Market Power and Rents in Global Supply Chains

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1. Introduction

Market power and competition policy in food supply chains has emerged as an important economic issue and a highly sensitive item on the policy agenda all around the world. For example, as recently as in May 2009, the Polish government made a statement that *"Food retailers in Europe have largely failed to pass on market price reductions to consumers, keeping their margins high and causing many farmers to abandon agriculture because of poor incomes" (forexpros.com, May 25, 2009)* and in June 2009 Belgian farm unions blocked large retailers' stores demonstrating against low farm prices.

Similar claims that large, often multinational, retailers and food companies are depressing farm prices because of their market power have been made in many countries around the world. Farmers as well as small traders have been staging protests against the opening of new supermarkets in their neighborhoods. Increasingly, these claims are also made in emerging and developing countries where a rapid expansion of modern supply chains is affecting farmers and society as a whole. For example, in 2006, demonstrators outside the Wal-Mart shareholders meeting in Mexico City protested against *"the low wages Wal-Mart pays its employees, the low prices it pays to its suppliers, and the disregard Wal-Mart has for the cities and communities where it establishes its stores,"* as part of a campaign called "Buy Local, Not Wal-Mart" (Globalexchange.org, November 14, 2006).

The academic literature on these developments yields several interesting insights. First, the concentration and market power in retailing, in contrast to food processing, is a relatively recent phenomenon. In fact, until the 1970s, even in the US and Europe, reports worried about the unequal bargaining power between (small) retailers and (large) food processing companies.

The real wave of consolidation of the retail sector in the US and EU largely took place in the 1990s, through natural growth as well as through mergers and acquisitions.

Second, the welfare and competition effects of the growth of modern processing and retailing companies are more nuanced and complex than often claimed.[1] In many cases, despite growing concentration, consumers appear to benefit from retail competition. This is also illustrated by several events around the world. For example, in 2007, the press reported demonstrations in Nitra, a middle-sized town in Slovakia, demanding that the city government would give Lidl – a hard discount multinational retailer – a license to open a supermarket in their part of town, which was disproportionately populated by pensioners and low wage consumers – consumers which hoped to benefit from increased competition and low prices. Similarly, when Lidl recently opened its budget shop in Wolverhampton, UK, after months of controversy, the press reported that hundreds of customers were queuing before the doors when it opened and quoted grandmother Iris Whitehouse, aged 78, who said: *"I'm delighted because the prices here are better than other shops in the area, which are just too expensive for pensioners who have to watch the penny" (expressandstar.com, May 21, 2009).* The recent enlargement of the European Union with ten new and poorer member states also provides an illustration of the benefits from retail competition. Increased competition in the retail sector is argued to be one of the main reasons why consumer food prices increased less than predicted with EU accession in the new member states (Csaba Csaki, pers. comm.).

While both consumers and farmers seem to be facing a concentrated structure in their exchange process, consumers seem to benefit from strong competition, while farm organizations often claim that concentrated retailers hurt them. However, even this conclusion does not seem to

[1] In this paper, we do not focus on the direct impact on the small scale retail sector, but rather on producers and consumers. In India, and many other countries, small shopkeepers have been strong opponents of modern retailers.

hold generally. For example, recently, in a very different part of the world, in Uttar Pradesh in India, where the state government closed down modern supermarkets, there were protests, not just from consumers, but also from farmers, afraid of foregoing the benefits of the retailers' presence: "*Hundreds of farmers gathered today by an agricultural collection depot run by a top national retailer [in India] to call for Uttar Pradesh to reopen Western-style supermarkets closed last week. […] "It seems there is some other politics behind this abrupt decision which is certainly not in the interest of farmers," said farm leader Ram Chandra Verma. The Reliance centre buys up farm produce from local farmers. For many farmers it saves them money because they no longer have to go through traditional middlemen to sell their goods."(Livemint.com, August 28, 2007).* Also in other developing countries, studies show that farmers and rural households may benefit from inclusion in modern supply chains, even if market power in these supply chains is very concentrated. For example, both Minten *et al.* (2009) and Maertens *et al.* (2009) find strong benefits for small farmers in Madagascar and rural households in Senegal, respectively, despite producing for monopoly exporting companies.

Nuanced conclusions, referring to a complex combination of effects, also follow from careful economic assessments which point at trade-offs between scale economies, enhanced bargaining power against large suppliers, and monopolistic price-setting (Dobson and Waterson, 1997; Chen, 2003). In fact, there is surprisingly little consensus based on scientific evidence on the welfare effects of growing market power. For example, there is an extensive strand of literature arguing that high retail concentration leads to higher consumer prices (e.g. Cotterill, 1999; Yu and Connor, 2002). Another set of empirical studies claims to have evidence for exactly the opposite result: that retail consolidation has no significant, or even a negative impact

on consumer prices (e.g. Newmark, 1990; Binkley *et al.*, 2002). It is equally hard to find compelling evidence on supplier impacts of increased retail concentration.

Finally, an important shortcoming of this literature for a global assessment is that the theoretical models typically focus on the trade-off between market power and scale economies. However, these models assume that factor markets work well and that contracts are enforced – aspects which are not realistic in many countries, in particular poorer ones. As we will show, it is essential to integrate these characteristics of the economy since they affect both how surplus is created and how it is distributed – and how competition affects it. In summary, it seems that while different stakeholders do often have very strong perceptions on the real impact of supermarkets on social welfare, most of their discourse is based on simple, ad hoc arguments. In contrast, the evidence on the expected negative impact of concentrated food and retail industries appears to be much weaker, and the underlying mechanisms far more complicated than what is suggested in the media and policy debates.

In this paper, we will first briefly review the literature on competition in food supply chains, by focusing on western, "developed" markets, and then move to the context of developing countries, where globalization is also resulting in the increased presence of large (often multinational) corporations, in food manufacturing as well as in retailing, causing unrest in some communities. More specifically, the paper is organized as follows. Section 2 reviews evidence on concentration in food supply chains. Section 3 reviews insights from the literature and Section 4 presents a model to assess the welfare effects of competition in supply chains, when factor markets are incomplete and contract enforcement is imperfect.

The analysis in this paper is related to important strands of recent literature. One is the impact of foreign investments, in particular by multinationals in developing countries. For

reviews of this literature, see Brown *et al.* (2003), Klein *et al.* (2001), UNCTAD (2005) and Colen *et al.* (2008). Another related literature is on the spread of modern retailers and food companies and their supply systems and product standards and what this implies for farmers, in particular for small farms and rural development (e.g. Reardon and Berdegue, 2002; Maertens and Swinnen, 2009; Minten *et al*. 2009; Reardon *et al.* 2009). However, while there are a lot of references to and discussions on market power in this literature, very few of the papers explicitly analyze the impact of market power or competition. A third set of related work are recent papers by McCorriston and Sheldon (2007) and McCorriston (2006) on the effects of trade liberalization in commodity chains with imperfect competition.

2. The Evolution of Concentration in Food Chains[2]

There appears general agreement in the literature that 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 retailing companies (Dobson *et al.*, 2003; McCorriston, 2006; Messinger and Narasimhan, 1995; Roland Berger, 2009). 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).

Despite this apparent agreement in the literature, representative and consistent data to show this trend are often not provided and the documentation is quite ad hoc. We briefly review here some of the data that are provided in the literature, but refer to the discussed reports for more details.

[2] For more details on this, see also two other presentations in this session at the IAAE congress.

First, the data reveal little concentration in food manufacturing at the global level for total packaged food sales. The top fifty food manufacturers have a combined market share of less than 20% in global packaged food retail sales (Gehlhar, 2008). However, high concentration rates do occur for some specific products or in specific regional markets. This is largely driven by a few big multinational food manufacturers, such as Unilever, Nestle, and Danone – who are selling products exhibiting pronounced brand loyalty and are market leaders in many countries (Dobson *et al.* 2001). As Gehlhar (2008) reports, food manufacturers tend to strategically focus on specific product lines "where they have inherent advantages".

Second, the concentration and market power of the retail sector is a relatively recent phenomenon. In fact, until the 1970s, even in the US and Europe, most of the literature dealt exclusively with the effects of monopolistic behaviour by food manufacturers, with the implicit assumption that buyers are atomistic price-takers (e.g. Lustgarten, 1975). The food retailing service was a largely fragmented sector compared to the food manufacturing sector. For example, Sexton and Lavoie (2001) cite a summary report of the National Commission (1966) which argued that especially in grocery manufacturing, concentration had reached "undesirable high levels". Meanwhile, Dobson and Waterson (1997) mention that in 1961, the leading 5 firms controlled only 8-9% of national retail goods sales in the UK. This rose to 14.4% in 1982, and to 22.2% in 1992. Concentration increased dramatically afterwards. In the US, the combined market share of the four largest grocery retailers increased dramatically over the past two decades: from 14% in 1984 over 22% in 1994 to 55 % in 2001 (Brunn, 2006; Kinsey, 1998). Clarke *et al.* (2002) report that by the mid 1990s, retail concentration in the EU had become considerably higher than in the food manufacturing industry: the 20 largest firms account for 40 % of the aggregate retail food turnover in the EU, while the corresponding figure for the food

manufacturing sector was only 15%. At the end of the 1990s, the average five-firm concentration ratio in the grocery retailing sector was close to 50% in the EU-15, but with substantial variation among EU member states. For food retail in general, Germany, the UK and Hungary have relatively high concentration ratios, with market shares held by the largest five food retailers (i.e. the C-5 concentration ratios) at a level of over 70% in 2006 (Consultative Commission on Industrial Change 2008). More recent figures by Einarsson (2007) show that the grocery market is even more concentrated in northern Europe: the three-firm concentration ratio's for 2004 are Denmark (91.2 %), Finland (79.6%), Iceland (81%), Norway (82%), Sweden (91.2%). At the other hand of the distribution are countries like Romania and Poland, with the largest five retailers having a joint market share of less than 20%.[3]

In summary, while the data are less than perfect, what is available suggests that the food processing sector is characterized by substantial concentrated in specific commodities, but less so at the aggregate food sector level. The past two decades have witnessed important growth in concentration in the retail sector in rich countries, and a spread to emerging countries through significant international and domestic investments, contributing to growing concentration as well.

3. Insights from of the literature

While there seems to be agreement in the literature about the high level of concentration in the food chain, it is much less clear what implications this has for customers well as suppliers of the concerned companies. We will first review some theoretical arguments and then empirical evidence.

[3] For a discussion of the so-called "retail revolution" in Central and Eastern Europe, see Dries *et al.* (2004).

Theory

Basic economic principles suggest that high concentration will lead to market power and thus inefficiencies. In general, depending on the situation, higher buyer power vis-à-vis suppliers of inputs (or labor) may lead to lower input prices than desirable; and higher seller power vis-à-vis customers (or downstream industries) to higher consumer prices. This would lead to "double market power" as companies in concentrated sectors use their weight to negotiate lower prices from suppliers, but also use their selling power to impose higher retail prices to the consumer than in the competitive case. [4]

However, several scholars have argued that while buyer concentration is a useful first indicator of possible buyer power, higher concentration does not necessarily translate into high buyer power and/or high seller power (Clarke *et al*., 2002; Peltzmann, 1977).

In fact, concentration may be welfare improving for more than one reason. First, it may lead to important gains in efficiency if there are scale economies in the industry (e.g. Demsetz, 1973; Guy *et al.*, 2004). There is some evidence that this applies to the food industry. A 2006 USDA-ERS report examined mergers and acquisitions in the meat, poultry, dairy and grain processing industry in the US in the period 1972-1992. After the merger, labor productivity in the acquired plants increased substantially, up to twice the initial level.

Second, efficiency will also increase if transaction costs are substantially lower as a result of high market power (Shervani *et al*., 2007). Third, investments in research, development and innovation may require a certain degree of market power, so as to ensure that companies who invest can reap the benefits from the innovation. In a fully competitive market, certain efficiency improving innovations may not emerge (e.g. Pray *et al.*, 2005).

[4] Mc Corriston and Sheldon (2007) show how such market power affects both the distribution of rents in the chain and effects of trade liberalization.

Fourth, the efficiency and price effects of concentration depend on the rest of the supply chain. For example, another reason why retail consolidation may lead to lower consumer prices, is that high buyer power can lead to better bargaining power vis-à-vis the main suppliers, which may feed through to lower consumer prices eventually (e.g. Chen, 2003; Dobson and Waterson, 1997). In fact, before the wave of consolidation which was witnessed in the retail sector in the 1990s, most studies about market structure in retailing focused on the strong bargaining power of suppliers with respect to retailers, whereas retailers were usually considered to be price-takers (e.g. Lustgarten 1975). In those times, increasing consolidation of retailers was perceived as potentially social welfare improving, as it would allow them to exert "countervailing power"[5] vis-à-vis their main suppliers. As such, the use of buyer power by supermarkets is a relatively recent phenomenon and tends to be more of a concern in relations between retailers and farmers, than between retailers and large suppliers such as Unilever, Nestle, Philip Morris and Danone. In the latter case the market power issue of concern here is between the farmers and the food processors.[6]

Sexton and Zhang (1996) argue that, especially for fresh commodities such as fruits and vegetables, suppliers are small and unconcentrated, and sell unbranded and highly perishable goods, resulting in a very low price elasticity of supply. The scope for the buyer to use his buying power is substantial here. Also Dobson *et al.* (2003) raise concerns that "producer market power has largely given way to retailer buyer power, where retailers hold the whip hand over

[5] Countervailing power was a term coined by Galbraith (1952) to describe the ability of large buyers in concentrated downstream markets to extract price concessions from suppliers (From: New Palgrave Dictionary)

[6] There is anecdotal evidence that there is intensive bargaining between the " successive oligopolies" in the food chain. For example, Dobson *et al.* (2001) mention that Nestle's strong position in the UK enabled it to resist downward pressure on prices by supermarket chains. Another recent example is from 2009 in Belgium, where retail chain Delhaize refused to give in to a unilateral price increase by one of their main suppliers, Unilever, finally resulting in a general boycott of Unilever products by Delhaize. The conflict, which took almost a month' time, is said to have hurt both firms.

producers". They argue that retailers are increasingly using aggressive bargaining strategies, resulting in lower prices and margins for producers.

Finally, another reason why concentration may not result in higher prices and why intensive price competition may be observed in relatively concentrated markets relates to firm heterogeneity. If an industry is highly concentrated but firm sizes are very unequal, collusion will be more difficult, as the costs are higher. In an "asymmetric" market environment, where one large firm coexists with a few smaller firms, it is less likely that they will collude (e.g. Compte *et al*. (2002); Kühn (2002); Kühn (2004)).

Empirical evidence

While the theoretical arguments apply both to buyer and seller power - and thus the impact on consumers and farmers of concentration in the food chain, the empirical studies and policy debates typically focus on one of these (farmers or consumers). Until recently, empirical studies have focused mostly on consumer effects.

There are a number of empirical studies relating consumer prices to local concentration of retailers. However, they arrive at very diverging conclusions. On the one hand, Hall *et al.* (1979), Lamm (1981), Marion *et al.* (1993), and various studies by Cotterill (Cotterill 1986; Cotterill and Harper, 1995; Cotterill 1999) find that there is a positive correlation between retailer concentration and food prices. On the other hand, Kaufman and Handy (1989), Newmark (1990) and Binkley and Connor (1998) find a negative or insignificant correlation between concentration and food prices. Likewise, Binkley *et al.* (2002) find "*little compelling evidence that consolidated markets engage in non-competitive pricing behaviour*".[7] An interesting paper

[7] Newmark (1990)'s main critique on past studies is that they fail to include a measure of non-price competition, while average quality or provision of services may be higher among retailers with a high market share (see also

in this context is by Cooper (2003), who summarizes the findings from the Competition Commission's report into UK supermarkets. He reports that prices did not vary with the number of local competitors, but were often lower in the proximity of certain lower priced large stores, as supermarkets often benchmarked the prices of certain key-products with the prices of their main competitors.

Most, but not all, studies on developing and emerging countries find that the arrival of large modern retailers led to lower consumer prices. For example, Reardon and Hopkins (2006) argue that modern supermarkets in Chile reduced the cost of the food consumption basket of the lower and middle income consumers, by charging lower prices than traditional markets. Similar observations are reported by D'Haese and Van Huylenbroeck (2005) for South Africa, and by Neven et al. (2006) for Kenya (especially for processed foods and non-food items). However, Minten (2008) finds that food prices in global retail chains in Madagascar are 40%-90% higher than in local traditional retail markets, after controlling for quality.

Studies which have focused on the relation between increased retail concentration and profitability, have also found little conclusive evidence that consolidation has led to increased profits for retailers. For example, in an empirical study, Messinger and Narasimhan (1995) do not find increased profitability among retailers as a result of increased consolidation between 1981 and 1991. In fact, they even find a modest reduction in profitability for both food manufacturers and for retailers. Also Farris and Ailawadi (1992) report little change in retailer profitability between 1972 and 1990.

Barla (2000) provides empirical evidence that the strong competition in the presence of apparent concentration in the industry may be due to the difficulties of collusion between

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Anderson, 1993). Newmark includes customer income as a proxy for demand for extra services in his price regression. His methodology is again scrutinized by Yu and Connor (2002), mainly because it fails to correct for "non-competing" grocery stores.

heterogeneous firms. Another reason may be the presence of discounters. For example, while retail concentration in Germany is quite high, there is strong competition on the selling side, with as main engine the "hard discounters" such as Aldi and Lidl (Dobson *et al.* 2001).

Also on the upstream side (the farmer) there is little compelling evidence about abuse of buying power in the literature. On the one hand, Lloyd *et al.* (2009) provide a formal test for buyer power, and show that the hypothesis of perfect competition can be rejected in 7 of the 9 food products investigated. On the other hand, Sexton *et al*. (2005) mention that it is practically impossible to measure the retailers' buying power, as prices paid by retailers to their suppliers are "typically not revealed". Apart from some weak anecdotal evidence, also Dobson *et al*. (2001) fail to find clear evidence of abuse of market power vis-à-vis farmers, in an empirical investigation based on interviews with retailers, farmers supplying them, and larger suppliers. They review a case where a farmers' organization in the UK alleged "*that supermarket chains pay very low prices for farm products, but fail to pass low prices on to consumers*". After an investigation, however, the Competition Commission (2000) argued that the low producer prices were mainly a result of excess supply, and had been passed on to consumers, or were compensated by other cost increases.

Despite the inconclusive evidence on the impact of concentration in the food and retail industry in the literature, one may still ask whether there may be reasons why farmers and consumers may be differently affected despite the fact that both are small atomistic agents and often weakly organized.

One possible argument why consumers may be less susceptible to retail and food industry concentration is that consumers may have more choice than suppliers do. According to Bresnahan and Reiss (1991), who investigate competitive pressures at the village level, the

impact of a new entrant in the market is hardly felt from the moment that there are three firms already. Dobson et al. (2001) argue that even if retail concentration is higher, the concentration of buyer groups may be even higher. If retailers are organized in buyer groups, which collectively bargain for supplies, but compete against each other in the sellers' market, customers may face a lower concentration ratio than suppliers do. Along these lines, Sexton and Zhang (2001) argue that the relevant geographic and product markets for the purchase of raw agricultural commodities will usually be narrower, and, thus, concentration will normally be higher, than in the relevant markets for the associated finished products. Geographic markets are narrower because farm products are often bulky and/or perishable, causing shipping costs to be high, restricting the products' geographic mobility, and limiting farmers' access to only those buyers located close to the production site.

That said, in many developing and emerging countries the arrival of modern food and retail companies are likely to reduce trading restrictions, and to enhance, rather than reduce, competition for farmers products - and hence to offer benefits for them.

Furthermore, once one accounts for the specificities of production processes and the institutional environments, the so-called weak bargaining position of local farmers vis-à-vis larger companies should be qualified. We explain this in detail in the next section.

4. Market power and rents with imperfect factor markets and contract enforcement problems

Two key characteristics of rural areas in developing and emerging countries are factor market constraints and weak institutions for formal contract enforcement. These conditions have

major implications for the distribution of rents in global supply chains and the impact of competition. To show this we first start off with a simple conceptual framework; we then outline the contours of a more elaborate theoretical model; and we finally review some empirical evidence.

Globally, vertical coordination has emerged as a business response to farmers' factor (input) market constraints limiting their ability to produce high-quality products. Empirical studies show that in global supply chains, local suppliers in developing and transition countries are engaging in complex contracting with companies selling into high-income markets - either domestically or internationally. These contracts not only specify conditions for delivery and production processes but also include the provision of inputs, credit, technology, management advice, and so forth (Swinnen 2007; World Bank 2005). The latter are particularly important for local suppliers who face important local factor market imperfections. In particular, imperfections in credit and technology markets are typically large, which implies major constraints for investments required for quality upgrading, especially for farmers who cannot source from international capital markets.

Market power and competition in food processing and retailing companies can affect both rent creation (efficiency) and rent distribution (equity) in these chains. First, excess processing capacity and shortage of quality supplies would increase the incentives for processors to provide interlinked contracts. Second, competition would prevent companies from exercising monopoly power in the setting of the contract conditions. However, thirdly, there may be a problem of sustainability of the contracts with competition. For example, with pre-financed feed by dairy companies, or pre-financed seed and fertilizer by crop processing companies, farms can sell their output to competing processors who can offer higher prices since they do not have to incorporate

the costs of the assistance programs. This may cause the collapse of the contracts, in particular in the presence of weak contract enforcement institutions.

A Conceptual Framework

To understand the relationship between equity and efficiency with interlinking markets, consider a contract between a supplying farm, with welfare represented by expected utility U^F, and a processing company, with expected utility U^C. Figure 1 illustrates the pre- and post-contracting welfare of the agents. Without interlinked contracts the utility possibility frontier is U_0U_0. Assume that actual pre-contract utility is at (U^F_0, U^C_0), represented by point A.

By introducing an interlinked contract, farms can access credit, inputs, etc. which were unavailable before and companies can have access to higher quality supplies. Total welfare increases and the utility possibility frontier shifts to U_1U_1. The question is who benefits from the welfare increase: both agents or only one? In other words, will the new equilibrium be at point B, D, or E? At point B, both parties share in the gains from the institutional innovation, and everybody is better off. At point D, the processing firm extracts all the rents of the innovation. There are several models in the development economics literature which model show one can arrive at point D. For example if company C sets the conditions of the contract, supplier F will accept the contract as long as it represents an improvement of its expected utility. Hence, at the margin, it will be optimal for C to present F with a contract with conditions which provide F with an expected utility equal to U^F_0, F's reservation utility. This is the case represented by point D. Papers in the development economics literature show how in output-credit market interlinkages (trader-company) C typically does this by subsidizing credits (lower interest rates) and taxing outputs (lower output prices) (Stiglitz and Weiss, 1981).

However, it can get worse. The interlinking of transactions may actually bestow additional monopoly power upon C. Bell (1988) shows how in a Nash bargaining framework a peasant may be worse off in dealing with a landlord with interlinked transactions than with separate bilateral bargains. Personalized and interlinked transactions can weaken the collective bargaining strengths of workers vis-à-vis employers (Bardhan, 1989). In these cases, one may end up at point E, where F's utility is actually lower after the contract innovations, despite the fact that total welfare has improved significantly.

Intuitively, one would expect that competition among processors and retailers should play an important role in the rent distribution. First, excess processing capacity and shortage of quality supplies would increase the incentives for processors to provide farm support, and therefore induce a shift from the U_0 U_0 to U_1U_1 frontier, for example from A to B.

Second, competition on the processing side would prevent companies from exercising monopoly power in the setting of the contract conditions and would make it more likely that one would end up somewhere around point B, or even H, rather than D, or even E. This is illustrated in Figure 2. Companies can either compete on the producer prices offered, or on the services they provide to their suppliers, including input programs.

However, thirdly, there may be a problem of sustainability of the new contracts with more competition. For example, with pre-financed feed by dairy companies, or pre-financed seed and fertilizer by crop processing companies, farms can sell their output to competing processors who can offer higher prices since they do not have to incorporate the costs of the assistance programs. This may cause the collapse of the contracts, and is more likely to occur with more competition. Moreover, with more competition, the penalty for opportunistic behavior becomes lighter: firstly because the threat of cut-off from future credit arrangements is less

stringent, as there are other credit providers available (Hoff and Stiglitz, 1998); secondly because reputation effects are less prevalent in a competitive market, where buyers are less likely to coordinate and share information. In summary, if we consider Figure 2 again, while competition seems important to induce a desirable distribution of the gains (i.e. be at point B or H instead of D or E), competition could undermine the ability to obtain the gains, i.e. one would fall back to point G.

To study how these various effects interact and how external conditions and commodity characteristics affect these outcomes we need a richer and more detailed model. Such model is developed in Swinnen and Vandeplas (2009). Here we outline the key features and implications of the model.

A Model

Consider the general case where a farm can sell products to a trader or a retailing or processing company – which we refer to as "the company". This company 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 $\overline{l}$. 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 factor market imperfections. Assume that the buyer has access to the required capital and 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 $\bar{k}$, with $\bar{k}$ depending both on the capital intensity of the crop, and on the buyer's potential return to alternative investments.

The net value that is created when the farmer and the buyer collaborate amounts to $\theta = p_h - \bar{l} - \bar{k}$. If the contract terms are determined as in a simple principle-agent model 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 $Y_{pf} = \bar{l}$ and $\Pi_{pf} = p_h - \bar{l}$. 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 (cfr. Williamson, 1981). 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 φ^f. This way, he can always at least earn an income $\bar{l} + \bar{k} - \varphi^f$.

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.[8] By sideselling, the farmer's payoff is $p_s - \varphi^f$. For the supplier to voluntarily comply with the contract, his contract income Y must cover his disagreement payoff (i.e. $Y \geq \bar{l}$), and be at

[8] 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, $p_s = p_l$. In some cases, p_s is even lower than p_l, 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).

least as much as his outside options, obtained from breaching the contract, i.e. his incentive compatibility constraints must be satisfied: $Y \geq \bar{l} + \bar{k} - \varphi^f$ and $Y \geq p_s - \varphi^f$.[9] The resulting contract (Y, Π) will then be defined by

$$Y = max\ (\bar{l}\ ,\ \bar{l} + \bar{k} - \varphi^f\ ,\ p_s - \varphi^f) \qquad (1)$$

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

This contract is feasible only if it also satisfies the buyer's participation constraint $\Pi \geq \bar{k}$, 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" ε, defined as

$$\varepsilon = max\ (0,\ \bar{k}\ - \varphi^f,\ p_s - \bar{l}\ - \varphi^f). \qquad (3)$$

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 $\partial\varepsilon/\partial\bar{k} \geq 0$, $\partial\varepsilon/\partial\varphi^f \leq 0$, and $\partial\varepsilon/\partial p_s \geq 0$: the higher the famer'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

[9] 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.

efficiency premium. Hence, as long as the contract can be made self-enforcing, 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:[10]

$$p_h \geq p_h^{min} = max\,(\bar{l} + \bar{k}\ ,\ \bar{l} + 2\bar{k} - \varphi^f,\ p_s + \bar{k} - \varphi^f) \qquad (4)$$

This condition captures several reasons for potential contract failure. If $p_h < \bar{l} + \bar{k}$, the net surplus of the transaction will be negative, and there is no incentive for contract formation. If $p_h > \bar{l} + \bar{k}$ but smaller than $\bar{l} + 2\bar{k} - \varphi^f$, or than $p_s + \bar{k} - \varphi^f$, 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. Hence, contracting is more likely to break down if the value in the chain (θ) is low (p_h relative to the opportunity cost of capital $\bar{k}$ and labour $\bar{l}$), if there are more alternative sales outlets for high-value products (i.e. p_s is high), and if farm reputation costs φ^f are low. Under these conditions, suppliers will still be able to earn their opportunity cost of labor.

The Impact of Competition

We can now derive the impact of competition (Ψ, with $0 \leq \Psi \leq 1$) on farm incomes (Y) and on contract feasibility ($p_h - p_h^{min}$) as follows:

$$\frac{\partial Y}{\partial \Psi} = \frac{\partial Y}{\partial \bar{l}} \cdot \frac{\partial \bar{l}}{\partial \Psi} + \frac{\partial Y}{\partial p_h} \cdot \frac{\partial p_h}{\partial \Psi} + \frac{\partial Y}{\partial \varphi^f} \cdot \frac{\partial \varphi^f}{\partial \Psi} + \frac{\partial Y}{\partial p_s} \cdot \frac{\partial p_s}{\partial \Psi} \qquad (6)$$

[10] We implicitly assume that the buyer can commit to the contract; see Swinnen and Vandeplas (2009) for when this is not the case.

$$\frac{\partial[p_h - p_h^{\min}]}{\partial \Psi} = \frac{\partial p_h}{\partial \Psi} - \frac{\partial p_h^{\min}}{\partial \bar{l}} \cdot \frac{\partial \bar{l}}{\partial \Psi} - \frac{\partial p_h^{\min}}{\partial \varphi^f} \cdot \frac{\partial \varphi^f}{\partial \Psi} - \frac{\partial p_h^{\min}}{\partial p_s} \cdot \frac{\partial p_s}{\partial \Psi} \qquad (7)$$

where $\partial Y/\partial \bar{l} \geq 0$, $\partial Y/\partial p_h = 0$, $\partial Y/\partial \varphi^f \leq 0$, $\partial Y/\partial p_s \geq 0$, $\partial p_h^{min}/\partial \bar{l} \geq 0$, $\partial p_h^{min}/\partial \varphi^f \leq 0$, $\partial p_h^{min}/\partial p_s \geq 0$, (in each case the effect is zero when the constraint is not binding and strictly positive or strictly negative when the constraint is binding).

The first term on the right hand side of equation (6) captures the traditional argument that competition between buyers has a positive impact on the suppliers by increasing demand which increases the supplier's price. Formally, increased competition between private buyers will increase the ex ante outside option suppliers face at the time of contract negotiation. While the non-contract outcome, in which they for instance produce for the local low value market, remains an option, they have also more buyers for the high-value product. In our model, this implies an increase in the supplier's opportunity cost of labour $\bar{l}$: $\partial \bar{l} /\partial \Psi > 0$ *for* $0 \leq \Psi \leq 1$.

The second term captures the effect of competition on the company management. Competition may end the "quiet life" of the processing company management (Hicks, 1935). A company manager's incentives for cost reduction and innovation will be stronger in a competitive environment. There is an extensive literature on how competition and privatization changed manager and firm behavior in transition countries (Roland, 2000; Konings and Walsh, 1999). To keep the model simple, we assume that improved management reduces inefficiencies in marketing, resulting in a higher p_h: $\partial p_h/\partial \Psi > 0$ for $0 \leq \Psi \leq 1$. This increases the contract surplus.

The third term captures the impact of competition on the farmer's reputation. Competition between buyers will reduce the supplier's reputation cost φ^f from breach of contract ($\partial \varphi^f/\partial \Psi < 0$). One reason is that when the number of companies increases the penalty for contract breach may decline, because the threat of cut-off from future contract arrangements is

less stringent, as there are other contract partners available (Hoff and Stiglitz, 1998). This argument is in line with Eswaran and Kotwal (1985), who state that reputation is an effective weapon against moral hazard only for suppliers "of those factors that are in excess supply". In other words, a higher demand for the supplier's produce lowers his reputation cost from breaching a contract. Another reason why the penalty for breaching a contract is lower with more competition, is that reputation effects are less prevalent in a competitive market, where agents are less likely to coordinate and share information (see e.g. Zanardi 2004). This will make it easier for an opportunistic supplier to find an alternative buyer. Local information networks work less well when the number of agents expands, as it costs more in terms of effort, money, and/or time to let information spread among a larger group of agents. While this obviously makes contract breach by the supplier more likely, and thus the sustainability of contracts less likely (as we will discuss further), as long as contracts are provided, this effect also benefits farms.

The fourth term captures the fact that competition will also increase the supplier's ex post outside option and thus increase his share of the contract value through a higher number of opportunistic buyers, i.e. an increased p_s ($\partial p_s / \partial \Psi > 0$). The reason is that 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.

In summary, from equation (6) it follows that, as long as contracts do not break down, competition will induce an increase in farm surplus from production, since all terms on the right hand side are positive.

However, the effects only hold to the extent that the contracts are provided. Indeed, competition will not only affect the demand for output, but also the provision of inputs as companies will anticipate farmers' actions.[11] With (increased) competition between buyers, input provision may be unsustainable, and contracting may break down even if it would be socially efficient.

In terms of our model, equation (7) captures the various mechanisms which affect contract enforcement with increased competition. The first term of the right hand side of equation (7) is positive while the other terms are negative. The first term captures the effect that competition induces an increase in efficiency in the chain which improves the high value product price and thus the surplus for the buyer.

The other terms capture sub-effects of competition which, while increasing the suppliers share of the contract, also make it more likely for him to breach the contract. Each of these sub-effects of competition represented by the last three terms on the right hand side of (7) decreases the lower bound p_h^{min} and hence has a negative effect on contract feasibility. First, competition will increase the supplier's opportunity cost of labour ($\bar{l}$), and thus reduce the net surplus of the contract (θ). Second, competition will reduce supplier reputation costs, which will lead to a higher benefit from opportunistic behaviour. Third, competition is expected to increase the supplier's ex post outside option, i.e. his payoff from side-selling the high value product. This will also result in a lower likelihood of interlinked contracts.

In summary, in this model competition is expected to increase the supplier's benefits, conditional upon contract enforcement. However contract enforcement may be less likely with

[11] This effect is related to the standard economic theory of credit markets which predicts that competition between lenders may reduce the provision of credit (e.g. Petersen and Rajan 1995).

increasing competition, although the result is not unambiguous and depends on the relative importance of various sub-effects of competition.

Empirical evidence

The question which of the indicated effects dominates and what the resulting welfare effects are, is also importantly an empirical issue. In Swinnen at al. (2007) we review empirical evidence on this issue from the literature in developing and transition countries. The main conclusions from this review are as follows.

The empirical literature provides case studies and evidence that support each of the separate theoretical arguments made above. [12] First, some studies show that more competition does lead to more contracting and a concomitant willingness to provide farm assistance trough vertical coordination. Second, other studies show that competition increases the suppliers' bargaining position, inducing a shift in producer prices or forcing buyers to provide better contract terms. Third, empirical evidence also suggests that input programs have collapsed due to competition.

Concluding Comments

There are complex interactions between concentration in global food chains, efficiency and rent distribution. Concentration has increased over the past decades, and this has contributed

[12] There is some interesting comparative analysis in the cotton sector in Africa and Central Asia. A comparative analysis of contracting and interlinking in the cotton sector in Central Asia confirms the importance of competition as an important factor to protect small farms against rent extraction by large processors (Swinnen *et al.* 2007). The only places where farmers are consistently exploited is in monopolized systems, such as in Uzbekistan, Tajikistan (and Turkmenistan). In contrast, in Kazakhstan and Kyrgyzstan, the cotton chain is characterized by strong competition among private gins buying cotton seeds from small farms for processing, with much better conditions for farmers. Competition plays a very important role in the cotton supply chains by inducing both beneficial equity and efficiency effects. Poulton *et al*. (2004) conclude their comparative analysis in African cotton chains saying that strong competition has led to contract breakdowns.

to welfare gains through scale economies. The evidence on whether the associated growth in buyer and seller power has hurt consumers and farmers is mixed.

In this paper, we argue that the growth of global food chains affect farmers in developing countries by increasing market opportunities for them. Moreover, in the presence of market imperfections and contract enforcement problems, efficiency premiums in vertically coordinated contract arrangements may provide additional benefits for farmers.

Increased competition is likely to benefit farms by improving contract conditions, but may hurt them as contract enforcement becomes more complicated.

The empirical literature provides substantial evidence that contract terms indeed improve with more competition, but also that input and credit programs have collapsed because of (too much) competition and opportunistic behavior by farmers.

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Figure 1. Equity and efficiency effects of interlinking markets

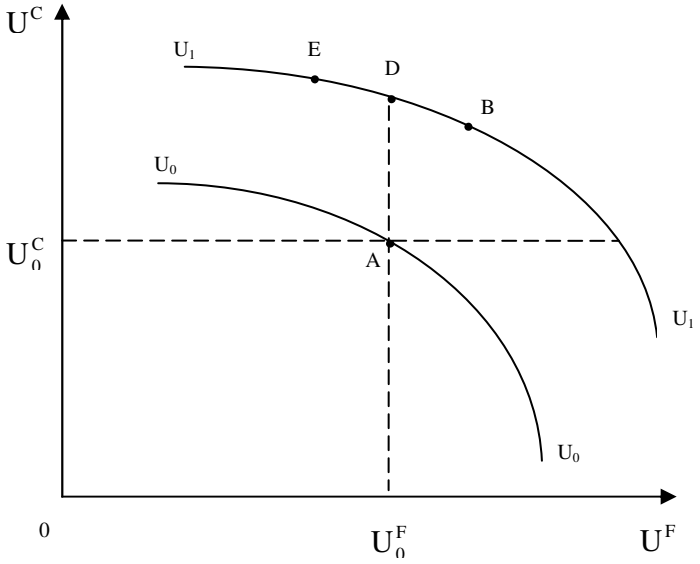

Figure 2. Effects of competition on interlinking markets