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Smallholder market participation: Concepts and evidence from eastern and southern Africa ☆

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Abstract

This paper reviews the evidence on smallholder market participation, with a focus on staple foodgrains (i.e., cereals) in eastern and southern Africa, in an effort to help better identify what interventions are most likely to break smallholders out of the semi-subsistence poverty trap that appears to ensnare much of rural Africa. The conceptual and empirical evidence suggests that interventions aimed at facilitating smallholder organization, at reducing the costs of intermarket commerce, and, perhaps especially, at improving poorer households' access to improved technologies and productive assets are central to stimulating smallholder market participation and escape from semi-subsistence poverty traps. Macroeconomic and trade policy tools appear less useful in inducing market participation by poor smallholders in the region.

Keywords: Food security; Market participation; Poverty traps; Price policy; Trade policy; Transactions costs

Contents

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Introduction

Why is smallholder market participation so important to economic growth and poverty reduction? The answer traces its origins at least to Adam Smith and David Ricardo: given a household's desire for a diverse consumption bundle, it can either undertake production of all such goods and services for autoconsumption, or it can specialize in production of those goods in which it is relatively skilled – i.e., holds comparative advantage – consuming some portion and trading the surplus for other goods and services it desires but for which it holds no comparative advantage in production. The welfare gains that result from choosing market-oriented production and exchange emerge not just from the one-off, static welfare effects of trade according to comparative advantage, but perhaps even more from the opportunities that emerge from larger-scale production in the presence of nontrivial fixed or sunk costs of production (Romer, 1994) and from dynamic technological change effects associated with increased flow of ideas due to regular trade-based interactions (Romer, 1993), leading to more rapid total factor productivity growth (Edwards, 1998). Hence economists' appropriate preoccupation with trade and market-based exchange.

So why do so many smallholders in low-income rural areas opt out of markets? Surely this reflects something more than just widespread error. Instead, the problem is that market participation is a consequence as much as a cause of development. Just "getting prices right" does not induce broad-based, welfare-enhancing market participation. Farm households must have access to productive technologies and adequate private and public goods in order to produce a marketable surplus. Yet investment in private assets, improved technologies and public goods requires that households earn enough that they can save, invest and generate adequate tax revenue for governments. Moreover, the institutional and physical infrastructure necessary to ensure broad-based, low-cost access to competitive, well-functioning markets likewise requires significant investment, typically by the public sector, paid for out of tax revenues or aid flows. One thus has to get institutions and endowments, as well as prices, "right" in order to induce market-based development.

Those with access to adequate assets and infrastructure and faced with appropriate incentives engage actively in markets, while those who lack one or more of those three essential ingredients largely do not. Such multiple market participation equilibria commonly arise due to the fixed and sunk costs of investment, the coordination problems that arise in many cases of public goods provision, and the liquidity constraints that hamper households, as well as governments at all scales, in the low-income world (Barrett and Swallow, 2006). One low-level equilibrium – a poverty trap – is associated with semi-subsistence production by smallholders operating rudimentary production technologies with limited assets and participating modestly, if at all, in competitive and regionally or globally integrated markets offering remunerative terms of trade. Other, higher-level equilibria associated with technological advance, increased commercialization and asset accumulation often simultaneously exist. The policy objective in rural development is to help households move out of low-level equilibria and then stay out permanently.

The transition from low productivity, semi-subsistence agriculture to high productivity, commercialized agriculture has been a core theme of development and agricultural economics for half a century or more. Timmer (1988) referred to this as the "agricultural transformation", noting that processes of agricultural and rural transformation not only usher in increased productivity and commercialization in agriculture, they also involve economic diversification and accelerated economic growth so that agriculture's share of employment and output shrinks, even in rural areas. A key paradox is that increased smallholder market participation and total factor productivity growth must therefore go hand-in-hand with increased migration of smallholders out of agriculture. Of course, this implies that the commonplace sociopolitical objectives of (i) keeping everyone on the land, and (ii) stimulating agricultural transformation, may be mutually incompatible in the presence of fixed costs that create minimum efficient scales of operation in modern, market-oriented agriculture.

So what does it take to break out of the semi-subsistence poverty trap that appears to ensnare much of rural Africa? This paper explores one small dimension of that problem, considering what it takes to ignite increased smallholder market participation, with a focus on staple foodgrains (i.e., cereals) in eastern and southern Africa.[1] Unfortunately, the wave of market-oriented liberalization that overtook most of sub-Saharan Africa has not fully delivered on its promises.[2] In some places, there seems to have been some level of retreat into subsistence (Jayne, 1994;

[1] This commodity and regional focus was prescribed by the organizers of the FAO Conference for which this paper was originally prepared. The core conceptual points are far more general, however, and the empirical evidence appears broadly consistent with that from staple grains markets in other low-income regions as well. For strictly cash crops not autoconsumed by agricultural households (e.g., cocoa, coffee, cotton, sisal, tea), concerns about producers' net buyer status obviously fall away; but the other issues remain. Moreover, once one moves into the domain of cash crops, market participation depends in part on the reliability of food supply to the prospective producer household. The sorts of problems identified in this paper as impeding staple grains market participation indirectly discourage cash crop participation because households must reallocate resources towards self-provision of essential food commodities (de Janvry et al., 1991; Fafchamps, 1992; Jayne, 1994; Omamo, 1998a,b). Thus stimulating smallholder market participation in staple grains markets often has the general equilibrium effect of increasing participation in cash crop markets as well.

[2] There remain open disagreements within the development and research communities as to whether the problem has been incomplete liberalization or reversal of liberalization measures, or whether the problem is that liberalization as practiced was insufficient to ignite broad-based economic growth and poverty reduction. This paper abstracts from that debate.

Barrett, 1998; Reardon et al., 1999) in the wake of liberalization, even as other households have seized on emerging opportunities for more remunerative, market-oriented production, often coupled with technological progress and improvements in institutional and physical infrastructure (Kherralah, 2000; Minten et al., submitted for publication). This bifurcated pattern is commonly found in systems characterized by multiple equilibria.

The tepid performance of staple foodgrains markets and smallholder producers in the wake of liberalization in eastern and southern Africa serves as a caution against placing undue confidence in trade and price policy as instruments for stimulating smallholder market participation and agricultural and rural transformation. Price-based, top-down macro and trade policy interventions have to date proved insufficient to ignite such development. The evidence reported below suggests that interventions aimed at facilitating smallholder organization, at reducing the costs of intermarket commerce, and, perhaps especially, at improving poorer households' access to improved technologies and productive assets are central to stimulating smallholder market participation and escape from semi-subsistence poverty traps in the region.

The conceptual and limited available empirical evidence casts some doubt on attempts to facilitate national "self-sufficiency" in staple food commodities or, more generally, to induce vigorous supply response or broad-based rural welfare gains through trade and price policy instruments alone. Such strategies assume (i) that national-level trade and price policy uniformly and robustly affects producer prices, which in turn affect smallholder production patterns, which clearly relies on assumptions of both spatial price transmission and smallholder market participation, and (ii) that smallholder welfare is improved by higher prices. While the desire for increased staple food crop production and greater (and lower cost) intra-African trade in staples is clearly warranted, the crucial question is how best to advance those goals. Is trade policy to adjust border parity prices for staple foodgrains really the appropriate policy response to the very real and serious problem of stagnant per capita food production, and to large and growing staple food imports from outside Africa into the region, some of it in the form of food aid? This paper makes the case that trade policy and other top-down, price-based macro policy instruments may prove ineffective in promoting smallholder market participation and agricultural and rural transformation in the absence of ancillary interventions at micro- and meso-scale along the lines of more traditional agricultural development policy.[3]

Conceptual foundations

Market participation choice in a nonseparable household model

In order to frame the discussion that follows, let me briefly lay out a simple, stylized model of household market participation behavior. The limited empirical literature on the subject – reviewed in the next section – implicitly or explicitly uses some variant of this model to explain observed agricultural marketing behaviors. The key features of the model are that market access is not uniform because households may face different transactions costs to market participation (Omamo, 1998a,b; Key et al., 2000; Renkow et al., 2004) and that geographic markets may likewise be differentially integrated into the global economy because of spatial differences in costs of commerce, in the degree of competition among marketing intermediaries, or both (Fackler and Goodwin, 2001). These two simple, realistic features rationally induce some households to self-select out of markets, attenuate the behavioral and welfare effects of price shocks, and result in structural patterns of market participation that have substantive implications for agricultural development policy and the use of other policy instruments, such as trade and exchange rate policy, for stimulating agricultural productivity growth and rural poverty reduction.

Assume a representative household maximizes its utility, defined over consumption of a vector of agricultural commodities, y^c for $c = 1, \ldots, C$, and a Hicksian composite of other tradables, x. It earns income from production, and possibly sale, of any or all of the C crops and from off-farm earnings, W, which could be earned or unearned. Each crop is produced using a crop-specific production technology, $f^c(A^c, G)$, that maps the flow of services provided by privately held quasi-fixed (and thus nontradable) assets – land, labor, livestock, machinery, etc. reflected in the vector $\mathbf{A}$ – and public goods and services, such as roads, grades and standards, extension services etc., represented by the vector $\mathbf{G}$, into output. The central role played by physical (e.g., road, electricity) and institutional infrastructure (e.g., extension services, contract enforcement and police protection, grades and standards, market information services) is too often underappreciated in economic analyses of market-related behaviors. The farmer chooses whether or not to participate in crop markets as a seller, as represented by the vector $\mathbf{M}^{cs}$, where each element of the vector takes value 1 if the household enters the market to sell crop c, and $M^{cs} = 0$ if it elects not to sell the crop. Similarly, the household chooses the buyer-side market participation vector $\mathbf{M}^{cb}$, taking value one for every crop the household elects to buy and zero for all others.[4] The resulting net sales of a crop,

[3] Barrett and Carter (1999) make a similar case with respect to an earlier generation of policy debates about structural adjustment and related market-oriented liberalization programs.

[4] Households will not both buy and sell the same crop in this simple, one-period model because of the price wedge created by transactions costs, so there exists a complementary slackness condition, $M^{cb} \cdot M^{cs} = 0$, at any optimum.

$NS^c \equiv f^c(A^c, G) - y^c$, are nonzero if and only if either M^{cb} or M^{cs} equal one. The household faces a parametric market price for each crop, p^{cm}, and a vector of crop-and-household-specific transactions costs per unit sold, $\tau^c(\mathbf{Z}, \mathbf{A}, \mathbf{G}, W, \mathbf{NS}^c)$ that may depend on public goods and services, **G**, (e.g., radio broadcast of prices that affects search costs, extension service information on crop marketing strategies, road accessibility to market), household-specific characteristics (e.g., educational attainment, gender, age) that might affect search costs, negotiating skills, etc., reflected in the vector **Z**, as well as the household's assets, **A**, liquidity from non-farm earnings, W, and net sales volumes. The latter might affect transactions costs when there is a fixed cost component such that per unit total transactions costs fall as volumes transacted increase. This could also capture nonlinear pricing wherein intermediaries offer different prices for output depending on the sales lot size.[5] The household's choice can thus be represented by the optimization problem[6]:

$$\underset{M^{cb}, M^{cs}, y^c, x, A^c}{\text{Max}} \; U(y^c, x)$$

Subject to the cash budget constraint

$$p^x x + \sum_{c=1}^{C} M^{cb} p^{c^*} y^c = \sum_{c=1}^{c} M^{cs} p^{c^*} f^c(A^c, G) + W$$

the nontradables' availability constraints

$$A = \sum_{c=1}^{C} A^c$$
$$(1 - M^{cb}) y^c \leqslant f^c(A^c, G) \quad \forall c = 1, \ldots, c$$

with each household-specific crop price determined by the household's net market position:

$$p^{c^*} = p^{cm} + \tau^c(Z, A, G, W, NS^c) \quad \text{if } M^{cb} = 1$$
$$p^{c^*} = p^{cm} - \tau^c(Z, A, G, W, NS^c) \quad \text{if } M^{cs} = 1$$
$$p^{c^*} = p^{a} \quad \text{if } M^{cb} = M^{cs} = 0$$

where p^a is the autarkic (i.e., nontradables) shadow price that exactly equates household demand and supply.[7] Because of the dichotomous nature of the market participation variables and the different prices associated with different market participation decisions, in order to solve this optimization problem, one must find the optimal $\{\boldsymbol{y}^c, \boldsymbol{X}, \boldsymbol{A}^c\}$ choices and the associated utility level conditional on each feasible combination of $\mathbf{M}^{cs}$ and $\mathbf{M}^{cb}$, then identify the market participation vectors $\{\mathbf{M}^{cb}, \mathbf{M}^{cs}\}$ that yield the maximum welfare (Key et al., 2000; Stephens and Barrett, 2006).

As is familiar from the nonseparable household modeling literature (de Janvry et al., 1991), the transactions costs to market participation create a kinked price schedule reflecting the price band defined by market prices plus and minus those costs, reflecting the net prices for buyers and sellers, respectively. The wedge created by transactions costs naturally leads some households to self-select out of the market for some goods that they both produce and consume, so that subsistence farmers whose allocation decisions are guided by shadow prices endogenous to the household co-exist alongside commercial producers whose decisions are guided by market prices endogenous to the local market. Moreover, the price band yields kinked demand and supply schedules that diminish price responsiveness because households cease to be price takers when they move into the autarkic region. Such nonconvexities are the basic building blocks of poverty trap models (Azariadis and Stachurski, 2005).

One last critical feature we need to consider is the potential geographic specificity of market prices for crops. A vast literature documents sizeable intermarket margins for agricultural commodities. Basic models of spatial equilibrium hold that the crop price, p^{cm}, in each local market, m, relates to the border price, p^{cb}, in a manner analogous to the relation between the household-specific price and the local market price:

$$p^{cm} = p^{cb} + t^c(G, Q) \quad \text{if } m \text{ is an importing market}$$
$$p^{cm} = p^{cb} - t^c(G, Q) \quad \text{if } m \text{ is an exporting market}$$
$$p^{cm} = p^{am} \quad \text{if } m \text{ is autarkic}$$

where intermarket costs of commerce, $t^c(G, Q)$, are a function of the state of public goods and services (e.g., communication and transport infrastructure, property rights, etc.) and the aggregate throughput in the local market, Q, and p^{am} is the local market price that equates local market demand (i.e., market demand across all households in m) with local market supply. This simply implies that the market price taken as given by individual households is endogenously determined within a price band for geographically specific markets.

These two distinct layers of transactions costs – one that is household-specific and another that is crop-and-location-specific – create two different, inter-related market participation questions. First, does the household participate in the local market? Second, does the local market participate in the broader, national or global market? These different costs create buffers that policy must overcome in order to directly affect producer behavior and welfare.

[5] This obviously renders transactions costs endogenous. Another way to allow for the possible endogeneity of transactions costs is to allow for multiple marketing channels and farmers choose which, if any, to enter. In this latter spirit, Fafchamps and Hill (2005) study how Ugandan coffee farmers choose between trader pickup at farmgate and self-transport to market when selling their output.

[6] This model abstracts completely from risk issues. The extension to production and/or price risk is straightforward and simply reinforces the core points that follow, as the literature on investment under uncertainty in the presence of sunk costs demonstrates (Dixit and Pindyck, 1994).

[7] This assumes that households make simultaneous discrete market participation (autarky, buyer or seller) and continuous purchase or sales volume choices, conditional on market participation. Bellemare and Barrett (2006) discuss the distinction between sequential and simultaneous choice and present empirical evidence on livestock producers in Ethiopia and Kenya.

This double buffering effect is perhaps most easily understood graphically. Consider Figs. 1 and 2, which depict different households operating in two different markets. Fig. 1 represents a stylized low population density, low agricultural potential, more remote location with smaller aggregate demand and supply and larger costs of commercial integration with the border. Fig. 2 represents a stylized higher population density, high agricultural potential area with better access to international markets. Each graphic shows the same border parity price, p^{cb}, but with larger market-level costs of commerce for location 1 than location 2, as reflected in wider price bands (the dashed black lines, marked $p^{cb} \pm t^c(G, Q)$, which slope towards p^{cb} due to the fixed cost component of transactions costs). The different structural conditions give rise to smaller and more inelastic aggregate demand (AD) and supply (AS) in more remote region 1, than in region 2.

The consequence is that region 1 is autarkic, with an active market that exchanges local produce within the community at a price above the border parity price. Meanwhile, by virtue of its better endowments, region 2 is a net exporting region with a local market-clearing price below the border parity price. Given the substantial costs of commerce and crop production in region 1, even fairly substantial changes to the border parity price – perhaps due to global market shocks, perhaps to trade policy reforms or exchange rate adjustment – will not affect local market equilibrium in the segmented market. By contrast, any upward border price adjustment will raise prices, supply and exports from region 2, given its integration into the broader economy. This simple stylized model can thereby account for spatial dispersion of prices, heterogenous supply response to exogenous price shocks, and incomplete spatial price transmission.[8]

Now let us consider household-level variation within a local market. Each figure depicts the same two households. For simplicity's sake, assume they have exactly the same demand schedule (D) for the staple crop. But because household J is less well-endowed with productive assets than household K, their supply curves differ – $S(A^J) < S(A^K)$ at any price level – perhaps because K has more land and livestock to devote to production. Likewise, household-specific transactions costs differ, perhaps because K's superior endowments afford lower-cost access to finance. The result is that in the autarkic, remote market 1, K is a net seller and J is a net buyer. Although both households produce the staple crop, K's greater asset endowment leads to greater output and thus a higher probability of market participation as a seller and a higher sales volume conditional on market participation. Structural differences between households also lead to cross-sectional variation in unit prices, even without allowing for any differences in product quality or timing of transactions.[9] Of greatest interest for policy analysis purposes, neither household's behavior or welfare would be affected by most reasonable upward adjustments in the border parity price because of the market's isolation, as discussed already. Only micro- or meso-level interventions that shift household-level productivity or demand or local market-level transactions costs will generate behavioral or welfare effects.

By contrast, in market 2, lower prices drive household J out of production of the staple crop altogether, although because it is a net buyer in either market, J's welfare is higher in market 2 thanks to the lower prices. Household K – a net seller in autarkic market 1 – becomes, just barely, a net buyer in net exporting market 2. But because the upper bound of K's price band falls just below its autarkic equilibrium, although any upward adjustment in the border parity price will induce a corresponding increase in local prices because the market is integrated into the broader global economy, there is a sharp limit on household K's supply or welfare response to higher market prices, as these are likely to knock it out of the market into an autarkic position. Household J, however, will remain a net buyer even in the face of more substantial price increases in market 2. Thus supply response and welfare effects to exogenous changes in border parity prices can vary considerably among households due to structural differences among them.

Combining these two layers of costs, it becomes apparent that structural factors associated both with the costs and competitiveness of market access and intermediation, and with the productive endowments of individual households, affect market participation and the supply response to and welfare effects of exogenous border parity price changes. The costs of commerce may dominate in some places, private asset holdings in another. But both of these structural features are central to explaining patterns of market participation and thus the ease with which policymakers can use price, trade or macro policy to achieve either staple foodgrains supply or rural welfare objectives.

Another way to see this effect is to consider the instantaneous welfare elasticity with respect to any exogenous change in a crop's border parity price, p^{cb}, referred to by Deaton (1997) as the "net benefit ratio". The net benefit ratio, $\beta \equiv \frac{p^{c^*} NS^c}{W + \sum_{c=1}^{c} p^{c^*} f^c} \cdot \frac{\delta p^{c^*}}{\delta p^{cm}} \cdot \frac{\delta p^{cm}}{\delta p^{cb}}$, is the budget share of the net sales of commodity c times the marginal effect of the change in market price on the household's shadow price

[8] A substantial literature on spatial price analysis, market integration and price transmission explores these issues in detail. See Fackler and Goodwin (2001) for a detailed overview and Abdulai (2007) for a recent review of the evidence as it relates to eastern and southern Africa. An important but often-overlooked issue in the price transmission literature concerns the degree of competition among marketing intermediaries. In imperfect competition, price transmission might be highly asymmetric, with traders passing on higher input prices to farmers, but not higher crop output prices. The very thin literature on this topic finds some evidence of bottlenecks in particular links in the marketing channel or in particular locations in Madagascar and Rwanda (Barrett, 1997; Minot, 1998; Moser et al., 2006).

[9] Deaton (1997) explains how cross-section unit value differences might reflect endogenous quality differences, but under the maintained hypothesis that household-level transactions costs are zero.

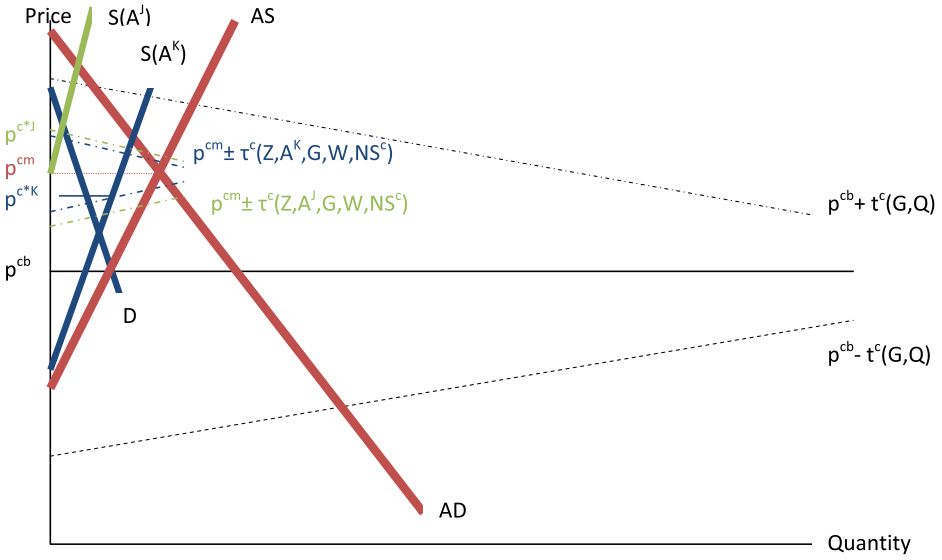

Fig. 1. Market equilibria in a stylized remote, low-potential rural area.

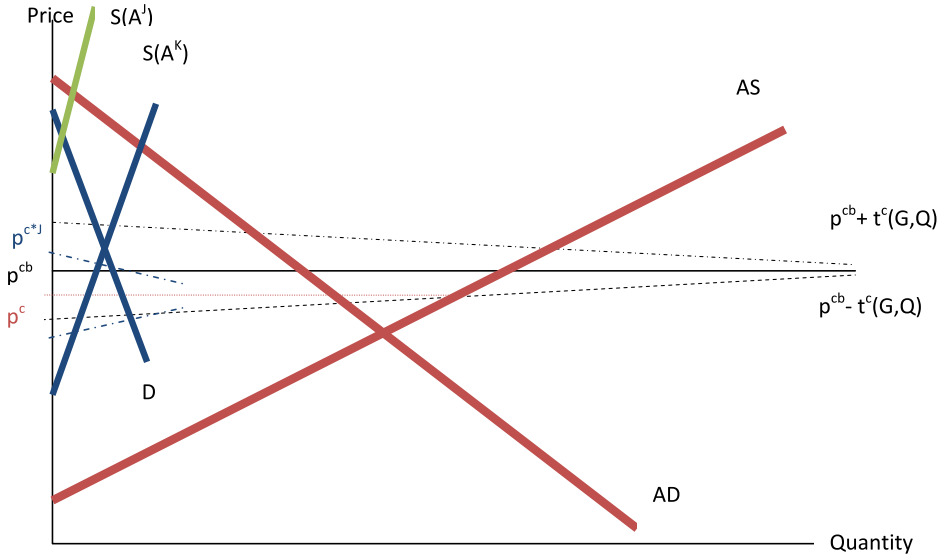

Fig. 2. Market equilibria in a stylized accessible, high-potential rural area.

times the marginal effect of the change in the border parity price on the local market price. In Deaton's standard formulation, assuming scalar prices uniformly faced by all households (i.e., without household- or market-specific price bands), the two partial derivatives each equal one. Thus, for net seller households in markets competitively integrated into the global economy, $\beta^* \equiv \frac{p^{c^*} NS^c}{W + \sum_{c=1}^{c} p^{c^*} f^c}$ is positive and equal to the income share represented by crop net sales, while for net buyers in markets competitively integrated into the global economy, β^* is negative and equal to the budget share of net crop purchases. However, once one allows for the possibility of nontrivial transactions costs of household market participation and similarly for nontrivial costs of intermarket commerce, these effects can be easily attenuated. In the limit, for autarkic households operating within the price band created by transactions costs, and for a household participating in any local market that operates within the geographic price band created by costs of intermarket commerce, the instantaneous welfare effect of border price changes is zero. Hence the frequent ineffectiveness of trade, exchange rate and other macro level policies in stimulating either smallholder market participation or significant improvements in rural producers' welfare.

Of course, the net benefit ratio is a very short-run measure of welfare effects. It does not allow for partial equilibrium adjustment of consumption or production behaviors, much less for general equilibrium effects associated with

induced changes in labor and other markets. Yet the core qualitative point remains: frictions that reduce household participation in local markets, local markets' integration with the broader, global economy, or both, attenuate the welfare effects of price changes induced by government use of policy instruments or by other exogenous shocks.

This principle carries over from welfare effects to behavioral response, as well. Autarkic behavior associated with selective market failures "severely constrain peasants' abilities to respond to price incentives and other external shocks" (de Janvry et al., 1991, p. 1401). Going one step further, Dyer et al. (2006) show how factor market linkages substantially complicate aggregate supply response as changes in market prices can indirectly alter even the shadow prices in subsistence households via general equilibrium effects in land and labor markets. The resulting aggregate supply effect is analytically ambiguous, depending fundamentally on the nature of the other markets. If, for example, increased staple crop production on commercial farms in response to increased prices bids away labor and land from subsistence households, the induced supply contraction among the latter subpopulation can reduce, even reverse the aggregate supply response of commercial farmers.

This simple nonseparable model with double buffering due to household- and market-level transactions costs thus allows the market participation and welfare effects of price and trade policy changes to vary by crop, household and location. As the next sub-section demonstrates, it also helps to underscore the important linkages between markets and technologies. These features are useful in next section's framing of the extant empirical evidence on smallholder market participation, as well as the policy implications of that evidence.

Markets and technologies

The relationship between markets and technologies is complex. For present purposes, three key points merit brief attention. First, from the household's perspective, a market is analytically equivalent to a production technology. This implies that market participation choices can be studied similarly to technology adoption choices. Second, a household's production technology choices fundamentally affect its market participation choices by affecting its productivity. Households operating rudimentary agricultural productivity technologies may participate in markets, but often only because they must use commodity markets as a way to resolve pent up demand for financial services to which they have no access. Thus promoting technological advance is essential to inducing broader-based market participation and aggregate supply response to price-based policy instruments. Third, and underscoring the close interdependence between markets and technologies, the returns to adoption of improved production technologies is fundamentally influenced by the nature of the market. Individual producers always have an incentive to adopt a cost-reducing technology. But the gains from adoption depend fundamentally on aggregate supply response and induced price changes. Because well-integrated markets transmit excess supply to distant locations, the returns to increased output diminish less quickly there than they do in segmented or poorly integrated markets and the potential for adverse welfare effects on non-adopters is likewise lower.

Consider the first point: from the household's perspective, a market is analytically equivalent to a production technology. Consider a crop c' that the household wishes to consume. There are multiple ways to "produce" c'. The most obvious is direct production, $f^{c'}(A^c, G)$. But there are also at least $C-1$ alternative means attainable through the production and subsequent market sale of another crop with the sales proceeds used to purchase c'. This latter "technology" is represented by $\frac{p^{c^*}}{p^{c'^*}} f^c(A^c, G) \forall c \neq c'$, and has all the usual (quasi-concave, monotone, etc.) properties of a standard production technology. The choice of means by which one obtains c' boils down to standard Ricardian analysis of comparative advantage and choice to produce according to comparative advantage, given the complex shadow price schedule identified above. That choice is no different than the choice among alternative means of directly producing c', i.e., market participation decisions are analytically analogous to technology adoption decisions. Social scientists can study the two phenomena similarly but, as we see in the next section, empirical research on market participation behavior has been extremely thin, especially as compared to technology adoption studies, perhaps especially with respect to staple food commodities.

It bears brief mention that in both the technology adoption and market participation cases, fixed costs and risk play an important role. As Romer (1994) explains in discussing trade policy, in the presence of fixed costs, production scale matters to whether or not it is optimal to produce or consume a good at all. When one allows for goods to appear or disappear from a household's optimal portfolio based on achieving a critical market mass, the efficiency losses associated with trade frictions due to transactions costs can become quite large.[10]

The second core point of this sub-section is that technologies directly affect market participation because the productivity of a household's asset stock heavily influences

[10] At the sectoral-level this also relates to Hirschman's (1958) idea of backward and forward linkages, which likewise rest fundamentally on the notion of pecuniary externalities linked to economies of scale, and on what Fleming (1955) referred to as "vertical" external economies associated with the cost effects associated with expanded intermediate goods production. When supply expansion of an industry drives down input prices for a downstream sector with which it has a trading relationship, it can not only have a multiplier effect, in the presence of fixed and sunk costs it can also make emergence of entire sectors suddenly profitable, leading to very large social returns to investment in the upstream sector. Johnston and Mellor (1961) seized on this idea to make the case for massive investments in improving agricultural technologies so as to drive down input prices in post-harvest value-added activities (e.g., canning, milling, food processing, textiles or leather production) and stimulate the non-farm sector. Timmer (1988) develops these ideas further in his discussion of the agricultural transformation.

its net marketable surplus position. In Figs. 1 and 2, we illustrated the differences in market participation patterns that arise among households due to variation in endowments of productive assets. Differences in production technologies generate precisely the same effect. The differences between stylized households *J* and *K* in those figures could be generated by *K*'s use of superior technologies, with identical productive asset endowments between the two households, as much as by endowment differences given the same technology in use. Those using highly productive modern technologies are far more likely to produce more than they choose to consume than are those who use the same input bundle but with more rudimentary production technologies. Improved production technologies thus provide a more reliable driver of increased supply than do exogenous price shocks due to policy change.

Third, markets also influence technology adoption patterns by affecting the returns to increased output. In the unrealistic, limiting case where a household has no market access, incentives to adopt improved technologies are limited because the household-specific shadow price falls quickly as its own demand for the crop becomes satiated. In the opposite limiting case of a household facing infinitely elastic demand for its marketable surplus, returns to additional output are not diminishing due to (shadow) price effects. The issue here relates less to household-specific transactions costs and market participation status than to local market conditions. In better integrated markets, returns to increased output diminish less rapidly than in locally segmented markets characterized by more price inelastic demand (Gabre-Madhin et al., 2002).

This merely reflects the classic "technology treadmill" effect (Cochrane, 1958). The idea is simple but powerful. In a small open economy in which producers face infinitely elastic demand, the social gains from any technological change accrue entirely to producers in the form of higher profits. By contrast, if demand is perfectly inelastic, all the social gains accrue to consumers in the form of lower prices. The distribution of the gains from technical change therefore depend crucially on the price elasticity of demand for the product, which in turn depends heavily on how well integrated the local market is with broader national, regional and global markets. Since most agricultural products exhibit highly inelastic demand, if only because of physiological limits to food consumption, maintaining efficient market integration is that much more important in order to ensure producers benefit in the long-run from technological change. Producers adopt new technologies because they reduce unit costs, thereby increasing productivity and output. But in general equilibrium, when enough producers adopt the cost-reducing technology that the aggregate supply curve shifts and prices fall too, it potentially leaves producers worse off than before if demand is sufficiently inelastic.

This reveals an important fallacy of composition: what is welfare-enhancing and optimal in the small may prove welfare-reducing in the large. For this reason, the state of agricultural markets – which determine the price elasticity of demand faced by producers – and the dynamics of adoption are central to understanding the distributional effects of technology adoption. Early adopters benefit, at least temporarily, while late adopters and non-adopters never benefit or even suffer welfare losses due to diffusion of improved technologies. Better integration of local markets into broader global markets limits the losses suffered by smallholders too poor to afford new technologies, increases the gains enjoyed by those farmers who do adopt improved production technologies, and increases the incentives to invest in adoption of new technologies.

Empirical evidence on smallholder market participation in eastern and southern Africa

With this conceptual background in place, we now review the empirical evidence on smallholder market participation in eastern and southern Africa. This review is based on a literature review of journal articles, book chapters and working papers published over the past two decades. There are quite a few papers that touch on market participation issues with respect to higher value cash crops, livestock or animal products, such as fruits and vegetables in Kenya (Dolan and Humphrey, 2000; Kherralah, 2000; Humphrey et al., 2004; Minot and Ngigi, 2004), coffee in Uganda (Fafchamps and Hill, 2005), livestock in Ethiopia, Kenya or both (McPeak, 2004; Barrett et al., 2006; Bellemare and Barrett, 2006), milk in Ethiopia (Holloway et al., 2000, 2005), cotton in Mozambique, Tanzania, Uganda, Zambia and Zimbabwe (Poulton et al., 2004), and cotton and tobacco in Mozambique (Boughton et al., in press). There's also a small, emerging literature on smallholder participation in new contract farming and modern marketing channels associated with supermarkets and other large-scale downstream distributors (Reardon and Barrett, 2000; Kirsten and Sartorius, 2002; Reardon et al., 2003; Weatherspoon and Reardon, 2003; Minten et al., submitted for publication; Neven et al., submitted for publication). But those studies are likewise predominantly about high-value commodities, especially horticultural crops. Two seminal papers on smallholder market participation focus on staple foodgrains, but in other regions: coarse grains in Senegal (Goetz, 1992) and maize in Mexico (Key et al., 2000).

The body of empirical evidence concerning smallholder staple foodgrains market participation patterns in eastern and southern Africa is thin but consistent and clear with respect to some basic descriptive patterns. First, a relatively small share of rural households or crop producers – the appropriate population varies by study – sell staple foodgrains. This holds with respect to gross sales, but especially in net terms (i.e., sales less purchases). Second, there are strong associations between households' asset holdings, especially of land, and geographic factors such as market access and agroecological zone and household-level market participation patterns. Wealthier households and those cultivating in higher potential agroecological zones appear

much more likely to sell to market than are other households. Third, transactions costs associated with weak institutional and physical infrastructure are substantial and appear to distort production and marketing behaviors significantly, muting the effects of price policy and causing significant social inefficiency. These three core themes – that many farmers are not net staple crop sellers, that net sales are positively associated with asset endowments and favorable geography, and that transactions costs exert considerable influence on crop marketing patterns – follow directly from the previous section's model. The sub-sections that follow elaborate on the empirical evidence for these three points.

Cross-sectional evidence on smallholder market participation patterns

The population of eastern and southern Africa remains disproportionately rural, with the overwhelming majority of residents growing staple foodgrains. But most such production continues to be for autoconsumption, i.e., semi-subsistence rather than commercial production. A relatively small share of households sell foodgrains and for many of those who do sell, the quantity sold is often small and dwarfed by gross purchases at other times of the year. For example, Stephens and Barrett (2006), studying smallholders in western Kenya, find that of the nearly 30% of the sample that were net maize sellers in the harvest period, 62% were net maize buyers a few months later.[11] Renkow et al. (2004) similarly find that about 10% of their sample of western Kenyan maize farmers both bought and sold maize, and that 83% of maize sales occurred within two months of harvest, when prices reach seasonal lows, with purchases generally occurring far later in the season, after households' stored maize had run out and when prices typically reach their intra-annual highs.

The available empirical evidence varies considerably in several dimensions. The type of household survey sample collected ranges from nationally representative of all households or of rural households, to purposive samples. Some authors report net sales, while others report gross sales. Most of the studies offer crop-specific estimates, but in some cases they report commodity aggregates (e.g., "basic foods", "cereals"). Thus the direct comparability across the published studies of smallholder participation in staple foodgrains markets in eastern and southern Africa is somewhat limited by methodological differences. That caveat aside, however, very consistent patterns emerge that merit attention.

As Table 1 shows, across multiple countries, crops and years, sellers consistently represent a minority of farmers or rural households (depending on the survey definition). Less than one-quarter of rural households in the Ethiopia sample had gross sales of any of the five cereals covered by Levinsohn and McMillan (2007); similarly, less than one-quarter of Rwandan households were net sellers of beans or sorghum (Weber et al., 1988). The highest estimates – of 45% net maize sellers in Zimbabwe in 1984–1985 and 39% net sellers of maize in Somalia in 1986–1987 – are now quite dated figures from countries that have experienced serious crises in the meantime that have almost certainly driven those figures down dramatically. While the coverage and comparability of the studies cited in Table 1 are limited, the pattern is nonetheless quite clear: relatively few rural farm households are actively engaged in staple foodgrains markets as sellers. Moreover, because of the double buffering effect explained in the preceding section, these survey figures on local market participation necessarily overestimate the share of farmers who participate in national or global markets.

While few households are net, or even gross, sellers of foodgrains into the market, this does not imply widespread self-sufficiency in foodgrains among smallholder households. Indeed, true autarky – no sales and no purchases – is rare. Cadot et al. (2006) estimate that only 7.5% of Madagascar's farms were autarkic in 2001, down a bit from what Barrett and Dorosh (1996) found a decade earlier.

Rather, a large share of smallholders – commonly a majority – are net buyers of the food crops they produce, relying on proceeds from cash crops and off-farm employment to generate the earnings needed to supplement their own food crop production with market purchases. Of course, this means that most small farmers in the region are hurt, not helped, by policies that increase local prices for staple foodgrains. Weber et al. (1988) made this core point 20 years ago, finding that in major grain producing regions of five countries for which data were available in the mid-1980s, 50% or less of smallholder producers were net sellers of staple grains they grew. Indeed, in several places they found net buyers were an outright majority. For example, 61% of rural households in Somalia were net maize buyers, 67 and 73% of rural households in Rwanda were net buyers of sorghum and beans, respectively. Still, policymakers and many development researchers continue to discuss development policy for rural Africa as if all farmers were net sellers of the crops they produce and thus stood to benefit from increased prices. The evidence against that popular belief is by now overwhelming.

Moreover, it is not just that few households sell foodgrains into the market. There is also tremendous concentration of sales among a relatively small share of those producers who do sell. For example, in their study of rice producers in Madagascar, Barrett and Dorosh (1996) found a Gini coefficient of gross rice sales of 0.829 as just 5% (16%) of rice farmers accounted for 50% (80%) of rice sales. Similarly, Nyoro et al. (1999) find that roughly 10%

[11] Stephens and Barrett (2006) seek to explain, in particular, the 'sell low – buy high' phenomenon, wherein smallholders sell crop in the immediate post-harvest period when prices are low, only to buy back the same commodity a few months later when prices are sufficiently greater that conventional discount rate or storage loss explanations seem grossly insufficient to explain the puzzle. Aside from pure net buyers (i.e., those who never sell crop), the most common maize marketing pattern in their data was 'sell low-buy high'.

Table 1
Staple foodgrains market participation in eastern and southern Africa

Country	Crop	Year	% Sellers (g = gross, n = net)	Study
Ethiopia	Maize and teff	1996	25[n]	Jayne et al. (2006)
	Barley	1999–2000	10[g]	Levinsohn and McMillan (2007)
	Maize		23[g]	
	Sorghum		11[g]	(rural households only)
	Teff		20[g]	
	Wheat		12[g]	
Kenya	Maize	1997	29[n]	Nyoro et al. (1999)
		1998	34[n]	
		1999	39[n]	Renkow et al. (2004)
		2000	30[n]	Jayne et al. (2006)
Madagascar	Rice	1990	32[g]	Barrett and Dorosh (1996)
		2001	25[n]	Minten and Barrett (submitted for publication)
Mozambique	Basic food	1996–1997	14[g]	Heltberg and Tarp (2002)
	Maize	2001–2002	30[g]	Boughton et al. (in press)
	Maize	2005	16[g]	Tschirley and Abdula (2007)
	Rice	2002	43[n]	
Rwanda	Beans	1986–1997	22[n]	Weber et al. (1988)
	Sorghum		24[n]	
Somalia	Maize	1986–1987	39[n]	Weber et al. (1988)
Tanzania	Food	2003	33[n]	Sarris et al. (2006)
Zambia	Maize	2000	26[n]	Jayne et al. (2006)
Zimbabwe	Maize	1984–1985	45[n]	Weber et al. (1988)
	Grains	1996	27[g]	Govereh and Jayne (2003)

of the farmers accounted for about 75% of all the maize sold by Kenyan smallholders in both 1997 and 1998, while Boughton et al. (in press) found that only 6% of maize growers in Mozambique account for 70% of total quantity sold. Jayne et al. (2006, p. 334) summarize findings from five different surveys concerning maize in the region conclude that "a small group of relatively large and capitalized smallholder farmers … (usually 1–3% of the total farm population), located in favorable agroecological areas, [account] for 50% of the marketed maize produced by the smallholder sector." Clearly, staple grain sales are extremely concentrated in the hands of a relatively few producers. As the evidence discussed in the next sub-section demonstrates, these are also the wealthiest farmers.

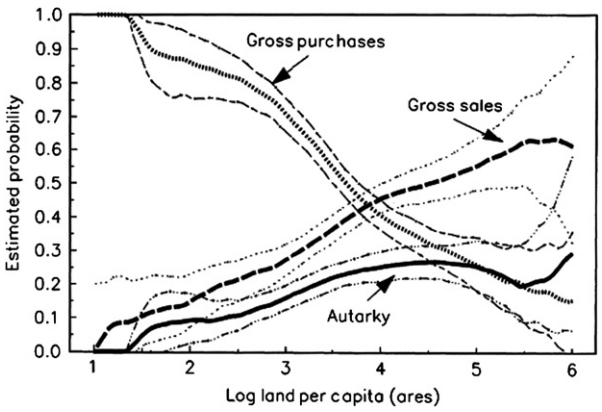

Fig. 3. Rice market participation patterns by land holdings, Madagascar, 1990.

Patterns by private asset holdings and geography

The patterns described above do not appear uniform across all smallholders. Rather they seem closely related to households' endowments of productive assets and production technologies, as well as their geographic location. The standard pattern for gross sales, purchases and autarky is depicted in Fig. 3, which shows three nonparametric regressions reflecting the estimated probability of being in each of those three regimes (reproduced from Barrett and Dorosh, 1996). Farm households with the least land (and other productive agricultural assets) are almost always gross purchasers in the market, but the probability of making gross purchases declines steadily as a household's land holdings increase. Conversely, the likelihood that a farm household registers any gross sales is very low – less than 20% – over the first third of the land distribution but rises steadily, such that the best endowed quartile of farmers exhibit a probability greater than 50% of selling to market. In the 1990 Malagasy farm household data, households with median land holdings had equal probability (about 40%) of making gross purchases and gross sales. Perhaps least intuitive for many observers, the probability of a household being autarkic – i.e., neither a rice buyer nor seller – increases steadily with land holdings up to the median, after which it is essentially constant. Autarky is not the domain of the poorest, but rather an option only for those with adequate resources to disengage from the market when transactions costs and the risk associated with commercial exchange prove too great.

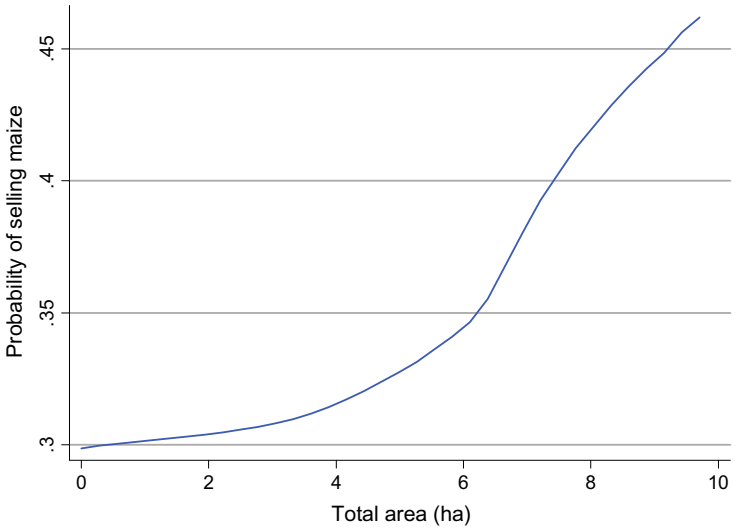

Fig. 4. Maize market participation patterns by land holdings, Mozambique 2001–2002.

Fig. 4 shows a very similar pattern of maize sales among rural households in Mozambique in 2001–2002.[12] The probability of selling is low and generally flat over most of the land distribution, then climbs steeply for the upper 10% or so of the land distribution, those with four or more hectares. Again, the positive association between land holdings and gross market participation as a seller is striking and clear. Indeed, these patterns appear repeatedly in the few studies from the region that study smallholder market participation (Nyoro et al., 1999; Heltberg and Tarp, 2002; Cadot et al., 2006).

The gross sales patterns likely understate the relation between household wealth and marketing patterns given that a certain amount of gross sales by poorer smallholders reflect merely displaced financial market distortions as farmers will use commodity markets to sell, then later buy back a commodity (or commodities) seasonally as a form of de facto seasonal credit when they are rationed out of lending markets (Stephens and Barrett, 2006; Barrett, 2007). The evidence from eastern and southern Africa on the relation between net foodgrain sales and household assets or income is strong and widespread. Levinsohn and McMillan (2007) find that net sellers of wheat are far richer than net buyers, that net benefit ratios are higher for poorer households, indicating that poorer households benefit proportionately more from a drop in the price of wheat than richer households do. They likewise find that the proportion of net sellers is increasing in living standards, reflecting geographic concentration of net sellers in higher potential regions with better marketing infrastructure. Nyoro et al. (1999) find very similar patterns in Kenya, where the only region in the country in which over half of the surveyed households were net maize sellers was the high potential zone for maize cultivation, which was also relatively more affluent. They too find a strong relationship between household well-being and net maize sales. And Jayne et al. (2001) and Minten and Barrett (submitted for publication) likewise find far higher rates of net seller households and sales volumes conditional on market participation in higher potential areas of Kenya and Madagascar, respectively.

Fig. 5 again reproduces results from farm households in Madagascar, this time showing that not only are net rice sales strongly increasing in land holdings, but that marketable surplus increases even more steeply (Barrett and Dorosh, 1996).[13] Households with median land holdings were roughly at zero net sales, while the lowest quartile of the land or income distribution had net benefit ratios below −0.2, indicating significant vulnerability to staple foodgrains price increases, while the wealthiest 10% or so of farmers would stand to gain, with net benefit ratios above 0.2. Note that this "food price dilemma", wherein higher prices that induce added output from net sellers comes at a (short-term) cost in terms of the welfare of poorer households (Timmer et al., 1983), generally does not apply to higher-value commodities such as livestock, export crops and non-food agricultural commodities, for which net purchases by rural households appear relatively rare.[14]

[12] Thanks to David Mather for generating this nonparametric Nadaraya–Watson regression with bandwidth = 3.5 and an Epanechikov kernel. A version of this plot appears (nested with similar plots for cotton and tobacco sales) in Boughton et al. (in press).

[13] The difference between the two reflects storage and interhousehold transfers, indicating that households routinely save or give away a statistically significant share of their output once they get to a net benefit ratio of 0.10 or more.

[14] For higher-value commodities, the same strong relationship between household endowments of productive assets and gross or net sales position holds. For example, Holloway et al. (2000, 2005) find a strong relationship between dairy sales and both herd size and adoption of higher-yielding cross-bred breeds in the Ethiopian highlands. Bellemare and Barrett (2006) similarly find that household assets and herd size have a strong positive effect on pastoralists' livestock sales in southern Ethiopia and northern Kenya. And Neven et al. (submitted for publication) find that land holdings are the key determinant of participation in high-value horticulture contract farming with supermarkets in Kenya.

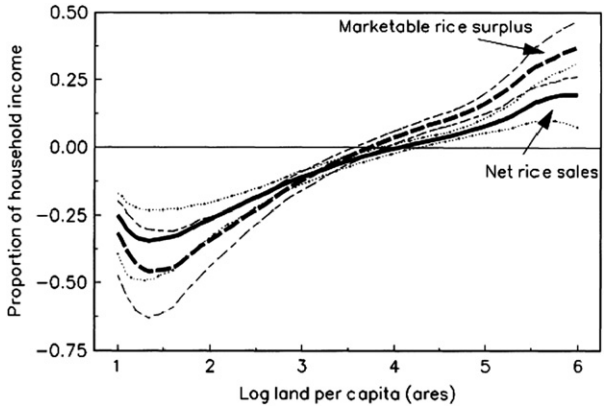

Fig. 5. Net rice sales and marketable surpluses by land holdings, Madagascar, 1990.

Private asset holdings can also play a valuable, indirect role in facilitating access to credit necessary to undertake productive investment. A large literature has established the empirical regularity that credit and insurance access is strongly and positively related to borrowers' wealth (Besley, 1995). Multiple studies find that households with access to credit transact more in foodgrains markets (Cadot et al., 2006; Stephens and Barrett, 2006). While the pathways through which this effect emerges are not yet entirely clear, it seems likely that part of this effect emerges because liquidity permits households to invest in higher-yielding, longer cycle crops, in seasonal inputs that boost yields, and in improved production technologies that require some initial sunk costs. Findings of apparent complementarities between cash crop and food crop production – such as higher use of purchased fertilizers and greater food crop yields among cash crop producers – could well arise in part due to credit commonly provided under cash cropping contracts (Govereh and Jayne, 2003). There thus appear multiple pathways through which private wealth affects market participation.

Since market participation is directly related to generating a marketable surplus, which in turn depends on productivity, wealth likely has an important impact through its influence on technology adoption patterns as well. Indeed, in their study of market participation in Mozambique, Heltberg and Tarp (2002) find that maize yields have the greatest marginal impact on market participation, for both poor and non-poor households, with more than twice as great an impact as the next most important factor (access to transport). While the obvious endogeneity of yields, technology choice and market participation choices makes inference in this area a bit troublesome, the intuition is clear, even if the empirical evidence is thin and statistically contestable: improved technologies are associated with increased market participation.

The market participation impacts of policy and project interventions

> "... the costs of transacting are the key to the performance of economies. There have always been gains from trade..., but so too have there been obstacles to realizing these gains ... The costs of transacting ... are the key obstacles that prevent economies and societies from realizing well-being." North, 1989, pp. 1319–1320.

In order to study directly the impact of different policy or project interventions on smallholder market participation, one would need longitudinal data on smallholders and the means – through randomization of interventions or availability of suitable instruments to control for placement and selection effects in non-random interventions – to identify induced behavioral changes. To the best of my knowledge, no such study exists, certainly not with respect to staple food grains in eastern and southern Africa. The lack of direct study of the impact of interventions on smallholder market participation sharply limits the empirical evidence base on which to make inferences as to what effect different policies have on market participation behavior. The available evidence offers necessarily murkier, indirect evidence as to what sorts of interventions are most likely to stimulate increased market participation. The central themes that stand out in the literature are that the key interventions to induce increased smallholder market participation are aimed at reducing the costs of households' access to local markets, of integrating local and international markets, and of organizing farmers, as well as policies to stimulate increased trader competition.

The primary theme in the literature on smallholder market participation is the importance of transactions costs. Coase (1937) famously observed that transactions costs are the basis for the organization of all economic activity and can explain much of the behavior of households and firms. Following Key et al. (2000), household crop supply and welfare response to exogenous market price changes are heavily affected by transactions costs, which create important discontinuities in supply response and nonconvexities commonly associated with poverty traps. The transactions costs that have attracted most attention by analysts are those associated with transport. Thus Heltberg and Tarp (2002) and Boughton et al. (in press) both found that household ownership of means of transport (bicycle or motorized vehicle) increases foodgrains market participation and sales volumes conditional on participation. Jayne (1994) and Omamo (1998a,b) both found that high marketing costs for low value-to-weight staple foodgrains drive smallholders to grow importable staples, substituting for cash crops offering higher returns if the costs of commerce were less significant. Overall, Omamo (1998a) reports that smallholders in western Kenya could raise farm profits by at least one-third if the significant transactions costs to crop market participation did not induce greater cultivation of maize and sorghum (and less of cotton) than straight comparative advantage in production would predict. He shows how the seemingly inefficient prominence of low-return food crops among western Kenyan smallholders reflects a rational food import substitution response by households to high transport costs in product markets.

Renkow et al. (2004), also studying Kenyan smallholder households, find that fixed transactions costs, on average, act like a 15% ad valorem tax on crop sales, slightly lower in areas with reliable motorized transport service and that are closer to markets. Because fixed transactions costs thus appear "a significant, but not insurmountable, barrier to market participation" (p. 361), they argue for public infrastructure investments as a means to increase the net returns to agricultural production by lowering transactions costs and by improving the timely availability of inputs such as fertilizers, thereby increasing productivity and marketable surpluses. Moreover, the gains from such public infrastructure investments would accrue disproportionately to relatively remote rural households, who appear worse off by most welfare measures.[15]

Taking a very different approach, Cadot et al. (2006) attempt to estimate the costs of entry into agricultural markets for pure subsistence producers in Madagascar. They estimate massive costs to entering markets: 124–153% of subsistence farmers' annual production. Their findings point to remoteness as a substantial barrier to entry into commercial farming, along with credit constraints, crop price risk, and insufficient asset holdings (especially land and education). They also find that subsistence farmers' average agricultural profits are 30% lower than those for farmers who sell to market, a figure strikingly similar to Omamo's (1998a) from western Kenyan maize systems.

The problem is not simply household-level transactions costs. As reflected in the conceptual model laid out in the previous section, the market-level costs of reaching international markets also play an important role by segmenting spatially distinct markets and thereby dampening both competition and price transmission. Moser et al. (2006) report that directly measurable transport costs to the *nearest* major city average 12–18% of rice prices in rural Madagascar and that the costs of interregional commerce within that country are sufficiently great that more than 80% of the nation's nearly 1400 communes are economically separated from the nation's main market in Antananarivo. Mabaya (2003) similarly reports very high marketing margins for spatial arbitrageurs operating in maize markets in Zimbabwe.

Fiscal retrenchment by governments has cut sharply into roads maintenance, police protection and provision of other essential public goods and services in much of eastern and southern Africa. Poor access to such goods and services promotes isolation that negatively affects uptake of improved production technologies, market participation, exports and food security (Stifel et al., 2003; Minten and Barrett, submitted for publication).[16] Coupled with exchange rate devaluation or depreciation that drives up the cost of tradable inputs (e.g., fuel), many market-oriented reforms of the past twenty or so years have sharply increased the costs of commerce, driving some regions and households back towards subsistence production (Jayne, 1994; Barrett, 1995, 1998, 1999; Reardon et al., 1999). These effects have not been uniform and in many places have been outweighed by the added vigor of newfound competition in markets in which private intermediaries had long been banned from competing against parastatal marketing boards, as well as by rapid progress in information and communications technologies such as mobile telephony. The spatially diverse impacts of liberalization on market performance and participation in much of rural sub-Saharan Africa likely owe much to the countervailing effects of this twinning of deregulated competition with degraded institutional and physical infrastructure, which has been labeled the "market relaxation – state compression hypothesis" (Barrett, 1995).

One often-overlooked effect of weak marketing infrastructure – both institutional (e.g., contract law, police protection, uniform grades and standards) and physical (e.g., roads, electricity) – is that it leads to considerable spot market price risk (Fafchamps, 2004). Price risk is another important impediment to market entry (Heltberg and Tarp, 2002; Cadot et al., 2006), as well as to adoption of improved agricultural technologies and investment in productive assets, thereby compounding the market participation effects. Indeed, reducing price risk is a prime reason many farmers in Madagascar cite for signing on with contract farming schemes (Minten et al., submitted for publication). As government control over agricultural pricing tended to reduce both the mean and variance of producer prices in the pre-liberalization era (Kreuger et al., 1988), market-oriented reforms have generally led to greater price volatility, which in some cases appears to have fuelled a retreat towards subsistence by some producers and increased isolation of some markets, such as more remote areas that previously benefitted from panterritorial pricing policies (Jayne, 1994; Barrett, 1995, 1998, 1999; Minot, 1998; Reardon et al., 1999).

Competition among traders is related to, but distinct from, issues of spatial price transmission, price risk and

[15] Evidence from other, higher-value commodities reinforces the impression that transactions costs that appear quite high relative to the price fetched by or paid for a commodity play an important role in explaining low rates of smallholder participation in staple foodgrains markets in eastern and southern Africa. For example, even in remote pastoralist areas of southern Ethiopia and northern Kenya, where extraordinarily high transport and security costs drive substantial wedges between local and terminal (Nairobi and Addis Ababa) prices, virtually all households sell livestock to market. But even in a setting with negligible supporting institutional or physical infrastructure, and even though a majority of sales were for only one animal (thus, no spreading of fixed costs across multiple units), marketing costs amounted to less than six and nine percent of pastoralists' livestock sales revenues in Kenya and Ethiopia, respectively. Thus, over the 2-year period 2000–2002, 92% of Kenyan households and 87% of Ethiopian ones sold livestock (Barrett et al., 2006).

[16] Conversely, recent rural road improvements by the government of Madagascar induced the main horticulture exporter to extend the geographic reach of its contracting with small farmers, drawing in an estimated 1,000 additional growers in a single year (Minten et al., submitted for publication).

the costs of arbitrage. When markets are spatially segmented and marketing costs are substantial and involve a significant fixed or sunk cost component, the minimum efficient scale of arbitrage may create natural oligopsony or monopsony. Thus, Bernier and Dorosh (1993) found that only 29% of rice farmers in Madagascar had access to more than one crop buyer and outside the central highlands – home to the nation's best infrastructure – that figure fell to only 6%. Barrett (1997) similarly finds that in spite of massive entry into low-entry cost niches of food marketing channels post-liberalization in Madagascar, high entry costs into wholesaling, interregional transport and interseasonal crop storage sharply limit competition and boost intermediary profits in those functions. Further reinforcing the impression that imperfect competition may be an issue in at least some settings, Moser et al. (2006) find evidence consistent with excess marginal profits to rice arbitrage at regional scale in Madagascar. Osborne (2005) likewise finds that imperfect competition among traders in grain markets in Ethiopia inflates their profits and drives down prices paid to farmers. If imperfect competition in rural markets is widespread – a hypothesis subjected to surprisingly little empirical testing in rural Africa (Osborne, 2005 is a notable exception) – then competition policy may be an important tool of government to improve price transmission and the appeal of market participation for smallholders.

One response to imperfect competition in the marketing channel is to organize farmers so as to gain bargaining power so as to extract better terms of trade from downstream purchasers. There has thus been considerable resurgence of interest in farmer cooperatives, direct marketing by growers, and other commercial ventures aimed at increasing seller-side bargaining power in agrifood markets (Kirsten and Sartorius, 2002). Farmer organizations can facilitate vertical and horizontal coordination that can otherwise lead to low-level equilibria in the presence of product- or contract-specific assets (Williamson, 1985). Because asset-specificity leaves investors vulnerable to contract hold-up problems, there are significant prospective gains to avoiding spot markets by instead undertaking contracts that provide assurances against hold-up – most commonly through interlinkage of forward sales contracts with input supply, credit, provision of extension services, etc. – and that enable producers to coordinate on quality control and product assembly so as to reduce the average fixed costs intermediaries face in collecting commodities (Kirsten and Sartorius, 2002). Various forms of cooperatives and contract farming schemes are the most common such mechanisms. In at least some settings, well-managed farmer groups have indeed proved reasonably successful in generating better terms of trade for producer members, although most such evidence comes from cash crops, especially dairy and horticulture (e.g., Minot and Ngigi, 2004; Poulton et al., 2004; Nyoro and Ngugi, 2007). To date, there has been relatively little documented success with foodgrain farmer organizations in eastern and southern Africa. Moreover, Cadot et al. (2006) find that producer associations in Madagascar increase the return to commercial farming but do not facilitate entry into commercial farming for subsistence producers. This conforms with findings in the contract farming and supermarkets literatures that farmer-level organizations intended to facilitate access to higher-return marketing channels appear to be serving largely established farmers already generating surpluses and selling to market (Reardon et al., 2003). So the smallholder market entry impact of farmer organizations remains unclear.

The complex impact of food aid on smallholder market participation

As eastern and southern Africa has become the primary destination for global food aid over the past two decades, increasing questions have emerged about its impact on markets and local agricultural producers. There is no direct evidence, at least of which I am aware, of the smallholder market participation effects of food aid. The evidence that exists is quite indirect, following one of four channels.

The first, and most discussed pathway by which food aid might impact smallholder market participation, concerns its impact on foodgrains price distributions. By increasing aggregate supply, imported food aid almost always drives down local prices, although the extent of price decline is inversely related to the quality of targeting of food aid distribution to the poor and food insecure, for whom income elasticities of demand for food are highest (Barrett and Maxwell, 2005). Perhaps the greatest concern about transoceanic food aid shipments is that poor timeliness of deliveries may amplify price volatility in local markets. Lower prices, greater price risk, or both will typically discourage smallholder market participation, although it is essential to keep in mind that lower foodgrains prices benefit most rural Africans, especially poorer smallholders who are typically net grain buyers (Barrett and Maxwell, 2005; Levinsohn and McMillan, 2007). But the overall impacts of food aid shipments on foodgrains price patterns in eastern and southern Africa have varied markedly across countries and years (Donovan et al., 2006; Maunder, 2006; Tschirley, 2007).

A second possible effect of food aid likewise operates through market price distributions, but in this case through demand-side interventions by agencies buying foodgrains under local and regional purchase schemes. A rapidly growing share of global food aid – now more than half of all non-US food aid – is purchased in the developing world as World Food Programme (WFP) local and regional purchases quadrupled from 1999 to 2005. Since WFP now conducts more than 75% of all of its local and regional purchases in Africa, this new development is of particular pertinence to the region. Out of the 4 million metric tons of cereals food aid distributed in Sub-Saharan Africa in 2005, 1.3 million tons – one-third – was sourced through local or regional purchases (WFP, 2006a). Food aid

procurement in South Africa, Tanzania, Uganda and Zambia has grown especially rapidly, perhaps exceeding 20% of marketed maize surpluses in Uganda in 2005 (Tschirley, 2007). In principle, local and regional purchases boost aggregate demand and can raise (and perhaps stabilize) foodgrains prices, inducing increased smallholder market participation, especially if purchases are coordinated through direct procurement from farmers' groups. While WFP aims to use local and regional purchases to help stimulate competition, farmer groups and food marketing infrastructure development in the region, the very limited empirical evidence to date suggests quite mixed impacts on the marketing system and on local prices (WFP, 2006b; Tschirley, 2007).

The third means by which food aid shipments might impact on smallholder foodgrains market participation rates has to do with impacts on farm productivity. While much popular discussion has emphasized "dependency effects" and the alleged disincentive effects food aid has on smallholder producers, the best available empirical evidence that directly studies food aid's impact on farm productivity suggests this is not a problem (Abdulai et al., 2005; Lentz et al., 2005; Barrett, 2006). Indeed, well-targeted food aid that obviates seasonal liquidity and nutritional constraints may actually boost smallholder productivity and lead to increased, not decreased, market participation (Bezuneh et al., 1988; Abdulai et al., 2005).

The final, and most commonly overlooked, mechanism by which food aid might impact on foodgrains market participation has to do with induced transport cost effects. Because food aid shipments from ports (or regional procurement sites) to remote distribution centers tend to increase lorry backhaul capacity (i.e., once empty of grain deliveries, lorries have space to bring back products from recipient areas), they can drive down the costs of evacuating products from those areas. Furthermore, because food aid distribution is point based, it induces people to come to towns to receive assistance, thereby covering any fixed cost component to town-based sales of marketable surpluses. Food aid may thus decrease both household- and market-specific marketing costs for recipients. Very limited evidence from grains markets in Ethiopia (Negassa and Myers, 2007) and livestock markets in northern Kenya (McPeak, 2004) suggest such effects. But I am not aware of any direct evidence of changed backhaul capacity on transport costs or market participation.

Overall, the limited and indirect evidence on the impact of policy and project interventions on smallholder foodgrains market participation reinforces the conceptual primacy of measures that reduce the structural impediments to exchange – i.e., in improved institutional and physical infrastructure – and that improve smallholder access to productive assets and improved production technologies. Reinforcing feedback between market participation and improved technology adoption can compound the natural, one-off gains from such reforms, which generally appear far more promising than efforts based exclusively on trade or price policies. Reduced transactions costs and risk for households and marketing intermediaries, improved institutional and physical infrastructure, and increased competition all matter, probably moreso than does price or trade policy directly.

Conclusions and policy implications

The empirical evidence from eastern and southern Africa suggests that most smallholders do not participate as sellers in staple foodgrains markets, at least not at any significant scale. Clearly there exist significant barriers to entry into commercial staple foodgrain markets that discourage significant sales by smallholder producers. In areas that are reasonably well integrated into the international market, conventional price and trade policies can work, subject to the standard caveats associated with the "food price dilemma" (Timmer et al., 1983). But such policies will continue to draw marketed supply disproportionately from wealthier households that have the land, livestock, capital and improved technologies to generate significant marketable surpluses, even within these privileged regions. Such households presently account for the overwhelming majority of staple foodgrains sales. Entry barriers thus substantially reduce the reach of government price and trade policy, whether for the purpose of inducing supply response to promote exports or reduce import dependence, or with the aim of reducing rural poverty. Without complementary interventions to attend to the entry barriers that inhibit smallholder market participation, the impacts of conventional, top-down macro policies on smallholders are far more limited than policymakers might believe or wish. The evidence on anemic smallholder performance in the wake of economic liberalization efforts provides abundant evidence in support of this claim.

Stimulating increased participation by most smallholders – and thus greater reach for price and trade policies in affecting food supplies and farming households' welfare – will likely require interventions to address the entry barriers that impede foodgrains market participation. Smallholders face two basic classes of entry barriers. The first are micro-scale, associated with households' insufficient private access to productive assets, financing and improved production technologies with which to generate adequate marketable surplus to make market participation feasible and worthwhile. The consistently strong positive relationship across multiple countries, crops and years between net foodgrain sales and land holdings, livestock ownership, credit access or other measures of wealth underscores how important these endowment effects are to understanding patterns of smallholder market participation. This pattern is consistent with the semi-subsistence poverty traps hypothesis, wherein poor farmers lack the assets to produce marketable surpluses and therefore cannot reap the considerable gains attainable from market-based exchange, which limits their ability to accumulate (or borrow) assets, reinforcing the initial condition and generating a low-level

dynamic equilibrium (Carter and Barrett, 2006). Breaking out of such semi-subsistence poverty traps requires interventions to build up assets, facilitate uptake of technologies that increase the productivity of existing asset holdings, break down barriers to finance and market access that impede asset accumulation and technology adoption, or some combination of these.

The second class of barriers to entry occur at meso-scale. Especially in more remote areas, the high costs of commerce limit both household-level market access and market-level spatial price transmission and trader competition. The latter effect leads to thinner and more volatile markets, thereby limiting households' incentives to increase productivity so as to generate marketable surpluses. Traders have little incentive to incur large fixed costs to reach such households and regions, reinforcing households' inclinations towards semi-subsistence production for purely local market exchange. Once again, reinforcing feedback can lead to a low-level equilibrium trap. Investments in building up institutional and physical infrastructure at community and regional scale appear unusually important in addressing such entry barriers. Aggregate supply response to induced changes in transactions costs are likely to exceed those to trade and price policy in many rural areas for the simple reason that inducing increased market participation by the large share of producers not presently engaged in markets appears the greatest prospective source of untapped marketed staple foodgrains supply in the region (Omamo, 1998a; Heltberg and Tarp, 2002; Renkow et al., 2004). Policies that reduce marketing costs for both households and for traders who intermediate between local rural markets and international and national markets, as well as interventions to expand uptake of improved technologies and increase the stock of productive assets controlled by smallholders, are thus essential complements to traditional trade and price policies for policymakers wishing to stimulate foodgrains supply, reduce poverty among smallholders, or both.

The double buffering that limits smallholder market participation sharply limits the effectiveness of commonly employed national-level policy instruments – such as exchange rate depreciation/devaluation, import tariffs, export bans, panterritorial pricing by marketing boards, etc. – in stimulating welfare-enhancing commercialization in staple grains outside the subpopulation of better-endowed farmers living in higher potential areas well integrated into global markets. In low-income countries characterized by weak institutional and physical marketing infrastructure and lots of poor producers operating rudimentary technologies with a limited stock of productive assets, such macro level policies are, at least in the short-to-medium term, relatively ineffective in generating significant behavioral or welfare responses among agricultural households. Similarly, the buffering of households from global markets complicates the effects of international food aid on smallholders in the region. Insofar as food aid addresses some of the micro- or meso-level impediments to smallholder market participation, it can offset the macro-level aggregate supply and price effects that so commonly worry observers.

These results point to a three-pronged strategy for inducing increased smallholder market participation: macro and sectoral-level price and trade policy for wealthier farmers in better integrated marketsheds, and micro- and meso-level interventions for poorer smallholders and regions less well integrated with national and international markets. Establishing the appropriate emphasis among and sequencing of the three is a context-specific empirical task. And there likely exist synergies among these distinct policy tracks due to the spillovers that exist across scales of analysis – i.e., relieving micro- and meso-level constraints makes macro policy more effective and a more hospitable macro policy environment makes it easier to induce micro-level responses (Barrett and Swallow, 2006).

First, for the minority of farmers who already participate in foodgrains markets, one needs to study patterns of market integration and price transmission to establish where markets do and do not function effectively in transmitting excess demand and supply across space.[17] Macro and sectoral policies to promote supply expansion and uptake of improved technologies can be effective among these subpopulations in reasonably well-functioning markets.

Second, one needs to establish when barriers to market participation depend largely on privately held assets – e.g., land, livestock or crop-specific capital – or production technologies needed to generate adequate surpluses to induce crop sales, and when they are more a function of meso-level institutional and physical infrastructure deficiencies. In the former case, the appropriate policy response would be improved access to financial services (credit, savings, insurance), technology transfer, and asset building programs – e.g., livestock transfers or food-for-work projects to invest in on-farm soil and water conservation structures (Holden et al., 2006). In the latter case, one needs to invest in remedying local infrastructure deficiencies, whatever they might be (roads, communications, police protection, etc.). The limited evidence that tries to weigh the merits of these different interventions tends to place primary importance on privately held assets as the greater constraint to market participation and rural poverty reduction (Boughton et al., in press; Cadot et al., 2006; Minten and Barrett, submitted for publication), although the evidence remains at best suggestive.[18] This is an exceedingly important question that merits more attention from researchers.

[17] See Abdulai (2007) or Moser et al. (2006) for discussion of and evidence on such issues.

[18] Public goods and services do not appear as important in these studies, but that could well be because there is insufficient variation in these variables in cross-section, especially once one controls for other covariates (e.g., agroecological conditions, prices) that are often highly collinear with the provision of the physical and institutional infrastructure necessary to make markets work for the rural poor.

Finally, policymakers must bear in mind that policies to stimulate productivity growth and commercialization in smallholder agriculture must be coupled with policies to absorb those who will inevitably exit farming as part of the agricultural transformation. Not everyone has the scale or the skill to make it in commercial farming. This implies a need for complementary investment in "trade adjustment assistance" for poorer smallholders in the form of health and education investments that build and protect human capital so as to improve their labor productivity and employability off the land. Increased smallholder market participation will inevitably go hand-in-hand with increased smallholder migration out of agriculture – and in some cases out of rural areas – following the familiar path of agricultural transformation.

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