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World Development Vol. 39, No. 4, pp. 561–568, 2011

0305-750X/$ - see front matter

doi:10.1016/j.worlddev.2010.09.012

Input Choices in Agriculture: Is There A Gender Bias?

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Summary. — This paper examines evidence of gender biases in the decisions of agricultural households, utilizing data from International Crops Research Institute for the Semi-Arid Tropics's village level studies in India (1975–85). The main empirical finding is that households with a high proportion of boys tend to use some agricultural inputs, including fertilizers and irrigation services more intensively than households with girls. This pattern is more pronounced among wealthier households but does not appear to be driven solely by bequest motives or male child labor productivity.

Key words — South Asia, India, agriculture, demographics, gender, input use

1. INTRODUCTION

This paper measures the impact of household demographics on agricultural decisions. We study the effects of child-gender on short- and medium-term investments in productive inputs, asking two questions: first, does available evidence supports the notion that agricultural decisions in households with male children differ from those made in households without boys; and second, if such a pattern of bias is present, what are the possible origins of the bias? We focus attention on the use of inputs that provide short-term benefits in production and also generate long-run consequences for agricultural productivity. We ask whether having a male child increases the marginal investment in land compared with having only a female child, and whether such decisions arise simply due to bequest motives or whether they reflect something more fundamental about the productive effects of accumulating physical and human capital in households with boys.

Finding ways to increase and maintain agricultural productivity remains a priority for most developing economies. Although the Green Revolution minimized food shortages in many countries, malnutrition, hunger, and food insecurity persist. It is now widely recognized that in rural and agrarian economies, improvements in health and nutritional outcomes are brought about not only directly, *via* improvements in nutrition and health, but also indirectly, through investments in agricultural production and practices. As a result, governments and donors seek to boost agricultural productivity by relaxing credit constraints, supplying more and better inputs, improving distribution and marketing networks, and minimizing discrimination against resource-poor farmers. However, the effectiveness of interventions and targeted reforms must be examined within the larger context of the targeted population and the potential behavioral responses to incentives.

In many developing countries households appear to demonstrate a marked "son preference," which is hypothesized to arise out of a mix of socio-economic and cultural pressures (Vlassoff, 1990). There is evidence of son preference in educational investment, nutrient investment, and health investment of children in developing countries (in the case of India see for example, Behrman, 1988; Borooah, 2004; Rosenzweig & Schultz, 1982). Moreover, models of intertemporal decision-making have also shown that the birth of boys relative to that of girls can lead to subsequent changes in savings patterns and labor supply decisions of parents (Deolalikar & Rose, 1998). Though the majority of these studies have used data from agrarian households, these models have not explicitly studied the relationship between son preference and investment in productive assets such as land and agriculture. The implications of son preference on short- and medium-term agricultural productivity may arise from decisions about fertilizer, manure, and crop residue management that influence soil quality and productivity over time, or from longer-term investments in soil conservation, irrigation, or mechanization. In situations where land is bequeathed to a son, it is not unreasonable to expect that resource managers may only undertake these kinds of investments if it is clear that a son's farming efforts will provide security in one's old age. Alternatively, if agricultural

* An earlier version of this paper was presented in Portland, OR, at an annual meeting of the Agricultural and Applied Economics Association. We are grateful to attendees for comments. We also thank ICRISAT for providing data and Bina Agarwal, William Masters, Kathryn Boys, and several anonymous reviewers for their comments and constructive suggestions, This research was made possible, in part, through support provided by the Office of Agriculture and Food Security, Bureau for Global Programs, US Agency for International Development, under the terms of SANREM CRSP Award No. PCE-A-00-98-00019-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the US Agency for International Development. Final revision accepted: September 9, 2010.

investments improve the stock of human capital in a farm household, thereby contributing to labor productivity over time, a male bias may simply reflect fundamental features of agricultural production—such as synergies between human and physical capital—rather than discrimination against girls at the time of inheritance and, by extension, the period preceding land transfer. The policy implications of these very different scenarios could be quite distinct. A complication, of course, is that both may be present.

Against this backdrop, this article provides two main contributions to the gender preference literature. First, we seek to uncover and document differences in the ways rural households behave toward cultivation and field operations depending on the proportion of sons within the household. As reasoned above, one might expect that households with more males would tend to invest more in agriculture. Indeed, we report evidence below that is consistent with this conjecture. However, the causal mechanism behind this pattern is more elusive. Our second contribution is then to shed some light on the importance of two particular motivations, inheritance and labor productivity, for this observed correlation. Specifically, if son preference is due solely to an inheritance motivation then we would expect to see agricultural input use increasing when only one son is in the household—and the effect greatly diminishing or non-existent for all households. In contrast, we do not find this in our specifications. Likewise, even after controlling for child labor, we still find a positive correlation between agricultural input usage and son preference

2. HOUSEHOLD DEMOGRAPHICS AND DECISION MAKING IN AGRICULTURE

In economics, accumulating evidence indicates that the behavior of decision makers may vary depending on household composition and the gender mix of individuals in the household (Deaton, Ruiz-Castillo, & Thomas, 1989; Doss & Morris, 2001; Fuwa, Ito, Kubo, Kurosaki, & Sawada, 2006; Haddad & Reardon, 1993). There is a growing literature that documents the impact of having a son or a daughter on family formation, household income and wages, savings and time allocation by parents. Research covers both traditional and non-traditional societies in a range of geographical settings (e.g., Deolalikar & Rose, 1998; Lundberg, 2005; Lundberg & Rose, 2002; Rose, 2000). Benjamin (1992), for example, in testing the separability of production and consumption decisions studies the impact of household demographic characteristics on farm input choices, concluding that the gender composition of the household may condition production decisions.

The predominant focus of the literature has been on south Asia (but see Quisumbing Haddad, & Peña, 1995 for a somewhat wider survey). In India, the evidence regarding gender discrimination is mixed. Deaton (1989) using consumption expenditure data from the much larger National Sample Survey of India does not find any evidence of discrimination in the allocation of goods within a household.[1] In contrast, Behrman and Deolalikar (1990) using ICRISAT data from a sample of villages in rural India find that women are more prone to food shortages and malnutrition, and that food price elasticities are generally negative for girls and women, suggesting asymmetric treatment of women, especially in periods of food shortage and insecurity. Deolalikar and Rose (1998) using the same data as the earlier authors find that the birth of a girl relative to a boy causes a subsequent change in consumption and savings behavior of households. Rose (2000) also provides empirical evidence supporting a gender bias and provides a theoretical framework for examining the time allocation by men and women following the birth of a male child. The main findings of the study are that in the presence of imperfect capital markets, there is marked difference in time allocated to farm and non-farm employment following a gender shock. In the case of rich households having access to credit, men and women both increase the leisure or time spent at home which Rose attributes to income and substitution effects. For poorer households with limited credit, the birth of a male child results in an increase in the time spent at home by females. However, this is compensated by an increase in work time by males. Investment in male children in the first period ensures that in the second period the son is available to support his elderly parents thereby acting as a substitute for the parents' social security. Such a pattern lends further support to the conjecture that child gender can influence the way households invest in farming activities in terms of time and level of activities. If parents want to ensure later income, they will have incentives to invest in land in early periods to ensure that it remains arable and fertile in the future.

All these findings point to the plausibility that having boys in the family might be an important variable influencing several household decisions. We submit to testing the conjecture that child gender can independently affect investments in land by way of cultivation practices such as fertilization, use of manure, and improvement of drainage or adoption of resource enhancing technologies or soil conservation. To measure the potential effect of gender-based differentials in agricultural investments, we focus on agricultural land and the use of agricultural inputs. We find a positive relationship between the proportion of male children in a family and both the level of fertilizer applied and the amount of land under irrigation. We investigate whether observed patterns accord with the predictions of a model in which male labor is more productive or families value bequests. It is our contention that in the context of the ICRISAT sample, some choices regarding agricultural inputs, technologies, and conservation practices depend on the gender composition of the children in the household.

3. CONCEPTUAL FRAMEWORK AND EMPIRICAL SPECIFICATION

Our conceptual framework for studying the relationship between agricultural input usage and family gender composition is grounded in an intertemporal household model where resource constrained household heads make choices every period on how much to invest in their land. Some inputs in the agricultural production process increase yields (affecting food supply and household income) as well as having the long-term benefit of maintaining soil quality. For example, in order to remain sustainable, that is, maintain equivalent or higher yields in the future, the household must invest in the land, if only nominally. Our hypothesis is that the introduction of a male child relative to a female child alters the way households choose to invest in their land. This could be either because male labor is more productive in farming or because households with males are more likely to invest in inputs that improve the quality of land that will be subsequently passed through inheritance to sons. The second motivation could reflect a pure bequest motive or could also reflect old-age security concerns since parents might reasonably expect to have an incentive to invest in land (through improvements or maintenance of soil quality by addition of inputs such as fertilizer