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Smallholder Participation in Agricultural Value Chains: Comparative Evidence from Three Continents

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Abstract

Supermarkets, specialized wholesalers, and processors and agro-exporters' agricultural value chains have begun to transform the marketing channels into which smallholder farmers sell produce in low-income economies. We develop a conceptual framework through which to study contracting between smallholders and a commodity-processing firm. We then conduct an empirical meta-analysis of agricultural value chains in five countries across three continents (Ghana, India, Madagascar, Mozambique, and Nicaragua). We document patterns of participation, the welfare gains associated with participation, reasons for non-participation, the significant extent of contract non-compliance, and the considerable dynamism of these value chains, as farmers and firms enter and exit frequently.

JEL Codes: L23, L24, O13, O14, Q12

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1. Introduction

The modernization of agricultural value chains – the systems by which food flows from the farm gate to the consumer – is both a consequence and cause of economic development. Commercial demand increases due to income and population growth, urbanization, and trade liberalization. Marketed supply simultaneously rises due to productivity improvements in production, post-harvest processing, and distribution systems. The two processes reinforce each other, as the extensive literature on the “agricultural transformation” explains (e.g., Johnston and Mellor 1961, Timmer 1988). The combination of increased commercial demand and supply induces the emergence of modern marketing channels employing sophisticated management methods, such as costly grades and standards or vertical coordination or integration of activities that profitably add value to raw commodities through transport, storage and/or processing. Participant farmers – whose comparative advantage allows them to tap the latent demand of better-off or more distant markets made accessible by emergent agricultural value chains (AVCs) – typically improve their productivity and profitability, thereby further stimulating commercial demand and supply through reinforcing feedback. The emergence and modernization of AVCs thus result from and contribute to economic development.¹

To what extent do smallholder farmers participate in this process?² This paper addresses that question through two contributions. It first develops a simple conceptual framework to illustrate the process of contracting between smallholders and a modern agribusiness firm engaged in post-harvest processing, storage, or distribution. Our framework emphasizes several key features that emerge consistently in empirical studies of smallholder participation in AVCs, such as the prominence of geographic supply chain placement and farmer selection effects, the heterogeneity of contractual arrangements and contract terms, the prospective roles of farmer groups and cooperatives as contracting agents, and the highly variable (albeit typically positive) average returns to farmers from value chain participation.

¹ See Reardon and Timmer (2007), Swinnen (2007), and Reardon et al. (2009) for recent overviews of the literature on AVCs in developing countries.

² The term smallholder has no universally accepted definition. Here we loosely use the term to refer to farmers who operate a modest amount – typically less than two hectares – of cultivable land, relying heavily on family labor, and who have limited access to other productive resources.

This paper then offers an empirical meta-analysis of smallholder participation in AVCs in five countries across three continents: India in Asia; Ghana, Madagascar, and Mozambique in Africa; and Nicaragua in Central America. The objective is to document patterns of participation, the gains associated with participation, and the reasons for non-participation. A comparative approach enables us to tease out general patterns that transcend the specific contextual details of any particular country setting, commodity or contracting firm.

The question of smallholder participation in AVCs is of great importance to policymakers seeking to stimulate rural economic growth and poverty reduction. From the mid-1980s through the turn of the millennium, the prevailing development policy orthodoxy emphasized macroeconomic (e.g., exchange rate, trade, taxation) and sectoral (e.g., agricultural, industrial, services) policies following the so-called Washington Consensus. But this strategy often bypassed smallholder households because (i) market segmentation impeded price transmission, which in turn distorted incentives and prevented the successful uptake of arbitrage opportunities (Barrett 2008); (ii) macroeconomic and sectoral approaches ignored the many market failures constraining smallholder supply response (Barrett and Carter 1999); and (iii) the Washington Consensus largely ignored the institutional preconditions for markets to facilitate exchange and welfare improvements (North 1990; Greif 1993; Platteau 1994a, 1994b, and 2000; Fafchamps 2004).

Since the turn of the millennium, attention has shifted toward more micro-level and institutional policies. In particular, contractual arrangements with downstream processors, agro-exporters and retailers, often orchestrated through farmer groups, are increasingly seen as a means of overcoming the market imperfections that led to the failure of macroeconomic and sectoral adjustment policies (Grosh 1994; Gow 2000). Yet smallholder access to evolving AVCs – especially to more remunerative markets – is commonly limited. Smallholders' productivity may be limited by geographic or biophysical constraints such as insufficient water for irrigation or they may lack access to limited productive assets (e.g., land, livestock, labor, tools), constraining their capacity to generate a marketable surplus. The production technologies available to and appropriate for smallholders can be similarly limiting. Finally, institutional constraints - such as limited access to credit and insurance, insecure land rights, and uncertainty

regarding new risks – may further reduce the feasibility and attractiveness of AVC participation for smallholders.

The handful of empirical studies on the welfare effects of modern AVC participation have faced methodological difficulties in establishing the causal impacts of AVCs (i.e., in determining whether observed increases in welfare can really be ascribed to participation in AVCs), so the degree to which participating smallholders benefit remains somewhat uncertain. This is especially true in cases where new institutional arrangements leave smallholders exposed to risks of which they were not fully aware *ex ante*, and in cases where buyers are monopsonistic or oligopsonistic and thus enjoy contractual bargaining power over farmers that may permit firms to extract most of the gains from trade (Sivramkrishna and Jyotishi 2008; White 1997).

Consistent with the uncertain welfare results, in places where smallholder participation has actually taken place on a large scale, it has been subject to significant reversals. Agricultural value chains routinely shed participants or collapse completely. These patterns of engagement with and disengagement from marketing arrangements closely resemble patterns of smallholder adoption and disadoption of agricultural technologies (Feder et al. 1985, Foster and Rosenzweig 2010).³

The remainder of the paper proceeds as follows. In section 2, we lay out a conceptual framework with which to study evolving AVCs. Section 3 briefly describes the data from five countries used in our analysis. In section 4, we discuss comparative empirical evidence from five study countries and studies specific to these countries. Section 5 concludes.

2. Conceptual Framework

In this section we lay out a brief conceptual framework in which an agricultural commodity-processing or distributing firm contracts with smallholders for commodities that it sells either

³ Indeed, there are strong unexploited parallels between the technology adoption and market participation literatures, each of which strives to explain the limited uptake of seemingly profitable “technologies”. In the case of market participation, the seemingly profitable technology is a new marketing channel or a contract with a buyer. See Barrett (2008) for more on the parallels.

wholesale or retail on urban or foreign markets.⁴ Our stylization abstracts from many observed variations and circumstances, such as the case in which independent local assemblers buy from farmers and sell to urban or foreign wholesalers, or foreign importers contract directly with local farmer groups. Such permutations can be readily accommodated within our framework, but we omit them in order to focus on the key relationships and factors determining smallholder participation in evolving AVCs, as well as the terms and benefits of such participation.

We assume the firm is a price taker – that is, it takes commodity prices as given as they are determined on competitive urban or international markets – although we will later briefly relax this assumption. The firm sources the commodity from the lowest cost supplier(s), subject to meeting the firm’s quality and quantity requirements.⁵ In doing so, the firm also takes into consideration the costs – fixed and variable – of commodity procurement, the uncertainty surrounding whether farmers will actually deliver, and the dynamic (i.e., learning and reputation) effects of current contracting choices on future procurement options.

The firm has the option to procure commodities from the international market, where quality is assumed to meet local standards and expected prices are also taken as given, and where contracting partners often face stronger incentives to maintain their reputation as trustworthy contracting partners with respect to local markets, which minimizes the likelihood that the firm will face holdup problems (Williamson, 1985). This import procurement option sets a benchmark profit level for the firm. A profit-maximizing firm considers whether there exist domestic procurement options preferable to the import procurement option. As we explain below, this involves assessing candidate supply regions, identifying specific farmers or farmer groups within chosen regions to whom particular contract terms might be offered, and evaluating whether a farmer is likely to both accept and honor the offered contract. These decisions play out simultaneously across multiple locations and with multiple farmers in each given location, as well as over time, since both the firm and smallholders learn from past behaviors.

⁴ See Narayanan (2010b) for a more formal and specific development of several aspects of this framework.

⁵ See Laffont and Tirole (1993) and Bajari and Tadelis (2001) for classic theoretical works on procurement.

This conceptualization of the firm's problem lends itself to a simple graphical representation of observed contracting patterns and the possible smallholder welfare gains associated with participation in AVCs. Figure 1 presents the stylized problem. The firm's (expected) profits are measured on the vertical axis, with its reservation expected profit level, $\underline{\pi}$ (i.e., the profit level associated with import procurement; the lower bar denotes a minimum level), shown on the y -axis. The expected welfare gains of smallholder i in location j from selling to the firm, w_{ij} , is shown on the x -axis, with \underline{w}_{ij} representing the smallholder's reservation expected welfare level (i.e., the smallholder's opportunity cost of participating in the AVC; the lower bar once again denotes a minimum level).

The wedge bounded from below by $\underline{\pi}$ and by \underline{w}_{ij} and above by the Pareto frontier (i.e., the arc that depicts the maximum feasible combinations of firm and smallholder welfare) represents the prospective gains from contracting. In equilibrium, contracts are signed only if the wedge has an expected nonzero measure, and contracts are honored only if the actual wedge has a nonzero measure, i.e., the area of the wedge must be nonzero both at the time of contract agreement and delivery. Interestingly, this is a necessary but not sufficient condition, since the likelihood that a contract will be signed and that it will be honored both increase as the distances between the Pareto frontier and both $\underline{\pi}$ and \underline{w}_{ij} increase. To put it simply, the more each party has to gain from contracting with the other, the more likely one is to observe a contract between them, and the more likely is that contract to be honored. As the number of potential smallholder suppliers increases, the firm can more credibly make take-it-or-leave-it offers and, if turned down, find an alternative supplier at low marginal search costs. Above a certain number of prospective suppliers, the contract terms are such that the firm enjoys maximal expected profits A_{ij} , and the smallholder supplier is held down to his reservation expected welfare level \underline{w}_{ij} , as in the canonical principal-agent model (Bolton and Dewatripont 2005).

This simple framework offers a clear and concise way to understand the procurement decision of firms and patterns of smallholder participation in (and welfare gains from) AVCs. It also underscores a range of challenges faced by empirical researchers in seeking to estimate the determinants and welfare impacts of smallholder participation in AVCs, as we explain below.

To conceptualize the channel participation process, we assume the firm approaches the contracting choice sequentially. In the first stage, the firm chooses where to locate its procurement activities based on geographic attributes associated with a high probability of procuring a sufficient quantity of one or more commodities of a satisfactory quality. This might relate to the location of a processing plant for a perishable commodity, to geographic variation in growing conditions or transport infrastructure, or other factors at a scale beyond individual farmer attributes. Consequently, for some regions j , the firm's expected profits from contracting are less than the expected profit level associated with import sourcing, i.e., $A_{ij} < \bar{\pi}$, and so the firm will simply not procure from region j . In the second stage, conditional on the firm choosing to enter region j , it chooses specific farmers i to whom it offers a contract, and it also chooses the terms of the offered contract. In the third stage, the farmer chooses whether or not to accept the contract offered. In the fourth stage, once supply and demand shocks are realized and the commodity is ready to be delivered, the firm and smallholder both choose whether to honor the contract terms, i.e., whether the firm will hold up the supplier and whether the producer will side sell to an alternative buyer (a phenomenon which Fafchamps (2004) refers to as "leaking"). The process begins again in the next production period, with firms and prospective suppliers updating their information sets based on realized experiences in the most recent period. In the remainder of this section, we explore the details of each of the four contracting stages.

2.1. Stage 1: Firm Choice of a Procurement Location

In deciding on one or more locations from which to procure agricultural commodities, the firm considers several factors. First, the agro-ecological suitability of candidate regions, due to basic agroclimatic and hydrological conditions, can limit both the potential production volume and the quality of specific agricultural commodities. Second, and no less important, the firm considers a location's associated suite of transaction costs including the transportation costs incurred when picking up agricultural commodities, the prevalence of insecurity and crime, the quality of phone service, and the institutional conditions that may influence the likelihood of contract compliance by smallholders. Some geographic determinants can easily be observed by the researcher and the firm (e.g., distance, road quality and water availability), but others are often unobservable (e.g., institutional reliability).

The choice of procurement location encompasses not only the region of sourcing, but also the location of warehouses and processing facilities and the allocation of responsibility for transportation between the farmer and the firm. Much as governments and humanitarian agencies routinely find geographic targeting an efficient means for making transfers, firms routinely engage in geographic targeting of procurement, as a longstanding literature on industrial location emphasizes (Smith 1971).

These geographic placement effects obviously heavily influence smallholder participation in AVCs. Holding the probability of contract performance constant, firms typically begin by targeting the most accessible areas likely to meet their procurement needs, retaining these regions as supplier basins if contracting experiences there meet or exceed expectations. Firms sometimes perceive less accessible areas as higher-return or lower-risk, however. This may be because spatial market segmentation offers significant returns to arbitrage, because suppliers in remote markets have fewer side-selling opportunities, or because firms enjoy monopsonistic or oligopsonistic power on the local market for value-added agricultural production. Thus, although firms often prioritize areas close to roads or major urban areas or processing plants, this is not always the case, as some of the empirical evidence in the next section illustrates.

The firm faces a number of regions, each of which consists of a number of prospective suppliers. The geographic differences between two regions are illustrated in figure 2, which plots the interregional differences in a firm's expected gains from contracting. Let $\varphi(A_{i1})$ denote the distribution of expected profits from locating procurement in region 1 as a function of the maximum profit to be made in that region. Likewise, let $\varphi(A_{i2})$ denote the distribution of expected profits from locating in region 2 as a function of the maximum profit to be made in that region. In the context of figure 2, the firm would choose to locate in region 1, since that is the only region which, on average, guarantees the firm's reservation level of expected profit, $\bar{\Pi}$.

Alternatively, if the firm's reservation level of profit $\bar{\Pi}$ were to lie to the left of the mean expected profit in region 2 (i.e., to the left of the peak of $\varphi(A_{i2})$), the firm could choose to locate in either region, depending on the risk preferences of its managers. Indeed, managers who are willing to tolerate some risk (embodied in the spread of each distribution in figure 2) in exchange

for higher expected profits would locate in region 1, which has higher expected profit but also a higher expected profit variance, whereas managers who are not willing to do so might locate in region 2, which has lower expected profit but also a lower expected profit variance.

The key feature of our formulation of the firm's first-stage procurement location choice is that not all farmers have ready access to modern, potentially more remunerative AVCs. Smallholders further from roads and major urban areas and cities, with less reliable communications and transportation infrastructure, in lower-potential agro-ecological zones, in regions where crime and insecurity are more prevalent, etc. may be less likely to be offered contracts. This has strong potential implications for patterns of spatial inequality, as smallholders in areas deemed "better" by firms are also likely to enjoy preferential access to higher-value AVCs and marketing opportunities, reinforcing their initial advantages. In so far as regional attributes are often correlated with farmer characteristics – for example, more fertile areas are more densely populated and thus have smaller average farm sizes – mistaken association of firm contracting patterns with farm-specific characteristics – such as farm size – can follow naturally from ignoring geographic placement effects in firm contracting behavior.

Procurement location effects, although pronounced, are commonly overlooked in the literature. One reason is that there is no farm-level variation in supplier status in areas where firms choose not to contract, so these areas are often omitted from surveys aimed at understanding AVC participation patterns and impacts. When such regions are included, the use of geographic fixed effects effectively wipes out all explanatory power associated with the omitted area's characteristics. Social scientists need to understand the procurement location aspect of firms contracting choices, however, both in order to control for it when estimating the welfare effects of participation in AVCs, and in order to identify interventions that might expand the number of regions in which a firm contracts with smallholders and thereby enable greater smallholder market participation.

2.2. Stage 2: Firm Contract Offer

Conditional on the firm choosing to enter a region j , the firm chooses contract terms and the growers within that region to whom it offers a contract. Conceptually, the decision is reasonably

simple: offer contracts only to the N farmers $i = 1, \dots, N$ for whom $A_{ij} - \Pi$ is greatest, such as those who, in figure 2, fall to the right of the vertical line in region 1. At this stage, the difficulty for firms lies in identifying which farmers are likely to be the most profitable suppliers, given the considerable uncertainty surrounding farmers' inclination or ability to adhere to the contract.

In order to identify the best contracting partners among smallholders, firms look for readily observable indicators. For horticultural products, for example, access to irrigation is typically key. Membership in a farmer organization or participation in a non-governmental organization (NGO) extension program can be another readily observable signal that helps the firm identify the best prospective suppliers. A farmer's expected scale of supply matters insofar as firms face smallholder-specific fixed costs that make bulk purchases more attractive. The presence of such smallholder-specific fixed costs clearly favors smallholders with more land suited to growing the contracted crop, better technical ability and more experience growing the commodities under contract, as well as the neighbors of such farmers and members of farmer groups or cooperatives, given that they can more easily tap into a social network that is relevant to their contracting activities. This scale effect is reflected in market participation data by a high concentration of sales among a small number of growers (Barrett 2008).

These scale effects, however, can also cut the other way, as larger farmers commonly enjoy greater access to a variety of sales outlets, thereby both increasing the risk to the firm of farmer side-selling and providing the larger farmers with greater bargaining power in contract negotiations. If the expected welfare gains to smallholder i in location j from selling to the firm, w_{ij} , are positively correlated with attributes such as farm size, access to irrigation, or technical ability, then "more desirable" suppliers may require more advantageous contract terms than would farmers with smaller landholdings, those without access to irrigation, and those whose technical ability is lower. For example, the positive AVC participation—farm size relationship is expected to be less pronounced than the market participation—farm size relationship. Some firms actively seek out smaller farms that they deem more reliable or pliable.

In figure 1, the relationship between farm size and participation in AVCs can be understood to turn on whether farm size (or any other supplier characteristics) is more correlated with the

maximal expected profit of the firm A_{ij} or with the expected welfare gains of smallholder i in location j from selling to the firm w_{ij} . If, for example, farm size is more correlated with expected firm profits, A_{ij} , the firm's expected profits are best served by contracting with larger suppliers. If instead farm size is more correlated with the smallholder expected welfare gains, w_{ij} , the firms will tend to seek out smaller suppliers.

The firm's selection of smallholders can be further complicated by the presence of farmer groups. Farmer groups can aggregate the production of member smallholders and increase product quality but may also increase the bargaining power of smallholders. Likewise, the involvement of NGOs may provide both the firm and smallholders with complementary services, including agricultural extension, initial provision of the capital required to finance inputs or investments, or *de facto* contract monitoring and enforcement. Moreover, when firms opt to contract with a farmer group or with an NGO, the smallholder-specific selection mechanism is distorted by the selection criteria of the farmer group or NGO itself. More generally, the fact that the firm strategically chooses the farmers to whom it offers contracts and that farmers strategically decide whether to participate – in other words, that contracts are not randomly assigned across smallholders in a given region – creates a selection problem for researchers who seek to estimate the welfare effects of or farmers' behavioral response to participation in modern AVCs.

Further complicating such estimation is the problem of unobservable farmer and region characteristics influencing participation. If selection occurs merely over observable attributes of farmers and these are all observed, dealing with the selection problem is relatively straightforward, following Heckman's method or equally well-established propensity score matching techniques. The fact that a good deal of selection almost surely occurs on unobservables, however, such as smallholder technical ability, entrepreneurship, risk preferences, trustworthiness, etc. significantly complicates the empirics of accurate estimation of the welfare and behavioral effects of participation in AVCs. Furthermore, knowing that the firm seeks particular attributes among its suppliers, some smallholders may choose to make strategic investments (e.g., adopt irrigation or join a farmer group) so as to attract contract offers. When pre-existing investments seem insufficient to attract contract offers for poorer smallholders,

outside agencies may also step in to facilitate contracting through group creation, agricultural extension, provision of certification services, investment in roads or irrigation, etc. Any such anticipatory behavior, however, whether by farmers or by NGOs or farmer groups, further complicates estimation of the causal link between farmer attributes and market participation or the welfare gains from participation by endogenizing key farmer attributes that naturally serve as explanatory variables.

The content and the form of contracts can vary markedly across locations and commodities. Contracts may take the form of an informal, oral agreement or of a formal, written agreement. Formal contracts typically entails higher initial transactions costs, but they often provide superior enforcement options (Platteau 2000). No contract can cover all the myriad contingencies that arise in agricultural production and distribution, however, and inevitable incompleteness limits the range of enforceability. Further, the costs of formal contract enforcement are often too high relative to the prospective recovered damages – and the likelihood of successful prosecution of breach of contract too low – to justify pursuing enforcement (Narayanan 2010b).

Lengthy written contracts typically specify pricing, delivery timing and volumes, quality standards and conflict resolution mechanisms. From the firm's perspective, however, the relative informality of an oral agreement could be preferable for several reasons. First, the firm may want to retain flexibility to renege on contracts, especially if there is uncertainty about final retail demand volumes or supplier yields. Second, the firm tends to favor informal contracts when it has strong pre-existing relationships with its suppliers, when nonrenewal of the contract provides adequate contract enforcement, and when it is too costly to resort to the formal legal system to enforce contracts (Fafchamps and Minten 2001). For these reasons, Narayanan (2010a) reports that 46 percent of the smallholders among five firms in India had oral agreements.

A firm can tailor contract terms, and it can choose volume, price, post-harvest processing, quality standards, production schedule, delivery timing, etc., to differentiate the contracted commodity from otherwise identical commodities that the smallholder might sell elsewhere. Such differentiation can potentially generate additional gains from exchange, insofar as the firm's final consumers value the attributes specific to the contracted commodities more than the

smallholders' alternative markets do. Some contracts link the purchase of a commodity by the firm with firm provision of inputs to smallholders, a guaranteed price to insure smallholders against price fluctuations, certification for characteristics which may garner a premium (e.g., the FairTrade label), or other forms of value addition.⁶ Such interlinkages of contract terms complicate empirical comparison of the contract price received by a smallholder with alternative local spot market prices. For example, stricter grading of contracted commodities or contract requirements for worker safety may drive up a smallholder's production costs relative to alternative outlets, thereby making his production of the contracted commodity too expensive to be sold on the local market.

2.3. Stage 3: Smallholder Contract Acceptance

Once presented with a contract, smallholders choose whether to accept the offer or not. Because firms cannot perfectly observe the reservation expected welfare level of a prospective supplier i in region j , \underline{w}_{ij} , it is possible that (i) a contract offer will be strictly inferior to a smallholder's opportunity cost from entering the contract, which may lead to renegotiation of contract terms or an outright rejection of the contract on the part of the smallholder; or (ii) the contract terms will yield expected welfare gains to the smallholder well in excess of \underline{w}_{ij} . The firm wants neither of these results.

Smallholder i in region j accepts the firm's contract offer when his subjective perception regarding his expected welfare level from participating in the AVC is at least as high as that of not doing so.⁷ A smallholder's participation in the AVC does not imply, however, that he perceives the contract as fair. It merely implies that the smallholder's subjective expectation of the welfare gains from the contract exceeds his reservation welfare level. Moreover, in the (likely) event of noncooperative bargaining between the firm and the smallholder, the contract offer will in general not lie on the Pareto frontier in figure 1. This reflects the inefficiencies

⁶ Insisting on standards that drive up the cost of production could actually be a way of preventing farmers from side-selling if the only outside option is the local market, which offers a significantly lower price for lower quality product. If the cost of production exceeds the market price there is no longer any incentive for growers to side-sell.

⁷ Note that a higher subjective perception of expected welfare does not necessarily mean that one expects a higher level of *income*. Because smallholders are typically risk averse, for example, a contract that would guarantee a fixed (or considerably less volatile) price equal to the expected price on the local market at the time smallholders deliver to the firm would be deemed superior to a contract in which the firm purchases the commodity from smallholders at a price equal to that on the local market.

associated with contracting in the face of uncertainty for both the firm and the smallholder. As such, the gains available for sharing depend fundamentally on the efficiency of the contracting institutions and the trust between the contracting parties.

The contract can potentially alter the smallholder's subjective expected level of welfare in several ways. First, contracting may resolve market failures in: (i) insurance markets, by providing insurance against price risk; (ii) financial markets, by providing access to credit; (iii) input markets, by providing access to the inputs necessary to undertake the production of cash crops; and (iv) information, particularly the uncertainties associated with the marketing and production of high-return, nontraditional commodities and the provision of agricultural extension services.⁸ Interlinked input and output market contracts can generate efficiency gains shared between firms and farmers, although not all contracts in AVCs involve interlinkage.

Second, the firm's logistical capacity may generate economies of scale or economies of scope which reduce costs, yielding efficiency gains that can be shared among farmers and the firm. Note that such gains can arise even in the absence of a contract that interlinks input and output markets. The sophisticated, hyper-efficient supply chain management techniques of many modern supermarket chains, for example, commonly generate efficiency gains that can be shared among contracting parties.

Third, if the contract reduces farmer exposure to risk, it can provide smallholders with incentives to increase their production of a commodity (Baron 1970; Sandmo 1971) or to invest in yield-stabilizing technologies such as irrigation or yield-increasing inputs such as fertilizer or improved varieties (Liu 2010; Michelson 2010a). Risk reduction may come directly through the contract terms or indirectly by linking smallholders to a broader distant market from which the smallholders are otherwise economically distinct.

Fourth, firms can certify compliance with standards for which distant consumers are willing to pay a premium. Much of the FairTrade movement is organized around this idea, as are the

⁸ Anecdotal evidence suggests that smallholders often trust private (i.e., firm-provided) extension services more than they trust public (i.e., state-provided) extension services (Umali-Deininger 1997).

Global Partnership for Good Agricultural Practices (GLOBALG.A.P) and the Rainforest Alliance. Research to date suggests that the primary sources of farmer gains from contracting arise from the resolution of market failures, economies of scale or economies of scope, and reduced exposure to market risk, rather than FairTrade or certification standards. Empirical evidence on this matter nonetheless remains too thin to form a strong conclusion.

While intuition and empirical observation both suggest that smallholders who participate in AVCs by contracting with a firm enjoy gains from participation on average, it is certainly possible for smallholders to accept contracts that are *ex ante* welfare reducing. These undesirable results can emerge from power relations (Basu 1986, 2007; Genicot 2002) or social pressure (Platteau 2000) as well as from misinformation or incorrect beliefs. In the former case, adverse contract impacts can persist, while in the latter case, they should be self-correcting after costly experimentation with contracting.

There is also the possibility that smallholders strategically decline welfare-enhancing contracts, preferring instead to hold out so as to observe the contracting experience of others and thereby resolve some of the uncertainty concerning the benefits of the contract. This possibility of strategic delay, which is an important feature of the literature on technology adoption (Foster and Rosenzweig 1995), implies an externality due to learning effects that could justify subsidized interventions to stimulate and accelerate smallholder participation in AVCs, although the empirical evidence on this point remains thin (Michelson 2010b). Moreover, externalities due to learning effects may be trumped by the benefits of early entry if a firm's contract terms are especially generous as it establishes itself and has to attract initial suppliers and has fewer options for holdup than an established buyer might have as the number of willing suppliers increases (Williamson 1985; see stage 4 below). There may be an important fallacy of composition associated with scaling up the participation of smallholders in AVCs; what is appealing to a single grower in the absence of general equilibrium effects may be less appealing once the system has fully responded and shifted the expected returns.

Note that the smallholder choice of contract acceptance, like the stage 2 firm choice of farmers to whom to extend contract offers, generates a selection effect that complicates precise

estimation of the behavioral or welfare effects of value chain participation. Anecdotal evidence suggests that many of the smallholder selection effects are associated with unobservables such as smallholder risk aversion, social networks, entrepreneurship, technical ability, how much the grower trusts the firm or its emissaries, etc. As already discussed, selection on unobservables substantially complicates inference in the absence of a randomized controlled trial in which smallholders are randomly assigned to participation in an AVC, which would be plagued by issues of non-compliance and questionable external validity (Barrett and Carter 2010).

2.4. Stage 4: Firm and Smallholder Decisions to Honor the Contract

Having agreed on a contract, the firm and the smallholder each decide whether to renege on the agreement when the time comes for the smallholder to deliver the contracted commodities and for the firm to pay. Smallholders have opportunities to breach by diverting some of the firm-provided inputs to non-contracted crops, by not adhering to the production schedule agreed upon with the firm, by side-selling, or by failing to deliver the agreed volume and quality on time. The firm may breach by not showing up to collect contracted harvest, by inappropriately rejecting product, by lowering the sales price after the supplier has incurred all production costs, or by delaying final payment. The opportunities for breach of contract are many because of the multidimensional nature of contract terms and because of the time lags and the relationship-specific investments involved. Further opportunities are provided by the asymmetry of information between the two parties, which enables farmers to mask side-selling as adverse production shocks, and by market power, which often allows the firm to unilaterally revise contract terms on suppliers lacking alternative outlets.

These prospective holdup problems create disincentives for contracting and may lead both the firm and smallholders to pass up potentially lucrative deals out of concern that once an agreement is struck, the other party will renege. Indeed, prospective holdup with little recourse for contract enforcement is a primary reason for vertical integration in agriculture. Hence the importance of selection on unobservables associated with trust, reliability and reputation.

Whenever one party reneges, the other party must decide whether to expend effort and resources trying to enforce the contract. Intermediation by farmer groups or NGOs on behalf of

smallholders may generate real benefits in this regard, providing an opportunity for smallholders to challenge the firm legally or politically. What is less clear is when the firm will pursue smallholders for breach of contract, and whether it will do so through formal legal channels or through informal ones (such as threatening to terminate contracts for a renegeing smallholder's neighbors) rather than simply dropping a nonperforming supplier in future periods (Narayanan 2010a).

Contract performance matters not merely because of the immediate payoff implications but also because of its potential dynamic effects on the AVC. Both the firm and smallholders update their prior beliefs based on each other's (and third parties') contract performance before re-evaluating the contract offer and acceptance decisions of stages 1 to 3 in future periods. The firm may drop farmers whose performance did not meet expectations. The firm may also drop smallholders who fully honored their contracts if, for example, it learns that other regions or other smallholders within the same region offer a more profitable or reliable source. Conversely, smallholders may exit the AVC if they find that the contract delivers less than anticipated, if new outside opportunities emerge, or if their circumstances change. Because of changing firm and smallholder attributes and learning from imperfect contract performance by both parties, change in contracting status is to be expected on both sides, although it remains a seriously understudied phenomenon.

3. Data

This section briefly describes the context and data for each of the five studies of smallholder contracting that we discuss in the comparative analysis below. Readers interested in greater detail should consult the source materials cited.

3.1. Ghana

The Ghanaian data come from a year-long panel survey of four villages in the Akuapem South district, one of the country's major pineapple growing centers. The survey was conducted in collaboration with the Institute for Statistical, Social and Economic Research, and funded by the United States Agency for International Development Assets and Market Access Collaborative Research Support Program (USAID AMA CRSP). Two hundred and eighty households were

interviewed once every two months in 2009. Survey topics included land tenure, farming activity including market sales, shocks, risk attitudes, education, social networks and membership in farmer cooperatives. Most households surveyed in 2009 were originally visited in 1997-98 (Conley and Udry 2010) and again in 2004 (Vanderpuye-Orgle and Barrett 2009). In December 2009, four focus groups were held in one of the villages with former and current pineapple growers and two growers' cooperatives; further interviews with agribusinesses, cooperatives and producers were undertaken in July 2010 (Walker 2009, Harou and Walker 2010).

In Akuapem South district, pineapples are a high-value, nontraditional crop grown primarily for export as whole fruits. As described in Conley and Udry (2010), the opening of European pineapple markets to Akuapem farmers in the mid-1990s had a transformative effect on local agriculture. But, as Fold and Gough (2008) describe, unanticipated changes in the European market around 2004 caused major disruptions for Ghanaian pineapple growers and fundamentally altered the terms of their contracts. Verbal agreements were not honored, and in some cases firms which had begun the process of harvesting pineapples from smallholder farms neglected to return to pick up the fruit, leaving the farmers with unsellable produce and without payment. Both farmers and exporting firms lost their businesses as a result of the demand shock, leading to a period of intense rationalization in the industry. Farmers interviewed in 2009 expressed regret for accepting verbal contracts with the buying firms, and reported that they would no longer sell without a written and legally binding agreement (Harou and Walker 2010).

3.2. India

The Indian data come from a survey of 825 farmers covering five commodity sectors (i.e., cotton, gherkins, marigold, papaya, and broiler chickens). The study area – nine administrative districts in the southern state of Tamil Nadu – is heterogeneous in its agro-ecological conditions, physical features, and levels of socio-economic development. Moreover, the study area includes districts that are among the richest as well as the poorest quintiles in India.

The survey, which was funded by the American Institute of Indian Studies, the International Food Policy Research Institute, and a Norman E. Borlaug Leadership Enhancement in Agriculture Program fellowship, was conducted in two phases between 2007 and 2010

(Narayanan 2010b). The list of contracting farmers for the year of the survey was obtained from one contracting firm in each of the commodities studied. Based on this list, all the villages in the sample area were divided into contracting villages or non-contracting villages. A similar exercise was carried out for the larger administrative units, blocks and districts. Starting from the largest administrative unit for the study area, contracting districts were sampled, within which contract and non-contract blocks were randomly sampled and then further on, within sampled blocks, contract and non-contract villages were sampled. In the villages sampled, a census house listing identified four key types of farmers: those currently contracting; those who grew the contract crop but for the open market or for other firms; those who had given up contracting; and those who had never contracted. The sample respondents were randomly selected from each type.

Gherkins are a nontraditional export crop with no domestic markets. The crop is procured from farmers and processed at small-scale plants by washing, rinsing, and preserving in brine, acetic acid, or vinegar. Gherkins are then either bottled and labeled for international clients or shipped in barrels for bottling. Cotton is a traditional cash crop in parts of the study area, with established local markets and networks. Recent years have seen mills integrating along the garment chain and extending backward to contract with farmers for good quality, long staple cotton for milling. Papaya was introduced in the region in the 1990s for extracting papain, an enzyme whose industrial uses range from making meat tenderizer to treating insect bites and other wounds. The variety is not ideal for table consumption, and the fruit is used to make candied fruit or puree. Marigold contracting was initiated by firms for oleoresin extraction for export, mainly as coloring agent for poultry feed. Marigold, however, has a thriving local market as a flower used for a number of ceremonial occasions, religious and otherwise. The broiler chicken industry is almost completely vertically integrated in the study region, a process that began in the mid-1990s. In this case, day-old chicks are provided by the firm and bought back. The firm acts as an aggregator but also has its own brand of chicken in various processed forms.

3.3. Madagascar

The Malagasy data come from a study conducted in the second half of 2008 (Bellemare 2010a). Data collection was funded by the World Bank through the Economic Development Board of Madagascar (EDBM).

The data cover six regions; three were identified as high-priority “growth poles” by EDBM (Anosy, Diana, and Vakinankaratra) while the remaining three were selected for their high prevalence of contract farming (Alaotra-Mangoro, Analamanga, and Itasy). In each region, 100 households were selected from the two communes with the highest density of contract farming, as per the 2007 census of communes conducted by the World Bank (Moser 2008). Half of the households in each region participated in contract farming, while the other half did not. The survey team collected household-, plot-, and crop-level data for all 1200 households and collected additional contract-level data for the 600 households who were participants in contract farming. Given the survey design adopted in Madagascar, the data also include sampling weights so as to make the data as close as possible to a random sample. The sample households grew several different crops under contract, ranging from basic grains such as rice, maize and barley to vegetables such as leeks, onions and tomatoes, to tubers such as cassava and potatoes, and for both domestic and foreign markets.

3.4. Mozambique

The Mozambican data come from the official agricultural household survey (TIA) produced by the Mozambican Ministry of Agriculture with the assistance of Michigan State University (Bachke, 2010). The data were collected between July and September 2002 and between September and December 2005, creating the only panel derived from TIA data.

The sample is based on the Agricultural and Livestock Census from 2000, using the standards of the National Statistics Institute. In 2002, 4908 households were interviewed in 80 of the country’s 128 districts, while in 2005 it covered 6149 households in 94 different districts, i.e. 14 new districts. The balanced panel consists of 3480 households. The sampling design aimed at evaluating rural production and incomes and a stratified, clustered sample design representative of rural small- and medium-holders at the provincial and national level was used (Bachke, 2010).

The survey collected detailed information on household characteristics, welfare indicators, landholdings, employment types and remittances as well as detailed information regarding farming practices, crops grown, harvested and sold, and livestock assets and incomes. In

addition, there is a community level survey for both years on marketing, prices and infrastructure. The focus of Bachke (2010), on which this paper draws, is on the impact of farmer groups on smallholder marketing behavior and welfare, although only a limited share of agricultural marketing in Mozambique during this period was through modern value chains.

3.5. Nicaragua

The Nicaraguan data were gathered between September 2007 and July 2008 in collaboration with the Nitlapan Institute at the Universidad Centro Americana and funded by the Social Science Research Council and the USAID AMA CRSP (Michelson et al. 2010; Michelson 2010a, and 2010b). Two primary supermarket chains operate in Nicaragua: the ten-store domestic chain La Colonia, and Walmart International, with 46 Nicaraguan outlets in 2009. Michelson et al. (2010) describe the sector, the evolution of respective procurement structures and the growth in retail and sourcing in the Nicaraguan supermarket sector since 2000.

Researchers collected household and community-level data for 397 supplier and 452 non-supplier households. The 397 surveyed supermarket supplier farmers comprise the small population of farmers who supplied horticultural products to the two primary supermarket companies over some period between 2001 and 2008. For the comparison sample, 452 non-supplier households were re-surveyed from an existing nationally representative panel that was restricted to 73 municipalities in which it was established that supermarkets had purchased horticulture. The original 1996 panel was the result of collaboration between the Nicaraguan Agricultural Ministry, the University of Wisconsin, and the Food and Agriculture Organization that followed a nationally representative area-based sampling procedure.

Price data in Michelson et al. (2010) were collected from a subset of the Nicaraguan supermarket supplier population. Three producer cooperatives with ongoing supply relationships with the two major supermarkets provided data on prices received and quantities sold over time. Traditional market data was accessed through Nicaragua's governmental statistical agency.

4. Empirical Findings

Given the framework developed in section 2 and the data described in section 3, we can now discuss the patterns that emerge from the evidence on the determinants, dynamics and welfare effects of smallholder participation in evolving AVCs in the low-income world. We structure the discussion in this section to mirror the four stages outlined in section 2.

4.1. Firm Choice of a Procurement Location

It should come as little surprise that geographic factors associated with biophysical crop production capacity and the physical and institutional infrastructure of post-harvest delivery figure prominently in patterns of farmer participation in AVCs. We emphasize this because geographic placement effects are commonly overlooked in the burgeoning literature on smallholders and AVCs.

The geographic factors that influence firms' placement decision necessarily vary by crop and agroecology. For example, in India, gherkins need to be processed within hours of harvest, so most firms work with suppliers within a 60 to 100-km radius of the plant. Gherkin firms also have informal eligibility criteria including farmer access to irrigation because the value of the produce depends heavily on predictable growth, which depends on reliable water availability. Cotton contracting is possible only in tracts with black soil, making only a small subset of the India study area a viable source for procurement by mills. Similarly, marigold requires a cooler climate and is sourced only from the hilly parts of the study area. Papaya is grown in tracts that are protected from the wind due to production risks associated with tree breakage and fruit loss. Firms in southern India often go to more remote areas where market segmentation reduces the risk of side-selling, as well as to peri-urban areas where transport and search costs are lowest. Because these geographic factors are commonly correlated with farmer attributes (e.g., land holdings, educational attainment, ethnicity), failure to control properly for the geographic placement effects of firm contracting can severely bias estimates of firm selection on farmer-level observables (Narayanan 2010b).

In Nicaragua, Michelson et al. (2010) show that community access to water, NGO operations in the municipality, and proximity to supermarket retail outlets are strong predictors both of

initial inclusion into the supply chain and of continued participation in the supply chain. In fact, community access to water and geography strongly predict which of the smallholders that entered the supermarket channel between 2001 and 2007 were still supplying supermarkets in 2008. Smallholder-level selection on observables seems less important than these community-level determinants in the Nicaraguan case.

In the export pineapple industry of Ghana, freshness is critical to product quality. As a result, the major pineapple cultivation areas are located close to the international airport in Accra and the major container ship seaport in Tema and the quality of road infrastructure has a major bearing on the viability of pineapple farming. Farmers in the most remote village (both in terms of distance and travel time to port) reported the most difficulties finding buyers for their crops and the greatest losses resulting from damage of crops on the rough roads between the farms and port. The transport cost is often passed on to farmers, either directly in the form of lower prices or indirectly by diminishing the probability of a buyer coming to take their crop. Farmers also risk losses if their crops spoil en route to the market or port, either due to heat or impact damage. Ideally, harvested pineapples should be chilled immediately and shipped to port on refrigerated trucks. However, most smallholders, and the middlemen who buy their produce, do not have access to refrigerated transportation. Thus farmers closer to roads and the port are more likely to venture into pineapple farming than those further inland and in less-accessible areas.

The geography of NGO activity and farmer group emergence also matters, since they commonly help with farmer technical training, initial provision of inputs to enter higher-value sub-sectors, and recruitment of commercial buyers. Bachke (2010) finds that proximity to the national capital in Mozambique significantly increases the probability of membership in a farmers' organization, which in turn sharply increases modern input use, marketed surplus and farmer incomes. Likewise, in Madagascar, members of peasant organizations other than contract farming groups are more likely to participate in contract farming, leading to higher farmer incomes, but group membership has no direct impact on income itself (Bellemare 2010a). As in Nicaragua, NGOs seem to play a significant role in stimulating and subsidizing the emergence and operation of farmer groups in Mozambique, especially in the most remote province. This effect appears to exist independently of the superior market access of the areas where the NGOs

work (Bachke, 2010). In the Ghana study area, the farmer-based company Farmapine was set up with NGO assistance in 1998 to build a refrigerated processing facility in the district capital, close to the farms, to wash, package and ship pineapples by continuous cold chain. Farmapine was large enough to export the fruits itself, bypassing the middlemen and achieving some stability for its members. However, the company collapsed in 2007 and has not since been resurrected (Fold and Gough 2008).

In a wide array of circumstances, NGO-mediated subsidization of smallholder entry is likely to result in increased expected profits to the firm as much as in expected welfare gains to participating suppliers. To date, little attention has been paid by either researchers or policymakers to the distribution of gains from NGO interventions among growers and buying firms. But casual observation across several of the schemes we have studied suggest that when NGOs target channel-specific interventions, these often (inadvertently) increase A_{ij} , the firm's profits, while more general improvements to smallholders' options outside of the AVC, w_{ij} , for example through provision of irrigation or other productive assets more often tilt the benefits of NGO or farmer group assistance in favor of farmers because those interventions can be used not only within the AVC but also in other livelihood activities.

An important implication of the geographic placement effects consistently observed in these studies is that they tend to reinforce geographic poverty traps and regional inequality. While there are exceptions to the rule (for example, NGOs that expressly seek out the poorest farmers in more remote areas and effectively equip them to produce high quality surpluses of adequate volume), our evidence suggests that firms commonly, but not always, opt not to buy from areas where infrastructure and agro-ecology conspire to make agriculture less profitable. Rather, they most often buy from areas where roads are better and access to water is easier, and which receive more attention from NGOs and donors. Insofar as participation in AVCs seems to generate economically and statistically significant gains to participating farmers on average (Swinnen 2007; Reardon et al. 2009; Bellemare 2010a; Michelson et al. 2010; Narayanan 2010b), this naturally fosters rising spatial inequality and can reinforce geographic disadvantage within countries. Even when less favored areas are included in AVCs, Bellemare (2010a) finds that the welfare gains from participation in higher agronomic potential regions more proximate to major

urban centers were significantly higher than in more remote areas of Madagascar, although statistically significantly positive in both.

4.2. Firm Contract Offer

Within selected geographic areas, firms choose the smallholders to whom they offer contracts. In survey data one typically observes only whether a farmer does or does not participate in a value chain. The country-specific work underlying this comparative paper includes the only two exceptions of which we are aware. Bellemare (2010a) uses a field experiment to elicit the willingness of both participants and nonparticipants to pay to participate in AVCs, a proxy for the farmer's likelihood of contract acceptance. Narayanan (2010b) elicits both participants' and nonparticipants' subjective perceptions of the returns distributions to contracting and the next best alternative. Generally, however, it is statistically impossible to distinguish between the firm's decision to extend a contract offer (stage 2) and the farmer's acceptance of the offer (stage 3).

To the extent that one believes that farmers with more land, livestock, irrigation, education and social connections enjoy superior options outside the value chain, and therefore have a higher reservation expected welfare level than do less well-endowed farmers (using the framework depicted in Figure 1), the stage 3 farmer choice can be expected to generate an inverse relation between value chain participation and observables associated with remunerative livelihood options outside the AVC, conditional on being offered a contract. This need not be the case, however, if contract terms are endogenous to the characteristics of farmers in a given area.

Farmer participation is clearly nonrandom, and the strength of the selection effects can be strong. In Madagascar, for example, the average treatment effect of participation in AVCs for smallholders (i.e., the difference in welfare levels between participants and nonparticipants due to participation in AVCs) triples when smallholder selection is taken into account (Bellemare 2010a).

Overall, evidence from these case studies suggests that landholdings and several other assets commonly reflecting initial welfare status have no consistent, generalizable causal relationship

with supply chain participation, contrary to much of the popular discourse on the topic. In Madagascar and Mozambique, landholdings have an unambiguously positive impact on participation at the margin. In Ghana, India, and Nicaragua, however, farm size appears unimportant or even, in some crops in India, negatively associated with farmer participation conditional on geographic placement effects. The heterogeneity of the evidence across commodities and countries underscores the earlier point about tradeoffs firms face in selecting farmers to whom to offer contracts. Contracting with larger, better-off farmers may reduce firm transaction costs but may require offering somewhat better contract terms and may increase the risk of supplier noncompliance. Various non-land measures of *ex ante* wealth likewise have uneven and generally weak association with farmer participation in value chains. For example, farmer literacy or educational attainment is positively associated with farmer group and market participation in Mozambique and Nicaragua, but not in Madagascar.

A few farmer characteristics do appear consistently associated with value chain participation, in particular access to irrigation and membership in farmer group. Both variables, however, are at least partly endogenous to participation in AVCs. Michelson (2010a) offers clear evidence that supermarket channel participation induces investment in irrigation by participating farmers. Moreover, evidence from a randomized experiment conducted by Ashraf et al. (2009) supports the existence of a causal link between group membership and value chain participation. This is similar to the pineapple industry in Ghana, where firms contract directly with cooperatives and larger farmers, and smallholders who do not sell through a cooperative choose between selling to a middleman or the local spot market (Harou and Walker 2010). Firms seek out cooperatives because the formal contracts written by cooperatives provide the buyer with certainty over produce availability. In addition, cooperatives can guarantee a certain minimum quantity, taking the responsibility to collect the produce from smallholders and reducing the transaction costs associated with firms collecting small quantities from a large number of suppliers.

In several of the study sites discussed in this paper, individual reputations and social connections play a major role in smallholder participation. Among Ghanaian pineapple growers, smallholders commonly participate through an outgrower arrangement with a larger neighbor. Given the difficulty of measuring relationship characteristics reliably in survey data, the prospect

of selection on unobservables looms large, making it challenging to establish the casual effects of AVC participation on household-level indicators of welfare. The first-best solution to this problem is randomized control trials. However, data and data collection do usually not allow for this (Barrett and Carter 2010), making it necessary to resort to instrumental variables, propensity score matching and panel data methods, or a combination of these.

4.3. Smallholder Contract Acceptance

It is difficult to disentangle firm- and smallholder-side selection effects in observational data. Direct observation, extensive discussion with farmers in these five countries, and regression analysis nonetheless reinforce several key points.

Smallholders routinely use AVCs to resolve market failures. Agribusinesses commonly offer suppliers reliable quality inputs, often on credit, technical extension advice, some degree of price guarantees, or a combination of these, thereby resolving financial, input or insurance market failures through interlinked contracts. In Ghana, buyers provide mid-season technical services and inputs; in Madagascar, processing firms provide agricultural extension services as part of their monitoring activities and participation in AVCs decreases (cross-sectional) smallholder household income volatility by about 15 percent (Bellemare, 2010b); in Mozambique, participants use more purchased inputs – seemingly due to lower unit prices – and enjoy greater harvests (Bachke, 2010); and in India and Nicaragua, contract pricing provides a *de facto* (albeit incomplete) hedge against price volatility (Michelson et al. 2010, Narayanan 2010b).

Regardless of the specific mechanism through which AVCs resolve market failures, the individual case studies discussed in this paper consistently find positive average returns to value chain participation, so participating farmers appear to accurately perceive and act on attractive contract offers. Of course, this is not surprising given basic revealed preference arguments. Farmers would presumably, on average, only accept contract offers that they expect to benefit them. Moreover, firms do not know smallholders' reservation welfare levels and will thus routinely offer contracts that deliver welfare gains in excess of these levels. Moreover, because firms face search costs they have an incentive to share in the gains from contracting even if they have a reasonably accurate sense of the farmer's reservation expected welfare level.

Membership in a cooperative or some other farmer organization seems to matter, in part because it lowers transactions costs and helps attract contract offers from firms, but also because the contract terms available through farmer organizations are commonly better than those available to individual growers acting on their own. Membership clearly has strong positive effects on welfare among participant farming households in Mozambique, through more marketed surplus and higher value of production, mostly driven by better access to production inputs (Bachke, 2010). Despite having to pay a cooperative membership fee in Ghana, most Ghanaian pineapple farmers join because these groups have greater bargaining power, the ability to demand written contracts and the financial might to take legal action in response to breach of contract. Cooperatives are also a vehicle for accessing resources and skills training. In Ghana, 27 percent of cooperative members mentioned the increased likelihood of receiving help from the government or from an NGO as their main reason for joining a cooperative. This raises the question of whether the groups have sufficient *raison d'être* to continue functioning if and when external support for them is discontinued (Harou and Walker, 2010).

When smallholders perceive that joining an AVC does not resolve (or even aggravates) pre-existing market failures, or if it introduces new risks, they commonly decline to participate. In southern India, for example, farmers with access to AVCs for cotton and gherkins believe that contracting raises net profit per acre. Non-contracting farmers, however, associate contracting with higher variance in returns, relative to both not contracting and to the perceptions of contracting farmers. In other cases, farmers decline contract offers that they perceive offer favorable monetary returns, commonly due to concerns about other risks, such as to health due to exposure to chemical inputs required under the contract, or to land, if the crop is seen as mining soil nutrients or the farmers perceives some risk of land foreclosure in the event of involuntary breach of contract (Narayanan 2010b).

Initially, smallholders may not fully understand the implications of participation in AVCs. Some smallholders appear to follow the past experience of others, entering in response to the observed past profits of other farmers, sometimes based on high past prices that disappear as many suppliers rush into the AVC. This is certainly true in the case of pineapple in Ghana

(Trienekens and Willems 2007; Stephens 2008), and it appears equally true in Nicaragua among supermarket horticulture suppliers and in southern India. Entry often appears to have been impulsive, focusing on the upside opportunities and insufficiently on the downside risks. This partially reflects a fallacy of composition problem, given finite firm demand: smallholders and NGOs see profitable outcomes from participation and expect similar profits for themselves. But in places where initial investments take some time to bear fruit,⁹ by the time new capacity comes online, market saturation may undermine the contract terms farmers face or increase the risk of contract breach by buyers, many of whom may themselves be late entrants with more precarious arrangements with retail clients, struggling to access the storage or transport capacity needed to evacuate produce in a timely fashion.

The pineapple experience in Ghana is instructive. Figure 3 shows the history of pineapple production in Ghana, where market participation accelerated in response to the profits enjoyed by early entrants in the 1990s (Conley and Udry 2010). This was followed by a supply crash in 2004-5. Fold and Gough (2008) attribute this to a shift in European consumer preferences, favoring a different variety of pineapple over that supplied by Ghana. However, discussions with local growers and the trade data presented in figure 3 suggest the crash may have been caused more by market saturation. Whether the crash was caused by shifting preferences or by market saturation, smallholder growers had relied on informal, oral contracts that were readily breached by buyers when the market collapsed. The collapse drove many pineapple growers from the value chain, especially the most recent entrants (Harou and Walker, 2010). Ironically, government and NGOs began promoting and subsidizing cooperatives in response to the apparent profitability of smallholder pineapple cultivation, helping to spark the market saturation problem, a patent case of the fallacy of composition just described. Thus, well-meaning external efforts to help smallholders who had initially been bypassed by agro-exporters may have inadvertently induced catastrophic losses for the same late entrants to the market. This cautionary tale risks repetition in many other places given rampant enthusiasm for engaging smallholders in AVCs.

⁹ For example, in Ghana, the pineapple production cycle lasts 15 months. In India, papaya takes at least eight months to become established and yield first fruit.

4.4. Firm and Smallholder Decisions to Honor the Contract

Given agricultural price and yield volatility, it should come as no surprise that both smallholders and firms commonly fail to fulfill the terms of agreed contracts. Even in the absence of outright malfeasance, adverse exogenous shocks can render one or both parties unable to complete the exchange as agreed. The presence of shocks affecting both contracting parties is precisely what gives rise to two-sided moral hazard and adverse selection problems. Neither smallholders nor firms can tell whether a contract counterparty simply reneged on the contract *ex post*, was rendered unable to fulfill the contract due to unforeseen circumstances, or was never really capable of meeting its contractual obligations. In most of our case studies, smallholders routinely claim that they bear the bulk of the downside risks, such as risk of non-payment due to the product not meeting agreed standards or loss of crops during shipping. Firms also routinely complain that farmers side sell and fail to deliver product as agreed, however. Written contracts can perhaps mitigate some of these problems by serving as a focal point to enforce compliance or by providing an avenue to legal recourse in the event of non-compliance. But as Narayanan (2010b) argues, smallholders typically have little capacity to prosecute firm breach of contract and firms typically are unwilling to jeopardize the relationships on which successful contracting commonly depends and, in any case, stand to recover less from most renegeing growers than it would cost to prosecute them. As a result, contract noncompliance by both farmers and firms runs rampant in AVCs, and that is likely an equilibrium (Platteau 2000, Fafchamps 2004). To date, there remains insufficient evidence as to what effect (if any) the use of formal written contracts has on either performance or *ex post* enforcement.

From our observations across the case study countries, the problem of holdup by firms appears to increase in the number of smallholders with whom the firm contracts. As firms face a larger pool of prospective suppliers, especially when the contract product is perishable, firms appear more likely to speciously reject commodities as not meeting agreed quality standards, or simply not show up to purchase contracted commodities. In Ghana, firms and their middlemen commonly come to harvest the crop. If they do not show to harvest, collect and pay for the crop, the smallholder's only outside option is sale on the local market at a much lower price, roughly half, or outright loss due to spoilage caused by waiting on the contracting firm. Similar problems were observed in India and Nicaragua in horticultural products.

Given uneven contract performance histories, it is not surprising that participation in AVCs exhibits considerable turnover. Firms frequently drop smallholders, and smallholders frequently opt out of AVCs. In Ghana, 56 percent of surveyed farmers who ever joined the pineapple agro-export value chain had exited by 2009. Around half of these cited lack of buyers or problems with exporters as the main reason for exit (Harou and Walker, 2010).

In southern India, all the crop value chains studied exhibited considerable smallholder movement in and out of the AVC. Among currently contracting farmers, 73 percent of marigold farmers had at least one year when they did not contract after they had entered the value chain. The corresponding figure was 63.5 percent for gherkins, and 93 percent for cotton.¹⁰

Michelson (2010a) finds that 38 percent of all Nicaraguan farmers who supplied horticulture to supermarkets since 2001 had exited the channel by 2008. The income effects of participation in the supply chain were nonetheless retained by those who exit, suggesting that participation in the supply chain represents a transition to a new equilibrium for smallholders, seemingly based on induced investments in irrigation, productive technologies, and new market relationships that allow them to sell year round and meet the transaction and quality requirements of the supply chain. Once these investments are made, smallholders no longer need to be insured against price risk, nor do they wish to abide by the other constraining prescriptions of the contract.

In Mozambique, the rate of exit from contracting farmers' organizations was also high (57 percent between 2002 and 2005) despite the estimated positive effects on welfare for smallholders who belong to those organizations. The most likely explanation for exit is that the NGO that supported the organizations reduced its support or stopped its operation in the area, indicating how dependent these organizations are on ongoing support to create the benefits that make farmers stay members (Bachke, 2010).

¹⁰ In India, however, breaks in contracting do not reflect dropping out completely, since respondents were current participants in an AVC.

At the same time as farmers routinely drop out of AVCs, firm drop out has been quite significant in India, where maintaining contractual relationships has been a struggle in the face of difficult contract enforcement, risky export markets due to receding demand and intense foreign competition, and domestic competition from other firms. The cotton contracting firm stopped contracting in the season following the survey. The marigold contracting firm studied is one of three marigold firms that continue to contract, the other two having stopped contracting when they failed to secure export orders. The volumes that gherkins firms procure ebbs and flows, so that inter-year variation is high, especially in contracted acreage as adjustment occurs mainly at the intensive margin rather than at the extensive margin, by the firm shedding farmers from its supplier listing. The number of regions firms procure from expands or shrinks, as does the pool of suppliers, depending on market conditions. Thus placement and selection effects vary intertemporally, further complicating careful inference with respect to the causal determinants of AVC participation and its welfare effects.

Overall, the picture we see across these commodities and countries is one of considerable contracting risk faced by both parties and a high rate of turnover from one year to the next. To date, we know little about the medium- or long-term sustainability of participation in AVCs by smallholders, although the topic clearly demands attention; this criticism can be addressed to a number of topics in development (McKenzie, 2010).

5. Conclusion

One of the more important and fascinating agricultural development phenomena of the past few decades has been the rapid transformation of agricultural value chains. The emergence in developing countries of supermarkets, fast-food chains, and other retailers with downstream market power, along with a more prominent role for global agro-exporters, have increased food availability, food diversity, and food quality standards. The relatively high upfront investments required to participate in modern markets is a challenge to the participation of smallholders, however. While the transformation of agricultural markets has progressed quickly in the middle-

income countries of Latin America, Central and Eastern Europe, and East Asia, it has only recently been gaining momentum in the low-income countries of South Asia and Africa.¹¹

In the same way that much of the early Green Revolution literature (Feder and O'Mara 1981) focused on limited small farmer uptake of improved seeds, fertilizer, irrigation, and other components of “modern” production systems, a large share of the emerging literature on modern value chains has been concerned with smallholder participation in AVCs¹² and with whether these same value chains might be leaving many poorer farmers behind.

This is perhaps unsurprising given that, historically, market sales of food have been heavily concentrated in the hands of a small number of producers, even in regions and countries in which market participation is broad-based. Although most of the evidence comes from staple grains markets, a relatively small group (i.e., less than 10 percent) of relatively well-capitalized farmers located in more favorable agro-ecological zones account for a significant majority of market sales throughout the world (Barrett 2008). This suggests that gains from agrifood value chain transformation accruing to net sellers in the form of higher profits will likely concentrate in the hands of a relatively modest share of the farm population in the developing world, although there is presently scant hard evidence on this important point.

Most empirical studies of the welfare effects of AVC transformation and participation have struggled to establish causality, i.e., to ensure that the estimated impacts on welfare can truly be ascribed to AVCs rather than to some unobserved factors. Consequently, the estimated impacts on welfare of participation in AVCs in those studies are not entirely reliable. To be sure, most such studies suggest that participating farm households enjoy higher levels of welfare. Few studies, however, have credible controls for the nonrandom pattern of geographic placement of firm contracting and of firm selection of individual suppliers into specific commodity value chains, raising serious questions as to whether the observed associations between farmer income

¹¹ Reardon et al. (2003, 2009), Reardon and Timmer (2007), and Swinnen (2007) document and interpret this transformation.

¹² See for example the 2009 special issues of *World Development* and *Agricultural Economics* as well as the edited volume by Swinnen (2007).

and participation, for example, reflect the welfare effects actually *caused* by the value chain transformation or merely placement and selection effects.

The good news is that some progress is being made in this area as researchers have begun exploiting panel data designs, credible instrumental variables for participation in AVCs, and randomization of interventions to properly control for exogenous drivers of both welfare changes and value chain participation (Ashraf et al. 2009; Bellemare 2010a; Michelson et al. 2010a).

Yet as this paper makes clear, much more remains to be explored. In particular, we know little about the effects of participation on potentially more durable and transformative gains associated with improved nutritional status and educational attainment by smallholders' children and smallholder households' accumulation of productive assets. Likewise, more needs to be done to determine whether the emergence of modern value chains shifts power within the household, for example whether men take over "women's crops" once they become profitable, or grab their wives' land as it becomes more valuable for cash cropping.

This paper has synthesized the findings from five countries – Ghana, India, Madagascar, Mozambique and Nicaragua – to inform a conceptual framework of the determinants and dynamics of smallholder participation in AVCs and to begin to tease out patterns that are too often elusive in a literature heavily dependent on small-scale, one-off case study evidence. We hope that this exercise helps spur further integrative modeling and meta-analysis of the distributional implications of accelerating structural transformation in the agricultural marketing channels of the low-income world.

References

- Ashraf, N., X. Giné and D. Karlan (2009). "Finding Missing Markets (and a Disturbing Epilogue): Evidence from an Export Crop Adoption and Marketing Intervention in Kenya." *American Journal of Agricultural Economics* 91(4):973-990.
- Bachke, M.E. (2010). "Do Farmers' Organizations Enhance The Welfare of Small-Scale Farmers?" Working Paper, Norwegian University of Life Sciences.
- Bajari, P. and S. Tadelis (2001). "Incentives versus Transaction Costs: A Theory of Procurement Contracts." *RAND Journal of Economics* 32(3):387-407.
- Baron, D.P. (1970). "Price Uncertainty, Utility, and Industry Equilibrium in Pure Competition." *International Economic Review* 11(3):463-480.
- Barrett, C.B. (2008). "Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa." *Food Policy* 33(4):299-317.
- Barrett, C.B. and M.R. Carter (1999). "Microeconomically Coherent Agricultural Policy Reform in Africa." In J. Paulson, ed., *African Economies in Transition, Volume 2: The Reform Experiences* (London: Macmillan).
- Barrett, C.B. and M.R. Carter (2010). "The Power and Pitfalls of Experiments in Development Economics: Some Non-random Reflections," *Applied Economic Perspectives and Policy* 32(4): 515-548.
- Basu, K. (1986). "One Kind of Power." *Oxford Economic Papers* 38(2):259-282.
- Basu, K. (2007). "Coercion, Contract and the Limits of the Market." *Social Choice and Welfare* 29(4):559-579.
- Bellemare, M.F. (2010a). "As You Sow, So Shall You Reap: The Welfare Impacts of Contract Farming." Working Paper, Duke University.
- Bellemare, M.F. (2010b). "Agricultural extension and imperfect supervision in contract farming: evidence from Madagascar." *Agricultural Economics* 41(6):507-517.
- Bolton, P., and M. Dewatripont (2005). *Contract Theory* (Cambridge, MA: MIT Press).
- Conley, T.G. and C.R. Udry (2010). "Learning about a New Technology: Pineapple in Ghana." *American Economic Review* 100(1):35-69.
- Fafchamps, M. and B. Minten (2001). "Property Rights in a Flea Market Economy." *Economic Development and Cultural Change* 49(2):229-267.

- Fafchamps, M. (2004). *Market Institutions in Sub-Saharan Africa: Theory and Evidence* (Cambridge, MA: MIT Press).
- Fold, N. and K. V. Gough (2008). "From Smallholders to Transnationals: The Impact of Changing Consumer Preferences in the EU on Ghana's Pineapple Sector." *Geoforum* 39:1687-1697.
- Feder, G. and G.T. O'Mara (1981). "Farm Size and the Diffusion of Green Revolution Technology." *Economic Development and Cultural Change* 30(1):59-76.
- Foster, A.D., and M.R. Rosenzweig (1995). "Learning by doing and learning from others: Human capital and technical changes in agriculture." *Journal of Political Economy* 103:1176-1209.
- Foster, A.D., and M.R. Rosenzweig (2010). "Microeconomics of Technology Adoption." Working Paper, Yale University.
- Genicot, G. (2002). "Bonded labor and serfdom: a paradox of voluntary choice." *Journal of Development Economics* 67(1):101-127.
- Gow, H. (2000). "Restructuring the Agribusiness Sector and the Role of Foreign Direct Investment." In A. Burrell and A. Oskam, eds., *Agricultural Policy and Enlargement of the European Union* (Wageningen: Wageningen Press).
- Greif, A. (1993). "Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders' Coalition." *American Economic Review* 83(3):525-548.
- Grosh, B. (1994). "Contract Farming in Africa: An Application of the New Institutional Economics." *Journal of African Economies* 3(2):231-261.
- Harou, A. and T. Walker (2010). "The Pineapple Market and the Role of Cooperatives." Working Paper, Cornell University.
- Johnston, B.F., and J.W. Mellor (1961). "The Role of Agriculture in Economic Development." *American Economic Review* 51(3): 566-93.
- Laffont, J.-J. and J. Tirole (1993). *A Theory of Incentives in Procurement and Regulation* (Cambridge, MA: MIT Press).
- Liu, E. (2010). "Time to Change What to Sow: Risk Preferences and Technology Adoption Decisions of Cotton Farmers in China." Working Paper, University of Houston.
- McKenzie, D. (2010), "Beyond Baseline and Follow-Up: The Case for More T in Experiments," Working Paper, Bureau for Research and Economic Analysis of Development.

- Michelson, H., F. Perez, and T. Reardon (2010). "Small Farmers and Big Retail: trade-offs of supplying supermarkets in Nicaragua." Working Paper, Michigan State University.
- Michelson, H. (2010a). "Welfare effects of supermarkets on developing world farmer suppliers: evidence from Nicaragua." Working Paper, Cornell University.
- Michelson, H. (2010b). "Estimating the Effects of Neighbors' Participation and Exit Behavior on Farmer Market Participation." Working Paper, Cornell University.
- Moser, C.M. (2008). "Report on the 2007 Commune Census." Working Paper, Western Michigan University.
- Narayanan, S. (2010a). "Relationship Farming: The Problem of Enforcement in Contract Farming Arrangements in India." Working Paper, Cornell University.
- Narayanan, S. (2010b). "Contract Farming as Frictional Equilibrium: A Theoretical Viewpoint with Empirical Evidence from Southern India." Unpublished PhD Dissertation, Cornell University.
- North, D.C. (1990). *Institutions, Institutional Change, and Economic Performance* (Cambridge: Cambridge University Press).
- Platteau, J.-P. (1994a). "Behind the Market Stage Where Real Societies Exist I – The Role of Public and Private Order Institutions." *Journal of Development Studies* 30(3):533-577.
- Platteau, J.-P. (1994a). "Behind the Market Stage Where Real Societies Exist II – The Role of Moral Norms." *Journal of Development Studies* 30(4):753-817
- Platteau, J.-P. (2000). *Institutions, Social Norms, and Economic Development* (Amsterdam: Harwood Academic Publishers).
- Reardon, T. and J. Berdegú (2002). "The Rapid Rise of Supermarkets in Latin America: Challenges and Opportunities for Development." *Development Policy Review* 20(4):371-388.
- Reardon, T., C.P. Timmer, C.B. Barrett and J. Berdegú (2003). "The Rise of Supermarkets in Africa, Asia, and Latin America." *American Journal of Agricultural Economics* 85(5):1140-46.
- Reardon, T., C.B. Barrett, J.A. Berdegú and J.F.M. Swinnen (2009). "Agrifood Industry Transformation and Small Farmers in Developing Countries." *World Development* 37(11):1717-1727.

- Reardon, T. and C.P. Timmer (2007). "Transformation of markets for agricultural output in developing countries since 1950: How has thinking changed?" in R.E. Evenson and P. Pingali, eds., *Handbook of Agricultural Economics, Volume 3* (Amsterdam: Elsevier).
- Sandmo, A. (1971). "On the Theory of the Competitive Firm under Price Uncertainty." *American Economic Review* 61(1):65-73.
- Sivramkrishna, S. and A. Jyotishi (2008). "Monopsonistic Exploitation in Contract Farming: Articulating a Strategy for Grower Cooperation." *Journal of International Development* 20(2):280-296.
- Smith, D.M. (1971) *Industrial Location: An Economic Geographical Analysis* (New York: John Wiley & Sons).
- Stephens, E. (2008). "Feedback Relationships between New Technology Use and Information Networks: Evidence from Ghana." Working Paper, Pitzer College.
- Swinnen, J.F.M. (2007). *Global Supply Chains, Standards and the Poor: How the Globalization of Food Systems and Standards Affects Rural Development and Poverty* (Wallingford, UK: CABI).
- Timmer, C.P. (1988). "The Agricultural Transformation." pp. 275-331 in H. Chenery and T.N. Srinivasan eds., *Handbook of Development Economics*, Vol. 1. Amsterdam: North-Holland.
- Trienekens, J. and S. Willems (2007). "Innovation and Governance in International Food Supply Chains: The cases of Ghanaian Pineapples and South African Grapes." *International Food and Agribusiness Management Review* 10(4):42-63.
- Umali-Deininger, D. (1997). "Public and Private Agricultural Extension: Partners or Rivals?" *World Bank Research Observer* 12(2):203-224.
- Vanderpuye-Orgle, J. and C.B. Barrett (2009). "Risk Management and Social Visibility in Ghana." *African Development Review* 21(1):5-35.
- Walker, T.F. (2009). "Summary of Focus Group Interviews: Pokrom." Working Paper, Cornell University.
- White, B.N.F. (1997). "Agroindustry and Contract Farmers in Upland West Java." *Journal of Peasant Studies* 24(3):100-136.
- Williamson, O.E. (1985). *The Economic Institutions of Capitalism* (New York: Free Press.)

Firm expected profits

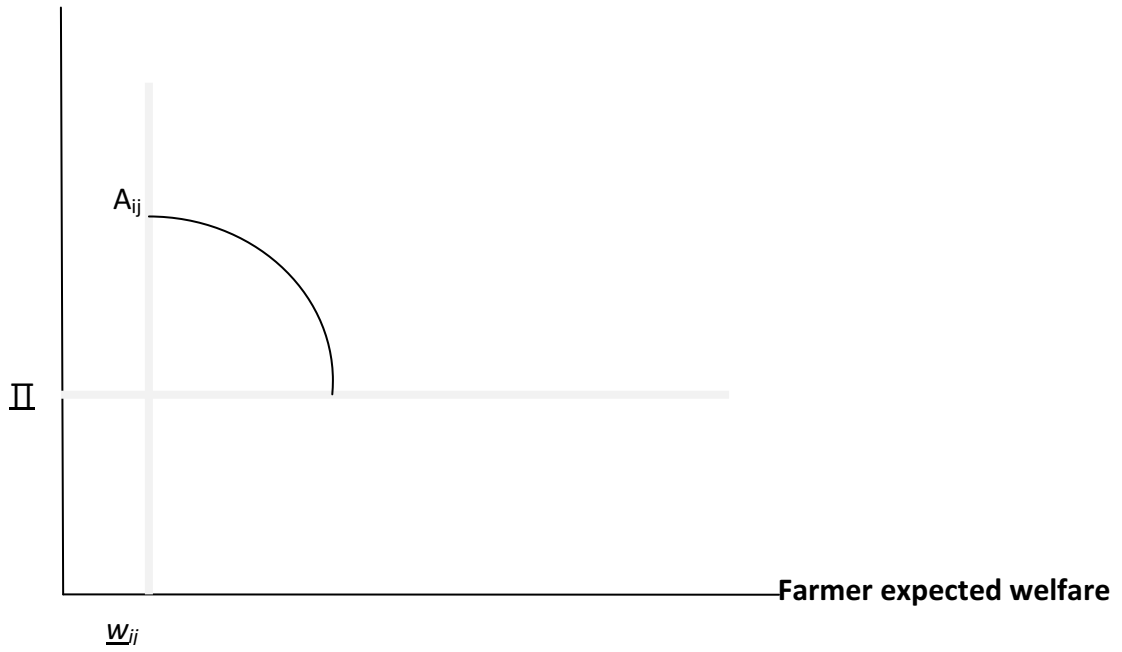


Figure 1: Gains From Contracting

Density of farmers

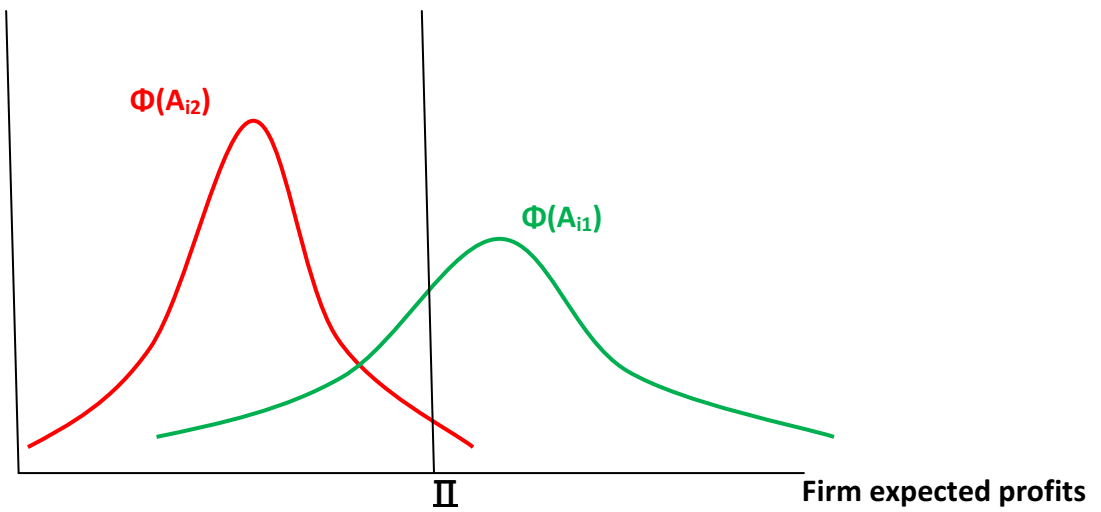
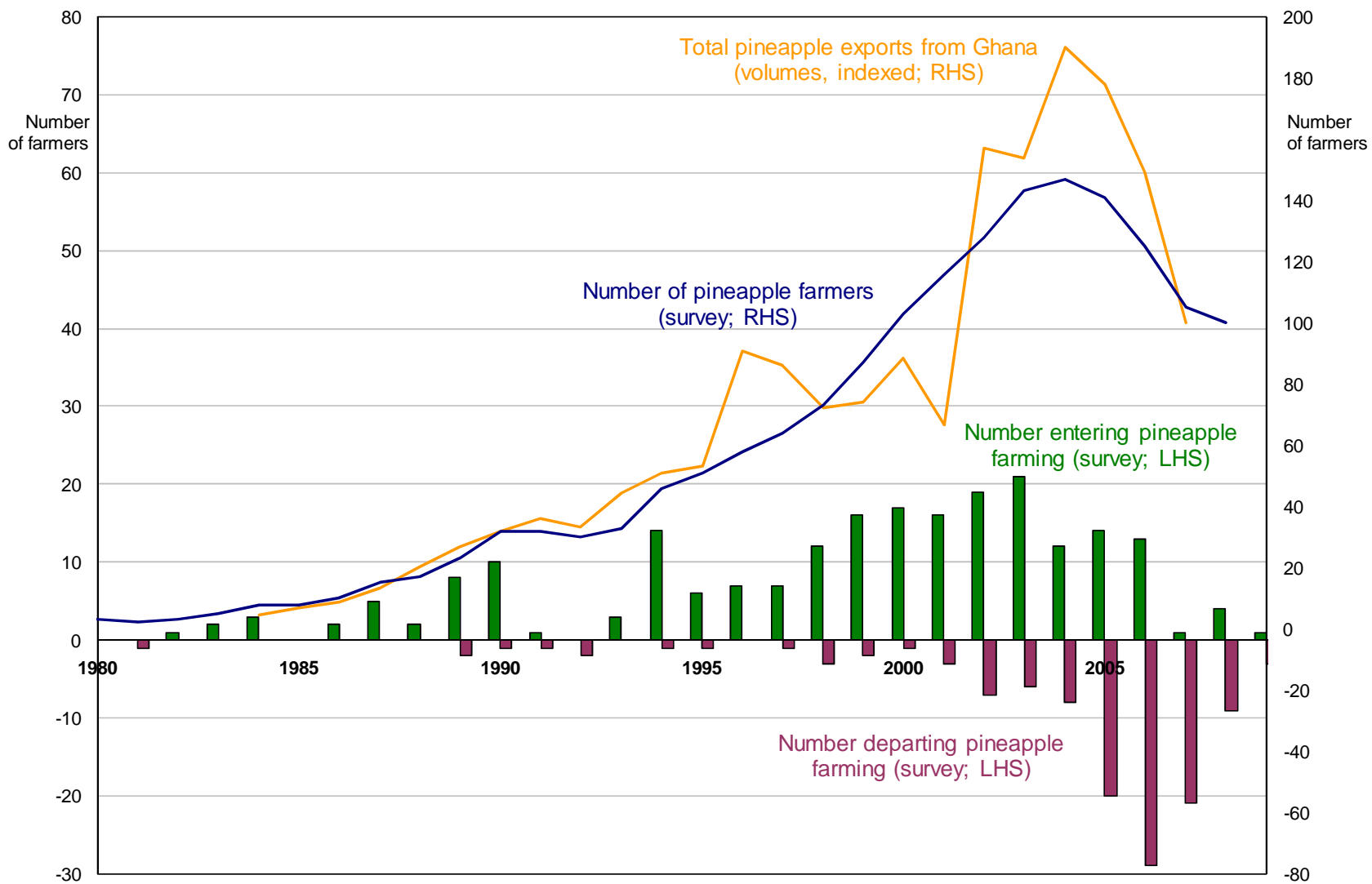


Figure 2: Geographic Differences in Firms' Expected Gains From Contracting



Sources: Export data from FAO TradeStats database, 2010. Individual farmer data from AMA-CRSP survey, 2009.

Figure 3: Pineapple Market Participation in Ghana, 1980-2009