

Chapter 3

Economic impact of food product innovation

Agricultural production has become progressively more mechanised, efficient and cost-effective over the last 80 years (Hennessy, 2004). One of the key economic drivers is the relative impact of cost seasonality of production – regions with strong seasonal cost advantages will tend to produce lower value products. An increase in demand for more processed food products induces a shift towards non-seasonal production.

The impact of increased agricultural efficiency is the lowering of food raw material costs. The impact of this on the USA food manufacturing sector (comparing 1975 to 1997) has been reviewed by Huang (2003). Over that period,

- gross output from the food sector increased by 1.88% per annum;
- net output increased by 3.58% per annum;
- on average around 60% of the cost of food was the raw material cost;
- multi-factor productivity index increased by 0.45% per annum (compared to the manufacturing sector productivity of 1.25%);
- capital investments increased by 2.25% per annum;
- the decline in processed food price was almost totally accounted for by the cost of raw materials;
- food manufacturing private R&D expenditure increased 2.22% per annum, compared to agricultural inputs R&D (4.04%) and all U.S.A. industries (5.78%);
- R&D expenditure represents 0.23% of sales.

In summary, these results provide a picture of an industry which is influential on the domestic economy, but not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector. Modelling the various interrelationships, Huang (2003) concluded that:

- overall real processed food prices declined by 2.13% per annum;
- improvements in food industry productivity contributed little (less than 0.14% for a 1% increase in productivity);
- the key driver for reduced processed food prices was a decrease in raw material prices (a 1% decrease in raw materials produced a 0.59% decline in processed food cost);
- real producer prices for “crude” food declined 3.6% per annum;
- mergers and acquisitions over the 1991 – 1998 period had little effect on productivity;
- production worker productivity increased by 1.33% per annum;
- a 10% increase in capital and labour inputs would increase net output of the food sector by \$4.3 billion.

While this is a useful guide to the food industry impacts and drivers in a high income economy, Mattas & Shrestha (1989) described the impact of the food sector in Greece – an economy heavily dependent upon its natural abundance of food. They emphasised the

interdependence of economic sectors. As background for this discussion, in Greece in 1980:

- agriculture constituted roughly 21% of output;
- food sector comprised 10% of value of exports;
- agriculture employed 33.6% of the labour force;
- raw and processed foods constituted 21.4% of the national economy's demand.

These authors reviewed the potential for the food sector to stimulate economic growth and development. The output multiplier (or total effect) of stimulating output for the national economy (average across all sectors) was 1.30. This means that a \$US1 million expansion of the whole economy's final demand would generate an additional output of \$US1.3 million.

A comparison across all the key economic sectors for the Greek economy in 1980 is shown in Table 1.

While the overall output multiplier was high for the processed food sector, the absolute impact in terms of income and employment was not as high as the agriculture sector. This reflects the relative size of these two sectors (Agriculture was nearly six times the value of the processed food sector). However, the interdependence of many different sectors with the food sector results in a major impact on the overall economy (as displayed by the multiplier). For example, a \$US1 million increase in income from the processed food sector would generate \$US4.26 million of income in the economy and an analogous increase in employment. This was the highest multiplier of any sector, including agriculture.

This output multiplier was explained in terms of the impact on non-food activities. For the output activity of the processed food industry in 1980, 62% was made up of direct outputs and 38% was from indirect activities. The authors also calculated that non-food outputs equivalent to 108% of the value of the processed food industry were used to support the food industry in Greece. It was estimated that 25 non-food sectors benefited by supporting the inputs required for the food sector. These included oil, banking, machinery, transportation, clothing and trade. Some of these sectors (including agriculture) that were important for the Greek economy were heavily reliant upon producing for the food industry. For example, the inputs purchased by the food industry from machinery, banking, chemicals and plastics sectors were almost 20% of the value of the output from each sector. More importantly, the analysis showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.

TABLE 1

Potential of sectors to stimulate final demand and economic growth in Greece (1980). (Modified from Mattas and Shrestha, 1989).

Sector	Output	Income		Employment	
	Multiplier or total effect	Total effect	Multiplier	Total effect	Multiplier
Raw Food	1.27	0.64	1.12	2.87	1.11
Processed Food (including beverages)	1.79	0.34	4.26	1.53	4.65
Tobacco	1.31	0.14	2.54	0.67	2.94
Mining	1.17	0.54	1.07	0.83	1.16
Textiles	1.45	0.30	1.62	1.33	1.79
Furniture	1.79	0.24	1.68	1.12	1.58
Machinery	1.29	0.24	1.32	0.95	1.32
Construction	1.39	0.34	1.39	1.47	1.22
Trade	1.18	0.28	1.11	2.06	1.08
National Economy	1.30	0.40	1.36	1.72	1.33

To define this in numbers: a 19% expansion of the food sector would result in an expansion of non-food output that was 62 times the expansion achieved by a 19% expansion in non-food output. Thus expansion of the food sector greatly expanded all sectors of the economy, whereas the converse was not true.

This paper exemplifies the critical economic impact of the processed food industry on a small economy that is based on agriculture. The leverage for the economy as a whole, from stimulating the expansion of the food sector, was clearly seen.

Whereas agricultural production is captured by the region or country where it is grown, other sectors (such as equipment/machinery, banking, biotechnology, etc.) represent portable opportunities and ideas. Agricultural production, with the exception of fresh fruit and vegetables, is generally processed where it is produced and cannot be readily relocated to another country or region.

The expansion into international markets is invariably driven by the food processing sector, not the traditional agricultural or commodity based raw materials (Athukorala and Sen, 1998; Martin, 2001; Rae and Josling, 2003). Commodity producers are finding that an increasingly difficult and competitive environment is driving down commodity prices, especially where products are not differentiated (Barone and DeCarlo, 2003).

Using Chile as the example, Athukorala & Sen (1998) studied the relative importance of market-oriented policy reforms and industrial restructuring on economic development. One of the key factors to the spectacular Chilean growth in the 1980s was the expansion of exports. While many reports have focused this success on the “primary sector”, these authors evaluated the International Industry Classification codes of exports from Chile and concluded that the impetus for export expansion had clearly come from “agro-based manufacturing activities” – not the traditional primary goods. These results were compared to 37 countries where data were available and complete for years 1970 to 1994. Results included:

- manufacturing exports increased from 66% to 81% of total exports;
- manufacturing share in developing countries increased from 27 to 79%;
- developing countries share of manufacturing exports increased from 6 to 24%;
- processed food as a % of manufacturing exports increased from 26.2 to 36.7%.

These data are similar to those by Rae & Josling (2003). Between 1975 and 1985, the global processed food trade increased by 5% per annum. This increased to 9.4% per annum from 1985 to 1995. In 1985, processed foods accounted for 55% of the total value of agricultural exports from developed countries, but only 40% of developing countries. By 1995, processed foods represented 66% of the agricultural exports from developed countries and 56% of that from developing countries.

The reasons for the growth of processed foods in world trade are complex, but Athukorala & Sen (1998) suggested the “internationalization of food habits”, increased importance and consumer demand for processed food, international migration, tourism and others may have provided a strong demand for growth in developing countries. Improvements in food technology, refrigeration facilities, transportation and supply chain management have made processed food items readily tradable across national boundaries.

Countries with processed food growths greater than 15% per annum included Bangladesh, Bolivia, Chile, Indonesia, Korea, Malaysia and Thailand. There is convincing evidence that domestic policy regime is the key determinant of the expansion of manufacturing exports from developing countries. There was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.

Athukorala & Sen (1998) emphasised the “spread effects” of the processed food industries in developing countries. Processed food industries have a large domestic resource content (as indicated above by Mattas and Shrestha, 1989). By contrast, the

production of conventionally manufactured non-food exports from developing countries is generally highly import dependent.

In a more recent study, Regmi et al (2005) report that, contrary to initial expectations, the phenomenon of a growth in export of processed foods has not led to significant growth in global trade. Only 6 percent of processed food sales are traded compared with 16 percent of major bulk agricultural commodities. Although consumer demand for processed foods continues to grow globally, growth in trade has generally stalled since the mid-1990s. Global trade in processed food grew rapidly during the 1970s and 1980s, as consumers in high-income countries demanded more foreign food products. Through the mid-1990s, these products accounted for a bigger share of growth in U.S. agricultural exports, with expanding exports to Japan, Canada, and Mexico. However, since the mid-1990s, growth in both global and U.S. processed food trade has slowed, and bulk agricultural commodities account for more of the recent growth in U.S. agricultural exports.

The slow growth in trade of processed food products has often been attributed to existing multilateral trade rules that favour trade in raw commodities at the expense of processed products. But trade policy is not the whole story, many other factors affect the choice of locations to produce and sell food products. Patterns of food trade are strongly influenced by the changing nature of competition in the global food industry which is influenced by factors such as shifting consumer preferences and the growth in multinational food retailers and the ways they manage their global supply chains. Consumer-driven changes are increasingly pushing food suppliers to meet consumer demand and preferences at a local level, even as the food industry becomes more global. The product life cycle for processed foods has become progressively shorter – most products show a cycle of 6–12 months. International distribution pathways and supply chains are therefore too long for companies to risk final product preparation unless it is close to market. Local processing allows manufacturers to strategically tailor both manufacturing and packaging to suit local tastes, preferences, and retailer needs. The result of this trend has been an acceleration of foreign direct investment (FDI), often at the expense of trade. As a case in point, U.S. food companies sell five times (\$150 billion) more through FDI sales than through U.S. export sales (\$30 billion).

It is also worth noting that food companies such as Nestle, Unilever, Kraft (etc) are truly global – having manufacturing sites all around the world. Retail giants, however, such as Carrefour (etc) are only regional. There are no truly global retailers.

The dynamic nature of added value food exports on an economy which is heavily dependent upon agricultural inputs has been defined by Winger (2004). Using the Harmonised System Classification of exports, food and agricultural products exported from New Zealand were assessed in terms of commodities and added value products. Given these products represent 50% of New Zealand's manufacturing income; their importance can be compared to developing countries with a strong agricultural base. An annual comparison was made from 2000 to 2004 (the only years with consistent export classification) (Table 2).

Clearly the importance of innovation and adding value to food products at a country level is important in export marketing. While there were fluctuations in export earnings from commodities (eg from 2002 to 2003), the income returns from added value products kept increasing every year. The proportion of added value products has increased from 44.5% of exports in 2000 to 54% of exports in 2004.

TABLE 2

Freight on board value of New Zealand food exports

Food type	Value (NZ\$ billion) for years ending June 30				
	2000	2001	2002	2003	2004
Value-added	5.28	6.71	7.41	7.60	8.11
commodity	6.57	8.80	8.68	6.67	6.92
TOTAL	11.85	15.51	16.09	14.27	15.03

Key points

1. In the USA, a study found that the food manufacturing sector is influential on the domestic economy, but not providing the improvements in efficiency and productivity of other sectors, including the agricultural sector.
2. A study in Greece, at the time when its economy was heavily reliant on agriculture, found that expansion of the food sector greatly expanded all sectors of the economy. The analysis also showed that there was a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector.
3. Exports of processed foods as a proportion of total agricultural exports grew markedly in a wide range of countries up to the mid 1990's.
4. There was a stronger correlation between growth in manufacturing exports and processed food exports, than there was between processed food exports and primary products exports.