# The Agricultural Transition and Fertility Decline in Developing Countries

Agriculture is the largest economic sector in the world and is the principal activity of most rural households in developing countries. Despite its impact on such a large population, agriculture is often overlooked by demographers as not being intricately related to the demographic processes of mortality, fertility, and migration (Stokes 1995). This paper reviews the different transition theories within demography, emphasizing the relationship of agriculture to fertility transition. An *agricultural transition* theory is then outlined. This theory elaborates on the processes associated with development from an agrarian to industrial society. Using data compiled from the Food and Agriculture Organization (FAO) and the United Nations, I explore the agricultural and fertility transitions in 100 developing countries that had relatively large agricultural populations as recently as the early 1960s.

## Literature Review

Fertility transition is a long-term decline in the number of children born per woman from four or more to two or fewer (Mason 1997). Fertility decline is the most varied process within the demographic transition. There have been many theoretical explanations for a fertility decline. One theory hypothesizes that intergenerational wealth flows between children and parents would change direction as a process of modernization, resulting in lower fertility (Caldwell 1982). While the economic theories highlighted demand for children, cultural theories focused on the supply of children and specifically on the use and diffusion of contraceptive practices. Easterlin (1975) developed a theory of fertility which captured the supply, demand, and costs of children into a single model of fertility decline. Agricultural development has had an explicit role in many of the theories of fertility transition. Economic models hypothesized that demand for children would be greatest in agrarian societies and would diminish as the society became more industrial. Caldwell's wealth flows model argues that in an agricultural society, children provided needed labor that increases the family's income generating power. However, during the transition away from familial to capitalistic economic production, this wealth flow is reversed. Caldwell stresses that this transformation is a process and not a sudden change. Because of this, a bifurcated system where both familial and capitalistic modes of production are operating can exist. Consequently, a society that meets these conditions will have high fertility but that fertility will drop quickly. The transition from a familial to capitalist economy is necessary given the increasing division of labor in the capitalist mode of production (Caldwell 1982).

In the most elaborate theory connecting agriculture and fertility, the land-labor hypothesis, Stokes and Schutjer argue that access to land can both increase and decrease the demand for children (1984). Distribution of land as well as the land tenure system are the basic rural institutions and therefore have a place in analyses of rural development and fertility. Stokes and Schutjer focus their analysis on two dimensions of access to land—size of land holdings and ownership of land—which each have their own distinct effect on fertility. They argue that the size of holdings should have a positive effect on fertility. Theoretically, households with larger land holdings have greater need for labor. This demand for labor translates into a demand for children, especially males. Land ownership has the opposite effect on fertility. High fertility has been hypothesized as a

way for parents to secure resources in their old-age. Households that own land can use that wealth as old-age security and therefore can afford to limit fertility.

**Data and Methods**

This paper combines data from the FAOSTAT database of the Food and Agriculture Organization (FAO) and from the United Nations Common Database. Fertility rates for each country from 1962-2004 were used to operationalize fertility transition. Agricultural data were taken from the Population Domain of the FAOSTAT database and include the total population, agricultural population, male economically active population (labor force), male economically active population in agriculture, female economically active population (labor force), and female economically active population in agriculture. The agricultural population comprises all persons and their families depending on agriculture, hunting, fishing, or forestry for their livelihood. The economically active populations refer to the number of all employed or unemployed persons, including new entrants into the labor force.

These measures of labor force in agriculture are gender specific, meaning that they do not report the proportion of females in agriculture relative to males in agriculture but are rather the proportion of females in agriculture relative to the total female labor force. This distinction is important because the female labor force in developing countries is often undercounted relative to the male labor force, especially in agriculture (Dixon 1982). Measuring the female population as a proportion of the total agricultural population would exacerbate this problem. This method of operationalizing the female agricultural population is also preferred over inter-gendered measures because female agricultural labor is not always substituted for male agricultural labor. Gendered differences in the size of land holdings, intensity of production, types of crops produced, use of mechanized farm equipment, production of cash crops, use of draught animals, and legal access to land or water prevent the direct substitution of female for male agricultural labor (Doss 2002; Henderson and Hansen 1995; Sachs 1996).

**Descriptive Results**

The percent population in agriculture, percent males in agriculture, and the percent females in agriculture were graphed for all 100 countries from 1961-1999. These trends were then compared to fertility rates over the same time period. Bangladesh closely approximates the first stage of the agricultural transition (Figure 1). Initially there was a high proportion of the population in agriculture with only slight differences between the males and females. As the country began its agricultural transition, the percent male and percent female in agriculture began to diverge. In 1961, over 87 percent of the total population in Bangladesh was agricultural, 85 percent of the male labor force and 89 percent of the female labor force was agricultural. By 1980, the percent population in agriculture had declined to just over 70 percent, percent male in agriculture was 65 percent and percent female in agriculture was still around 80 percent. In 1999, the percent population in agriculture for Bangladesh was 56 percent with a percent male in agriculture at 49 percent and percent female in agriculture around 66 percent. The most rapid decline was in percent male in agriculture while percent female in agriculture had a more modest drop. In comparing these trends to fertility rates (Figure 2), we see that fertility, with a 5 year lag, drops most rapidly during the period of divergence between male and female agricultural labor force participation.

South Korea, which was already in the process of an agricultural transition in 1961, provides a clear example of the final stages of the agricultural transition (Figure 3). In 1961, the percent population in agriculture and the percent male in agriculture were both 56 percent while percent female in agriculture was 70 percent. Over the next 3 decades the percent population in agriculture dropped to 31 percent in 1981 and 9 percent in 1999. The percent male in agriculture fell to 29 percent in 1981 and fell again to 9 percent in 1999 while the percent female in agriculture declined much more slowly, 44 percent in 1981 and 12 percent in 1999. In Figure 4, we again see a relationship between the agricultural transition and fertility decline. Additional analysis indicates that there are distinct regional patterns to both the agricultural transition and its relationship to fertility.

**Analytical Approach**

Although the descriptive analysis hints that these two processes—agricultural and fertility transition—are related, it gives no direct indicator as to the degree to which the two processes coincide. To complete the paper, I will use Time Series Analysis to model trends in agricultural labor and fertility.

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**Tables and Figures**

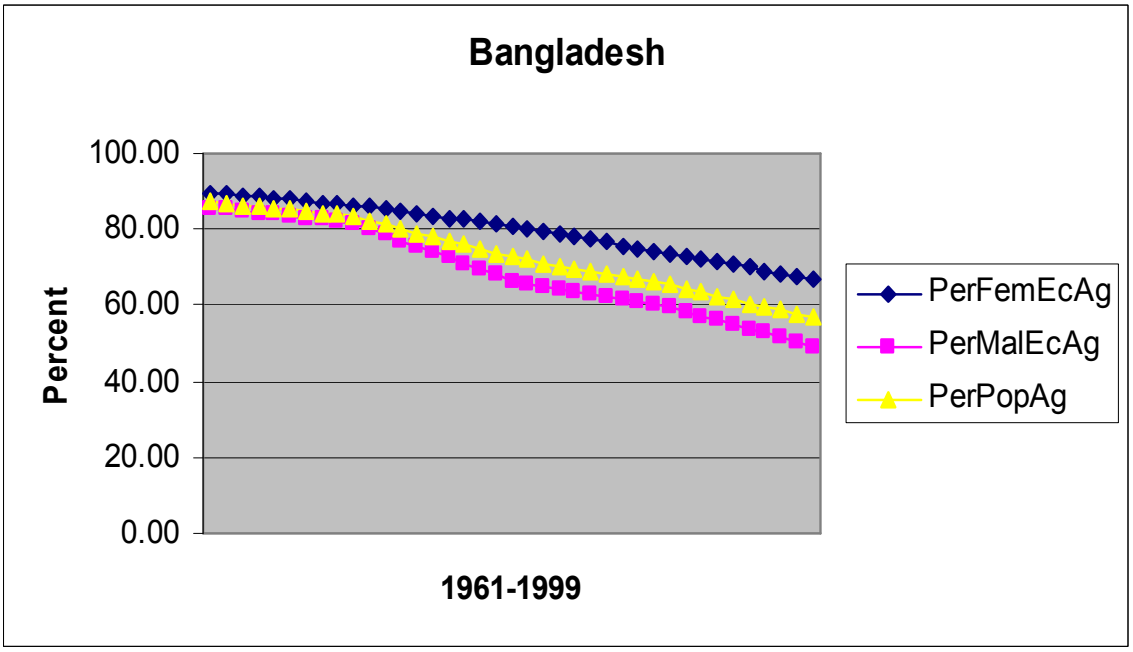


Figure 1.

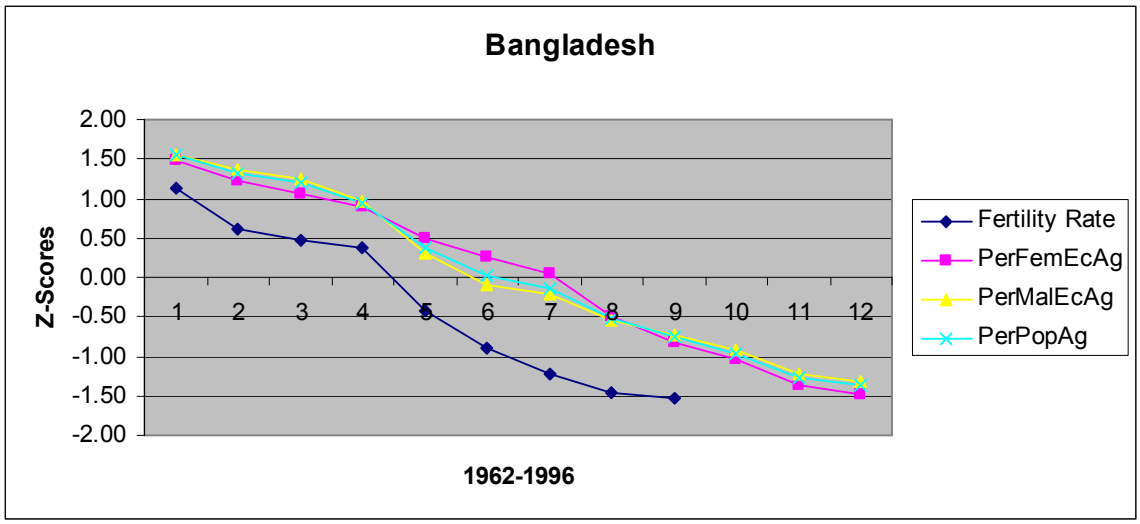


Figure 2.

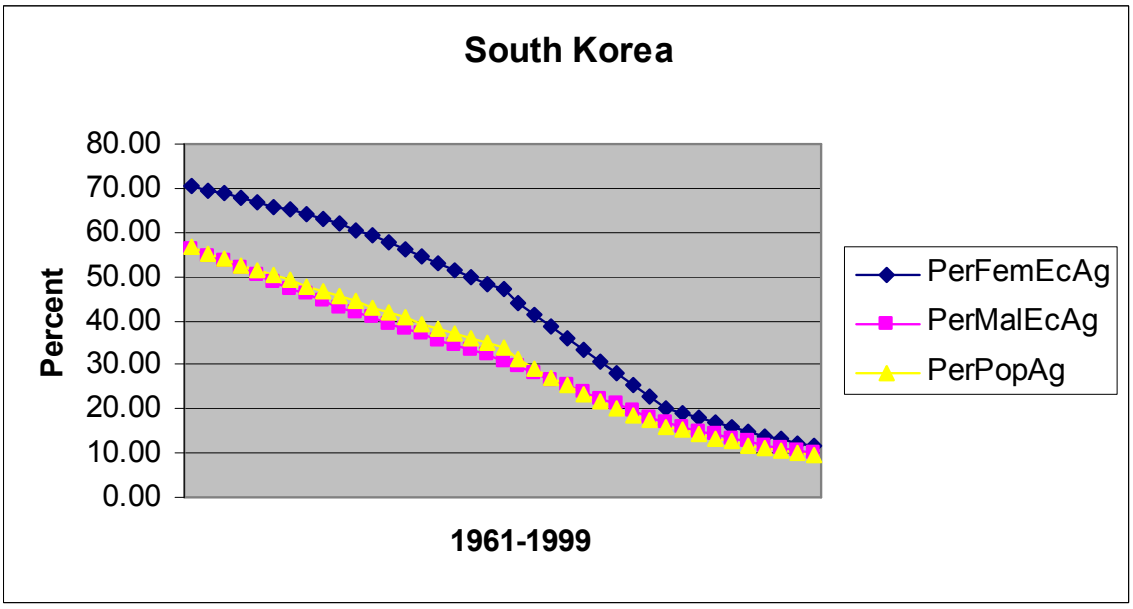


Figure 3.

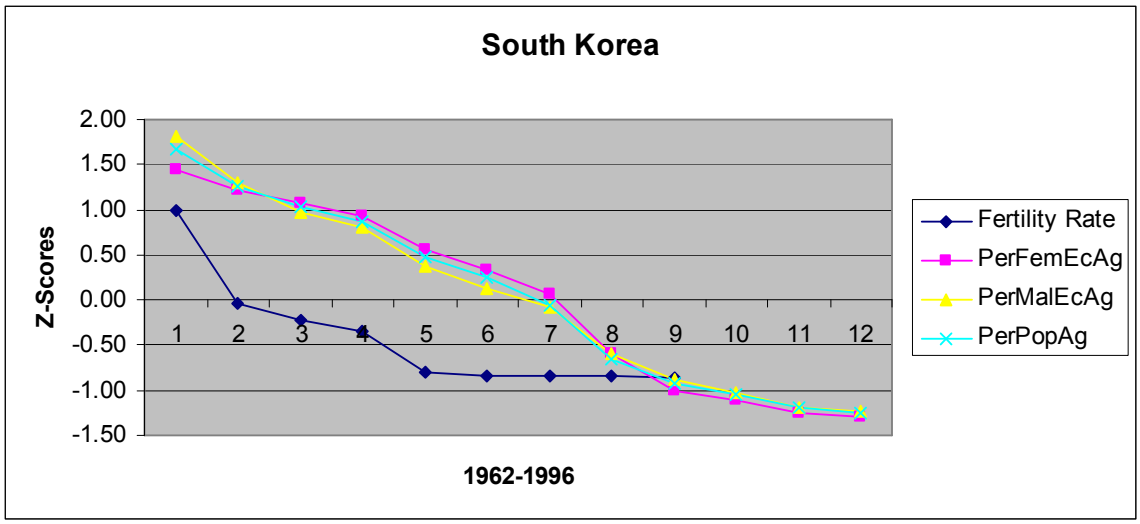


Figure 4.