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**COMPETITIVENESS:
CONCEPTS AND MEASURES**

*Occasional Paper Number 5
April 1995*



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**COMPETITIVENESS:
CONCEPTS AND MEASURES**

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*Occasional Paper Number 5
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INTRODUCTION

The purpose of this study is to explain and evaluate concepts and measures of competitiveness. Competitiveness means different things to different people. It is helpful to consider competitiveness at three different levels of aggregation:

- the firm;
- the industry or groups of industries; and
- the nation.

At each level of aggregation, there are different measures, or indicators, of competitiveness. They vary in what they imply about the present and future economic success or well-being of a firm, industry or nation. Some concepts of competitiveness are applicable at one level of aggregation but not at another.

This paper begins by discussing measures of competitiveness at the firm level, where the concept of competitiveness is most meaningful. The paper then turns to competitiveness at the industry level and then at the national level. The paper concludes with a discussion of the policy implications of the more persuasive concepts of competitiveness.

1. COMPETITIVENESS AT THE FIRM LEVEL

The concept of competitiveness is best understood at the firm level. In the simplest terms, an unprofitable firm is uncompetitive. In the textbook model of perfect competition, an uncompetitive firm is one with an average cost that exceeds the market price of its product offering. The value of the resources the firm is using (opportunity cost) exceeds the value of the goods and services it is producing. Resources are misallocated and wealth is being reduced.

In a homogeneous-product industry, a firm may be unprofitable because its average cost is higher than the average costs of its competitors. Its average cost may be higher than its competitors because its productivity is lower, it pays more for its inputs, or both. Its productivity may be lower because it is less efficiently managed (technical inefficiency, “X-inefficiency”), it operates at an inefficient scale, or both.¹

In profit-maximizing equilibrium in a homogeneous-product industry, the lower a firm's marginal or incremental cost is relative to those of its competitors, the larger is its market share, and, other things being equal, the more profitable it is. Thus, market share reflects input cost and (or) productivity advantages.

In a differentiated-products industry, a firm may be unprofitable for the same reasons as given above for a firm in a homogeneous-product industry. An additional reason is that its product offering may be less attractive than that of its competitors. Other things being equal, the less attractive a firm's product offering is, the lower is its equilibrium market share. The attractiveness of a firm's product offering may also reflect the efficiency of its past use of resources (such as research and development (R&D) or advertising).

¹ Caves and Barton (1990) and Scherer and Ross (1990, pp. 668–672) use the terms “technical efficiency” and “X-efficiency” interchangeably. They refer to a situation in which the operations of a firm or plant can be reconfigured or reorganized so that it produces a greater output with the same inputs and technology. More formally, a plant or firm is technically inefficient or X-inefficient if it is inside the boundary of the production set.

Thus, at the firm level, profitability, cost, productivity and market share are all indicators of competitiveness.² Profitability is a sufficient indicator of current competitiveness, although profitability is best measured over an extended period. Market share may also be a sufficient indicator of competitiveness if the firm is maximizing profits (i.e., not sacrificing profits in the pursuit of market share for its own sake). Of course, a firm can be competitive in a market that is itself declining. In this case, competitiveness does not ensure future profitability.

Average cost (relative to that of competitors) is a sufficient indicator of competitiveness in a homogeneous-product industry (unless low costs are achieved at the expense of future profitability). Unit labour cost (ULC) may be an adequate representation of average cost if labour cost constitutes a large fraction of total cost, but this is becoming increasingly infrequent.

Total factor productivity (TFP) measures the efficiency with which a firm converts the entire set of inputs required for production into output. TFP says nothing about input cost advantages or disadvantages. If output is measured in physical units (hectolitres of beer, tonnes of newsprint, number of television sets), TFP says nothing about the attractiveness of a firm's product offering. If output is inferred by deflating shipments data, then, depending on the deflator, output estimates may reflect some of the price premium a firm is able to command. Labour productivity may provide an adequate representation of TFP if labour is the predominant input. This is seldom the case.

One can compare interfirm TFP and TFP growth by using the translog multilateral productivity index derived by Caves et al. (1982). This index has been used to make interfirm comparisons of TFP and TFP growth rates in the railway and telecommunications industries in Canada. It has also been used to make international comparisons of industry TFP levels and growth rates (Denny et al. 1992).

TFP growth can be due either to technical change (a downward shift of the cost function) or to the realization of scale economies (a movement

² In its study of the effect of R&D tax incentives on competitiveness, the Commonwealth of Australia, Bureau of Industrial Economics (1993, Ch. 7), uses three statistical indicators of competitiveness: the growth rate of sales; the profit/sales ratio, and the profit growth / turnover ratio. The Bureau also uses six qualitative indicators: product quality and performance, customer satisfaction, product range, profits, costs, and production flexibility.

along the cost function). Indexes of TFP growth are also influenced by departures from marginal cost pricing.³ Denny et al. (1981) derived an expression to decompose measured TFP growth into its sources, technical change, scale economies and departures from marginal cost pricing. This approach has been used to estimate the rate of technical change in the telecommunications and railway industries in Canada.⁴ The rate of technical change can also be inferred directly from estimates of statistical cost functions.

It is possible for a firm to be profitable and have a large domestic market share and still be internationally uncompetitive. This can occur if the domestic market is protected by barriers to international trade. In this case, domestic firms may be profitable at present but might be unable to compete (i.e., stay profitable) if trade were opened up. To determine whether this could occur, it would be necessary to compare a firm's costs with those of potential international competitors.

A firm is an ongoing entity, and any meaningful measure of its competitiveness should take this into account. Thus, a firm's competitiveness should be measured by its profitability over a relatively long period rather than a limited period. The present discounted value of a firm's anticipated profit stream is the firm's market value (the market value of the firm's equity).

A firm is said to be uncompetitive if the market value of its debt and equity is less than the replacement cost of its assets. In essence, some or all of its past investments have turned out to be mistakes. Resources are being wasted *ex post*, that is, they are not earning their opportunity costs. The ratio of the market value of a firm's debt and equity to the replacement cost of its assets is known as Tobin's q . A firm with a Tobin's q of <1 is uncompetitive.

The anticipated future profits of a firm depend on its relative productivity and input costs and the relative attractiveness of its product offering over time. The future profitability of a firm may be a function of its

³ The use of revenue share weights to approximate the theoretically correct cost-elasticity share weights imparts a bias in TFP estimates if output price/marginal cost ratios vary across outputs.

⁴ For a TFP-level and growth-rate comparison of Canadian railways, see Lall (1992).

current spending on R&D, its patenting activity, or many other facets of the firm's strategy.

It is generally assumed that the goal of a firm is to maximize the sum of its current and discounted future profits. This assumption raises two questions. First, how do you do this? That is, what strategies, tactics and operational procedures do you adopt? Second, how do you know if you are succeeding? Could current profits be higher? How profitable will the firm be in the future? Could it be more profitable?

There is a huge body of academic literature and a thriving consulting industry with advice on realizing operational efficiencies and on managerial strategy. The Organization for Economic Co-operation and Development (OECD) (1992) summarized the operational and strategic sources of competitive success at the firm level:

The competitiveness of firms today is largely shaped by the various aspects of corporate organization that command the effectiveness of industrial R&D and other innovation-related investments. At [the] firm level, factors contributing to competitiveness thus include: the successful management of production flows and raw material and component stocks; the successful organization of effective interactive integrating mechanisms between market planning, formal R&D, design, engineering and industrial manufacture; the capacity to blend in-house R&D and innovation-related activities with R&D cooperation with universities and other firms; the capacity to incorporate closer definitions of demand characteristics and the evolution of markets into design and production strategies; the capacity to organize successful interfirm relationships with component and material supplier firms upstream and with retailers downstream; and finally the steps taken by firms to enhance workers' and employees' skills through investments in vocational training as well as to establish greater degrees of worker responsibility in production. (p. 239)

The strategic management literature is built on the presumption that individual firms are endowed with unique, intangible assets known as core competencies. These competencies must be accumulated internally over time. They cannot readily be purchased. The key is to anticipate which competencies will be highly valued in the future and then to develop competencies that are not only highly valued but also difficult to copy.

There are various ways a firm can exploit its stock of intangible assets. The objective is to exploit these assets to maximize the present value of the quasi-rents they generate. It is, however, not obvious when current and future quasi-rents or profits are in fact being maximized. Indicators of the current and, especially, the likely future success of the firm's strategies are required. In some cases, a high market share is an indicator of success.

In other cases, it is not. In some cases, low unit cost is an indicator of success. In other cases, it is not. It is extremely important to not confuse indicators with objectives. For the firm, the objective is to maximize the present value of profits. A high market share may indicate that this objective is being achieved. But a high market share is not necessarily desirable for its own sake.

A high market share will have greater implications for profitability, or wealth maximization, when it is measured at the firm level than when it is measured at the industry or national level. Oligopoly theory generally implies that a firm with a high market share has discretion over its price (dominant firm model) or has lower costs or more attractive products than its rivals (conjectural variations models). This implies that economic (above-normal) profits are being earned. There is no such implication at the industry level. Canadian producers as a group may have a large share of the U.S. market. They may also be competing away the benefits of any cost or product-quality advantages, in which case market share does not translate into rents or profits for Canadians. In addition, firms are better placed than countries to hire additional resources to expand or maintain their share of a growing market.

On the indicators of individual firm competitiveness, the OECD (1991) stated the following:

The factors which contribute to micro-economic competitiveness have long been a special concern of managerial and industrial economics. These disciplines use a wide range of indicators (market shares, profits, dividends, investment, etc.) to assess the competitiveness of firms. Corporate surveys and industrial case studies carried out over the last 20 years have found that:

- i) in most industrial branches and sectors competitiveness cannot simply be viewed as centred on prices and the cost of inputs (e.g. wages and indirect labour costs); and
- ii) a variety of non-price factors lead to differences in the productivity of labour and capital (scale economies, process systems, size of inventories, management, labour relations, etc.) and in the quality and performance of products. (p. 239)

The literature on business strategy is built on the premise that it is always possible to do better. There is a continual process of trial and error and of innovation and imitation. What works for one firm may also work for others.

In the context of industrial policy, the literature applies this principle to firms from different countries, suggesting that firms based in one country may, as a group, have lessons to learn from firms based in another country. Thus, North American business is said to have much to learn from Japanese business.

Nelson (1992) summarized the alleged collective failures of American business. These include the following:

- reliance on mass production instead of flexible manufacturing;
- excessive hierarchy;
- excessively narrow job assignments;
- weak linkages between R&D and production;
- poor quality and cost control;
- insufficient attention to production;
- ignorance of foreign markets;
- concentration on the short term at the expense of the long term;
- insufficient emphasis on training and retraining; and
- treatment of labour as a commodity rather than as a partner.

Canadian firms are thought to have the same failings and some additional ones. Porter (1991, Ch. 9) found that Canadian firms engage in excessive product diversification and excessive vertical integration and pay insufficient attention to product differentiation and the global marketplace.⁵ We rely too much on government. There is also an overreliance on low factor costs as a source of competitive advantage, leaving Canadian firms vulnerable to competition from firms with access to even cheaper inputs.

A focus on firm-level competitiveness implies a limited role for government. A nation is as competitive as its firms. Whether a firm is competitive depends on how it is managed. One thing we may have learned in the past 25 years is that governments have been poor managers and poor management consultants when operating in the market sector. Governments can contribute, though, by providing an environment conducive to good

⁵ In Porter's view (1991, pp. 314–315), Canadian firms expand domestically through conglomerate diversification and vertical integration rather than seeking out foreign markets. This leaves Canadian firms “vulnerable to attack from more specialized, internationally focused competitors.”

managerial practice. Such contributions are listed below, in order of priority:

1. Stabilize the country's economy.
2. Create a competitive environment. This is facilitated by elimination of barriers to international and domestic trade and to domestic entry.
3. Eliminate barriers to non-collusive cooperation among firms – cooperative efforts that may include benchmarking, research, development and commercialization. Such barriers are seen as a problem in the United States (Teece, 1991).
4. Improve three types of inputs: human capital, finance and public services (Purchase 1991). The quality of human capital available to firms depends on the quality of the (largely government-operated) educational system and the incentives to employees to improve their skills or acquire new ones. The terms on which finance is available depend on how much the government borrows and how the financial system is regulated. Governments can also ensure that the services they provide and the regulations they impose are administered efficiently.

2. COMPETITIVENESS AT THE INDUSTRY LEVEL

Competitiveness is frequently analyzed at the industry or sectoral level (D'Cruz and Fleck 1985; Industry, Science and Technology 1991) or at the “cluster” level (Porter 1990, 1991; Rugman and D'Cruz 1990). Industries or sectors may be analyzed because data on individual firms are proprietary. Industry analysis assumes that industry averages are meaningful. Intra-industry differences may, in fact, be large — there may be few, if any, average or representative firms. These differences may be a consequence of location, product or input mix, age, scale, historical circumstance or other factors.

Whereas the competitiveness of individual firms in a local or regional market can be assessed by a comparison with local or regional rivals, the competitiveness of an industry must be assessed by a comparison with the same industry in another region or country with which trade is occurring or could occur. Thus, a competitive industry can be defined as comprising interregionally or internationally competitive firms. The competitiveness of an industry may be inferred from the analysis of the competitiveness of the major firms in it. The study of firm-level competitiveness is discussed in Chapter 1. A firm is interregionally or internationally competitive if it is consistently profitable in an open market.

Measures of competitiveness may be calculated at the industry level if firm-level data are not available. As noted at the beginning of this chapter, these measures are averages and may not reflect the fortunes of any one firm in the industry involved. Most of the measures of competitiveness that can be calculated at the firm level can also be calculated at the industry level. Profitability can be calculated at the industry level. An industry that consistently earns average or above average rates of return in open competition with foreign suppliers can be regarded as competitive (it may be desirable to adjust for inter-industry differences in nondiversifiable risk).

Cost and Productivity Indicators

It is also possible to make international comparisons of cost and productivity at the industry level. Markusen (1992) suggested the following “positive, efficiency-based” definition of industry competitiveness:

(1) An industry is competitive if it has a level of total factor productivity equal to or higher than that of its foreign competitors. (2) An industry is competitive if it has a level of unit (average) costs equal to or lower than its foreign competitors. (p. 8)

International comparisons of total-factor productivity levels and productivity growth at an industry level were made by Denny et al. (1992).⁶ An international comparison of average costs in automobile assembly was made by Fuss and Waverman (1992). The Fuss and Waverman analysis decomposes cost differences into factor price and productivity differences. Their analysis also decomposed productivity differences into those that are attributable to differences in scale and those that are attributable to differences in technology.

One may make inferences about future competitiveness by extrapolating past rates of TFP growth. Of course, past rates of TFP growth may not prevail in the future (see the discussion of clusters in the section, “Trade and International Market-Share Indicators,” in this chapter). Factor prices and exchange rates may also change.

Partial cost and productivity comparisons can also be made at the industry level. This typically involves the international comparison of ULC or of labour productivity. An index of labour cost competitiveness for industry i in country j in period t can be defined by the following:

$$[1] \quad \text{ULC}_{ijt} = W_{ijt} \text{XR}_{jt} / (Q/L)_{ijt}$$

where W_{ijt} is the wage rate per hour in industry i in country j in period t ; XR_{jt} is the price of U.S. dollars in the currency of country j in period t ; and $(Q/L)_{ijt}$ is the output per hour of labour in industry i in country j in period t . Relative unit labour costs (RULC) in industry i for country j relative to country k at time t can then be expressed by the following equation:

$$[2] \quad \text{RULC}_{ijkt} = \text{ULC}_{ijt} / \text{ULC}_{ikt}$$

⁶ Relative efficiency, Θ , is calculated from the following equation:

$$\Theta = \ln(Q_A/Q_B) - 0.5(s_{KA} + s_{KB}) \ln(K_A/K_B) - 0.5(s_{LA} + s_{LB}) \ln(L_A/L_B) - 0.5(s_{MA} + s_{MB}) \ln(M_A/M_B)$$

where Q , K , L and M are output, capital, labour and materials, respectively; A and B are countries A and B , respectively; and s_{ij} is the proportion of total cost accounted for by the i th input in the j th country.

Country j 's ULC can rise relative to those of other countries for any or all of three reasons: wage rates increase faster than in other countries; labour productivity increases more slowly than in other countries; and the local currency appreciates relative to that of other countries.

Although ULC comparisons are increasingly viewed as poor indicators of international differences in total cost, the RULC measure can illustrate the type of competitive problems confronting an industry. Differential rates of inflation between countries j and k would, under conditions of purchasing-power parity, result in an offsetting exchange-rate movement, leaving RULC unchanged. If, however, the central bank is committed to defending the existing exchange rate, then there will be domestic deflation with accompanying unemployment, a currency crisis, or both. In this case, an increase in ULC relative to other countries may be an advance indicator of future current account deficits and adjustment problems.

An increase in the real wage for labour in industry i may also be associated with productivity growth in industry i and other industries, in which case ULC in industry i may remain unchanged. An increase in the real wage also implies that the opportunity cost of labour used by industry i has increased; that is, other industries are bidding up the price of labour (or, more broadly, the resources) used by industry i . Thus, an increase in RULC for industry i could reflect a shift in comparative advantage to other industries.

Similar considerations apply to exchange-rate appreciation. This may be a consequence of domestic “dissaving” (see Chapter 3). In this case an increase in RULC for industry i is the means by which resources are bid away from export or import-competing activity to supply government or other domestic consumption. An exchange-rate appreciation may also be a consequence of an increase in foreign demand for some of country j 's exports. If industry i is not one of those favoured with an outward shift in its demand, then the exchange appreciation and resulting increase in industry i 's RULC may be the means by which more favoured export industries bid away resources from the less favoured. Thus, a change in RULC resulting from a change in the exchange rate may also reflect a shift in comparative advantage.

The essential problem with unit-cost comparisons is their normative ambiguity. An increase in relative unit costs due to wage increases or exchange-rate appreciation is desirable if it is sustainable. It is sustainable if

it reflects an increase in the attractiveness or value of the home-country's exports to foreigners or an increase in the opportunity cost of the home-country's workers. If it is not based on this type of real improvement, it is not sustainable. If the increase in relative unit costs is not sustainable, the home-country's unit costs must ultimately decline relative to those of its trading partners. This decline may require any or all of productivity improvements, wage decreases or exchange depreciation.

In an assessment of the RULC approach to competitiveness, the OECD (1992) stated the following:

Relative unit labour cost (RULC) indices were for a long time considered as representing trustworthy indicators of competitiveness. Well into the 1980's in fact, many economists took the position that international competitiveness was determined mainly, if not solely, by export prices and these prices were determined mainly by unit industrial input costs, notably wages. They formed their policy recommendations on this basis. In terms of economic policy, this approach to international competitiveness led to:

- i) measures concentrated essentially on wage costs and on labour productivity (and sometimes solely on wage costs); and
- ii) the view that devaluation was a way to achieve gains in competitiveness. (p. 240)

In the view of the OECD, the RULC and devaluation approaches have been discredited because Japan and Germany experienced both rising RULC and increasing world market shares and because labour cost is no longer an important component of total cost. This misses the point. The Japanese and German experience is consistent with an outward shift in demand for their exports resulting in a new equilibrium with a higher price (exchange rate) and quantity (world export share).

In other words, if market demand shifts outward and the market supply schedule is upward sloping, then the effect of the *shift* in demand is an increase in both the equilibrium market price and the equilibrium quantity. The fact that we observe both a price increase and an increase in the quantity demanded (and supplied) in this case doesn't contradict the law of demand, which is a statement about the relationship between price and quantity *along* a demand schedule.

The OECD's (1992) second point has somewhat more validity. Labour cost may be a small component of the cost of tradeable goods and services. Changes in labour cost may be offset by changes in other factor

prices or in other sectors. Therefore, changes in RULC might not result in great changes in exchange rates. A broader unit-cost measure might be a better predictor. A broader unit-cost measure might incorporate the cost of capital as well as the cost of labour.

In recent years, analysts came to view the cost of capital itself as a more general indicator of the cost disadvantage faced by home-country producers in foreign markets. The the lack of long-term planning of North American firms and their consequent lack of investment in technological and organizational innovation were blamed on the high cost of capital in North America. But, unlike labour, capital is internationally mobile. In the absence of currency controls, the real cost of finance should not differ by more than the country-specific (exchange-rate) risk premium. Bruce (1992) concluded that the lower cost of finance experienced by Japanese firms in the 1970s came at the expense of Japanese savers who were prevented, at that time, from seeking higher yields abroad. There was no cost-of-capital advantage to the Japanese economy as a whole.

The cost of capital also depends on the corporate tax regime. The difference between the cost of finance and the required or hurdle rate of return is the so-called tax wedge. Bruce's data indicate that, with the exception of R&D, the tax wedge on capital investment is higher in Canada than in the United States (Bruce 1992, table 2).

A consistently higher home-country tax wedge will ultimately be offset by an exchange depreciation or a domestic deflation, with accompanying unemployment. Taxation also distorts. Canadian production and exports will be less intensive in the activities in which the Canadian excess tax wedge is the greatest. Capital and mobile labour (mobile factors) will relocate where they are less heavily taxed. Indeed, Mintz (1993) has argued that national competitiveness should be defined in terms of attractiveness to mobile factors. This is the approach taken in the well-known *World Competitiveness Report*. This contains a subjective ranking by business executives of the attractiveness of various countries as a location for their businesses.

Trade and International Market-Share Indicators

International market shares and trade balances are frequently used as industry-level indicators of competitiveness. Markusen (1992) suggested the following “positive, trade-based” definition of industry competitiveness:

In a free-trade environment: (1) An industry loses competitiveness if it has a declining share of total domestic exports or a rising share of total domestic imports deflated by the share of that good in total domestic production or consumption. (2) An industry loses competitiveness if it has a declining share of total world exports or [a] rising share of total world imports of that good deflated (divided by) the country's share of world trade. (p. 8)

Porter (1990, 1991, p. 26) uses a revealed comparative advantage (RCA) measure of competitiveness. A nation's RCA can be calculated on an industry basis or for disaggregated product classes. The RCA for country j in product class i is defined by the following:

$$[3] \quad RCA_{ij} = \frac{[(\text{exports of product } i \text{ by country } j) / (\text{world exports of product } i)]}{[(\text{total exports of country } j) / (\text{total world exports})]}$$

If RCA_{ij} is >1 , then country j has an RCA in product i . Porter (1991) used the Canadian share of 1989 world market economy exports (5.1%) as his denominator. Thus, Canada is competitive, according to Porter, in products for which its world market economy export share exceeds 5.1%. Porter also stipulated that competitive industries must have a positive net trade balance, unless their RCA is >2 (1991, p. 412). Thus, an industry with 6% of world exports and 7% of world imports would not be deemed competitive. Porter stated that a situation such as this “raises serious questions about the strength of a nation's indigenous comparative advantage . . .” (p. 412). A country such as this might simply be a conduit through which the exports of other countries flow. Another possibility is, however, that the industry or product grouping encompasses both products in which the country has a comparative advantage and products in which it has a comparative disadvantage.

Having determined the industries in which Canada is competitive, Porter (1991) then investigated the basis for this competitive advantage. Note that, by definition, there will be a group of industries in which Canada has an RCA. These industries may be more or less productive or have a faster or slower rate of productivity growth than their counterparts in other countries.

Sources of comparative or competitive advantage — they are the same thing to Porter (1991) — include factor costs, market access and innovation. Factor-cost advantages may reflect natural resource or labour endowments. This is the traditional explanation for comparative advantage. Favourable market access may be the result of geographic advantages

(transportation costs) or of tariffs against third countries. An innovation-based comparative advantage may reflect human capital endowments; that is, skilled labour and professional services may be in plentiful supply. This favours industries that are relatively intensive users of these inputs. This advantage can be “engineered” in the sense that skills and knowledge can be acquired. An innovation-based comparative advantage may also involve favoured access to technology or know-how. Such access may be a result of proximity to important suppliers or public-sector research institutions.

An innovation-based comparative advantage also reflects the agglomeration economies realized through the grouping of firms with complementary technological needs. This advantage may also be engineered in the sense that, having achieved a critical mass with government support, a group may become self-sustaining.

Innovation to improve productivity (process innovation) may sustain or even create conventional input-cost advantages. Improvements in transportation and product handling may sustain or create market access advantages.

For Porter (1990), the key to per capita income growth is productivity growth; the key to productivity growth is innovation; and the key to innovation is a properly functioning “diamond” or cluster (innovation system).⁷ The country with the strongest diamonds will have the highest rate of productivity growth and will ultimately have an absolute advantage over countries with weaker diamonds. The pattern of exports is, however, a matter of comparative advantage. To the extent that Porter's work has any predictive content, it is that the industries with the strongest diamonds are the ones in which a country will have a comparative advantage in the future. Although Canada exports semi-processed resource products, this does not imply that Canadian diamonds in other sectors are weaker than those in other countries. Canada could be quite innovative in other sectors but even more innovative or efficient in resource products.

Industrial clusters are analyzed because the study of clusters may help us to determine whether the firms in them are likely to be competitive or profitable in the future. Students of economic growth are of the opinion that process innovation and product innovation most likely occur at the cluster level (Nelson 1992; Steed 1992).

⁷ Clusters are sets of industries linked by vertical or horizontal relationships (Porter 1990, p. 73).

Clusters, or innovation systems, are groups of firms and non-market institutions that interact to accumulate knowledge. The key links are vertical (between customers and suppliers), horizontal (imitating rivals, cooperative R&D through industry associations), and between firms and non-market institutions (universities and public-sector research institutes).

The study of clusters is an attempt to understand the growth process and determine where product, process and organizational innovations come from. More precisely, it attempts to determine where these innovations have come from in the past. The study of clusters is historic and dynamic. It recognizes that individual innovations do not simply occur. They are the result of past learning, that is, of a cumulative process. Learning is also interactive. We must learn from someone.

If the study of clusters, or innovation systems, is the study of interactive learning, then clusters should be defined by the frequency and importance of interactions among suppliers, customers, rival firms and non-market institutions. The quantification of the process of innovative interaction is difficult and in its early stages. A dollar magnitude may be attached to links with suppliers or customers insofar as goods or services are bought or sold. But these transactions have varying degrees of innovative content.

The literature contains many examples of customers specifying the type of new or modified product or service they need (Rosenberg's "learning by using"). There is no reason to believe, however, that the amount of innovation inspired by the customer is proportional to the purchases of each customer. At present, the literature (Porter 1991; Quebec 1992) has reached only the first stage in identifying upstream suppliers and downstream customers. Quantification of the knowledge content of their transactions is yet to come.

Another indication of innovative interaction within clusters is the formation of spin-off businesses. This is the incubator function. It has been studied by Litvak and Maule (1972) and the Ontario Premier's Council (Ontario, 1988, Vol. II) among others. Their studies either recount the histories of entrepreneurs or count the number of spin-off businesses for which a given enterprise is responsible.

Direct measurement of interaction usually entails surveys that ask the sources of information used by the respondents' R&D personnel. These

surveys provide a useful reality check of the claims of government laboratories regarding the magnitude of their client bases.

If clusters are the basis of product and process innovation, then firms that are linked to effective clusters should be profitable or competitive in the future. Porter (1991) concluded that Canadian clusters are “narrow and shallow,” as a consequence of several factors:

- The domestic industrial-machinery industry in Canada is quite small. Collaboration between machinery manufacturers and Canadian industries on process improvements is therefore limited.
- The intensity of industrial R&D (both proprietary and cooperative) in many Canadian industries (such as pulp and paper) is lower than in other countries.
- There is little in the way of customer pressure for better products, and product rivalry is weak.
- The Canadian social safety net (unemployment insurance) provides no incentive for upgrading (training and retraining) the labour force.

Rugman (1992) criticized Porter's (1991) report. The essence of Rugman's criticism was that the competitive diamond theory does not apply to Canada or perhaps to any small economy. According to Rugman, we should view demand conditions, rivalry and related and supporting industries in an international rather than a local context. The effectiveness of Canadian clusters cannot be assessed solely in terms of their domestic links. Foreign customers, foreign suppliers, foreign rivals and local affiliates of foreign-owned firms are necessarily part of the innovation systems, or clusters, in small economies. This has been true and, given the legacy of history, must continue to be true of Canada (McFetridge 1993; Quebec 1992).

The future profitability or competitiveness of Canadian-based firms depends crucially on the effectiveness of transborder or international innovative clusters competing with the largely domestic clusters in the United States and in other large countries. In Porter's (1990) terms, the question is whether Canadian firms can readily “tap into the U.S. diamond.” His answer is that innovative links require geographic proximity. The

implication is that innovative clusters must be both geographically concentrated within Canada and close to key U.S. customers and suppliers. This would seriously limit both the location and the nature of successful innovative activity in Canada. These limitations would become more severe as the centre of gravity of U.S economic activity shifts southward towards the Sunbelt.

A related issue is whether foreign subsidiaries are or can be effective participants in domestic clusters. There is plenty of evidence of the participation of foreign-owned firms in domestic innovative activity. There is also evidence that this participation has, in some instances, been quite limited, despite the size of the firms involved. This is why Porter (1991b) and the current Ontario government's industrial strategy (Ontario 1992) emphasize the importance of attracting to Canada the "home-base" (i.e., innovation-intensive) activities of multinationals.

An alternative, advocated by the previous government of Ontario, is to assist locally owned "threshold" firms to become worldclass firms (Ontario 1988, Vol. I). The growth of local firms into multinationals is a clear indicator of their economic success. Whether targeting assistance to threshold firms is likely to produce competitive, domestically owned multinationals is another question entirely. Whether these "hothouse multinationals" would continue to see Canada as a natural home base after they are established is also questionable.

The economic return on innovation takes the form of better products and (or) lower costs. This shows up as higher productivity. Innovation need not change the pattern of Canadian exports (i.e., comparative advantage) to be economically beneficial. Innovative activity should not be subsidized to change the composition of Canadian exports. Any subsidy or support for innovation should be based on the positive externalities it entails rather than on trade consequences.

Some additional public policies would be conducive to competitiveness. These would be policies to promote or at least remove the impediments to the development of the financial and technological business infrastructure. The financial infrastructure may be a source of concern if existing financial instruments are unsuitable for knowledge-intensive firms with no tangible assets to use as collateral. The technological infrastructure includes public-sector institutions engaged in technological innovation. It includes government laboratories, research institutes and technology

centres, as well as universities and other technologically oriented post-secondary institutions.

3. COMPETITIVENESS AT THE NATIONAL LEVEL

National Economic Objectives

The fundamental objective of government economic policy is (or should be) the maximization of economic welfare. Economic welfare is generally defined as the stream of per capita consumption possibilities over time. The greater the rate of growth of per capita income is, the greater are future consumption possibilities. The rate of growth of per capita income can be increased by saving (foregoing current consumption) and investing in tangible and intangible capital.

When the present generation saves, it foregoes consumption. Saving is desirable only insofar as it yields commensurate benefits in the form of increased future consumption. The savings rate in an economy can be too high, as well as too low. A higher rate of productivity or per capita income growth does not imply an increase in economic welfare if it is the result of excess or “forced” saving on the part of the present generation. The consensus is, however, that the present generation is saving too little rather than too much (Nicholson 1993), in which case an increase in the rate of growth of per capita income or productivity resulting from any increase in saving will also increase economic welfare.

The optimization of investment requires that the resources available for investment be allocated to the projects yielding the highest social rates of return. This maximizes the increase in future income achievable with a given level of investment. This is generally thought to require policy intervention to encourage those forms of capital accumulation that yield high social rates of return but for which market incentives (private rates of return) are inadequate.

Increasing the savings rate and allocating investment resources in accord with social-rate-of-return criteria will have the effect of increasing the rate of growth of per capita income and increasing economic welfare. National competitiveness is consistent with the improvement of the nation's economic welfare to the extent that it is defined as the rate of growth of per capita income. In this vein,

Markusen (1992) suggested the following “normative” definition of national competitiveness:

A country is competitive if it maintains a growth rate of real income equal to that of its trading partners in an environment of free and (long run) balanced trade. (p. 7)

This definition requires some qualification. First, the growth rate of trading partners is important only as an indication of the growth possibilities open to the home country. A nation's economic welfare depends only on its own rate of per capita income growth. It is neither enhanced by growing faster nor diminished by growing slower than its trading partners. Second, the requirement that there be balanced trade is a constraint rather than an objective. Over the long term, exports must be sufficient to pay for imports.

Indicators of National Competitiveness

Many indicators of national competitiveness have been suggested. Most investigators see competitiveness as involving a number of factors. Analysts' definitions of national competitiveness differ according to the factors they emphasize. Broadly speaking, there are two alternatives. The first is to emphasize real per capita income or productivity growth. The second is to emphasize trade performance.

Real per Capita Income or Productivity Growth

Real per capita income growth and productivity growth are related but not identical concepts. Markusen (1992, pp. 17–19) explained this point in detail. He showed that real per capita income depends on TFP, the endowment of capital and natural resources, and the terms of trade. An increase in TFP (often defined as technical change) increases per capita income, as does an increase in the national endowment of natural resources or physical capital or an improvement in the terms of trade.

An improvement in a country's terms of trade occurs when its exchange rate appreciates or when the prices of its exports increase relative to those of its imports. When a country's terms of trade improve, its exports effectively buy more imports. The country can thus import more or export less while maintaining balanced trade.

Either way, an improvement in the terms of trade increases the amount of domestic consumption possible with a given resource endowment and balanced trade.

An improvement in a country's terms of trade, and thus in its per capita income, may occur if there is a worldwide excess demand for the goods and services it exports and (or) a worldwide excess supply of the goods and services it imports. That is why the trade and the per capita income approaches to national competitiveness are related.

When a country's export portfolio is concentrated in high-growth industries and its import portfolio is concentrated in slow-growth or declining industries, this may be a harbinger of an improvement in its terms of trade. This would depend, in part, on the speed of the global supply response to these conditions of excess demand or supply.

An increase in the national endowment of natural resources or physical capital will also increase per capita income. Increases in these endowments result from past investments in physical capital and exploration for resources.

Increases in TFP also increase per capita income. Increases in TFP result from technological and organizational innovation and from improvements in human skills and knowledge, which, in turn, result from investments in research and education (intangible capital), among other factors.

In sum, per capita income can be increased by investing in intangible capital (knowledge), physical capital or natural resource exploration. The key is to allocate investment dollars efficiently across investments. Efficient investment requires that social rates of return on all forms of investment be the same at the margin. Much of the recent focus has been on the excess of social over private rates of return on investments in R&D and on the possible failure of market mechanisms to allocate sufficient resources to investments in R&D.

Most of the writing on national competitiveness either uses the terms *productivity growth* and *per capita income growth* interchangeably or deals only with the productivity component of per capita income growth. The term *productivity growth* is also used loosely to refer to labour productivity and sometimes to refer to TFP.

Per capita income growth is the best indicator of national economic success. The most important source of per capita income growth is TFP growth. In practice, either per capita income or TFP growth will serve as an indicator of national competitiveness.

Trade Performance

Some of the measures of good national trade performance suggested in the literature are (1) a shift in export composition toward higher value added or high-technology products; (2) constant or increasing world market shares; and (3) a current account surplus.

Export Composition and Market Shares

The emphasis on export composition links the trade performance approach to competitiveness with the productivity growth approach. One approach, used by Scott and Lodge (1985) and D'Cruz and Fleck (1985), measures the proportion of national exports accounted for at various times by sectors with a high value added per worker or by high-tech sectors. A relatively high or increasing proportion of exports accounted for by sectors with a high value added per worker may imply a comparative advantage or an increasing comparative advantage in high-wage sectors. This does not necessarily imply that national productivity or per capita income is increasing faster than in other countries. It implies only that productivity is increasing faster in tradeable-goods industries with a high value added per worker than in other tradeable-goods industries. As Harris (1993) pointed out, however, this productivity growth or upgrading is important in both low- and high-value-added industries and in both the traded-goods and non-traded-goods sectors.

In their study of Canadian competitiveness, Rugman and D'Cruz (1990) made use of a "growth/share matrix" from the *World Competitiveness Report*. This matrix plots national shares of world exports against national rates of growth of exports. Rugman and D'Cruz reproduced this matrix as figure 1.5 in their study. The figure shows that Japan, Germany and the United States are well positioned, with big shares of fast-growing markets. Of course, the smaller countries (including Canada) have smaller shares. Some smaller countries also appear to participate more in slow-growing markets than the large countries do.

Rugman and D'Cruz (1990) also plotted Canada's market share in its leading export industries against the rate of growth in world exports in these

industries (figure 1.6 in their study). Canada has an RCA in some fast-growing industries (automobiles and parts) and in some declining industries (cereals and natural gas). Rugman and D'Cruz equated competitiveness with having a big RCA in a fast-growing market.

As an indicator of future economic prospects (rather than as an objective), having an RCA in a fast-growing industry makes intuitive sense. Depending on the supply response in other countries, this may mean increasing demand for your exports and possible improvements in your terms of trade. Other things being equal, a comparative advantage in fast-growing industries will result in a higher national per capita income.

That the national rates of growth of per capita income have historically been correlated with the quality of national export portfolios is a testable hypothesis. The empirical literature on international differences in productivity growth indicates no relationship between export intensity and productivity growth. Recent comprehensive statistical studies showed that international differences in productivity growth rates are a function of per capita income levels (productivity grows faster in poorer countries, implying a convergence of income levels) and the ratio of investment to gross domestic product (GDP). Given these two variables, there is no relationship between either export intensity or the trade balance and productivity growth (Levine and Renelt 1992).⁸

The cross-sectional relationship between export composition and per capita income growth or productivity growth has not been much investigated. An investigation might involve the estimation of cross-sectional relationship between the weighted average rate of growth of world exports in the industries in which each country has an RCA and subsequent national rates of growth of per capita income.

⁸ Levine and Renelt (1992) found that, given the investment/GDP ratio, none of exports/GDP, imports/GDP, total trade / GDP, "excess imports" / GDP, or "excess exports" / GDP are correlated with per capita real GDP growth. All the exports, imports and total trade / GDP ratios are correlated with the investment / GDP ratio. For a discussion of the limited relationship between trade performance and per capita income levels or growth rates found in other studies, see U.S. Department of Commerce, International Trade Administration (1987, pp. 13–53). Neither Levine and Renelt (1992) nor Levine and Zervos (1993) found a robust correlation between measures of monetary and fiscal rectitude and real per capita growth. Thus, the emphasis on prudent macroeconomic management as a means of achieving competitiveness may not be as firmly grounded empirically as many economists, including the author, have assumed.

Current Account Balance

A nation's competitiveness is frequently associated with its current account surplus. A nation's current account surplus may be driven by world demand for its exports, or it may be a consequence of a variety of other factors. Cooper (1988) and Harris (1992) explained this concept using the introductory textbook of national income identity.⁹

A current account deficit can be a consequence of a government budgetary deficit (government “dissaving”), a savings rate that is low relative to the level of private investment occurring in the economy, or both. The so-called twin deficits case involves a government budget deficit and a current account deficit. In the twin deficits case, the government's net borrowing competes with private investment for the available flow of domestic savings. Some of the private investment is crowded out. If an initial state of balance is assumed, the excess of the remaining private investment plus the budget deficit over the flow of savings is financed by foreign borrowing, which results in a capital account surplus. The capital inflow puts upward pressure on the exchange rate and (or) the domestic price level, causing a current account deficit.

The current account deficit is the mirror image of the capital account surplus. The capital account surplus is a financial transfer from foreign lenders to domestic borrowers. The current account deficit is the “real transfer” from foreigners — the excess of the real goods and services imported from abroad over the exports sent abroad in return.

The reason the concept of the real transfer matters is that, in running a budget deficit, the government is using more resources than it has commandeered in taxes. When it borrows abroad or forces the private

⁹ National income (Y) is the sum of consumption (C), investment (I), and government expenditures (G) and exports (X) less taxes (T) and imports (M). National saving (S) is the excess of income over consumption. Thus,

$$Y = C + I + G - T + X - M$$

$$S = Y - C$$

$$X - M = T - G + S - I$$

$$\text{current account balance} = - \text{capital account balance}$$

$$\text{current account balance} = \text{government saving} + \text{private net saving}$$

$$\text{current account balance} = \text{private net lending} - \text{government net borrowing}$$

sector to do so, the government is getting real resources from abroad. These could come entirely in the form of additional imports consumed by the government. A simple scenario would be the government's borrowing in Britain and using the proceeds of the loan to purchase a British submarine for the navy.

More complex scenarios of this type are virtually certain to occur. When foreign borrowing occurs, there is upward pressure on the exchange rate (or the domestic price level if the exchange rate is fixed). Imports become cheaper, and domestic exports become more expensive. Imports increase, and exports decrease. Output declines in some or all export industries and some or all import-competing industries. These industries therefore use fewer resources, thus effectively freeing up domestic resources for use by the government.

An unavoidable consequence of domestic “dissaving” and the associated foreign borrowing is that domestic firms in the traded-goods and services sectors become “less competitive,” even though neither they nor their foreign competitors have changed the way they do business. In most cases, the market shares of domestic producers (value of domestic production divided by value of world production) will fall. The amount of the loss in share depends on the substitutability of foreign goods and services for domestic ones.

A low savings rate and a large government deficit are seen by many economists as the source of the U.S. competitiveness problem. Nelson (1992) summarized the argument for this as follows:

... it is argued that the short time horizons that characterize American business decisions as compared with Japanese is [*sic*] exactly what economic theory would lead one to expect, given the high “cost of capital” in the United States and the lower cost (at least until recently) in Japan. The high cost of capital in turn is due to low private savings and a large public sector deficit. Our profligacy has forced us to borrow from abroad to finance the gap between private and public spending and U.S. production. From this point of view, the fact that we run a trade deficit is seen as the cause, as much as the consequence, of the high price of the dollar, which is needed to support our net import position. Our low savings rate, which is only partially offset by borrowing from foreigners, has been a principal factor behind our low rate of investment in new plant and equipment relative to Japan, and thus a major factor behind our slow productivity growth. In the midst of all this, it isn't surprising that many American firms are losing out to foreign ones. (pp. 9–10 mimeo version)

The Department of Finance (Dodge, 1993) has sketched out a similar scenario for Canada:

- The cumulation of Canadian governments' deficits has resulted in a level of public debt that is second only to Italy among the G-7 countries relative to the size of the economy. Measured on a national accounts basis, general government debt here amounts to fully 56 per cent of GDP as compared to 36 per cent in the U.S. and only 4 per cent in Japan
- Large government deficits also absorb domestic savings. Currently, domestic savings could more than satisfy Canada's private investment needs *if* there were no government deficits. Instead, governments soak up over one third of Canada's savings.
- This competition for savings puts upward pressure on real interest rates. And it also means that Canada is pushed into heavy reliance on foreign savings.
- This is mirrored in Canada's current account deficit with the rest of the world which, in 1992, stood at over 4 per cent of GDP. This is unquestionably the highest ratio of all G-7 countries, with Italy a distant second at just over 2 per cent. (pp. 3–4)

Harris (1992, pp. 26–30) rejected this scenario. He maintained that it was a “consumption boom,” rather than the fiscal deficit, that is responsible, in part, for the current account deficit.

Harris (1992) cautioned that the relationship between domestic net saving and the current account balance is one of identity, not causality. Harris suggested that the Canadian exchange rate was overvalued over the period 1985–1989, perhaps as a consequence of either an exchange-rate bubble or domestic monetary policy. In his view, both an overvalued exchange rate and a domestic consumption boom contributed to the increase in the current account deficit over the 1985–1989 period.

In sum, a current account deficit may be driven by fiscal or monetary policy rather than by an inherent failure of domestic firms in the traded-goods industries to perform to international standards. Although the United States has attempted to remedy its trade imbalance with Japan by trying to “open up” Japanese markets, it is widely argued that this will have little effect because Japan has a net saver status and the United States has a net dissaver status (see *The Economist*, Feb. 5, 1994, p. 73).

4. CONCLUSIONS

At the firm level, the concept of competitiveness is well defined and useful, though hardly novel. It is simply the sustained ability of firms to operate profitably in open markets. The key question is how they can do this. There is a vast amount of literature and an infinite array of consultants to offer guidance.

Unless government has unique insights into managerial strategy, there is a limited direct role for it in encouraging firm-level competitiveness. Governments may, in some cases, be better placed to engage in benchmarking or to offer foreign market or political intelligence. Otherwise, the appropriate role for government is to maintain a stable economic environment and a competitive public infrastructure.

The concept of competitiveness can also be applied at the industry level, although the fit is not as “comfortable” as it is at the firm level. A competitive industry is an industry comprising firms operating profitably in open markets on a sustained basis. Cost, profit and productivity indicators of competitiveness can be applied at the industry level, as well as at the firm level.

Competitiveness at the industry level is frequently equated with RCA. This is a somewhat narrower definition of competitiveness, as specialization in export industries need not be complete, and firms in industries with a comparative disadvantage (import-competing industries) are not necessarily condemned to poor profitability.

The innovative process can be most fruitfully studied at the industry or cluster level. Innovation is a cumulative, interactive process, and the extent of the interactions of domestic firms with their customers, suppliers, rivals and the public sector will have implications for the firms' future productivity growth. Public policy should encourage and facilitate this interaction.

The concept of national competitiveness is not particularly useful either as an objective for public policy or as an indicator of national economic performance. Nations are not firms.

There is widespread consensus that the appropriate objective of national economic policy is to maximize the present value of the stream of per capita consumption possibilities available to the present and future generations. Nations with higher rates of real per capita income growth are generally more successful in meeting this objective. The rate of per capita income growth depends principally, but not entirely, on the rate of productivity growth. National competitiveness is an appropriate goal if it is defined as productivity and per capita income growth.

The public and political concern with competitiveness is frequently motivated by the perceived threat of job losses due to imports or loss of export markets; however, national prosperity is principally, though not entirely, a question of productivity. Trade performance is not an end in itself. It is important only insofar as it contributes to growth in per capita income. Although there could be a relationship between national export composition or national shares of world markets and the subsequent growth of national per capita income, no such relationship has been empirically established. Moreover, as Krugman (1994) emphasized, for economies such as the United States, where international trade accounts for a relatively small fraction of economic activity, there is no a priori reason to expect there to be any relationship between trade performance and the rate of per capita income growth.

Although the pursuit of competitiveness as defined in terms of national trade balances, world market shares or export composition is not an appropriate policy goal, the pursuit of increased opportunities for trade is. The Canadian experience confirms that productivity and per capita income growth can be achieved through the increased specialization made possible by trade liberalization. Countries with small domestic markets require access to foreign markets and the ability to compete profitably there.

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