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Correspondence: jo.swinnen@econ.kuleuven.be
Introduction

The growth of high value agrifood chains and the associated spread of quality standards has triggered a vigorous debate in the development community on the effects on poor producers in developing countries.¹ Quality requirements in high value chains affect farms through several channels. First, increasing public quality requirements in richer countries are also imposed on imports and consequently have an impact on producers and traders in exporting nations (Jaffee and Henson, 2005; Unnevehr, 2000). Second, global supply chains are playing an increasingly important role in world food markets and the growth of these, often vertically coordinated, marketing channels is associated with increasing quality standards (Swinnen, 2007). For example, modern retailing companies increasingly dominate international and local markets in fruits and vegetables, including those in many poorer countries, and have begun to set standards for food quality and safety in this sector wherever they are doing business (Dolan and Humphrey, 2000; Henson et al., 2000). Third, rising investment in processing and retailing in developing countries also has induced demand for higher value and higher quality standards commodities from local producers in order to serve the high-end income consumers in the domestic economy or to minimize transaction costs in their regional distribution and supply chains (Dries et al., 2004; Reardon et al., 2003).

The development implications and the impact for small farmers has been actively debated. On the one hand, agriculture in developing countries, and exports of agricultural commodities, are seen as a very important potential source of pro-poor growth (World Development Report, 2008). On the other hand, tightening food safety and quality standards, both from private and public sources, strongly affect domestic and international trade and value chains (Jaffee and Henson, 2004). Some have argued that they are reinforcing global

¹ The arguments and empirical evidence in this paper cover areas which are traditionally referred to as “developing countries”, “transition countries” and “emerging countries”. Many of the arguments are valid across these regions; where not, the differences will be specifically identified.
inequality and poverty as (a) they are introducing new (non-tariff) barriers to trade, (b) they are excluding small, poorly informed, and weakly capitalized producers from participating in these high quality supply systems, and (c) because large and often multinational companies are extracting all the surplus through their bargaining power within the chains (Augier et al., 2005; Reardon and Berdegué, 2002; Unnevehr, 2000; Warning and Key, 2002).

A key concern is that the process of vertical coordination will exclude a large share of farms, and in particular small farmers. Three reasons are mentioned for this. First, transaction costs favor larger farms in supply chains, since it is easier for companies to contract with a few large farms than with many small ones. Second, when some amount of investment is needed in order to contract with companies or to supply high value produce, small farms are often more constrained in their financial means for making necessary investments. Third, small farms typically require more assistance from the company per unit of output. The concern of the exclusion of small farmers is voiced often and raised in many studies on the impact of the growth of high value chains, which has often emphasized the shift to larger preferred suppliers and the exclusion of small farms (e.g. Reardon et al., 1999; Reardon and Barrett, 2000).

However, there is considerable debate and uncertainty on the validity of these arguments, and more generally on the welfare implications of high value chains (Swinnen, 2007). First, while quality and safety standards indeed make production more costly, at the same time they reduce transaction costs in trade, both domestic and internationally (Henson and Jaffée, 2007). In other words, besides barriers, standards can also be catalysts for trade (Maertens and Swinnen, 2010). Second, recent empirical studies show that smallholder participation in high quality global supply chains is much more widespread than initially argued and that the situation is actually very diverse – see further in this paper for references. Small farmers are dominant participants in modern supply chains in countries and sectors as
diverse as domestic horticultural supply chains in Asia (e.g. China), cotton chains in Central Asia (e.g. Kazakhstan), horticultural exports from Africa (e.g. Madagascar) and various supply chains (dairy, barley, …) in Eastern Europe (e.g. Poland). There are also cases where farm structures in modern supply chains are mixed, for example in vegetable exports from Eastern Africa (e.g. Senegal); or where large farms dominate, such as in F&V supply chains in Southern and Eastern Africa and grains and oilseeds in the former Soviet Union (e.g. Russia and Kazakhstan). Recent evidence also shows that important changes may occur over time within a chain, but the direction is equally diverse: small farmer participation declined in some cases (horticultural exports in Senegal) and increased in some other cases (tea in Sri Lanka).

There is less evidence on the third issue, which is the rent distribution within these supply chains. Empirically, most studies have focused on the exclusion issue and very few studies actually measures welfare, income or poverty. The few studies that do measure welfare effects find positive effects for poor households in developing countries who may participate either as smallholder producers or through wage employment on larger farming companies (Maertens and Swinnen, 2009; Maertens et al., 2009; Minten et al., 2009). What is remarkable is that these strong benefits occur in several of these cases despite the fact that smallholders and rural workers face monopsonistic processing, trading and retail companies.

A key factor is that the introduction of higher quality requirements has coincided with the growth of contracting and technology transfer (Swinnen 2007; Dries et al. 2009). Contracts for quality production with local suppliers in developing countries not only specify conditions for delivery and production processes but also include the provision of inputs, credit, technology, management advice etc. (Minten et al., 2007; World Bank, 2005). The latter are particularly important for local suppliers who face important local factor market imperfections – another key characteristic. In particular imperfections in credit and
technology markets are typically large, which implies major constraints for investments required for quality upgrading, especially for local firms and households who cannot source from international capital markets. However, the enforcement of contracts for quality production is difficult in developing countries which are often characterized by poorly functioning enforcement institutions. These enforcement problems can add significantly to the cost of contracting and may prevent actual contracting to take place.\(^2\)

**Increased importance of high-value commodities**

The growth of high-value supply chains in emerging and developing countries is related to two factors: (1) the growth of demand for high value products in local markets and (2) increased exports of high-value commodities to high-income countries.

First, domestic consumption of high-value crops such as fruits and vegetables in developing countries increased with 200% in the period 1980-2005, while consumption of cereals stagnated in that period (World Bank, 2008). This growth relates to increasing incomes and urbanization and is reflected in the rapid growth of modern food industries and retail chains (“supermarkets”) in urban market segments (Gulati et al., 2007; Reardon et al., 2003). Modern retail companies have expanded rapidly throughout the developing world and have set high standards for food quality and safety (Dolan and Humphrey, 2000; Henson et al., 2000). Important factors behind the spread of modern food industries have been liberalized investment policies and the associated inflow of Foreign Direct Investment (FDI) in developing country food sectors. FDI stocks expanded from less than 10% of GDP in the early 1990s in most developing and emerging countries to 25% in 2005 in Southeast Asia and the transition countries, and 30% in Africa and Latin-America (UNCTAD, 2010). In the

\(^2\) There is an extensive literature on the role of formal and informal enforcement institutions in development, e.g. North (1990), Platteau (2000), Greif (2006), Fafchamps (2004), Dhillon and Rigolini (2006), etc.
majority of African countries the agri-food sector accounts for a vast share of FDI inflows (UNCTAD, 2010).

Second, high-value food exports – including fruits and vegetables, meat and milk products, and fish and seafood products – from developing countries increased with more than 300% in the period 1980-2005 and now constitute more than 40% of total developing country agri-food exports (World Bank, 2008). The growth in high-value agricultural export products from developing countries has been much faster than the growth in traditional tropical exports such as coffee, cocoa and tea, which decreased in overall importance (Figure 1). For Asia the shift towards non-traditional and high-value exports started earlier, but for Africa and for Latin America and the Caribbean the decreasing importance of traditional crops and the growth in fruits and vegetable exports took mainly place over the past two decades.

These non-traditional exports mainly concern higher-value products such as fruits, vegetables, flowers, fish and seafood, that are consumed in fresh or processed form and for which the value (per weight or per unit) is typically much higher than for more bulky primary commodities destined for further processing such as the typical tropical products. In Africa, the exports of fruits and vegetables has increased from 1.9 billion USD in 1990 to 5.6 billion USD in 2007 (FAOSTAT, 2010). Several African countries; including very poor countries such as Côte d’Ivoire, Ethiopia, and Senegal have become important suppliers of fresh fruits and vegetables to EU markets. Similarly, several poor Latin American countries (Guatemala, Honduras, Bolivia) have successfully increased their exports of fresh vegetables to the US.

The importance of this shift from traditional to non-traditional export commodities is twofold. First, many developing countries have for decades been highly dependent on one or just a few export commodities, which has made countries vulnerable e.g. to volatilities and shocks in world market prices. The shift towards non-traditional exports implies more
diversified export portfolios, which reduces these vulnerabilities. Second, non-traditional exports are high-value products for which the value per unit or per weight is much higher as compared to typical traditional tropical exports such as coffee, tea and cocoa. This creates opportunities for rural income mobility and poverty reduction among smallholder producers in these countries.

**Organization and structure of high-value chains**

The shift towards high-value agriculture is accompanied by a thorough transformation of the agri-food sector. This restructuring or “modernization” of the supply chain includes (1) the increasing number and stringency of standards - both public and private - for quality and safety; (2) a shift from a fragmented sector to consolidation in the chain (mostly at the level of processing, distribution and/or retail); (3) a shift from spot markets transactions in traditional wholesale markets to increasing levels of vertical coordination in the supply chain. These structural changes have important implications for the participation of small farmers and the distribution of the benefits,

**Increasing Public and Private Standards**

During the past decade standards, including public regulations as well as private corporate standards, have increased sharply, especially for non-traditional export products such as fresh fruits and vegetables and seafood that are easily perishable. Fresh food exports to the EU for example have to satisfy a series of stringent public requirements; including marketing standards, labeling requirements, conditions concerning contamination in food, general hygiene rules and traceability requirements. In addition, private standards, focusing on food quality and safety, organic production or fair trade, are increasingly established by large food companies, supermarkets chains and NGOs and play an increasingly important role in agro-
food trade (Jaffee and Henson, 2005). The demand for higher food standards changed the way of doing business along the food chain (Kinsey, 2003).

Public and private food standards have often been mentioned to act as barriers for developing countries’ food exports, but it is remarkable that many poor countries experienced accelerated growth in fresh produce exports to high-income countries exactly during a period of sharply increased food quality and safety standards. For example, between 1997 and 2006, horticultural exports from Senegal increased fivefold (Maertens et al., forth), while the number of new SPS-measures which were notified to the WTO increased sixfold over the same period (Henson, 2006).

*Increased consolidation in food processing and retail*

Consolidation is taking place in the food industry, both in high income countries and in emerging economies. Most of this process is through mergers and acquisitions, and it applies both to food processing and retail companies (Dobson et al., 2003; McCorriston, 2006; Messinger and Narasimhan, 1995). Large food companies are also increasingly spreading globally, through foreign direct investments. In this way they contribute to concentration outside their home markets (Clarke et al., 2002).

In many European transition countries, the five-firm concentration ratio in food retail is already high, above 60 percent in many countries. For example, the top five supermarkets in Bulgaria, Romania and Poland represented respectively 59%, 61% and 57% of supermarket sales in 2009. In most of South America, East Asia (outside China), and South Africa the average share of supermarkets in food retail went from only 10% – 20% in 1990 to 50% – 60% by the early 2000s (Reardon et al., 2003). Also food processing and exporting has become increasingly consolidated. For example, in Senegal, the number of exporting firms of green bean reduced from 27 in 2002 to 14 in 2008 (Maertens et al., 2010).
Vertical Coordination

The move towards high-value supply chains with increasingly stringent standards has lead to changes in the organization of supply chains. Rather than being based on spot market transactions, high-standards food supply chains entail varying levels of vertical coordination at different nodes in the chains. First, at the production level contracting and vertical coordination has grown strongly in some of the high-value supply chains in Latin-America, Asia, Europe and Africa (Dirven, 2006; Gulati et al 2007, Reardon et al., 2009; Swinnen, 2006; 2007; World Bank, 2005). Part of these vertical coordination initiatives include the provision of farm assistance programs to the farms. These farm assistance programs include a variety of measures, such as credit, transportation, physical inputs, and quality control. However also investment loans and bank loan guarantees are provided in several cases.

High value agricultural production and rising food standards are increasingly associated with a shift towards even more extreme levels of vertical coordination in upstream processing and trading. Large exporters increasingly engage in fully vertically integrated estate production where wage laborers are hired to work on large-scale plantations (Minot

3 A 2005 comparative study by the World Bank on Eastern Europe and Central Asia came to the conclusion that such vertical coordination programs were important in transition countries for several commodities, and growing (World Bank, 2005; Swinnen, 2006). The study concluded that, for example, in the dairy sector, extensive production contracts have developed between dairy processors and farms, including the provision of credit, investment loans, animal feed, extension services, bank loan guarantees, etc. In the sugar sector, marketing agreements are widespread, but also more extensive contracts, including also input provisions, investment loan assistance, etc. In both the dairy and sugar sectors, the extent of supplier assistance by processors also goes considerably beyond some of the trade credit and input assistance provided by agribusiness to farms in some developing countries. In cotton, cotton gins typically contract farms to supply seed cotton and provides them with a variety of inputs. This model, which is common in Central Asia, resembles that of the gin supply chain structure in developing countries, such as in Africa. However, the extent of contracting and supplier assistance seems to be more extensive in Central Asia, with credit, seeds, irrigation, fertilizer, etc. being provided by the gins. In fresh fruits and vegetables, the rapid growth of modern retail chains with high demands on quality and timeliness of delivery is changing the supply chains. New supplier contracting, which is developing rapidly as part of these retail investments, include farm assistance programs, which are more extensive than typically observed in Western markets. They resemble those in emerging economies, but appear more complex in several cases. Finally, in grains there is extensive and full vertical integration in Russia and Kazakhstan, where large agro-holdings and grain trading companies own several large grain farms in some of the best grain producing regions.
Second, also downstream vertical coordination is increasing, which is apparent in vertical relationships between global retailing and food import companies and overseas suppliers. Most African fruit and vegetable exporters, for example, have ex ante-agreements with European importers before the start of the season. Some of these agreements are oral and do not include binding specifications in terms of prices or delivery dates. Yet, most large exporters increasingly engage in more binding contracts with buyers, including a (minimum) price, quantity and timing of delivery. Some exporting firms even receive pre-financing from their overseas partners (Maertens et al., 2007).

**Effects**

*Early literature*

There are (at least) two strands in the early literature. One strand has its roots in research in the transition process of former Socialist countries to a market economy and showed that throughout the many countries of Central and Eastern Europe and the former Soviet Union, massive investments by, often foreign, food companies and agribusiness were a major engine in the restructuring and upgrading of the food system (e.g. Gow et al., 2000; Gow and Swinnen, 1998; 2001; Dries and Swinnen, 2004). They established modern supply chains which not only brought profits to their own companies but had a major positive impact on the efficiency of the farm sector, through spillover effects with vertical coordination in the chain. Farm investments, productivity, competitiveness and product quality increased substantially after the food company and agribusiness investments.

Around the same time, a series of studies from emerging and developing countries in Latin America, Asia, and Africa indicated that investments by modern retailing companies
(“supermarkets”) and food multinationals may have undesirable equity effects (e.g. Reardon and Berdegué, 2002; Weatherspoon and Reardon, 2003). The growth of modern supply chains was argued to lead to the exclusion of small and poor farmers. They were excluded (a) because modern companies wanted to rationalize on transaction costs by working with only a limited number of suppliers, (b) because small and poor farmers were not able to satisfy the quality standards imposed by these modern supply chains. Another concern was that, if small farmers were included, the unequal bargaining position in the chains would lead to wealth extraction by the large retailing and food companies. The combination of these factors was argued to lead to a negative impact of modern supply chains on rural poverty and increase inequality.

**Methodological issues and recent studies**

Many of these studies – including our own - suffered from methodological problems, such as: (1) the definition of smallholders is not consistent over different studies, which makes comparison and general conclusions difficult; (2) an exclusive focus on direct effects while indirect might be important as well; (3) a focus on product market effects and exclusion of labor market effects; (4) the lack of a coherent conceptual or analytical framework to study the effects and to guide empirical analyses; (5) the nature of the data (in terms of representativeness, absence of panel data etc.). Because the lack of data on these processes in traditional databases such as, for example, national statistics or widely implemented surveys, the information sources used in these studies were company interviews, case studies, cross-section datasets with many endogeneity problems etc.

Since then a growing body of new evidence and insights based on new and (often) better data, using more carefully designed surveys, more accurate statistical analyses, and
better conceptual frameworks is emerging. The rest of this paper summarizes some key findings coming out of this recent literature.\(^4\)

Up front, one needs to make two qualifications. First, the nature of this exercise (short paper) implies ignoring a variety of nuances and a wealth of details. Second, although, on average, the quality of the studies has improved considerably in recent years, not all methodological problems have been resolved.

The rest of this paper presents some key findings organized around three important and controversial issues:

1. Do small farmers participate in modern supply chains?
2. What are the impacts on farmers that do participate in modern supply chains?
3. Can one draw conclusions on welfare and poverty effects based on the analyses?

**Small Farmer Participation in Modern Supply Chains**

The early claims on the exclusion of small farms from vertically integrating supply chains were based on limited empirical evidence. New empirical evidence from a variety of countries show a largely consistent and much more nuanced picture. The studies generally confirm the main hypotheses that transaction costs and investment constraints are a serious consideration in these chains and that processing and retailing companies express a preference for working with relatively fewer, larger, and modern suppliers. However, empirical observations also show a very mixed picture of actual participation in high-value chains, with much more small farms being contracted than predicted based on the arguments above.

\(^4\) For more details, see for example the 2009 special issue of World Development (edited by Reardon, Berdegué, Barrett and Swinnen), a series of case studies in World Bank (2005), and Swinnen (2006, 2007).
In India small farmers play an important role as suppliers in growing modern supply chains (Gulati et al. 2007). In China, production in the rapidly growing vegetable chains (and in many other commodities) is exclusively based on small farmer production (Wang et al. 2009). Surveys in Poland, Romania and CIS find no evidence that small farmers had been excluded in developing supply chains (Dries and Swinnen, 2004; van Berkum, 2005). In the CIS, the vast majority of companies had the same or more small suppliers in 2003 than in 1997 (White and Gorton, 2005). Studies on high value export vegetable chains in Africa find in some cases that production is fully organized in small farms (Legge et al, 2006; Minten et al., 2009) or fully in large farms (Maertens et al., 2008) or mixed in small and large farms (Jaffee, 2003; Maertens and Swinnen, 2009). This is summarized for a selection of countries in Table 1.

Hence, the new literature shows that small farmers are indeed “excluded” in some supply chains and in some countries, but that this is far from a general pattern, and that small and poor farms are included in supply chains to a much greater extent than expected ex ante based on arguments of transaction costs and capacity constraints.

Some studies show there is variation in the nature of contracts going to different farm structures. Often, supplier programs differ to address the characteristics of these varying farms. For example, in case studies of dairy processors investment support for larger farms include leasing arrangements for on-farm equipment, while assistance programs for smaller dairy farms include investments in collection units with micro-refrigeration units (World Bank, 2005).

Some studies find that within the “small farm” group it is the (relatively) richest and most educated that are included and that the poorest are being excluded (e.g. Maertens and Swinnen, 2009; Neven et al., 2009). However, even this is clearly not a general conclusion. Other studies show that the poorest may be included, and some countries (e.g. China
horticulture) even show that the “horticultural revolution” (associated with simultaneous
dramatic growth of modern retail investments and urban demand for horticultural products) is
associated with a pro-poor bias in the supply chain (Wang et al., 2009).

Motivations to source from small farms

Hence, despite the apparent disadvantages noted earlier, the empirical evidence suggests that
small farmers integration in high value chains is widespread. Furthermore, empirical
evidence indicates that companies in reality work with surprisingly large numbers of
suppliers and of surprisingly small size. This then begs the question: why, or under which
circumstances, do companies work with small farmers despite the costs as indicated above?

From the studies, there appear to be several reasons.

First, the most straightforward reason is that companies have no choice. In some
cases, small farmers represent the vast majority of the potential supply base and hold access
to key productive resources. This is, for example, the case in the dairy sector in countries
such as Poland, Bulgaria and Romania, where the vast majority of farms only have a few
cows. Similarly, in parts of Africa where land is an important major constraint (such as in
vegetable producing regions of Madagascar) contracting is mostly with small farms who are
the owners or users of the land, while in other regions were land is much less a constraints
(such as in part of Senegal) export companies work more with their own farms which are
established on easily accessible plots of land. Similarly, in many part of East and South Asia,
including China, with a high population pressure on the land, sourcing is often from small
farmers.

Second, company preferences for contracting with large farms are not as obvious as
one may think. While processors may prefer to deal with large farms because of lower
transaction costs in e.g. collection and administration, contract enforcement may be more
problematic, and hence costly, with larger farms. For example, Van Berkum (2006) concludes that processors repeatedly emphasized that farms’ “willingness to learn, take on board advise, and a professional attitude were more important than size in establishing fruitful farm-processor relationships”.

Third, in some cases small farms may have substantive cost advantages. This is particularly the case in labor intensive, high maintenance, production activities with relatively small economies of scale, such as dairy or vegetable production. For example, Key and Runsten (1999) present evidence that small farmers’ production costs in Mexican vegetable contract production were 45% lower than that of specialized farms owned by the processing companies. Small farmers had significantly lower labor costs because of access to unremunerated family labor for which markets are missing, and much lower costs of supervising, transporting and recruiting labor input; and because they did not pay any government benefits. And also pest control costs were lower due to better crop monitoring and thereby lower chemical use. Further, small farmers yields in vegetable production were 20% higher than on the firm’s own farms.

A fourth reason is that processors may prefer not to become too dependent on a few large suppliers. In interviews with retailers and processing companies, managers expressed these considerations: to reduce the risk of contract hold ups by large suppliers they preferred to work with a mix of large and small suppliers.

Fifth, the nature of transaction costs is another element. Higher transaction costs makes sourcing from suppliers more costly. In the literature, a standard argument is that transaction costs per unit of output are lower for large producers and hence small producers will be excluded. However, such conclusion is overly simplistic and depends on the specific (often implicit) assumptions on the nature of the transaction costs. In reality there are different types of transaction costs that might be important. For example, common
transaction costs might include costs of search (by company procurement agents that are looking for producers that are willing to supply high value products), supervision costs, quality and process control costs and the costs of enforcing agreements. As an illustration, consider the following quote from Minten et al. (2009) on processor-farmer interactions in high value vegetable production in Madagascar:

“To monitor the correct implementation of the contract conditions, the [processor] has ...around 300 extension agents who are permanently on the payroll of the company. Every extension agent is responsible for about thirty farmers. To supervise these, (s)he coordinates [another] five or six extension assistants ... that live in the village itself. During the cultivation period of the vegetables, the farmer is visited on average more than once a week ...to ensure correct production management as well as to avoid ‘side-selling’. ...99% of the farmers say that the firm knows the exact location of the plot; 92% of the farmers say that the firm even knows ...the number of plants on the plot. For crucial aspects of the production process, such as pesticide application, representatives of the company will even intervene in the production management to ensure it is rightly done. [One-third] of the farmers report that representatives of the firm will themselves put the pesticides on the crops to ensure that it is rightly done.” (p. 14).

This example clearly illustrates that the notion of fixed transaction costs per supplier is not (necessarily) consistent with reality. Some transaction costs are fixed per supplier (e.g. contract negotiation costs), some are fixed per unit of output (e.g. output control costs) and some are fixed per unit of production input (e.g. monitoring of plots and production activities). These different types of transaction costs will differentially affect the attractiveness to source from smallholders.

Finally, processing companies also differ in their willingness to work with small farms. Case studies indicate that some processing companies work with small local suppliers even when others do not. These companies have been able to design and enforce contracts which both the small firms and the companies find beneficial.
Motivations for small farmers to supply high-value chains

Another important question is why small farmers themselves are interested in supplying high-value chains under contract with agro-industries. One of the most obvious reasons is that high-value chains offers higher prices and therefore profits on high-value production, and ultimately farm incomes, are larger. However, studies that have empirically examined the motivation of farmers to engage in high-value contract-production, show that guaranteed sales and prices, and access to inputs and credit play an important role, rather than direct profit and income effects. Table 2 shows that the dominant motivation for small cotton farmers in southern Kazakhstan to enter high-value contracting with gins is the improved access to credit. For horticulture farmers in Senegal, guaranteed market access and access to inputs are the most important motivations for farmers to engage in high-value export production under contract with the agro-exporting industry. For horticulture farmers in Madagascar this is income stability and shorting of the lean period. The observed difference in farmers’ motivation across countries is related to differences in institutional development, especially diverging access to credit and input markets.

Small farmer inclusion and governance

An important aspect of the growth of modern value chains is the governance and industrial organization of these supply chains. In particular, as already mentioned earlier, there is much evidence that vertical coordination is widespread in high value chains, often as an institutional response to overcome problems of local market imperfections. With investors and food companies facing important problems of sourcing high quality produce on the supply side and high consumer standards on the demand side, vertically coordinated systems have emerged to control standards by suppliers and to provide suppliers with inputs and
management advise. Vertical coordination varies from integrated (large) farms managed by food companies to extensive contracting arrangements with smallholders.

The rise of contracting, far from leading to the exclusion of poorer farmers, is shown to improve access to credit, technology and quality inputs for poor, small farmers that heretofore were faced with binding liquidity and information constraints due to poorly developed input markets (Key and Runsten, 1999). Studies have found extensive evidence of input provision through interlinked contracts – in the form of inputs, credit, bank loan assistance, technology and management advice, etc. – in modern supply chains; e.g. for vegetable exports from Senegal, Madagascar and Kenya (Jaffee, 2003; Maertens and Swinnen, 2006; Minten et al., 2007); for diverse agri-food chains in Armenia, Georgia, Moldova, Ukraine and Russia (White and Gorton, 2005); for cotton supply chains in Central Asia (Sadler, 2005); for dairy supply chains in Poland and Bulgaria (Dries and Noev, 2005; Dries and Swinnen, 2004); for horticulture and other food supply chains in Latin America (Dirven, 1996); etc.

Minten et al. (2009) and Maertens and Swinnen (2009) find that due to increased vertical coordination in newly emerging supply chains between buyers and poor, small farmers in African countries, such as Madagascar and Senegal, poor rural households experienced measurable gains from supplying high standard horticulture commodities to global retail chains.

However, this is not always the case. For example, in China Wang et al. (2009) found that while rising urban incomes and emergence of a relatively wealthy middle class were associated with an enormous rise in the demand for fruits and vegetables, almost all of the increased supply was being produced by small, relatively poor farmers that sell to small, relatively poor traders. Despite sharp shifts in the downstream segment of the food chain towards modern retailing (e.g., there has been a rapid increase in the share of food purchased
by urban consumers in supermarkets, convenience stores and restaurants), modern marketing chains have almost zero penetration to the farm level.

In general, a wide variety of models of food value chain development have emerged, with variations both across countries and across sectors, reflecting different commodity and market characteristics, resource constraints etc. For example, in parts of Africa where access to land is ample and easy, large scale farms have been set up in some cases. In other cases, where land is already used by smallholders and land pressure is strong, contracting systems have been set up. Comparative advantage of small versus large farming systems, associated with different types of commodities – such as extensive grain growing versus intensive high quality vegetable production systems – have also led to different chain models.

**Endogenous Vertical Coordination and Farm Structures**

The evidence presented here suggests an interesting paradox. With the demand of modern supply chains, small farmers may not be able to make the necessary upgrades by themselves without support packages by processors or agribusiness. If there are sufficient (quality) supplies available for processors, they will not be willing to introduce such vertically coordinated (VC) support packages. If there are not sufficient supplies, VC will be forthcoming. Hence, we have the paradoxical situation that small poor farms may be best off (in the perspective of “supply chain driven development”) if they are in an environment which is dominated by small poor farms.

Hence, different outcomes emerge in rural settings that have highly unequal distributions of land resources (such as, in some nations in Latin America and parts of the former Soviet Union—which have some individuals holding massive estates and many smaller, relatively poor farmers), compared to rural societies characterized by more egalitarian distributions of cultivated land (e.g., China, Vietnam and Poland). In
Vandemoortele et al. (2009) we formally analyze these effects. We show that the initial resource endowments and production structure will affect both the size of the high value economy and the integration of smallholders. With a heterogeneous production structure, the most productive farms may start supplying high value products early. The less productive farms will be excluded. When the production structure of an economy is more homogeneous, high value production will only start later in the development process, but once started the process will be more inclusive.

There is some empirical evidence for this hypothesis. Companies seem to be most likely to reach out to small farms when they face a supplier base which is dominated by small farmers not able to supply the commodities they want, and least likely when there is a heterogeneous farm structure with some farms able to deliver the desired supplies. For example, some international dairy companies and foreign investors target larger farms as their preferred suppliers and only reach out to smaller suppliers if they need them to secure supplies.5

These developments have major implications for the development of agricultural structures in these countries. As private-sector-driven institutions develop to address these different supplier bases, these institutions will in the longer run have an important impact on the resulting and evolving agricultural structures, with the initial structure having an important impact on the one evolving in the medium term. Hence, the existing differences are not necessarily a transitional (temporary) phenomenon, but are likely to have long-lasting impacts on the agricultural structures, because institutional innovations which are emerging to address the constraints and opportunities posed by the current structures, are “locking-in” the existing structures in a long-run institutional framework.

5 It should be noted that “large” is a relative concept, even in neighbouring countries and within a single sector. For example, in Hungary, large dairy farms are farms with a few hundred or thousands of cows, in Poland farms with more than 20 cows, and in Romania farms with more than five cows.
Impact of Modern Supply Chains on Participating Farms

So far we have concentrated solely on the question whether small farms are able to participate in high-value chains. We have not addressed the issue whether, if they are integrated, they are able to capture part of the surplus which is created in these global supply chains. This particular, and admittedly quite narrow, focus is representative of much of the debate that has taken place on this issue over the past decade, both in academic and policy circles.

While there was regular mention of the rent distribution issue, very few studies have actually formally analysed or empirically measured the welfare effects for small farms in these chains.6

We first discuss some theoretical considerations and later some conceptual issues.

Rent distribution in high value chains: theoretical issues

A formal analysis on how the increased demand for quality is leading to opportunities for surplus creation in supply chains, and what the implications are for income distribution and growth if the production of quality products in developing countries is constrained by weak contract enforcement institutions and imperfect factor markets is in Appendix 1. Here we summarize key findings.

Our main findings are that factor market imperfections induce interlinked contract arrangements, and that the extent of inefficient separation (absence of socially efficient contracting) is affected by the value in the chain, the size of the enforcement costs and the relationship specific investment.

6 Some other studies have tried to measure effects on investment and product quality (Dries and Swinnen, 2004) and on indicators of income shortfalls (Minten et al., 2009).
If factor market imperfections induce interlinked contract arrangements, the extent of inefficient separation (absence of socially efficient contracting) is increasing in the enforcement costs and in the specific inputs required for high value production.

The distribution of the gains from contracting depends on the overall rent that can be created by the contract and the enforcement costs. Transfers from one agent to the other, which we call "efficiency premia", play a crucial role. With positive enforcement costs in contracting, an efficiency premium may have to be paid by one agent to the other in order to make the contract self-enforcing. The size of the efficiency premium depends on the enforcement costs and on the rents created by the contract. We find that the higher the enforcement costs and the lower the rents created by the contract, the higher the efficiency premium. Moreover, we find that "development", i.e. an exogenous improvement of enforcement institutions and of the functioning of credit markets, has non-linear effects on both equity and efficiency, and may hurt some of the contracting parties under some conditions.

Moreover, we find that "development", i.e. an exogenous improvement of factor markets and enforcement institutions may hurt some of the contracting parties under some conditions. More specifically, the analysis shows that as enforcement institutions develop, it will be cheaper to enforce contracts through third-party enforcement, and efficiency premiums are less likely. In general, efficiency will increase. First, because the incidence of inefficient separation is expected to diminish; second, because third party enforcement is becoming cheaper and therefore has a less depressing impact on the contract surplus. Nevertheless, efficiency may decrease, as third party enforcement is substituting for efficiency premium payment. Further, especially for lower chain values the share of total income that accrues to the supplier may go down with development, as he misses out on his efficiency premium.
Empirical evidence

As far as we are aware, the only study which has actually empirically measured income and poverty effects of smallholder participation in high value chains is by Maertens and Swinnen (2009). This study finds that for the case of vegetable exports in Senegal, rural households benefit strongly from participation as contract farmer.

Other studies have measured and analyzed impact on productivity, investments, and quality of produce of participating smallholders in developing countries. In general, they indicate positive effects. Studies indicate that small farmers benefit from contracting in high-value supply chains in terms of increased productivity; enhanced access to inputs and to cash e.g. Minten et al. (2009) for Madagascar, Gulati et al. (2007) for Asian countries. For example, Dries and Swinnen (2004) and Dries et al. (2009) show that the rise of contracting in Eastern Europe leads to improved access to credit, technology and quality inputs for poor and small farmers that were faced with binding liquidity and information constraints due to poorly developed input markets.

There is ad hoc evidence that suppliers do receive an “efficiency premium” in environments with weak contract enforcement. Processors and retailers need to pay an extra premium to induce farmers to produce and deliver according to the contract terms if outside enforcement options are limited. Another factor is that modern supply chains often pay (on time and in cash). While the systematic evidence on this is limited and one should be careful in making general conclusions, evidence seems to suggest that problems of delays in payment are lower in modern supply chains than elsewhere.7

7 The importance of timely payments in vertical coordination schemes and modern supply chains is documented in Fafchamps (2004), Swinnen (2006), White and Gorton (2005), and Van Herck et al. (2010).
Finally, at least at early stages of market development, high value chains may create competition rather than reduce it. While multinational companies and large retailers are often said to be involved in monopolistic price-setting on the supplier side, the rent extraction problems seems to be more problematic in more developed market economies – or later stages of transition. In developing and (early) transition countries, the emergence of modern supply chains may increase (or create) competition for the local markets and for the established traders and middlemen, benefiting farmers (Swinnen and Vandeplas, 2010).\(^8\)

However, at later stages of chain development, in particular when factor markets work better, concentration may become a serious concern (see Appendix 1 for a formal analysis).

**Effects on Poverty Alleviation**

The review of the evidence so far indicates that (a) smallholder participation in the modern supply chains improves the welfare of these smallholders, and (b) that there is a diversity of experiences on smallholder participation. However, these observations by themselves do not allow to draw comprehensive conclusions about the impact on poverty alleviation of modern food value chain developments. For this one also needs to consider other effects.

So far we have not addressed the issue whether rural households are necessarily better off by participating as small farmers in these modern supply chains than as employees on large scale farms. This is the underlying assumption of much of the focus on smallholder participation in value chains. However, recent research suggests that there may not be a simple relationship between small farmer participation and rural poverty alleviation.

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\(^8\) The issue of competition is analyzed in more detail in Swinnen and Vandeplas (2009) and Swinnen et al. (2008) – for empirical analyses see e.g. Minten et al. (2008).
First, to measure poverty effects, one should take into account the heterogeneity among smallholder farmers. Many studies have implicitly assumed that smallholder participation benefits poverty reduction. However, not all smallholders are poor and contract-farming might be biased against the poorest.

Also, and importantly, to measure rural poverty effects one should take into account labor market effects from people being employed on larger farms or from being hired in other activities related to the modern supply chains (grading, packaging, …). Most studies on development and welfare effects of modern supply chains do not include labor market effects. However, studies who include these effects come to very different conclusions. To our knowledge, only four studies analyse these effects of modern supply chains, all analysing horticultural exports: Maertens and Swinnen (2009) for Senegal; McCulloh and Ota (2002) and Neven et al. (2008) for Kenya; and Barron and Rello (2000) for Mexico. They find that the labor market effects are very important sources of additional income for rural households, and that rural households who have members employed on estates or on the companies benefit strongly from this employment.

Moreover, (although there is certainly need for more empirical work to draw general conclusions), what is available suggest that where there smallholders are only partially participating as suppliers, the poorest rural households may benefit more from inclusion through the labor market than through smallholder participation. These findings are very important as they put the welfare implications of the small farmer issue in a very different perspective, and they suggest that whether small farms are included in these chains, or not, is unlikely to be a good indicator in itself of the welfare implications.

Second, an issue which has not been analyzed empirically but which recent theoretical work has shown to be crucial to determine broader welfare and poverty effects is the spillover effects on traditional markets (Xiang et al., 2010). The growth of modern
supply chains will induce a shift of suppliers from traditional to modern markets, and thereby cause price effects on these traditional markets. These price effects and their welfare implication depend crucially on scale economies in modern versus traditional production systems, on the role of trade, and on relative demand and production elasticities, and on the factor intensity of high value commodities (Carter, 1989). In poor countries where modern supply chains increase demand for labor intensive commodities, the spillover effects are likely positive.

Another issue is that the studies focusing on equity issues have very strongly focused on the supply side of the system. New studies contribute two important insights on why one needs to take a broader perspective. First, in the poorest countries, the importance of modern supply chains for domestic consumption is currently very limited and is likely to remain so for the medium future (Minten and Reardon, 2010). Second, in medium income countries, consumers benefit strongly from the increased competition (lower prices) and of increased variety in terms of quality variation and commodity variation.⁹

**Policy implications**

The importance of high-value agricultural markets in developing regions has increased over the past decades. These changes create important opportunities for enhancing agricultural productivity and for increasing rural incomes and reducing poverty, while they also impose major challenges for developing countries and for the most resource constrained households.

In this final section we present policy recommendations to enhance the welfare benefits of the rural poor in high-value supply chains. We start with general recommendations and afterwards discuss more detailed policy issues.

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⁹ A study by Huffman and Johnson (2004) on the early transition period in Poland found that consumer welfare increased dramatically by the increased variety in products available.
The first general recommendation is the recognition of the importance of high-value chain development and the vertical coordination phenomena in global and domestic agro-food chains and, therefore, the need to explicitly integrate these developments into policy thinking and program strategies. Structural changes and vertical coordination in high-value agro-food chains are important developments, also in low-income countries, in the light of economic growth as well as poverty reduction and rural development.

The second general policy issue is that there is significant variation across countries and sectors. The implication is that, as there is no one-size-fits-all strategy but instead several models of supply chain coordination, reflecting commodity characteristics, the distribution of land and labour in the region and different stages of development, there is no one-size-fits-all policy. Instead optimal policies and policy components will also need to differ and change to reflect these differences.

The third general issue is that by far most of the policy attention has gone to the effect on smallholders. However, it is crucial to recognize and support the beneficial effects of employment in the high-value agricultural sector. The potential beneficial welfare effects from wage employment in high-value agricultural supply chains are usually overlooked by policy makers. When the shift to more integrated, employment in agro-industrial firms will become more important, the direct and indirect effects of this employment should be appreciated and considered in the overall strategy of rural development.

In Appendix 2, we discuss in detail some policy issues that are relevant for reaping the potential benefits created by high-value supply chains. We first propose policies that enable and stimulate the development of these chains. Then we focus on policies that enhance the participation of smallholders in high-value supply chains.
Appendix 1: A model of quality and rent distribution in global value chains

The objective of this model is to formally analyze under which conditions poor producers can benefit from the introduction of quality standards in high value chains. The paper develops a model to derive the efficiency and distributional effects of quality standards in supply chains taking into account key characteristics of the supply chains between rich consumers and poor producers in developing countries; and how the process of development changes these effects (see Swinnen and Vandeplas (2009) and Swinnen et al. (forth) for the full model).

Consider the situation where a farming household in a developing country – which we refer to as “the supplier” – can sell products to a trader or a retailing or processing company – which we refer to as “the buyer”. This buyer can sell the product (possibly after processing) to consumers – either domestically or internationally – at a unit price \( p_h \).

To produce a high-value product, the supplier needs to invest an amount of labour \( l \). We assume the supplier’s opportunity cost of labour is \( l \). For instance, if his best alternative is to produce a low-value product for the local market, \( T = p_l \), i.e. the low value product unit price. The production of high-value commodities requires an extra capital investment \( k \) to buy specific inputs (e.g. fertilizers, credit, seeds, technology). We assume that the supplier does not have access to capital by himself because of credit market imperfections. These constraints effectively prevent the supplier from producing high-quality raw material. If the buyer has access to the required capital, he can offer a contract to the supplier, which includes the provision of inputs on credit and the conditions (time, amount and price) for purchasing the farmer’s product. We refer to the buyer’s opportunity cost of capital as \( k \), with \( k \) depending both on the capital intensity of the crop, and on the buyer’s potential return to alternative investments.

Like Kranton and Swamy (2008), we assume an indivisible production function and a fixed proportions production technology. The net value that is created when the farmer and the buyer decide to collaborate, amounts to \( \theta = p_h - T - k \). We assume that the contract terms are determined as in a simple principle-agent model, in which the supplier receives his outside option, and the buyer extracts the entire surplus. Under perfect enforcement of contracts, the respective incomes of the farmer and the buyer are then given by \( Y_{pf} = T \) and \( \Pi_{pf} = p_h - T \). However, when contracts are legally unenforceable – as is the case in many developing and transition countries - opportunistic behavior may lead to hold-ups if one of the agents has an attractive alternative to contract compliance. First, the farmer can divert the received inputs to other uses, such as selling them or applying them to other production activities (e.g. subsistence crops). We assume that if the farmer violates a contract, he suffers a reputation cost \( \phi \). This way, he can always at least earn an income \( T + k - \phi \).

This can be interpreted in a broad sense not only as a pure loss in terms of reputation, but also as a social capital cost or a moral loss, or the loss of future trade opportunities (cfr. Klein, 1992; Moore, 1992; McLeod, 2006). Alternatively, this could be modelled as a repeated game, but to follow Kranton and Swamy (2008), we have chosen for this approach. A high discount factor in a repeated game would be equivalent to a high reputation cost \( \phi \) in our model.

Note that we adopt Kranton and Swamy (2008)’s assumption that the supplier’s opportunity cost of the received capital is equal to the buyer’s opportunity cost of capital.
An alternative way to hold up the buyer is when the farmer applies the inputs to the crops, as agreed in the contract, but then sells the high value output to an alternative buyer. Such “sideselling” can be profitable as the alternative buyer does not need to account for the cost of the provided inputs. However, the competing buyer may not value the product as much as the contract buyer who outlined the production process from the start according to his specific needs. To account for this, we define $p_s$ as the “spot market price”, i.e. the price offered by competing buyers. By sideselling, the farmer’s payoff is $p_s - \phi$. The different payoffs under each contingency are shown in Figure A1 below.

**Figure A1: Game tree with various holdup opportunities**

For the supplier to voluntarily comply with the contract, his income from the contract $Y$ must cover his disagreement payoff (i.e. $Y \geq \bar{T}$), and be at least as much as his outside options, obtained from breaching the contract, i.e. his incentive compatibility constraints must be satisfied: $Y \geq \bar{T} + \bar{K} - \phi'$ and $Y \geq p_s - \phi'$. The resulting contract $(Y, \Pi)$ will then be defined by

$$Y = \max (\bar{T}, \bar{T} + \bar{K} - \phi', p_s - \phi') \quad (1)$$

and $\Pi = p_h - Y$. \quad (2)

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12 $p_s$ reflects the degree of buyer-specificity of the production standards (the higher the specificity of the product or the quality standards, or the higher the transaction costs of switching, the lower $p_s$ is). If the product is homogenous, $p_h = p_s$. If high-quality products are valued only as much as low-quality products, $p_h = p_s$. In some cases, $p_s$ is even lower than $p_h$, e.g. if there is no local market (yet) for the high-quality product. An example is the case of broccoli and cauliflower in Guatemala, as discussed by Glover and Kusterer (1990).

13 We assume the buyer can commit to a pre-agreed price, in other words, we do not allow for ex post renegotiation of the contract price.
This contract is feasible only if it also satisfies the buyer’s participation constraint $H \geq \bar{k}$, which imposes a lower bound on $p_h$. If $p_h$ is sufficiently high, it is possible to adjust the contract terms such that the respective buyer’s participation constraints as well as the supplier’s incentive compatibility constraints are simultaneously satisfied. In the adjusted contract, the buyer pays the supplier a premium on top of the perfect enforcement outcome to prevent violation of the contract after the inputs are delivered. This is equivalent to the concept of “efficiency wages” (Salop, 1979), whereas the employer pays a higher wage to his employees to minimize their incentive to quit and seek a job elsewhere, after having trained them. We therefore refer to the difference between the producer’s payoff under (costless) perfect enforcement ($Y_{pf}$) and under costly enforcement ($Y$) as an “efficiency premium” $\epsilon$, defined as

$$\epsilon = \max (0, \bar{k} - \phi', p_s - \bar{T} - \phi').$$  (3)

Making the contract “self-enforcing” by paying an efficiency premium is a rational strategy for the buyer, as it can earn him a better payoff than his outcome when being held up, or upon contract breakdown. It follows from (3) that $\partial \epsilon / \partial \bar{k} \geq 0$, $\partial \epsilon / \partial \phi' \leq 0$, and $\partial \epsilon / \partial p_s \geq 0$: the higher the farmer’s opportunity cost of using the specific inputs for other purposes, or the higher the price is that opportunistic buyers offer for the supplier’s produce, the higher this efficiency premium must be. A higher reputation cost from breaching the contract reduces the required efficiency premium.

Hence, as long as the contract is enforced, the supplier’s income will be increasing in his ex ante as well as his ex post outside options. However, contracts will only be feasible for a specified range of parameter values. The conditions for contract feasibility are summarized in the following restriction on $p_h$:

$$p_h \geq p_h^{\min} = \max (\bar{T} + \bar{k}, \bar{T} + 2 \bar{k} - \phi', p_s + \bar{k} - \phi').$$  (4)

This condition captures several reasons for potential contract failure. If $p_h < \bar{T} + \bar{k}$, the net surplus of the transaction will be negative, and there is no incentive for contract formation. We refer to this situation as “efficient separation”. If $p_h > \bar{T} + \bar{k}$ but smaller than $\bar{T} + 2 \bar{k} - \phi'$, or than $p_s + \bar{k} - \phi'$, there is no price the buyer can offer to the supplier in order to make him comply with the contract. In other words, the premium that the buyer has to pay the supplier not to breach the contract is larger than the buyer’s gross revenues: he cannot afford this. Under these conditions, the contract will not be realized, even if it would be socially efficient to do so. This is referred to as “inefficient separation”. Hence, contracting is more likely to break down if the value in the chain (\(\theta\)) is low ($p_h$ relative to the opportunity cost of capital $\bar{k}$ and labour $\bar{T}$), if there are more alternative sales outlets for high value products (i.e. $p_s$ is high), and if farm reputation costs $\phi'$ are low. Under these conditions, suppliers will still be able to earn their opportunity cost of labor.

**Supervision and external enforcement**

Another way to enforce contracts is by investing in supervision, or by engaging third party enforcement, if it is not prohibitively costly. Less inefficient separation will then occur, but the total contract surplus will be reduced. Assume that $M$ is the cost of guaranteed enforcement through supervision or third party enforcement, and that $M$ is paid ex ante. $M$ could be the cost of hiring lawyers or payment to the local mafia for enforcing the contract,
or wages of local staff to monitor contract compliance. Minten et al. (2009) document investments in extensive supervision and monitoring systems in African horticultural exports where quality characteristics are unobservable. But also in the case quality characteristics are observable, monitoring can be used to ensure contract compliance and avoid input diversion or sidesales of the crop (e.g. Conning, 2000). Another example of extra costs for contract enforcement is where buyers offer suppliers additional inputs as fertilizers and pesticides for their own food crops to avoid input diversion (e.g. Govereh et al., 1999).

All examples can be modeled as enforcement through an extra cost \( M \). The surplus is reduced by an amount \( M^{14} \) to \( p_h - \bar{k} - \bar{T} - M \), and the buyer’s income is \( p_h - \bar{T} - M \). Hence, it is in the buyer’s interest to invest in supervision if \( M < \varepsilon \) with \( \varepsilon \) defined as in equation (3). As a result, supervision is more likely to occur with (a) higher \( \bar{k} \), (b) higher \( \gamma \), (c) lower \( \phi_f \), and (d) lower \( l \). The opportunity for supervision or third party enforcement will impose a higher limit to the supplier’s payoff from the contract.

**Competition**

The traditional argument is that competition \((\Psi, \text{ with } 0 \leq \Psi \leq 1)\) between buyers has a positive impact on suppliers: it increases demand for their product and, if the different buyers do not collude, competition will drive up the suppliers’ price (Inderst and Mazzarotto, 2008). Our model also yields this competition effect. Competition will increase the supplier’s outside options (through \( \bar{T} \) and \( p_s \)) and thus increase his share of the contract value. Formally, the introduction of competition between private buyers will increase the ex ante outside option suppliers face at the time of contract negotiation. Indeed, not only the non-contract outcome, in which they continue to produce for subsistence remains an option, but they can also go to another buyer to see which contract terms he would offer them. In our model, this implies an increase in the supplier’s opportunity cost of labour \( \partial l / \partial \Psi > 0 \).

Second, the introduction of competition between private buyers will stimulate innovation and reduce inefficiencies in marketing, resulting in a higher \( p_h \). This increases the contract surplus.

However, competition will also affect the provision of inputs. With (increased) competition between buyers, input provision may be unsustainable, and contracting may break down although it would be socially efficient. In terms of our model, competition between buyers will reduce the supplier’s reputation cost \( \phi_f \) from breach of contract \((\partial \phi_f / \partial \Psi < 0)\). Third, increased competition may give rise to an increased ex post outside option of the supplier through a higher number of opportunistic buyers, i.e. an increased \( p_s \) \((\partial p_s / \partial \Psi > 0)\). With more buyers, it will be harder to behave monopsonistically, or to coordinate or collude among buyers. Moreover, more buyers may bring a wider diversity of buyers, including buyers who potentially have a higher valuation of the high quality good.

We can summarize the impact of competition on farm incomes \((Y)\) and on contract feasibility \((p_{h_{min}})\) as follows:

\[14\] Note that in this paper, we consider the social gains of the contract as the sum of the gains of the supplier and the buyer. As such, \( M \) is a cost to society. One could argue that payments to third parties, be it lawyers, or local people hired to supervise, also benefit society and should be included in the gains, rather than the costs.
\[
\frac{\partial Y}{\partial \Psi} = \frac{\partial Y}{\partial T} \cdot \frac{\partial T}{\partial \Psi} + \frac{\partial Y}{\partial p_h} \cdot \frac{\partial p_h}{\partial \Psi} + \frac{\partial Y}{\partial \phi^f} \cdot \frac{\partial \phi^f}{\partial \Psi} + \frac{\partial Y}{\partial p_s} \cdot \frac{\partial p_s}{\partial \Psi}
\]  
(5)

\[
\frac{\partial [p_h - p_h^{min}]}{\partial \Psi} = \frac{\partial p_h}{\partial \Psi} - \frac{\partial p_h^{min}}{\partial \Psi} \cdot \frac{\partial T}{\partial \Psi} - \frac{\partial p_h^{min}}{\partial \Psi} \cdot \frac{\partial \phi^f}{\partial \Psi} + \frac{\partial p_h^{min}}{\partial \Psi} \cdot \frac{\partial p_s}{\partial \Psi}
\]  
(6)

as \(\partial Y/\partial T \geq 0, \partial Y/\partial p_h = 0, \partial Y/\partial \phi^f \leq 0, \partial Y/\partial p_s \geq 0, \partial p_h^{min}/\partial \phi^f \geq 0, \partial p_h^{min}/\partial p_s \geq 0, \)  
(in each case the effect is zero when the constraint is not binding and positive or negative when the constraint is binding) From equation (5) it follows that – as long as contracts do not break down – competition will induce an increase in farm surplus from production, since all terms of the formula are positive (or zero). However, from equation (6) it follows that competition may make contracting less feasible. The first term on the right hand side of equation (6) is positive, meaning that competition may enhance efficiency and have as such a positive (partial) effect on contract feasibility. The next three terms, however, are negative, implying that competition increases the lower bound to \(p_h\) and hence can have a negative effect on contract feasibility.

The impact of development

Development is a broad concept and is both cause and consequence of the formation of interlinked contracts. Here we look specifically at the impact of changes in two factors which we assume to be determined exogenously and which coincide with "development" (\(\Omega\)): the improvement of (public) enforcement of contracts and the improvement of the functioning of factor markets. First, if enforcement becomes less costly with the emergence and better functioning of formal institutions, this will affect the emergence and distributional effects of interlinked contracts. Second, if factor markets develop, producers’ access to specific inputs will become less constrained, and this will obviously also affect contractual arrangements. To precisely identify the mechanisms, we analyze these effects separately.

Improvement of enforcement (institutions)

It is generally observed that formal enforcement institutions become more effective with development (Djankov et al., 2003; North, 1990). In our model, this implies that third party enforcement becomes less costly \((\partial M/\partial \Omega < 0)\). An obvious implication is that for a larger range of \(p_h\), third party enforcement will be preferred to efficiency premium payment. This will have implications for both contract formation as well as for rent distribution.

Improved enforcement institutions does often, but not in all circumstances, benefit both contracting parties. Indeed, for some values of \(M\), only the buyer will gain, and the seller will lose, as cheaper third party enforcement will deprive the latter from his efficiency premium, and as such reduce his income. This is consistent with other literature (e.g. Anderson and Young, 2002), stating that better enforcement does not necessarily benefit contracting agents.

Factor market development

The development of factor markets is expected to relax credit constraints and to improve access to input markets. With this, suppliers are expected to obtain better access to profitable market opportunities outside of the contract, hence \(T\) will increase \((\partial T/\partial \Omega > 0)\). \(Y\) will
increase, as long as $p_h$ is larger than $p_h^{\text{min}}$. An increase in $\bar{T}$ may however also induce an increase in $p_h^{\text{min}}$, and as soon as $p_h < p_h^{\text{min}}$, contracts will break down.

Apart from factor markets, also output markets may develop. If local consumers become richer, they may acquire stronger preferences for high quality food products (e.g. Swinnen et al., 2008). This may make it easier for suppliers to side-sell high quality products at better prices: $p_s$ will increase ($\partial p_s / \partial \Omega > 0$). As long as third party enforcement is too costly, this will increase the supplier’s income from the contract, $Y$.

Development can change the organization of agricultural production even more dramatically, by giving suppliers direct access to inputs. If credit constraints are relaxed, or input markets develop, buyers do no longer need to give inputs on credit. Pure output contracts become feasible. With pure output contracts, the set up of the model will change into a standard specific investment setting. Processors no longer need to give efficiency premiums to make suppliers comply with the contract. This will reduce $Y$, the suppliers’ income from the contract, but may increase contract feasibility by reducing inefficient separation.\footnote{However, even in the case of pure output contracts, inefficient separation (i.e. underinvestment) may arise if $p_s$ and $\varphi^*$ are low, such that $\bar{k} + \bar{T} > p_s + \varphi^*$. To analyze the case of pure output contracts with specific investments in greater detail, a different model set-up may be required. A very insightful discussion of the case where suppliers do not face credit constraints, but buyers choose to do part of the upfront investment to make contracts self-enforcing, is provided in Gow et al. (2000).}

Hence, improving factor markets may or may not benefit the supplier. It may benefit him in the sense that as he gets access to inputs by himself, there is no inefficient separation anymore. Hence, even at low values of $p_h$, suppliers obtain access to the necessary inputs. However, the share of total income which accrues to the supplier may be lower in a pure output contract than in an interlinked contract.

**Summary**

Hence, both parties may benefit from development, primarily through a decrease in the incidence of contract breakdown. However, some aspects of development may as well reduce contract feasibility (i.e. the increase in $\bar{T}$ and in $p_s$). Further, even if development in many cases will have a positive impact on the supplier’s payoff, under some conditions, he will (perhaps surprisingly) suffer a loss, as cheaper third party enforcement will deprive him from his efficiency premium, and reduce his income. This is consistent with other literature (e.g. Anderson and Young, 2002), mentioning that better enforcement does not necessarily benefit each of the contracting agents. Also Marcoul and Veyssiere (2008) report that (poor) suppliers who require incentive payments to comply with the contract, will receive a better price than (rich) suppliers who do not (as they do not require input provision).
Appendix 2: Policy implications

The importance of high-value agricultural markets in developing regions has increased over the past decades. These changes create important opportunities for enhancing agricultural productivity and for increasing rural incomes and reducing poverty, while they also impose major challenges for developing countries and for the most resource constrained households.

In this final section we present policy recommendations to enhance the welfare benefits of the rural poor in high-value supply chains. We start with general recommendations and afterwards discuss more detailed policy issues.

The first general recommendation is the recognition of the importance of high-value chain development and the vertical coordination phenomena in global and domestic agro-food chains and, therefore, the need to explicitly integrate these developments into policy thinking and program strategies. Structural changes and vertical coordination in high-value agro-food chains are important developments, also in low-income countries, in the light of economic growth as well as poverty reduction and rural development.

The second general policy issue is that there is significant variation across countries and sectors. The implication is that, as there is no one-size-fits-all strategy but instead several models of supply chain coordination, reflecting commodity characteristics, the distribution of land and labour in the region and different stages of development, there is no one-size-fits-all policy. Instead optimal policies and policy components will also need to differ and change to reflect these differences.

The third general issue is that by far most of the policy attention has gone to the effect on smallholders. However, it is crucial to recognize and support the beneficial effects of employment in the high-value agricultural sector. The potential beneficial welfare effects from wage employment in high-value agricultural supply chains are usually overlooked by policy makers. When the shift to more integrated, employment in agro-industrial firms will become more important, the direct and indirect effects of this employment should be appreciated and considered in the overall strategy of rural development.

In the rest of this section, we discuss in detail some policy issues that are relevant for reaping the potential benefits created by high-value supply chains. We first propose policies that enable and stimulate the development of these chains. Then we focus on policies that enhance the participation of smallholders in high-value supply chains.

Enabling and stimulating the development of high-value supply chains

When policy makers want to increase the benefits for small farmers through their participation in high-value agriculture, a first series of policy issues consists of enabling and stimulating the development of these high-value supply chains. There is a need for increasing the capacity for producing high-quality and safe food. There is evidence of low-income countries being able to establish the regulatory, technical and administrative arrangements to meet tightening standards in high-value agricultural markets.

In addition to increasing the supply capacity for high quality and safe food, there is a need for creating the capacity to respond quickly to emerging food safety issues, changing legislation
and a variety of private standards. Some key elements for improving the capacity for compliance to food standards are:

**Improving the administrative, infrastructure, technical, scientific and juridical capacity**

The public sector can play a role in improving the administrative, infrastructure, technical and scientific capacity for the production and marketing of high-standard food products. The development of food safety management and control systems is essential for participation in the growing high-value agricultural markets and involves attention to the legal system, institutional transformations, human capital formation, and physical infrastructure.

Government investment in projects, institutions and technical assistance to stimulate higher quality and strengthen public sector quality testing are necessary to build up food quality and safety capacity. This could include the development of systems for accreditation, conformity assessment, labeling and certification, the establishment and maintenance of monitoring and control systems, investment in laboratory units and scientific human resources, laying down directives for ‘good agricultural practice’, promoting better post-harvest practices, developing better traceability systems, etc. However, certain investments, such as investment in cold storage capacity and transport facilities are more efficiently dealt with by the private sector.

High-value chains are typically characterized by vertical coordination to guarantee quality and food safety throughout the supply chain. To stimulate the development of high-value chains, it is therefore crucial to enable vertical coordination. This may entail institutional changes, such as specifying property rights, creating the right juridical system and supporting contract-enforcement mechanisms.

**Farmer and business assistance programs**

Preparing suppliers for quality- and standards-driven markets will make it easier for them to be integrated in high-value agricultural markets. Especially farmers and smaller agro-food businesses face substantial constraints to gain access to information on changing food safety legislation and quality standards in global markets, to translate that information into specific investment needs, to realize those investment and manage high-quality production. Farmer and business assistance programs can play a crucial role in providing technical and market information, appropriate credit schemes and technical assistance for high-value production. In addition, there is a potential role for the government and international organizations in establishing and developing sustainable trading relationships through specific marketing assistance programs.

**Demonstrating capacity for producing high-standard food**

To participate in high-value global supply chains, developing countries need to demonstrate their capacity for high-standard food production. It is it is not enough to comply with stringent food standards; this compliance also needs to be demonstrated such that specific food products from specific countries are perceived as safe and high-quality products by domestic and foreign consumers. Therefore, conformity in quality and compliance to food safety standards is important. Even if individual private firms are able to comply with strict requirements, a country as a whole will not be able to gain market access and significant market shares if there is no conformity. This requires specific measures such as labeling, certification and promotion of high-value products, which involves public as well as private investments.
Stimulating investment in the agro-food industry

Probably one of the most essential elements for the integration in, and the development of high-value food supply chains, is to encourage private investment – domestic as well as foreign investment – in the agro-food industry. A good investment climate is the driving force behind economic growth and poverty reduction, and policy uncertainty is the primary concern of firms in developing countries. There is ample evidence that a poor policy environment has a negative effect on investment in the agro-food industry and on vertical coordination programs. As such it constrains integration in high-value supply chains and the beneficial effects of vertical coordination. Also, macro-economic stability is a key condition for stimulating domestic investment and attracting foreign investors but, even more so, for supplier assistance programs or other forms of chain-based finance in vertically integrated supply chains. Since vertical coordination is importantly a financial activity, significant economic instability may cause coordination and enforcement failures, eventuate in a collapse of contract schemes and obstruct the development of high-value supply chains.

Foreign investment in the agro-food industry can play an important role in increasing developing countries’ supply capacity for high-standard agricultural production and facilitate their integration in global supply chains. Because of the link with their home economies and subsidiaries in other countries, foreign investors and multinational companies have better access to high-value agricultural markets, better knowledge on food safety and quality issues, and enhanced financial and technical capacities to meet compliance with food standards. This might develop the supply and marketing capacity of the host economy as a whole and improve, through spillover effects, the capacity of domestic firms.

Rethinking the role of the government

The development of high-value supply chains and vertical coordination requires a fundamental rethinking of the role of the government and policy-making. Large companies develop their own standards, their own extension services, their own supply channels and wholesale exchange institutions, quality testing, etc. Some of these activities are in areas where traditionally governments were considered to play an important role. Hence, there are fundamental and difficult questions on the role of the government in such a changed environment.

Collaborations between private companies, which play a crucial role in the supply chain process, and public authorities, international organizations, and private companies should be at central stage. Successful public-private partnerships require a well-organized private sector with representative and effective farmer business associations that are supported by the government, and a forum for communication. For example, private sector involvement in public standard setting, development of certification procedures, and the establishment of control systems for food safety is important as private companies are often better informed about technical possibilities. Also, several innovative chain-based financing instruments in high-value supply chains have arisen as private initiatives, with a (limited) role for the government.

Government intervention could include the provision of the regulatory and legal system which is required for these instruments to function; or there may be a role in co-financing seed money to start up some of these innovations. Governments should be open to innovations which explicitly take into account the supply chain as a structural aspect of the
financing problem, while being critical on which role international organizations and the government should play.

**Enhancing the participation of small farmers**

For policy-makers concerned with pro-poor economic growth, enhancing efficiency and equity in high-value agricultural supply chains is a key point. Therefore, policies should enhance and stimulate the participation of the rural farm population in these supply chains and an equitable distribution of rents in the chain.

*Reduce transaction costs*

The disadvantage of small farmers in high-value supply chains is partially due to transaction costs. Therefore, there is a need for government policy to focus on reducing transaction costs. This can be done in several ways.

First of all, vertically coordinated systems are a private sector response to overcome transaction costs faced by small, individual farmers (access to information, costs related to quality control etc.) and should therefore be promoted.

Second, the transaction costs faced by private actors when transacting with a large number of farmers could be reduced by investing in intermediary institutions. Intermediary institutions reduce the number of transactions and the cost of exchange between farmers and processors or input supplier. Specific investments in this could include the creation of farm associations and collection points where processors and retailers can source from many small suppliers at low transaction costs.

*Investment in infrastructure*

Improvements of rural infrastructure can reduce transport cost and, more generally, the cost of including supplies from remote areas. Rural infrastructure is identified as a serious constraint on the development of high-value agricultural activities, and particularly on integrating smaller producers and producers in more remote areas. For example, bad roads, regular electricity interruptions, lagging communication possibilities, etc. impede the coordination between producers, traders and processors, and constrain investments. Public investments in such infrastructure would stimulate (a) agribusiness investment, (b) vertical coordination with suppliers, and (c) inclusion of small farmers in remote areas.

*Investment in farmers associations*

Producer organizations can play an important role by enlarging the scale of the units that traders have to deal with and by improving small farmers’ bargaining power. By grouping a large number of small farmers, producer organizations reduce the number of transaction the agro-food processor or exporter faces. Stimulating farmer associations is an often mentioned policy. In fact it is hard to find a policy document which does not mention it as an important policy. However, the creation of farmer associations that are integrated in the coordination system of high-value agricultural supply chains might require innovative approaches. Producer organizations often lack technical background and coordination skills to manage the quality requirements. Governments and development agencies play an important role in supporting the capacity building of producer organizations and especially in establishing and promoting linkages between farmer organizations and the private sector.
**Enforce competition**

Competition in high-value supply chains is of great importance; both for efficiency and equity. Competition induces processors, retailers, and input suppliers to provide more supplier assistance programs and it constrains rent extraction of suppliers by up- or downstream companies. Given these strong benefits of competition for farmers in the chain, ensuring competition is an important role for the government. Competition should be enforced through both domestic policies (e.g., competition policies, lower barriers of entry) as well as external policies (e.g., liberal trade policies). The importance of competition does not only apply to private companies, but holds also for the case when the government is directly or indirectly imposing a monopoly system and thereby extracting rents from farms. Moreover, competition is also important on the input side. The existence of alternative channels of credit or inputs will constrain rent extraction in the supply chains. Therefore, investments in alternative sources of farm finance, such as cooperative credit associations, microcredit institutions, etc. should be supported and continued.

**Enhance the bargaining power of farmers**

Empowering farmers is needed to strengthen their position in the chain and vis-à-vis governments in bargaining for better contract deals, better policies, etc. Several of the policies mentioned earlier will contribute to this objective, such as stimulating farmers associations, investing in quality control institutions, competition policies, etc. There are a number of additional policy measures to enhance the bargaining of farmers.

First, this involves investment in institutions to assist farms with contract negotiations and dispute settlements. Measures to increase the transparency of contracts, provide for dispute settling arrangements, provide market benchmarks for price negotiations, training farmers in their rights/obligations as contractors, etc. are all important to increase the transparency of the contracting system, competition among contracts, and thereby the bargaining position of farms. As it is generally either not possible or too costly to resolve disputes in courts, alternative dispute settlement institutions can play an important role.

Second, empowering farmers entails investment in institutions for (independent) quality and safety control and certification. Investing in quality control centers has additional advantages of enhancing the bargaining power of suppliers and ensuring correct payments for quality in the chain. This will lead to better investment incentives and more equal distribution of rents. Improving quality controls, e.g. by introducing an independent control institution, or by letting farm representatives participate in the evaluation has both efficiency and equity benefits.

Third, empowering farmers will also come importantly from alternative options in accessing inputs and selling their products. Hence, it is important to encourage alternatives in input and output markets. Competition and liberalization of export regimes will also enhance the farms’ situation. Here also investments in projects and institutions supporting higher quality will contribute to this goal.
References


Carter 1989

Clarke et al. 2002


Danielou & Ravry 2005


Dirven 1996

Dirven 2006


Dobson et al. 2003


Dries and Noev, 2005

Dries et al. 2009


Gow and Swinnen 1998


Tropical products include coffee, cocoa, tea, nuts and spices, textile fibres, sugar and confectionary; temperate products include cereals, animal feed and edible oils; high-value products include fruits, vegetables, fish, seafood, meat and meat products, milk and dairy products; other products include tobacco and cigarettes, beverages, rubber, and other processed food products.

1 Developing countries include all low- and middle-income countries in Africa, Central-America, South-America and the Caribbean; East Asia, South Asia, Southeast Asia and Central Asia.

Source: Maertens et al. (2009)
Table 1: Smallholder procurement in Sub-Saharan African export supply chains

<table>
<thead>
<tr>
<th>Country</th>
<th>Commodity (group)</th>
<th>Year of survey</th>
<th>Share of exports sourced from smallholders</th>
<th>Number of smallholder producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>Fruits &amp; vegetables</td>
<td>2006</td>
<td>45%</td>
<td>3,600</td>
</tr>
<tr>
<td></td>
<td>Pineapples</td>
<td>2006</td>
<td>10-15%</td>
<td>300 - 400</td>
</tr>
<tr>
<td></td>
<td>Papaya</td>
<td>2006</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetables</td>
<td>2002</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>Pineapple</td>
<td>1997</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mango</td>
<td>2002</td>
<td>&lt; 30%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Banana</td>
<td>2002</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>French beans</td>
<td>2005</td>
<td>52%</td>
<td>600 - 900</td>
</tr>
<tr>
<td></td>
<td>Tomatoes</td>
<td>2006</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Kenya</td>
<td>Fresh fruit and vegetables</td>
<td>2002</td>
<td>± 50%</td>
<td>12,000 - 80,000</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Fresh vegetables</td>
<td>2004</td>
<td>90-100%</td>
<td>9,000</td>
</tr>
<tr>
<td>Zambia</td>
<td>Vegetables</td>
<td>2003</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>Fruits &amp; vegetables</td>
<td>1998</td>
<td>6%</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Maertens et al. (2009)
Table 2: Motivations of small farmers to supply high-value chains

a. Cotton farms in Kazakhstan

<table>
<thead>
<tr>
<th>Reason for contracting (%)</th>
<th>Most important reason (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guaranteed product sales</td>
<td>9</td>
</tr>
<tr>
<td>Guaranteed price</td>
<td>4</td>
</tr>
<tr>
<td>Access to credit</td>
<td>81</td>
</tr>
<tr>
<td>Access to quality inputs</td>
<td>11</td>
</tr>
<tr>
<td>Access to technical assistance</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Swinnen, 2005

b. Vegetable farms in Sub-Saharan Africa

<table>
<thead>
<tr>
<th>Reason for contracting (%)</th>
<th>Most important reason (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable income</td>
<td>66</td>
</tr>
<tr>
<td>Stable prices</td>
<td>19</td>
</tr>
<tr>
<td>Higher income</td>
<td>17</td>
</tr>
<tr>
<td>Higher prices</td>
<td></td>
</tr>
<tr>
<td>Guaranteed sales</td>
<td></td>
</tr>
<tr>
<td>Access to inputs &amp; credit</td>
<td>60</td>
</tr>
<tr>
<td>Access to new technologies</td>
<td>55</td>
</tr>
<tr>
<td>Income during the lean</td>
<td></td>
</tr>
</tbody>
</table>

Source: Minten et al., 2006; Maertens et al., 2006