CHAPTER 2

An Updated View of African Factor Markets

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Overview

Common wisdom: *Land, labor, and capital markets remain largely incomplete and imperfect in Africa*.

The findings:

- *Factor markets generally are not missing. Many farmers in Africa trade in labor and land markets.*
- *But factor markets regularly fail these farmers, which impedes productivity growth and poverty reduction.*
- *The pattern of market failures is general and structural, not related to the gender of the household head or geographic characteristics, such as the distance to roads or large population centers.*
- *In some countries, the degree of market failure varies between agroecological zones, suggesting that market performance across the region is related at least in part to agroclimatic factors outside households' control.*

Policy message: *The overall message is a strong endorsement of the maintained hypothesis that underpins much current discourse on African agricultural and rural development: there is a pressing need to address widespread input market failures that impede productivity growth and poverty reduction. There is also a call for further research into identifying the nature of market failures in rural Africa.*

The Issue: Is Factor Market Failure Widespread?

Agricultural factor markets of Sub-Saharan Africa (SSA) are widely believed to be failing or incomplete. 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. However, 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 nonmarket force, or impossible 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 is *failing* in the sense that exchange takes place at noncompetitive prices, that is, prices that do not equate marginal benefit and marginal cost. 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 well-being.

Consider the following illustration. High transaction costs, weak enforcement of contracts, and significant output risk—features common to rural economies in SSA—could induce market failure by causing mismatches in supply and demand or supporting noncompetitive pricing. But these features also increase suppliers' costs, which shifts supply curves inward, raises equilibrium prices, and reduces trading volumes. In the latter case, low levels of input use are the equilibrium outcomes of competitive markets, even though such levels may be suboptimal from a social perspective. This distinction is essential for policy design, because the instruments for fixing missing markets are not the same as those for introducing competition to noncompetitive markets or increasing the welfare of certain agents in a well-functioning market.

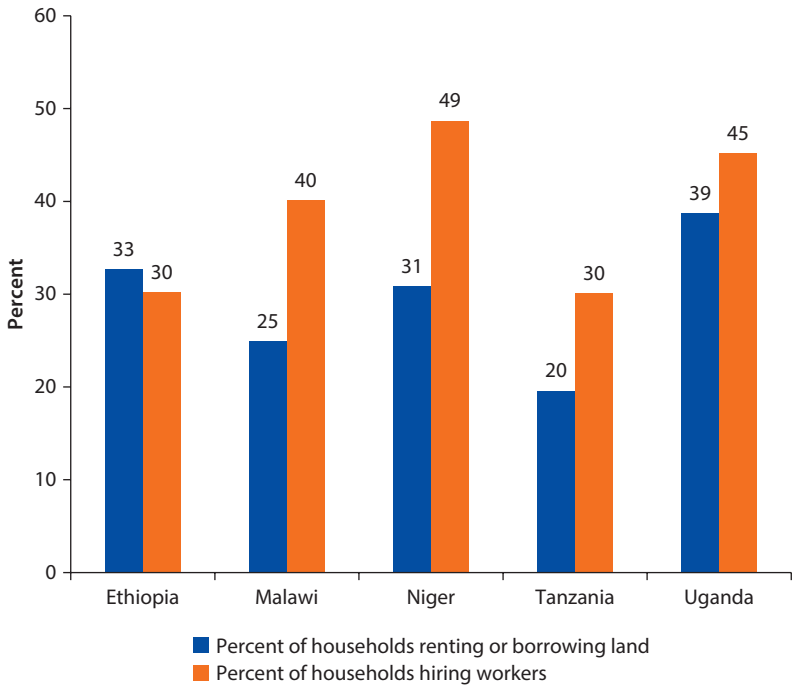
Given that policy makers and donors make substantial investments based on the assumption of market failure, careful empirical study of the hypothesis that *factor market failures are widespread in rural Africa* is clearly desirable. The goal of this study is to test this hypothesis comprehensively in Ethiopia, Malawi, Niger, Tanzania, and Uganda, to distinguish between the three cases described above.

The Analysis: Testing the Separation Hypothesis

The study makes two main contributions. First, it provides a comprehensive overview of farmers' participation in factor markets. The focus is on land and labor markets, as it is commonly conjectured that few farmers participate in these markets in rural Africa, instead relying on household labor and owned or informally allocated land. The study shows that a large share of farmers transacts in agricultural labor and/or land markets (figure 2.1). Even excluding harvest labor hiring, a large minority of cultivating households participates in labor or land markets, or both. These markets plainly exist and are used extensively, so it would be clearly incorrect to portray land and labor markets as "missing" across much of SSA. (Chapters 3 and 6 investigate African land and labor markets, respectively, in greater depth.)

Second, the study assesses how well factor markets function. The analysis uses a well-established, reduced-form approach to test for failures in the markets serving agrarian households (Benjamin 1992; Udry 1999). The test is grounded in the standard model of the agricultural household (Singh, Squire, and Strauss 1986),

Figure 2.1 Many Rural Households Trade in Land and Labor Markets



Source: Calculations from the Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS–ISA) data.

which makes explicit the prediction that when markets are complete and competitive, 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. Separation is consistent with complete and competitive markets; rejection of the separation hypothesis is consistent with market failure.

At the heart of the empirical test is the observation that with separation, the number of working-age people in the household does not affect the amount of labor used on the farm. The intuition is straightforward: if a farmer can borrow, lend, buy, and sell inputs freely and at market prices, then it should not matter whether the household consists of one person or 10. The hypothesis is tested by estimating regressions of total farm labor demand (given by log L_h) on prices, labor and land endowments, and household characteristics using the following general specification:

$$\log L_h = \alpha + \beta \log \overline{L}_h + \delta \log \overline{A}_h + \gamma Z_h + \phi \, Prices + \mu_h$$

where α, β, δ, γ, and ϕ represent coefficients; subscript h indicates households; and μ is an error term with mean zero. $\overline{L}$, $\overline{A}$, and Z represent (respectively) the number of working-age adults in the household, land endowments, and

household demographic characteristics. The *Prices* variables include nonlabor input prices, market wage rates, price of land, and price of output. The test focuses on the estimate of β. The separation hypothesis is represented by the null hypothesis H_o: $\beta = 0$. Rejection of the null in favor of the alternative hypothesis, H_A: $\beta \neq 0$, implies the absence of complete and competitive markets. If the null hypothesis is rejected (that is, the coefficient on household size is statistically distinguishable from zero), it can be concluded that some factor markets (potentially including markets for labor, credit, insurance, or land) are failing. A detailed exploration of precisely which markets are failing requires additional estimation, which is left to future analysis.

The data are from the World Bank Living Standards Measurement Study and Integrated Surveys on Agriculture (LSMS-ISA) project, sponsored by the Bill & Melinda Gates Foundation. LSMS-ISA is implemented by the national statistics offices of participating countries, with technical expertise and oversight provided by the Development Research Group of the World Bank. Five countries are studied here: Ethiopia, Malawi, Niger, Tanzania, and Uganda. The nationally representative data sets cover a comprehensive set of demographic, health, economic, and agriculture topics. Although there is variation in survey content between countries, efforts were made to ensure as much cross-national comparability as possible in questionnaire design and coverage. Because the hypotheses of interest here relate to market function within a cultivation period, the analysis uses data relevant for the major cropping season in some of the most recent waves of each of the data sets. These are the 2011 cropping season in Ethiopia, 2008/09 rainy season in Malawi, 2010 rainy season in Niger, 2010 long rainy season in Tanzania, and first cropping season of 2010 in Uganda.

The analysis is based on some simplifying assumptions. It treats land inputs as fixed within the cropping season and household labor endowment as exogenous. The labor endowment of a household is defined as the number of adults ages 15–60 years. Demographic controls are included in all the regressions, but the labor endowment is not further disaggregated by demographics (although box 2.1 assesses whether the gender of the household head plays a role).

Box 2.1 Is Market Failure Selective?

The study describes the structural failure of multiple factor markets in rural Africa. But are these problems ubiquitous in these countries, or are they concentrated among identifiable subpopulations? To explore this question, the study examines some of the household- and location-level correlates of factor market failure. The approach remains strictly reduced form. To test whether a particular characteristic is associated with variation in the degree of market failure, the variable for that characteristic is included in the estimating equation independently and interacted with the log of the household size variable. In this way, the analysis can assess whether the estimated relationship between household labor endowment and labor demand varies in magnitude or statistical significance with each characteristics of interest. Such a result

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Box 2.1 Is Market Failure Selective? *(continued)*

Table B2.1.1 Market Failure Affects Men and Women

	Dependent variable: Log labor demand				
	Ethiopia	*Malawi*	*Niger*	*Tanzania*	*Uganda*
Log of household size	0.579***	0.680***	0.816***	0.588***	0.331***
	(0.085)	(0.073)	(0.074)	(0.061)	(0.049)
Head is female	−0.138	−0.018	0.450**	−0.149	0.031
	(0.179)	(0.145)	(0.199)	(0.130)	(0.084)
Head is female x log of household labor endowment	−0.077	−0.063	−0.470***	0.081	−0.047
	(0.155)	(0.139)	(0.179)	(0.113)	(0.061)

Note: ** and *** denote significance at the 5 and 1 percent level, respectively.

would suggest that factor market failures affect subpopulations in different ways, and are not generalized within rural Africa. The analysis considers three sources of heterogeneity in access to complete markets: gender of the household head, distance from key points such as paved roads and large population centers, and agroecological zone (AEZ).

Table B2.1.1 shows the results of regressions with controls for the gender of the household head. There is little evidence of heterogeneity in factor market performance by gender of the head. In all the study countries other than Niger, the coefficients on the level and interaction variables are statistically insignificant and of relatively small magnitude. Overall, it does not appear that gender of the household head helps in explaining variation in the completeness of the markets facing rural households.

Similar regressions were estimated including *distance* variables (distance from paved road, closest town, regional capital, and a large market), and these also proved uninformative. Although market failure might be considered more likely in remoter areas, there is little evidence of this in these data. There is also no change in the main result when the sample is split by above/below median wealth; education variables are interacted with household size; or additional controls for soil type are included in the regression.

Evidence of differences across AEZs is more mixed. For Malawi and Uganda, there are no significant differences between AEZs. For Ethiopia, the only statistically significant difference (from the baseline category of cool, subhumid tropics) is in warm, semi-arid areas, where smaller households exhibit lower demand for agricultural labor. However, the interaction term with log of household size is not significantly different from zero in any of the AEZs, and the magnitude and statistical significance of the coefficient estimate on log of household size are essentially unchanged. In Niger, there is likewise a level difference in conditional labor demand between AEZs, with greater demand in arid areas than semi-arid areas, but the interaction with log of household size is again not significant, and there is no discernible effect on the log of household size coefficient of interest. In Tanzania, there is suggestive evidence that factor market failures are greater in areas outside the warm, subhumid tropics that are home to the bulk of Tanzanian cultivation. This finding is surprising, as it suggests that rural market failures are most acute where agricultural production is least concentrated.

The analysis also ignores the role of supervisory household labor as a complement to hired labor, and does not impose an adjustment factor for possible productivity differences between hired workers and household workers. Extensions to cover these concerns are left for future work. All the regressions are weighted by inverse sampling probabilities, and standard errors are clustered at the level of the zone (Ethiopia), TA (Malawi), grappe (Niger), or district (Uganda and Tanzania).

The Results: Market Failure Is Pervasive in Rural Africa

For all five study countries, the analysis strongly rejects the hypothesis of complete and competitive factor markets. In all countries, the β coefficient is statistically different from zero. The estimated elasticity of farm labor demand with respect to the household labor endowment ranges from 0.32 in Uganda to 0.75 in Niger. The magnitude of this elasticity can be taken as a rough indicator of the depth of market failure. Demand-side participation in labor markets appears weaker in Niger than in the other study countries. Although many households in Niger hire agricultural laborers (figure 2.1), the total amount of labor applied to farms in Niger is linked more closely to the (larger) size of Nigerien households than it is in the other study countries. Nevertheless, the consistent message is that across all the study countries, agricultural households are not served by complete and competitive markets for factors of production.

The results indicate that the pattern of market failures is general and structural. The core results do not vary meaningfully with the gender of the household head, geographic characteristics such as the distance to roads or large population centers, education level of the household head, wealth, or controls for soil type (see box 2.1). In some countries, the degree of market failure varies between agroecological zones, suggesting that market performance across the region may be related in part to agroclimatic factors outside households' control.

However, the overall message is an endorsement of the maintained hypothesis that underpins much of the current discourse on African agricultural and rural development: there is a pressing need to address widespread, systemic market failures that impede productivity growth and poverty reduction.

The Implications

The overall conclusion rejects the notion of widespread *missing* markets, but supports the assumption among the development community that factor markets are not complete and competitive. These market failures are not concentrated among households readily identified by location or gender, but are general and structural.

Although the reduced-form "separation hypothesis" test implemented here relies on an analysis of labor demand, the analysis does not allow identification of precisely which factor markets fail. The results do not necessarily imply that labor markets fail, because violations of the separation hypothesis

can occur even with perfectly functioning labor markets (Barrett 1996). That a large share of agricultural households transacts in rural labor and land markets suggests that the issue is less one of outright market absence than structural barriers. The barriers might be related to financial intermediation, uncertain and expensive contract enforcement, or weak physical infrastructure resulting in high transactions costs, all of which can impede efficient factor market functioning.

Programming and policy making should account for the fact that factor markets within major SSA countries are not fully integrated. Hence, interventions that treat the rural farm economy as a unified, well-functioning whole are unlikely to achieve the desired objective. As the development community and African governments increasingly intervene to try to rectify perceived market failures, the onus is on researchers to locate more precisely the sources and causes of factor market failures that impede productivity and income growth in rural Africa. Effective targeting of interventions likely depends on additional work beyond the tests in this study. However, the findings given here suggest that policy makers might focus more on reducing barriers to market participation and improving the efficiency of markets than on wholesale creation of factor markets, as such markets plainly exist in the study countries.

Additional Reading

This chapter draws on:

Dillon, Brian, and Christopher B. Barrett. 2017. "Agricultural Factor Markets in Sub-Saharan Africa: An Updated View with Formal Tests for Market Failure." *Food Policy* 67: 64–67. https://doi.org/10.1016/j.foodpol.2016.09.015.

Other key references:

Barrett, C. 1996. "On Price Risk and the Inverse Farm Size–Productivity Relationship." *Journal of Development Economics* 51 (2): 193–215.

Benjamin, D. 1992. "Household Composition, Labor Markets, and Labor Demand: Testing for Separation in Agricultural Household Models." *Econometrica* 60 (2): 287–322.

Dillon, Brian, and Christopher B. Barrett. 2017. "Agricultural Factor Markets in Sub-Saharan Africa: An Updated View with Formal Tests for Market Failure." *Food Policy* 67: 64–67.

Singh, I., L. Squire, and J. Strauss, eds. 1986. *Agricultural Household Models: Extensions, Applications, and Policy*. Baltimore: Johns Hopkins University Press.

Udry, C. 1999. "Efficiency in Market Structure: Testing for Profit Maximization in African Agriculture." In *Trade, Growth and Development: Essays in Honor of T. N. Srinivasan*, edited by G. Ranis and L. K. Raut. Amsterdam: Elsevier.