



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Added Value: Don't Believe the Hype

by
Chris Nixon

February 7, 1994

NZ INSTITUTE OF ECONOMIC RESEARCH (INC.)
P O BOX 3479
WELLINGTON, NEW ZEALAND

Tel: (04) 4721 880
Fax: (04) 4721 211

No liability is accepted for errors of fact or opinion in this report whether or not due to negligence on the part of the Institute, its contributors, employees, or Board of Trustees.

1. Introduction

In this first stage our aim has been to investigate trends revealed by macroeconomic statistics, the micro and macroeconomic rationale for adding value, the factors encouraging or constraining it, and industry data on adding value to primary products. Broadly speaking the term "adding value" is used here to mean further processing¹ of raw materials or intermediate goods towards the form desired by final consumers, with the aim of increasing unit values.

We have confined ourselves mainly to examining the data. Although we discuss the issues, we do not reach any firm conclusions on the macroeconomic benefits of adding value to primary products at this stage of the project. We note that the adding value theme has an important role in current economic debate with policymakers and industry groups looking to added value as a path to growth, export income and profitability. An obvious but important point is that adding value is not costless - at the firm² level profitability is the primary objective, which may or may not be consistent with increased processing. Furthermore, as was learned from the era of protection and subsidies, increased domestic processing is not necessarily synonymous with enhanced value added. Put another way, at the macroeconomic level New Zealand's areas of comparative advantage have a major bearing on activities that are or should be undertaken here, and these areas of comparative advantage seem unlikely to shift rapidly, despite liberalisation.

These issues need to be considered in the context of recent and prospective economic performance and policy trends. In the last decade the New Zealand economy has been subject to widespread reforms affecting most industries and markets. The broad thrust of these reforms has been to encourage responsiveness to market signals, and to lower the influence of government - for example through regulation, protection and subsidies. The objective has been to allow resources, particularly labour and capital, to move into activities in which this country has comparative advantage i.e. is relatively more cost efficient than its competitors, and thus to establish an improved base for macroeconomic performance. Principal macroeconomic objectives are to improve growth in employment and incomes, and to put our external accounts on a sounder footing. It is possible, but not axiomatic, that adding value to an increased degree to our primary products will accelerate progress towards those objectives.

¹ Further processing in the primary sector includes development of new species, for example through biotechnologies.

² The firm in this context would include any enterprise such as a farm, forest, sawmill etc based in or on the primary sector.

Whatever the impact of these reforms, trends in the table below have been for a rise in the primary sector's contribution to GDP, and a similar decline in manufacturing share. The export mix in terms of degree of transformation has not changed dramatically, nor the structure of imports.

| NEW ZEALAND REAL GDP SHARES ³ (%) | | | |
|--|---------|---------------|----------|
| | Primary | Manufacturing | Services |
| 1982 | 8.6 | 22.8 | 68.6 |
| 1983 | 9.2 | 22.9 | 67.9 |
| 1984 | 8.4 | 22.7 | 68.9 |
| 1985 | 8.1 | 23.9 | 67.9 |
| 1986 | 10.0 | 22.5 | 67.5 |
| 1987 | 10.1 | 22.4 | 67.5 |
| 1988 | 11.0 | 21.2 | 67.8 |
| 1989 | 10.8 | 20.9 | 68.3 |
| 1990 | 10.7 | 21.0 | 68.3 |
| 1991 | 11.1 | 20.2 | 68.8 |
| 1992 | 11.6 | 19.7 | 68.7 |

Source: Department of Statistics - National Accounts

Certainly if we dig behind the raw statistics there have been many important changes at enterprise and industry level. However, although primary food processing, for example, has grown relatively rapidly in output and export terms in recent years, the bulk of our exports by value are still simply transformed primary products, and there is considerable potential for further processing.

There are two broad lines of argument linking the structure and performance of the economy to value added. The first is that because primary products or simply transformed versions thereof still account for about 70% of New Zealand's export receipts, our external accounts and GDP per capita are excessively vulnerable to fluctuations in commodity markets. Hence, it is argued, further processing of an increased proportion of our primary produce would lower this volatility and add to our export receipts.

The second is that in a developed economy, even one such as New Zealand based heavily on agricultural exports, it might be expected that more progress along the value added chain would have occurred than is evident. There are at least two powerful pressures or incentives for this to occur. One is trends in world trade, with rapid growth in manufactures and services over the last 20 years but minimal

³ NB These 'real' shares differ from the nominal shares quoted elsewhere, but trends over time will be similar.

growth in agricultural volumes/values. Movement along the value added chain would therefore suggest more chance of participation in the faster growing components. Another is the possibility that producers of highly differentiated products have more market power than producers of commodities, and hence the ability to sustain better value added and profitability performance than the latter.

2. Concepts and definitions

If research into "adding value" and general debate about the issues is to be meaningful and lead to positive responses either at the policymaking or industry level, then there has to be some clear idea of the concept being analysed.

We have adopted here the most general use of the term suggested by Bollard (1991) the author i.e. adding value means transforming a product or service into something of higher value by further cultivating it, processing it, marketing it or reorganising its production or transformation. Although this is not the only possible description of the concept, it is reasonably general and pertinent to the primary products (agricultural and forest-based) we are concerned with here. In general terms, value added is the difference between a market's willingness to pay for a product, and the cost of inputs.

In the national accounting framework, value added is the contribution to gross domestic product (GDP) made by an activity. The accounting identity is:

$$\begin{array}{c} \text{Intermediate consumption (inputs purchased from other businesses, including} \\ \text{imports)} \\ \text{plus} \\ \text{Contribution to GDP (value added to inputs)} \\ \text{equals} \\ \text{Value of total output} \end{array}$$

Value is added by the contributions made to the product by the labour force, by plant and machinery and by other capital assets on farms or in firms. The statistical definitions of value added are:

- the difference between total revenue of a firm and cost of bought-in raw materials, services and components;
- the value which the firm has "added" to these bought in materials and components by its production processes;

- alternatively it measures salaries and wages, plus capital charges (including depreciation) rent and dividend payments, plus net indirect taxes.

In New Zealand's official statistics there are three measures of value added:

Business value added = salaries + wages + taxes + gross profits (pre interest). Refer for example enterprise surveys, economic censuses, and Quarterly Survey of Manufacturing.

Value added (national accounting), which is the above adjusted for user charges such as insurance, bank charges, ACC levies.

Net output = industry sales less materials purchased (but with no deduction of payments for services from other firms, as per value added).

It follows from these definitions that value can be added in three main ways:

- Through further processing towards the form desired by others in the production chain or final consumers, included in which might be quality issues (marketing, distribution, delivery times);
- By reducing input costs (through changed sources of inputs, more efficient organisation, reduced wastage);
- Increased output prices, for a defined product, which may reflect demand and supply cycles.

Note that there are various aspects of increased added value implicit in these definitions. The first might be described as "active" added value i.e. resulting from deliberate efforts by an enterprise, industry or government to increase the degree of transformation or otherwise raise unit values. There are also elements in value added such as terms of trade and output prices which are to some extent outside the influence of individual producers. This distinction is one source of the measurement problems discussed in a later section.

3. The production chain

This leads into the issue of whereabouts in the production chain the predominant components of added value might occur. In this study we are focussing principally at a sectoral level, but our analysis needs to be linked to enterprise level business decisions and macro-economic implications. As noted in Bollard (1991), for most products there is a sequence of production steps which represent a chain of adding value. A firm makes a choice about how far to transform its products along this

chain, although added value as defined is unlikely to be its main objective. As per Tilley (1989) "... From the perspective of a firm, value-added is not a relevant criterion for decision making. Value added does not enter into a firm's decision-making process. Firms that add value are not necessarily profitable nor do they significantly add to employment in a region. Firms that facilitate exchange may be very important to the marketing process, but may not be large employers. Even firms that are involved in the physical transformation of raw materials may be highly automated."

This is a narrow perspective of the issues, and ignores the importance of inter-firm and inter-sectoral linkages, explicitly or implicitly aimed at product differentiation and increased value added.

In practice, adding extra value occurs at one of a number of levels:

- Pre firm/farm/forest (e.g. technology developed through R & D which is embodied in primary sector activity).
- Within a plant (e.g. in the meat processing trade, animals are slaughtered and transformed from carcasses to bone-in pieces, to frozen boned or fancy cuts, all inside one freezing works). Statistically, this example would be classified as part of manufacturing i.e. meat processing.
- Within a firm but via several plants (e.g. milk produced by NZ Co-operative Dairy Company (NZCDC) farmers, processed by NZCDC dairy factories, and turned into cultured dairy products by the New Zealand Milk Corporation).
- Within an industry but through several firms (e.g. in the fabricated metals industry, production of steel casings and frames that are sold to other firms for producing industrial machinery).
- Within a country via several industries (e.g. the growing of trees for chipping and production of wood panel products, which are then turned into furniture.).
- Within a firm but across several countries.

For some primary products, we could list many firms and sectors with a role adding value to or in some way transforming that product. The earliest point in the chain might be the geneticist developing new breeds of animal, or types of tree i.e. a service sector activity feeding into the primary sector. The last point in the chain is the final consumer probably, in the case of most primary products, somewhere outside New Zealand. Note that the value chain does not have discrete starting and

end points, but is really a continuum including gathering market feedback from final consumers.

Some analysts e.g. Kraybill and Johnson (1989) argue that sectoral value added is inappropriate as a basis for rural development policy. First, because many of the problems of agriculture have their origin in the interrelationship *between* agriculture and the rest of the economy. Second important parts of the rural economy are ignored if the focus of policy is sectoral. Third, governments are not sufficiently clairvoyant to be able to choose which industries and which firms can endure in a region. While these points have some validity in the regional context of their research, our focus is value added across sectors, rather than just in agriculture, and our geographical focus is in New Zealand as a whole rather than sub-regions. It might also be said that one route to enhanced value added performance based on the primary sector is through changing interrelationships with the rest of the economy.

4. Issues in measuring value added

Although measurement of value added is conceptually simple, the results can be sensitive to measurement problems, and uncertain in interpretation. In particular, there is the problem of knowing whether the measured change in value added is the result of exogenous changes in output or input prices, or due to increased transformation or marketing effort aimed at enhancing added value.

The first issue is the level of aggregation at which value added is being assessed. Industry classifications in the official statistics are normally by reference to the observable characteristics of industrial activities (i.e. inputs, processes and outputs). The broadest level of disaggregation is into primary, manufacturing and services sectors. The primary sector normally refers to activities directly relating to natural resources. Manufacturing is defined as the physical or chemical transformation of materials or components into new products. There is no agreed definition of what comprises the services sector which tends to be treated as a residual. The table belows illustrates the statistical organisation of industries using national accounting definitions into sectors, and gives a broad indication of the economy wide production chain.

| NZ GDP Distribution 1991/92 (Estimates) | |
|---|---|
| PRIMARY (10.4%) | Agriculture Fishing and Hunting Forestry Mining and Quarrying Food, Beverages and Tobacco Textiles, Clothing and Footwear Manufactured wood products Paper products and Printing |
| MANUFACTURING (17.5%) | Chemicals, Plastics, Rubber, and Petroleum Non-metallic mineral products Basic metal industries Fabricated metals Other manufacturing |
| OTHER SECONDARY (7.3%) | Electricity, gas and water Construction Trade, restaurants and hotels Transport and storage Communication |
| SERVICES (64.8%) | Finance and business services Community and personal services Government services Miscellaneous |
| TOTAL (100%) | |
| Source: NZIER Sectoral Projections September 1992 | |

There are finer degrees of industry disaggregation in the national accounts and inter-industry data. Different criteria can also be applied in classifying industries. For example, manufactures are sometimes sub-divided into three groupings by degree of transformation - raw materials, intermediate goods, and final goods. The OECD has developed a classification of products and industries based on the major factors thought to affect competitiveness. Industries are divided into five groups - resource-intensive, labour-intensive, scale-intensive, specialised suppliers, and science-based.

The point of stating this is that in the context of adding value to primary products, value may be added throughout the production chain. Hence measurement of changes in degrees of value added needs to take into account changes within sectors, but also shifts in the relative amount of value added as between sectors.

Conceptually, the degree of value added to primary products in all domestic sectors could be rising while the degree of value added within the primary sector was falling. For example the food processing industry could achieve increased value added ratios by raising output prices, or by achieving lower input prices from the primary sector, but possibly at the expense of the latter's value added.

We also need to take into account the impact of the final demand mix on value added. What is the significance of the fact that the bulk of New Zealand's raw and semi-processed primary output is exported? For some items, producers may have a choice as to how much to produce and whether to export or sell into the domestic market, according to the relative profitability. In the case of primary products, amounts produced in the short-term are driven by climatic conditions or historic breeding/planting cycles rather than availability of inputs, as might be the case in downstream industries.

For a small country such as New Zealand, exports are the only option for the bulk of primary products, and simply transformed versions of these. A shift to increased transformation thus effectively changes our export mix, rather than increasing production for domestic markets. Thus one of the macroeconomic questions is about the likely differences between export markets for "commodity type" primary products, as traditionally accessed, and the export markets for added value products that we aspire to attack on a larger scale. It does not seem self-evident that international markets for "value-added" products should be subject to any less intense competition than for commodity type exports. However there may be contrasting market adjustment processes to shortages and surpluses, and as alluded to earlier, the possibility of increased market power in some highly differentiated products.

There is also an argument that particularly in a small and isolated country such as New Zealand, the demands of the domestic market are not sufficient to ensure international quality standards. This means that sustainable value added activities are only likely to emerge from industries with significant exposure to export markets.

5. What is the economic significance of adding value to primary products?

Adding value is not an end in itself, but potentially a means to improved returns at the enterprise level, and enhanced welfare at the macroeconomic level. There are incentives to enhance added value, but also economic constraints on what is viable. For example, an enterprise has to consider such factors as the added investment in

plant and machinery and labour necessary to add value. In a financial sense e.g. medium term returns on equity adjusted for risk, where is a sensible cutoff for added value. It also has to be aware of what enterprises further back and further forward in the chain are likely to undertake.

Bollard (1991) notes that in practice most firms or farms have limited processing and distribution capabilities and options. They may be unaware of technology options or unable to finance them. Inputs may be scarce or too costly, they may lack economies of scale or scope, or take a short term or narrow view of the firm's scope.

As well as these private reasons constraining added value, there may be market reasons e.g. distorted price and investment decisions as a result of taxes, subsidies, tariffs and other government interventions, or inflation.

From a macroeconomic perspective, it is simple enough but unhelpful to state that the accounting identity that higher value added in real terms means more income for distribution to labour and capital. Underlying this are questions as to the links between adding value, comparative advantage, competitiveness and productivity. We need to be more specific about the issues involved, for example:

- What are the implications of deregulation for value added?
- Will increased success in adding value to primary products be reflected in progress towards objectives of macroeconomic management such as improved growth and employment rates, and a more robust external account for New Zealand? What are the dynamics of this process?
- How does increased added value relate to welfare objectives (consumer and producer surplus i.e. economic rent) and what are distributional impacts?

Bollard (1991) suggests three important determinants of how much domestic value added might occur in a country:

- the comparative costs of producing a basic product in New Zealand, relative to producing it other countries;
- the comparative costs of processing it in New Zealand, relative to processing it in other countries;
- the relative transport and marketing costs in selling unprocessed compared with processed products in overseas markets.

These are based on static trade models in which perfect competition is a key assumption. Other models that assume imperfect competition point to another set of potentially important determinants of and constraints on domestic value added at the enterprise or industry level:

- The role of economies of scale, scope and imperfect competition.
- Dynamic considerations i.e. taking into account the costs and time lags in investing in plant necessary to enhance added value.
- Transport cost impacts of processing to a higher degree far from major markets.
- Other transaction costs involved in identifying, establishing and maintaining new markets for higher value added goods.
- Barriers to trade access for processed products.
- Availability of technology and intellectual property fo. processing.

At least in hindsight, market distortions in the days of heavy government intervention were important i.e. had a significant influence on decisions about investment and degrees of processing undertaken in New Zealand. Hence there were reasons for wondering about the degree and distribution of value added - particularly in the primary sector. Now, in a deregulated era, are there still grounds for concern i.e. market failures that might be addressed at a policy level, or are markets generally working well enough to generate satisfactory outcomes?

Bollard notes that the degree of domestic value added can be (positively or negatively) affected by almost all aspects of regulatory reform. This includes the removal of entry restrictions and price controls which will change the incentives industries have to carry out further processing or enter other industries or vertically integrate.

This raises the issue of the extent to which government intervention generally, including taxes and subsidies, deregulation, and exhortation, the areas of comparative advantage, and how quickly this occurs. Alternatively, how powerful are the market signal effects of deregulation, vis-a-vis residual blockages? Unfortunately comparative advantage, while a key issue, leads us into measurement difficulties particularly with respect to disaggregation.

The arguments for adding value to primary products seem to come down to the fact that in raw form they are income inelastic; they suffer from trade volatility; and the long term tendency is for declining terms of trade for primary producers (although

this latter does not necessarily imply declining returns). In addition, potential for economies of scope may be limited for commodity type products.

Two major constraints on adding value are subsidies on primary producing sectors in the rich Northern Hemisphere countries, in turn providing an incentive to locate processing facilities in those countries. In addition, trade barriers against processed products (e.g. wood panels or sawn timber) rather than raw logs can have a similar effect. (There may be good economic reasons in any case for exporting raw logs rather than wood products).

On manufacturing value added, Park (1988) concludes that

"One of the major findings of this study is the extent to which an economy becomes increasingly sensitive to external factors as it progresses through successive stages of development... Irrespective of the branch of manufacturing industry, industry tends to be generally affected more by regional-specific factors than than external factors at the initial stages and the early second stages of industrialisation. At the advanced stages of industrialisation, most industrial activities become extremely responsive to the ebbs and flows of the world economy, and the worldwide performance of a given industry. The reason may be that as the economy passes through the successive stages of specialisation, it will be also progressively drawn into the international division of labour and trade. Of course, the pace of integration into the world economy may vary considerably from industry to industry, but ultimately all reach the point where the external economic environment becomes a more dominant factor than region-specific internal economic conditions in explaining the region's manufacturing value-added (MVA) growth... More specifically, the results show the that the part of MVA growth attributable to internally generated economic forces as measured by the regional effect tends to increase initially in step with rising per capita incomes and then begins to diminish continuously as per capita incomes rise beyond a certain critical level."

One interpretation of this is that the greater the processing or target value added in New Zealand, the smaller the relative importance of inherent cost advantages in primary production. Factor markets (such as for labour, transport, and capital) assume increasing importance, in the international competitiveness of processed goods. In other words, the economic viability of local processing of primary products is increasingly dependent on relative efficiencies of resource and factor goods. In the absence of protection or subsidies any shortfall in total factor productivity locally, relative to international standards, has to be compensated for by a corresponding margin in unit costs.

At one level this implies increasing exposure to international competition with increased transformation. Market structure arguments might work in the opposite direction, suggesting that increased product differentiation might offer a degree of protection from competition, albeit within narrow boundaries.

6. Trends in value added

Bearing in mind the measurement issues discussed earlier, empirical work includes analysis of pertinent official statistics, and of material on value added in the relevant sectors. Statistical analysis is described and interpreted in the following:

6.1 Inter-industry data. Attachment 1 sets out the relevant sections of the 1986/87 input-output tables, to show the relative extent of value added in that year for primary and processing industries, plus some of the major flows of intermediate inputs, at the 62 industry level.

This shows the disposition of output from primary industries into the processing industries, and directly or indirectly into service industries or final demand. At the bottom of each column are summary ratios for inputs, and at the end of each row, summary ratios for outputs.

The first row, entitled *dairy farming*, shows that in 1986/87 virtually all of the output of *dairy farming* (\$1345 million) was absorbed by *slaughtering and preserving meat* and *dairy products*, mainly the latter. In turn, about 75% of the output of *dairy products* was exported, most of the balance going to household consumption.

Value added to gross output ratios were 54% for *dairy farming*, and 22% for *dairy products*.

The second row, *sheep and beef farming*, shows that of the output of that industry (\$3102 million) about 40% went into *slaughtering and meat preserving* and 22% into *textiles*. In turn about 57% of the output of *slaughtering and meat preserving* (\$4526 million) and 52% of *textiles* output (\$2124 million) was exported.

Value added to gross output ratios were 48% for *sheep and beef farming*, 25% for *slaughtering and meat preserving*, and 30% for *textiles*.

The fourth row shows that of the output of *forestry and logging* (\$1519 million) about 15% and 7% respectively went as intermediate inputs into *wood and wood products* and *paper and paper products* with 55% allocated to increases in stocks.

Value added to gross output ratios were 69% for *forestry and logging*, 40% for *wood and wood products*, and 36% for *paper and paper products*.

Comments: This data shows inter-industry relationships, final demand patterns, value added ratios for one year only. They give a snapshot of the production chain for primary products, and highlight that value added ratios within industries were in that year much higher for the primary industries than for the relevant processing

industries. Unfortunately we have no direct measure of relationships since at that level of disaggregation, although SNA data discussed below does allow some broad comparisons between 1986/87 results, and those for later years.

What they do show are widely contrasting patterns of value added, within and across three simple chains. The attachment also shows how final demand patterns vary, again across production chains. The initial conclusion is that there is no necessary simple correlation between further processing and value added ratios, or between value added ratios and exports. Note though, that these conclusions are based on information for one year only, and these relationships are likely to have changed radically since.

6.2 National accounts. Trends in value added to output ratios by industry (25 disaggregation) at current and constant (1982) prices are derived from the latest national accounts. The constant price series for output is derived by deflating nominal gross output for each sector by the appropriate producer price index for outputs. The results are shown in graphs as per attachment 2. Nominal export to output ratios are also shown for the period from 1984.

For comparison purposes between this 25 industry aggregation and the 62 industry data discussed above:

- *Agriculture* includes dairy farming, sheep and beef farming, other farming and agricultural services.

- *Food beverages and tobacco* includes slaughtering and preserving of meat, dairy products and other food preparations.

Comments: Three points emerge from the tables and graphs in attachment ...

- Value added ratios in the processing sectors are markedly lower than in the primary sectors.

- With the exception of forestry for which a marked upward trend is evident since 1983, there is no clear trend in value added ratios.

- With the exception of Agriculture, value added ratios at constant prices appear to be falling.

As in Bollard (1991) there are some important caveats in considering this data. The NZSIC system includes some widely defined and some narrowly defined industries. In the former there are more inter-firm transactions, and these will affect the measure of value added.

In biological industries involving plant, tree or animal growth it may be difficult to incorporate the inputs to the biological process (e.g. pasture) into value added.

Agriculture: There were major declines in value added in the period 1972-85, followed by a sharp rise in 1985-1987. These movements are partly a consequence of terms of trade movements, legislative changes in price control, and problems in defining intermediate inputs satisfactorily. E.g. fertiliser and pasture development could be treated as either an intermediate input or as capital expenditure.

Forestry, Wood and Paper products: The major movements in the value added ratios in these sectors partly depend on the extent to which the product is sold downstream or is passed on to upstream industries for further processing. E.g. the upturn in value added in forestry from the mid 1980s reflects the increase in log prices, and the direct export of raw logs. This was at the expense of the wood and paper products sector which lost cheap raw materials. Changes in valuation of wood stocks have affected value added. In addition, the wood products sector has been affected by the boom-bust nature of the construction sector, and the paper products sector was dominated by the large capital investments of the 1970s and early 1980s.

Food processing: The value added ratio here may be biased by the inability of price deflators for this series to reflect large movements in meat and dairy prices. In the last decade it has also been affected by rationalisation problems in the meat industry. Livestock are not sold to the meat industry, but a charge is levied on their processing, which causes statistical problems.

Textiles and clothing: This sector's value added ratio is influenced by fluctuations in input prices e.g. wool and synthetic fibres, and also by import liberalisation which put output prices under downward pressure, particularly in clothing and footwear.

These broad ratios and their trends raise the question of the most appropriate measure of value added. Arguably, from a macroeconomic perspective the principal goal is aggregate GDP at constant prices, which reflects the level of output as well as a constant value added to output measure. Consistent with this, we should be looking at both parameters for suitable industry groups i.e. agriculture, food processing, textiles in an attempt to capture most of the value added chain for agricultural produce. Similarly forestry, wood products, and paper for this aspect of processing.

Initial consideration suggest that there are some important internal conflicts in this production chain, with each successive stage in the production chain wishing to maximise output prices and minimise input prices. At the same time competition in markets will limit output given upward pressure on prices. We also need to

consider the implication that "added-value" is not usually a primary or even secondary objective of firms.

Attachment 3 gives some of the results from aggregation of value added across related sector groupings. These are very crude measures of adding value to primary products, because many other non-primary intermediate inputs enter the production chain at various stages.

Summation of nominal value added and gross output for the first group (agriculture, food beverages and tobacco, textiles, trade restaurants and hotels) shows that over the period the aggregate value added to gross output ratio fluctuated around the 40% level, with no clear trend either way. However contributions to the total from some of the component industries did vary significantly. For example, agriculture contributed about 25% of this ratio in 1978, but its contribution was down to only 17% in 1991. In contrast, food etc. contributed only 15% of this ratio in 1978 but by 1991 its contribution was up to nearly 21%.

For the second group (forestry, wood products, paper and construction) there was some upward trend in the aggregate ratio, and also some shifts in contribution to the aggregate. The contribution of forestry moved from 7% to 22%, whereas the contribution of construction moved from 58% to 42%.

These results reflect shifts over time in industry weightings in aggregate value added and gross output for the groups, and do not necessarily have great explanatory power. However they do cast a different light on value added trends to that given by value added ratios for individual sectors.

6.3 Exports: Since some of the arguments surrounding added-value are couched in terms of export implications, we have included export to output ratios in the earlier value added to output graphs. We then tested for correlations between Agricultural value added and Agriculture, Food, beverage and tobacco, Textiles and Trade, restaurant and hotel exports. Similarly, the relationship between Forestry value added and Forestry, Wood products, Paper & printing and Construction exports were examined.

The correlation coefficient measures the extent to which any two variables are linearly related. Two variables with a perfectly negative relationship have a correlation coefficient equal to -1. Alternatively, two variables with a perfect positive relationship have a correlation coefficient equal to +1. Therefore the correlation coefficient may vary between -1 and +1, depending on the amount of correlation between the two variables being measured.

We find strong preliminary positive correlations between Agricultural value added and Agricultural (.54) and Trade, restaurant and hotel (.88) exports and negative correlation with Food, beverage and tobacco (-.46) and Textile (-.11) exports. In contrast, both Forestry exports (-.16) and paper exports (-.34) are negatively correlated with Forestry value added, while Wood products (.10) and Construction (.12) appear weakly correlated with Forestry value added.

Note that these tell us nothing about causation or its direction. A high correlation coefficient may suggest correlation between two variables, however it would not be valid to suggest that one variable is causing the movement of the other. It may be that both variables are caused by a third variable, for example the state of the economy. Also the correlation coefficient is measuring a linear relationship between two variables. It may be that where the correlation coefficient is low, the two variables may be related in a non-linear fashion.

7. Summary

We have reviewed some of the data on trends in value added, in both quantitative and qualitative frameworks. The qualitative framework reveals some important examples of efforts to exploit value-added opportunities, with particularly marked breakthroughs in development of new species and markets. The numbers suggest some positive trends in value added ratios for some production chains but in most cases these are not marked.

An initial conclusion is that liberalisation in New Zealand has increased the incentive for local industries to exploit export market opportunities and a lot of effort is going into adding value as one way to penetrate existing markets and develop new ones. However, liberalisation also works on the other direction by exposing local producers to international prices and cost structures (ie forestry), overseas technologies, and economies of scale and scope, and confronting them with trade barriers skewed against further domestic processing. Hence there will still be prominent examples where the net export and welfare gains for New Zealand are greater in commodity markets (e.g. raw logs) than in processed forms.

The shift along the processing chain is thus likely to continue to be evolutionary rather than revolutionary, with our export dependence remaining heavily slanted towards 'commodity' type exports.

8. Further Research

A list of industries have been drawn up to be analysed. It is intended to pick four or five case studies and show the success or failure of added value initiatives. In the third year of the study we could compare selected case studies with the New Zealand experience of adding value. After comparing different countries and agricultural industries the case studies have been narrowed down to five. These industries include:

- The Danish dairy industry;
- The Israeli fruit industry;
- The Chilean fruit industry;
- Pacific North West forestry industry;
- Australian beef industry.

8.1 Comparison Tables

Average Annual Growth Rates in Agricultural GDP for target countries

Fertiliser Consumption

Sources of Competitive Advantage

Government Involvement

Competitive Structure of Commodity

Foreign Direct Investment

Major Success Factors

9. Bibliography

- A Review of Science in New Zealand, Food Research (Excluding Dairy Research) Science Review No. 3, Ministry of Research, Science and Technology December 1991.
- ACIL, *Agricultural Marketing Regulation : Reality versus Doctrine*, NZ Business Roundtable, 1992.
- Badulescu, Petre (1991) *International Technological Knowledge Differences and Economic Growth Comparisons: USA Versus West Germany and Sweden Versus Norway, 1963-1988*. Applied Economics, 1991, 23, 263-282.
- Bollard AE & J McNaughton, *Adding Value in New Zealand The Role of Technology*, Ministry of Research Science and Technology Report No. 14 January 1992.
- Centre for International Economics, *The Economic Potential for Adding Further Value to Victorian Agricultural Products*. October 1990.
- Coffey W, Value-added Timber Exports, *NZ Forest Industries* June 1991 p12.
- Crocombe GT, Enright MJ & Porter ME, *Upgrading New Zealand's Comparative Advantage* Oxford University Press 1991.
- Crown Research Institutes, Research Companies for New Zealand. *Report of the Ministerial Science Task Group* Wellington June 1991.
- Dairy Exporter*, 'Adding value' - a key to securing European market access, February 1992.
- Department of Statistics (1991) *Inter-Industry of the New Zealand Economy 1987*. Wellington, New Zealand.
- Donald, Alon et al (1990) *Opportunities for Better Returns from the Products of Agriculture and Forestry*. Paper presented to National Science and Technology Analysis Group. Canberra, November 1990.
- Edlin B, Processing Pushes up Terms of Trade. *NZ Forest Industries* July 1991 p10.
- Enderwick P & Downes K, Value Added in Primary Industries: Three Cases From the New Zealand Meat Industry. *New Zealand Journal of Business*. Volume 13 1991.

Erickson, Rodney A (1989) *Export Performance and State Industrial Growth*. The Pennsylvania State University.

Export News, Added Value is Added Quality February 1990 p40.

Export News, Export gains likely from timber invention. July 14 1992.

Export News, Getting the most out of a log, February 27 1992 p10.

Export News, Hamburgers by the Million July 30 1992

Export News, It's Time To Get Smart. August 1991 p16.

Export News, Push for Radiata. August 15 1991 p1.

Export News, Revolution in Hardwoods February 27 1992.

Gallacher J Should we be maximising Added Value? *Manufacturer* June 1989 p6.

Grocers' Review, Convenience and Added Value Help Meal Solutions. August 1990 p41.

Harthoorn, R and Wossink, G (1987) *Backward and Forward Linkages of Dutch Agriculture*. *European Review of Agricultural Economics*, 14 (1987), 328-333.

Hewett EW, Horticulture is it Blooming or Withering? *Growing Today* Dec/Jan 1988 p27.

Lindsay, Holly (1989) *The Indonesian Log Export Ban: An Estimation of Foregone Export Earnings*. *Bulletin of Indonesian Economic Studies*, Vol. 25, No. 2, August 1989.

Maunder H, Research with Added Value. *NZ Commercial Grower* August 1989 p5.

MWBES, Adding Value to Lamb Exports, *NZ Meat Producer* Second 1991

New Electronics, Barcodes used for Pelt ID. June 92 p23

NZ Farmer, Avoid Traps adding value November 27 1991 p7

NZ Farmer, Avoid Traps adding value November 27 1991 p7

NZ Farmer, Enhancing Advantage key fortex objective, November 1991 p7

NZ Farmer, Fortex is Pelt Leader, February 26 1992.

NZ Meat Producer, Various Issues.

Park, Se-Hark (1988) *A Decomposition Analysis of Manufacturing Value Added and Structural Change by Industry and Region 1963-1980*. *The Developing Economies*, XXVI-3 (September 1988).

Pope CJ, *International Markets of Horticultural Products - What Place Australasia? Australian Temperate Fruits Review Conference 1989*.

Smith LW, Biochemicals from by products. *Food Technology in New Zealand* March 1991 p21.

Spring D, Success through Adding Value - the Dairy Industry case study, *Manufacturer* November 1991 p8.

Todhunter J, Adding Value to New Zealand Wool: A Blueprint Bulmer & Sons - Bradford February 1992.

Wood R, Added Value lifts Bobby Calf Profile. *NZ Farmer* 24.8.88

van Wyk L, Value-added Strategies for solid wood products. *NZ Forest Industries*, September 1989 p36.

INTER-INDUSTRY TRANSACTIONS TABLE
1986/87

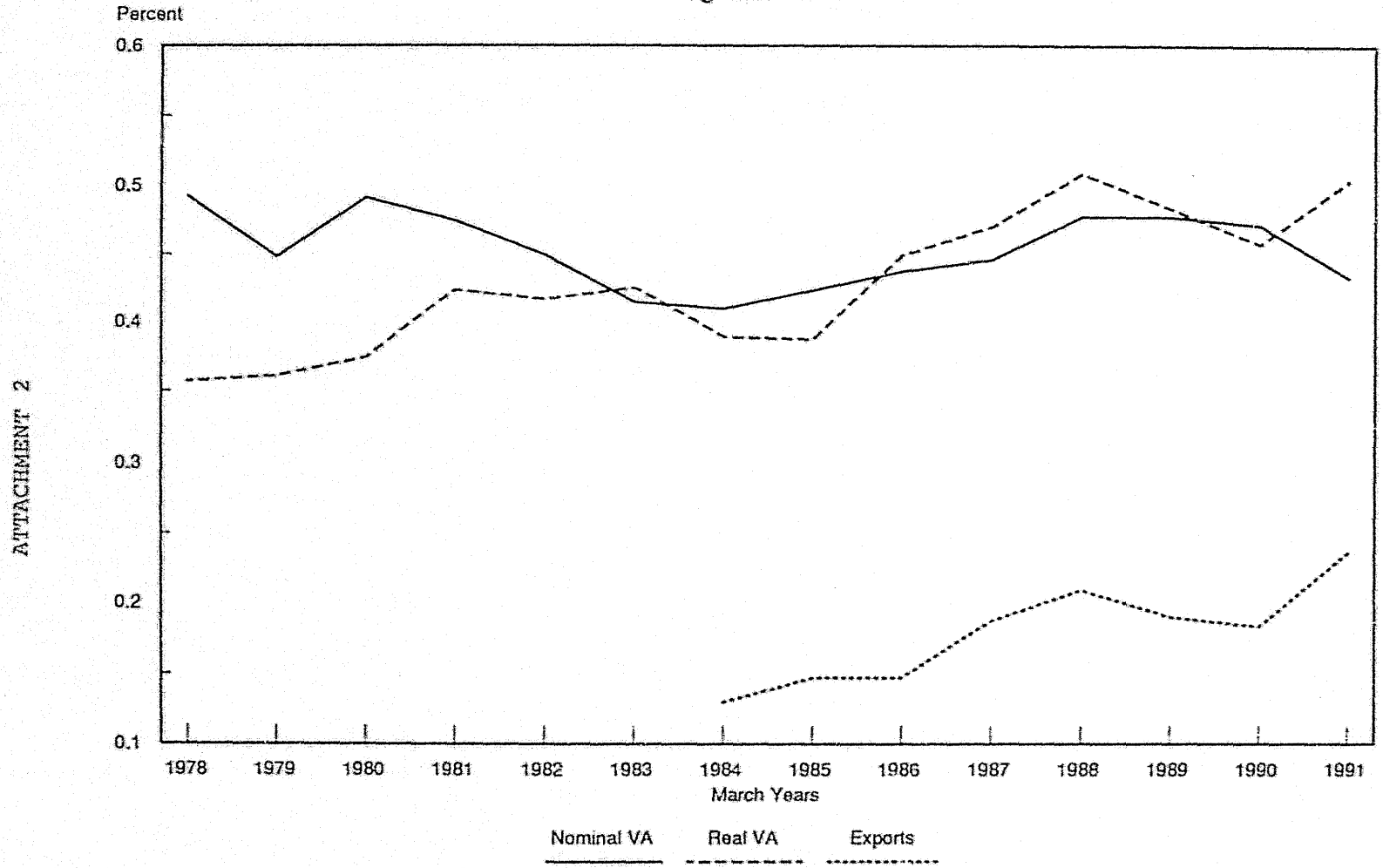
| INTER-INDUSTRY EXPORT | Primary sector | | Secondary sector | | Tertiary sector | | Quaternary sector | | Quinary sector | | Sextenary sector | | Septenary sector | | Octenary sector | | Non-Enumerated | | |
|---------------------------|----------------|---------|------------------|---------|-----------------|---------|-------------------|---------|----------------|---------|------------------|---------|------------------|---------|-----------------|---------|----------------|---------|------|
| | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | Domestic | Foreign | |
| Aluminium | 41 | 43 | 21 | 4 | 4 | 4 | 202 | 106 | 0 | 39 | 0/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Chemical | 43 | 44 | 21 | 4 | 4 | 4 | 202 | 106 | 0 | 39 | 0/2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Engineering | 27 | 46 | 16 | 6 | 0 | 0 | 412 | 22 | 29 | 42 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Food services | 35 | 12 | 13 | 11 | 7 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Textiles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Transport & communication | 2 | 0 | 0 | 0 | 0 | 0 | 808 | 1 | 67 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Wholesale & retail trade | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 331 | 344 | 134 | 29 | 194 | 1122 | 413 | 318 | 474 | 744 | 643 | 842 | 328 | 219 | 983 | 119 | 196 | 3187 | 6274 |
| Primary sector | 305 | 312 | 229 | 46 | 158 | 629 | 202 | 313 | 272 | 314 | 204 | 242 | 160 | 227 | 312 | 132 | 181 | 2877 | 5872 |
| Secondary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tertiary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quaternary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quinary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sextenary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Septenary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Octenary sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Enumerated | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note:
1. Goods returned to origin from the agricultural and forestry sector
2. Domestic total inter-industry flows from all sectors

| Export | Import | Balance | Export | Import | Balance |
|--------|--------|---------|--------|--------|---------|
| 0.21 | 0.24 | 0.03 | 0.21 | 0.24 | 0.03 |
| 0.22 | 0.25 | 0.03 | 0.22 | 0.25 | 0.03 |
| 0.23 | 0.26 | 0.03 | 0.23 | 0.26 | 0.03 |
| 0.24 | 0.27 | 0.03 | 0.24 | 0.27 | 0.03 |
| 0.25 | 0.28 | 0.03 | 0.25 | 0.28 | 0.03 |
| 0.26 | 0.29 | 0.03 | 0.26 | 0.29 | 0.03 |
| 0.27 | 0.30 | 0.03 | 0.27 | 0.30 | 0.03 |
| 0.28 | 0.31 | 0.03 | 0.28 | 0.31 | 0.03 |
| 0.29 | 0.32 | 0.03 | 0.29 | 0.32 | 0.03 |
| 0.30 | 0.33 | 0.03 | 0.30 | 0.33 | 0.03 |
| 0.31 | 0.34 | 0.03 | 0.31 | 0.34 | 0.03 |
| 0.32 | 0.35 | 0.03 | 0.32 | 0.35 | 0.03 |
| 0.33 | 0.36 | 0.03 | 0.33 | 0.36 | 0.03 |
| 0.34 | 0.37 | 0.03 | 0.34 | 0.37 | 0.03 |
| 0.35 | 0.38 | 0.03 | 0.35 | 0.38 | 0.03 |
| 0.36 | 0.39 | 0.03 | 0.36 | 0.39 | 0.03 |
| 0.37 | 0.40 | 0.03 | 0.37 | 0.40 | 0.03 |
| 0.38 | 0.41 | 0.03 | 0.38 | 0.41 | 0.03 |
| 0.39 | 0.42 | 0.03 | 0.39 | 0.42 | 0.03 |
| 0.40 | 0.43 | 0.03 | 0.40 | 0.43 | 0.03 |
| 0.41 | 0.44 | 0.03 | 0.41 | 0.44 | 0.03 |
| 0.42 | 0.45 | 0.03 | 0.42 | 0.45 | 0.03 |
| 0.43 | 0.46 | 0.03 | 0.43 | 0.46 | 0.03 |
| 0.44 | 0.47 | 0.03 | 0.44 | 0.47 | 0.03 |
| 0.45 | 0.48 | 0.03 | 0.45 | 0.48 | 0.03 |
| 0.46 | 0.49 | 0.03 | 0.46 | 0.49 | 0.03 |
| 0.47 | 0.50 | 0.03 | 0.47 | 0.50 | 0.03 |
| 0.48 | 0.51 | 0.03 | 0.48 | 0.51 | 0.03 |
| 0.49 | 0.52 | 0.03 | 0.49 | 0.52 | 0.03 |
| 0.50 | 0.53 | 0.03 | 0.50 | 0.53 | 0.03 |
| 0.51 | 0.54 | 0.03 | 0.51 | 0.54 | 0.03 |
| 0.52 | 0.55 | 0.03 | 0.52 | 0.55 | 0.03 |
| 0.53 | 0.56 | 0.03 | 0.53 | 0.56 | 0.03 |
| 0.54 | 0.57 | 0.03 | 0.54 | 0.57 | 0.03 |
| 0.55 | 0.58 | 0.03 | 0.55 | 0.58 | 0.03 |
| 0.56 | 0.59 | 0.03 | 0.56 | 0.59 | 0.03 |
| 0.57 | 0.60 | 0.03 | 0.57 | 0.60 | 0.03 |
| 0.58 | 0.61 | 0.03 | 0.58 | 0.61 | 0.03 |
| 0.59 | 0.62 | 0.03 | 0.59 | 0.62 | 0.03 |
| 0.60 | 0.63 | 0.03 | 0.60 | 0.63 | 0.03 |
| 0.61 | 0.64 | 0.03 | 0.61 | 0.64 | 0.03 |
| 0.62 | 0.65 | 0.03 | 0.62 | 0.65 | 0.03 |
| 0.63 | 0.66 | 0.03 | 0.63 | 0.66 | 0.03 |
| 0.64 | 0.67 | 0.03 | 0.64 | 0.67 | 0.03 |
| 0.65 | 0.68 | 0.03 | 0.65 | 0.68 | 0.03 |
| 0.66 | 0.69 | 0.03 | 0.66 | 0.69 | 0.03 |
| 0.67 | 0.70 | 0.03 | 0.67 | 0.70 | 0.03 |
| 0.68 | 0.71 | 0.03 | 0.68 | 0.71 | 0.03 |
| 0.69 | 0.72 | 0.03 | 0.69 | 0.72 | 0.03 |
| 0.70 | 0.73 | 0.03 | 0.70 | 0.73 | 0.03 |
| 0.71 | 0.74 | 0.03 | 0.71 | 0.74 | 0.03 |
| 0.72 | 0.75 | 0.03 | 0.72 | 0.75 | 0.03 |
| 0.73 | 0.76 | 0.03 | 0.73 | 0.76 | 0.03 |
| 0.74 | 0.77 | 0.03 | 0.74 | 0.77 | 0.03 |
| 0.75 | 0.78 | 0.03 | 0.75 | 0.78 | 0.03 |
| 0.76 | 0.79 | 0.03 | 0.76 | 0.79 | 0.03 |
| 0.77 | 0.80 | 0.03 | 0.77 | 0.80 | 0.03 |
| 0.78 | 0.81 | 0.03 | 0.78 | 0.81 | 0.03 |
| 0.79 | 0.82 | 0.03 | 0.79 | 0.82 | 0.03 |
| 0.80 | 0.83 | 0.03 | 0.80 | 0.83 | 0.03 |
| 0.81 | 0.84 | 0.03 | 0.81 | 0.84 | 0.03 |
| 0.82 | 0.85 | 0.03 | 0.82 | 0.85 | 0.03 |
| 0.83 | 0.86 | 0.03 | 0.83 | 0.86 | 0.03 |
| 0.84 | 0.87 | 0.03 | 0.84 | 0.87 | 0.03 |
| 0.85 | 0.88 | 0.03 | 0.85 | 0.88 | 0.03 |
| 0.86 | 0.89 | 0.03 | 0.86 | 0.89 | 0.03 |
| 0.87 | 0.90 | 0.03 | 0.87 | 0.90 | 0.03 |
| 0.88 | 0.91 | 0.03 | 0.88 | 0.91 | 0.03 |
| 0.89 | 0.92 | 0.03 | 0.89 | 0.92 | 0.03 |
| 0.90 | 0.93 | 0.03 | 0.90 | 0.93 | 0.03 |
| 0.91 | 0.94 | 0.03 | 0.91 | 0.94 | 0.03 |
| 0.92 | 0.95 | 0.03 | 0.92 | 0.95 | 0.03 |
| 0.93 | 0.96 | 0.03 | 0.93 | 0.96 | 0.03 |
| 0.94 | 0.97 | 0.03 | 0.94 | 0.97 | 0.03 |
| 0.95 | 0.98 | 0.03 | 0.95 | 0.98 | 0.03 |
| 0.96 | 0.99 | 0.03 | 0.96 | 0.99 | 0.03 |
| 0.97 | 1.00 | 0.03 | 0.97 | 1.00 | 0.03 |
| 0.98 | 1.01 | 0.03 | 0.98 | 1.01 | 0.03 |
| 0.99 | 1.02 | 0.03 | 0.99 | 1.02 | 0.03 |
| 1.00 | 1.03 | 0.03 | 1.00 | 1.03 | 0.03 |

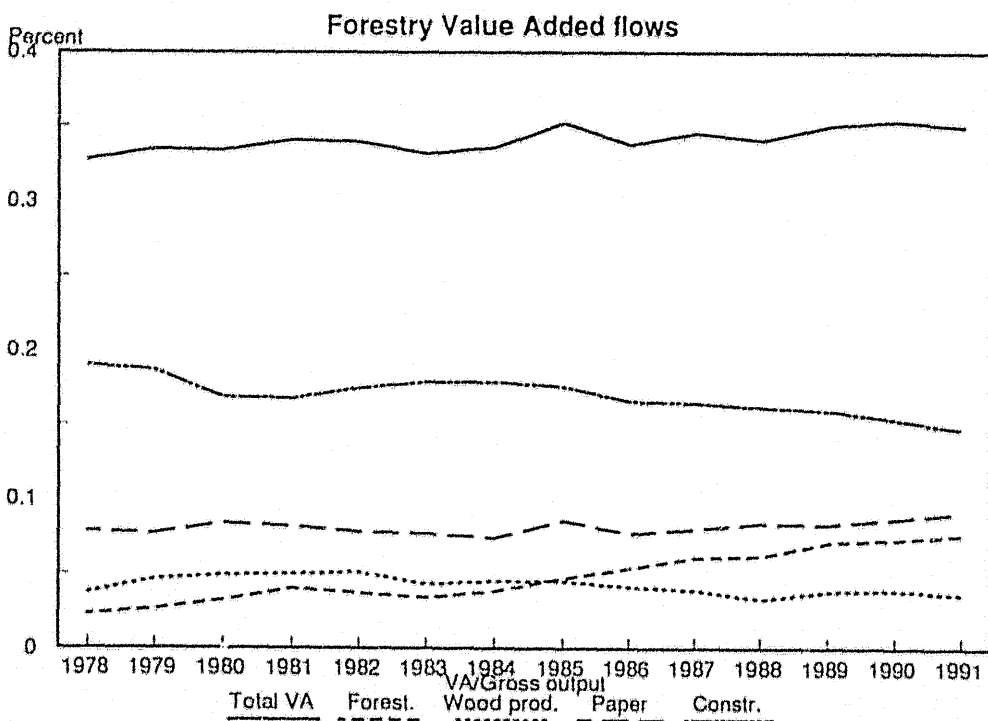
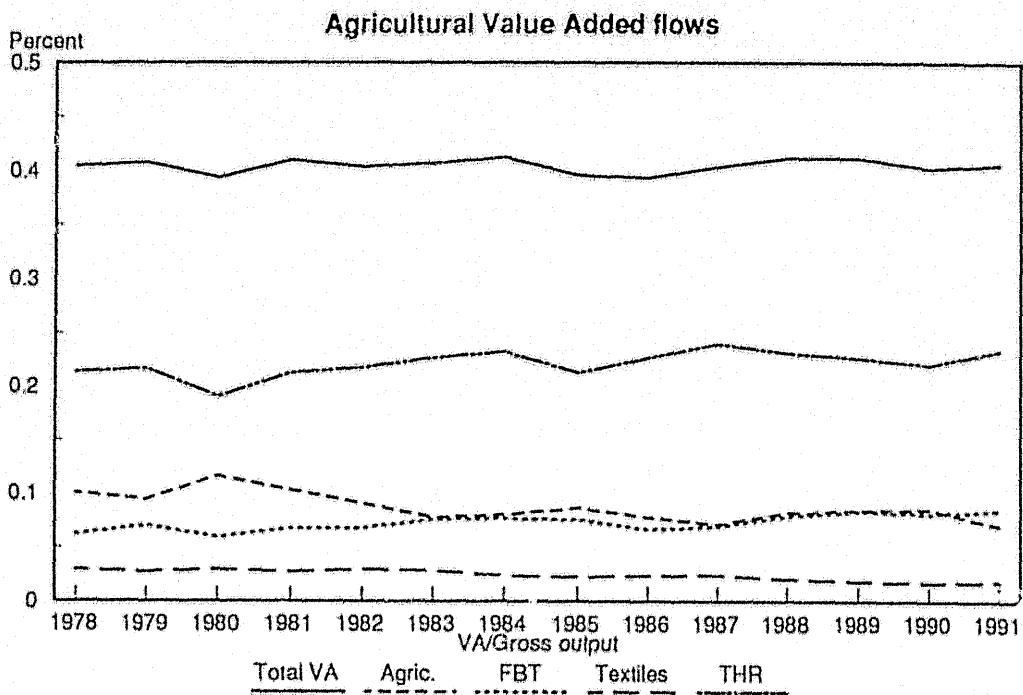
Note:
1. Goods returned to origin from the agricultural and forestry sector
2. Domestic total inter-industry flows from all sectors

Agriculture



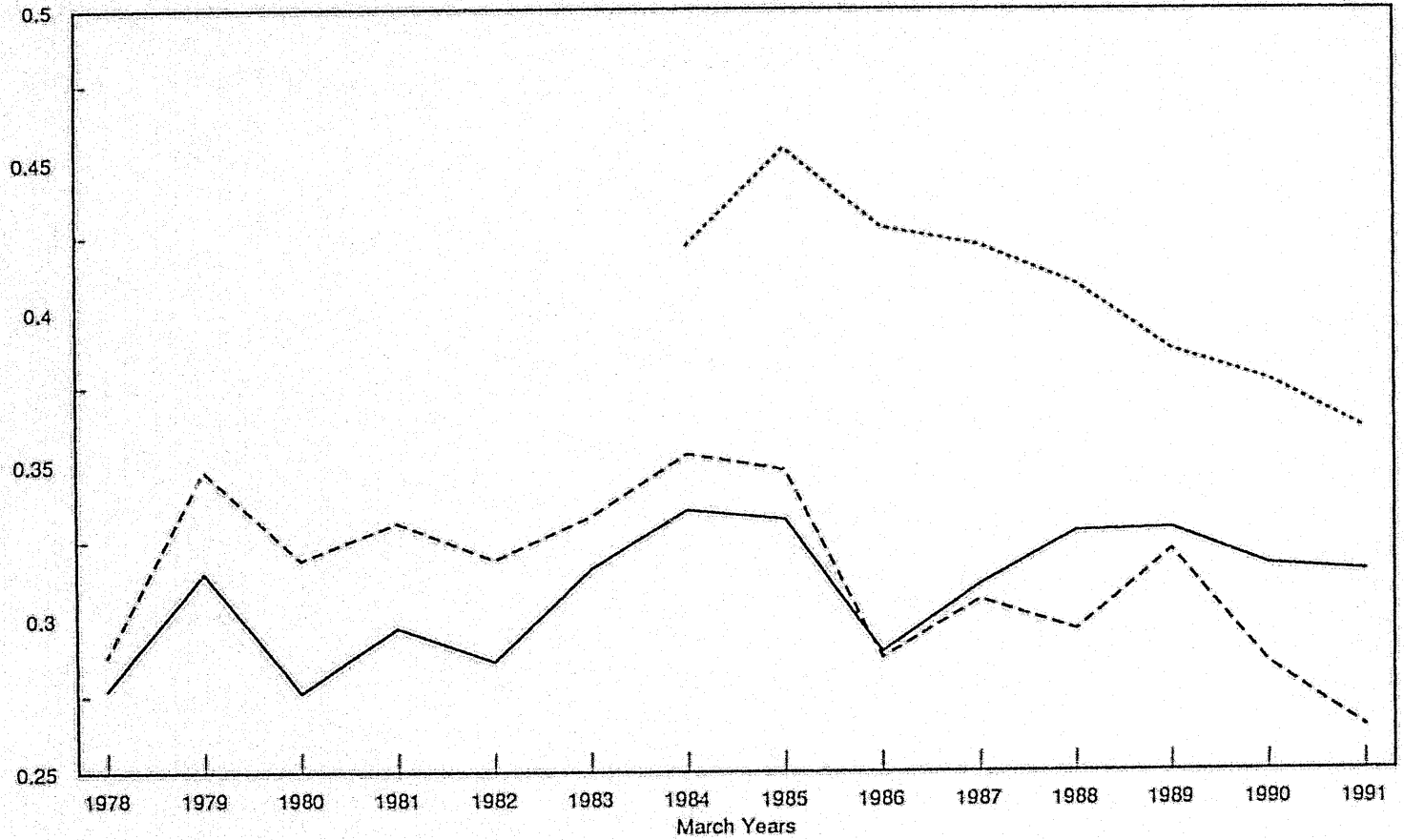
Gross output is the denominator

ATTACHMENT 3



Food, beverages and tobacco

Percent



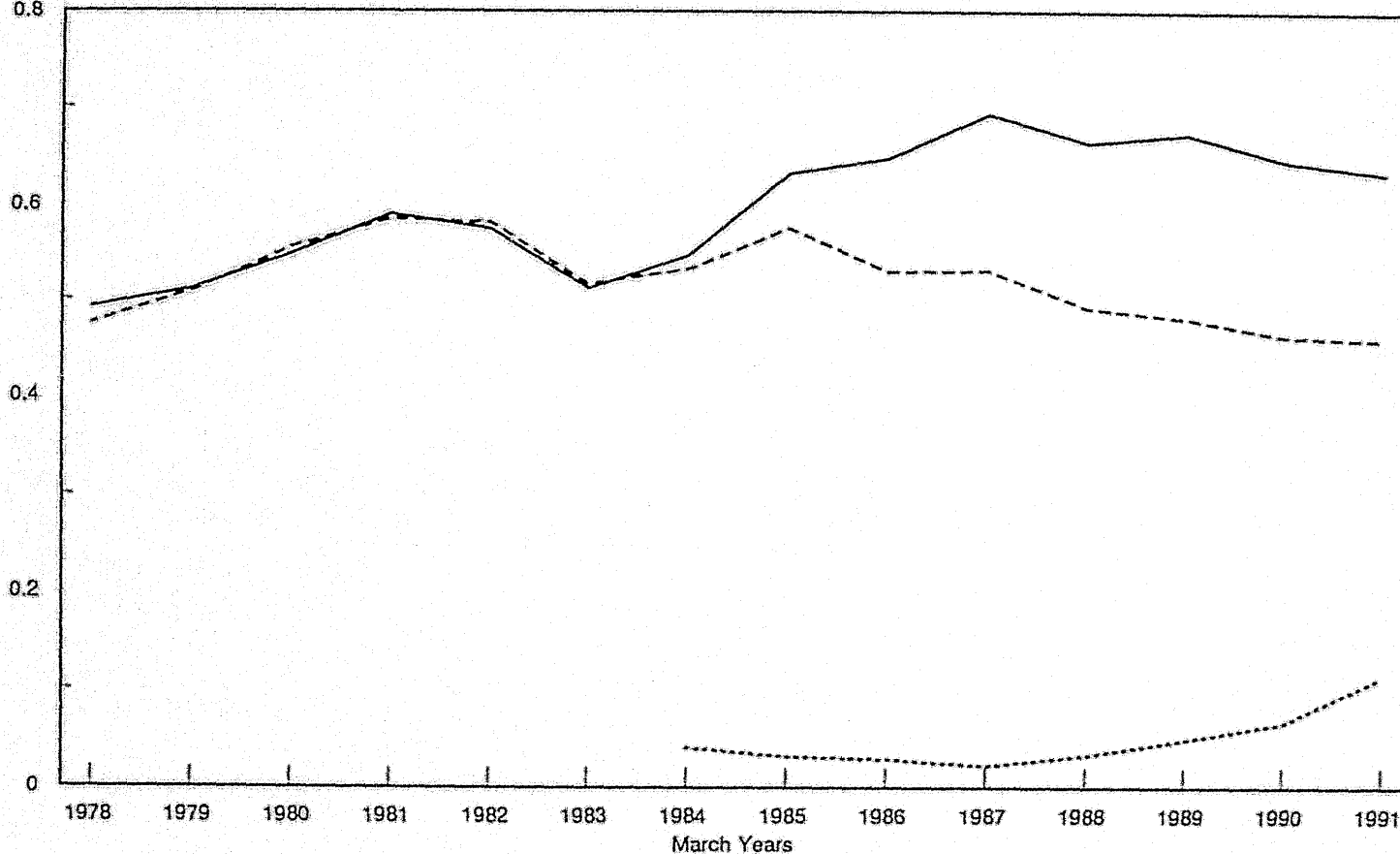
Nominal VA Real VA Exports

Gross output is the denominator

Forestry

Percent

0.8



March Years

Nominal VA

Real VA

Exports

Gross output is the denominator

Textiles

Percent

0.45

0.4

0.35

0.3

0.25

0.2

0.15

1978

1979

1980

1981

1982

1983

1984

1985

1986

1987

1988

1989

1990

1991

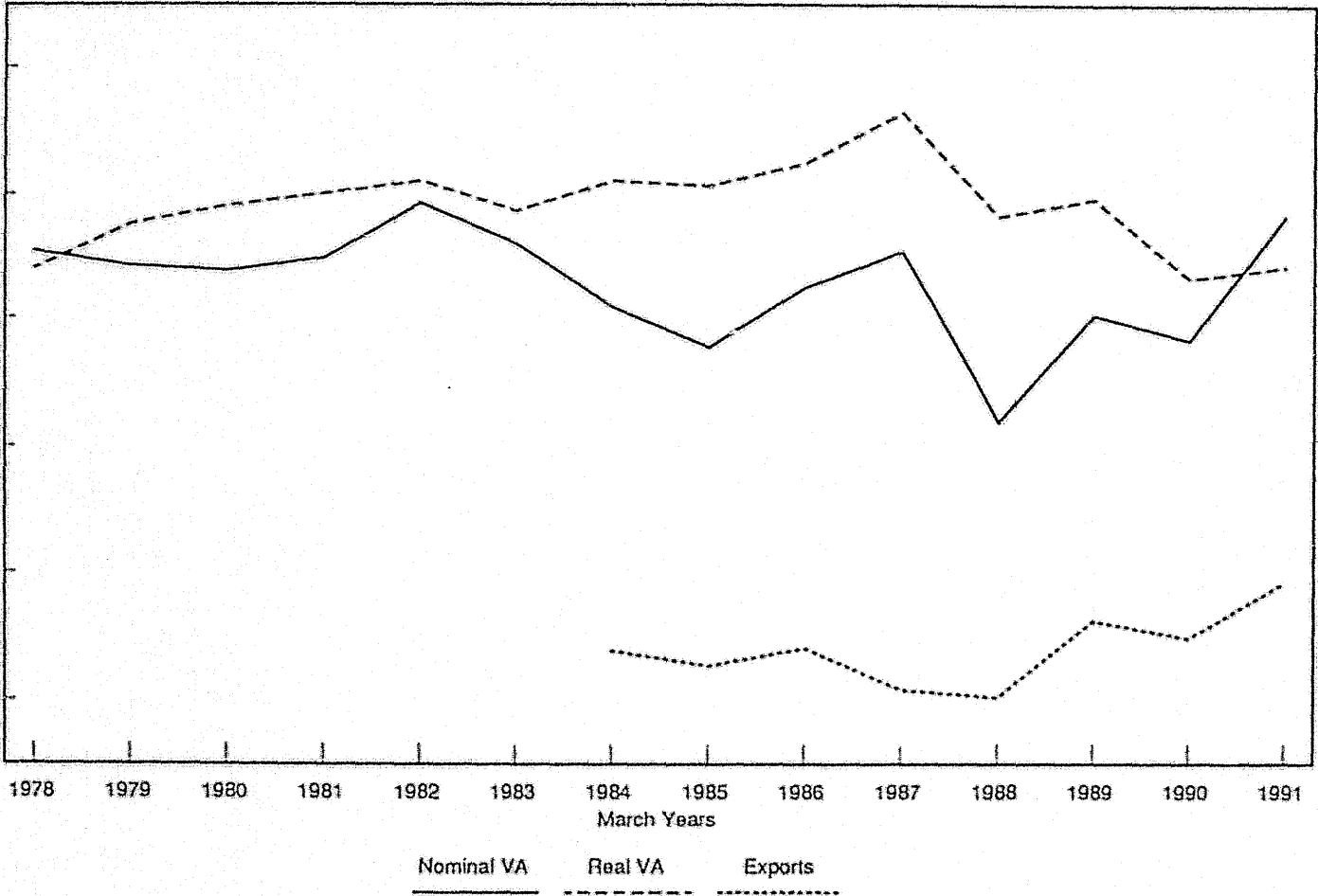
March Years

Nominal VA

Real VA

Exports

Gross output is the denominator



Paper and printing

Percent

0.45

0.4

0.35

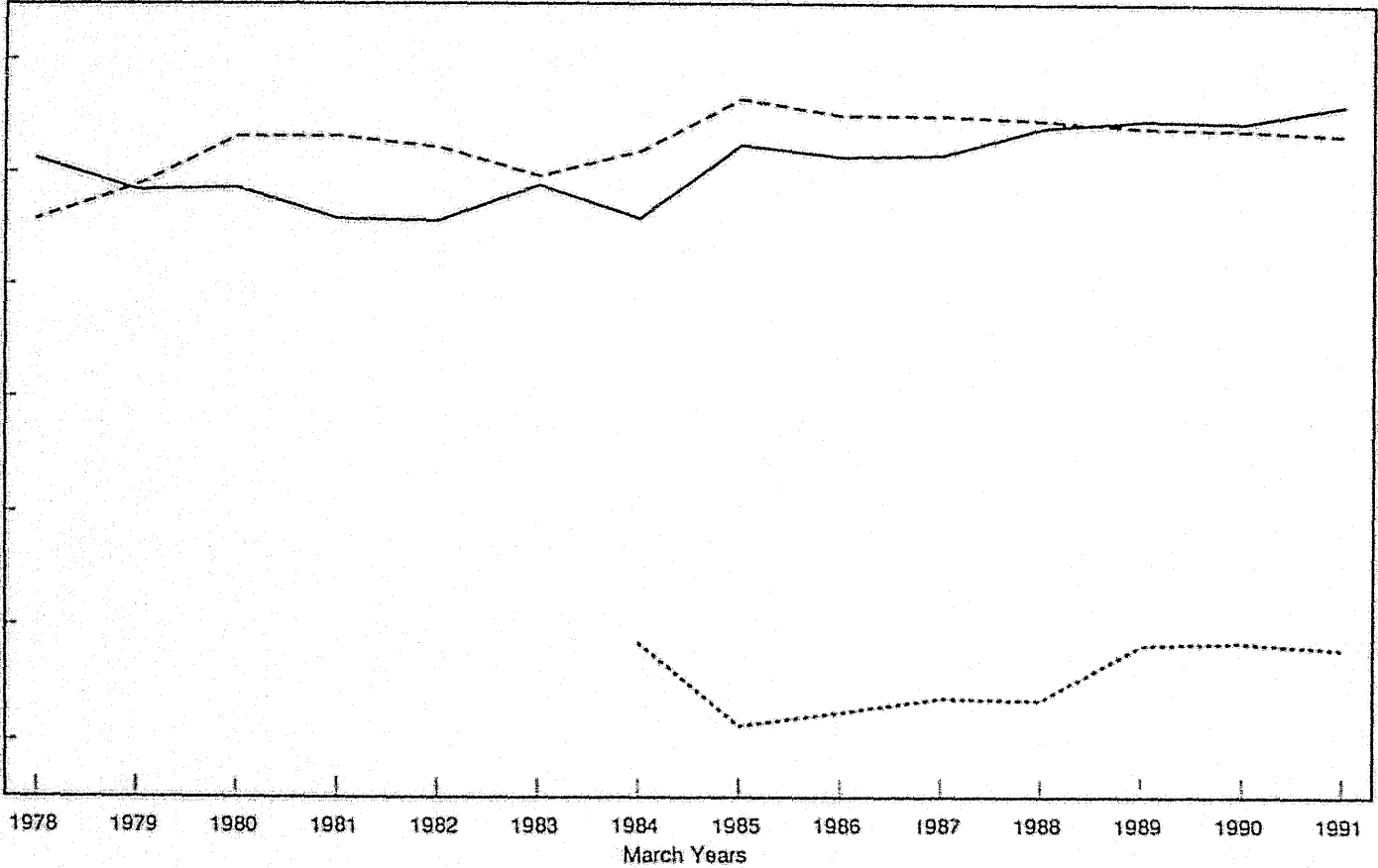
0.3

0.25

0.2

0.15

0.1



Nominal VA

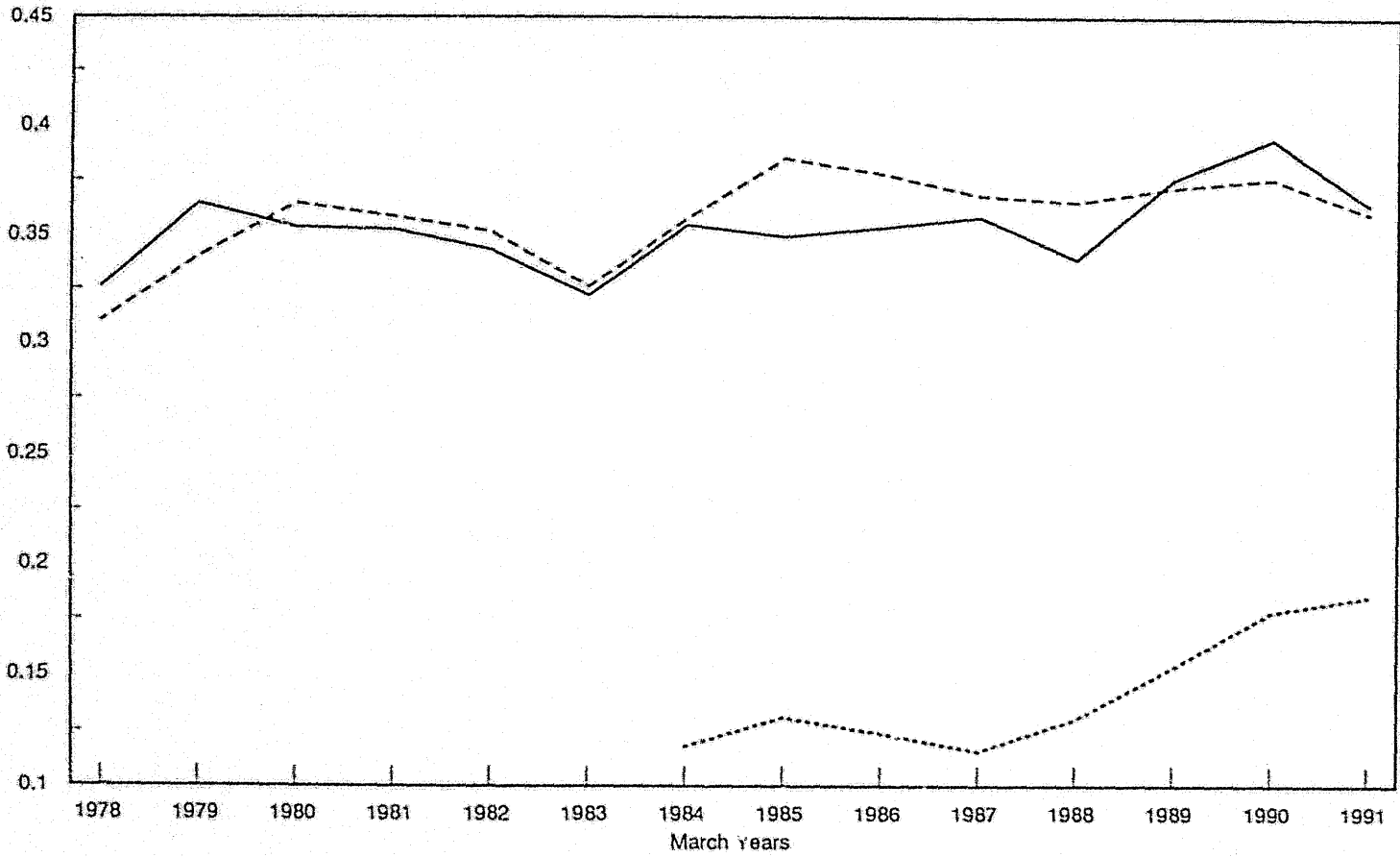
Real VA

Exports

Gross output is the denominator

Wood products

Percent



Nominal VA

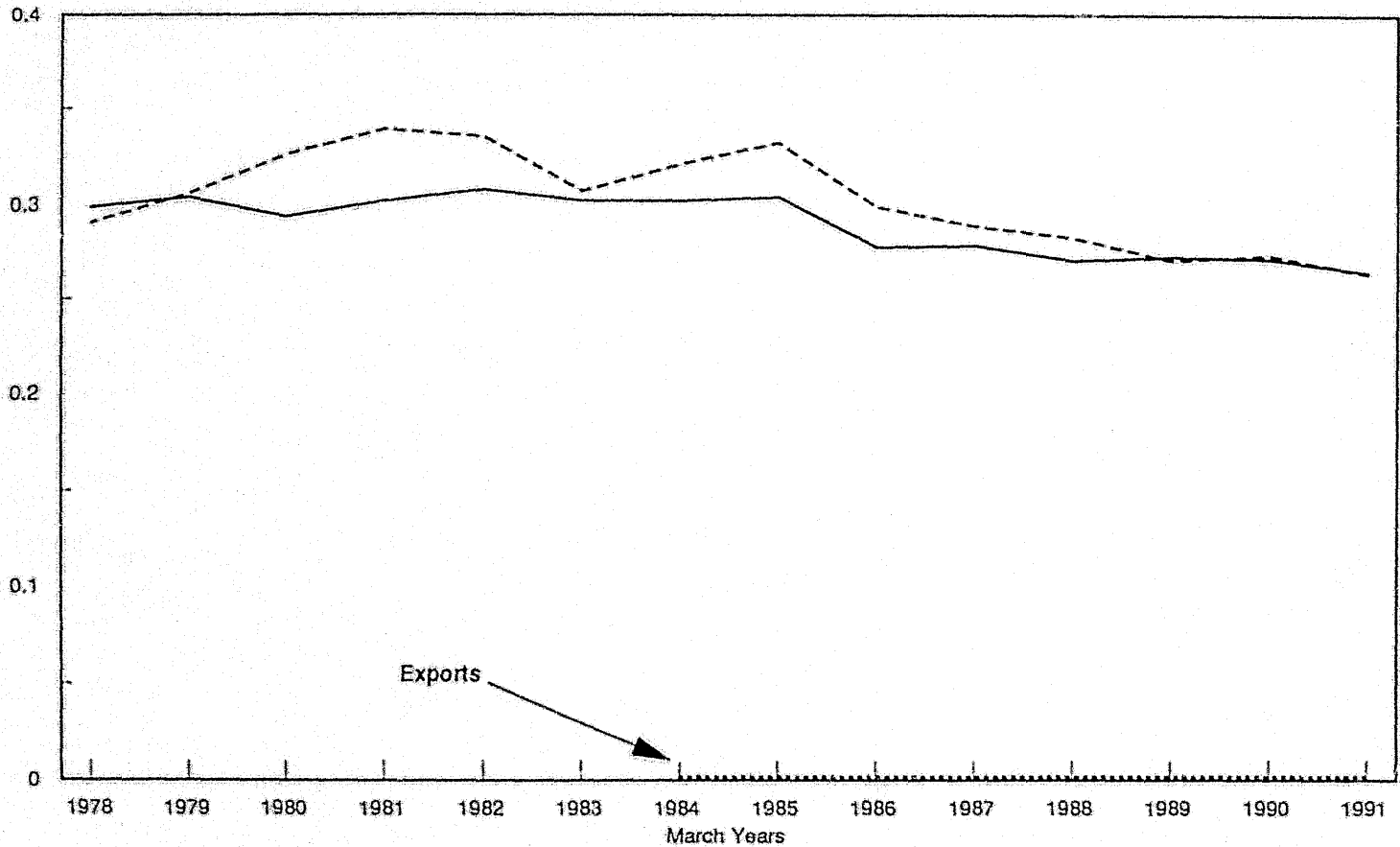
Real VA

Exports

Gross output is the denominator

Construction

Percent



Exports

Nominal VA

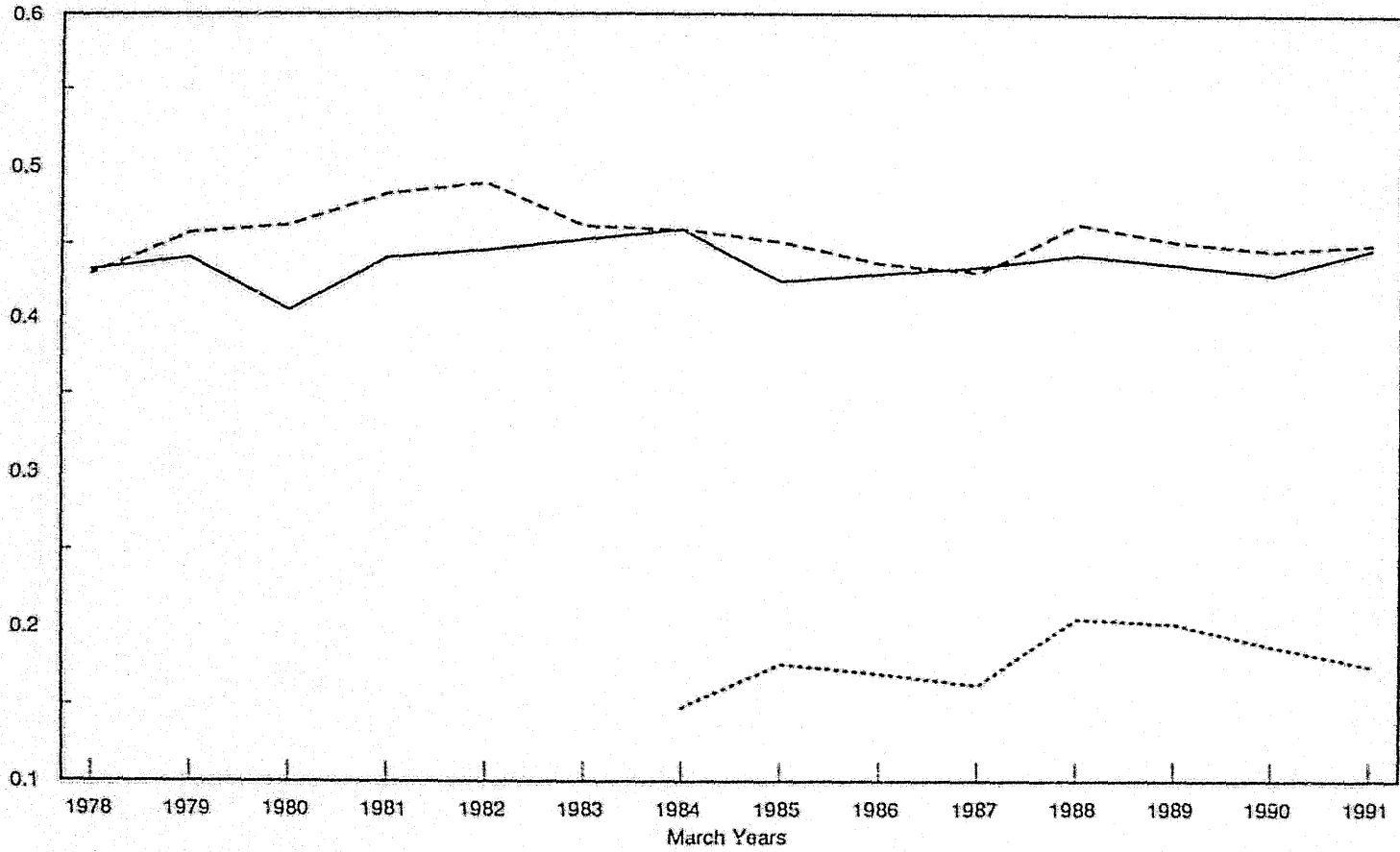
Real VA

Exports

Gross output is the denominator

Trade, restaurants and hotels

Percent



Nominal VA

Real VA

Exports

Gross output is the denominator