Journal of Development Economics 129 (2017) 58–72

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Adverse selection in asset markets: Theory and evidence from the Indian market for cows

Santosh Anagol

Business Economics and Public Policy Department, Wharton School, University of Pennsylvania, Wharton, USA

ARTICLE INFO

Keywords:
Adverse selection
Agricultural markets
Livestock
India

ABSTRACT

Dairy cows cycle through periods where their quality is more observable (the milking phase), and where their quality is less observable (the dry phase). This variation in quality observability creates the potential for an adverse selection problem. I develop a theoretical model of trade in dry and milking cows and find empirical evidence consistent with the adverse selection theory. In particular, dry animal prices fall less in response to negative shocks relative to milking animal prices, which is consistent with the model's prediction that negative shocks actually help the dry animal market by pushing more high quality owners to sell.

1. Introduction

Development economists have long focused on understanding how market failures play a role in generating low incomes in the developing world. Major emphasis has been placed on market failures generated by asymmetric information (Akerlof, 1970), with primary applications to credit markets (Karlan and Zinman, 2009; Udry, 1994), formal and informal insurance markets (Gunnsteinsson, 2017; Kinnan et al., 2010), and agricultural commodities (Hoffmann and Gatobu, 2014; Bai, 2015). In this paper I present evidence consistent with the presence of asymmetric information in the livestock market, a major market where little previous work has attempted to understand the implications of asymmetric information.

Poor households in the rural areas of developing countries often rely on livestock markets to sell output from household production and to trade assets to smooth consumption (Rosenzweig and Wolpin, 1993; Udry and Kazianga, 2005). As a result, a large literature in development economics studies the efficiency of rural asset markets (Fafchamps and Gavian, 1996; Barrett and Coppock, 2003; Jodha, 1975). This paper is the first to study adverse selection as a potentially important form of market inefficiency in the context of rural livestock markets. Adverse selection is particularly plausible in these markets because households are likely to develop private information about their animals in the process of household production.

There are two important welfare consequences that motivate the study of adverse selection in the rural livestock market context. The first consequence is distortions in the quantities and prices of goods traded, such as inefficiently low numbers of transactions or sales occurring at artificially low transactions prices (Akerlof, 1970). This is the standard consequence that motivates the large empirical literature on adverse selection in other markets. In the context of rural livestock markets, inefficiently low transaction rates will lead to households not owning the optimal number of animals given their production capacity, or to difficulty in selling their livestock assets at prices commensurate with true value when experiencing low income shocks.

The second consequence is that adverse selection problems in productive buffer stock asset markets, such as the one studied here, can lead to poor households producing less efficiently than rich households. For example, households may sub-optimally invest in improving the quality of their animals because asymmetric information prevents sellers from proving the true quality of their animals to buyers. This problem is especially relevant for the poor, because poor households are the most likely to be forced to sell their livestock assets in response to income shocks.[1]

I focus on the market for dairy animals in rural India for three reasons. First, dairy animals are a common asset owned by households throughout the developing world. In India, approximately 85 million households, or 45 percent of all rural households, own at least one dairy animal.[2] Second, I show that dairy animals are used as a buffer stock asset in that they are frequently sold in response to negative income

E-mail address: anagol@wharton.upenn.edu (S. Anagol).

[1] For example, Anagol et al. (2017) discuss adverse selection in the market for cows as one potential explanation for their finding of low average returns on dairy cow investments in India.

[2] The rate of dairy ownership was calculated from the REDS 1999 nationally representative survey of rural India. The total number of households in rural India is from the Indian 2001 census.

http://dx.doi.org/10.1016/j.jdeveco.2017.06.002
Received 23 August 2016; Received in revised form 28 May 2017; Accepted 30 June 2017
Available online 9 August 2017

shocks. These reasons motivate the analysis of dairy animals as a common buffer stock asset used by poor households in the absence of formal financial assets.[3]

The third reason for focusing on dairy animals is that fieldwork at Indian cattle markets suggested that unobservable quality plays an important role in the determination of trading volumes and prices. Sellers provide no certified evidence of records on milk yields, health status, or fertility histories for animals being presented at cattle markets. Buyers judge quality based only on what they observe of the animal at the market. A number of market practices suggest that quality is difficult to observe. Sellers reputedly make superficial changes in the appearance of their animals to distort buyers' impressions of quality. For example, sellers will not milk dairy animals for two days prior to bringing their animal to market to make the animal's udder look engorged. Also, sellers of dairy buffaloes rub engine oil on their animal's skin to make it look shinier which is a correlate of animal health. Overall, fieldwork yielded little evidence of formal certification services or other market mechanisms that could provide credible quality information to buyers.

I exploit a particular feature of the dairy animal production technology to perform new types of adverse selection tests. The observability of a particular animal's quality changes over time due to naturally occurring lactation cycles. When in lactation, it is possible for buyers to test an animal's milk for quality, observe information about the quantity of milk produced, and observe that the animal is fertile. When a milk animal is dry, it is impossible to test its milk quality, and in certain cases difficult to prove that the animal is fertile. Dry periods for animals in India are estimated to be approximately 160 days per year; thus, dry periods are long enough to make an adverse selection problem in the market for dry animals economically important. My approach is to test whether prices and trading patterns associated with this naturally occurring change in information observability are consistent with an adverse selection model.

I present a model of trade in an asset market where potential sellers either are forced to sell due to a liquidity shock ("distress" sellers), or choose to sell when the market offers a higher price than their valuation ("non-distress sellers"). All sellers can sell their cow at an anonymous cattle market. In addition, a fraction of both distressed and non-distressed sellers has the opportunity to sell to a buyer in their social network, where they will receive a price slightly higher than the market price available for their cow (as long as the quality of their cow is higher than the average quality on the market).

The model is analyzed under two distinct information assumptions. In the model corresponding to the dry cow market, quality is unobservable at cattle markets, but observable to buyers within the social network. In contrast, quality is always observable to buyers of milking cows, regardless of whether the buyer is at an anonymous cattle market or within the social network. The model shows how the market for dry animals will not completely unravel because distress sellers will be willing to sell higher quality dry animals on the anonymous cattle market. Buyers recognize that there will be some higher quality dry animals on the market (although they cannot tell exactly which ones), and thus some amount of trade will occur in dry animals on the anonymous cattle market.

I derive a series of predictions to test in the data, which can be categorized into predictions on trading patterns and prices. I begin my evaluation of the model by deriving its simplest predictions on pricing and trading volumes. First, the model predicts that dry animal prices will be lower than milking animal prices. This is true in the data, although this is a weak test of the model as it is easily explained by an alternative model where dry cows have a discount because they will not produce revenue until further in the future.

The model also predicts that trading volume in dry cows will be lower than that in milking cows; this is because non-distressed owners of dry cows in the model prefer not to sell their higher quality dry cows at the lower adverse selection price. Empirical results from the two datasets I study suggest that dry cows are more likely to be traded than milking cows. However, it is difficult to interpret this as evidence against the adverse selection model as Indian cows are, in general, more likely to be dry than milking (regardless of whether they are traded). For example, we estimate that 65 percent of cows that are traded are dry at the time of the trade, and the remaining 35 percent are milking. However, I also estimate that cows are dry 75 percent of the year on average; so the fact that cows are more likely to be traded when dry may just reflect the fact that cows are more likely to be dry than milking in general.

A second trading pattern prediction is that milking animals should be more likely to be sold at anonymous cattle markets, relative to dry animals. The model generates this prediction because there is a set of dry animal owners of high quality cows who do not have the opportunity to sell in to their network, and prefer not to sell at the anonymous cattle market because the market does not reflect the full quality of their cow. Using transaction level data on the identity of trading partners, I find that dry animals are 13 percentage points less likely to be sold at cattle markets relative to milking animals. This is an economically large relationship given that the mean fraction of animals sold at cattle markets is only 16 percentage points, and robust to the inclusion of a wide set of animal and household controls. Nonetheless, it is difficult to rule out all alternative explanations for this correlation.

I therefore focus most on the model prediction which (arguably) is less easily explained by theoretical mechanisms that do not include adverse selection. The model shows that when negative shocks affect a village the average unobservable quality of dry animals for sale will improve. The intuition for this result is that households that would otherwise wait until their higher quality dry animals enter the milking phase before selling will now be forced to sell into the dry animal market. Looking at the sample of nationally representative rural dairy animal sales in the REDS 1999 survey, I find that dry animal prices are essentially unaffected by village level negative shocks, whereas milking animal prices fall on the order of approximately 30 percent. The model provides an explanation for why milking animal prices would drop so much in response to shocks, but dry animal prices will not: the negative shock causes the unobservable quality of dry animals to improve in response to the bad shock, and this positive price effect appears to approximately cancel out the negative price effect that we would expect because the local income shock causes a local supply shock. Under the conservative assumption that crop level shocks do not affect local equilibrium discount rates, the estimates suggest that approximately 10 percentage points of the 23 percentage point dry animal discount between milking and dry cows in normal crop output times is due to the adverse selection problem.

My methodology builds on previous empirical approaches to test for adverse selection by studying a market where quality observability changes for an otherwise similar good. This stands in contrast to the two major types of tests in the existing literature, in which the researcher compares the quality or price of the adversely selected set of goods with the non-adversely selected set of goods. The first type of test compares the quality of traded goods with the quality of non-traded goods, arguing that adverse selection will cause traded goods to be of lower quality than non-traded goods.[4] The second category of papers compare prices of goods sold by sellers who appear more likely to adversely select on

[3] The efficiency of cattle markets is also important for the development of micro-finance in India, as dairy animals are one of the most common assets purchased with new micro-finance loans. For example, the Cashpor micro-finance group reports that approximately fifty percent of its clients use new loans to purchase dairy animals. Basix, another large micro-finance lender, reports that 25–30 percent of its loans are made for the purpose of "dairying and other allied activities".

[4] Other papers related to the quality comparison approach are Bond (1984), Pratt and Hoffer (1984), Greenwald and Glasspiegel (1983), Emons and Sheldon (2002) and Sultan (2008).