SCHOOL OF STATISCS
UNIVERSITY OF THE PHILIPPINES DILIMAN

WORKING PAPER SERIES

To One Hundred Million and Beyond:
Population Management should be mainstreamed in the Philippine Development Agenda

by

Dennis S. Mapa, Arsenio M. Balisacan, Sharon Faye Piza and Jose Rowell T. Corpuz

UPSS Working Paper No. 2014-01
January 2014

School of Statistics
Ramon Magsaysay Avenue
U.P. Diliman, Quezon City
Telefax: 928-08-81
Email: updstat@yahoo.com

To One Hundred Million and Beyond: Population Management should be mainstreamed in the Philippine Development Agenda[1]

Dennis S. Mapa[2], Arsenio M. Balisacan[3], Sharon Faye Piza[4] and Jose Rowell T. Corpuz[5]

ABSTRACT

The population-and-development orthodoxy, or the positive influence of a rapid fertility decline on the long term economic growth prospects of a country, is a widely recognized phenomenon and is seen to explain a significant portion of the high economic growth experienced by East Asian economies starting in the 1960s. However, in the Philippines the debate on the link between population and development continues to be contentious largely due to the hard line stance of the Catholic hierarchy on the matter, such as espousing only the natural family planning method and maintaining its traditional stance against modern family planning methods. While the on-going debate at the Philippines' Supreme Court continues to drag on the implementation of the Reproductive Health (RH) Law, seen by many as an institutional reform that will help slow down the country's population growth, the impact of a rapidly growing population, expected to reach 100 million in 2014, on poverty continues to drive more Filipinos into misery. The core idea which links population and development is the demographic transition. As countries move from large families (high fertility rate) into small families (low fertility rate), they pass through what is called a *Goldilocks period,* described as a generation or two in which fertility rate is neither too high nor too low. Advocates of accelerating the demographic transition have placed emphasis on the need for public efforts to heighten voluntary reduction in fertility rates. Thus, there is a need to influence public policies that play an important role in assisting the population, particularly poor households, in achieving a voluntary reduction in fertility rates. From the experiences of our neighbors in East Asia, are there policy lessons that we can learn to harvest quickly this demographic *dividend*? Which government policies succeeded in bringing down fertility rate to accelerate the demographic transition? Given the unique position of the Philippines (i.e., the highly influential Catholic Church's very strong

---

[1] This article is from the study "Can Population Management be Mainstreamed in the Philippine Development Agenda" funded by the Philippine Center for Population and Development (PCPD)

[2]Associate Professor and Director for Research, School of Statistics and Affiliate Associate Professor, School of Economics, University of the Philippines Diliman, Quezon City. Email: csmapa@up.edu.ph, cdsmapa@yahoo.com.

[3]Secretary, National Economic and Development Authority (NEDA), Pasig City and Professor (on secondment), School of Economics, University of the Philippines Diliman, Quezon City.

[4] Consultant, Asian Development Bank (ADB), Pasig City.

[5]Postgraduate Student, The University of Warwick, United Kingdom.

resistance to proposals for population management), are there alternative, albeit second-best, strategies available (acceptable to the Catholic hierarchy and other critics) that will help achieve the same objective of speeding up the demographic transition? These are the questions that will be answered by this paper.

I. Introduction

Rapid population growth in the Philippines over the last several decades has hindered the country's economic development. For the period 2000 to 2010, the Philippines had one of the highest population growth rates (at 1.90 percent)in the Southeast Asian region and the second largest population (more than 92 million in 2010), next only to Indonesia. According to the Population Commission (POPCOM), the country's population will hit 100 million in the latter part of 2014.It is therefore comes as no surprise that in 2012, about 25 percent of the country's population equivalent to about 23.7 million, were living below the poverty line (NSCB, 2013).

The core idea which links population and economic growth is demographic transition, described as a change from a situation of high fertility and high mortality to one of low fertility and low mortality. A country that enters into a demographic transition experiences sizable changes in the age distribution of the population. These changes affect economic growth.

Demographic transition has three phases, each phase having a different impact on the economy. Phase one is triggered by an initial decline in infant mortality but fertility remains high, resulting in the swelling of the youth dependency group as well as demand for basic education, primary health care, and other population-related services. This phase creates a big challenge to the economy as scarce development resources are funneled to consumption rather investment, thereby hindering economic growth. It should be noted that the Philippines has been stuck at the first phase of the demographic transition for the last 50 years. In the second phase of the transition, these "baby boomers" enter the adult labor market (some 20 years later) and if the market is able to absorb them, they can accelerate the phase of economic growth. This is the phase when the proportion of working-age population is highest and the age dependency ratio or the ratio of young dependents (0 to 14 years) and elderly (65 years and above) over the working age (15 to 64 years) is lowest. Examples of East Asian countries that are currently in the second phase of the demographic transition are Thailand, Singapore, Taiwan and South Korea. The third and last phase of the transition is when the elderly cohort (those aged 65 years and above) swells relative to the total population. An example of a country currently at the third phase of the demographic transition is Japan.

Unlike most of its Southeast and East Asian neighbors, the Philippines failed to achieve a similar demographic transition in the past three decades. All of these countries' (including the Philippines) mortality rates broadly declined at similar rates. In the Philippines, however, fertility rates dipped slowly; so while population growth rates substantially dropped to below 2 percent a year in other countries (such as Thailand, Indonesia, and Vietnam), the Philippines' high population growth rate of more than 2 percent per year hardly changed.

Studies have shown [Bloom and Williamson (1997), Bloom and Canning (2001), Bloom, Canning and Sevilla (2001) and Radelet, Sachs and Lee (1997)] that demographic transition accounts for a sizeable portion (about one-third) of the economic growth experienced by East Asia's economic "tigers" during the period 1965 to 1990.

First Demographic Dividend

The effect of the demographic transition on income growth is known as the first demographic dividend. In the course of the demographic transition, countries experience an increasing share of the working age population relative to the total population and this creates favorable effects on the per capita income. To measure the impact of the demographic transition on income growth in the Philippines, Mapa and Balisacan (2004)[6], using cross-country data from 80 countries over the period 1975 to 2000, showed that the difference in the population structure of Thailand (currently at the second phase of the demographic transition) and the Philippines (currently at the first phase of the demographic transition) accounts for about 0.77 percentage point of forgone average annual growth (missed first dividend) for the Philippines from 1975 to 2000. This forgone growth accumulates to about 22 percent of the average income per person in the year 2000. It is even more impressive when translated into monetary values. It would have meant that rather than a per capita GDP of US$993 for the year 2000, Filipinos would have gotten US$1,210 instead. Moreover, poverty incidence would have been reduced by about 3.6 million. Fewer Filipinos would have been counted among the poor by the year 2000.

In the follow-up study of Mapa, Balisacan and Briones (2006)[7], using Philippine provincial data from 1985 to 2003, the authors showed that a one-percentage point increase in the proportion of young dependents in 1985 (proxy for the demographic transition variable) results in an estimated 9 basis points decrease on the average growth rate of income per person in the provinces from 1985 to 2003, all things being the same. This shows that had the provincial average proportion of young dependents in

[6]Funded by the Philippine Center for Population and Development (PCPD).
[7]Funded by PCPD.

1985 been lower at 36 percent (which is the average for the lowest 10 provinces) rather than a high of 42 percent, average per capita income growth could have risen by 0.63 percentage-points per year, representing an increase of 7.12% in the average per capita income in 2003.

Second Demographic Dividend

Mason (2007) discusses another form of dividend resulting from the demographic transition and refers to it as the second demographic dividend. The *second demographic dividend* results from the society's response to the prospect of an aging population, an outcome as the nation's age structure enters into the third phase of the demographic transition. The challenge faced by societies (and governments) when there is a substantial percentage of the elderly population is how to support their consumption, given a reduction in their income. There are common approaches to this problem. These include: (a) relying on public (or familial) transfer systems and (b) increasing saving rates and accumulating greater physical wealth or capital. Individuals accumulate savings in their working years and this serves as a buffer during the retirement years. While accumulation of capital can be used to deal with the life-cycle deficit in the older ages, this capital also influences economic growth. As Mason points out, increased saving rate in a society results in more rapid economic growth, creating the second demographic dividend. Mason estimated that the first and second demographic dividends account for 37.7% of the yearly average per capita growth rate of Japan from 1950 to 1980.

Thiscurrent study uses household data from various surveys, such as the National Demographic and Health Surveys (NDHS) and the Family Income and Expenditure Surveys (FIES)to determine the impact of the mainstream policy variables, such as investment in health, education, and women's welfare, on fertility rate.In particular, the paper seeks to quantify the effectof investment in health, investment in education, and labor force participation of women, on fertility rate.

II. Speeding up the Demographic Transition

The effects of rapid population growth (or high fertility level) on economic growth and poverty have been carefully studied, documented and quantified by researchers and the results point generally to the same conclusion: rapid population growth in poor and developing countries hinders economic development, pushing the next generation into the poverty trap. The Philippines appears to be the only country in Asia, and perhaps one of the few in the world, where the population issue remains controversial to this day.

The main policy issue that should be addressed immediately is how to harvest the demographic dividend quickly. Advocates of speeding the demographic transition placed emphasis on the need for public effort to accelerate voluntary reduction in fertility rates. Sachs (2008) pointed out that *"demographic transitions, where they have occurred, have typically been accelerated and even triggered, by proactive government policies."* Thus, there is a need to craft public policies that can engender voluntary reduction in fertility rates, including unwanted fertility, particularly among poor households. Unwanted fertility alone contributes about 16% of the future population growth (Herrin and Costello, 1996).

The Goldilocks Period and High Economic Growth

As countries move from large families (high fertility rate) and high poverty into small families (low fertility), high living standards and ageing, they pass through what is called a ***Goldilocks period***: a generation or two in which fertility rate is neither too high nor too low (The Economist, 2009). This fertility rate consistent with stable population is about 2.1, also known as the replacement rate of fertility. The fall to replacement fertility is a unique and precious opportunity for higher economic growth. The figures in Table 1 show the Total Fertility Rates (TFR) for selected countries in East Asia from the period 1960 to 2006. The table shows rich countries that have gone through, and poor countries racing through the demographic transition and achieving the replacement fertility rate of 2.1: Singapore in the mid-1970s, South Korea in mid-1980s, Thailand in 1990, Vietnam and Myanmar in 2006. It is interesting to note that only three (3) countries in the table have TFRs of more than 3.0 in 2006: the Philippines (3.30), Lao PDR (3.29) and Cambodia (3.27). Moreover, Lao PDR and Cambodia have reduced their TFR much faster than the Philippines, having TFRs of about 6 during the 1990s compared to the Philippines' TFR of 4.31. It would be disheartening to see that years down the road, Lao PDR and Cambodia will enjoy the dividend associated with the demographic transition and transform their economies to the level that will improve the lives of millions of their citizens, while the Philippines continues to languish in the high population growth-high poverty incidence trap.

Table 1.Total Fertility Rate (TFR*) for Selected East Asian Countries

Country	Year					
	1960	1970	1980	1990	2000	2006
South Korea	5.67	4.53	2.83	1.59	1.47	1.13
ASEAN 5						
Singapore	5.45	3.09	1.74	1.87	1.44	1.26
Thailand	6.40	5.33	3.21	2.11	1.86	1.85
Indonesia	5.52	5.35	4.36	3.10	2.42	2.23
Malaysia	6.81	5.47	4.21	3.68	2.96	2.65
Philippines	6.96	6.20	5.17	4.31	3.62	3.30
Rest of SE Asia						
Vietnam	6.05	5.89	4.97	3.62	1.90	2.08
Myanmar	6.06	5.98	4.54	3.38	2.41	2.10
Brunei Darussalam	6.83	5.62	4.04	3.20	2.58	2.34
Cambodia	6.29	5.81	5.84	5.73	3.96	3.27
Lao PDR	6.42	6.42	6.41	6.08	4.03	3.29

*TFR is the average number of children a woman would bear during her lifetime given current age-specific fertility rates

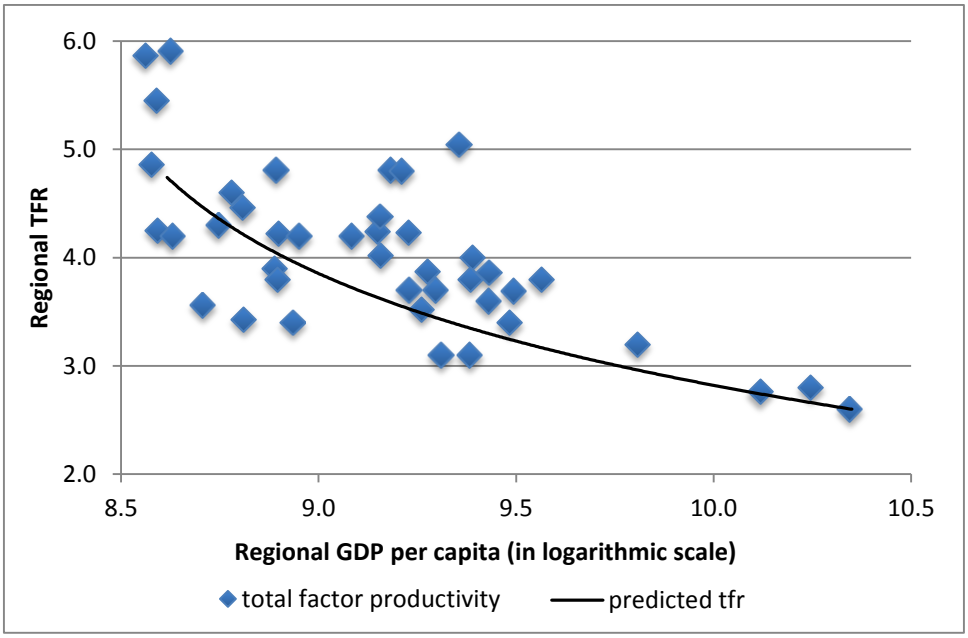
Are we there yet?

The current strategy of reducing total fertility rate by relying on the Natural Family Planning (NFP) methods clearly will not bring us to the ***Goldilocks period*** at a faster pace. The former Health Secretary Esperanza Cabral realized this when she acknowledged that *"even as population growth is coming down, it is not coming down at the rate necessary to improve the socioeconomic status of the country."*(Philippine Daily Inquirer, 2010)

The slow pace by which the total fertility rate has been reduced, (from 6.96 in 1960 to 3.30 in 2006), a measly 1.6 percent per year, can be attributed to a lack of concrete and proactive government policies on population management aimed at accelerating the demographic transition. What then will the TFR of the country be in the future under the same set of policies (e.g., leaning towards the use of the natural family planning methods)? When do we achieve the *Goldilocks period* that is conducive for higher economic growth under the status quo?

An essential variable that determines fertility rate is income. It has been observed that as the income of the household increases, the fertility rate tends to decrease. Figure 2 shows the relationship between regional per capita income (in natural logarithm) and the regional total fertility rates from 1993 to 2006. The TFR regional data is generated from the National Demographic and Health Survey (NDHS) while the regional per capita income came from the Regional Gross Domestic Product (RGDP) report of the National Statistical Coordination Board (NSCB). The figure shows that as the income of the region increases, the TFR decreases. It should be noted that no region has reach a TFR of 2.1.

Figure 1.Relationship between TFR and per capita GDP by Philippine regions (1993-2006)



Using the relationship between per capita income and TFR, Mapa, Lucagbo and Ignacio (2010) built an econometric model to determine the effect of income on TFR, controlling for other factors such as education of the household head and labor force participation of women, among others. The study shows that increasing per capita income by one percent reduces TFR by 0.025 per year. Using the results of the study, simulation analysis was done to plot the path of the country's TFR under two scenarios.

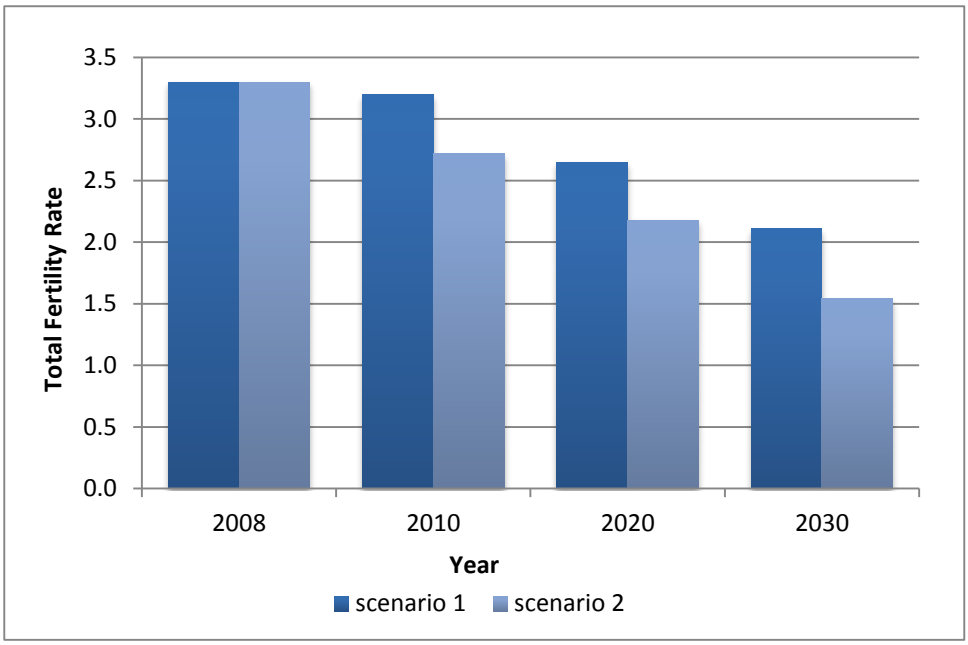
Scenario 1 is the business as usual scenario where TFR is reduced mainly as a result of increasing income. This scenario assumes that the country's GDP is growing at an average of 4 percent per year (and thus per capita GDP is growing at 2 percent per year, net of the population growth of about 2 percent per year).

Scenario 2 assumes the same average income growth of 4 percent plus government intervention to relieve the population pressure from unwanted fertility, estimated to

account for 16 percent of the future population growth. To be more realistic, scenario 2 further assumes that only 90 percent of the households with unwanted fertility will be covered by the government program.

The current and future TFRs under these two scenarios are presented in Figure 3. Using the 2008 TFR of 3.3 as base value, in the business as usual scenario 1, the *Goldilocks period* will be reached by 2030, or twenty years from now. In the second scenario where government intervention targets only households with unwanted fertility, the *Goldilocks period* will be achieved 10 years early or in about 2020.

Figure 2. Total Fertility Rates under Two Scenarios



The same simulation exercise was made for the poorest 40 percent of the households, where the TFRs are high. In 2008 for example, while the overall TFR of the country was 3.30, the TFR of the poorest 20 percent (or the bottom quintile) was at 5.20 and the second quintile at 4.20. The values in Table 2 show that, under the status quo, the households in the bottom quintile will not experience the *Goldilocks period* in this generation. The TFR of the poorest 20 percent of the households 30 years from now (or in 2040) will be at 3.47. This estimated TFR in 2040 will still be higher than the recorded TFR of Thailand in 1980 at 3.21.

Table 2.Total fertility rates of the second and bottom quintile under two scenarios

Scenario	2008	2010	2020	2030	2040
Second quintile					
Scenario 1	4.20	4.09	3.55	3.01	2.47
Scenario 2	4.20	3.16	2.62	2.07	1.53
Bottom quintile					
Scenario 1	5.20	5.10	4.55	4.01	3.47
Scenario 2	5.20	3.93	3.39	2.85	2.31

Under scenario 2 where government intervenes through proactive population management policies, the TFR of the poorest 20 percent will be at a manageable level of 2.31 by the year 2040.

For households in the second quintile, the TFR will still be at 2.47 in year 2040 under the status quo, while the *Goldilocks period* will be achieved earlier in year 2030 when the TFR for this group is projected to be at 2.07.

III. Alternative Drivers in Reducing Fertility Rate

Reproductive Health (RH) Law

There is an urgent need to address the country's bourgeoning population and bring down the fertility rate to a level that is conducive to higher economic growth. Policy makers must tackle head-on the country's rapid population growth though proactive government policies, such as the Reproductive Health (RH) Law. The failure to implement the provisions of the law because of the restraining order from the country's Supreme Court is very unfortunate because the damage that a rapid population growth will bring to this generation and the next is irreversible. However, given the realities of the political dynamics in the country—in particular, the perceived influence of the Catholic Church on the electorate—it may take some time before policy makers can implement initiatives that will directly decrease fertility rate, a policy that the Catholic hierarchy vehemently opposes.

There are several factors that will influence the future population growth in the Philippines. Herrin and Costello (1996) identified three possible sources of future population growth (estimated at 1.90 percent per year from 2000 to 2010): (a) unwanted fertility, (b) wanted fertility and (c) population momentum. Their estimates show that unwanted fertility will contribute about 16 percent to the future population growth; wanted fertility will add another 19 percent; and population momentum will contribute the remaining 65 percent.[8]

While unwanted fertility accounts for only 16 percent of the future population growth, a government intervention, in the spirit of the RH Law, can have significant impact in lowering the country's overall fertility rate, particularly the fertility rate of the poorest 20 percent of the country's population, where the number is still high. Simulations made by Mapa, Balisacan and Corpuz (2010) showed that, using the 2008 Total Fertility Rate (TFR) of 3.3 as base value, the *Goldilocks period* (TFR of 2.1) will be reached by 2030 under the business–as–usual scenario. In another (second) scenario where government intervention (e.g., provision in the Reproductive HealthLaw) targets only households

[8] Births are considered unwanted if they occur after a woman has reached the point at which she does not wish to continue child bearing. All other births, including those that are mistimed will be considered wanted. Population Momentum refers to the tendency for population growth to continue beyond the time that replacement-level fertility has been achieved because of a relatively high concentration of people in the childbearing years. This phenomenon is due to past high fertility rates which result in a large number of young people. As these youth grow older and move through the reproductive ages, the greater number of births will exceed the number of deaths in the older populations (World Bank). Population momentum is relevant to the Philippines given that its population is composed mostly of young individuals (median age is between 23 to 25 years).

with unwanted fertility and with a 90 percent success rate, the *Goldilocks period* will be achieved 10 years earlier or in about 2020.

Moreover, the TFR of the poorest 20 percent of the households will still be at a high of 3.5 by 2040 if the government does not intervene. Under the second scenario where government intervenes through proactive population management policies, the TFR of the poorest 20 percent will be at a manageable level of 2.3 by the year 2040.

While there is a pressing need to identify policies that will reduce or better yet eliminate unwanted fertility to speed up the demographic transition, it is also important to come up with a set of possible second-best policy options that will help lower the fertility rate, targeting the effects of wanted fertility (e.g., encouraging households to reduce family size) and the population momentum. It should be noted that wanted fertility and population momentum contribute an estimated 84% to our future population growth (Herrin and Costello, 1996). Efforts to lower fertility through direct government initiative can complement the second-best options that will lower wanted fertility and lessen the impact of population momentum.

The challenge is to identify the drivers of income growth which, in turn, has been shown to be a major determinant of fertility rate. A second-best solution to the problem of reducing fertility rate is to identify which of these drivers have the most impact on fertility rate for a given amount of investment.

Alternative Drivers

Three main fertility-reducing variables have merited the attention of researchers in demography and economics: education of women, female labor force participation, and health of children. These determinants have also been the mainstream policy variables that influence income growth or economic well-being.

Studies show these three variables to be significant in reducing fertility rate and many have taken these as feasible solutions to the problems brought about by rapid population growth. It is also worth noting that these solutions could be identified as second-best policy options that will lower fertility rate, that is, these are different from addressing biological and behavioral factors through which socioeconomic, cultural, and environmental variables affect fertility (Bongaarts, 1978). The latter set of variables are called the intermediate fertility determinants and include exposure factors (proportion married), deliberate marital fertility control factors (contraception) and natural marital

fertility factors (sterility, spontaneous intrauterine mortality, and duration of the fertile period)[9].

Education of Women

Education is a key determinant of fertility, and it is commonly perceived to be negatively correlated with fertility. This idea is in fact supported by an economic theory of fertility, in which women value the sum quality of all their offspring and optimize fertility and child investment choices accordingly (Becker, 1960). There are several channels through which women's education can affect fertility[10]. First, a higher permanent income due to better education will induce a woman to tilt her optimal fertility choices toward fewer offspring of higher quality (Mincer, 1963; Becker and Lewis, 1973). Second, a highly educated woman will more likely pair herself with a highly educated man via what is called *positive assortative mating* which can further increase household permanent income and alter optimal fertility choices (Behrman and Rosenzweig, 2002). Third, a woman's education may directly improve her knowledge of fertility options and healthy pregnancy, as well as her ability to process the information thereby resulting in a lower fertility rate (Grossman, 1972).

Education affects fertility at the aggregate and individual levels. At the aggregate level[11], proxy variables include the number of schools in the nearby village where the household is located (Casterline, 1985), average length of education on cumulated fertility (Tienda et al., 1985), measures of cumulated fertility and proximate determinants (Lesthaeghe et al., 1985), proportion of women with post-primary education (Hirschman and Guest, 1990), mean educational level in the community (Thomas, 1999), and proportion of literate women (Diamond and Steel, 1996). The results of these different studies show that the aggregate level of education has negative effects on the first and higher-order births.

Moreover, these studies show that women living in areas with a higher percentage of literate women and a high average level of education have weaker fertility desires than women with the same educational level living in other areas (Kravdal, 2001). The result, however, is only significant from models with an urban or rural area as part of the control variables. By facilitating the diffusion of new ideas and information about the advantages of smaller families and by presenting a new set of opportunities for women which make childbearing and rearing more costly, households in more highly educated communities promote lower fertility (Tienda et al., 1985).

---

[9] Refer to Davis and Blake (1956) article for a more detailed discussion on this.
[10] These were drawn from McCrary and Royer (2005).
[11] See Kravdal (2000) for a more detailed discussion.

At the individual level, education creates a substantial and significant difference in fertility between an educated and an uneducated woman. The former normally displays lower fertility than the latter. Kravdal (2001) gives a summary of the reasons why this is so: (1) the high opportunity costs of childbearing involved in some types of work that may be offered to the better-educated woman, (2) the cash expenses and children's reduced contribution to domestic and agricultural work as a result of children's schooling, which tends to be encouraged by educated mothers, (3) the reduced need for children as an old-age security, (4) the higher prevalence of nucleated families, which may reduce fertility partly because childbearing costs to a larger extent must be covered by parents, (5) a stronger desire to spend more time caring for the child and to invest more in each child, (6) stronger preferences for consumer goods or other sources of satisfaction, (7) a lower infant and child mortality (due to better maternal knowledge), (8) a possible stimulating impact of higher purchasing power resulting from the educated woman's own work or their marriage into a relatively rich family, (9) the relatively higher age before entering married life among better educated women, (10) their knowledge about and acceptance of modern contraception, and their ability to use it sufficiently, as well as their more efficient use of traditional methods because of better knowledge about their own bodies.

These studies have further shown that women's schooling is negatively correlated with fertility and positively correlated with contraception use. Significantly, it was argued that while investment in primary education is necessary, it is better to invest in higher level of education as fertility and contraception models show that the impact of education increases with educational level (Tuman et al., 2007). Some of the econometric models show a positive relationship between some primary schooling and fertility suggesting that schooling does not have a depressing effect on fertility until the secondary level (Ainsworth et al., 1996). Apart from the inconsistent effect of primary education on fertility, it was also established that the marginal effects of higher levels of education have a strong and negative effect on fertility in rural areas, which is associated with women's labor market potential.

Labor Force Participation of Women

In establishing the relationship between fertility and female labor force participation, empirical researches have been supported by main economic theories such as Easterlin's (1973, 1980) relative income hypothesis, Becker's (1981) new home economics and Cigno (1992) and Cigno and Rosati (1996) asset theory of children[12]. The relative income hypothesis emphasizes the role of male incomes, relative to economic aspirations, as the driving force behind fertility and female labor force participation. The

[12] Refer to McNown and Rajbhandary (2003) for more information on these theories.

theory of the new home economics stresses the role of female wages, representing the opportunity costs of childbearing, as determinant of fertility. Finally, the asset theory of children focuses on the children as investment goods in a model of intergenerational transfers.

Like women's education, labor force participation is also important in explaining the fertility behavior of women, and the main explanation has something to do with childbearing and child rearing. Child-bearing involves time-consuming efforts that often restrict the parents, particularly the mother, from participating in the labor market (Weller, 1977). Similarly, child rearing or the process of caring for and raising a child from birth to adulthood leads to the negative relationship between female labor force participation and fertility. Brewster and Rindfuss (2000) suggest that women who wish to participate in the labor force must either limit their fertility or make an alternative arrangement on how to take care of their children. The study also shows that the mother's time spent in child care has a significant and negative effect on the likelihood of having another birth. It also tends to reduce the mother's labor supply (Hotz and Miller, 1988). This relationship has been observed mostly in the developing countries. Women in developing countries are less likely to participate in the labor market when they have multiple births (Porter and King, 2009). Using sex of the first child as instrument for fertility decisions in Korea, Chun and Oh (2002) find that, on average, having an additional child reduces labor force participation by almost 40 percent.

However, the relationship between female labor force participation and fertility is different for studies done in developed countries. In Sweden, for instance, the parental leave program and the availability of subsidized childcare as well as flexible working hours have facilitated market work for women of childbearing ages (Sundstrom and Stafford, 1992). In the United States, fertility and female labor force participation rates increased in the last twenty years, and most of the increase in female labor supply in the last two decades has occurred among women with newborn children (Ferrero and Iza, 2004).

These studies have shown that it is important to examine and analyze the roles of institutions and public policies in the labor market. Adsera (2003) finds that, on the one hand, when unemployment is low and institutions easily accommodate the entry-exit of the labor market, fertility rates are around replacement rate. On the other hand, whenever the costs of childbearing in terms of loss of present or future income are intensified by high unemployment and rigid labor markets, fertility rates are very low. Government employment can have positive effects on fertility as it provides more stable opportunities for women's employment during economic downturns as well as more liberal leave programs. In developed countries, women in general have found ways to combine work and child rearing (Brewster and Rindfuss, 2000).

Child mortality

The negative relationship between mortality[13] and fertility is explained by two hypotheses. The first is referred to as the *child survival hypothesis* and the second is called the *replacement hypothesis*. The *child survival hypothesis* refers to the parents' perceptions of the child mortality conditions in their social setting while the *child replacement hypothesis* refers to parents' response to mortality incidence in their own household. Scrimshaw (1978) believes that the assumption that high fertility is a necessary biological and behavioral response to high mortality is manifested in different theories and hypotheses such as demographic transition theory, child replacement hypothesis, and child survival hypothesis. Demographic transition theory states in its simplest form that mortality declines are eventually followed by fertility declines, *child replacement hypothesis* states that parents try to replace children who die and *child survival hypothesis* states that couples target a specific number of children who can survive to adulthood.

Ben-Porath (1976) discusses two types of fertility response to child mortality: (a) *hoarding* or the parents' response to expected mortality; and (b) *replacement* or theparents' response to an experienced death of a child in the household. Using micro data of retrospectively reported births of Israeli women, the researcher shows that experienced mortality reduces the probability of stopping at a given birth and reduces the intervals between births. In another study by Hondroyiannis and Papapetrou (2002), the authors show that, in the long run, a decrease in infant mortality rates reduces fertility rates, controlling for economic performance and the labor market policies.

However, there are some researchers who remain skeptical about the fertility-inflating effects of child mortality. In particular, Sah (1991) argues that a single-stage choice model can only give ambiguous explanation of the mortality-fertility relationship. He presented a more complex fertility model and showed that, on the contrary, fertility increases as mortality rate declines. Dyson and Murphy (1985) also showed that, in some cases, a decline in mortality rate can be accompanied by a brief increase in fertility rate due to the contemporaneous changes in other factors such as a decrease in widowhood and disease related sterility. Chowdhury et al. (1976), using data from Pakistan and Bangladesh where moderately high levels of fertility and mortality are observed, found no significant evidence of increased desire to replace a child in households who experienced a death of a child. In summary, the research studies have varying results on whether reducing child mortality will really reduce fertility rate, controlling for other factors.

---

[13] In the literature, mortality can refer to either infant or child mortality.

IV. What the Evidence Shows: Empirical Analysis using Provincial Panel Data

An econometric model using an intra-country provincial panel data[14] is constructed to quantify the impact of *women's education* (measured as the average number of years of schooling), *health services* (proxied by under-5 year mortality rate), *family planning* (using contraceptives, both modern and natural methods) and *employment rate of women* (aged 15 to 49 years old) on *total fertility rate* (proxied by the total number of children ever born (TCEB) to a woman aged between 15 to 49 years old). The panel data set covers the period 1998, 2003 and 2008 and coincides with the National Demographic and Health Survey (NDHS) conducted by the National Statistics Office (NSO) every five years.

The figures in Table 3 are the Regional TFRs for the survey periods 1998, 2003 and 2008. Of the 17 regions, only the National Capital Region (NCR) had a TFR (2.3) that is near the replacement rate of 2.1 in 2008. The rest of the 16 regions had an average TFR of at least 3.0, with six regions having a TFR of at least 4.0 in 2008. The last column of Table 1 shows the change in the TFR from 2003 to 2008 and the figures suggest that the drop in TFR has been slow during the last five years, with only six regions (NCR, CAR, MIMAROPA, Western Visayas, Northern Mindanao and SOCCKSARGEN) experiencing a drop of at least 0.1 per year in TFR.[15]

The figures in Table 4 reveal the bivariate correlation between the total number of children ever born (TCEB) to a woman aged 15 to 49 and the variables identified as crucial in reducing the TFR. Aside from per capita income (in natural logarithm), expected to be negatively correlated with fertility rate (-0.44), three other variables are highly correlated with TCEB: education of women (measured in terms of years of schooling) with a correlation of -0.63, under-5 year mortality rate with a correlation of 0.54, and the contraceptive prevalence rate (CPR) using modern methods with a correlation of -0.30. The signs of the correlation coefficients of these three variables are consistent with expectation. Increasing the education of women will result in a lower fertility rate; similarly, lowering mortality rate will result in a lower fertility rate, all things being the same. Moreover, increasing the contraceptive prevalence rate (modern methods) is expected to decrease the overall fertility rate. The correlation of the employment rate of women (aged 15 to 49 years) and TCEB is close to zero (0.03), while that of CPR for natural methods and TCEB is negative, albeit also close to zero (-0.04).

---

[14] The provincial database of the Asia-Pacific Policy Center (APPC) was used in the econometric models. The resulting provincial panel data has 73 cross sectional units (provinces) and 3 time periods (1998, 2003 and 2008), for a total of 219 observations.

[15] If this trend continues, it would take at least 10 years before the TFR in these regions (with the exception of the NCR) will be near the replacement rate of 2.1.

Table 3. Regional Total Fertility Rates (TFRs)

Region	Total Fertility Rates			
	1998	2003	2008	Change ('08-'03)
NCR	2.5	2.8	2.3	-0.5
CAR	4.8	3.8	3.3	-0.5
Ilocos Region	3.4	3.8	3.4	-0.4
Cagayan Valley	3.6	3.4	4.1	0.7
Central Luzon	3.5	3.1	3.0	-0.1
CALABARZON	3.7	3.2	3.0	-0.2
MIMAROPA	-	5.0	4.3	-0.7
Bicol Region	5.5	4.3	4.1	-0.2
Western Visayas	4.0	4.0	3.3	-0.7
Central Visayas	3.7	3.6	3.2	-0.4
Eastern Visayas	5.9	4.6	4.3	-0.3
Zamboanga Peninsula	3.9	4.2	3.8	-0.4
Northern Mindanao	4.8	3.8	3.3	-0.5
Davao Region	3.7	3.1	3.3	0.2
SOCCSKSARGEN	4.2	4.2	3.6	-0.6
Caraga	4.7	4.1	4.3	0.2
ARMM	4.6	4.2	4.3	0.1

Sources: NDHS 1998, 2003, 2008 final Reports, National Statistics Office (NSO); Collado (2010).

The figures in Table 5 show the results of the econometric model employed to systematically determine the factors that influence the average number of children ever born to a woman aged between 15 to 49 years old (TCEB). It is interesting to note that, controlling for other factors such as per capita income, the education of the woman has the largest impact on the average TCEB. The result shows that increasing the number of years of schooling of a married woman by one more year will decrease the average TCEB by about 0.22 children. This result supports the findings of McNicoll (2006) that education, particularly of women, played a significant role in accelerating the demographic transition in East Asian economies. Note too, that education has a positive and significant effect on the average per capita income growth rate of the country. In an

earlier study based on Philippine data from 1985 to 2003, Mapa, Balisacan and Briones (2006) showed that the education of the household head (the variable used in their econometric model) has a significant and positive impact on the average per capita income growth. The result of the study showed that increasing the education of the household head by one more year will increase the average yearly per capita income growth rate by about 0.16 to 0.27 percentage point, all things being the same. This shows that education is a significant factor in decreasing total fertility rate and in increasing average income growth rate.

Table 4. Correlation Matrix of the Variables in the Econometric Model

Variable	TCEB	Mortality Rate	Women Education	Per Capita Income	CPR Modern	CPR Traditional	Women Employment Rate
TCEB	1.000						
Mortality Rate	0.535	1.000					
Women Education	-0.633	-0.539	1.000				
Per Capita Income	-0.437	-0.211	0.342	1.000			
CPR Modern	-0.301	-0.294	0.446	0.252	1.000		
CPR Natural	-0.038	0.092	0.080	0.067	-0.187	1.000	
Women Employment Rate	0.032	-0.015	-0.094	-0.114	0.134	-0.150	1.000

For the contraceptive prevalence rate (proxy for family planning), the empirical results show that CPR (modern method) is negatively and significantly related to the average TCEB, holding other factors constant. In model 2, increasing the modern CPR by 10 percentage points five years ago will decrease the current TCEB by about 0.18. The CPR (natural method), however, is not significantly related to TCEB, although the sign of its coefficient is negative (as shown in model 1).

The results from the econometric model suggest that the government should increase the use of the modern family planning method if it wants to significantly reduce the country's total fertility rate. Currently, the CPR (of women ages 15–49) in the Philippines is quite low, estimated at only 50.6 percent in 2006. [16]

[16] The Commission of Population (POPCOM) 2010 target was to increase CPR to 60 percent from 50.6 percent in 2006 and increasing the natural family planning ("modern") method to 17 percent from 0.3 percent in 2006. The POPCOM forecasts that the increase in the CPR and change in the usage mix will

Another relevant variable that has significant impact in reducing fertility rate is the under-5 year mortality rate (the proxy for quality of health services). The result from the econometric model shows that decreasing the under-5 year mortality rate by 1 per 1,000 children will decrease the average TCEB by about 0.002 children, holding the other factors constant. Similar to the education variable, this empirical result is consistent with McNicoll's findings showing that preventive measures for health outcomes offered a relatively high pay-off in terms of reducing fertility rates, as experienced by the East Asian economies (McNicoll, 2006). However, compared to the education variable, the under-5 year old mortality is not a strong factor in determining the average per capita income growth, although its correlation with income growth is negative, as shown by Mapa, Balisacan and Briones (2006).[17]The women's employment rate is also negative and significantly related to fertility rate. The result from Table 5 shows that if the employment rate of women increasesby 10 percentage points, the average TCEB will decrease by about 0.10, holding all other factors constant.

Table 5.Econometric Model for Total Children Ever Born
Panel Estimation using Fixed Effects Model

	Model 1					Model 2			
Variable	**Estimated Coefficient**		**Standard Error**	**t-stat**		**Estimated Coefficient**		**Standard Error**	**t-stat**
Per capita income	-0.409	**	0.125	-3.26		-0.424	***	0.144	-2.95
Women's education	-0.217	***	0.046	-4.75		-0.217	***	0.045	-4.86
Women's employment rate	-0.928		0.718	-1.29		-1.011	*	0.707	-1.44
Mortality rate	0.002		0.002	1.27		0.002	*	0.0017	1.21
CPR (modern; lag 5 years)	-1.911	***	0.652	-2.93		-1.841	***	0.589	-3.12
CPR (natural; lag 5 years)	-0.571		1.217	-0.47		-	-	-	-
Constant	9.125	***	1.507	6.05		9.219	***	1.651	6.58

***, **, * significant at 1 percent (two-sided), 5 percent (two-sided), and 10 percent (one-sided) levels, respectively

Both Models have an over-all R-squared of about 50 percent.

V. Conclusions and Policy Implications

Addressing the poverty problem is the single most important policy challenge facing the country today and one cannot ignore the growing empirical evidence linking rapid population growth, on the one hand, and poverty, on the other. Development policies aimed at addressing the alarming poverty situation in the country must include

---

decrease the TFR to 2.9 in 2010 from 3.3 in 2006. Given the result of this study, the forecast TFR of 2.9 for 2010 may not be realized.

[17] Using the Bayesian Averaging of the Classical Estimates (BACE) approach, the probability that under-5 year old mortality has significant impact on the average per capita income growth is only 0.45, compared to 0.82 for education.

measures that help reign the country's bourgeoning population and bring down the fertility rate to a level that is conducive to higher economic growth. Policy makers must address the country's rapid population growth head-on though proactive government policies, such as the Reproductive HealthLaw. The failure to implement the provisions of the RH Law, more than a year after it was approved, is very unfortunate since the damage that a rapid population growth will bring to this generation and the next is irreversible. The country simply cannot afford to have millions of Filipinos go through the vicious cycle of high fertility and poverty: a high fertility rate prolongs poverty for these households who, in turn contribute to high fertility rate.

At the household level, rapid population growth resulting in a large percentage of young dependents negatively affects the welfare of the elderly, decreasing their saving rate and making them vulnerable to poverty, particularly when the elderly-headed household is supporting an extended family (the children and grandchildren). These effects on the elderly tend to be exacerbated by inadequacy in the country's social protection system.

The major policy concern that should be addressed immediately is to speed up the demographic transition, from the first phase to the second phase, in order to harvest the demographic dividend quickly. Experiences from countries that have benefited from the demographic dividend point to the need for government support, such as providing contraceptive services and accurate information, to accelerate voluntary reduction in fertility rates as quickly as possible. Public policies should be proactive in assisting, particularly the poor households, in achieving a voluntary reduction in fertility rates.

The "business as usual" attitude towards the country's rapidly growing population is unacceptable. The damage that a rapid population growth will bring to this generation and the next is irreversible. The immediate danger to social progress is the country's rapid population growth, not the prospect of a demographic winter.

Drawing from the lessons learned regarding the key factors that helped accelerate the demographic transition in the country's East Asian neighbors, the study identifies the other policy handles that could complement the RH Law currently still being debated in the Supreme Court. The key findings from the East Asian experiences are verified through empirical analysis using provincial panel data. The literature suggests four key areas that helped speed up the demographic transition in several East Asian economies from the 1960s up to the 1990s: (a) increasing the educational attainment (particularly of women) up to the secondary level, (b) providing family planning services, (c) improving health services, and (d) getting the marriage age of women to rise (primarily by improving education level and enhancing higher female labor force participation).

At the same time, government must also directly intervene by, for example, providing contraceptive services to poor households that cannot afford these services.Without

such intervention, the fertility rates in these households are likely to remain high and even becoming unmanageable, effectively trapping them to long-term poverty.

The empirical analysis identifies four areas that can reduce fertility rate. Two very strong factors that influence reduction in the TFR are *increasing the education level of women* and *increasing access to contraceptive use*. Moreover, *improving health services* through lowering of the under-5 year mortality rateand *increasing employment opportunities of women* have modest effects in reducing the TFR.

A very promising policy handle in reducing fertility rate is in improving the level of women's education. The result of the study shows that increasing the average years of schooling of women by one year will decrease fertility rate by about 0.220, all things being the same. Thus, increasing the average years of schooling of women by five more years will reduce TFR from the current 3.3 to about 2.1 and achieve the Goldilocks period. Since education is also a positive determinant of income growth, this policy handle will also enhance the country's prospect to move to a higher path of sustained per-capita income growth.

However, the data shows the average years of schooling of women in the sample is already 9 years (about 3rd year high school) and increasing it by five more years will bring the average years of schooling to 14 years (college graduate). This may entail a huge investment and may be very difficult to achieve. A more plausible alternative is lowering fertility through the implementation of the provisions of the RH Law (making contraceptives accessible, particularly to poor households) where the estimated TFR of 2.1 will be reached in about 12 years.This estimatewas arrived at on the assumption that CPR will increase to 70 percent in the next five years and 80 percent in the next 10 years (with the contraceptive use biased towards the modern method). This will bring the CPR of the country near the average of the countries in the East Asia and the Pacific where CPR is about 77 percent in 2005 to 2009 (United Nations estimates). Vietnam and Thailand CPRs are 80 percent and 77 percent, respectively, in 2005-2009.

The country can no longer afford to ignore the population issue. It is paying a high price—by way of its rather dismal performance in economic growth and poverty reduction—for its rapid population growth.

References

Adsera, A. (2003). Changing fertility rates in developed countries: The impact of labor market institutions. *Journal of Population Economics, 17*, 17-43.

Alonzo, R. P., et al. (2004). *Population and poverty: The real score* (Discussion Paper No. 2004-15). Diliman, Quezon City: University of the Philippines Diliman, School of Economics.

Ainsworth, M., Beegle K., &Nyamete, A. (1996). The impact of women's schooling on fertility and contraceptive use: A study of fourteen sub-Saharan African countries. *The World Bank Economic Review, 10*(1), 85-122.

Amin, S, Diamond, I., & Steel, F. (1996). Contraception and religious practice in Bangladesh. In G. W. Jones, R. M. Douglas, J. C. Caldwell and R.M. D'Souza (Eds.). *The Continuing Demographic Transition.* Oxford: Clarendon Press.

Balisacan, A. M. (2010). *MDG 1 (Extreme Poverty and Hunger) in the Philippines: Setting the scores right and achieving the targets* (Discussion Paper No. 2010-09). Diliman, Quezon City: University of the Philippines Diliman, School of Economics.

Becker, G. S. (1960). An economic analysis of fertility. *Demographic and Economic Change in Developed Countries.* (Universities – National Bureau Conference Series 11) Princeton: Princeton University Press, 209-240.

Becker, Gary S. (1981). *A Treatise on the family.* Cambridge: Harvard University Press, first edition.

Becker, G. S. & Lewis, G. (1973). On the interaction between the quantity and quality of children. *Journal of Political Economy, Part 2: New Economic Approaches to Fertility*, *81*(2), S279-S288.

Behrman, J. R. & Rosenzweig, M. R. (2002). Does increasing women's schooling raise the schooling of the next generation?. *American Economic Review, 92*(1), 323-334.

Ben-Porath, Y. (1976). Fertility response to child mortality: Micro data from Israel. *The Journal of Political Economy, 84*(4), S163-S178.

Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review, 4*(1), 105-132.

Brewster, K. L. &Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. *Annu. Rev. Sociol., 26*, 271-296.

Bloom, D. & Canning, D. (2001). Cumulative Causality, Economic Growth, and the Demographic Transition. In N. Birdsall, A. C. Kelly and S.W. Sinding (Eds.). *Population Matters, Demographic Change, Economic Growth and Poverty in the Developing World.* Oxford University Press.

Bloom, D. E. & Williamson, J. G. (1997). *Demographic transitions and economic miracles in emerging Asia* (Working Paper 6268). National Bureau of Economic Research.

Bloom, D. E., Canning, D., &Sevilla, J (2001). *Economic Growth and Demographic Transition* (Working Paper No. w8685). National Bureau of Economic Research.

Casterline, J. B. (1985). Community effects on fertility. In J. B. Casterline (Ed.). *The Collection and Analysis of Community Data.*Voorburg: International Statictical Institute.

Chowdhury, A.K.M, Khan, A. R., & Chen, L. C. (1976). The effect of child mortality experience on subsequent fertility: in Pakistan and Bangladesh. *Population Studies*, 30 (2), 249-262.

Chun, H. and Oh, J. (2002). An instrumental variable estimate of the effect of fertility on the labor force participation of married women. *Applied Economic Letters, 9*, 631-634.

Cigno, A. (1992). Children and pensions. *Journal of Population Economics, 5*, 175-183.

Cigno, A. &Rosati, F. C. (1996). Jointly determined saving and fertility behavior: Theory, and estimates for Germany, Italy, UK, and USA. *European Economic Review, 40,* 1561-1589.

Coale, A.J. & Hoover, E.M. (1956). *Population Growth and Economic Development in Low-Income Countries*. Princeton: Princeton University Press.

Collado, R. V. (2010, October). *Regional divides in the correlates of fertility: An analysis of the 2008 NDHS.* Paper presented at the 11th National Convention on Statistics (NCS), EDSA Shangri-La Hotel, Mandaluyong City.

Concepcion, M. B. (2004, November). *Fertility and poverty linkages: Evidence from the 2003 National Demographic and Health Survey.* Paper presented at the 2003 NDHS Data Dissemination Forum, Dusit Hotel Nikko, Makati.

Cruz, C. J. P. & Cruz, G. T. (2010, February).*Revisiting Philippine population aging…is 60 the new 70?*. Paper presented at the Philippine Population Association (PPA) Annual Scientific Conference, Heritage Hotel, Pasay City.

Dyson, T. & Murphy, M. (1985). The onset of fertility transition. *Population and Development Review*, 11.

Easterlin, R. A. (1980). American population since 1940. In M. Feldstein (Ed.), *The American economy in transition* (pp. 275-321).Chicago:University of Chicago Press.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy, 80*(2), 233-255.

Herrin, A. N. & Costello, M. P. (1996). Sources of future population growth in the Philippines and Implications for Public Policy. New York: The Population Council.

Hirschman, C. & Guest, P. (1990). Multilevel models of fertility determination in four Southeast

Asian countries: 1970 and 1980. *Demography*, 27, 369-396.

Hondroyiannis, G. &Papapetrou, E. (2002). Demographic transition and economic growth: empirical evidence from Greece. *Journal of Population Economics, 15*(2), 221-242.

Hotz, J. & Miller, R. A. (1988). An empirical analysis of life cycle fertility and female labor supply. *Journal of the Econometric Society, 56*(1), 91-118.

Kravdal, O. (2001). Main and interaction effects of women's education and status on fertility: The case of Tanzania. *European Journal of Population, 17*, 107-136.

Lesthaeghe, R., Vanderhoeft C., Gaise, S., & Delaine, G. (1985). Regional variation in components of child-spacing: The role of women's education. In R. Lesthaeghe (Ed.), *Reproduction and social organization in sub-Saharan Africa*.Berkeley: University of California Press.

Magsino, C. L. (2010, October 20). An optimistic look at the population issue. *Philippine Daily Inquirer,* (under letter to the editor).

Mapa, D. S. (2009), Young Population Matters: More is not Necessarily Merrier (Policy Brief 2009-01). Philippine Center for Population and Development (PCPD), Makati City.

Mapa, D. S. & Balisacan, A. M. (2004). Quantifying the impact of population on economic growth and poverty: The Philippines in an East Asian context. In L. A. Sevilla (Ed.), *Population and development in the Philippines: The ties that bind*. Makati City: AIM Policy Center.

Mapa, D. S., Balisacan, A. M. & Corpuz, J. R. (2010). *Population Management should be mainstreamed in the Philippine Development Agenda* (Policy Brief 2010-01). Makati City: Philippine Center for Population and Development (PCPD).

Mapa, D. S., Balisacan, A. M. & Briones K. J. (2006). Robust Determinants of Income Growth in the Philippines, *Philippine Journal of Development (PJD),33* (1-2), 1-32.

Mapa, D. S., Albis, M. L., Bersales, L.G. & Daquis, J. (2011). *Determinants of Poverty in the Elderly-Headed Household.* (Working Paper 2011-04). Diliman, Quezon City: University of the Philippines, Diliman, School of Statistics.

Mapa, D. S. & Bersales, L.G. (2008). Population Dynamics and Household Saving: Evidence from the Philippines. *The Philippine Statistician*, *57* (1-4), 1-27

Mapa, D. S., Davila, M. L., &Albis, M. L. (2010, February 4-5). *Getting Old before Getting Rich: An Analysis of the Economic State of the Elderly in the Philippines.* Paper presented at the Philippine Population Association (PPA) Annual Scientific Conference at the Heritage Hotel, Pasay City.

Mapa, D.S., Lucagbo, M.D.C., & Ignacio, C.S. (2010, February 4-5). *Is Income Growth Enough to Reduce Fertility Rate in the Philippines? Empirical Evidence from Regional Panel Data.* Paper presented at the Philippine Population Association (PPA) Annual Scientific Conference at the Heritage Hotel, Pasay City.

Martinez, D.F. & Iza, A. (2004). Skill premium effects on fertility and female labor force supply. *Journal of Population Economics, 17*(1), 1-16.

Mason, A. (2007). Demographic Dividends: The Past, the Present and the Future. In Mason, A. and Yamaguchi, Mitoshi (Eds.). *Population Change, Labor Markets and Sustainable Growth: Towards a New Economic Paradigm*. ELSEVIER.

Mason, A. & Lee, R. (2006). Reform and Support systems for the elderly in developing countries: Capturing the second demographic dividend. *GENUS*, *62*(2), 11-35.

McCrary, J. & Royer, H. (2005). The effect of maternal education on fertility and infant health: Evidence from school entry policies using exact date of birth. *Journal of Economic Literature*.

McNicoll, G. (2006). Policy Lessons of the East Asian Demographic Transition*. Population and Development Review (PDR), 32* (1)*,* 1-25.

McNown, R. &Rajbhandary, S. (2003). Time series analysis of fertility and female labor market behavior. *Journal of Population Economics, 16*(3), 501-523.

Mincer, J. (1963). Market prices, opportunity costs, and income effects. In C. Christ (ed.), *Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld.* Stanford: Stanford University Press.

Montalvan, A. J. II (2008, October 6). Edcel's Winter. *Philippine Daily Inquirer*, (under the column Kris-Crossing Mindanao).

National Statistics Coordination Board (2011).*One Family per 100 was lifted out of Food Poverty in 2009, Press Release.* Retrieved from www.nscb.gov.ph/pressreleases/2011/PR-22011-SS2-01_pov2009.asp.

Pernia, et al.(2011). *Population, Poverty, Politics and the Reproductive Health Bill* (Discussion Paper 2011-01). Diliman, Quezon City: School of Economics, University of the Philippines Diliman.

Philippine Daily Inquirer (2010, February 28). Interview with Health Secretary Esperanza Cabral by Jerry E. Esplanada.

Porter, M. & King, E.M. (2009). Fertility and women's labor force participation in developing countries.

Radelet, S., Sachs, J. & Lee, J. (1997). Emerging Asia: Changes and Challenges *Economic Growth in Asia.* Asian Development Bank (ADB).

Sachs, J. D. (2008). Common Wealth: Economics for a Crowded Planet. Penguin Books.

Sah, R.K. (1991). The effects of child mortality changes on fertility choice and parental welfare. *The Journal of Political Economy, 99*(3), 582-606.

Scrimchaw, S.C.M. (1978). Infant mortality and behavior in the regulation of family size. *Population and Development Review, 4*(3), 383-403.

Social Weather Stations (2011). *Fourth Quarter 2010 Social Weather Survey: Hunger up to 18.1% of families,* SWS *Media Release*. Retrieved from: www.sws.org.ph

Sundstrom, M. & Stafford, F. P. (1992). Female labour force participation, fertility and public policy in Sweden. *European Journal of Population, 8,* 199-215.

Tienda, M., Diaz, V.G. & Smith, S.A. (1985). Community education and differential fertility in Peru. *Canadian Studies in Population, 12*(2), 137-158.

The Economist (2009, October). Falling fertility: How the population problem is solving itself.

Thomas, D. (1999). Fertility, education and resources in South Africa. In C. H. Bledsoe, J. B. Casterline, J. A. Johnson-Kuhn and J. G. Haaga (Eds.), *Critical Perspectives on Schooling and Fertility in the Developing World* (pp. 138-180). Washington: National Academy Press.

Tuman, J.P., Ayoub, A.S. & Roth-Johnson, D. (2007). The effects of education on fertility in Colombia and Peru: Implications for health and family planning policies. *Global Health Governance, 1*(2).

Villegas, B.M. (2010, September 19). Population Statistics are being doctored. *Manila Bulletin*, (under Business and Society).

Weller, R.H. (1977). Wife's employment and cumulative family size in the United States, 1970 and 1960. *Demography, 14*(1), 46-65.