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## Agricultural factor markets in Sub-Saharan Africa: An updated view with formal tests for market failure

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### ABSTRACT

This paper uses the recently collected Living Standard Measurement Study–Integrated Surveys on Agriculture Initiative data sets from five countries in Sub-Saharan Africa to provide a comprehensive overview of factor market participation by agrarian households and to formally test for failures in rural markets. Under complete and competitive markets, households can solve their consumption and production problems separately, so that household factor endowments do not predict input demand. This paper implements a simple, theoretically grounded test of this separation hypothesis, which can be interpreted as a reduced form test of market failure. In all five study countries, the analysis finds strong evidence of factor market failure. Moreover, those failures appear general and structural, not specific to subpopulations defined by gender, geography, human capital, or land quality. However, we show that rural markets are not generally missing in an absolute sense, suggesting that market existence is less of a problem than market function.

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### 1. Introduction

In the structural adjustment era of the 1980–90s, widespread belief in the efficiency of markets underpinned a broad transition away from government management and toward market liberalization in much of Sub-Saharan Africa (SSA). In the ensuing decade and a half, as it has become clear that liberalization *per se* was not sufficient to raise growth rates and rapidly reduce poverty throughout the region, attention has returned to market failures. Among the markets most widely believed to be failing or incomplete are the agricultural factor markets of SSA. And indeed, there are good reasons to suspect that rural markets are not functioning well in this region, as agricultural productivity and rates of modern input use lag far behind the rest of the world (World Bank, 2008). With the aim of stimulating productivity growth and reducing poverty, substantial resources are committed each year to programs aimed at improving the function of agricultural input and output markets in African economies.

To make appropriate policy choices in an atmosphere of potentially dysfunctional or imperfect markets it is important to distinguish between three cases. The first is a situation in which a market is truly *missing*, in the sense that exchange is legally prohibited, rendered infeasible by some non-market force, or impossi-

ble to undertake without the creation of a new regulatory or market-making institution. The second is a case in which a market is in operation but *failing* in the sense that exchange takes place at non-competitive prices, i.e., prices that do not equate marginal benefit and marginal cost. And the third situation is one in which a market is present and functioning at competitive prices, but welfare outcomes for some households are so low that the development community uses the mantle of “market failure” to motivate interventions aimed at improving wellbeing.

To illustrate, consider the following situation for a generic agricultural input. Suppose that the market for the input is hampered by high transaction costs, weak enforcement of contracts, and significant output risk – features common to rural economies in SSA. These forces could induce market failure by causing mismatches in supply and demand or underpinning the formation of oligopolies by a small number of active suppliers. But these features also increase suppliers’ costs, which shifts supply curves inward, raises equilibrium prices, and reduces trading volumes. If it is the latter case that pertains in a particular market, then low input use is the equilibrium outcome of competitive markets, even though it may be sub-optimal from a social perspective.

This distinction is essential to policy design, because the instruments to fix missing markets are not the same as those to introduce competition to non-competitive markets or to increase the welfare of certain agents in a well-functioning market. If evidence suggests that factor markets are missing in their entirety, the

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appropriate step is likely to create markets by assigning property rights, removing restrictions on certain forms of exchange, or providing public goods that make exchange feasible (e.g., information, roads, agricultural research stations). If, by contrast, there is robust evidence of market exchange but evidence indicates that agricultural factor markets are not competitive, then there is a case for interventions directly targeted at the sources of market failure. These might take the form of policies to improve contract enforcement, to end collusion, or to lower costs of production through investment in public goods and services such as physical (e.g., power, roads, telecommunications, water) and institutional (e.g., grades and standards) infrastructure. Finally, if a market exists and operates at market-clearing prices, but outcomes are considered sub-optimal from a social perspective, then greater attention should be paid to increasing the value *above* current market prices of the land and labor that constitute the primary endowments of the poorest households. Policies in this domain may include training and education, subsidies, taxes and transfer to mitigate endowment inequalities, or temporary assistance to stimulate learning-by-doing or take advantage of agglomeration externalities.

The aim of this paper is to provide an over-arching, updated view of agricultural land and labor markets in sub-Saharan Africa, in light of the above categorization. The analysis is in two parts. First, we document the patterns of market participation by agricultural households using recently collected, nationally representative data from five countries: Ethiopia, Malawi, Niger, Tanzania, and Uganda. We show with descriptive evidence that, in fact, a large share of farmers transact in agricultural labor and/or land markets, as well as in the market for other, related goods.<sup>1</sup> These markets plainly exist and are used extensively. While transaction costs may prohibit market participation by some households in some markets (de Janvry et al., 1991), it would clearly be incorrect to characterize the land and labor markets of SSA as *missing* in a broad sense.

Second, we use a well-established, reduced form approach to test for market failures (Benjamin, 1992; Udry, 1999). The test is grounded in the standard model of the agricultural household (Singh et al., 1986), which makes explicit the prediction that under complete and competitive markets households can make decisions about production and consumption separately. This is widely known as the *separation hypothesis*. If the separation hypothesis holds, households behave as if they allocate resources to maximize farm profits first, and then make consumption choices conditional on the budget set that results from farm profit maximization. Endowments and preferences affect consumption, but not first-stage production choices. This generates the testable prediction that the household's labor endowment is not predictive of labor demand on the family farm when markets are functioning well.<sup>2</sup>

We test this prediction for the five study countries. Our findings strongly reject the null hypothesis of complete and competitive markets. Although there is some between-country variation in the elasticity of farm labor demand with respect to the number of working age household members, our main estimates lie in the range 0.32–0.53 for all countries. We further show that the pattern of market failures is general and structural, related neither to the gender or education of the household head nor to geographic characteristics such as the distance to roads or large population centers. We do find that in a few cases the degree of market failure

varies between agro-ecological zones, suggesting that market performance across the region is related at least in part to agro-climatic factors outside households' control (Binswanger-Mkhize and Savastano, 2014).

Although we implement the above test using the labor demand equations of household farms, the results of these tests do not reveal whether the underlying market frictions are in the market for labor or for some other good. Rejection of the separation hypothesis is evidence that *at least two* factor or output markets fail to clear at competitive prices (it is well known that resource flows and relative prices can adjust to accommodate one quasi-fixed or non-tradable factor of production – see Feder, 1985). However, if there are failures in at least two markets, then the separation hypothesis will generally be rejected even if the market in which the test is implemented is capable of functioning well (in the sense that prices and quantities can adjust to equate marginal benefit and marginal cost).<sup>3</sup>

Overall our findings suggest that while factor markets are not missing, even 15–20 years after structural adjustment there is reason to believe that widespread market failures in rural SSA lead to sub-optimal resource allocation. This impedes productivity growth and poverty reduction. Of course, not every market failure is sufficient to merit intervention, and determining which market imperfections should be targeted by governments and donors requires case-by-case analysis of the related costs and benefits (Holden and Binswanger, 1998). The contribution here is to use recent, nationally representative data and theoretically grounded tests to show that in recent years market *existence* is less of a problem than market *function*, and to characterize the extent of the latter at the national scale.

The work here contributes to two primary strands of literature. The first is the voluminous body of work on agricultural input markets in sub-Saharan Africa, to which we cannot do justice with a review. It does bear mentioning that our findings align with one of the central themes in Fafchamps (2004), which documents the widespread existence, richness, and adaptability of rural markets in SSA.

This paper also contributes to the recent body of work evaluating market function or testing the necessary conditions consistent with market failure in a variety of settings in sub-Saharan Africa. Not surprisingly, the findings in this literature are mixed. Berg (2013) uses anticipated changes in household income in South Africa to test for the presence of credit constraints. While he cannot reject that the observed patterns are due to precautionary savings, he does find strong indicative evidence of credit market failures. In the context of a multi-factorial randomized controlled trial, Karlan et al. (2014) find strong evidence for incomplete insurance markets among farmers in Ghana. Barrett et al. (2008) show with data from Côte d'Ivoire that significant differences exist between shadow wages derived from estimated production functions and local market wages paid the same workers, which can be interpreted as evidence of failure in multiple agricultural input markets. On the other hand, separate studies from Kenya and Malawi suggest that given the relative prices of outputs and fertilizer, subsidies may induce most farmers to apply fertilizer at levels well beyond that which is profitable, calling into question the degree to which input market failures are a binding constraint on productivity (Ricker-Gilbert et al., 2009; Sheahan, 2011). This paper augments these country-specific studies by applying a standardized, general test to recent, high quality data from five different countries.

<sup>1</sup> See Sheahan and Barrett (2014), Palacios-Lopez et al. (2015), and Deininger et al. (2015) for detailed analyses of these related markets using data from the same survey project that we use.

<sup>2</sup> There is also a structural approach to the study of the separable household model, involving estimation of production functions and comparison of the marginal product of inputs to their market prices (Jacoby, 1993; Skoufias, 1994; Barrett et al., 2008; Le, 2010). We focus on the reduced form approach because it lends itself more readily to interpretation as a specific test of market failures.

<sup>3</sup> The natural next step is to ask whether we can use additional tests to determine which markets are the source of the underlying failure. That is the subject of ongoing work.

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