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**FRAMEWORK FOR ANALYZING
THE COMPETITIVENESS OF
THE AGRI-FOOD SECTOR**

Working Paper 3-93

**Competitiveness Division
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ABSTRACT

1. Competitiveness is the sustained ability to profitably gain and maintain market share in domestic and/or export markets. It also is the ability to profitably provide buyers with a product-price combination that is at least as attractive as that offered by other suppliers. These definitions are subject to a number of qualifications.
2. Competitiveness of a product/commodity/industry/sector can be assessed in terms of export and import market shares and other performance measures such as growth rates of output, investment and profitability. International comparisons of underlying factors such as productivity growth rates and input prices/costs help to identify reasons for changes in competitiveness.
3. Competitiveness at any point in time is a function of the ability to provide buyers with value for money, that is, of cost and product quality. Success in meeting this goal is a function of a country's resource base and how well it has managed to upgrade its factors of production. The size and other characteristics of domestic demand also have an influence. Other determinants are the organization and goals of firms and how they compete with each other, and the performance of supporting and related industries. Government policies and programs and chance events also have important influences on the competitiveness of a sector. The effect of each of these determinants is influenced by the others; the "linkages" among them are a key factor in competitiveness.
4. This view of the nature and determinants of competitiveness is proposed as the basis for an agri-food competitiveness framework to guide the research and policy analysis of Agriculture Canada. It incorporates, among others, the ideas on competitiveness proposed by Michael Porter. It can be applied to any one part of the sector, but might be most useful if applied in an overall agri-food sector context.
5. Application of the framework to the agri-food sector and various parts of it encounters a number of data and methodological problems but provides useful insight to competitiveness issues. Perhaps most importantly, application of the "competitiveness lens" to public policies and programs can contribute to consideration of new or revised approaches that might facilitate industry self-reliance, market responsiveness, and competitiveness.

FOREWORD

This working paper was drafted by Don West, with significant input from many people both within and outside Agriculture Canada.

The framework described will undoubtedly be revised over time, in light of our experience. In this regard, comments and suggestions from readers would be very much appreciated. Please forward any comments to Don West, Competitiveness Division, Policy Branch, Agriculture Canada, Room 691, Sir John Carling Building, 930 Carling Avenue, Ottawa, Ontario, K1A 0C5.

Ken Ash
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EXECUTIVE SUMMARY

The economic well being of Canada's agri-food sector is increasingly influenced by its ability to compete with other countries in domestic and foreign markets. One objective of this paper is to contribute to a common understanding of what is meant by the concept of competitiveness. A second objective is to outline ways to generate the information needed for assessing industry competitiveness, evaluating its determinants and identifying the implications for government policies and programs.

The Concept of International Competitiveness

As applied at the product, firm, industry or sector level, there are basically two common approaches to defining competitiveness. One is in terms of its result, especially the ability to profitably gain and maintain market share. The second is to define it in terms of its attributes, that is, the ability to profitably provide buyers with a product-price combination that is at least as attractive as that offered by other suppliers. More specifically, the definitions are:

Market Share: The sustained ability to profitably gain and maintain market share in domestic and/or export markets.

Product-Price: An internationally competitive firm, industry or sector is one that has the sustained ability to produce and deliver goods and services in the form and at the time, place, and price which together form a package at least as attractive to buyers in domestic and/or international markets as that offered by potential foreign suppliers, while earning at least opportunity costs on resources employed.

The concept of competitiveness gives rise to a number of conceptual and empirical issues. The following observations may be made:

- No one performance measure, such as market share, will likely be sufficient to serve as an adequate indicator of competitiveness.
- At the regional or national level, the concept of competitiveness is especially controversial but a productivity definition may be appropriate.

- Trade and investment decisions by firms are closely linked, especially in the strategies of "global" firms. This weakens the use of trade measures alone as competitiveness indicators; the assessment and interpretation of the competitiveness of an industry in a particular country must take into account the behaviour of multinational firms.
- Domestic and international trade policies affect measures of competitiveness and measures of the determinants of competitiveness. Competitiveness issues most often relate to how well an industry would perform in a different policy environment.
- The focus of this framework is on competitiveness in international markets but this also involves competitiveness with other industries in both domestic and export markets.
- While efforts must be made to assess competitiveness at a point in time (e.g., today), such efforts encounter a range of conceptual and empirical problems. The analysis of changes over time in performance and in the factors influencing competitiveness is helpful both in assessing current competitiveness and in finding ways to improve it.

Determinants of Competitiveness

The theory of comparative advantage and various extensions of it provide an important basis for understanding the factors which influence the competitiveness of an industry. These factors include differences among countries in resource endowments and the proportions in which resources are used by various products, consumer preferences, economies of scale and the structure of markets. The theory shows that specialization and trade usually (but not always) leads to greater economic welfare for all countries involved and that free trade tends to provide this result.

Industries that would have the lowest opportunity cost compared to other countries in the absence of trade (i.e., have a comparative advantage) are those that would be the most competitive in a free trade situation. The competitiveness of an industry can be increased through increased productivity, lower relative input prices, or a relatively stronger product market.

Trade theory, however, provides limited information on the dynamics of how to increase competitiveness and why industries in some countries are more successful at doing so than others. The work of

Michael Porter and others has examined these questions from more of a business management perspective. Porter, in his book The Competitive Advantage of Nations, focuses on the characteristics of a "home market" which contribute to industry success in international markets. He groups the characteristics into a set of six interrelated determinants. They are factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry, chance and government policies.

Other researchers have taken somewhat different approaches. Rugman and D'Cruz, for example, have argued that Porter's model ("diamond") needs to be modified for Canada to account for its close linkages to the U.S., especially since the Canada-U.S. Free Trade Agreement. They also emphasize the roles of strategic alliances and industry clusters. Martin et al. make a distinction between factors that are controlled by industry or government or are uncontrollable.

Analytical Framework for the Agri-Food Sector

The proposed framework for analyzing the competitiveness of Canada's agri-food sector and sub-sectors (industries) incorporates many of the ideas discussed above.

While the framework could be applied to the sector as a whole or any part of it, the ultimate goal is the welfare of the overall agri-food sector, consistent with economy-wide objectives.

The framework has three main elements:

- 1) general assessment of degree of competitiveness and likely changes in competitiveness as indicated by changes in performance measures,
- 2) analysis of why a sector/industry/commodity/product is more or less competitive than others and is becoming more or less competitive, i.e., identification of the determinants of competitiveness and how they operate in specific cases, and
- 3) analysis of policies and programs in terms of their effects on competitiveness and the development of policy options to improve competitiveness.

1. *General Assessment of Competitiveness*

The competitiveness of industries with few barriers to trade can be assessed by examining their economic performance. Performance indicators include trends in market share measures such as: (a) domestically produced sales as a share of total domestic market, (b) exports as a share of the domestic markets of foreign countries, (c) exports as a share of world trade, (d) exports as a share of the domestic industry's production, of agri-food exports, and of total exports, and (d) the corresponding import shares. Other performance indicators are trends in profitability, output, value added, exports, imports, product prices and investment, including foreign direct investment. The standards for comparison are growth rates in previous periods and those in other countries. A range of indicators should be examined and interpreted carefully, especially the degree to which they might be influenced by domestic and trade policies.

A more complete assessment of competitiveness, especially where barriers to trade or domestic support programs are significant (in Canada or other countries) would involve examination of trends compared to those in other countries of some of the determinants of competitiveness identified below.

2. *Determinants of Competitiveness*

- ***Cost Competitiveness***

Cost is clearly a key determinant or attribute of competitiveness especially for relatively homogeneous products with many suppliers. Like all determinants, this applies at all levels and segments of the production-processing-distribution system.

While ideally one would like to compare unit marginal costs across countries and how they are related to output, this is typically not feasible, at least beyond the primary commodity level. However, comparisons of prices paid for major inputs and productivity levels, and how these have been changing in each country, provide some clues to cost competitiveness. They also can point to possible problem areas such as raw product prices, labour costs or productivity, although a weakness in one such area might be offset by a strength in another.

- *Product Competitiveness*

Product competitiveness refers to the ability to provide non-price characteristics of the "product" such as its physical attributes, delivery services, guarantees and other terms and conditions of sale demanded by buyers. Since these characteristics typically involve the preferences of buyers or are very confidential, assessment of product competitiveness will be highly judgemental. However, information on buyer preferences as revealed by the analysis of market trends, surveys, trade shows and so on could be compared with the product mix of the industry.

As in the case of cost competitiveness, having identified a possible area of concern or opportunity, the issue then becomes one of why and what to do about it. This leads to the consideration of the following more fundamental determinants.

- *Factor Conditions*

A continuing process of upgrading factors used in production, processing and distribution is needed for sustained competitiveness. Examples from the agri-food sector include research on soil and water conservation methods, formal and on-the-job training of workers, managers and scientists, plant and animal breeding programs and improvements to transportation infrastructure. Empirical studies of the costs and benefits of these programs and the effectiveness of the relevant institutional structures would help efforts to upgrade factors.

Canada's supply of basic and advanced labour, technology and capital includes foreign sources.

- *Demand Conditions*

Characteristics of domestic demand such as its size, growth rate and composition can have either a positive effect on competitiveness by stimulating innovation and entry of firms or a negative effect by inducing complacency. Positive aspects of Canada's domestic food demand include high per capita incomes, a multicultural society and consumer pressures for convenient, nutritious and safe foods. However, the relatively small size and a slow rate of growth of the domestic food market reduces the incentive and increases the risk of new product development, although they also put pressure on firms to find export markets. Some parts of the sector have a long tradition of tailoring products

to the needs of specific export markets and trade liberalization will increase the rewards for doing so.

Research on Canadian and foreign demand conditions could include market forecasting, analysis of consumption trends by socio-economic characteristics, assessments of consumer preferences and the estimation of demand functions.

- *Related and Supporting Industries*

Strong supporting industries facilitate access to cost effective, innovative inputs. Related industries complement various "value chain" activities (such as technology development, manufacturing and distribution) and increase demand for complementary products.

Despite the advantages of strong domestic suppliers, the relatively small Canadian agri-food sector also depends on access to foreign suppliers. This access will be facilitated by trade liberalization.

The provision of transportation services, credit, and other inputs involves a number of policy issues. Research could focus on these and more generally on the effectiveness and efficiency of domestic and foreign related and supporting industries in meeting the needs of the sector. Which industries are classified as "related" and "supporting" depends on the industry of primary interest. For any one part of the agri-food sector, other parts of the sector could be important as either a source of goods and services or a market for products or byproducts.

- *Sector Structure, Linkages and Strategies*

Industry structure influences and is influenced by firm activities and industry performance. Issues relate to economies of size and scope, the nature of competition among firms, vertical and horizontal linkages, institutions, the degree to which the industry is exposed to world markets and the role of multinational firms. Government policies with respect to competitiveness, food quality and safety, market regulation and international trade have an important influence on how the sector is organized and performs.

Research on these issues would be based on microeconomic industrial organization and strategic management theories. An understanding of firm level and institutional level strategies would

be needed but the focus would be on public policy issues, not the development of firm level strategies.

- *The Role of Chance*

Unexpected or chance events, from the point of view of sector participants, can significantly affect sector competitiveness. Examples are extremely favourable or unfavourable weather in Canada or foreign countries, trade agreements and technological changes. Policies for ameliorating the effects of such changes (e.g., price and income stabilization programs) can themselves affect competitiveness.

Research is needed on ways to facilitate adjustment to chance events including the development of production and marketing systems responsive to change.

- *Government Policies and Activities*

Macroeconomic, horizontal and sectoral policies clearly influence the competitiveness of the agri-food sector. They do so through their effects on the other determinants.

Research projects such as those identified above or focusing on a specific policy (e.g., tax policy) would contribute to understanding these effects.

3. *Policy Analysis and Development*

The identification and analysis of policy changes which would contribute to improved competitiveness of the agri-food sector and/or parts of it requires a program of research and consultation with all affected parties. A common understanding of the concept of competitiveness and the factors influencing it is thus needed.

This framework provides a way of defining competitiveness issues, provides a guideline for the research needed, and should be helpful in identifying policy options. Significant methodological and data limitations in conducting the research and analysis are recognized. However, to the extent feasible, the aim remains one of creating an improved and more widespread understanding of agri-food industry competitiveness, and related public policy options to better enable industry to improve its economic performance and realizing its full potential.

FRAMEWORK FOR ANALYZING THE COMPETITIVENESS OF THE AGRI-FOOD SECTOR

Competitiveness Division Agriculture Canada

I. Introduction

The current drive by business and government to assess, understand and improve the international competitiveness of firms and industries has arisen from the globalization of business activities and trade liberalization. A more open economy in a world focusing on global markets for products and global sources of inputs increases the need for the agri-food sector in Canada to be internationally competitive. Only by improving its competitiveness can the sector provide increased incomes for its participants and enhance its contribution to national economic growth.

Government policies in Canada, at the national, provincial and industry/sectoral levels, must increasingly take into account the goal of international competitiveness since such a large part of the economy is subject to international pressures and/or can benefit from international markets. This focus on competitiveness, however, has raised issues with respect to the determinants of competitiveness and how this goal relates to other goals of society. These issues clearly apply to the agri-food sector.

Our aim in developing this analytical framework is twofold:

- 1) to contribute to a common understanding of the concept of "agri-food sector competitiveness"; and,
- 2) to propose an analytical approach that will generate the information necessary to assess (a) the agri-food sector's current and likely future competitive strengths and challenges and (b) the implications for all parts of the sector of existing and possible new policies and programs.

Sections II and III discuss the concept of competitiveness and review theories of competitiveness respectively. Section IV builds on II and III to develop a framework for assessing competitiveness and analyzing its determinants. Section IV also briefly discusses the application of the framework to policy analysis and development.

II. The Concept of International Competitiveness

At least in a broad sense, a competitive product is one that can be sold at a profit and competitive firms, industries and sectors are ones that can supply such products in sufficient volume to provide an acceptable level of income. However, for purposes of competitiveness assessment, research and policy, a more precise definition is required. Specific definitions found in the literature vary widely; a partial listing is provided in Appendix I.

The differences among the various definitions in the literature reflect, in part, the different contexts in which competitiveness is studied. The objective of this section is not to say that one or the other is correct, but to select one that best meets the needs of sector policy analysis and development. In doing so, the concern is less with specific wording than with understanding what is meant by competitiveness and how it should or should not be applied.

One broad approach evident in Appendix I is to define competitiveness in terms of the desired outcome. The performance measure often targeted in this approach, especially at the firm level but also at the industry level, is market share. Thus, after considerable discussion, the Agri-Food Competitiveness Task Force (1991) established as part of Agriculture Canada's Agri-Food Policy Review, followed this approach. It defined a competitive industry as one that possesses:

The sustained ability to profitably gain and maintain market share in domestic and/or export markets.¹

The Agri-Food Competitiveness Council adopted this market share definition but added essentially three conditions: environmentally sustainable methods, legitimate business practices and no government interference².

¹ Although "sustainable" is not included in the definitions given in the text of the Task Force's report, it is used in the Appendices and other documents.

² The Council's (1992) definition is "The sustained ability to profitably gain and maintain market share. Competitiveness will be achieved in ways that are environmentally sustainable; are economically rewarding for all sectors of the industry; result from legitimate business practices, free of government interference; and recognize that Canada competes against products from other countries in both domestic and export markets".

A second broad approach to defining competitiveness is to do so in terms of the conditions that must be met to be economically successful in an open trading environment. As illustrated in Appendix I, there are several ways to state these conditions but the following captures the essential points:

An internationally competitive firm, industry or sector is one that has the sustained ability to produce and deliver goods and services in the form and at the time, place, and price which together form a package at least as attractive to buyers in domestic and/or international markets as that offered by potential foreign suppliers, while earning at least opportunity costs on resources employed.

This product-price definition of competitiveness is useful in that it emphasizes the conditions that must be satisfied in order to be competitive, especially the need to (a) meet buyer preferences for various product/service attributes and (b) to have the ability to attract the land, labour, capital, goods and services including entrepreneurship, to do so. This definition thus helps to identify the determinants of competitiveness.

Several issues arise with respect to the concept of competitiveness and its use. These issues mostly apply to both the market share (or any other performance measure) and the product-price definitions although in some cases more to one than the other.

1. Competitiveness Indicators

Domestic and export market shares are useful criteria of competitiveness to the degree that they reflect industry output and hence the industry's contribution to the economy. Note, however, that an industry with growing levels of output would be deemed uncompetitive if its growth in sales was below the rate of growth of the domestic and/or foreign market because its market share would fall. In this sense, this is a tough standard, and may not be appropriate in all contexts (e.g., the wheat sector of a country with relatively limited crop land could be profitable at a certain level of output but could not be expected to maintain its share of a growing domestic or international market). Conversely, however, an industry with declining output could be deemed to be competitive if its output was falling at a slower rate than the rate of decline of the relevant market.

If strictly applied, the market share definition implies that market shares in domestic and export markets are the only criteria of

competitiveness (given profitability and perhaps other conditions). Importantly, however, the product-price definition is not inconsistent with the use of a range of performance measures, including market shares as appropriate, to assess/monitor competitiveness of an industry. If a number of performance measures were declining, for example, then it would be unlikely that the conditions of this definition were being met. Such performance measures are discussed further in a later sector.

2. Products, Firms, Industry Segments/Industries/Sectors, Regions/Nations

The issue is whether one definition of competitiveness is equally applicable to these various levels of aggregation. The market share and product-price definitions would be most applicable to products, firms, industry segment/industries/sectors, although the most appropriate specific performance indicators and a set of determinants could differ somewhat. For example, firms tend to focus on market share as an indicator. Also, a firm's strategies must deal with competition with other firms within its industry whereas at the industry level the competitiveness concern is with the industry's share of the domestic and foreign markets vis-à-vis foreign sources. At the geographic (regional and national) level, however, the applicability of these two definitions is questionable.

Michael Porter (1990) has suggested that competitiveness at the national level is meaningful only insofar as it relates to the generation of high and increasing levels of income and that this means it must be defined in terms of high and increasing levels of productivity. In this sense, he defines productivity as the (real) value of output per unit of labour or capital, a value which depends "on both the quality and features of products (which determine the prices they can command) and the efficiency with which they are produced" (p.6). The equation of national competitiveness with productivity is at least implicit in the definitions proposed by a group of Canadian business and labour leaders and by the U.S. President's Commission on Industrial Competitiveness (as cited in Government of Canada, 1991 and Nimmo, 1991, respectively).

Trade economists, however, are concerned that the notion of competitiveness of nations leads to the mercantilist view that the national goal should be to accumulate foreign exchange by increasing exports and reducing imports. This implies that one country's gain is another's loss whereas the "correct" view is that international trade can improve the economic welfare of both countries by allowing each to specialize in producing what it does relatively well (Krugman (1993)). Comparative advantage is discussed briefly in Section III.

In any case, this framework focuses on competitiveness at the "industry" level where "industry" refers to all activities from farm input supply to final buyer. In doing so, it also is concerned with the competitiveness of products, firms and industry segments and the possibility that some parts of a sector may be more competitive than others is recognized. This focus is further defined in Section IV.

3. Foreign Direct Investment and Globalization

The use of market shares as indicators of competitiveness can be misleading if changes are taking place in foreign direct investment. Thus, outbound foreign direct investment could be a positive indicator of competitiveness but reduce the export market share. Investment in foreign countries typically occurs after the development of a strong base and successful export performance (Porter, 1990, p.283). In some cases, however, it could indicate a lack of, or deterioration in, the competitiveness of a home based facility.

Inbound foreign direct investment also could be a positive indicator of competitiveness and, consistent with the market share definition, would increase domestic market share, other things equal. However, unless the foreign investment was in terms of creating a "home base" (see below) the interpretation of growth in such investment as a positive indicator of longer term competitiveness may be questioned, as Porter and others have done.

The implications of foreign direct investment for competitiveness are related to the increasing globalization of industries, including the agri-food industry. Globalization has implications for how the competitiveness of an industry in a particular country is assessed and explained as well as for government policies. Trade and investment decisions are closely linked, especially in the competitiveness strategies of "global" firms.

At the industry level, Porter (1986) examines globalization by comparing two polar types of industries based on the strategies of multinational firms comprising them. One type of industry he calls "multidomestic"; that is, "one that is present in many countries -- but one in which competition occurs on a country-by-country basis" (p.20). Multinational firms entering such countries can do so for a number of reasons (e.g., take advantage of know-how gained in their home market) but their behaviour is adapted to that market, that is, it is largely country specific and independent of what is happening in other countries. Examples are the service and consumer packaged goods industries.

At the other extreme are global industries in which a firm's competitive position is significantly affected by its position in other countries and vice versa. In this case, the international industry is not merely a collection of domestic industries but a series of linked domestic industries in which the rivals compete against each other on a truly worldwide basis (p.20). Examples include semiconductors and automobiles. In other words, "An industry can be defined as global if there is some competitive advantage to integrating activities on a worldwide basis" (p.21.).

In Porter's view, the important consideration for a country's economic development is not the nationality of the owners of global firms but whether or not a country is selected as the firm's "home base". "The home base is where strategy is set, core product and process development takes place, and the essential and proprietary skills reside. The home base is the platform for a global strategy in the industry in which advantages drawn from the home nation are supplemented by those from an integrated, worldwide position" (Porter, 1990, pp.69-70). Home base activities contribute significantly to an economy, both directly and indirectly and a policy goal is to create the environment necessary to attract such activities. Porter's research on national competitive advantage focuses on understanding the characteristics of such an economic environment. The characteristics that he has identified are outlined in Section III along with the views of others on the role of multinational firms and the elements of competitive advantage.

4. International and Domestic Policy Environment

These definitions do not explicitly rule out the use of boarder measures, subsidies nor other forms of support as sources of "competitiveness" nor do they refer to policies which hinder competitiveness such as some regulations. This is appropriate as a starting point; one issue is how well the industry is doing under existing conditions including the domestic and international policy framework. But the ultimate interest is in (a) how well an industry would meet the competitiveness criteria in the absence of measures that would be trade distorting, unsustainable as a government expense, or otherwise unacceptable; and (b) identifying policy and program changes that would enhance competitiveness, including the removal or modification of those that hinder competitiveness. Policies with respect to competitiveness, however, must take into account the full range of the country's economic and social goals.

Since both the performance indicators and determinants of competitiveness are influenced by current and perhaps past policies and

programs, the task of assessing the "fundamental competitiveness" (i.e., competitiveness in the absence of such measures) of an industry is far from straightforward. For example, a market share maintained by import controls does not reflect fundamental competitiveness nor do small export shares due to a lack of access to foreign markets indicate a lack of competitiveness.

The influence of government domestic and trade policies on competitiveness is discussed in the sections on determinants and policy development.

5. Competitiveness in Domestic vs. International Markets

The focus of this paper is on international competitiveness, i.e., competitiveness vis-à-vis foreign suppliers in domestic and export markets. As emphasized by the product-price definition of competitiveness and explained by the theory of comparative advantage, international competitiveness involves the ability to compete with other domestic industries for resources. In addition, industries compete in product markets (both at home and abroad) for the consumers' dollar. For example, efforts of the Canadian pork industry to be more competitive with the U.S. pork industry would also help it to be more competitive with other meats and alternative sources of protein in both countries. For industries largely protected from imports, competitiveness with other products in the domestic market might be the primary concern.

6. Degrees of Competitiveness and Competitiveness Over Time

The question of whether or not an industry is competitive can seldom be answered fully or even satisfactorily by only looking at performance measures or determinants at a point in time. For example, if an industry open to international competitiveness exported ten percent of its output and had a return on investment equal to that of all manufacturing, one might conclude that it was internationally competitive in that period. This judgement might be reinforced (or not) by comparisons of other performance measures, costs, productivity, etc., with other countries. In practice, however, international comparisons of absolute values of such measures run into a number of conceptual and empirical problems. These and other measurement issues are discussed in Section IV.

The fall-back approach is to examine trends in these variables to see if they indicate whether the industry is becoming more or less competitive over time. However, the analysis of changes in performance and determinates over time is more than a fall-back position; it helps to

identify emerging issues and reasons for changes in competitiveness. As noted in the definition, "sustainability" is a characteristic of competitiveness.

Competitiveness at the industry level is a matter of degree in the sense that industries produce a range of products in various locations and sell in various markets. An industry is unlikely to be equally competitive in all such dimensions. The real question is how firms, and, as appropriate, governments can improve the competitiveness of industries or industry segments over time by being more successful than other countries in finding ways to reduce costs, develop new products, upgrade factors of production and so on.

The degree to which an industry is competitive obviously depends on prices in foreign markets. The way in which competitiveness is related to prices and costs is illustrated in Appendix II for the case of a homogeneous product, competitive markets, and a small country. More complicated models would be needed to show these kinds of relationships for differentiated products and imperfectly competitive markets.

In conclusion, the market share and product-price definitions highlight somewhat different aspects of the broad concept of competitiveness. Both provide useful direction for monitoring, research and analysis. The choice of one or the other (or some third alternative) depends on the context in which "competitiveness" is being addressed.

III. Determinants of Competitiveness of an Industry

This section summarizes the theory of comparative advantage, Michael Porter's analysis of competitive advantage and some additional views on the determinants of competitiveness.

1. Comparative Advantage

One explanation of international trade patterns is provided by the theory of comparative advantage. A nation will maximize economic welfare by specializing in the production and export of those products which it can produce at a cost, in terms of forgone production of other products, that is relatively less than the cost incurred by other countries, while importing those products for which its costs are high relative to the cost incurred by other countries. According to this theory, the (opportunity) cost of producing various products differs among countries

because of differences in resource endowments (land, labour, capital) and the proportions in which resources are required to produce the products given the technologies available in each country. By modifying various assumptions, the theory can be extended to explain the effects of variables such as factor mobility, factor prices, and consumer preferences on production and trade (for example, see Leamer, 1984, Caves, 1980, Enders and Laysan, 1987, Houck, 1986).

Perhaps the key conclusion of the theory is that, other things equal, the economic welfare of a country or region can be increased by specialization and trade compared to self-sufficiency in all products. In addition, with a few exceptions, "free trade" will tend to produce this result. In other words, comparative advantage is an important determinant of the competitiveness of industries; not all industries will be equally competitive in an open market situation.

Whereas the theory of comparative advantage focuses on relative costs or, more generally, on the relative attractiveness of price-non-price packages, at a point in time, efforts to increase competitiveness also must consider factors or activities that can shift the economy to a higher "production possibilities" level. Examples are upgrading the quality of resources, increasing rates of process and product innovation, and improving coordination systems. These other factors are important in explaining how comparative advantage has changed in the past and could be changed in the future. They thus help to identify sources of economic growth of a nation. These other determinants apply to all sectors but are especially important for understanding competitiveness of relatively high value added segments of imperfectly competitive industries.

While traditional trade theory focuses on differences among countries in resources, technology or tastes to explain trade patterns, efforts have been made more recently to take into account the influence of economies of scale, imperfect competition and other market imperfections (Krugman, 1990). These efforts have been in response to the growing need to explain more fully trade in differentiated, capital intensive products where these characteristics are important.

This "new" trade theory represents an enrichment rather than replacement of the traditional theory and produces some new, or at least modified, results. For example, consideration of the role of economies of scale adds an element of arbitrariness to the explanation of trade patterns. This is illustrated by the example of aircraft production in Seattle, Washington. Historically it started there and increasing returns kept it there. In addition, although increasing returns reinforces the

benefits of free trade, the new trade theory also provides support for the possibility that export subsidies, temporary tariffs and other trade measures could provide advantages to a nation (Krugman, 1990, pp.1-8). The implications for government policy are explored by "strategic trade theory" (Porter, 1990, p.777).

A numerical example illustrating some aspects of comparative and absolute advantage and the concept of competitiveness is provided in Appendix III.

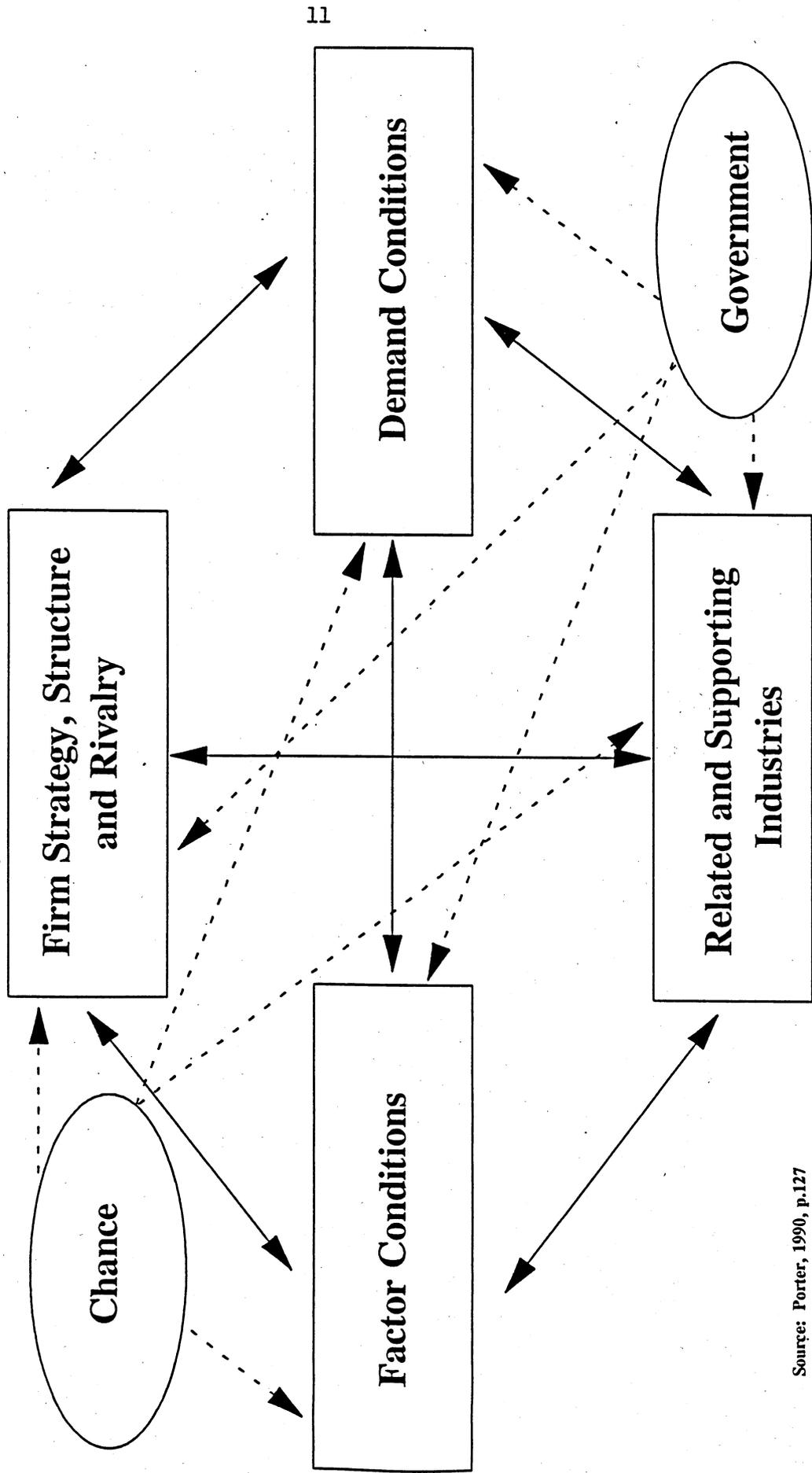
As indicated in Section II, Appendix II provides a simplified view of the relationships among costs, prices and competitiveness using demand and supply analysis and assuming a homogeneous product and perfectly competitive market. The effect of changes in the variables discussed here and in other parts of this section is to modify the level and/or shape of these functions or to replace them (new products) and hence change the performance/competitiveness of the industry. For the case of differentiated products and imperfectly competitive markets the analysis would be much more complicated and would include the effect of changes in the structure of the market and the conduct of firms participating in it.

2. Porter's View of Competitive Advantage

Michael Porter's theory of "competitive advantage" (1990) is an effort to identify the many factors that influence competitiveness and to show how they relate to each other and to the economic performance of a nation's industries in a global economy. While the traditional and new trade theories provide the important explanations of production and trade patterns and their effects on economic welfare, the work of Porter and others discussed in this section aims at understanding the process of change and why particular industries in particular countries have been more successful than others.

Based on his review of the literature and his analysis of countries and industries which are highly successful in competing on world markets, Porter has grouped the factors affecting competitiveness into six categories. Four categories are considered to be "determinants" of competitiveness; they are factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. The other two categories are chance and government; they influence competitiveness but are not considered to be determinants in the same sense as the other four. The interrelationships among the six are illustrated by his "diamond" (Figure 1).

FIGURE 1
NATIONAL DETERMINANTS OF COMPETITIVE ADVANTAGE:
"THE DIAMOND"



Source: Porter, 1990, p.127

The following parts of this subsection briefly highlight a number of Porter's observations and views on each of the six categories.

a) *Factor Conditions*

Although a nation's endowment of land, labour and capital is important in explaining competitive advantage, factors which are created are more important for most industries.

"Basic factors" such as natural resources, climate, location, unskilled and semiskilled labour and debt capital are mostly inherited or developed with relatively "modest and unsophisticated" private and social investment. They are becoming less important and less sustainable as sources of competitive advantage because firms can increasingly source from the cheapest country.

"Advanced factors" such as communications infrastructure, highly trained personnel and university research institutes require relatively large and sustained investments. Advanced factors are relatively scarce and difficult to obtain but important for achieving competitive advantages such as differentiated products and proprietary technology.

An important distinction is that between "generalized" factors (such as a well developed highway system and a pool of college educated employees) and "specialized" factors (such as narrowly but highly trained people). Because of the cost, riskiness and uniqueness of specialized resources they are less mobile and/or less easily duplicated by other countries and thus are a more important and sustainable source of advantage. A strong base of generalized factors is needed to develop specialized factors (e.g., only a few college educated people will become Ph.D.'s).

Continual upgrading of factors of production, especially the advanced and more specialized factors, is required for sustainable competitive advantage. Not all types and varieties of factors can be created; the other determinants of competitive advantage will influence which factors are developed and upgraded. In some cases, factor scarcity is a driving force for upgrading factors.

b) *Demand Conditions*

Characteristics of home demand are important in the development of internationally competitive firms and industries. Home demand is usually best understood by local firms because of proximity, language, regulation and culture. It is the least costly to monitor and less risky.

Also, the pressures of buyers for improvement are more directly transmitted to firm decision makers.

A large home market benefits industries or industry segments where economies of size in production are important, large investments are required in research and development (R&D), or uncertainty is high. A rapidly growing market facilitates investment by reducing risk but can also lead to complacency unless rivalry is strong.

On the other hand, a small or relatively quickly saturated home market can pressure firms to seek export markets. Other characteristics of home demand are more important since they influence the rate and character of improvement and innovation by firms. Thus, sophisticated and demanding buyers, whether consumers, distributors or manufacturers force an industry to meet high standards of product quality, features and service. These demands can result from underlying consumer tastes and preferences and a range of factors including geography, climate, natural resource availability, taxation, social norms and government regulations.

A large number of independent domestic buyers with differing views of product quality, etc. stimulates innovation and facilitates entry of new firms.

The significance of the size and other characteristics of home demand for success in foreign markets depends on the degree to which they reflect or anticipate demand characteristics in foreign markets. The internationalization of domestic demand (through consumers who travel abroad, multinational firms with subsidiaries in several other countries, training programs which attract foreign students, etc.) helps to increase foreign demand for the nation's products.

c) *Related and Supporting Industries*

Internationally competitive supplier industries provide efficient, early, rapid and perhaps preferential access to the most cost effective inputs. More importantly, they provide easier ongoing coordination and hence more effective utilization of inputs. Most importantly, however, home based suppliers allow the close working relationships needed for process innovation and upgrading. Inputs without a significant effect on innovation or on product and process performance can be obtained from foreign sources.

"Related industries are those in which firms can coordinate or share activities in the value chain when competing, or those that involve

products that are complementary (such as computers and applications software)" (1990, p.105). Value chain activities include technology development, manufacturing, distribution, marketing or service. The advantage of home based related industries are in terms of information flow and technical interchange and in some cases the formation of formal alliances. International success by one industry also can "pull through" demand for complementary products of firms in the home country.

d) *Firm Strategy, Structure and Rivalry*

National advantage is enhanced by a good match between goals, strategies and ways of organizing firms, which differ appreciably among nations, and other sources of competitive advantage in a particular industry. A wide range of social and historical factors have led to differences among countries in management practices and individual attitudes toward risk and international competition. These factors thus affect how firms are organized and operated. Firm behaviour is influenced by the degree to which ownership or management is in control and the reward system for employees as well as factors such as the performance of capital markets and intangibles such as the prestige afforded various types of activity.

Domestic rivalry is important because it pushes firms to improve and to innovate in ways that enhance international competitiveness of firms and industries; other sources of national competitive advantage (e.g., factor costs) are common to them and so they must find new ways to excel. Economies of scale should be sought not through "nurturing one or two firms that become 'national champions'" (1990, p.117), but through firms that sell abroad. A group of firms is more likely to create a range of competitive products and the improvements by one will tend to be soon shared by all. Geographic concentration of an industry both reflects and increases these benefits.

New business formation is an important contributor to rivalry. New businesses often serve new market segments and introduce new ways of doing things. Entirely new firms can be created as spin-offs from established firms, by employees of suppliers and customers and as the result of research, training and ideas. The creation of new firms is affected by factor conditions, demand conditions and other factors discussed above. Internal diversification, the establishment of a new business in a related industry by an existing firm, is another source of new firms and also is influenced by the various elements of the diamond.

e) *The Role of Chance*

"Chance events are occurrences that have little to do with circumstances in a nation and are often outside the power of firms (and often the national government) to influence" (1990, p.124). Examples include new inventions, major new technologies such as biotechnology, discontinuities in input costs such as the energy crisis, financial market shifts, foreign government decisions and wars. Such events can nullify sources of competitive advantage and create new ones. The ability of an industry to respond will depend on the status of other parts of the competitive diamond. The latter also affects the environment for invention and entrepreneurship and hence where they will occur.

f) *The Role of Government*

The role of government is best viewed in terms of its influence on the four determinants of competitiveness rather than as a separate determinant. Its influence, of course, can be positive or negative. Subsidies, educational policies, product regulation, procurement policy, capital market regulation, tax policy and antitrust laws are examples. Government policies also can be affected by the determinants (e.g., pressure to introduce a product safety standard where domestic demand is strong).

g) *Porter's Diamond*

The four key sets of determinants of competitive advantage are dependent on and reinforce each other. For example, effective supplier industries require access to quality factors of production and good working relationships with demanding buyers.

The four determinants, their elements and their interrelationships represent factors that have been observed or considered to be the basis of a competitive advantage by some industry in one country versus that industry in another country. The influence of any one element depends on the industry and the circumstances, even to the degree that the direction of the effect can be positive or negative depending on the specific case (e.g., a large domestic market can provide opportunities for developing economies of scale while a small domestic market can provide the impetus for developing export markets). In other words, no one determinant/element is necessary or sufficient to assure international competitiveness and the relative importance of it varies by industry, product segment and the other determinants of a country's competitiveness.

3. Additional Views on Competitiveness

Other writers, in particular Alan Rugman and Joseph D'Cruz (1991), believe that in a world of liberalized trade, Porter's definition of "home market" and hence the size and shape of the "diamond" need to be modified. In particular, they argue that the Canada-U.S. Trade Agreement means that the Canadian diamond is really a Canada-U.S. diamond. The reason is that Canadian manufacturers, for example, can and must respond to U.S. buyer needs and have ready access to U.S. supplier firms. They also disagree with Porter's treatment of multinational firms, citing the major contributions that such firms make to the Canadian economy, even though the firms may not consider Canada their "home base".

D'Cruz and Rugman (1992) highlight the importance of various competitiveness factors, including the concept of industry clusters and networks and the need for "leading firms". In their view, global competitiveness depends on three elements: company, sector and country competitiveness. For the most part, however, they also have a business orientation and their focus on issues important to Canada complements the work of Porter.

The World Competitiveness Report identifies five characteristics that influence the competitiveness of a country's business (1989). They are input factors, transformation processes, supporting environment, industrial portfolio and business confidence. The Report focuses on overall evaluations of the relative competitiveness of countries. In the 1991 Report, over 330 criteria were identified and placed into eight "factors of competitiveness". The eight factors were domestic economic strength, internationalization, impact of government, finance, infrastructure, management, science and technology and people. These criteria are applied at the country level using various data and the opinions of business leaders. While the discussion surrounding the application of these criteria/factors may provide some useful insights, the rankings of countries fluctuates from year to year. This implies that short term rather than long term factors predominate in these assessments.

Sector competitiveness is influenced by macro as well as microeconomic policies. While research on the competitiveness of the agri-food sector would not be expected to include analysis of macroeconomic relationships, it would include analysis of the implications of changes in macroeconomic variables such as interest and exchange rates on sector competitiveness.

With respect to the agri-food sector, the Agri-Food Competitiveness Task Force largely adopted the Porter framework, although, as indicated above, they developed a market share definition of competitiveness. A supporting study of six agri-food industries (1991) also was based on the Porter approach.

A competitiveness framework developed by Martin, Westgren and van Duren (1991) also uses market share and profits as competitiveness indicators. One feature of their approach is the categorization of the various factors affecting competitiveness by the degree to which firms and/or governments do or do not control them. The firm controls its own strategy, products, technology, training, R&D, cost and linkages; government controls the business environment (taxes, interest rate, exchange rate), international trade policy, R&D policy, education and training, linkages and regulations/standards; quasi-controllable variables are input prices and demand conditions; and uncontrollable factors include the natural environment. An advantage of this approach is that, by identifying specific areas of "control", it emphasizes that both business and government have roles to play and to a significant degree what each does will influence the success of the other's activities.

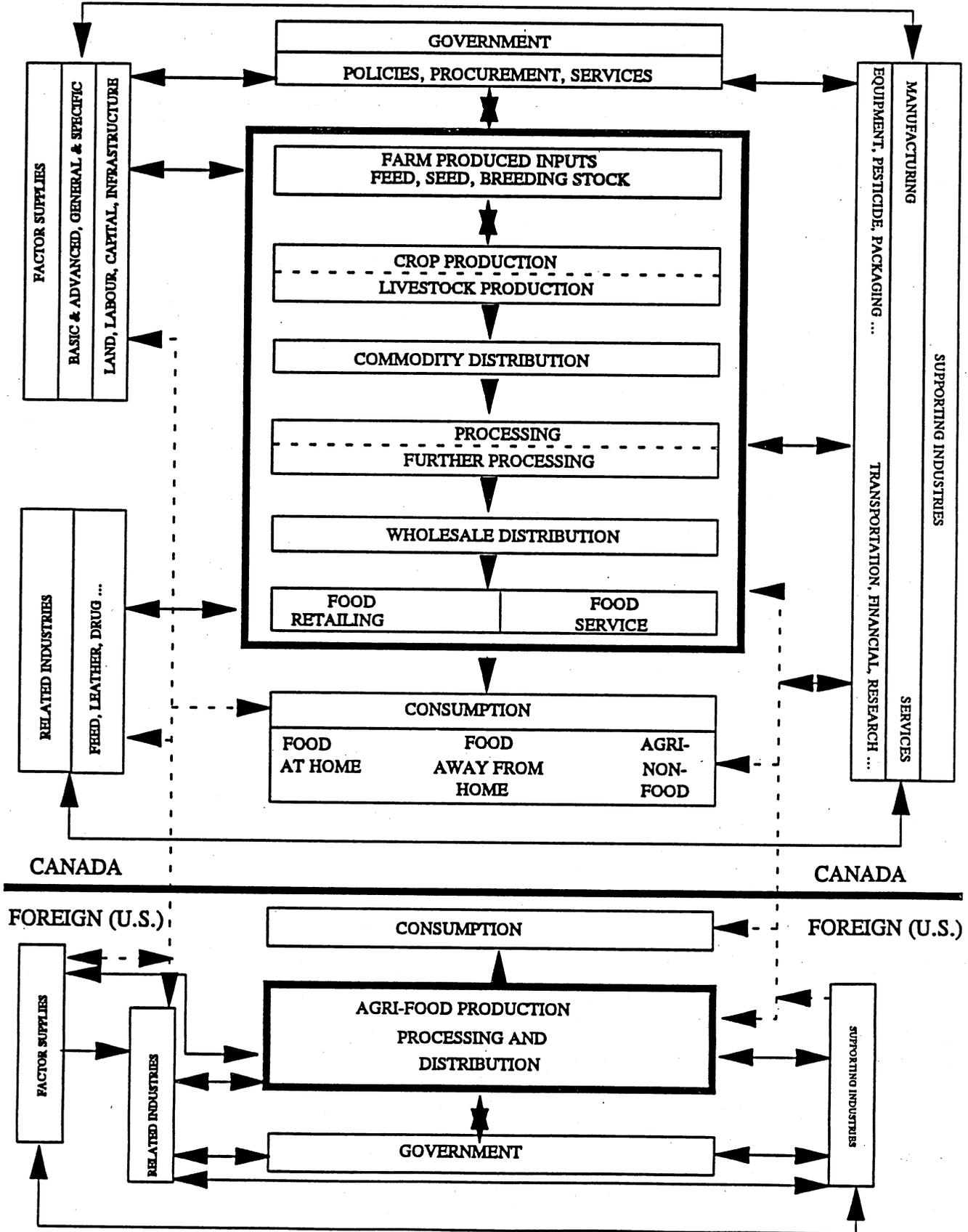
There are many theories and approaches to the analysis of competitiveness. The objective here is not to prescribe one over the other as the most appropriate in all circumstances, nor to adopt the generic remedies that some of these theories and approaches imply. Rather, the aim is to explicitly describe current perspectives on the concept of competitiveness, and to build a more common and widespread understanding of the diverse and dynamic factors that affect the competitiveness of firms, sectors and nations.

IV. Analytical Framework for the Agri-Food Sector

This section outlines an approach to the application of the concept and theories of competitiveness to the agri-food sector. It uses the definitions of Section II and draws on the theories/approaches discussed in Section III. The categorization of determinants is largely that provided by Porter, although their names and/or content are modified in light of the approaches used or suggested by others and judgements about the most useful way to assess and analyze the competitiveness of the agri-food sector.

The agri-food sector extends from farm and processor input supply industries to consumers, domestic and foreign (Figure 2). Key elements of the sector are the suppliers of agri-food specific inputs, farmers,

FIGURE 2
CANADA'S AGRI-FOOD SYSTEM



Note: Government affects all segments. Linkages to foreign sector varies by country; detail for foreign country not shown. Relationships among commodity/product industries are not shown.

processors, distributors and consumers, and the vertical and horizontal linkages among them.

Governments and other sectors of the economy (such as transportation services, finance, education, other manufacturing), and physical infrastructure have very important influences on the sector. They are not considered to be part of the agri-food sector but they are part of the agri-food system ("diamond") since their performance has a major influence on the sector's competitiveness.

Focusing on the agri-food sector as a whole as the entity of interest implies that studies and policy analyses primarily focused on one part of the sector (e.g., farm or processing, commodity or product) must take into account competitiveness implications for other parts of the sector. A related point is that a sub-sector analysis requires careful definition of its scope so that all key relationships are covered. For example, butter and margarine manufacturers compete for much the same market. Recognition of these interdependencies among the several parts of the agri-food sector clearly is important for the policy development process. This approach, however, does not imply that all parts of the agri-food sector or any sub-sector are, or will become, in some sense equally competitive³.

³ The interdependency between parts of the agri-food sector appears to be increasing over time as a result of various structural, economic, technological and policy changes. Fewer and larger firms, especially at the processing and retailing levels, increasingly segmented consumer demand, improved information systems, trade liberalization and changing sectoral and non-sectoral policies are among the forces that are modifying traditional attitudes and linkages among participants in the sector.

Focusing analytical efforts on the agri-food sector as a whole, and not just one part of it, ensures that explicit consideration is given to these evolving interrelationships within the sector. The holistic approach also helps to ensure that the antagonism and unintended consequences often associated with analysis that considers just one part of the sector, perhaps to the detriment of some other part, is avoided.

In some cases, of course, an economy-wide focus will be most appropriate.

The three major stages of the analytical process in applying this framework to the agri-food sector are:

- 1) general assessment of degree of competitiveness and likely changes in competitiveness as indicated by changes in performance measures,
- 2) analysis of why a sector/industry/commodity/product is more or less competitive than others and is becoming more or less competitive, i.e., identification of the determinants of competitiveness and how they operate in specific cases, and
- 3) analysis of policies and programs in terms of their effects on competitiveness and the development of policy options to improve competitiveness.

1. General Assessment of Competitiveness

Following more or less directly from the APR Task Force definition of competitiveness, indicators or measures of competitiveness are: (a) domestically produced sales as a share of total domestic market, (b) exports as a share of the domestic markets of foreign countries, (c) exports as a share of world trade, (d) exports as a share of the domestic industry's production, of agri-food exports, and of total exports, (e) the corresponding import shares and, (f) associated changes in profitability.

Following from the discussion of the concept of competitiveness in Section II, changes over time in other aggregate measures of economic performance, especially when compared to changes in other countries, also are useful indicators of competitiveness. These measures include growth in output, value added, exports, imports, product prices and in particular, investment, including foreign direct investment. These measures indicate the attractiveness of the industry for investors and therefore, its competitiveness because for much of the Canadian agri-food sector they are strongly influenced by international economic forces. The standards for comparison are growth rates in earlier periods and growth rates in other countries.

Data for constructing performance measures are available from individual countries and international agencies. Often, however, data are not directly comparable or in the detail desired so that considerable effort and judgement is required to develop useful measures. Also, current data (e.g., last two years or so) usually are not available. Despite these

limitations, measures can be constructed which provide useful indicators of performance and a number of studies have done so.

However, changes in market shares, investment and other performance measures need to be evaluated carefully. As emphasized in Section II, the major limitation on all of these performance measures of competitiveness is that they are influenced by the domestic and trade policies of Canada and other countries. For industries with import quotas, for example, these measures provide little evidence of competitiveness should the border be opened. Assessment of the competitiveness of such industries requires examination of the determinants of competitiveness. Even for relatively open sectors with few government programs assessment of future competitiveness requires an understanding of the influence of the more fundamental determinants of competitiveness.

2. Determinants of Competitiveness

As discussed above, the determinants of competitiveness are numerous, but the theory of comparative advantage and the ideas of Porter, the APR Task Force and others provide a basis for systematically examining competitiveness issues. The following essentially highlights and outlines the way in which the various components of competitiveness theories may be applied to the agri-food sector and its several sub-sectors with the objective of developing sound analyses of competitiveness policy issues.

While cost competitiveness and product competitiveness are in one sense clearly determinants of competitiveness, in another sense they are best described as attributes. The latter approach follows from the product-price definition of competitiveness.

a) *Cost Competitiveness*

Except for any premiums for a differentiated product (where the latter includes characteristics of the product itself and related services such as assured quality and timeliness of delivery), the competitiveness of a product at any point in time is determined by unit costs. The relevant cost is the opportunity cost of producing/supplying the product. Although efforts have been made to calculate such measures, they encounter numerous problems (Dunmore, 1986, Barkema and Drabenstott, 1988).

Accounting costs generally include historical costs and arbitrary allocation procedures. International comparisons are difficult since standard procedures for measuring and reporting are generally not used.

However, unit cost comparisons are sometimes attempted since they may at least be indicative of underlying competitiveness of a product (e.g., wheat, cheese). Unit costs can be obtained by surveys of farms/firms or by budgeting/economic engineering procedures which utilize input price data and input-output data to estimate costs for typical production units.

An additional consideration is that the relevant cost comparison includes marketing and distribution costs as well as production costs. For example, farm-to-port transportation and handling costs are a major competitiveness factor for Canada and the U.S. in the grain sector and these costs should be taken into account.

Even if these difficulties were adequately resolved, the resulting unit cost estimates would reflect average costs rather than marginal costs. They therefore would provide little information on the relationship between costs and changes in output. At least for competitive markets, simply comparing prices would be a better approach because prices (averaged over an appropriate period) would reflect all costs and do so at the margin. If two countries are engaging in trade, however, prices will differ only by transfer costs; the issue then is how much each country will produce at the expected local price.

Ideally, cost competitiveness would be estimated/analyzed by estimating supply functions. A supply function provides information on how the level of output/size of industry (and hence market shares, given information on demand functions) would be affected by changes in product prices, a question of particular interest in assessing implications of liberalized trade. The effect of changed input costs and productivity would be seen by shifts in the supply function and/or changes in the elasticity of supply. Indeed, the various determinants of competitiveness identified by Porter act so as to shift the supply function outward and/or essentially replace it with a new one representing a new/differentiated product and/or change the structure of the market altogether. As indicated earlier, the supply (and demand) function analysis is summarized in Appendix II. An example of its application to (Australian) agriculture is provided by Sharples and Milham (1990).

Given the empirical difficulties in estimating unit costs and supply functions, many studies simply attempt to gain some insight into cost competitiveness by comparing input prices and productivity measures.

This is particularly true at an industry level where many products are involved and an average "unit" cost estimate is of limited applicability. Cost competitiveness, however, does not require that every input nor even any input have the same or lower price as in other countries. Productivity differences can offset production input price differences.

The estimation of absolute input price differences between two countries, however, is far from straightforward: purchased materials and supplies must be standardized for quality, location and terms of sale; labour costs must include both wages and benefits; buildings and equipment, land, operator labour, etc. give rise to additional issues such as depreciation rates and rents. With the possible exception of a few key inputs with well defined market values (e.g., wage rates, fertilizer prices, raw product prices) the most useful approach is to compare changes in prices/values between countries rather than absolute differences; relative rates of change indicate whether a country is becoming more or less competitive with regard to that input (only).

In any case, factor price comparisons should be used in conjunction with productivity comparisons. However, productivity comparisons are also difficult to make. The most common measure, labour productivity, is relatively straightforward but can be misleading because it really attributes all sources of output growth to labour. Multifactor productivity measures avoid the problem but they are index values and so can only be used for comparisons over time, not absolute comparisons. Estimation of multifactor productivity measures requires sophisticated analyses of carefully constructed data sets on inputs and outputs of an industry (e.g., see Hazledine, 1991). The required data are available for only a limited number of countries and industries.

Any absolute comparison of values between countries must be in a common currency. This means that they are heavily influenced by the exchange rate. Interpretation of absolute comparisons over time must take account the influence of changes in the exchange rate and differences in inflation rates between the two countries (real exchange rates).

In some respects, the types of cost comparisons described herein only represent alternative indicators of competitiveness; they are especially useful when performance measures such as market shares are inappropriate (e.g., because of trade barriers). However, they also are a step in the direction of explaining changes in performance indicators and in identifying competitiveness problems/opportunities.

Estimating and monitoring these kinds of cost/input price/productivity measures is a way of identifying competitiveness issues and advancing our understanding of them. More importantly, however, is the need to explain such differences in a way that appropriate governmental and/or private sector responses can be developed and implemented. As an example, observed differences in productivity might be explained in terms of differences in plant sizes, R&D spending and/or other factors.

b) Product Competitiveness

The counterpart to a cost analysis would be an evaluation of the product offered compared to that of other suppliers where "product" refers to all non-price characteristics such as physical attributes, delivery services, guarantees and other terms and conditions. These characteristics compared to those of competing products clearly affect demand and the price that can be obtained for the product. Quality assessments would have to be in terms of perceived buyer demands (e.g., for red versus green apples, degree of fat in meat cuts). This is the type of information generally obtained through various marketing activities such as buyer surveys and trade shows. Careful analysis of market price differentials and quantities sold also might be used.

This type of analysis is similar to that of cost competitiveness in that it provides an indicator of competitiveness and as well helps identify areas for improving competitiveness. For example, it could go beyond overall performance indicators by indicating that, for a certain product, "freshness" was a concern; but the question of how to improve "freshness" would remain. The more fundamental problem, for example, could be a lack of research on packaging, inadequate market coordination and so on.

The following sections move the analytical framework further in the direction of identifying why cost, productivity and product value differences exist and what might be done about them.

c) Factor Conditions

Continuing improvement in the international competitiveness of the agri-food sector will require a continuing effort to upgrade all factors used in production and distribution. These factors are land, labour and capital where capital includes buildings and equipment, plants and animals. Examples of issues are how to deal with the effects of many current farm production practices on soil fertility and water quality, how to develop research capacity needed to respond to consumer demands for

food safety, nutrition and convenience and how to ensure the supply of both low and high skilled labour, all in the context of the competitive pressures of globalization and trade liberalization.

For example, the existence of specialized faculties of agriculture across Canada and in many other countries offering not only undergraduate but also advanced degrees in agricultural and related disciplines demonstrates the widespread recognition of the need to develop highly trained agricultural/food scientists. Examples of questions which may need to be addressed to ensure effective development of labour resources are: whether the mix of disciplines is appropriate, whether enough resources are being made available, whether they are being used as effectively as possible, and whether students have the required knowledge and incentives to enter these programs of study. While empirical analysis can go only so far in answering these questions, information could be generated which would be helpful. This would range from attempting to forecast demand for people with certain skills to analysis of the performance of current institutional arrangements. Comparisons among institutions in Canada and/or with those in other countries could be helpful in developing criteria/standards as a basis of comparison and source of ideas for improvement. Such a project would complement the wider federal government review of Canada's educational/training system.

A second example is the need to upgrade soil and water quality in the context of both greater and sustainable agricultural productivity and more general environmental concerns. Empirical analysis could include assessment of the short term and long term economic tradeoffs in Canada and comparison of them with other countries, i.e., will environmental measures needed or likely to be taken in various countries imply a competitive advantage or disadvantage for Canada? What measures can be taken to minimize the costs or change the incidence of the costs so that negative effects on competitiveness are minimized and positive effects maximized?

The development of "advanced" and "specialized" factors in the agri-food area clearly has implications for agri-food research in areas such as biotechnology, development and maintenance of gene pools and the development of storage and processing methods. The performance of the agri-food research effort is affected by organizational structure, research funding and incentives for private research, including intellectual property rights. Many of these topics are being examined and additional analysis in terms of international competitiveness of the sector may be needed.

Canada's supply of basic and advanced labour, technology and debt capital includes foreign sources. The Canada-U.S. Free Trade Agreement, for example has facilitated the movement of labour services into Canada. On the other hand, outward movement also is facilitated. As noted by van Duren (1992), the need is for a "human, physical and socio-cultural infrastructure" that encourages not only the development of basic and enhanced factors but also encourages them to remain in Canada.

Factors also include physical infrastructure. The competitiveness of the agri-food sector is clearly dependent on effective rail, road, port facilities and communication systems. Policy changes (e.g., transportation policy) and access to new markets may require new infrastructure. While the agri-food sector is only one user of much of the nation's infrastructure, it is a major user of some parts of it.

As these examples indicate, the analysis of some of the issues with respect to factor conditions and agri-food competitiveness touch on broader social/economic/technological issues. As such, studies could be complex and employ a multidisciplinary effort. However, more narrowly focused economic studies (e.g., factor demand and supply analysis) also could be useful (e.g., to explain or forecast wage rates or labour supply in Canada compared to other countries).

d) Demand Conditions

The domestic demand for Canada's agri-food sectors has characteristics favourable to product innovation and differentiation. These characteristics include high per capita incomes and a multicultural society. Also, Canadian consumers, like those in many other countries, are increasingly concerned about nutrition, food safety and convenience as well as quality characteristics such as taste and freshness.

However, the Canadian market is relatively small and, outside of Central Canada, dispersed. Also, aggregate demand growth is largely limited to population growth (although demands for convenience, nutritional quality and so on can provide opportunities for growth in value added). These factors increase the risk of and limit the rewards for new product development. In addition, for some food and beverage industries, the highly protected nature of the Canadian market and of local markets within the country may have reduced the pressures for innovation normally associated with firm rivalry.

Useful studies of the characteristics of the domestic demand for agri-food products include short and medium term outlook, descriptive

studies identifying consumption trends by income group, household size, ethnic background and other household characteristics, assessment of consumer preferences using surveys or focus groups and econometric estimation of price and income elasticities of demand.

Trade liberalization means sharper competition for domestic suppliers and opportunities to expand exports. While competition in U.S. markets is severe, Canadian firms have the benefit of experience in meeting the special needs of a variety of market segments not greatly different to those found in the U.S. Also, some segments of the Canadian agri-food sector have experience in meeting the demand requirements of other countries, especially those of the U.S. In some cases, the export market is the dominant market. At the commodity level, the prime example is wheat where some ninety percent of production is exported. Canada has focused on the demand of buyers for high protein wheat but the quality characteristics being demanded appear to be changing and if so an appropriate response by the sector must be developed.

In other words, a number of characteristics of Canada's domestic demand and previous export experience can be positive factors in maintaining and increasing international market shares. With trade liberalization and globalization, the influence of foreign market demand, also is important. This implies that the study of both domestic and foreign markets should be part of competitiveness research. Differences between the food at home and food away from home markets must be recognized. In addition, research is needed on the implications of foreign market demand characteristics for domestic policies and programs. Thus, an evaluation of the quality/pricing system for a commodity/product must take into account the demands of both domestic and foreign buyers. For example, Japanese and U.S. consumers apparently prefer more marbling in their beef than do Canadian consumers.

Non-food uses also can be an important aspect of the demand for some agricultural products. Competitiveness in these markets could be considered in its own right and also as a source of overall sector competitiveness.

e) *Related and Supporting Industries*

Supporting industries for the agri-food sector include transportation services, financial services, equipment manufacturers, and suppliers of inputs such as fertilizer, energy, ingredients and packaging. These industries or firms within them specialize in serving the agri-food sector to varying degrees. The sector is clearly dependent on their

economic performance. In some cases, especially in agricultural regions, the economic well being of these industries is clearly tied to that of the agri-food sector. Porter's concept of a "cluster" of industries, that is a set of industries with complementary activities, is useful in understanding and analyzing the ways in which these industries do or could contribute to agri-food sector competitiveness.

Globalization and trade liberalization are putting pressure on input supply firms, both from competitors in other countries and from the agri-food sector as the latter strive to meet global competition in its markets. An example is the change that has taken place in the packaging industry in Canada. However, despite advantages of home based suppliers described by Porter, the relatively small Canadian agri-food sector depends heavily on foreign suppliers (e.g., for farm equipment) and may increasingly do so. Whether or not this is correct in a specific situation and its implications in terms of access to needed supplies, technology and services could be examined. Government regulations can affect such access, however, as is the case with certain pesticides, and this would be another area for analysis.

Transportation issues (method of paying Crow benefit, trucking regulations) and financing issues (monetary policy, roles of public and private sector farm lenders venture capital) are ongoing and have important competitiveness implications for the agri-food sector. For the most part, these issues relate to government policy. The performance of these industries affects the cost of service to the agri-food sector (branch line issue in Western Canada, number of rail cars needed at a particular time and place). In the longer term, these industries influence the relative profitability of various parts of the sector (e.g., grain versus livestock and commodity versus value added activities in Western Canada) and hence their international competitiveness.

Related industries for the sector include those using various byproducts such as the leather industry and pharmaceutical industry. Byproduct industries are especially important for some sub-sectors such as egg processing/pharmaceutical but in general they have not been a high priority area for economic analysis.

In addition, related industries include those using similar processes or producing complementary products. Examples would be the fish products industry (e.g., freezing technology, distribution services) and the chemical industry (e.g., filtration methods).

Research on related and supporting industries from the point of view of agri-food competitiveness would focus on how well they meet the

needs of the agri-food sector. This would include the capacity, efficiency and innovativeness of these industries as such and the "linkages" between them and the sector. As indicated by the issues identified above, government policy also would be an important area of investigation. The various types of analyses that might be undertaken are discussed in more detail in the following section.

The identification of "related" and "supporting" industries obviously depends on the industry of primary interest. This brief discussion of related and supporting industries has been in terms of industries of importance to but not generally considered part of the agri-food sector, the focus of our interest. In terms of any one commodity, important related and supporting industries would include other agri-food commodity sectors/industries. For any one segment of a commodity sector, the economic importance of other parts of the agri-food sector and within-sector linkages are crucial. These various within-commodity sector relationships are considered in the following category of determinants. This category includes the firm level factors that Porter included under the heading of Firm Strategy, Structure and Rivalry.

f) Sector Structure, Linkages and Strategies

The way that firms, industries and markets are structured affects the way that firms compete or cooperate with each other and hence the overall economic performance of the sector. This structure-conduct-performance relationship is not one way; for example, conduct such as pricing practices can affect industry structure. Also, these relationships often are far from straightforward. For example, the optimal firm organization will be related to economies of size and scope in production and distribution, market size and the nature of competition/rivalry/coordination among firms. In addition, a number of institutional arrangements such as marketing boards and a wide range of government policies affect behaviour and the performance of the sector.

An important element of the structure of an industry is the degree to which it is open to foreign suppliers and/or foreign markets. Trade liberalization means more competition for local markets and improved opportunities to export. The pressures and opportunities for change will be especially significant for Canada's agri-food sector. While some parts of the sector such as wheat, parts of the livestock-meat industry and whisky have long had an international orientation, much of the agri-food sector has focused almost exclusively on the domestic market. The reasons include Canada's high levels of border protection, border protection by other countries, cost factors related to climate, farm and firm size and perhaps the strategies of multinational firms with regard to the

global role of their "branch plants" which often has focused on serving only the Canadian market.

Also, high levels of market concentration as well as the small Canadian market have perhaps reduced the degree of rivalry and potential rewards below levels needed to foster process and product innovation that would be optimal in a more open global environment.

This relatively protected economic environment has affected the goals and strategies of all parts of the sector including producers. Moving to an agri-food sector more open to international competition has strategic implications for each part of the sector's "value chain" including farmers and their organizations, processors and distributors, and governments⁴. Current examples include the need for supply management systems to focus more on changes in market demand and product innovation, and the role of competition policy given the significant rationalization that appears to be needed in the food processing sector.

The competitiveness of any one segment (e.g., meat processing) cannot be fully assessed or explained unless done so in the context of its vertical linkages/"value chain". For example, the competitiveness of the meat processing industry is heavily dependent on the competitiveness of the feed-livestock-slaughtering-processing-distribution system. For analytical purposes, however, specific studies may well focus on an issue primarily concerning one segment or one interface (e.g., market) between two segments.

Horizontal linkages range from cooperatives and marketing boards to industry associations and joint ventures and can cross commodity/industry lines.

Each participant in the sector must decide what if any changes are needed in its goals and strategies for attaining them. Government can assist by assuring that its policies and programs are consistent with the emerging competitive situation, and thereby enable industry to effectively respond to market and economic developments. This would involve a program for disseminating the information generated by research and analysis, consulting with sector participants on its significance, and developing appropriate government policies and programs.

⁴ Porter uses the term "value chain" to refer to the following activities within a firm: inbound logistics, operations (manufacturing), outbound logistics, marketing and sales, and after-sale service. He calls the vertical set of supplier, manufacturer, distributor value chains the "value system" (1990, pages 41-43).

Examples of studies which might be undertaken are:

- Research on specific industries could examine issues such as economies of size compared to the size distribution of firms; capacity utilization; R&D spending compared to the rates of innovation; and the respective government policy options.
- Research on vertical linkages might look at how demand/supply changes are transmitted among vertical segments. Projects could examine both the technical and pricing efficiency of vertical coordination systems such as markets, contracts and ownership.
- Research on horizontal arrangements such as marketing boards and other institutions at the farm level and joint ventures at the processing level is needed in terms of their influence at their respective levels and in terms of their vertical effects.
- Linkages between domestic and foreign firms, including the role of multinational firms would also be an area of study.

Such projects would draw on microeconomic/industrial organization and strategic management concepts. The concept of a "cluster" of industries could help to define the scope of some studies. The focus, however, would be on industry level public policy issues, not the development of firm strategies. Public policy affects firm strategies and the way in which this occurs must be understood by governments. However, the development of firm-level strategies, while important and an area requiring research by firms and other groups, is not in and of itself seen as an area for public policy research.

g) The Role of Chance

Chance plays a major role in the competitiveness of Canada's agri-food sector. Examples (from the point of view of sector participants) are political decisions such as the United Kingdom's decision to join the European Economic Community, the Canada-U.S. Free Trade Agreement, and wars; major changes in consumer preferences such as the health concerns about cholesterol in the diet; the development of new transportation and handling systems for perishable products; out-breaks of disease; and, at least in the short term, the weather. Whether or not any of these are considered to be chance events depends on whether or

not one believes that they should be predictable within a relevant time frame.

Major long-lasting changes like trade agreements and inventions have long-lasting effects on competitiveness. The significance of short term chance events is initially short term but can, depending on the sector/government response, have longer term effects. For example, efforts to protect farmers from short term market fluctuations with stabilization/support programs can have either positive or negative effects on competitiveness over the long term depending on how the programs are designed. At another level, the outbreak of disease in Denmark's hog industry allowed Canada to greatly increase exports of pork to Japan - an opportunity to establish a long term market for Canadian pork. This longer term result apparently did not occur but perhaps lessons can be learned.

Consideration of the role of chance emphasizes the need for production and marketing systems which are responsive to change. A grading/pricing system and breeding/feeding programs designed to meet a perceived domestic consumer preference will be a competitive advantage only until preferences change or export markets with different preferences open up. Unless the systems can quickly identify and adapt to these changes they will become a competitive disadvantage. Research on competitiveness which clearly takes into account the role of such "chance" events on observed measures of competitiveness would be helpful in designing policies, programs and institutional arrangements which facilitate adjustment to them.

h) Government Policies and Activities

Federal and provincial policies and programs affect virtually every aspect of food production, processing and distribution. They include macroeconomic policies (fiscal and monetary policy); trade policy; industrial and regional development policies; science and technology, labour and credit policies; tax policy; and income support programs. In addition, they include a large number of sector-specific policies and programs aimed at stabilizing farm incomes, improving farm productivity, improving the technical and pricing efficiency of food markets and ensuring food safety. Many of these policies and programs contribute to competitiveness, some may be neutral and others, such as interprovincial trade barriers, clearly have a negative effect on efforts to create a national environment in which improved industry competitiveness is facilitated.

In implementing these policies and programs, governments can directly and indirectly influence behaviour in the economy and the various parts of it. This is done through the specifics of regulations, the allocation of grants and subsidies, and various tax provisions which favour or penalize one type of activity or another. In addition, governments themselves engage in economic activities such as the provision of ports, highways, education and research. They also are major buyers of goods and services for operational needs, defense, and programs such as food aid.

The discussion of the other determinants of competitiveness provides several examples of the influence of government policies and activities. For the most part, analyses of the role of governments would be in terms of their influence on the determinants of competitiveness and the linkages among the determinants. Policy development is discussed further in Section 3.

i) *The Agri-Food System*

While it is useful to isolate several groups of variables as key determinants of competitiveness, considering them in a system-wide framework emphasizes the interrelationships among these determinants and how they relate to all parts of the agri-food sector (Figure 2). Clearly, the degree to which a firm's strategy usefully focuses on cost or product differentiation depends on consumer demand characteristics, the degree of market concentration/industry structures, and access to the factor supplies/input suppliers that can support the strategy. The importance of these linkages in the agri-food sector is illustrated by poultry processors and the food service industry. The latter are concerned about not only the price but also the availability of poultry meat that meets their specifications.

One aspect of the systems approach which must be considered when applied to a specific situation is its geographic scope. While some issues (e.g., Western grain transportation policy) may have a regional focus, economic linkages with other regions should be part of the analysis. Also, the important role of multinational firms at both the processing and distribution levels and the dependence on imported machinery and equipment and other imports suggest an international framework is required, at least for some sectors and issues. As indicated in various sections and by Figure 2, the close linkages between the Canadian and U.S. economies, especially as the free trade agreement is implemented, means that in important respects, the U.S. should be considered as part of the system.

While the contribution of the systems approach is to help ensure that all variables and their interrelationships are considered when conducting competitiveness research and analysis, their relative importance will vary by industry/industry segment.

Also, while the system identified herein helps to expand the scope of analysis (search for determinants) beyond a narrowly defined industry, it does not incorporate the need to examine some issues in the context of overall, macroeconomic competitiveness of the nation. An example would be the allocation of public research funds among sectors of the economy.

3. Policy Analysis and Development

The need for policy change could arise from developments affecting the sector or from changes in the weights applied to goals for the sector. For example, trade liberalization places greater weight on the need to be internationally competitive, while regional development objectives might limit overall national competitiveness. Also, there could be tradeoffs between competitiveness, measures essential for economic growth, and other goals such as income security and equity. Options for meeting competing goals in a balanced way need to be identified and their economic effects considered (e.g., Ash and Brink, 1992).

The development of policies to increase the competitiveness of the agri-food sector requires an understanding by all of those involved in the policy process of the concept of competitiveness, why improved competitiveness should be desired, the factors that determine competitiveness, and the way that changes in government policy and programs might increase the competitiveness of the sector. The process of policy development thus involves research and consultation.

This analytical framework provides a basis for understanding the nature of competitiveness and conducting the research required. Clearly, one set of determinants is the actions of governments. Economic policies and programs are especially important because they influence other determinants and the incentives for change. The discussion also identifies a number of specific public policy issues related to competitiveness. For example, if input costs were found to be high relative to those in other countries due to a government regulation or program that increased costs, then options for modifying the program should be developed and evaluated in terms of their effects on competitiveness and other goods. Alternatively, a policy or program may need to be introduced or made more effective (e.g., technology transfer, training). While some empirical research has been done, more work is

needed to estimate underlying economic relationships and to analyze policy options.

Competitiveness research and policy analysis employ a variety of methodologies and data sources. A large amount of secondary data is available and efforts could be made to obtain primary data from sector participants as required. A wide range of analytical tools also are available. However, in many cases, data and/or methodological limitations are severe.

The discussion of cost competitiveness indicated the problems researchers encounter in obtaining information that would allow meaningful cost analysis, especially international comparisons. Additional problems are encountered when one considers research on other aspects of competitiveness. For example, Canada's Census of Manufactures is conducted annually but the data are available only with a two to three year lag. Also industry definitions (in terms of products produced) are quite broad and coverage of small establishments has become less detailed due to budgetary restraints. The U.S. Census is conducted only on a five year cycle with surveys in the other years. The use of census data to measure changes in numbers and sizes of establishments and enterprises (firm data are not provided), and the cost and revenue structure of industries is thus limited. Information is available from other Statistics Canada surveys on sales and profits but these are firm level data and all of a firm's data are allocated to the industry accounting for the largest part of its revenues. Obtaining primary data is an option (but an expensive one) and firms can be reluctant to share confidential information.

The analysis of characteristics such as rates of innovation, degree of product differentiation, degree of rivalry among firms, quality of resources, attitudes toward exporting, etc. encounter even greater difficulties in terms of data availability and methodology. In many cases, various "proxy" variables must be developed.

These analytical difficulties are identified here to provide some perspective on what can realistically be expected in terms of empirical analysis by governments. Individual firms, of course, face a somewhat different set of opportunities and constraints in conducting research. They at least have access to their own information and also have perhaps more specific or limited research objectives. The challenge is to develop quantitative and qualitative information to provide empirical information needed to make informed judgements. Various published studies provide useful illustrations of approaches that might be adopted.

Effective consultation with all participants in the sector will, of course, also be an essential part of the process. As indicated at the outset, an important reason for preparing this framework paper is to allow all interested parties to develop a better and more common understanding of competitiveness issues, a prerequisite to the development of acceptable policy options to improve the competitiveness of the agri-food sector. In the longer term, the aim is to facilitate the development of a more self-reliant, market responsive and profitable agri-food sector.

Assessments of the competitiveness and trends in competitiveness of the agri-food sector and parts of it will help to more clearly define policy issues and research needs. This framework is intended to aid in conducting such assessments and, more importantly, to guide research on the determinants of competitiveness. As the framework emphasizes, a large number of interrelated factors must be taken into account, including the activities of governments.

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APPENDIX I

SELECTED DEFINITIONS OF COMPETITIVENESS

The following are definitions of competitiveness found in the literature:⁵

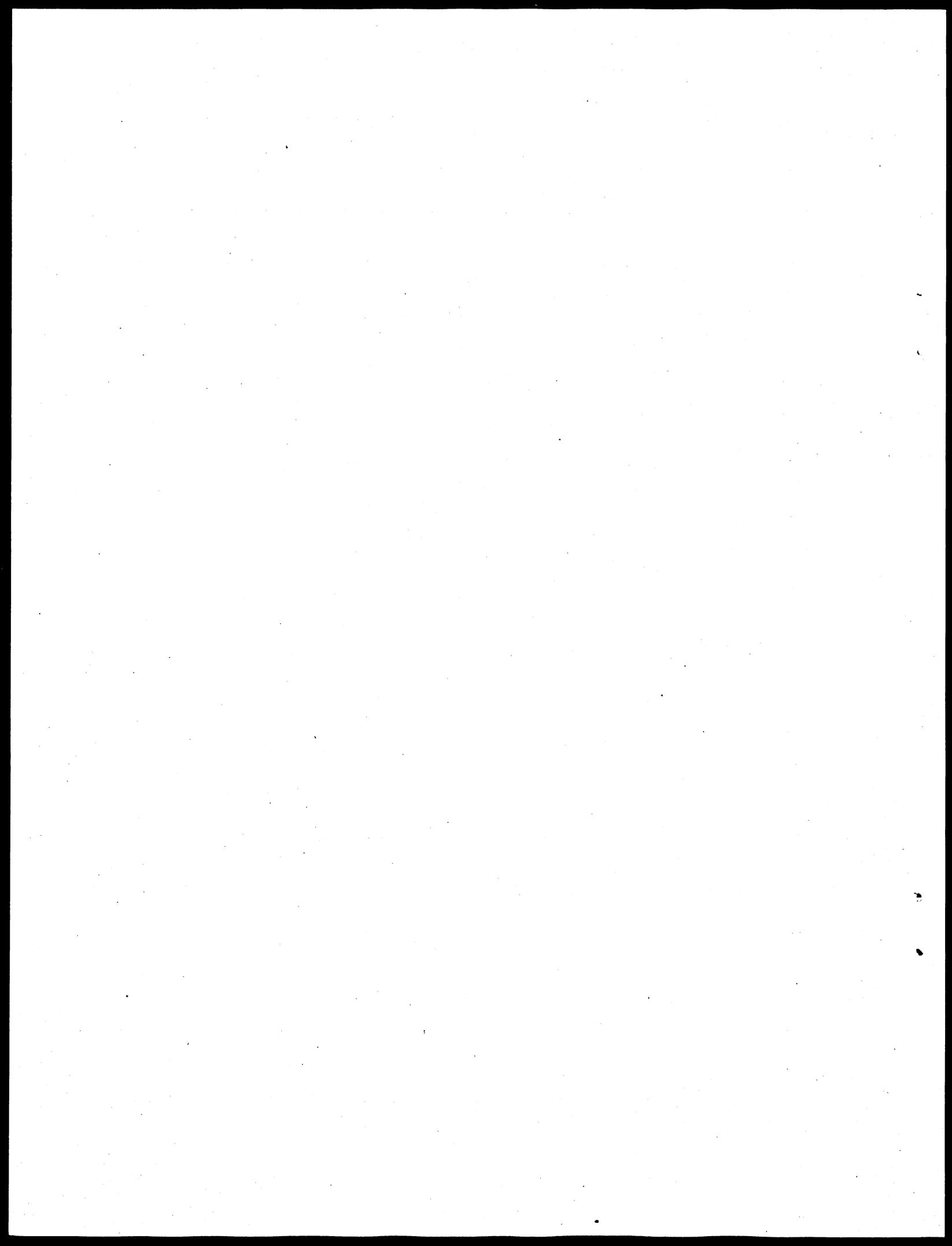
- Competitiveness is "the ability of a nation to produce, distribute, and service goods in the international economy in competition with goods and services produced in other countries and do so in a way that earns a rising standard of living". (from Scott and Lodge (1985), quoted in White, 1987, p.8)
- Competitiveness is the "... ability to deliver goods and services at the time, place and form sought by overseas buyers at prices as good or better than those of other potential suppliers whilst earning at least opportunity cost returns on resources employed". (Freebairn (1986, p.2), quoted in Sharples and Milham, 1990, p.1)
- Competitiveness is "a national ability to produce and market products in international trade while earning a level of returns to the resources (both human and physical) used to produce those products which is at least comparable to what those resources could earn in alternative activities". (Langley (1986), quoted in White, 1987, p.9)
- "... the measure of U.S. agriculture's international competitiveness may not necessarily be whether the peak market shares of the 1970s can be regained. Rather, the focus for the future may revolve around whether U.S. producers can profit from their exports." (U.S. Congress, Office of Technology Assessment, 1986, p.7)
- "For a firm, competitiveness is the ability to design, develop, manufacture and market products at home and in other nations in competition with other firms. For a nation, it means doing all this without a decline in the real standards of living of its citizens." (U.S. Congress, Office of Technology Assessment (1988, p.25), quoted in Industry, Science and Technology Canada, 1991, p.3)

⁵ Reproduced from Ash and Brink (1992), Appendix I.

- "Competitiveness [...] is a statement about differences in market prices, government interventions and everything else factored in." (Dunmore, 1989, p.18)
- "Competitiveness can be broadly defined as the ability to sell commodities to overseas buyers at prices as low as or lower than those of other potential suppliers while earning at least opportunity cost returns on domestic resources used to produce and market these commodities." (Vollrath, 1989, p.18)
- Competitiveness is the "... ability to design, produce and market goods and services, the price and non-price characteristics of which form a more attractive package than those of competitors". (IMD and World Economic Forum, 1990, p.8)
- "... comparative advantage applies to a world of efficient well-functioning, undistorted markets, and competitiveness applies to the world as it actually is." (Barkema, Drabenstott, and Tweeten, 1990, p.254)
- "The only meaningful concept of competitiveness at the national level is national productivity." (Porter, 1990, p.6)
- "Competitiveness is the ability to profitably gain and maintain market share in the domestic and/or export market." (Task Force on Competitiveness in the Agri-Food Industry, 1990, p.3)
- "... being competitive is the ability to deliver goods and services at the time, place, and form sought by buyers, in both the domestic and international markets at prices as good [as] or better than those of other potential suppliers, while earning at least opportunity costs on resources employed." (Cook and Bredahl, 1991, p.1472)
- "Competitiveness is a structural quality built into [a country's] public and private institutions and ultimately woven into its social, economic and political fabric. [...]"

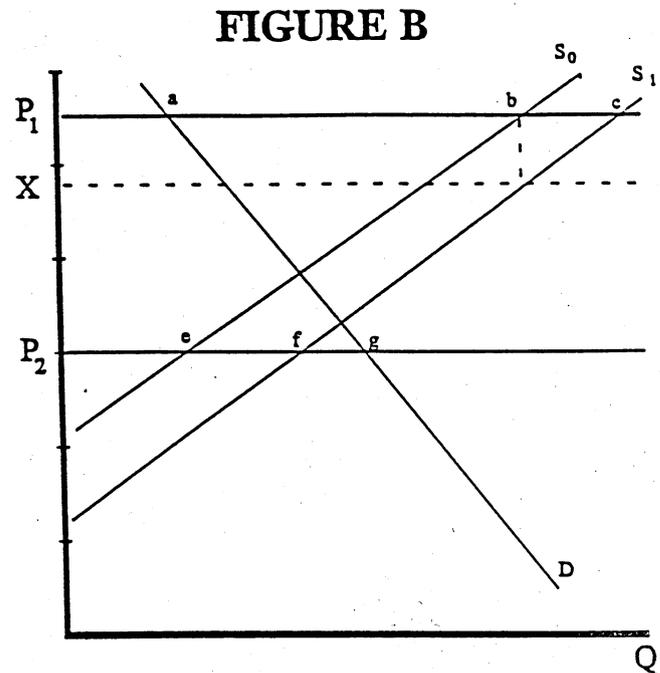
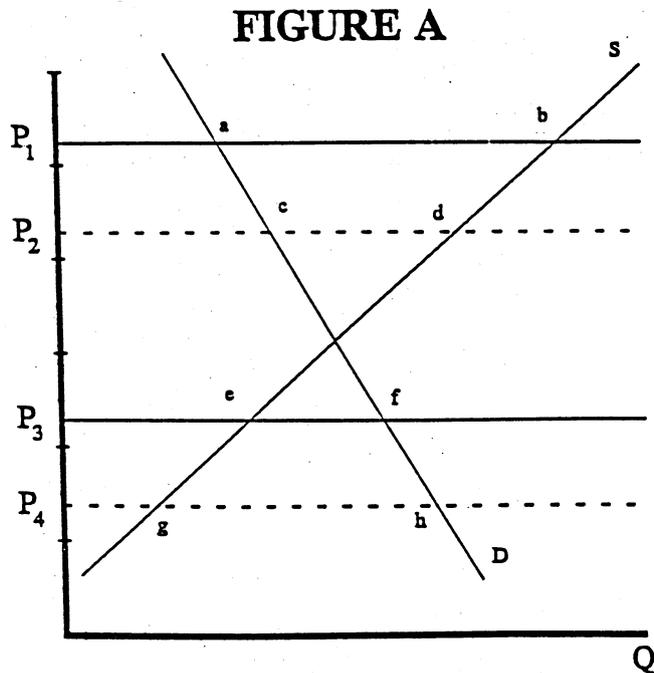
Competitiveness depends on competition, and economic efficiency and innovation are the result." (Purchase, 1991)

- "National competitiveness is better defined by reference to broader indicators that show the extent to which a country's involvement in global markets through trade, investment, and technology flows to growth in real income." (Economic Council of Canada, 1992, p.6)



APPENDIX II

DEMAND AND SUPPLY ANALYSIS



A. Given Canada has demand curve D and supply curve S for a product:

(i) World price P_1 implies produce quantity b , consume a and export $(b-a)$. If world price falls to P_2 while Canada's demand and supply functions do not change, Canada is less competitive. Production falls to d (not zero), consumption increases to c and exports fall to $(d-c)$.

(ii) World price P_3 implies produce quantity e , consume quantity f and import $(f-e)$. Canada is less competitive than in situation (i) but still competitive at output level e . If world price falls to P_4 , this implies that Canada is competitive only at output level g , domestic market share has fallen from e/f to g/h .

B. Given Canada has demand curve D and supply curve S_0 , assume that increased productivity or lower input prices in production or distribution shifts the supply curve to S_1 ;

(i) Given world price P_1 exports increase from $(b-a)$ to $(c-a)$. Presumably Canada's share of world trade increases (since the

world price is assumed constant), i.e., an increase in competitiveness. Note that unit cost of production at output b falls from P_1 to x but industry output would expand to c where price would equal marginal cost.

- (ii) Given price P_2 , Canada's domestic market share increases from e/g to f/g , i.e., an increase in competitiveness at that price.

APPENDIX III**NUMERICAL EXAMPLE OF COMPARATIVE AND
COMPETITIVE ADVANTAGE****Introduction**

A recurring question is the distinction between comparative advantage and absolute advantage. For example, if Canada exports a product to the U.S., buyers in the U.S. must find that the (delivered) price of the Canadian product is as low (or lower) as that of the comparable quality product from U.S. and other foreign sources; this is a comparison of absolute differences. The more Canada can increase the absolute difference between the attractiveness to buyers of its product (price, non-price) package over that of other (potential) suppliers, the greater its competitive advantage. Such an increase in competitiveness will only be possible, however, if Canada's comparative advantage in supplying this product has increased, for example, through more value adding or cost reducing technological improvements compared to other products and to other countries.

In this discussion, references to differences in costs and prices apply to the situation prevailing before trade takes place or before the effects on them of a change in technology, consumer preferences, etc. are realized. After trade is allowed or the effects of changed conditions are fully felt, prices and costs (net of transfer costs) will equalize, assuming competitive markets, or stabilize at levels reflecting differences in market power and "product" characteristics.

Example**Case 1****Production Possibilities
Given 100 units of
resources**

$$10X + 20Y = 100$$

Country A **Resource Costs**

1 unit of X costs 10 units of resources
1 unit of Y costs 20 units of resources

Opportunity Costs

1 unit of X costs 1/2 unit of Y i.e.(10/20)
1 unit of Y costs 2 units of X i.e.(20/10)

- (iii) B would be economically better off if it produced only X and imported Y (assuming a linear production possibilities function, otherwise it would produce some X and import less Y). If self-produced, 1Y costs 3X, if imported (with no transfer costs), 1Y costs 2X. For example, rather than consuming 6.7Y and 0X, it could consume 6.7Y (producing 5.7 and importing 1) and 1X, or some other combination of X and Y, assuming Country A would be willing to trade. Applying the same sort of reasoning to A, it also could benefit from trade.

Using market share as the indicator of competitiveness, production of X in B would be more competitive than production of Y and vice versa in Country A.

When trade takes place, the relative prices and opportunity costs of X and Y change in both countries. The equilibrium levels of production and consumption will be somewhere between the extremes of (10X and 0Y) or (0X and 5Y) in A and (20X and 0Y) or (0X and 6.7Y) in B. The equilibrium quantities and price will depend on consumer preferences in the two countries.

Case 2

- (iv) In terms of **resource productivity**, B has increased its absolute advantage in producing both X and Y. If increased competitiveness were equated with increased productivity, producers of both X and Y in B would now be more competitive.
- (v) In terms of **opportunity cost**, B's absolute advantage over A in producing X and disadvantage in producing Y has not changed from that of Case 1. The reason is the assumption of "equal proportional" technical change; there has been no change in comparative advantage. However, it can now produce more of X and/or Y than before and this increase in competitiveness would be reflected in performance measures. If the productivity of producing X and Y had increased at different rates, then the opportunity cost of each in B would have changed (possibly to the degree that B lost its comparative advantage in X but gained comparative advantage in Y); B's opportunity costs would have changed relative to A's opportunity costs since the latter have not changed; and hence its competitiveness in each product would have changed.

- (vi) With no trade, B is better off than in the Case 1 situation of no trade since it is now getting more output per unit of resources.
- (vii) By engaging in trade, B can become still better off than in the no trade situation of (vi). The reasons are the same as in (iii) but B would be better off than in (iii) because of the increased productivity of its own resources. The "terms of trade" (i.e., cost of importing Y in terms of X) will not have changed (because of the linearity, and assumed equal technical change). The level of trade likely would increase but this would depend on consumer preferences/demand for X and Y in both countries.
- (viii) Consumers in Country A also will be better off even though productivity of their domestic economy has not changed. The reason is that the cost of importing X has fallen.
- (ix) The producers of Y in Country B and of X in Country A would be worse off because of trade since the real prices of their output have fallen. In principle, however, the gains by the other producers (and consumers) in each country could be used to compensate the losers so that everyone would be better off.

Conclusion

This simple example illustrates the difference between absolute advantage and comparative advantage. It also illustrates in a limited way that competitiveness is importantly a question of comparative advantage and overall productivity whether considered in terms of the market share or product-price definitions. In this regard, the assumptions of homogeneous products and linear production possibility functions are major limitations.

