their land to a younger generation. Farmers who retire qualify for a pension

with the basic rate of 5,403 euro. A sum of 338 euro per hectare of Utilizable Agricultural Area (UAA) up to a maximum of 24 hectares may also be paid with the maximum payment under the scheme of 13,515 euro per year. The benefit is payable for 10 years or up to the age of 70.

7.4 Japanese Farmer's Pension Fund

This fund is established to provide farmers with retirement income protection and smooth inter-generational transfers of farmer businesses. To be eligible to join the fund, the farmers must cultivate at least 0.5 hectares. The revision of the Farmer's Pension Fund Law in 1996 allows anyone who does not have their own farmland can be enrolled in the pension scheme if they conclude Family Business Agreements and meet certain pension scheme requirements including that they are engaged in farm management. Later in 2002, anyone who participates in the National Pension primary group insured, engages in agriculture and is under the age 60, also qualifies for the Farmer's Pension Fund.

7.5 Australian Retirement Assistance to Farmers

The Retirement Assistance for Farmers Scheme was implemented in Australia in 1997 to provide low income farmers or old age farmers with the opportunity to transfer their farms to the younger generation without having their pension entitlement affected by the Age Pension gifting provisions. The 1996 census[3] shows that approximately 13,307 farmers or farm managers out of 200,000 identified farmers or farm managers, aged 60 years or over were earning less than the age pension. In 1996, the government thus constituted the Special Rural Task Force to study the effect of social security program on farmers. The Task Force found that farmers were unable to transfer the farm to a younger generation because they could

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[3] Bills Digest No.2000-01, Parliament of Australia

be precluded from the pension for five years. As a result, the Task Force recommended a temporary exemption from the disposal provisions when the farms are transferred to the children to ease the transfer of the farm. Afterwards, the government also set up the Agricultural Advancing Australia (AAA) package, which provides both incentives for farm adjustment to ensure an efficient and competitive farm market and a welfare safety net for farmers. Farmers and their spouses who are eligible for the program receive age pension five years earlier than they would have if the scheme did not exist. To be eligible for the program, the farmer must have owned his/her land for at least 15 years and have an average total income for the three financial years before farm transfer equal to or less than the Age pension rate. However, there is an increasing likelihood that the nest generation does not want to farm.

8. Policy Options for Thai Farmers

Like farmers in other countries, the Farmers in Thailand are facing with income variability and risk of disaster. The current farmer assistance programs focus more on providing the farmers with easy access to capital. All these programs provide incentives for farmer to increase lending and spending activities among farmers. When farmers have difficulty repaying the outstanding loan, the government intervention through farmers' suspension program makes the financial market for farmers even worse by distorting loan repayment behaviors among farmers. Additionally, Thai farmers are not covered under the Thai Social Security program and there is no other program providing saving incentives for farmers. As a result, the current statistics show that Thai farmers' debt levels have increase in the past few years as a result of current farmer assistance programs. If nothing has been changed

in the current government policy for farmer assistance, this could lead to a negative long-term effect on farmer's poverty trap problem shown in the theoretical result and empirical evidence sections. Farmers in Thailand are not only facing poverty trap problem, but they are also working beyond their retirement ages to maintain the household income levels and living standards. Farmer household earn income from both farm and off-farm income. The composition of farmer households' sources of income also varies with farm type. Moreover, the nature of farm business causes farmer households to have different savings habits than most other households. Thus, saving and retirement planning affected by savings and retirement policies are of considerable importance to farmer households.

To alleviate the poverty problem among farmers, retirement and saving schemes can play a very important role.   The appropriate program for Thai farmers should provide both income stabilization protection and risk management scheme. To provide the retirement saving incentives, the government should consider old Canadian NISA account or the US FARRM account. The income stabilization part of the program for Thai farmer should provide a combination of tax-deferred and matching deposit by the government to the special farmer account. The withdrawal of money under the program should also work under an income trigger to make sure that the participants will withdraw the money only for their bad years and/or retirement years. The risk management scheme should include disaster assistance portion similar to what provided under the CAIS program. Additional savings under this scheme represent a form of self-insurance on the asset side for farmers in contrast to an increased crop insurance premium on the expense side. Policy design should aim to induce farmers to reply more on their own safety nets, and reduce farmers' reliance on ad hoc government subsidized crop insurance program. Greater deposits into rural

financial institutions will also strengthen the rural communities. Increasing rural deposits will also lead to a greater level of rural lending.

9. Conclusion

This article theoretically proves that poverty problem could be explained through a life cycle model considering net savings during the working years and inter-generational transfer and retirement income during the retirement years. Net saving during the working years is the net amount of revenue after taking into account consumption expenses, investment in children, and investment for retirement. Because the farmers in Thailand are not covered under the social security program, they will have to rely more on inter-generational transfer from their children during retirement years. As a result, farmers tend to have larger family size to serve as a retirement income protection. The empirical evidence also supports this finding. The larger family size can be observed among households with larger monthly income, individual with lower education level, households with smaller amount of pension and welfare income, household with smaller investment income, and households with smaller spending in human capital investment in children.

Current government policies for farmer assistance are focusing more on providing access to capital for farmers; thus, it encourages lending activities among farmers without saving incentives. Without saving incentives for retirement, farmers will wind up under the poverty trap. Saving incentives either for bad years or for retirement year is an important risk management scheme for farmers. It can help farmers better manage their risks and create a more effective self-help safety net. As savings increase, farmers' investment portfolio becomes more diversified and financial risk protection for farmer increases. This article reviews policy alternatives

to search for an appropriate risk management scheme for Thai farmers.   The

recommendation is that the government should revise current policy for farmer

assistance to include saving and risk management elements. Once the saving and risk

management scheme are put in place, Thai farmers can rely more on their own built

safety net than on the government budget. The program with saving incentives will

also strengthen rural communities and rural financial markets by increasing the

deposit amounts from farmers

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