

Competition in the Food Chain

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Executive Summary¹

Recent events in world commodity markets coupled with high and volatile levels of retail food inflation across many countries have given rise to the functioning of food supply chains. Although there are many factors that impact on the functioning of the supply chain (including technology, changing consumer tastes, regulation and so on), there has been a concern that competition (or the lack of it) can also have an important impact on price developments. The aim of this background paper is address competition in the food supply chain and summarise the key insights from research.

Assessing competition in the food sector is complex; the food supply chain is made up of a series of vertically-related industries where concerns about competition may arise within or between any of these stages. This gives rise to a number of issues including buyer as well as seller power and how the nature of the vertical linkages in the supply chain can impact on the overall functioning of the supply chain including the impact on consumers as well as suppliers (farmers). Though recent events on world markets and the experience of food inflation serve as background to the current focus on the food sector, there are some long-standing concerns about developments in the food sector: a low share of the ‘food dollar’ received by farmers, high levels of concentration in food processing and retailing and increased consolidation through mergers and acquisitions in these stages of the food chain. Given the vertically-related nature of the food supply chain, addressing competition at any stage is to recognise that both horizontal and vertical effects are likely to determine the final effect on consumers.

In this paper, we assess a range of concerns relating to competition in the food sector. These include: competition in food processing and retailing; vertical relations including the impact of buyer power; the penetration of private label products, and mergers and acquisitions in the food sector. We note that addressing the competition issues in the food sector is made more challenging given the multi-product nature of food retailing and access to appropriate data to both gauge the extent of competition and to assess the likely impacts of firm behaviour both within and across vertical stages in the food supply chain.

Finally, against the background of high levels of food inflation, we also assess how competition in the food sector may affect the price transmission process between prices at the farm (or world markets) through to consumers. There are many dimensions to price transmission and we address how characteristics of the food sector may impact on price developments in retail markets and, more specifically, the mechanism via which competition in the food sector may affect the price transmission process.

¹ This paper was prepared as the OECD Secretariat background paper for the OECD Competition Roundtable in Paris (October, 2013) for the special session on ‘Competition in the Food Chain’.

Competition in the Food Chain

1. Introduction

Recent events on world commodity markets, coupled with high levels of food inflation across many countries, have raised concerns about the functioning of the food chain and the lack of transparency about price transmission through various stages in the food chain from upstream segments through to consumers. While there are potentially many factors that can influence the functioning of the food chain in specific settings (either at the country or sector level), there has been increasing concern about competition throughout the food supply chain in many countries. These issues have been reflected in a number of ways: for example, anti-trust investigations involving firms in the food sector; anti-trust authority reviews relating to the functioning of the food chain, either at the sector level or focussing directly on specific commodity-food chains; through efforts to understand price formation and transmission throughout the food chain and to encourage greater transparency with respect to price developments (for example, the High Level Panel on Food Prices instigated by the European Commission); and engagement with stakeholders throughout the food sector (for example, the US Department of Justice's engagement with farmers, academics and a wide range of interested parties and experts that were summarised in the report on "Competition and Agriculture", Department of Justice (DoJ), 2012).

The overall aim of this paper is to address competition issues in the food chain, to assess how the recent developments that have been experienced in the food chain across many countries (i.e. the growing dominance of retailing, consolidation, the increased penetration of private labels, concerns over bargaining power, a low share of the 'food dollar' received by farmers and so on) tie with increasing concerns about both horizontal and vertical market power. In the context of recent events on world commodity markets, we also address the issue of price transmission between different stages in the food supply chain and how competition may impact on the price transmission process.

In this paper, we draw on both theoretical and empirical research to provide relevant insights into various aspects of competition that arise throughout the food sector. Researchers face many challenges in addressing competition in the food sector: in part, this reflects the on-going changes in the food sector and the complexity of dis-entangling horizontal and vertical issues within this context; but it also reflects access to data (particularly given the multi-product nature of food retailing and the fact that prices at intermediate stages of the food chain are unlikely to be observed) which provides a not inconsiderable barrier to investigating competition issues. These issues also make constitute a barrier to increasing transparency on how prices are determined and commodity price shocks are transmitted through the food supply chain.

This paper is organised as follows. In Section 2, we present some background which ties with concerns about food prices in OECD member countries in recent years and link these developments with overall concerns about the food supply chain. In Section 3, competition issues that arise in the food sector are addressed. Reflecting concern over recent developments on world agricultural markets, issues relating to price transmission are covered in Section 4 where competition (or the lack of it) may impact on the price transmission process. In Section 5, we summarise and conclude.

2. Impacts of Food Price Developments on the Food Supply Chain

As a precursor to the overview on competition issues in the food supply chain, it is worth highlighting three issues that serve as background to the recent intensification of interest in the food sector: first, food inflation has been high across OECD countries though the extent of retail food price inflation has varied considerably; second, raw commodity-retail food margins have varied over this period but the pattern of retail price changes have not reflected changes at the raw commodity (farm level) stage; third, over the longer time frame, there has been concern that increased competition in the downstream stages of the food chain has been a factor in the widening spread between farm and retail prices.

2.1 Food Inflation

Since 2007 developed, emerging and developing economies have experienced high levels of food inflation. The cumulative impact of food inflation for selected OECD countries is shown in Table 1. The cumulative impact of year-on-year food inflation since 2005 till 2011 has seen food prices increase by around 22 per cent on average across OECD countries. However, there has been substantial variation with relatively low levels of food inflation in the US (14 per cent) through to higher levels in Turkey (67 per cent) and Mexico (48 per cent). Trade and macroeconomic policies-as well as underlying levels of national food supplies-can all impact on the exposure of the domestic food sector to events in world markets that can partly explain why food inflation would differ. Gelos and Ustyugova (2012) present an overview of why food inflation may differ across countries. However, even in the EU with a more common policy environment, food inflation has varied: in the UK, for example, between 2005 and 2012, food inflation has resulted in food prices increasing by more than double the rise in food prices experienced in Italy (36 per cent versus 15 per cent)..

To put the food inflation experience in context, Table 1 also reports the cumulative rise in prices in the non-food sector. On average, across the OECD as a whole, non-food inflation has resulted in an 11 per cent cumulative increase in prices, which is approximately half the level experienced in the food sector. But the difference between food and non-food inflation has been more marked in other countries as shown in Table 1; for the UK, the cumulative effect of non-food prices has lead to an increase of 13 per cent, compared with cumulative food inflation effect of 36 per cent; in Italy, food inflation has had only a marginal effect compared with non-food inflation (15 per cent compared with 11 per cent); in Hungary, food prices have risen by 46 per cent compared with 23 per cent in the non-food sector.

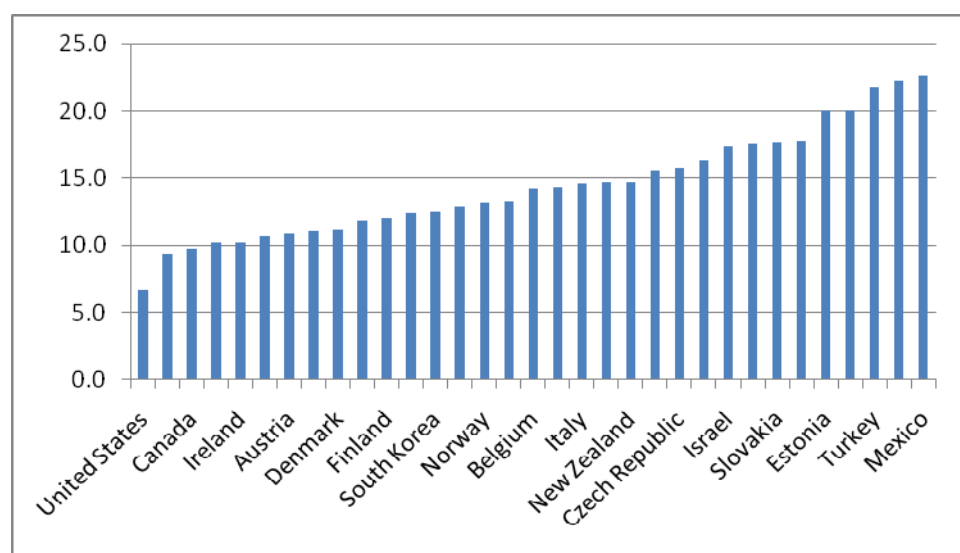
Table 1: Cumulative Impact of Food and Non-Food Inflation between 2005-2011 in Selected OECD Countries

<i>Country</i>	<i>Food Inflation, Cumulative Effect (%)</i>	<i>Non-Food Inflation, Cumulative Effect (%)</i>
Canada	23.8	9.3
Mexico	47.8	24.5
Hungary	45.7	22.5
Italy	15.3	11.2
Spain	31.7	10.7
Turkey	67.4	50.9
UK	36.4	13.1
US	14.2	12.1
OECD Average	21.7	11.4

Source: Data compiled from OECD

Food prices are, not surprisingly, a sensitive issue largely due to the proportion of income spent on food and also the potentially regressive effect it has on lower income households. In Figure 1, the share of household income spent on food in OECD countries is reported. This can vary substantially, from around 22 per cent in Turkey and Mexico to less than 10 per cent in the US, Canada and the UK. However, even in countries where the aggregate share is relatively low, since the lower income groups spend a greater proportion of their income on food, the rise in food prices can have a regressive effect on the less well-off.

Figure 1: Share of Household Expenditure Spent on Food, 2011 (%)



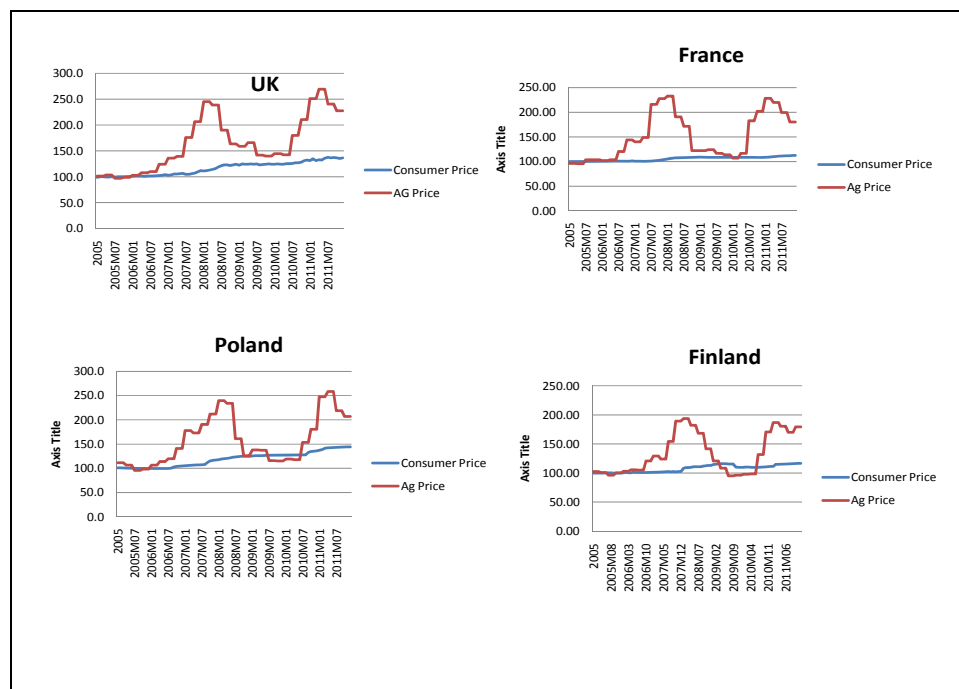
Source: Data compiled from USDA Economic Research Service

2.2 Recent Behaviour in Farm-Retail Spreads

While retail food price inflation has been more volatile than non-food inflation (especially in recent years), an additional dimension to recent events is that retail food prices have been less volatile than farm level/raw commodity price levels. This causes farm-retail margins to change but with the main source of these changes being in the upstream stages of the food chain. As an example of this, Figure 2 presents data for farm-retail price spreads for a selection of EU Member States covering the cereals-bread sector. Though the magnitude of the changes can differ, the experience is common: during the 2007-2008 commodity price ‘spike’, prices at the farm level increased and, while retail prices also increased, the changes at the farm level were more substantive than those at retail. This would have caused the farm-retail margin to narrow. The behaviour of the farm-retail price level following the 2011 commodity price rise was similar with most of the fluctuations in prices originating in the upstream sectors. Commodity price ‘spikes’, by definition, are associated with steep declines following the initial surge which has caused the farm-retail price margins to widen once again when prices have subsequently fallen.

Concerns about competition in the food sector often relate to the behaviour of farm-retail spreads, specifically the issue of price transmission through the food supply chain. The issue of price transmission is complex as concerns relate to not just the extent of the pass-through but also the rate at which the price changes are passed through and how long the upstream price changes take to be passed through into the retail sector, as well as the particular pattern of the price dynamics. For example, there may be asymmetric price transmission where price increases are passed through more fully and more quickly than price decreases.

Figure 2: Farm-Retail Price Spreads for Cereals-Bread, 2005-2011, for Selected EU Member States.



Source: Data compiled from Eurostat

Observations about the behaviour of farm level (or raw commodity) prices and corresponding retail prices tie in with competition issues throughout the supply chain². To the extent that competition in the food sector does affect the outcome, the mechanism is important and recent research has tied the price transmission process more directly with the characteristics of the vertically-related food sector as we outline in Section 4.

2.3 Long-Term Retail-Farm Margins

Concerns about market power in the food sector can be reflected in what happens to the farm-retail spread over a longer period of time. In Figure 3, the cereals-bread farm-retail price spread for the US is presented but covering a longer time period than the EU data shown above. Consistent with the EU experience on spreads, in the period when commodity prices rose post-2007, the farm-retail spread narrows. However, over the longer time frame, there is a tendency for the farm-retail price spread to widen. The concern here is that market power throughout the food supply chain may have contributed the widening spread; this could arise

² Reflecting these concerns, a recent US General Accounting Office (GAO) report noted:

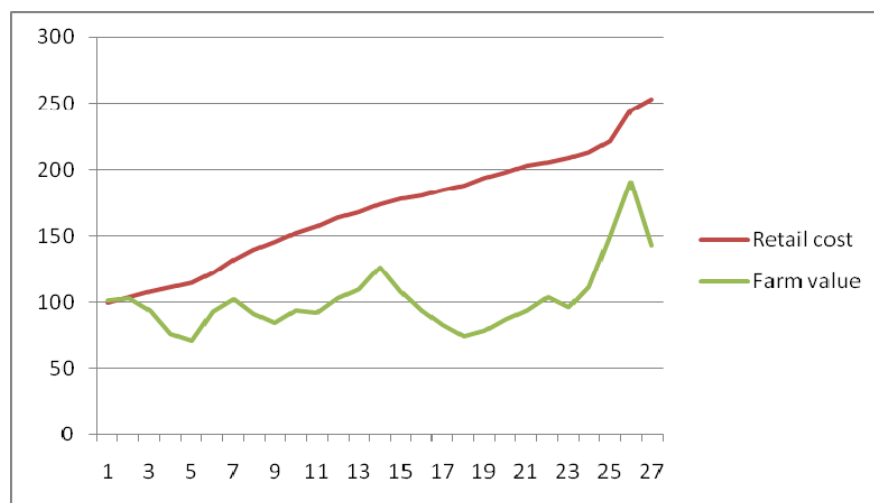
“While experts told us [market] concentration did not cause the commodity and food price increases, some experts suggested that concentration may nevertheless have affected food prices. Some experts told us that market power, to the extent that it exists in these industries would likely have dampened the food price impact. This is because firms with market power may absorb some rising input costs, rather than pass them through to consumers in the form of higher food prices. However, other experts said that market power, particularly at the retail level, may have played a role in maintaining high food prices...declines [in commodity prices] may not have been reflected in food prices” GAO, 2009. p.27).

from seller power at either or both the food processing or retailing sectors, and/or via the exercise of buyer power.

Of course, cereals at the farm level and bread and bakery products at the retail level are not the same thing, though observing the widening spread serves to highlight one of the main challenges in assessing the impact of market power at either end of the food marketing chain. The spread could widen, for example, due to productivity or technological developments. Changes in the patterns of consumer purchasing patterns and the increasing share of ‘marketing inputs’ (packaging, transportation, increases in quality etc) into the final product could also impact on this spread³. In this context, the share of farm value in the final price of bread and bakery products has fallen from around 12 per cent in the mid-1980s to around 5-6 per cent in the 2000s⁴. Though the decline in the share of the food dollar received by farmers may reflect increased bargaining power of agents downstream, given the range of factors that can determine how the spread changes over time, it is challenging to allocate the precisely the contribution of each of the potential factors to the farm-retail spread.

In sum, although there are many factors that impact on the functioning of the supply chain and the behaviour of farm-retail spreads over both the short and long-run (including technology, changing consumer tastes, regulation and so on), there has been a concern that competition (or the lack of it) can also have an important impact on price developments. The range of competition issues in the food sector is addressed in the following section; how competition may impact on the price transmission process is addressed in Section 4.

Figure 3: Cereals-Bread Farm-Retail Price Spreads, US: 1983-2009 (1983=100)



Source: Data compiled from USDA

3. Competition Issues in the Food Sector

To understand the wide range of competition issues in the food sector, it is helpful to outline a framework to identify where they may arise. With the food supply chain being characterised as a series of vertically-related markets, competition issues can arise *within* any stage of the food chain or with respect to the nature of the vertical linkages *between* any of the stages.

Figure 4 presents a stylized representation of a vertically-related food sector that highlights the intermediate stages between agriculture at one end (or, if an internationally imported raw commodity, the international market) through to consumers at the other. In between, there are

³ Wohlgenant (2001) discusses the range of factors that impact on marketing margins over time.

⁴ The share of cereal inputs into bread and bakery products is based on US data.

a range of activities involving food processing and manufacture, and food retailing. There could be additional features to add to this framework (e.g. wholesaling, distribution, other means of consuming food (food away from home), commodities or food products that are traded internationally, farmers selling directly to consumers and so on) but in terms of our focus on competition issues in the food sector, the stylised framework is sufficient to identify where the main concerns are likely to arise.

There are three main sectors that are tied together in the food chain: agriculture; food processing/manufacturing; and retail. In the simplest terms, agricultural output is sold to the food processing sector, the output from this sector being passed on to the retail sector. Though the data will vary across countries, agriculture's share of the total 'food dollar' can be relatively low, representing the contribution of the downstream sectors to value-added in the food chain. For the US in 2011, agriculture's share of the 'food dollar' was 15.5 per cent, with marketing costs associated with the downstream sector accounting for 84.5 per cent. Agriculture's share in the food dollar has been declining over time: in 1995, agriculture's share was 18.1 per cent. Data produced by the US General Accounting Office shows that, over a longer time frame, agriculture's share of the food dollar was as high as 30 per cent in the mid-1980s. As the GAO report points out, there are two perspectives of agriculture's declining share. On the one hand, the increase in marketing costs in the food supply chain may reflect increasing productivity and technological innovation in the downstream food supply sector; on the other hand, the declining share could reflect increasing market power in the downstream sectors resulting in lower prices for farmers as a result of the on-going consolidation in the processing and retailing sectors of the supply chain (GAO, 2009).

Concerns with competition in the food chain most obviously arise with respect to the levels of market concentration at each stage; as we will note below, food processing and retailing tend to be highly concentrated across many OECD countries. The existence of buyer groups may also contribute to the existence of buyer power in the food sector. In the context of a vertically-related food sector where we have a limited number of sellers at each stage, we would have a food supply chain that would be characterised as successive oligopoly.

A further characteristic to address in the context of the structure of these markets is the process of consolidation which is reflected in increases in concentration at each of these stages. This process of consolidation is reflected in two aspects; first, the declining number of enterprises operating at each stage (which may reflect the role of economies of scale and scope at various stages in the food supply chain) and, second, by the numbers of mergers and acquisitions. Although the majority of mergers and acquisitions in the food sector are domestic, there has also been an increase in mergers and acquisitions across borders. A final point to note on this point is that-in the context of successively related (and oligopolistic) markets-consolidation at one stage impacts on the extent of competition throughout the supply chain as a whole; for example, a merger in the food processing stage reduces the number of firms which buy from farmers while reducing the number of firms that sell to food retailers thus potentially changing, not only the extent of competition horizontally, but also vertically.

In the context of vertically-related markets, characterising relations between suppliers also matters. A textbook characterisation of successively-related markets may assume arm's length or linear pricing; for example, farmers offer their output on the spot market which is bought by a downstream firm. But the role of spot markets has been diminishing and where contracts of some form typically link suppliers at each stage. Crespi *et al.* (2012) record the decline of cash markets and the growth of contract agriculture in the US. At one level, the increasing use of contracts represent the importance of vertical coordination which is an important concern for any firm operating in any of the downstream sectors. The need to have the product delivered on time, in a sufficient amount and of appropriate quality may be seen as an

appropriate mechanism for the food chain to function efficiently. But there also are a range of competition concerns that relate to these supplier relations.

The issue of buyer power is a potential concern in the food sector. Buyer power can be manifested in a number of ways including (in the standard textbook case), a lower price received by the supplier but it may also reflect contractual terms and conditions where the upstream supplier is the weaker party in the contract. Although these bargaining issues may reflect an issue of “unfairness” throughout the food supply chain, the issue of buyer power also depends on the outcome on final consumers. While the standard textbook case would indicate buyer power to lead to lower supplier prices and higher consumer prices, it is feasible that buyer power may lead to lower retail prices; as we discuss below, the effect on retail prices being contingent on the form that buyer power takes.

Although potentially related to the bargaining issue between stages, vertical restraints is also an issue that characterises links in the food chain, most obviously between food processors and retailers (with increasing recognition that the stronger party tends to be the retailers). Vertical restraints involve a departure from linear pricing and cover a wide range of practices. While they directly lead to dividing the joint rents available between the food processing and retailing stages, they also have potential efficiency effects on the functioning of the supply chain. For example, to the extent that successively oligopolistic marketing chains result in efficiency losses associated with double marginalisation (i.e. the existence of double mark-ups), some vertical restraints may ameliorate this effect thus lowering consumer prices and increasing output in the supply chain as a whole. The potential impact of buyer power in the food sector will therefore likely be contingent on the stages at which buyer power is likely to apply i.e. there should be a distinction between retailer-processor relations and retailer/processor-farm relations.

A final aspect of vertical relations that has been a feature of the food supply chain in many countries has been the growth of private (or own) label products sold by retail chains. The penetration of private labels has been an important aspect of not only how retailers compete directly with one another (thus increasing differentiation between retailers) but they also directly compete with products originating from the manufacturing sector. Private labels therefore have both a vertical and horizontal effect, the issues arising from private label penetration relating to their impact on the prices of nationally-branded products and the incentives for product innovation in the food sector.

We discuss these aspects of competition in the food sector below⁵. However, in interpreting the data and the related research, it is important at the outset to be clear about defining the appropriate ‘market’. The data most widely available for characterising market structure (and hence an indication of the extent of competition) in the food sector relates to concentration ratios, typically reported at the national level. These data may, however, not give an adequate indication of the extent of competition that impact on consumers or upstream suppliers; important in this regard is how the ‘market’ is defined.

⁵ The issues are necessarily selective and there are some aspects are omitted from the coverage in this paper. For example, we do not cover issues concerning agricultural cooperatives which may ameliorate buyer power facing farmers and which may be a relevant feature in some countries. Similarly, we do not cover the role of monopsony/monopoly state trading enterprises; these have become less important in many OECD countries in recent years (most notably, following the demise of the Canadian Wheat Board in 2012 and the earlier de-regulation of the Australian Wheat Board). State trading enterprises matter as they have the potential to affect competition in both procurement and distribution and are still employed in some OECD countries (for example, the Japan Food Agency) but are not covered in this background report.

Take, for example, retail food markets. What matters for consumers is how they can substitute across different retailers or grocery outlets. So, even though the national concentration ratio may be low, if a retail chain has a dominant position in a given market (geographical) space such that it is difficult for a consumer to travel to another retail chain, then local markets may be more concentrated than the national concentration ratios may suggest. Aside from defining the market in geographical dimensions, size of outlets also matters: a convenience store or an outlet with a limited range of products may not be a close competitor with a hypermarket. The Competition Commission reflected on these issues in a recent investigation on the UK food sector; the 'market' definition related to-for competition between larger grocery stores- a 10-to-15 minute drive time for consumers while, for mid-range grocery stores, competition would be effective for competition between other mid-level grocery stores within a 5-10 minute drive time and by larger grocery stores within a 10-15 minute drive time (Competition Commission, 2008)⁶.

Similar issues in defining a market may arise with respect to procurement. Even though the number of intermediaries at the national level may be high, there may be greater concentration at the local or regional level. For example, farmers may be inhibited from seeking alternative buyers for their output if transport costs are high (particularly if the product is perishable) which means they may be bound by the availability to supply buyers who have a local/regional dominant position.

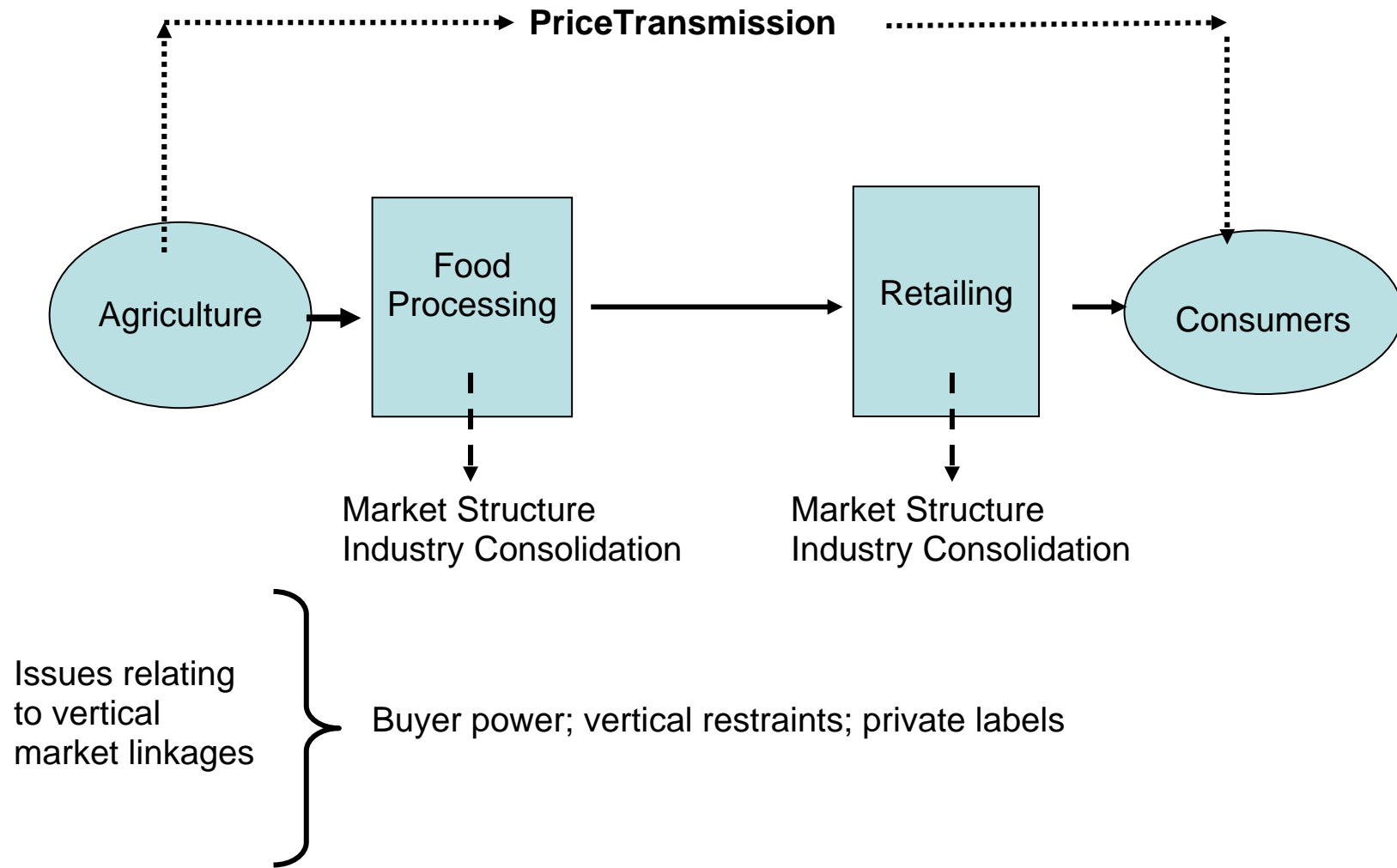
In sum, while much of the data relating to market concentration reported below relates to national concentration ratios, it has to borne in mind that national level data may not fully reflect the extent of competition at either end of the food supply chain. Related to this, empirical studies which rely on national data may not fully gauge the impact of competition (or lack of it) on consumers and suppliers. Where data and empirical studies do make reference to market definitions, we note these cases.

A final comment to make is that, even when relying on concentration ratios to motivate concerns about competition, these data may not fully reflect the nature or extent of competition in the food sector. Although a reported concentration ratio for a at the appropriately defined level of industry aggregation may be high, competition may nevertheless be relatively intense. Empirical studies that attempt to gauge the intensity of competition attempt to resolve the issue of number of firms versus behaviour, noting that it is the latter that matters for assessing the intensity of competition. Studies in this regard are referred to under the heading of the New Industrial Organisation, and though this approach has some issues over interpretation (not least when they rely on national level data), they do nevertheless attempt to separate the issue of numbers versus behaviour. We comment on these studies as they have been applied to the food sector below.

With these caveats in mind, we break down food sector competition issues into six (potentially over-lapping) areas: competition in food processing; competition in food retailing; buyer power; vertical restraints between retailers and manufacturers; the penetration of private labels; and consolidation via mergers and acquisitions in the food sector.

⁶ Defining a geographical market in this way will also tie with other aspects of competition. For example, planning laws may determine the extent to which large retail outlets can be established which therefore may impose a barrier to competition in given local markets.

Figure 4: Stylized Framework to Address Competition and Pricing Issues in the Food Sector



3.1 Competition in Food Processing

Though much of the recent attention regarding competition in the food chain has focused on developments in retail markets (see below), it should be noted that some of the highest levels of concentration in the food sector are to be found in food manufacturing. Table 2 reports data on the 3 firm concentration ratios (CR3) for food processing across several EU Member States. Although the data is somewhat dated (it refers to the mid-1990s), it nevertheless shows already high levels of concentration across a number of countries. There are two key points to note from this table. First, for many of the food manufacturing activities, there are on average high levels of concentration across the EU. For example, baby food, canned soup, pet food, ice cream and chocolate manufacture, all come out with high levels of concentration. Second, note that there is also substantial variation in industry concentration across the EU, even for the same industry classifications. Take, for example, wrapped bread which has an average CR3 across the selected EU countries of around 60 per cent; but it is as high as 96 per cent in Spain and as low as 44 per cent in Finland. Even though these figures are dated (and have likely increased), the data serves the purpose of highlighting the high levels of concentration that exist in the intermediate stage in the food supply chain.

Table 2: Food Manufacturing Industry Concentration (3 Firm Ratio) in Europe (mid-1990s)

	<i>Ireland</i>	<i>Finland</i>	<i>Denmark</i>	<i>Italy</i>	<i>France</i>	<i>Spain</i>	<i>UK</i>	<i>Germany</i>	Average
	<i>d</i>	<i>d</i>	<i>rk</i>		<i>e</i>	<i>n</i>		<i>y</i>	e
Baby Food	98	100	99	96	93*	54	78	86	88
Canned Soup	100	85	91	50	84	-	79	41*	76
Ice Cream	-	84	90	73*	52	84	45	72	71
Yoghurt	69	83*	99*	36	67	73	50	76	69
Chocolate Man	95	74	39	93	61	79	74	-	74
Pet Food	98	80	40	64*	73	53	77	87	72
Breakfast Cereal	92	-	70	88	70	82	65	67	76
Tea	96	90	64	80	82	62	52	55	73
Snack Foods	72	70*	78	71	50	56	73	48	65
Carbonates	85	50	-	60	69	79	55	60*	65
Pasta	83	97	61	51	57	65	37	49	63
Wrapped bread	85	44	59	80	70	96	58*	-	70
Biscuits	83	73	44	55	61	53	42	50	58
Canned fish	-	70	49	68	43*	33	43*	-	51
Mineral Water	-	100	70	37	-	31	14	22	46
Fruit Juice	-	70	65	62	26	38	35	46	54
Canned vegetables	-	68	50	36	29	-	-	-	46
Average	88	77	67	66	62	63	55	58	67

*Denotes 2 firm concentration ratio

Source: Cotterill (1999)

Table 3 shows more recent data, this time the 4 firm concentration ratio (CR4), covering the US food manufacturing sector and reflects the concerns about increasing concentration in the food sector over recent years. Again, high levels of concentration can be found in some activities, most notably, pet food (71 per cent), wet corn milling (84 per cent), cane sugar refining (95 per cent) and soybean processing (82 per cent). These figures compare with an average CR4 of 50 per cent for US food manufacturing as a whole (covering 47 industries at

the 6 digit NAICS level). The table also shows the change in industry concentration since 1997. In most cases, concentration has increased and, in some cases, the increase has been considerable. On average, the CR4 has increased by 13 per cent over this 10 year period. Most of the industries reported above witnessed large increases in concentration: pet foods (an increase of 22 per cent), wet corn milling (17 per cent), butter manufacturing (51 per cent). Even for industries with relatively low CR4s, the increase has been substantial: fluid milk manufacturing has a CR4 of 46 per cent but has shown an increase in concentration between 2007-1997 of 116 per cent.

Table 3: US Food Manufacturing: Industry Concentration (1997) and Changes in Concentration (2007-1997)

<i>Industry</i>	<i>4 Firm Concentration Ratio (CR4, %)</i>	<i>Changes in CR4: 2007-1997 (%)</i>
Pet food	71	22
Wet corn milling	83.8	17
Soybean processing	81.5	2
Other oilseed processing	79.5	19
Breakfast cereal manufacturing	80.4	-2
Cane sugar refining	95.2	-4
Fluid milk manufacturing	46	116
Creamery butter manufacturing	78.9	51
Dry pasta manufacturing	62.9	10
Average (47 industries)	50.3	13

Source: Crespi *et al.* (2012)

Concentration ratios may not in themselves indicate concerns relating to the abuse of market power; rather it is firm conduct that matters. In this regard, there have been efforts by the research community to measure the degree of market power in food manufacturing with most of these empirical studies being applied to US data. These studies apply the New Empirical Industrial Organisation (NEIO) approach to measure market power⁷. Sperling and Sheldon (2003) give an overview of this approach as applied to the food sector. On the whole, the evidence as it arises from these studies does not indicate significant departures from the competitive benchmark. The GAO overview of the food sector also arrives at the same conclusion (GAO, *op. cit.*)⁸. Where there have been (statistically significant) departures from the competitive benchmark, the degree of imperfect competition estimated has been relatively weak.

There are well known criticisms of this approach: they tend to assume product homogeneity, that the industry is characterised by symmetric firms and that firms are assumed to exhibit constant returns to scale. Morrison Paul (2001) has addressed this latter issue and has shown that, when accounting for scale effects, even if some departure from the competitive benchmark is found, scale effects can often dominate the market power effect i.e. there are efficiency benefits associated with high levels of concentration. In their estimates of departures from the competitive benchmark across forty food manufacturing activities, Bhuyan and Lopez (1997) found that 20 of these exhibited increasing returns to scale.⁹

⁷ As noted above, the NEIO approach aims to address the extent of competition rather than the focus just on the number of competing firms.

⁸ The GAO (2009) study concludes: “Most of the studies we reviewed found either no evidence of market power, or efficiency effects that were larger than the market power effects of concentration. While some studies found some evidence of market power, it is unclear whether concentration caused it.” GAO, 2009, p.26).

⁹ Nevo (2001) explored the ready-to-eat breakfast cereal market and allowed for product differentiation between firms.

In sum, despite of the high levels of concentration in some industries, the extant empirical research does not indicate an overwhelming concern associated with firm conduct in food manufacturing. Of course, it could be the case that firm conduct is a concern but either that the data is not available to uncover it (the studies that have been carried out tend to focus on a narrow array of industries) or that the underlying model is not appropriate. It may also be the case that the main concerns are not with seller power (as the references above refer to) but with buyer power (addressed below). It may also be the case that the concerns about competition in the food sector arise primarily with respect to retailing which we turn to now.

3.2 Competition in Retailing

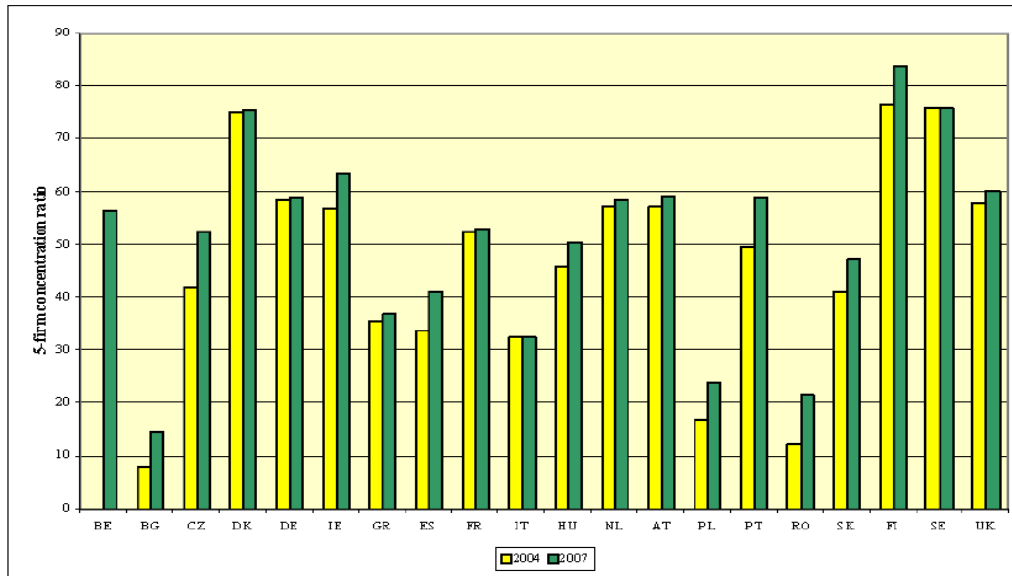
Competition in food retailing has, arguably, attracted the most attention in recent years. There are likely several reasons for this. First, retailers are the most obvious stage of the food chain when consumers purchase food. Second, concentration is high in several countries and has risen at a rapid rate. At the same time, the number of outlets involved at the food retailing stage has fallen sharply. The expansion of retailing is also worldwide: supermarkets have penetrated a wide range of markets in Asia, Latin America and Africa; Reardon *et al.* (2003) document these changes. This expansion has involved some key supermarket chains operating across a wide range of countries. Wrigley and Lowe (2010) present evidence on the country reach of these global chains: Wal-Mart (US) operates across 16 countries, Carrefour (France) over 33 countries and Metro (Germany) over 33 countries¹⁰. Finally, given the growing presence of food retail chains, there has also been concern about how the growing role and increasing concentration of retailers has on the food supply chain as a whole; the range of concerns stretch beyond seller power to the implications for suppliers at the manufacturing and farming sectors.

Figure 5 highlights concentration in food retailing across European countries. There are several notable points to make here. First, it is certainly the case that there are high levels of concentration in food retailing in several European countries. In some cases, the CR5 is particularly high, most notably in Finland, Denmark and Sweden. Second, even though concentration is high across some EU Member States, there are also a large number of cases across Europe where the retail sector is not concentrated: Bulgaria, Poland and Romania stand out in this case. However, the trend appears to be towards increasing concentration: even over this relatively short time span- the change in the CR5 has been quite high in some cases. For some countries, this increase has been from a relatively low base (the CR5 in Romania has for example doubled over this three year period) but even for countries with relatively high levels of concentration, the direction of the changes is consistent across countries. Third, despite these changes, there are some countries where retail concentration is limited, most obviously, Belgium. The variation across Europe in retail concentration can, of course, reflect a wide variety of factors related to regulation, planning laws and other factors which may give rise to barriers to entry¹¹.

¹⁰ Wrigley and Lowe (2010) survey the broad range of factors that have given rise to the growth in multinational retailing and the implications it has for international restrictions on trade and investment in services.

¹¹ Reflecting the change in concentration in food retailing, there have also been changes in shopping formats. In the UK, the number of grocery outlets (including the number of supermarkets) declined between 2000 and 2006 (Competition Commission, 2007). Herrmann *et al.* (2009) report an increase in the number of hypermarkets, supermarkets and discount outlets in Germany between 1980 and 2004 with the number of remaining grocery outlets falling by around 50 per cent.

**Figure 5: Concentration in Food Retailing in Europe, 2004 and 2007
(5 Firm Concentration Ratio, CR5).**



Source: Bukeviciute *et al.* (2009)

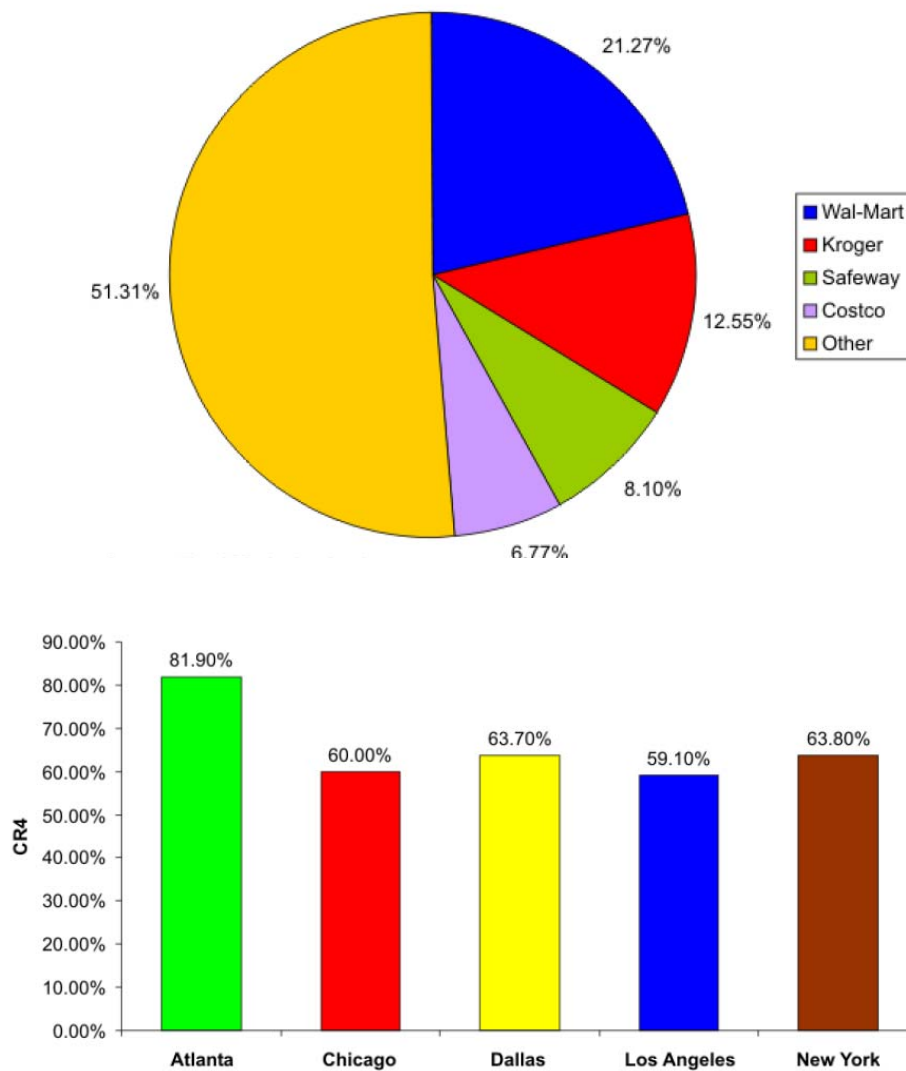
Changing retail trends in Australia give another example of high and rising levels of concentration in food retailing. A recent study (NARGA, *op. cit.*) reports that the top two food retailers (Coles and Woolworths) accounted for around 80 per cent of retail food sales in 2009. This compares with the UK where, even though food retailing is seen as being relatively concentrated, the top two firms account for (only) 48 per cent of total sales. The trend towards increased concentration in Australia has occurred at a fast rate. In 1990, these two firms accounted for 50 per cent of market share; by 1999, it had risen to 61 per cent and then rising to the current figure of around 80 per cent by the mid-2000s.

Competition in food retailing also has a local dimension: food shoppers tend to shop locally which means that national data on concentration ratios may not give an accurate reflection regarding the potential impact of market power in food retailing in specific geographical locations (see discussion in Section 2 on market definitions). This is reflected in data for concentration in US food retailing. As shown in Figure 6, at the national level, the CR5 is reported to be (just) less than 50 per cent. However, the national market may not be the appropriate focus. Richards and Pofahl (2010) present data that shows that across several states, the levels of concentration can be much higher. Figure 6 also highlights this dimension of concentration: the data shows that the CR5 is much higher in several US cities, most notably in Atlanta where the CR5 is around 80 per cent.

A further feature of competition in food retailing is the growing importance of discounters. We have already alluded to the presence of some of these firms given the emerging geographical span of Wal-Mart; other well-known discounters include Aldi and Lidl¹². Data on the presence of discounters in Europe is presented in Figure 7. There are two notable features from this figure. First, the relative importance of discounters varies markedly across countries. Discounters have a strong presence in Germany (most notably), Austria, Denmark, Poland and Hungary but have only a relatively minor role in the UK and Finland. The second notable point is that the role of discounters has been increasing (with some exceptions, most notably the UK).

¹² Senauer and Seltzer (2010) report that Aldi (a German discounter) had expanded into the US with more than 1,000 stores in 31 US states.

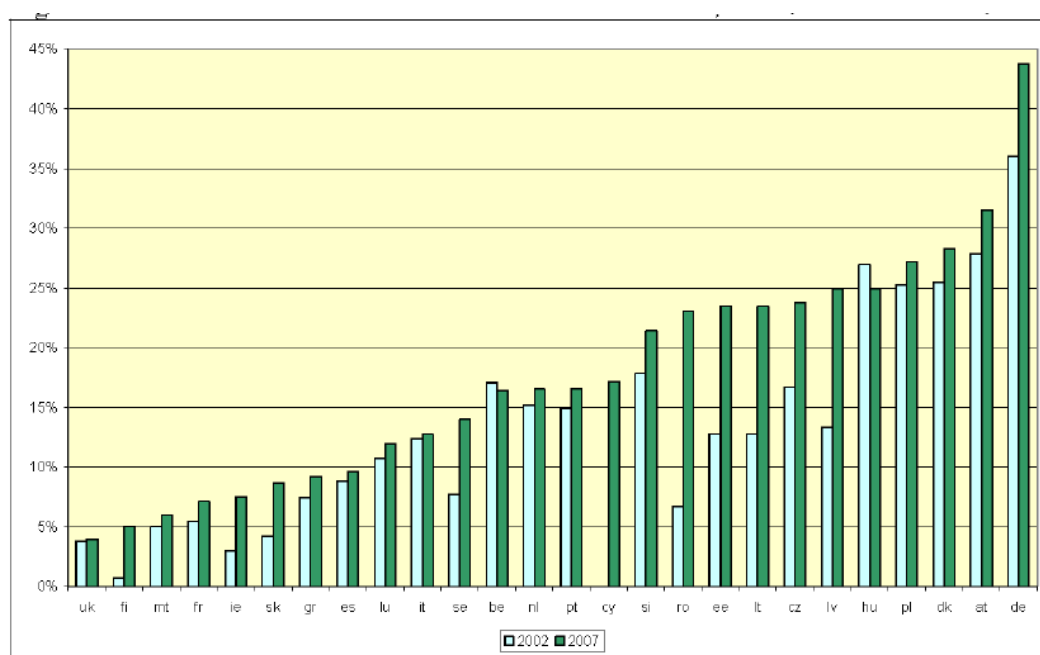
Figure 6: National and State Levels Five Firm Concentration Levels in the US, 2008



Source: Richards and Pofahl (2010)

The rapid growth in concentration at the food retailing level has, not surprisingly, given rise to concerns about market power. Early research on this issue focused on the links between levels of concentration and price levels. Cotterill (1986) using store level data from supermarkets in Vermont found that higher prices were associated with more concentrated markets though this conclusion was questioned by Newmark (1990) who showed that the relationship between concentration and prices did not exist when other factors (which as variation in income levels) were accounted for. In the spirit of the NEIO approach noted above, there has been a lack of studies on food retailing and, for those studies that have been carried out (for example, Gohin and Guyomard (2000) for France) they are not wholly convincing. Smith (2004) takes a broader perspective of competition amongst supermarket chains using data for the UK. The potential impact of discounters has been assessed by Hausman and Leiptag's study of Wal-Mart: they find that in specific geographical markets, prices in other supermarkets decreased by around 4 per cent following the entry of Wal-Mart (Hausman and Leiptag, 2007).

Figure 7: Discounters across EU Member States



Source: Bukeviciute *et al.* (2009)

There are significant challenges to addressing market power in food retailing and which have yet to be addressed adequately by research. The first of these is to recognise that food retailers are multi-product in nature often having on sale 30-40,000 product lines and are characterised by economies of scale and scope. Studies that have focussed on single product lines do not capture the multi-product nature of food retailing as retailers may compete across a variety of dimensions, not just on price but also on variety (Richards and Hamilton, 2006) and store attributes (Smith, *op. cit.*). Ellickson (2007) suggests that the multi-product nature of food retailing makes the supermarket industry a ‘natural’ oligopoly¹³.

Concerns about market power in food retailing can relate to seller or buyer power, or both. With the emergence of large food retailers, and given the links in the food supply chain, it is the interaction between horizontal and vertical issues which is an important feature of potential market power in the retail sector. Two notable enquiries on competition in grocery retailing have highlighted that concerns with retailers has focussed less on the seller power implications of retailers. Griffith (2004) notes the conclusion of the Australian parliament’s review on food retailing which identified the major winners from the expansion of food retailers were consumers who benefited from wider choice, greater accessibility and convenience and lower prices with the latter being in part due to greater economies of scale and scope. Similarly, the UK Competition Commission’s investigation into the grocery sector also highlighted the potential benefits to consumers from competition in food retailing despite the increase in market share of the major retailers. However, the concerns relating to how the increasing role of food retailers impacts on upstream suppliers has attracted increasing concern (Competition Commission, 2008).

¹³ Other studies have looked at price setting in the supermarket industry (Aguirregabiria, (1999) on inventories, Pesendorfer (2002) on sales and Slade (1998) on price setting with fixed costs) but these do not necessarily address issues directly related to market power.

3.3 Buyer Power

Buyer power has been defined as:

“...the situation which exists when a firm or a group of firms, either because it has a dominant position as a purchaser of a product or a service or because it has strategic or leverage advantages as a result of its size or other characteristics, is able to obtain from a supplier more favourable terms than those available to other buyers” (OECD, 1981)

and, more recently, as:

“[a buyer] can credibly threaten to impose a long term opportunity cost (i.e. harm or withheld benefit) which, were the threat carried out, would be significantly disproportionate to any resulting long-term cost to itself” (OECD, 1998).

Buyer power can arise in a number of forms including the price paid to suppliers, the nature and determination of contract terms, payments requested by retailers for access to shelf space and so on. Chen (2007) makes the point that, in addressing buyer power, a distinction should be made between buyer power where the supplier is powerless and the case where the supplier has some degree of market power; in the latter case, buyer power may be framed in the context of countervailing market power. Not only may the exercise of market power take different forms but the welfare and efficiency effects of buyer power will also be different. In the context of the discussion of competition in the food sector, there should therefore be a distinction made between buyer power that impacts on the farm sector (or other agents in the supply chain who are ‘powerless’ e.g. small processing firms) and buyer power that involves an interaction between retailers and food processors where market concentration in both sectors is relatively high.

Buyer power has arisen as a concern in the food supply chain. With high and increasing concentration at both the food manufacturing and retailing sectors, coupled with (to date) a lack of clear evidence that seller power in food retailing is a dominant concern, attention has focussed that market power may be exercised via procurement. For example, the UK Competition Commission’s investigation into the grocery sector highlighted 30 practices with respect to the relationships between supermarkets and buyers that could give rise for concern (Competition Commission, 2000); this issue was the focus of a subsequent investigation (Competition Commission, 2008). In a similar vein, Griffith (*op. cit.*) documents these concerns with the high levels of concentration in the Australian food retailing sector as noted above. Concerns regarding procurement were also raised in the US Department of Justice’s workshops on competition in the agricultural sector (DoJ, *op.cit.*). The academic literature has also reflected these concerns; see, for example, Dobson and Waterson (1999) and Dobson *et al.* (2003). The OECD have summarised issues with respect to buyer power in OECD (2008).

There are several dimensions to the buyer power issue as they arise in the food sector. First, the growing concentration in food processing and retailing suggests fewer firms that upstream suppliers can deal with. But these numbers may under-estimate the potential for buyer power. Dobson *et al.* (*op. cit.*) report that the role of buyer groups increases the level of concentration upstream suppliers face, at least in some countries. This is evident from Table 4. Though the data on retailer concentration is more dated than that presented in Table 2, it nevertheless indicates that buyer groups are an important feature of the food supply chain in several EU countries. While buyer groups are not important in some EU Member States (notably, Austria, the UK and Ireland), concentration at the retail stage increases in Denmark, France, Italy, the Netherlands and Spain when the top buying groups are accounted for.

Table 4: Retail Concentration Accounting for Buyer Groups, 1996.

Country	Excl. Buyer Groups	Incl. Buyer Groups	Country	Excl. Buyer Groups	Incl. Buyer Groups
Austria	58.6	58.6	Ireland	64.2	64.2
Bel/Lux	61.6	84.6	Italy	11.8	26.2
Denmark	59.5	76.6	Netherlands	50.4	69.6
Finland	89.1	89.1	Portugal	55.7	62.4
France	50.6	78.2	Spain	32.1	49.3
Germany	45.4	50.0	Sweden	77.9	77.9
Greece	28.0	28.0	UK	56.2	56.2

Source: Dobson *et al.* (2000)

Crespi *et al.* (*op. cit.*) focus on issues relating to meat packing in the US, a sector which has attracted a reasonable amount of research on buying (and selling) power in the past. They note that the high levels of concentration that have emerged at this stage in the food supply chain, has the potential to under-estimate the scope for buyer power. This is because the rise in the 4 firm concentration ratios in the meat packing industries has been associated with the closure of meat packing plants. For example, between 1980 and 2000, the CR4 in the cattle packing sector increased from 36 per cent in 1980 to 85 per cent in 2010, an increase of 136 per cent. The meat packing plants decreased from 743 to 135, a decrease of 82 per cent. Similar trends can be found in other meat sectors. As Crespi *et al.* (*op. cit.*) note, the decline in the number of plants can also have a regional dimension which can exacerbate the degree of market power in procurement. Crespi and Sexton (2005) reports evidence that the number of plants can have a greater impact on pricing than the number of firms. The regional aspect to procurement also arose in the Department of Justice workshops (see DoJ, *op. cit.*).

A second issue is that buyer power can be reflected in a number of ways. The standard textbook treatment of monopsony or oligopsony is that, with an upward sloping supply function, the buyer limits the quantities procured resulting in a lower price for suppliers and, in a single stage setting, a higher price for consumers. But there are other ways in which buyer power may occur and are consistent with the observation that the use of contracts has become an increasing important aspect of relations between participants at each stage of the food supply chain. Examples include de-listing (or threat of de-listing) of suppliers, slotting fees, forced discounts, retrospective payments, late payment, retrospective changes to contracts are all means via which buyers may influence the relations with suppliers. Griffith (*op. cit.*) highlights some of these issues in his assessment of food retailing issues in Australia and these issues (among others) have also been highlighted by the UK Competition Commission (Competition Commission, 2000 and 2008). Concerns here relate not just to prices upstream suppliers receive but that the suppliers bear the risk arising from unforeseen changes in the contract or the terms via which suppliers engage with retailers.

Empirical evidence on the existence of buyer power is generally lacking. Reflecting the application of the NEIO methodology to measure mark-ups, there has been research, most commonly applied to the US meat packing sector, to measure mark-downs. Schroeter (1998), Schroeter and Azzam (1990) and Koontz *et al.* (1993) found weak departures from the competitive benchmark. Crespi and Sexton (*op. cit.*) found rather stronger declines in the levels of prices paid to suppliers in the meat packing sector. However, and in line with the comments made above, the framework used to estimate mark-down departures from the competitive benchmark may not reflect efficiency issues in the supply chain, in this case with respect to processors having access to input at the right time. This is referred to as “captive supplies” and its role in ensuring efficiency in meat packing was highlighted in the GAO (*op. cit.*) assessment of market power in the US food sector.

3.4 Vertical Restraints

Vertical restraints come in a variety of forms and represent a departure from the assumption of arms length or linear pricing between the vertical stages: exclusive dealing, two-part tariffs, slotting fees, over-riders, discounts, resale price maintenance among others, are examples of vertical restraints. An overview of the issue of vertical restraints in the food sector is covered by McCorrison (2002) and McCorrison and Sheldon (1997). Early research on vertical restraints assumed an oligopolistic manufacturing stage and a competitive retail stage with more recent work reflecting the circumstances more likely to arise in the food sector i.e. where there is market power at retailing and where the vertical restraints may reflect the bargaining power of retailers over (oligopolistic) suppliers.

The challenge in addressing the role of vertical restraints is not that they arise but what effects they are likely to have on efficiency and welfare at different parts of the food chain¹⁴. Take, for example, the issue of slotting allowances which are fees paid by food processors to retailers for shelf space or slots (for example, end-of-aisle placement). Early papers on slotting allowances associated them with asymmetric information. New products are frequently introduced into the food sector, so the fees could be interpreted as a signal by the processor to the retailer about the likely success of the new product (Chu, 1992). Hamilton (2003), however, notes that the experience of slotting allowances as applied in the US food sector suggests that they are not limited to new product introductions and tend to be confined to certain product groups.

Slotting allowances can impact on the efficiency of the food chain and have important welfare outcomes though there is no consensus on the direction of the effect. Shaffer (1991), for example, assumes the retail sector is oligopolistic and the manufacturing sector competitive. The use of the slotting fee arises from the retailer's market power and is used to extract rent from the processors. Retail prices rise and consumer welfare decreases. Hamilton (*op. cit.*), however, sets out a different characterisation of vertically-linked industry; the retail sector is competitive and the processing stage has oligopsonistic power vis-à-vis the farm sector. The slotting allowances are instigated by the processors, the effect of this being to increase procurement from the farm sector. Farm prices and quantities procured rise and consumer prices fall, the outcome here being the mirror image of the welfare effects that arise in the Shaffer (*op. cit.*) characterisation with retailer market power. The lack of a clear consensus on the impact of slotting allowances shows that the impact is contingent on assumptions about market power in the supply chain and whether it is retailers or processors who instigate the slotting fees.

Perhaps not unsurprisingly, gauging what arrangements characterise manufacturer-retailer relations in the food sector is difficult to assess empirically. Villas-Boas (2007) makes an attempt to do this with an application using data from yogurt sales in US retailing. The innovation pursued by Villas-Boas is to identify the links between retailers and manufacturers when upstream prices cannot be observed, the approach here being to simulate market outcomes with alternative characterisations of retailer-manufacturer links to assess which one fits the observed data 'best'¹⁵. She finds that manufacturer-retailer relations in this sector are most likely characterised by wholesale price at marginal cost with retailers having pricing power. This outcome is consistent with non-linear pricing by manufacturers or with retailers having bargaining power in the food supply chain.

¹⁴ McCorrison (2002) cites the UK case where 40 per cent of suppliers noted they had to pay slotting allowances to retailers and the high level of promotional activity that is accounted for by slotting allowances in both the UK and US.

¹⁵ The innovation of accounting for retailer-manufacturer relations when only limited data exists (specifically when upstream price data is not available) has also been extended to addressing price transmission issues in the food supply chain (see below).

3.5 Private Labels

The penetration of private labels by retail chains is an increasingly important feature of the food sector, though the extent of this penetration varies across OECD countries with the highest levels of private label penetration to be found in Europe. On average, private labels account for 23 per cent of total retail food sales in Europe and 15 per cent in North America¹⁶. But even across Europe, there is substantial variation in the extent of private labels as shown in Table 5. Private label penetration ranges from 48 per cent of sales in the UK to a low of 17 per cent in Italy. In all countries, private label penetration has been increasing over the time period shown with notably high rates of growth in Slovakia, the Czech Republic and Poland. Other dimensions of private label penetration are also relevant: the extent of private label penetration varies by product category (Bergès-Sennou *et al.*, 2004) and it can also vary by retail chain. Although often perceived to be lower quality than the nationally branded products (for example, the penetration of private labels is higher when focussing on volume rather than value shares), private labels can range across high and low quality products.

**Table 5: Private Label Penetration in EU Member States, 2003-2009
(per cent of total sales).**

Country	2003	2009	% Change
United Kingdom	41	48	7
Germany	35	40	5
Belgium	38	40	2
Spain	29	39	10
Austria	n/a	37	n/a
Slovakia	11	37	26
France	28	34	6
Portugal	n/a	34	n/a
Denmark	25	28	3
Hungary	17	28	11
Finland	24	28	4
Czech Rep.	13	28	15
Sweden	22	27	5
Netherlands	22	25	3
Poland	7	21	14
Greece	n/a	18	n/a
Italy	14	17	3

Source: European Commission (2011)

For the retailer, private labels are a means via which they can differentiate themselves from other retailers but they also have the effect, since the retailer effectively also becomes the supplier, it therefore competes directly with the producer of the nationally branded product. In sum, the penetration of private labels can have both horizontal and vertical impacts on competition in the food chain. Research to date has, in large part focussed on the vertical dimension and whether the competition between private labels and nationally branded products leads to higher prices. As we detail below, insights from research on private labels suggest that the impact on consumers is ambiguous¹⁷.

¹⁶ The penetration of private labels is lower in other regions; NARGA reports the share of private label sales as low as 4 and 2 per cent respectfully in Asia-Pacific and Latin America (NARGA, 2010).

¹⁷ A survey on the broader issues with private labels can be found in Bergès-Sennou *et al.*, (2004). Steiner (2004) also provides an overview of the competition issues arising from private label penetration.

Mills (1995) is an early attempt which highlights the interaction between vertical and horizontal effects arising from the introduction of private labels. The benchmark characterisation of the vertical supply chain is with a monopoly retailer and a monopoly manufacturer of the nationally branded good. In this context, the manufacturer charges a monopoly wholesale price as does the retailer and social welfare is lower due to double monopoly. The private label (if introduced) will be of lower quality than the national brand but the effect of the introduction of the new (private label) product is two-fold. First, there is competition at the retail level between the national brand and the private label good. However, the vertical dimension is that the retailer now accrues a greater part of the (total) food chain rent. Second, the manufacturer of the national brand reduces the wholesale price of this product which implies that, at the retail level, the price of the nationally branded good will fall. Taken together, there is a redistribution of rent between the national brand manufacturer and the retailer and consumers gain because the price of the national brand good falls. The double marginalisation issue diminishes and social welfare increases.

However, Gabrielsen and Sjørgard (2007) show that the introduction of private labels may result in an increase in the prices of nationally branded products. Their set-up relies upon splitting consumers into two groups: those consumers who are loyal to the national brand and those who are more opportunistic and who are willing to switch to the private label. The national brand manufacturer has to decide between competing for the opportunistic consumers or exploiting the loyal consumers; in the former case, they will charge a lower price while, in the latter case, since the loyal consumers have price inelastic demand, a higher price can be charged. Gabrielsen and Sjørgard (*ibid.*) show that if the share of loyal consumers is relatively high, the branded manufacturer will focus on that group and a higher price will be charged. They also show that, in some circumstances, a private label may not be introduced at all. This would arise if the national brand manufacturer competes for the opportunistic consumer group by offering an exclusivity contract to the retailer at a low price and no private label will be introduced. Given the comment above that the share of private labels varies across product categories, this may be one reason why this dispersion in private label penetration arises.

The empirical evidence on the effects of private labels on prices is also mixed. Using US data, Harris *et al.* (2002), show that the entry of private labels is correlated with an increase in the price of national brands. Cotterill and Putsis (2000), based on 143 product categories and 59 geographical markets in the US, report that prices for both national brands and private labels tend to be higher when markets are concentrated and national brand share is high. Bontemps *et al.* (2008) explore the effects of private labels using French data covering 218 product groups. The effect on prices of national brands tends to be positively correlated with private label purchases though the effect on prices will vary depending on the type of private label (i.e. whether it is of lower quality or competes more directly with the national brand; low price private labels will have less of an impact). Further, the price effects have more impact on the leading national brand rather than second-tier brands.

There are three observations to note on research on private labels. First, while empirical evidence may be consistent with a stream of the theoretical research, empirical studies do not detail the mechanisms that cause this effect therefore making it difficult to choose between alternative theoretical models that would be consistent with the data. Second, as noted above, the introduction of private labels has both a horizontal and vertical effect. The latter arises through the retailer now competing directly with the national brand manufacturer and the retailer is able to capture some of the (total) supply chain rent. However, inter-retailer competition is not accounted for even though private labels allow some differentiation across retailers; the retailer is typically assumed to be a monopolist such that the focus is largely on the impact on national brands within a retail chain but not across retail chains. Third, it may be the case that not all impacts of private labels are accounted for. For example, a retailer may threaten to de-list national brands following the introduction of private labels (Daskalova,

2012). A final concern with private labels relates not to the price effects but on the incentives for product innovation. Steiner (2004) and Daskalova (*op. cit.*) raise these issues, the latter highlighting that the development of private labels may raise issues about propriety information developed by national brand manufacturers, though an overview sponsored by the EU suggests that there was no significant impact on innovation arising from the penetration of private brands (EU Commission, 2011).

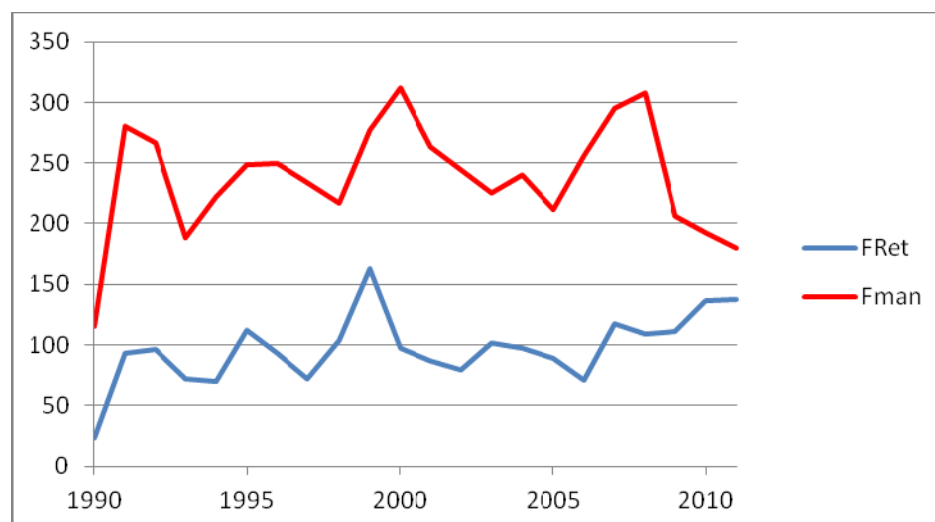
3.6 Consolidation through Mergers and Acquisitions

Reference has already been made above to the extent of consolidation that has occurred in the food processing and retailing stages in the food supply chain. In the European Competition Network (2012) review of anti-trust investigations into the food supply chain across Europe since 2005, 1,300 of the total number of investigations by national authorities related to merger and acquisitions (M&As). We report here on the main features in the process of consolidation involving M&As that has occurred in the food sector over the past 20 years.

There are three main features to note from trends in M&As in the food sector across OECD countries. First, merger and acquisition activity can be volatile; second, that most M&As occur in the food manufacturing not retailing stage in the supply chain; third, that cross-border M&As account for a significant proportion of overall M&A activity (though the relative significance of this can vary by country).

Figure 8 reports on the number of acquisitions in the EU food sector since 1990 separating acquisitions in the food retailing sector from food manufacturing. The figure shows clearly the first two of the points made above: that in terms of numbers of acquisitions there is more activity in food manufacturing than retailing and that the number of deals can vary considerably between years. This wave-like behaviour in M&As is not uncommon and one of the central features that arises from research on M&As is the factors that may cause this wave-like behaviour. Reference is typically made to technological change and de-regulation though, more recently, one of the main factors that have been highlighted has been misvaluation in financial markets: the mis-pricing of firms may lead to patterns of M&As that has little to do with “fundamentals”. A discussion of these issues can be found in Mitchell and Mulherin (1996), Harford (2005) and Rhodes-Kropf and Viswanathan (2004).

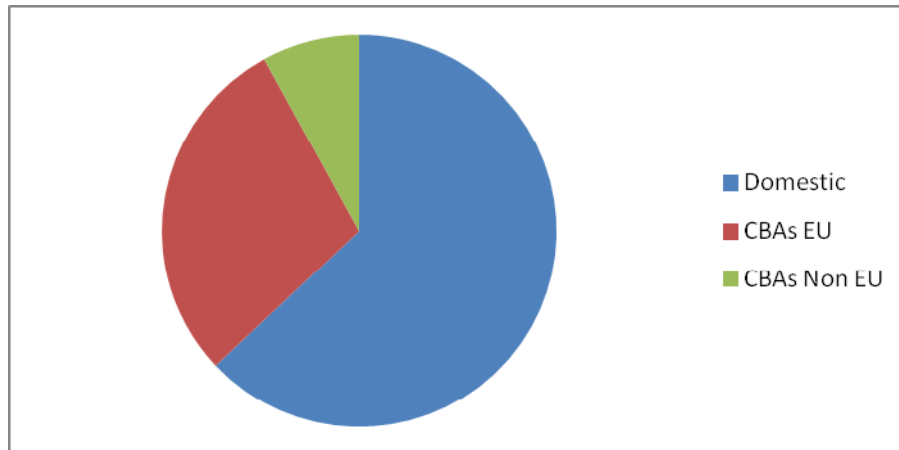
Figure 8: M&As in EU Food Manufacturing and Retailing



Source: Data compiled from *SDC Platinum*

The data reported in Figure 8 covers both domestic and cross-border M&As. With reference to the EU and focussing specifically on the food manufacturing stage, cross-border deals (CBAs) accounted for around 35 per cent of total M&As over the 1986-2011 period. Most of these cross-border deals originated and were targeted at other EU Member States. This data is presented in Figure 9 which highlights the distribution of M&A deals: domestic activity clearly accounts for the majority of M&A activity in EU Member States with the relative importance of deals involving EU countries clearly apparent. There may be good reasons why EU cross-border M&As typically involve other EU countries (for example, geographical proximity, close trade links, common policies and so on).

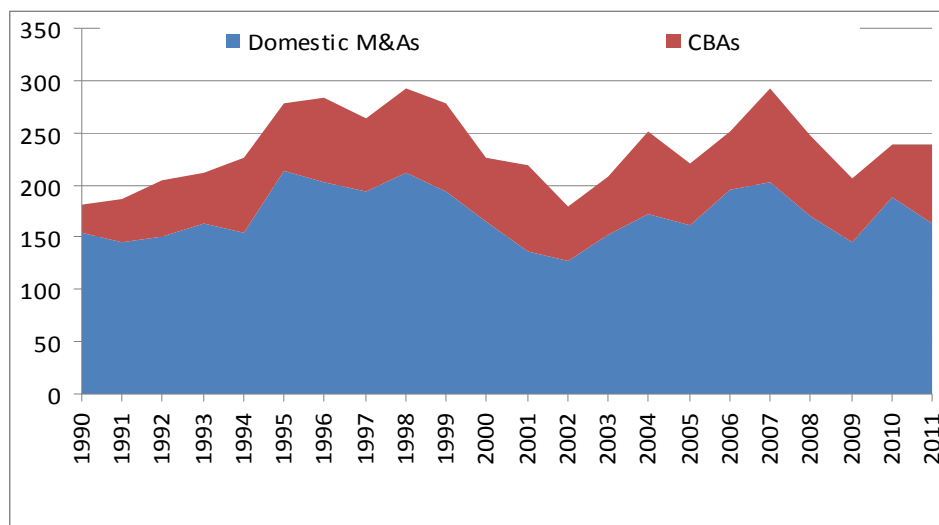
Figure 9: Distribution of Total M&As by Source: EU Manufacturing, 1986-2011



Source: Data compiled from *SDC Platinum*

The patterns in M&A activity reported for the EU are more general. Figure 10 reports M&A activity in the US food manufacturing sector between 1990 and 2011. The main features noted above are apparent here too: overall, the process of consolidation via M&As can be volatile; cross-border deals account for a significant proportion of total M&A activity; domestic deals nevertheless account for the majority of activity.

Figure 10: M&As in the US Food Manufacturing Sector, 1990-2011



Source: Data compiled from *SDC Platinum*

On mergers involving food sector specific data, there have been a limited number of studies, one of the key insights that arises being related to the market definition effect discussed above. Barros *et al.* (2006) assess the potential effects of mergers in the Portuguese food retailing sector: they estimate that prices to consumers would likely rise. There are two aspects to the merger effect: first, competition at the local level weakens; second, retailer buying power via suppliers will increase thus lowering costs, the net effect on consumers from the merger depending on how these cost savings are passed through to consumers. They find that pass-through is limited so that the effect of mergers at the retail level is for consumer prices to rise¹⁸. Allain *et al.* (2013) look at whether retail mergers would increase food prices. Using scanner level data from France, they find that mergers significantly raise prices, both for the merged firms and non-merged firms. They highlight that the main effect of these price changes come through the impact on local competition.

In terms of understanding the overall trends in M&As in the food sector, little research has addressed these issues. Focussing on US cross-border acquisitions, McCorrison and Sheldon (1998) highlight the role of the stock market and exchange rate fluctuations. Herger *et al.* (2008) take a more global perspective of cross-border deals in the food sector and also highlight the importance of macroeconomic and financial factors in driving cross-border M&As over time. They also found the Euro plays a role in increasing M&As between EU Member States.

3.7 Comments on Addressing Competition in the Food Sector

In this section, various aspects of competition issues in the food sector have been highlighted and, in the process, the insights from the current state of economic research on these issues have been reported. To some extent, research on these issues lags behind the increasing concerns about the functioning of the food supply chain and the way in which competition impacts on this. For example, empirical research on identifying whether market power is exercised in the food chain may be somewhat dated and, given developments in recent years in the food sector across many countries, it is not clear whether research has kept up with addressing the significance of these trends. Current challenges (covering both theoretical and empirical aspects of the issues) include dealing with multi-product retailers, highlighting the interaction between retailers and food processors when only limited data exists (if at all or is not available) and dealing with the causes and effects of industry consolidation.

In addition to the comments made above on specific issues, there are a number of more general comments that can be made when addressing the impact of competition in the food sector. These relate to the interaction between horizontal and vertical effects, the distinction between static and dynamic effects and the broader issues of ‘fairness’ in the food supply chain.

3.7.1 The Interaction between Horizontal and Vertical Effects

The framework outlined in Figure 4 highlighted that competition concerns can be horizontal in nature (given the high and rising levels of market concentration in food manufacturing and retailing) or vertical in nature (due to buyer power between the different stages). The important point to note is that these two dimensions of competition interact. Dobson and Waterson (1997) address this issue. They model the case where there is competition among a limited number of retailers who purchase inputs from a single upstream supplier. When there is consolidation in the retail stage, the effects on consumers (i.e. final prices) will be ambiguous since two effects are at play. On the one hand, consolidation lowers the number of firms, so prices may be expected to rise. On the other hand, consolidation at retail increases

¹⁸ Smith (2004) applies his framework on competition across supermarkets in the UK to simulate the potential effect of mergers between the largest firms.

the retailers' bargaining power with respect to the upstream supplier, which may be expected to lower consumer prices. Which effect dominates-and therefore the final effect on consumers-will depend on the intensity of competition at retail. If consumers regard the retailers' services as strong substitutes, then prices will fall and the combination of consolidation at one stage will interact with increased bargaining power with regard to the upstream stage, the combination of these horizontal and vertical effects having the potential to benefit consumers.

Another dimension to the horizontal-vertical interaction is the "waterbed" effect. In this case, strong retailers may be able to extract better terms from their upstream suppliers. But the upstream suppliers, to partially offset this effect via the main purchasers, may charge higher prices to the remaining buyers. Even if the net effect on consumers is positive, the impact of buyer power is to raise the costs for the weaker competitors in the final stage. Inderst and Valletti (2011) provide a recent analysis of this issue and they highlight the circumstances where the 'waterbed' effect can lead to consumer harm. This will arise if the supplier is able to price discriminate between purchasers and where the 'weaker' retailers rely on discounts for their competitive positions.

3.7.2 *Static versus Dynamic Effects*

In large part, the discussion above relates to the potential impact of market structure on prices; but this may not be the only aspect that matters. The (potential) lack of competition may also impact on the incentives to invest and to innovate. For example, in the context of the penetration of private labels, concern has been expressed on how the growing share of private labels will impact on product innovation. Daskalova (*op. cit.*) discusses these issues as does Ezrahi (2010). The report coordinated by the EU also explored these issues (European Commission, *op. cit.*). With regard to oligopsonistic power, Crespi *et al.* (*op. cit.*) express some doubt on this as it would not be in the long-term interests of buyers if suppliers were unduly influenced by short-term effects that impacted on their long-run potential to efficiently supply the inputs.

Inderst and Shaffer (2007) is a recent attempt to address this issue. They show that with retail mergers, product variety may also decrease following consolidation. Specifically, the retailer will no longer carry all products and the de-listing of products impacts on the incentives for the suppliers. The supplier re-positions its product lines which reduces product differentiation. This then further reduces consumer welfare. As above, these insights arise from recognising the interaction between horizontal and vertical effects, the horizontal effect of the retail merger impacting on the supplier which feedbacks through to consumers.

3.7.3 *'Fairness' in the Food Supply Chain*

A final observation is the distinction between 'fairness' and the consumer effects of competition in the food sector. Many of the concerns about developments in the food sector relate to the impact on certain groups within the supply chain (e.g. farmers) even though the effect on consumers may be positive. As has been highlighted from the insights from research throughout this section, developments in the food sector may be pro-competitive insofar as they lead to lower prices to consumers (or at least no evidence of consumer harm) even though this may involve rent re-distribution between players and across different stages in the food supply chain. It is important to differentiate between these two issues (i.e. the effect on consumers and fairness or rent distribution throughout the food chain) and the scope for competition authorities may be one but not the other. Other policies can also impact on re-distributional concerns, most obviously agricultural policy that has, in large part across OECD countries, been concerned with income issues in the farm sector. Changes in agricultural policy towards less support (or at least support in a particular form of sustaining

high prices) may also impact on the concerns about re-distribution for this specific group of constituents.

4. Price Transmission and Competition

Recent concerns about food prices and food inflation as detailed in Section 2 has led to concerns that competition (or lack of it) in the food sector has an important influence on the price transmission process. As previously noted, part of the concern refers to a notion of ‘fairness’ and that certain groups within the food supply chain take most of the burden of adjustment in the presence of sector specific shocks. As Figure 1 shows, in recent years when commodity prices have been volatile, farm prices have varied considerably more than retail prices. There are also wider concerns that while firms in an imperfectly competitive industry may be willing to pass on (to some extent) cost shocks through to consumers, they are less willing to reduce retail prices when costs subsequently decline. In other words, there is asymmetric price adjustment, the implications of this being that while mark-ups could decline in the face of cost increases, they subsequently widen when commodity prices decline. Given that a principal characteristic of commodity markets is volatility and, more recently, commodity price spikes, with asymmetric price adjustment, retail prices do not decline to match these commodity price falls¹⁹.

In this section, we explore the potential link between competition in the food supply chain and the transmission of price changes originating from the farm to the retail sector. The discussion focuses on the main intuition on how competition may influence the price transmission process with an Appendix providing more technical coverage of the issue. We highlight the key issues and then comment on more recent developments that relate directly to food supply chain issues as outlined in previous sections. The issue of pass-through is important in other areas of economics but, as we go on to discuss in more detail below, there are food sector specific issues that should (and have) also be accounted for in this assessment²⁰.

4.1 Competition and Pass-Through: Basic Insights

The main intuition relating commodity price changes to competition can be highlighted by drawing on the model of farm-retail price spreads initially developed by Gardner (1975). This model has been adapted by McCorrison *et al* (1998) to account for imperfect competition. In this framework, there is a single intermediary stage that is labelled the ‘food processing/retailing sector’ that produces a homogeneous good with firms pursuing quantity-setting strategies. As McCorrison *et al.* Show, the main intuition that lies behind the extent of price transmission arising from the impact of shocks occurring at the farm stage on retail prices can be separated into two parts:

$$PT = f(\Delta MU, \Delta C) \tag{1}$$

¹⁹ This issue of asymmetric price adjustment has been noted in other contexts and has been referred to as “rocket and feather” price dynamics. This pattern of price behaviour has been addressed in the context of gasoline prices (see OECD, 2013). Tappata (2009) provides a formal attempt to explain this pattern of asymmetric price behaviour,

²⁰ For example, price transmission ties with developments in macroeconomics and international economics, in particular, exchange rate pass-through (see, for example, early papers by Dornbusch (1987) and Feenstra (1989) and, more recently, Hellerstein (2008)). Public economists have been concerned with the incidence of taxes (Anderson *et al.*, 2001) and industrial organisation economists and on how market structure determines the impact of cost changes (see, for example, Dixit, 1986). Although the context sometimes differs, there are common mechanisms that determine cost, tax or exchange rate changes through to consumer prices and the role that competition plays in determining the transmission process.

i.e. the extent of price transmission depends on the change in the aggregate mark-up for firms that constitute this intermediate, oligopolistic food sector and the change in costs. Assume, initially, that the food sector is competitive such that the mark-up is zero. The extent of price transmission will then depend only on the change in costs. If a fixed proportion technology is assumed, then the extent of price transmission will reflect the share of agricultural raw materials in the (competitive) food industry cost function. So, if the share of agricultural raw materials in the food industry costs function is 25 per cent, the price transmission elasticity should be 0.25²¹.

However, if the mark-up is positive, then market power influences the degree of price transmission as the mark-up may change due to the change in the food industry costs where the change in the aggregate mark-up will depend upon the degree of market power (itself contingent on the nature of competitive interaction between firms and the number of competing firms) and the nature of the demand function. Note that if the demand function is log-linear, even if there is a positive mark-up, it will not change following any change in costs so the change in the mark-up will not influence the degree of price transmission in these circumstances. However, in other circumstances, the change in the mark-up plays a role and serves to reduce the price transmission elasticity (as long as the demand function is not 'too' convex). In this case, there is 'under-sifting' and retail prices will change less than farm-gate prices.

The main insight from the above is that with a change in the costs purchased by the food sector, there are essentially two factors which will determine how food prices will change. The first is the share of costs in the industry cost function. If the food industry is competitive, this will be the only factor which will matter. However, if the food industry is imperfectly competitive, the effect on food prices will depend on how the food industry mark-up changes. Conditional on the assumptions on the demand curve, the industry mark-up will fall and retail prices will rise by less than the increase in costs. In other words, the imperfectly competitive food industry absorbs some of the cost increases.

What other characteristics of the food industry will likely matter in determining this pass-through effect? One potential factor is economies of scale. We noted previously that, even if there was evidence of (a low degree of) market power, this may be offset by efficiency effects (see Morrison-Paul, (*op. cit.*) and Buyan and Lopez, (*op. cit.*)). Millàn (*op. cit.*) has also documented the existence of economies of scale in the Spanish food sector. If we had constant returns to scale, then we retrieve the comparison between the competitive and imperfectly competitive case as noted above. With increasing returns to scale, the under-shifting effect will weaken; conditional on the extent of the scale effect, it could be the case that food prices rise by more than the cost increase such that we would have 'over-shifting' rather than under-shifting.

Another characteristic of the food industry we have highlighted is the existence of buyer power. This too can impact on the transmission elasticity and has been explored by Wedgebriel (2004). He shows that the existence of oligopsony power may offset the effect of oligopoly power in determining the effect of cost changes on food prices. Specifically, while as we have discussed above, with (seller) market power in the food sector, the change in the mark-up determines what the transmission elasticity will be, when buyer power exists, what is

²¹ Even with a competitive food industry, there may be imperfect price transmission if we have a variable proportions technology as in Gardner (1975). However, the role of the substitution elasticity is likely to be swamped by relatively low degrees of market power as shown in McCorrison *et al.* (1999), so for simplicity, we will confine the discussion to a fixed proportions technology. The role of the elasticity of substitution appears in the more formal representation of the price transmission effect as outlined in the Appendix.

important is the change in the mark-down with the change in this mark-down being dependent upon the extent of competition in the procurement market and the functional form of the supply function. If the mark-down increases due to the change in costs, then this increases the price transmission elasticity and offsets the reduction in the mark-up. If oligopsony and oligopoly co-exist, it will be difficult to ascertain what aspect of market structure and competition is determining the (net) price transmission effect.

The vertical structure of the food chain will also determine the extent of price transmission; as noted in Figure 4, the food supply chain is a complex series of inter-related markets that could be characterised by imperfect competition at each stage. The issue then is how cost changes from the agricultural sector are passed through this chain of imperfectly competitive markets. McCorrison and Sheldon (1996) show that as the number of stages in the vertical chain increases, price transmission decreases below that expected in the single stage case. However, the extent of the decline is not a simple multiple of the single stage case since, in their framework, the perceived derived demand function facing each stage is contingent not just on the degree of market power at that stage (i.e. horizontal market power) but also on the degree of market power at succeeding stages. With this mechanism (and conditional on the demand function), market power throughout the successively oligopolistic food chain exacerbates the degree of 'under-shifting'.

The insight is straightforward since what determines the final change in food prices is the change in the mark-ups at each stage in the food chain. Even if we assume arm's length pricing between each of the stages in the food chain, market power at each successive stage determines what the change in the final price will be. What determines the mark-up in this intermediate sector is not just the extent of competition at that stage but the slope of the derived demand function facing that stage where this derived demand function depends on the extent of competition at the retail stage. The extent to which this cost is passed through to retail (assuming linear demand) will depend on how the food processing industry mark-up changes. Mark-ups in the retail sector are now only determined by the intensity of competition at the retail stage but also by the level of costs arising from the intermediate stage. As costs are passed through (albeit diluting the initial agricultural cost increase) the food manufacturing stage, then the change in the final retail price will be determined by the extent of cost pass-through that reaches the retail firms plus the change in the mark-up at the retail stage. Taken together, and conditional on the assumptions concerning the demand function, the vertically-related nature of the food chain exacerbates the extent of under-shifting that is likely to arise from imperfect competition.

Note that, in the case of successive oligopoly outlined here, we have assumed arm's length pricing has been assumed. But we also know from Figure 4 that how we characterise the links between the vertical stages is also an important feature of the food supply chain. In the McCorrison and Sheldon (*op. cit.*) paper, the degree of under-shifting is exacerbated due to the existence of double marginalisation. Any contract between the food processor and retailer that diminishes the double marginalisation effect should have an effect on pass-through. For example, if the contract (or vertical restraint) between retailers and manufacturers had the equivalent effect of vertical integration, price transmission would increase (at least relative to the successive oligopoly/arms length pricing case).

Recognising the chain aspect of the food supply sector raises further questions regarding the transparency of food prices in the food chain. First, is tying down precisely the effect of alternative vertical contracts on the price transmission effect. Second, and perhaps a more practical issue in terms of empirical research, there is a challenge to addressing price transparency by not just determining how prices at either end of the food sector change (i.e. agricultural and retail prices) but also intermediate prices. This poses a challenge with recent research addressing the price transparency issue with the focus on processing and retail prices thus excluding price changes from further upstream. We return to these issues below.

4.2 Matching Empirics with Theory

There is already a large empirical literature on the price transmission process in agricultural and food markets. Vavra and Goodwin (*op. cit.*) explore these issues with respect to price transmission in the food chain. Often motivated by widening margins between agricultural prices and downstream (usually consumer) prices, this strand of the literature has employed time series data to estimate the extent, rate and nature of the price adjustment process. This approach is informative in outlining the general features of the functioning of the food supply chain (see, for example, Bukeviciute *et al.*, *op. cit.*) with the econometric approach being flexible enough to address several interesting issues with respect to food price adjustment. For example, the methodology can be used to address asymmetric price adjustment as well as non-linear aspects of price behaviour; for example, that small cost changes may not be passed through to consumers but large price changes are.

While informative and, subject to data availability, relatively straightforward to apply, one problem with this approach is that it is largely *atheoretical*. In this context, it becomes difficult to ‘explain’ any of the results that are produced. For example, the econometric results may indicate imperfect price transmission; but since there can be many factors that influence pricing in the food supply sector, it becomes difficult to ascertain what has caused the observed lack of pass-through or particular pattern of retail price adjustment. Similarly, while the econometrician may conjecture that the lack of competition may result in asymmetric price transmission, in the absence of any structure to the underlying framework, it is difficult to ‘blame’ imperfect competition for this observation. At best, time series approaches on (typically) pairs of price series can be a “first test” relating to the functioning of the food chain but it is difficult to ascertain from this framework what factors will likely be driving the results.

Structural models improve upon purely time series approaches to price transmission insofar as they allow for the specification of the demand function and address the issue of mark-up changes that features as part of the price transmission process. Initial attempts to address price transmission in this way (though these are not necessarily reporting evidence of pass-through in food markets), give some insights. For example, Barnett *et al.* (1995) estimated a model of structural model for the US tobacco industry. They show that in the presence of market power, taxes are ‘over-shifted’. However, it should be noted that their model allows for increasing returns to scale which, as discussed above, may outweigh the influence of imperfect competition between firms. Recently, Delipalla and O'Donnell (2001) have estimated the incidence of taxes in the European cigarette industry and find evidence of ‘under-shifting’ of taxes among the largest EU countries though some evidence of ‘over-shifting’ arises in other countries. In terms of the European food sector, Bettendorf and Verboven (2000) have estimated a model of the Dutch coffee industry and found evidence of ‘under-shifting’ of raw coffee bean prices on retail prices.

To highlight how the characteristics of the food sector outlined above may affect price transmission, we highlight some of the more important insights that have emerged in recent research.

4.2.1 Decomposing Pass-Through

An important contribution to understanding the links between price transmission and competition in the food sector comes from the work of Nakamura and Zerom (2010). They focus on the US coffee sector largely due to the availability of data and the ability to trace the raw agricultural input (raw coffee beans) through to the retail stage. Also, since coffee is imported, they can easily allocate the share in costs to the raw commodity input and other costs. They make several contributions to the issue. First, they allow for sticky price

adjustment in the form of menu costs. Recent research in macroeconomics on the micro-foundations of inflation suggests that prices may be sticky in the sense that, due to menu costs (i.e. changing prices is costly), firms adjust prices infrequently. Second, they estimate a structural model that allows for product differentiation at the retail stage. Third, they can retrieve a measure of the mark-ups and assess how they change in face of cost shocks to the price of coffee.

The results are insightful. Overall, (long-run) pass-through is relatively low in the coffee sector with a one per cent shock in costs leading to around 0.3 per cent increase in retail prices. There are several factors that lie behind this result. Specifically, in their framework, menu costs are relatively low but even low menu costs can contribute to short-run price stickiness and delayed response to shocks. More importantly, the low pass-through arises because of downstream firms reduce their mark-ups by around one-third. As we have noted in the outline above, part of the mechanism of this effect is due to the change in the price elasticity of demand that depends on the curvature of the demand function. Borrowing the terminology from Klenow and Willis (2006), they refer to this “super-elasticity” (the percentage change in the price elasticity for a given percentage increase in prices) which they estimate to be relatively high at 4.6 per cent; it is the nature of this change in the price elasticity due to the shape of the demand function which gives rise to a substantial change in firm’s mark-ups. While not the only change that determines the overall price transmission effect, it is nevertheless indicative that how firms’ mark-ups change is an important aspect of the price transmission effect.

4.2.2 Asymmetric Price Adjustment

One of the common insights from time series econometric studies of price transmission is the existence of asymmetric price adjustment. This ties with common concerns about price adjustment in the food sector and elsewhere i.e. that the food industry is quick to pass cost increases on to consumers but less willing to reduce prices when costs subsequently decline. Meyer and von Cramon-Taubadel (2001) provides a review of these issues in agricultural and food markets. Peltzman (2000) explored whether this issue could be tied to concentration though insights from theoretical models on this issue have been limited. One possible reason for price asymmetry relates to search costs. Bernabou and Gertner (1993) highlight the interaction between inflation and search costs: if search costs are high, rising prices reduces the returns to consumer search and the firm widens its mark-up; if search costs were low, consumer search intensifies and price-cost margins narrow.

Richards *et al.* (2012) have explored this issue in the context of the recent experience with food price inflation. They show that the pricing conduct of firms varies with the direction of underlying commodity price shocks but that the outcome can vary by commodity sector. For example, for one commodity (potatoes), when commodity prices are rising, the industry mark-up decreases but when prices subsequently fall, the mark-up widens. They also show that the increase in the mark-up in the declining commodity price phase is greater than the reduction in the margin when commodity prices were rising. In the other commodity sector they explore (fluid milk), these asymmetric effects do not exist though there is still some degree of asymmetry to the extent that when commodity prices are falling, margins are unchanged but when they are rising, margins narrow.

4.2.3 Multi-Product Retailers.

Most (if not all) of the research that forms the basis of the previous discussion relates to single product firms; with imperfect competition, under-shifting is likely to arise unless the demand function is sufficiently convex. Yet, as we highlighted above, food retailers are multi-product outlets selling a wide variety of products and competing across a wider range of attributes. Previous work allowing for product differentiation did not tie down specific outcomes where

product differentiation reversed the outcomes or insights significantly from what we have noted above. For example, in Anderson *et al.* (2001), the convexity of the demand function will still play a crucial role in determining whether over-or under-shifting will arise.

Kim and Cotterill (2008) were among the first to estimate a structural model which allowed for product differentiation between brands with an application to the food sector. With the data relating to the US processed cheese market, the change in costs refer to the price of raw milk. Estimating a discrete choice model that allows them to estimate price (own and cross) price elasticities at the brand level, price transmission will depend on the substitutability between brands. They simulate pass-through for two alternative characterisations of firm behaviour, one where the market is fairly competitive (Bertrand-Nash pricing) and the other where pricing is collusive. In the case of competitive pricing, pass through of cost changes is almost complete; but with collusive pricing, there is a considerable reduction in pass-through. Since the estimates are at the brand level, the extent of pass-through also varies by brand. In aggregate, the transmission elasticity for collusive pricing is estimated to be around 85 per cent lower than the competitive case.

Hamilton (2009) has made an important contribution to understanding the links between the extent of price transmission and the existence of multi-product retailers. In essence, there are two aspects at play here; the first is the change in costs for a particular product; the second is the number of varieties put on sale by the multi-product retailer. Hamilton shows that as costs increase, the retailer puts less product varieties on sale. This softens price competition such that the net effect causes the retail price of the good to rise by more than the initial increase in costs. Though we have noted above that over-shifting of cost increases could arise with the demand function being sufficiently convex, under-shifting was more likely. However, in this case, over-shifting does not depend on the curvature of the demand function. The over-shifting effect among multi-product retailers arises here because variety withdrawal weakens the extent of competition in the retail market.

Hamilton and Richards (2011) have explored this issue empirically using detailed retail price data from the US ready-to-eat cereal market. They show that, in isolating the pass-through effect without the variety effect, pass-through of costs is indeed less than perfect. But when accounting for the variety withdrawal effect due to the increase in costs, pass-through increases above the initial increase in costs. While preliminary, the empirical results support the idea that accounting for the multi-product nature of supermarket retailers can give an outcome that would not arise in the standard framework and show that this particular characterisation of the food sector has to be accounted for in gauging the overall effect.

4.2.4 Pass-Through and Vertical Restraints

We have noted above that, in the context of food supply chains, market power at each stage can impact on the overall price transmission effect (McCorriston and Sheldon, *op. cit.*). But we have also noted in the characterisation of the food sector in Section 2, that vertical restraints are an important aspect of the relation between retailers and manufacturers. While McCorriston and Sheldon assume arm's length pricing-and therefore that the extent of double-marginalisation determines the cost pass-through the successive stages in the vertical chain, it may nevertheless be likely that vertical restraints may also impact on the price transmission outcome. Intuitively, if double marginalisation is the 'benchmark outcome', to the extent that vertical restraints ameliorate this effect, they will impact on the extent of pass-through.

This issue has been explored recently by Bonnet *et al.* (2009). Estimating a structural model using data from the German coffee market, they explore how non-linear pricing and vertical restraints such as wholesale price discrimination affects the pass-through of costs from the upstream sector. Benchmarked against the linear contract (arm's length pricing), they show

that the existence of vertical restraints serves to increase price transmission. With a 10 per cent increase in costs, the linear pricing case leads to an average 7.2 per cent increase in retail prices. The main result from their paper is that vertical restraints in the form of resale price maintenance increase the level of pass-through. The intuition they offer is that, in the presence of resale price maintenance, when there is a cost shock, the existence of the vertical restraint limits the ability of firms to adjust their mark-ups. Since we know from previous discussion that the change in the mark-up can help to reduce the price transmission effect, since the vertical restraint limits the extent to which firms can adjust their mark-ups, pass-through therefore increases.

Bonnet and Réquillart (2012) apply a similar framework to the EU sugar sector. Again, they allow for the existence of vertical restraints between soft drink manufacturers and the sugar processors, though they do not explore the range of outcomes with alternative characterisations of vertical restraints. However, they do highlight the pass-through effect at the brand level and draw a distinction between national brands and private labels. In aggregate, there is over-shifting (retail prices change by more than the change in costs), but the transmission effect varies by between 1.1 per cent and 1.23 per cent at the brand level. On the whole, the pass-through effect is greater for national brands than private labels though this may be due to differences in the initial mark-ups between branded and private labels.

4.2.5 Summary

In large part, concerns about the functioning of the food sector relate to transparency in the pricing of food products; in the context of recent developments in world and domestic agricultural markets coupled with high levels of food inflation across many OECD countries, there is concern that the competitive aspects of the food sector can affect the outcome. These concerns are fuelled with the high levels of concentration in food manufacturing and retailing and the on-going consolidation in the food sector.

In exploring the links between price transmission and competition, the key mechanism centres around the change in mark-ups: if firms have mark-ups above the competitive level, how these mark-ups change will be an important determinant of the outcome. The extent to which these mark-ups change will depend on not only the intensity of competition but also the characterisation of the demand function. Recent econometric developments and data availability allow for structural models to be estimated that account for brand competition at the retail stage (an obvious characterisation of the food retail sector) with extensions allowing for alternative characterisations of contracts between retailers and manufacturers. While this is an emerging research area, the framework presented here coupled with recent advances show that competition throughout the food supply chain is an important influence on price transmission and how consumers are affected by commodity price changes when the competitive aspects of the food supply chain are accounted for.

5. Summary and Conclusion

In this paper, we have reviewed a range of issues that relate to competition in the food chain and also tied these issues with price transmission. While outlining the range of concerns, we have also reported (albeit selectively) on how research provides insights on these issues. The overall message is that addressing competition issues in the food sector is complex and that further research is necessary in addressing the wide range of issues that are involved. The successively-related nature of the food supply chain highlights the interdependence between horizontal and vertical aspects of competition in the food sector while the multi-product nature of increasingly dominant retailers poses a significant challenge both for policy makers (i.e. that potentially the dominant effect of retailers may impact more on upstream suppliers than on consumers) and for researchers, not least in terms of access to appropriate data to assess these issues.

In many ways, the role of anti-trust authorities in addressing competition in the food sector should be no different from any other. Dealing with anti-competitive mergers, abuse of dominance, cartels and price fixing, vertical restraints and exclusive practices are all issues of general concern to competition authorities whatever the sector in which they arise. Yet, there are notable additional concerns in addressing competition in the food sector.

First, the food supply chain is a complex series of inter-related markets where competition at different stages of the supply chain matters for the overall functioning of the food sector. In this setting, concerns over competition may relate not just to the issue selling power but also buyer power and where the issue of buyer power can relate to vertical relations between any of the stages of the food supply chain (retailer-processor or retailer/processor-farmer). Furthermore, how retailers compete may also impact on the overall functioning of the food supply chain: for example, the increased penetration of private label products can affect how retailers and food manufacturers interact and also impact on product innovation.

Second, concerns over the farm sector's role in the food sector and the increased use of contracting has, in some cases, lead to the introduction of codes of practice to ensure more transparency on how farmers are tied into the overall functioning of the food chain. This, in part, reflects concerns that even if consumers benefit (or at least not harmed) by competition at the retail stage of the food chain, there are concerns with "fairness" and that the increased bargaining power of downstream food processors and retailers, has a potentially negative impact on the farm sector.

Finally, the sensitivity over food pricing issues coupled with the complexity of the vertically-related food chain has increased demands for greater transparency in the functioning of the food sector with regard to how prices evolve throughout the food supply chain and how competition at any stage and between stages impacts on the process of price transmission from the upstream stage through to retail.

While the evidence reported in this paper has drawn on developments in the food chain in a limited number of countries, commentators have suggested that the trends are likely to be common (or increasingly so) across a wider range of countries (Sexton (2010), Cotterill (*op.cit.*) and Reardon *et al.* (*op.cit.*)) i.e. increasingly dominant retail firms, consolidation at all stages in the food chain and a lower share of the 'food dollar' received by farmers. Addressing competition in the food sector is therefore likely to be an on-going concern, not only because of these apparently common trends but also due to the volatility in world agricultural markets and the increased emphasis on food security. Competition issues in the food sector will therefore fit within this broader policy agenda.

Appendix: Characterising Pass-Through in Agricultural and Food Markets

The transmission from agricultural (raw commodity) prices through to retail food prices depends on a number of factors with the impact of market structure influencing the extent to which the downstream firms' mark-ups change in face of the cost change. These factors take into account the nature of the food industry cost function (i.e. the shares of agricultural and other marketing inputs and the substitutability between these two sources of inputs), the supply elasticity of marketing inputs and the food industry demand function. These factors determine the extent of pass-through setting aside the potential influence of market structure.

To see the issues more directly, McCorrison *et al.* (1998) derive a price transmission elasticity involving an upstream agricultural market with an imperfectly competitive food industry as given by:

$$\tau = \frac{s_A (1 + \gamma\sigma)}{(1 + s_A\gamma\sigma) ((1 + \mu) + s_B\gamma\eta)} \quad (1)$$

where s_A is the share of the raw agricultural commodity in the food industry cost function, s_B is the share of other inputs, σ is the elasticity of substitution between agricultural and materials inputs, γ is the inverse elasticity of supply of marketing inputs and η is the industry elasticity of demand. The effect of competition enters via the μ parameter which relates to the elasticity of the industry mark-up which is given by $\mu = \omega(\theta/n\eta - \theta)$ with ω representing the change in the elasticity of demand for a given change in the retail price, where n is the number of competing firms and θ is a measure of the intensity of competition between firms.

It is useful to isolate the specific role market power may play in determining price transmission. To see this, assume a zero value for the elasticity of substitution between agricultural and other inputs together with a perfectly elastic supply for marketing inputs i.e. $\sigma = \gamma = 0$ ²². Also assume there is no market power in the food sector (for example, n is sufficiently large that the market is very competitive). Then the price transmission elasticity will be given by:

$$\tau_c = s_A \quad (2)$$

In other words, the change in retail prices should equal the share of agricultural inputs in the food industry cost function. If the share of agricultural inputs is relatively low this should be the extent to which retail food prices change.

To see how imperfect competition influences the price transmission outcome, employing the same assumptions above ($\sigma = \gamma = 0$), the pass-through effect will be given by:

$$\tau = \frac{s_A}{(1 + \mu)} \quad (3)$$

Comparing this with the pass-through elasticity in a competitive food sector, we have:

$$\frac{\tau_c}{\tau} = 1 + \mu \quad (4)$$

²² With the assumption of $\sigma = 0$ relates to the technology of the industry cost function and whether the inputs are substitutable; in the case of $\sigma = 0$, this implies a fixed proportions technology.

With a linear demand function, $\theta > 0$ and n sufficiently small, then $\mu > 0$; intuitively, the mark-up in the downstream food sector falls in face of the increase in costs. This serves to dampen the price transmission effect compared with the competitive case. In sum, subject to conditions on the demand function, market power in the food sector will lead to ‘under-shifting’ of retail food prices. So, if the agricultural input accounts for 25% of the food industry costs, the transmission elasticity will be less than 25%.

In summary, the effect of market power on price transmission in the food sector depends on how the food industry mark-up changes. This is the key point about competition and pass-through. It is not just about the number of firms and the intensity of competition; it is how these influence the *change* in the mark-up. In this context, even if we have a highly concentrated food sector (e.g. $n=2$) and competition between these firms is not “too” intense, the change in the mark-up will also depend on the nature (or, more formally, the convexity) of the demand function. If we had a log-linear demand function for example, the change in the mark-up would be zero no matter the structural characteristics of the industry.

McCorrison *et al.* (2001) have developed the pass-through elasticity to account for scale effects. The scale effect is captured by the parameter ρ ; with ρ greater (equal, less) than 1, this represents increasing (constant, decreasing) returns to scale. McCorrison *et al.* (*op. cit.*) amend the price transmission elasticity to account for this feature of the food industry cost function, the comparison with the competitive benchmark (subject to assumptions made about other parameters) now being amended to give:

$$\frac{\tau_c}{\tau} = 1 + \mu - \eta(\rho - 1)/\rho \quad (5)$$

If we had constant returns to scale ($\rho = 1$), then we retrieve the comparison between the competitive and imperfectly competitive case as noted above. With increasing returns to scale, the under-shifting effect now weakens; conditional on the extent of the scale effect, it could be the case that food prices rise by more than the cost increase such that we would have ‘over-shifting’ rather than under-shifting.

This basic structure highlights the main factors that would drive pass-through arising from shocks to the agricultural market through to the retail food market, but it necessarily relies on some simplifying assumptions. Relaxing these assumptions may affect the extent of pass-through.

First, it assumes the ‘food industry’ is characterised by symmetric (equal-sized) firms. Specifically, the market is split evenly between them implying they have equal cost structures and market shares. This simplifies the theoretical framework considerably though it does not settle easily with the characterisation of the food sector outlined in the text: it is obvious that firms are not of equal size, have identical market shares and have the same costs. When firms are asymmetric, the aggregate mark-up will change not just because of the change in costs but that the change in costs affects each firm to varying degrees. As such the level of market concentration may also change as the fall in costs favours larger and lower cost firms more than smaller, higher cost firms. Dung (1993), for example, shows that market power will increase. In turn, in the context of the above outline, this will serve to lower the degree of price transmission.

Second, it assumes that the downstream “food industry” is comprised of a single stage, effectively meaning that the food processing and retailing stages can be treated together. This therefore sets aside the issues associated with successive oligopoly and characterising vertical ties between stages.

Third, it also sets aside one of the main issues of the food sector where retailers are multi-product in nature and where consumers can choose from a wide-variety of (potentially) close substitutes. How vertical structure of the food chain and the existence of multi-product retailers may affect price transmission between agricultural markets and the retail food sector are highlighted in the text.

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