



Supply chains and economic development: Insights from the Indian dairy sector [☆]



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ABSTRACT

With almost three quarters of the labor force depending on agriculture in India, kick-starting agricultural growth is considered crucial for pro-poor development. More specifically, dairy production – which is labor-intensive but does not heavily rely on access to land – is generally expected to offer better prospects for income growth to the poorest among rural households. However, most policies aimed at increasing dairy production are based on ad hoc observations, with hardly any micro-level evidence. Using a unique primary dataset on 1000 rural households in Andhra Pradesh, this paper investigates the dairy production system, addressing three main research questions: First, we look at the typical profile of a dairy farmer and we find that both family traditions in dairy and owning (even a small piece of) land play a role in determining participation in dairy – while land size does not matter. Second, we show that dairy production is strongly and positively associated with improvement in rural livelihoods, in terms of income per capita, but that this positive relation only holds for larger dairy farms. In a third step, we look at the determinants of farm growth and we find that households having higher shares of graded dairy animals have grown more after 2005.

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1. Introduction

Agricultural development is widely recognized as being of crucial importance to achieve sustainable and equitable growth in developing countries around the world, and in particular in those with a high dependency on agriculture in terms of employment. The World Bank's 2008 World Development Report supports this claim by estimating that GDP growth originating in agriculture is at least twice as effective in reducing poverty than GDP growth originating in any other sector (The World Bank (2007): 6). More specifically, agricultural production activities such as dairy, which are labor-intensive but do not heavily rely on access to land or economies of scale are generally expected to offer better prospects for income growth to the poorest among rural households who

often have limited access to land, but easy access to cheap family labor.

Take the Indian case, which is the focus of this paper. The Indian government has massively promoted the dairy sector for its potential for 'pro-poor' growth. For instance, the *Operation Flood* program was launched in 1970 with the objective of increasing milk production and income of small rural farmers; in 30 years it has become one of the world's largest rural development programs. Similarly, during multilateral trade negotiations under the aegis of the World Trade Organization (Jha, 2003) as well as in bilateral negotiations on free trade agreements (Mondal et al., 2012), India has been requested repeatedly to reduce trade barriers for agricultural products, but it has managed to keep the dairy sector largely off the negotiation table based on its reported potential for pro-poor development (Goswami, 2007), employment generation and more generally based on livelihood concerns (Das, 2006).

However, the implementation of these programs and policies is often based on ad hoc claims and assertions, with hardly any micro-level evidence. To date, the lack of accurate official data has complicated meaningful analysis as well as the formulation of appropriate policy recommendations.

This paper aims to address this gap by studying production structures in the Indian dairy sector, based on micro-econometric

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evidence from Andhra Pradesh (A.P.), a state in the South of India. Our study first documents the observed dynamics in the A.P. dairy sector over the period 2005–2010 to investigate whether a process of agricultural transformation occurred in the A.P. dairy sector.¹ Next, we address three important research questions to understand the relation between dairy production and pro-poor development.

We first explore the determinants of participation in dairy and we find that, both family traditions in dairy and owning (even a small piece of) land play an important role. However, when analyzing potential nonlinearities in the impact of land on dairy participation, we also find that it is the change from being landless to owning (even a small piece of) land which influences the decision to engage in dairy – while the size of land does not matter.

Next, we study whether dairy farmers are better off – in terms of income per capita – compared to non-dairy farmers.² We use different estimation methods. As a first pass at this issue, we perform a simple OLS analysis, which has some limitations. To deal with the concern that dairy producers are intrinsically different from non-dairy producers, we use propensity score matching and to check whether unobservables are driving our results we rely on the Altonji et al. (2005) methodology. In all cases, we find that dairy farming is positively associated with higher income per capita.

However, when looking more closely at the different herd size categories, we find that the positive relation between income per capita and dairy production only holds for farmers that have at least 3 dairy animals (DA). This means that is not simply the change from not producing to producing milk that is associated with higher incomes, but that it is the switch from owning just 1–2 DA (most probably used only for household consumption) to a larger (more commercial) dairy farm that is correlated with higher incomes.

It is therefore important to understand the mechanisms leading to farm growth, and possibly to the key change from a small farm of 1–2 DA to a larger one. Thus, in a third step, we investigate the determinants of farm growth between 2005 and 2010. We perform our growth regressions, following Dries and Swinnen (2004) and Van Herck et al. (2012), and we find that small dairy farms are growing faster than larger dairy farms, that land – while being important for participation in dairy – does not matter for herd growth, and that households having higher shares of graded dairy animals have grown more after 2005.

The remainder of the paper is organized as follows. Section 2 presents the main features of dairy production in India and A.P. In Section 3, we describe how the data used in this study were collected. Next, in Section 4, we provide descriptive statistics on several key variables, as well as how these have evolved over the five-year period preceding our study. The empirical strategy used to address our research questions and the regression results are discussed in Section 5. Finally, Section 6 concludes.

2. The dairy sector in Andhra Pradesh

India is the largest milk producing country in the world with a production volume of a bit over 120 million tonnes of milk in 2010 (FAO, 2012). The total value of milk produced in India amounts to more than 43 billion USD, which compares to a total value of 38 billion USD for rice, India's major crop (FAO, 2012). This is mainly the result of an impressive growth rate of over 4% per year experienced in the last decades, triggered by major shifts in demand and important policy changes.

Dairy is a traditional activity in many regions of India, where

¹ In this period, Andhra Pradesh GSDP grew on average 9.3% per year (APSDPS, 2015).

² As a robustness check, we also look at asset ownership (other than land), and land ownership.

the majority of rural households has traditionally kept their own DA. In 2002 it was estimated that more than 70 million rural households derived direct income or employment from the dairy sector (Sharma et al., 2002). DA served as the main source of draught power in the fields, as well as a source of milk for own consumption.³ Milk has been promoted worldwide as an important instrument in the fight against undernutrition caused either by a lack of food or by an inadequately balanced food intake. Undernutrition is a pervasive problem in India, especially for young children. Over the past decade, strong income growth in India has been observed to lead to higher levels of consumption as well as to a diversification of diets towards high-value food products such as fruits and vegetables, meat, fish and dairy (Pingali, 2007).⁴ With increasing urbanization, Indian households face a wider range of product choice, and increasingly rely on markets to buy their daily cup of milk, rather than keeping their own cows or buffaloes. These factors have contributed to the rapid surge in market demand for milk. Starting from roughly the same level in 2003 (230 g per capita) (DAHDF, 2006), the per capita availability of milk in A.P. now exceeds the all India average by 30% (respectively 342 and 263 g per capita per day in 2010) (DAHDF, 2010). This implies that milk production growth is taking place faster in A.P. than in the rest of India. Still, milk buyers in A.P. seem to frequently run into acute deficits for raw milk, especially in summer, and informal interviews with key informants at milk processing companies in 2010 suggested that milk shortages are becoming more poignant every year (Squicciarini and Vandeplas, 2010).

3. Data collection

We use a unique household-level dataset that was collected between April and June 2010. The survey is set up to be representative for the rural population of the Southern half of A.P., covering Rayalaseema (in particular, the districts Kurnool, Cuddapah, Ananthapur, and Chittoor) and the Southern part of Coastal Andhra (more specifically the districts Nellore, Prakasam, Guntur, and Krishna) (see Fig. A.1). First, the region of study was subdivided into four zones based on milk production per rural capita, and buffalo or cow-based dairy production systems, which may correlate with weather and relative humidity conditions. Within each region, one district was sampled at random (see Fig. A.1). In the selected districts, 50 rural villages were randomly selected (of which 7 in Chittoor, 12 in Cuddapah, 16 in Kurnool, and 15 in Guntur) from the district-level list of villages which was obtained from the Government of A.P. (Government of Andhra Pradesh, 2009). In each village, a census was organized to record the number of female adult DA each household owned. Based on this number, households were classified into four categories (Category 1: 0 female adult DA; category 2: 1–2 female adult DA; category 3: 3–5 female adult DA; category 4: more than 5 female adult DA.). We only count female adult DA (having had at least one calve) as DA. Hence, we do not account for male or immature livestock in our classification of livestock holding size. We only count female adult DA (having had at least one calve) as DA. Hence, we do not account for male or immature livestock in our classification of live-

³ In contrast to many other livestock-based livelihoods in other countries or regions of the world, as a result of specific cultural norms, it is not very common to eat cow (or even buffalo) meat in most parts of India. Even though buffaloes are not considered holy animals, buffalo meat is eaten much less commonly in India than chicken, sheep or goat meat.

⁴ Kumar and BIRTHAL (2006) report that per capita consumption of milk in India rose from 40.4 kg per year in 1980 to 66.2 kg per year in 2000 and project that this will continue to increase to a level between 90.6 and 107.0 kg per year in 2025. More recent National Sample Survey Organization (NSSO) consumption data show that the average expenditure on dairy products by urban and rural Indian households was respectively 82 Rs and 50 Rs in 2006 compared to 74 Rs and 43 Rs in 2000.

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