

15-602E
no.67
c.3

Input-output Division



Technical Series



Statistics
Canada

Statistique
Canada

Canada



Input-Output Technical Series

The Input-Output Division Technical Series are intended for users interested in input-output tables and related research for analysis and applications. Readers of the series are encouraged to contact the authors with comments and suggestions. A complete list of the titles that have been released appears at the back of this paper.

Papers in the series are distributed to Statistics Canada Regional Offices and Provincial Bureaus of Statistics. The series appears in the "Listing of Supplementary Documents" (11-207). A complete set is also maintained in the Statistics Canada Library and is available for consultation.

To obtain the list of titles and/or an individual paper, please contact:

Consulting and Marketing
Input-Output Division
Statistics Canada
23rd Floor, R.H. Coats Building
Ottawa, Ontario, K1A 0T6
(613) 951-3697



Input-output Division



Technical Series



Statistics
Canada

Statistique
Canada

Canada



Input-Output Technical Series

The Input-Output Division Technical Series are intended for users interested in input-output tables and related research for analysis and applications. Readers of the series are encouraged to contact the authors with comments and suggestions. A complete list of the titles that have been released appears at the back of this paper.

Papers in the series are distributed to Statistics Canada Regional Offices and Provincial Bureaus of Statistics. The series appears in the "Listing of Supplementary Documents" (11-207). A complete set is also maintained in the Statistics Canada Library and is available for consultation.

To obtain the list of titles and/or an individual paper, please contact:

Consulting and Marketing
Input-Output Division
Statistics Canada
23rd Floor, R.H. Coats Building
Ottawa, Ontario, K1A 0T6
(613) 951-3697

**Statistics Canada
National Accounts and Analytical Studies
System of National Accounts
Input-Output Division**

**The Canadian Productivity Accounts:
Interpretation and Analytical Uses.**

By

René Durand

67- E

November 7, 1994

The Canadian Productivity Accounts: Interpretation and Analytical Uses

ABSTRACT - This article is the second of a series dealing with the multifactor productivity accounts of Statistics Canada. The first article presented an overall concrete description of the accounts and the various indices with graphics illustrating the major results achieved by the Canadian economy. This second article is more abstract and attempts to go deeper into the notion of productivity tying it with the notions of welfare, competitiveness and growth. We attempt in this manner to provide an overall analytical framework for a better interpretation of the meaning of multifactor productivity in the wider contexts of the analyses of competitiveness and welfare. We finally use this analytical framework to assess the popular views on competitiveness and its indicators.

RÉSUMÉ - Cet article est le deuxième d'une série portant sur les comptes de la productivité multifactorielle de Statistique Canada. Le premier article a présenté une description concrète d'ensemble des comptes et des divers indices accompagnée de graphiques illustrant les principaux résultats atteints par l'économie canadienne. Ce deuxième article se situe sur un plan plus abstrait et tente d'approfondir la notion de productivité tout en la reliant aux notions de bien-être, de compétitivité et de croissance. On essaie ainsi de fournir un cadre analytique d'ensemble permettant de mieux interpréter la signification des mesures de productivité multifactorielle dans les contextes plus amples de l'analyse de la compétitivité et du bien-être. On utilise enfin ce cadre analytique pour évaluer les visions populaires de la compétitivité et de ses indicateurs.

1 - Introduction

The national accounts of productivity produced by Statistics Canada were described generally in an earlier article.¹ The goal of this second article is to present an interpretation of these accounts for analytical purposes. In particular we will explore the relationship that exists between productivity and welfare and between productivity, growth and international competitiveness. The concept of productivity involved here corresponds to the concept of efficiency of the processes whereby the primary production factors, namely capital and labour, are transformed into various goods and services. It is thus a matter of

1. In summary, the multifactor productivity accounts of Statistics Canada seek to measure the technical and economic efficiency of industries in the business sector of the Canadian economy. In this performance analysis, the focus is on change. The productivity accounts measure changes in efficiency levels over time, rather than the actual efficiency levels achieved. To measure efficiency levels, and more particularly to compare them between countries, requires information that is not currently available. For details, see Durand (1993a).

total factor productivity, which theoretically increases only for reasons associated with technological change.

The total factor productivity accounts would seem to be normative in nature, as would - to a lesser extent, perhaps - the other components of national accounting. Performance analysis would for this purpose apply various evaluation criteria. These criteria may be objective, as, for example, in comparing the productivity of Canadian industries with that of corresponding industries in other countries. This performance analysis then falls within the broader framework of competitiveness analysis.

The evaluation criteria may, on the other hand, be more subjective, as in the analysis of welfare. The measurement of welfare calls upon the notion of a social utility function. This function measures, in ordinal fashion, the welfare of a society by weighting the utility functions of its members. One may, however, following Fisher (1930), analyse welfare on the basis of the more objective measure of the aggregate level of consumption. The higher aggregate consumption is, the higher, it may be assumed, will be the society's level of welfare, although this welfare depends on the distribution of such consumption among the members of the society and the weight assigned to its members in the social utility function. This weighting involves values and thus takes on a political character.

In a market economy operating under conditions of pure and perfect competition, consumption depends on the factor endowment of the members of the society (that is, their endowment of capital and labour) as well as their relative marginal productivity. The latter determines the rates of payment of the factors. The evolution of productivity influences the productivity of the factors and hence their payment. It therefore also influences the general welfare.

In addition, productivity analysis is one of the major foundations of the analysis of long-term economic growth. Even in a closed economy, it is important to study productivity in order to identify the factors that contribute to it and thus be able to act, through appropriate policies, on the growth of the economy.

The productivity accounts attack this question only indirectly, by trying to eliminate from residual productivity all factors that may be identified with and attributed to the consumption of factor inputs. Take, for example, the matter of estimating the impact of education on the productivity of labour. A more educated workforce will generally be more productive, but also more costly. The higher wage rates of skilled labour are themselves only the reflection of earlier investments in the education of this manpower - that is, the reflection of inputs of factors devoted to such education in the past. In weighting the various labour inputs by their relative wage rate, one can take account of their qualitative differences and incorporate the latter in the factor inputs so as to thereby separate them out from residual productivity.

Since the rise in production may be traced back as originating in part from this earlier use of production factors devoted to education rather than from current technical progress, taking these costs into account in the calculations reduces the measurement of the

contribution of productivity to growth. The residual productivity that remains, after taking into account the effect of all past and present factor inputs on the growth of production, must be explained by other variables.

The productivity accounts do not try to identify these other variables. Their purpose is solely to effect a separation between, on the one hand, the costly factors that underlie the growth of production, such as, basically, labour and physical and human capital, and on the other hand, the other factors, grouped together under the term "productivity."

These other factors, which do not entail immediate outlays associated with current production, consist mainly of technical progress, which is identified with the advancement of technical knowledge *applied* to the production of goods and services in the economy. But they also include other important phenomena such as economies of scale and factors that one tries to keep to a minimum, such as measurement errors in the inputs and outputs of the production system. These errors are attributable to errors in the data used, productivity calculation errors that result from a lack of information (such as information on inputs of natural resources, for example), and conceptual errors, that is, errors relating to the specification of measures. For example, the conceptual analysis framework may assume long-term equilibrium conditions which do not hold at the bottom of the economic cycle and may result in temporary biases of a cyclical nature in the measurements.

As a result of separating out the contribution of factor inputs from that of residual productivity elements to the growth of outputs, the nation's *growth accounts* can be established. Thus the accounts also report, together with the productivity indices, the measures of the growth of the outputs and inputs of the production system.

Initially, then, the study of productivity appears to be of fundamental importance, both for studies on growth and competitiveness and for welfare studies. It is not, however, the only important variable for these purposes. Many other variables influence growth, competitiveness and welfare. This is what we shall attempt to explore further in the paragraphs below. The following section takes a general look at the relationship between productivity, competitiveness, welfare and growth. This is followed by a description of the popular view of competitiveness, then an analysis of that view and a few conclusions.

2 - Productivity, competitiveness, welfare and growth

Canada's international competitiveness depends, at its outer lines of defence, on the evolution of the currency exchange rates that serve to determine the price of Canadian goods in relation to foreign goods in a common currency. However, exchange rates do not provide only common units of measurement of the value of goods in different countries. Quite to the contrary, they act as locks (in the sense of the gated chambers in a canal system) to equilibrate trade between countries. Trade tends to come into balance when the locks are open, that is, when there are fluctuating exchange rates, determined solely by private demand for and supply of the various currencies on the international market. But governments can - and often do - intervene to control exchange rates. Where they are

strictly controlled, exchange rates remain fixed and no longer serve to equilibrate commercial exchanges between countries.

If international competitiveness is measured in terms of relative prices of domestic goods in relation to foreign goods (in the case of comparable and tradable goods), it strictly depends on how exchange rates change over time and on the evolving structure of the relative prices of the various goods in the trading countries. In a perfectly flexible exchange rate system, a country cannot increase its competitiveness - that is (to temporarily use the term in a narrow sense), reduce its prices relative to those of competitor countries - by increasing its productivity more quickly than its trading partners. This would mean, in effect, that it continually increases its sales abroad while cutting back its own purchases from foreign countries, meaning that it continually expands its trade surpluses. With flexible exchange rates, the relative appreciation of its currency in relation to foreign currencies would quickly bring its trade back into balance.

In a fixed exchange rate situation, by contrast, trade surpluses do not tend to self-correct, and relative efficiency has a greater effect on the trade balance. These, however, are conclusions that emerge from a first level of analysis, which ignores the fact that exchange rates do not serve to balance only commercial exchanges, but more broadly, all exchanges between countries that have a currency exchange. If the door is thus opened to capital flows, these flows can themselves offset the flows of goods and services in commercial exchanges without there being any change in exchange rates. The latter measure the relative prices of the various currencies in terms of their supply and their aggregate demand, which in turn depends fully as much on capital flows as on trade.

The impact of productivity on competitiveness and trade flows thus depends on the flexibility of exchange rates and at the same time on capital flows. Capital flows, like exchange rates, can in turn be subjected to the control of the economic policy of the partner countries. To all this is of course added the entire range of direct government trade interventions, of both a tariff and a non-tariff nature. Lastly, competitiveness depends on the many variables in the marketing mix. In the context of a full analysis of all the forces in play, the relationship between productivity and international competitiveness is thus not a simple one.

In addition, this overall competitiveness, at the international level as well as at the national level, is differentiated according to the goods and services produced. Some firms or industries, by increasing their relative productivity in relation to foreign competitors more than other firms or industries, thereby increase their competitiveness on the domestic market as well as on the international market, independently of the overall competitiveness of the countries involved. By contrast, the other firms or industries see their comparative advantages reduced. This is a way of looking at the law of comparative advantages in a dynamic perspective. Economies can increase their relative strengths in some sectors and can weaken in other sectors without thereby changing their overall competitiveness to a significant degree.

When one looks at things from the latter perspective, which clearly differentiates the goods and services traded on international markets, one realizes that these goods and services in a sense have their own exchange rate. These exchange rates are none other than *purchasing power parities*, that is, the relative price levels of each good or service in a common currency. Thus, competitiveness analysis must involve a fine-grained analysis of the various goods and services traded on international markets after their quantity and price have been converted into common units of measurement. The unit prices of tradable goods, expressed in a common currency, for identical quantities with the same qualitative characteristics, are one of the most fundamental indicators of the specific competitiveness of each of these goods. But competition also operates in other ways that would take too long to discuss here. We would simply mention the knowledge of markets, qualitative differentiation of products, publicity, access to and control of major distribution channels, linguistic and cultural affinities, etc. In what follows, we shall focus exclusively on the price variable for comparable goods and services.

Unit prices depend, in each country, on the efficiency of the production processes used as well as the prices of the production factors, including imported factors. Factor prices, in turn, depend on their marginal productivity (demand for factors) and their supply, so that in the final analysis, unit prices are largely based on efficiency. Purchasing power parities are thus to a large extent based on the relative efficiency of the countries and on exchange rates, when the latter are subject to government control and to sizable capital flows. But it is purchasing power parity and not productivity that measures countries' price competitiveness on the international market, and it does so for each tradable good.

In light of the foregoing, one could, if trying to push the reasoning to its limit, say that purchasing power parity actually measures relative levels of efficiency among countries. But this would be inaccurate. This parity also reflects the relative effort expended in each country to support production activities, and more specifically it reflects the propensity to work and to save, that is, as noted above, the supply of factors. The latter in turn, in the absence of government control, influences international flows of capital between countries. Thus in competitiveness analysis there is the same breakdown of growth factors as is described above, with the contribution of factor inputs being separated out from the contribution of productivity gains.

The latter paragraphs lead us to consider that, in a microeconomic perspective at the very least, aggregate competitiveness along with sectoral competitiveness has perhaps no other meaning than to reflect the change in the relative performance of various production activities and, more generally, to reflect growth. Rapid growth associated with the judicious use and assignment of scarce resources is, all in all, the true performance criterion with regard to which trade activities themselves must be evaluated. Insofar as these activities favour absolute growth (the full employment of productive resources), as well as the growth of productivity, they support the development of overall efficiency. A country gains from being more competitive only by gaining from being more productive. Only the growth of productivity can bring about an increase in factor payment, and therefore it alone can support higher levels of welfare.

Differences in how productivity evolves, by favouring differences in how factor payment evolves, can also thereby cause these factors to move from one place to another. This is especially true for capital, which circulates quite freely among the developed countries. Administrative know-how usually immigrates with capital when the latter moves in the form of direct investment abroad. This is one of the many channels by which technical progress is disseminated among countries.

Thus, for example, a country, by maintaining relatively low prices on the international market (owing to its relative efficiency and the prices of its primary factors) can achieve high trade surpluses, which are themselves offset by direct investment abroad in a situation where exchange rates are perfectly flexible. Despite the gradual rise in the value of the yen, this example cannot help but remind us of trade in recent decades between Japan and its trading partners.

This example brings another dimension into the analysis. The current account surplus can be eliminated only by an equivalent deficit in the capital account. This deficit itself assumes a sufficient domestic savings flow.² Without these savings, the balance of payments deficit would result in the fall of the exchange rate and the working out of a new trade equilibrium.

In short, the maintenance of high industrial growth, as in the case of Japan and many other Asian countries, cannot rely solely on pure price competitiveness. It involves other variables such as saving: saving must be sufficient not only to absorb the trade surplus by investments abroad, but also to support the growth of the domestic capital stock required for industrial expansion itself. It also involves an expansion of available labour. The required growth of the primary factors in the national economy may, however, be mitigated by strong growth of productivity. What is operating here, clearly, is a dynamic which tends to run down and which can sooner or later lead to its own end.

This end could result - this is a hypothesis - from the gradual rise in the standard of living that is brought on by the rapid increase in productivity. By standard of living, we mean here, vaguely, the per capita consumption level. This leads us to the question of welfare, but we must first further specify the relationship between the latter and the concept of efficiency.

Above, welfare was provisionally defined by the level of consumption. This concept of welfare is restrictive, not only because it ignores certain realities such as income distribution, as already noted, but also and above all because it does not take account of the fact that consumption depends on the sacrifices - in saving and leisure time - that are necessary to support it. This leads us to suggest here a more comprehensive concept of welfare as a cost-benefit ratio between, on the one hand, the efforts expended to support production, and on the other hand, the benefits that society derives from its consumption. This is a concept, then, that brings together the notions of welfare and efficiency.

2. It could also be absorbed in part by issuing currency that serves as an international currency in the framework of expanding trade.

This cost-benefit ratio is in a sense an expanded performance or efficiency measure which may be identified as the fundamental measure of productivity and at the same time the fundamental measure of aggregate welfare.³ Of course, the distributional aspects are not immediately taken into account by what occurs in the production system other than by the relationship between efficiency and factor payment. But the fact remains that in this perspective, the growth and measure of productivity do not affect the growth and measure of welfare. Rather, they are one and the same.

To be sure, the traditional measure of welfare associated with the level of consumption can be broadened by expanding the basket of goods consumed to include leisure time. Labour then become endogenous. But it is less clear that the basket can be expanded to include the postponement of gratification which saving requires, and which defines it.⁴ To endogenize saving, it is necessary to introduce future consumption into the social utility function as well as a factor of equivalence between present consumption and future consumption - a discount rate,⁵ in a sense. Only then will the two measures of welfare - the one conceived in terms of consumption and the one developed above as being a cost-benefit ratio - be equivalent. By the same token, the rise in productivity will then appear as being the only growth factor for this welfare, at least if we ignore the distributional aspects.

We thus have a trilogy made up of productivity, welfare and competitiveness, two of the elements of which are co-extensive when the concept of efficiency is expanded to include much more than purely technical factors. Already the traditional concept of economic efficiency encompasses the concept of technical efficiency and at the same time transcends it, adding to it the minimization of costs in the perspective of a long-term equilibrium. Here this concept is further expanded by including, in the results of production activity, not only the support for current consumption of goods and services but also the accumulation of capital.

In a dynamic perspective with an unlimited horizon, this amounts to considering that the performance standard for production activities relates to the sustainable path of consumption over time, the boundary of which is hence delimited by net national income, that is, current consumption augmented by net capital formation. The expanded efficiency standard that we have just developed thus serves to impose a standard on the measure of production activity itself and shed new light on an old debate: that of choosing between the gross domestic product and the net domestic product as an aggregate measure of the activity of the economy. As we know, ecologists, for example, have often suggested that, in calculating aggregate production, it is necessary to deduct from the gross domestic the value of the consumption of natural resources and, more generally, the costs caused to

-
3. This idea would seem not to be a new one, as it can be found in the writings of Ricardo. As Blaug (1962 and 1968, p 118) reports, "For Ricardo, 'value' is an inverse index of the average productivity of labor and therefore of economic welfare; welfare is a matter of minimizing human effort per unit of output."
 4. Saving amounts to deferring one's present consumption in favour of future consumption.
 5. This discount rate may be seen as the price of future goods in relation to the price of present goods, but an equivalent, although less usual, way of representing it is as a volume ratio, with future goods being in a way depreciated in relation to present goods.

the environment by production activities. The expanded concept of efficiency proposed here tends to support their hypothesis.⁶

The measure or indeed the very concept of international competitiveness, moreover, generally refers only to goods tradable on international markets and does not directly bring in saving and labour as does the expanded measure of welfare or efficiency. Nevertheless, technical relationships link the outputs of the production system to its capital and labour inputs. How competitiveness evolves, then, depends on how this technical relationship evolves, and thus in the long run it basically depends on technical progress, just as it also depends on the inputs of labour and capital. These inputs themselves appear, to a large extent, transformed in the form of intermediate inputs from industries that are not necessarily directly subject to the full force of international competition. The efficiency of these industries and their behaviour on the factors market influence the price of the intermediate inputs of industries directly competing with foreign counterparts. Competitiveness on the international market thus depends generally on all the strengths and weaknesses of the national economy.

Thus, to be more competitive, it is necessary to innovate and to provide work effort and sufficient saving. These efforts negatively affect the level of welfare, as we have just seen, whereas technical progress positively affects it. It follows that a society may choose to voluntarily reduce its level of welfare in order to support its "competitiveness" and its expansion. Once more, competitiveness is above all a matter of price levels which themselves depend on both efficiency and the propensities to work and save. Thus, the concept of competitiveness cannot be identified with that of efficiency, as in the case of welfare.

But it is precisely here that the strands linking competitiveness and welfare weave together. Societies that have different values will perform differently on the international market even if, strictly from the standpoint of technical efficiency, they are equivalent.

Let us thus go back to the competitiveness-welfare relationship. With the gradual rise in the standard of living, it can be expected that leisure will take on more importance, and accompanying this leisure, the consumption of goods and services will rise. An increase in leisure and consumption means, all things otherwise being equal, a reduction in hours of work and in saving. A rise in the standard of living can thus lead to a change in the behaviour of economic agents and a reduction in the supply of primary factors, which would slow down the growth rate.

Thus people often speak of the Westernization of the lifestyle of Asian peoples. Might this phenomenon lead to a reduction in the propensity to save and work among the Japanese, gradually leading Japan on a path of less rapid growth, more similar to the group of front-running nations that it will have joined? Many think so. Japan, like many European countries, experienced rapid growth for several decades, seemingly attributable both to technological upgrading and to the determination of that country to regain the standing

6. For a fuller discussion of this question, see Durand, R (1993(b)).

that it had prior to World War II with regard to the wellbeing of its population in relation to the richest countries.

Once the target is reached, will there be a desire to go beyond it? Or, as seems more likely, will people in both Japan and the Western European countries maintain the rank while gradually reorienting the system toward more consumption and less saving? It is of course difficult to guess the future and find the answer to such a question. What seems certain is that one of the levers of accelerated growth of these countries will no longer be able to operate, namely the technological upgrading that kept the rates of productivity growth in those countries at a higher level than in the front-running countries such as Canada and the United States. We should now expect to see an equalization of technical progress among the industrialized countries, and consequently a reduction of the growth disparities among them. Growth could also become more uniform as a result of more similar patterns of population growth and growth of the labour force in the developed countries and perhaps, as mentioned above, as a result of increased uniformity of economic behaviours and attitudes.

3 - The popular view of competitiveness

Thus competitiveness could be closely linked to welfare. In addition, to return to the foundations that we laid above, the question of competitiveness, whether domestic or international, is of interest only insofar as it confronts the question of aggregate growth. Earlier, we established as reasonable the idea that competitiveness analysis brought to bear the same variables as growth analysis, namely efficiency (in an expanded sense of the term) and the availability of primary factors. From there to establishing an equation between competitiveness and growth there is only one further step.

This step appears to have already been taken, by economists such as Harris and Watson (1992), who have focused on analysing three recent views of competitiveness, namely those of Porter, Reich and Thurow. At the outset, Harris and Watson tackle the question of what it is that we are primarily seeking to optimize. In the language of economists, the answer is, of course, welfare. In the less formal language of business persons and various other groups concerned with economic matters, it may be a matter of maximizing things such as the trade surplus, the market share of Canadian products abroad, the value-added content of our exports, etc. It is not unusual to see such objectives expressed in economics-oriented newspapers and periodicals, for example.

Welfare, for the economist, is generally the result of two phenomena: aggregate growth and income distribution. We have replaced the concept of aggregate growth, above, by that of efficiency as the criterion for welfare. But aggregate growth is generally also what most participants in the competitiveness debate have in mind, either explicitly or otherwise. Why, after all, would we want to maximize our market share or our value-added content, if not to increase employment, income and welfare? To be competitive, it would seem, is associated, in the popular debate, with the full use of our resources and especially our labour, and with success in high-tech industries. Why these industries, if it

is not that they are industries of the future that generally pay high salaries and realize equally high profits? And it is only because they are highly productive that these industries so generously pay the primary factors.

The difference between the popular debate and the more structured approach of economic analysis is firstly that the question is posed more clearly in economic analysis, and secondly that the link between welfare and growth or competitiveness is also better articulated in the latter forum. Following Harris and Watson, one might also add a third major distinction, namely that economics does not claim to have the answer to the question of the sources of growth, unlike the "gurus" who generally enjoy a more receptive audience for their pronouncements. The language that they use - more everyday, more colourful, more reflective of the various groups concerned with the issue - would seem to be one of the ingredients that have contributed to their success. The analogies that they make with the competitiveness of firms in the domestic market - analogies that appeal more directly to business persons' intuitive understanding - would also seem to contribute significantly to their high ratings.

4 - The popular view and its conformity to two basic equations

Whatever the case, this leads us to propose two basic equations. The first is the equality between the notion of efficiency and that of welfare, for a given income distribution. The second is the equality between growth and competitiveness.

To be competitive is to ensure the highest level of growth. In turn this high level of growth is based on efficiency and the supply of factors. But from this no immediate conclusions may be drawn as to maximization of value-added in the popular sense or maximization of export market share. Admittedly, as stated above, the highest growth path is achieved by maximizing net domestic product, that is, the value-added net of the depreciation of capital. (By depreciation of capital, we mean here the depreciation of both assets that are produced and assets that are supplied by the environment.) But it is necessary to consider leisure and the preference for present consumption as items in the consumption basket, which leads us to the maximization of relative growth rather than the maximization of absolute growth, or, in the final analysis, the maximization of efficiency or of what others would call qualitative growth.

From there to favouring the growth of so-called high-value-added industries, there is but one step, which is unfortunately all too easy to take. This is due to a limited understanding of the functioning of society's productive apparatus. Any delivery to final demand in the economy and, in particular, any delivery so greatly appreciated and recommended on the export markets, is only pure value-added, even though a part of this value-added may come from the contribution of imported factors of production. But what difference does it make whether foreign factors are used if this contributes overall to our efficiency through a better use of our resources for other purposes?

This popular maxim is perhaps due to the largely artificial division of the economy's production activities into industries. Each industry contributes only partially to the value-added of goods and services delivered to final demand by the use of its capital and its labour. The value of goods and services delivered to final demand also depends on the contribution of purchased factors, which in the jargon of national accounting are called intermediate purchases. To maximize value-added at the industry level is to minimize the purchase of intermediate factors so as to maximize the value-added content specific to the industry. But what are purchases of intermediate goods and services, if not the value-added of upstream industries? What then remains of this popular maxim, considering that the division of production activities by industry is purely artificial?

What should be maximized, it appears, is the content consisting of domestic primary factors, as opposed to primary factors indirectly imported in the form of intermediate inputs of goods and services. But once again, what is the merit of maximizing, in the production of each good or service, the domestic value-added? Should not the value of these imports be gauged only in terms of the criterion of efficiency? Of course, one could argue here for instead using the more macroeconomic criterion of job creation. But does not job creation depend in part on our competitiveness, that is, the efficiency of our use and allocation of resources? And does it not depend more fundamentally on the more or less harmonious functioning of factor markets and macroeconomic policies for achieving economic equilibrium?

The maximization of value-added at the aggregate level does not consist, in all cases, in maximizing the value-added of each product delivered to final demand, but rather in maximizing the value-added of the economy as a whole through the allocation of productive resources to activities with the highest productivity for which, furthermore, we possess comparative advantages on the international market. International specialization may call for importing factors of production in many sectors. In other words, industrial clusters, so often discussed these days, potentially have, or ideally should have, transnational ramifications.

The analysis of the market share of exported goods on international markets quickly reaches its limits for similar reasons. Why seek to maximize our share of markets for products - such as clothing, for example - which generate activities in low-efficiency industries? Once again such prescriptions should be more selective.

It is hardly surprising, furthermore, to find that there is no correlation between the degree of openness of economies and their successfulness as measured by indicators such as the per capita net domestic product (NDP), for example. The importance of external trade for a given country depends on a host of factors, including in particular its resource endowment and the size of its domestic market. Some countries, such as the United States, have attained high levels of efficiency and welfare for many decades despite a relatively low level of external trade in relation to their NDP as compared to other less fortunate countries. External trade is not in itself a panacea for growth problems, and the maximization of market share, whether by product or more generally, has no particular prescriptive value.

Thus market share and purchasing power parity or price competitiveness do not appear to be useful indicators of performance problems in the better-articulated analytical context of aggregate growth and efficiency. If an economy is in decline, with high unemployment and a currency that is tending to depreciate over the long run, and if the standard of living of its agents is more or less stagnating, these are the real alarm signals. If in addition its international market share is falling for most exported products, imports are growing and its purchasing power parity is unfavourable, then the diagnosis is all the more complete. On the other hand, a decrease in the importance of international trade in itself is not a symptom of endemic illness, although a declining purchasing power parity can signal a loss of relative efficiency. But once again, when one is a front-runner, is losing some of one's lead so serious? Rather, is it not inevitable and even desirable?

5 - Conclusion

In this article, we have tried to articulate an analytical interpretation of the concept of economic efficiency and to relate this concept to the concepts of competitiveness, growth and welfare. We put forward two equations, namely the equality between efficiency and welfare for a given income distribution, and the equality between competitiveness and growth. This led us to consider the productivity accounts of Statistics Canada as one of the two major components of growth analysis, the second component being the supply of the primary factors of capital and labour in the economy.

Growth accounting thus consists in separating out factor inputs, which are essentially costly in nature, from the advancement of knowledge applied to the production of goods and services. The factor side includes the qualitative differences in labour that result from education and on-the-job training as well as all other qualitative differences in factor inputs which result from earlier investments. The purpose of separating out the sources of growth into costly factors and the advancement of knowledge is to gain a better understanding of the origins of this growth and, we hope, to guide private and public decision-makers so that they can further stimulate the growth of overall efficiency and the increase in welfare. The growth accounts do not push the analysis beyond this limit by attempting to explain, as does the recent literature on endogenous growth, the factors that underlie the sources of growth.

This conceptual analysis led us to compare the language of economists with that of business people and to explore the meaning and scope of popular maxims such as the one that calls for maximizing the importance of high-value-added industries, for example. This led us to conclude that while the objectives expressed by these business people and by an element of the economics-oriented press basically arose from the same desire to maximize welfare as lies at the heart of economic analysis itself, the ways in which the two approaches were articulated differed greatly.

The solutions called for in the popular view, while well-defined, do not in most cases stand up to rigorous economic analysis. The latter, for its part, despite centuries of reflection,

unfortunately still has little to offer to raise the level of social welfare. Perhaps more can be hoped for from recent reflections in the literature on endogenous growth.⁷

For our part, we have timidly advanced the hypothesis that the historical catch-up of various rapidly developing countries found its limit not only in the gradual slowing of technical progress but also in a gradual transformation of the behaviour of economic agents, more specifically in a gradual decline in their propensity to work and save, which might itself result from the rise in welfare. In short, our view of the relationship that characterizes the processing of factors into goods and services - generally perceived as an objective relationship, technical in nature - should perhaps, in the final analysis, be only the reverse view, that of the more subjective relationship of utility.

7. On this subject see Lucas (1993).

BIBLIOGRAPHY

Blaug, Mark (1962 and 1968), *Economic Theory in Retrospect*, Richard D Irwin, Inc., Homewood, Illinois.

Durand, René (1993a), "Le Programme de Productivité Multifactorielle de Statistique Canada," *L'Actualité économique*, Vol 69, No 4, December, pp 313-330.

Durand, René (1993b), "On the Measurement of Capital Services and Economic Efficiency," Statistics Canada, Input-Output Division, September.

Fisher, I (1930), *The Theory of Interest*, Macmillan, New York.

Harris, R G and W G Watson (1992), "Three Visions of Competitiveness: Porter, Reich and Thurow on Economic Growth and Policy," in *Productivity, Growth and Canada's International Competitiveness*, T J Courchene and D D Purvis (eds), The Bell Canada Papers on Economic and Public Policy and the John Deutsch Institute for the Study of Economic Policy, No 1, September, pp 233-296.

Lucas, Robert E (1993), "Making a Miracle," *Econometrica*, Vol 61, No 2, March, pp 251-272.

Porter, Michael E and Monitor Company, *Canada at the Crossroads, The Reality of a New Competitive Environment*, Business Council on National Issues and Minister of Supply and Services, Canada, 1991.

Romer, Paul (1986), "Increasing Returns and Long-Run Growth," *Journal of Political Economy*, 94, pp 1002-1037.

Statistics Canada, *Aggregate Productivity Measures*, Catalogue 15-204.

TECHNICAL SERIES/CAHIERS TECHNIQUES
INPUT-OUTPUT DIVISION/DIVISION DES ENTRÉES-SORTIES
STATISTICS CANADA/STATISTIQUE CANADA

- (1) Hoffman, et al., *User's Guide to Statistics Canada Structural Economic Models*, Input-Output Division, Statistics Canada, Revised September 1980.
- (2) Hoffman, et al., *Guide d'utilisation des modèles économiques et structureaux de Statistique Canada*, Division des entrées-sorties, Statistique Canada, Révisé septembre 1980.
- (3) Durand, R., and Rioux, R., *Estimating Final Demand Expenditure at Factor Cost and Net of Tax Price Indices in the Canadian Input-Output Tables*, Paper Presented at the International Round Table on Taxes and the CPI, Ottawa, Input-Output Division, Statistics Canada, March 3, 1987.
Out of Print. Durand, R., and Rioux, R., *Estimating Final Demand Expenditure at Factor Cost and Net of Tax Price Indices* Now published in *Economic Systems Research*, Journal of the International Input-Output Association, Volume 6, Number 3, 1994, pp.265.
- (4) Siddiqi, Y., Murty, P.S.K., and Diena, J., *Highlights of the Public Sector Market Study, 1983*, Input-Output Division, Statistics Canada, September 1987.
- (5) Murty, P.S.K., *Size and Structure of the Public Sector Market, 1983, Sources and Methods*, Input-Output Division, Statistics Canada, September 1987.
- (6) Durand, R., *The Adding-Up Problem in the Computation of Aggregate Constant Price GDP*, Input-Output Division, Statistics Canada, October 1987.
- (7) Durand, R., and Markle, T., *Measuring the Variability of Input-Output Structures: A Progress Report*, Input-Output Division, Statistics Canada, December 1987.
- (8) Durand, R., and Markle, T., *On the Variability of Input-Output Structures: A Progress Report on the Constant Price Industrial Input Structures*, Input-Output Division, Statistics Canada, April 1988.
- (9) Durand, R., and Markle, T., *Structural Change in the Canadian Economy: The Supply Side in Current Prices*, Input-Output Division, Statistics Canada, July 1988.
- (10) Durand, R., *Statistics Canada's Price Model: A Detailed Description of the Structure and Simulation Capacities*, Input-Output Division, Statistics Canada, August 1988.
- (11) Durand, R., and Markle, T., *Structural Change in the Canadian Economy: The Supply Side in Constant Prices*, Input-Output Division, Statistics Canada, October 1988.
- (12) Durand, R., and Markle, T., *A Diversity Analysis of Structural Change Based on the Canadian Input-Output Tables*, Input-Output Division, Statistics Canada, October 1988.
Out of Print Durand, R. and Markle, T., *Diversity Analysis of Structural Change Based on the Canadian Input-Output Tables*. Now published in *Economic System Research*, Journal of the International Input-Output Association, Volume 6, Number 3, 1994, pp.277

- (13)
Durand, R. and Markle, T., *Structural Change in the Canadian Economy: The Supply Side in Constant Prices*, Input-Output Division, Statistics Canada, October 1988.
- (14)
Murty, P.S.K., Généreux, P.A., Leblanc, D., and Grennberg, M., *Provincial Sales Tax Commodity Allocation Project, 1984 Sources and methods*, Input-Output Division, Statistics Canada, January 1989.
- (15)
Durand, R., *The Balancing Process of the Regional Input-Output Tables*, Input-Output Division, Statistics Canada, February 1989.
- (16)
Siddiqi, Y., Murty, P.S.K., and Diena, J., *Highlights of the Provincial Sales Tax Commodity Allocation Project, 1984*, Input-Output Division, Statistics Canada, January 1989. Reprinted from *Canadian Economic Observer*, May 1989.
- (17)
Durand, R., *Aggregation Formulas for Multifactor Productivity*, Input-Output Division, Statistics Canada, June 1989.
- (18-E)
Mercier, P., Durand, R., and Diaz, A., *Specification of Parameters for the National Input-Output Model*, Input-Output Division, Statistics Canada, December 1991.
- (18-F)
Mercier, P., Durand, R., et Diaz, A., *Spécification des paramètres du modèle d'entrées-sorties national*, Division des entrées-sorties, Statistique Canada, décembre 1991.
- (19-E)
Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984*, Input-Output Division, Statistics Canada, July 6, 1989.
- (19-F)
Siddiqi, Y. et Murty, P.S.K., *Impôts indirects sur les biens et les services dans les comptes d'entrées-sorties du Canada, 1984*, Division des entrées-sorties, Statistique Canada, 6 juillet 1983.
- (20)
Markle, T., *Progress Report # 5: On the Temporal Variability of the Aggregate Input Structure*, Input-Output Division, Statistics Canada, September 1989.
- (21)
Siddiqi, Y., and Murty, P.S.K., *Highlights of Commodity Taxes for 1984*, Input-Output Division, Statistics Canada, *Canadian Economic Observer*, September 1989.
- (22)
Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes - An Inventory before the GST*, Input-Output Division, Statistics Canada, *Canadian Economic Observer*, October 1989.
- (23)
Murty, P.S.K., and Siddiqi, Y., *Government Expenditures on Goods and Services and Transfer Payments in Canada, 1961-1985*, Input-Output Division, Statistics Canada, December 1989.
- (24)
Murty, P.S.K., and Siddiqi, Y., *Government Expenditures on Goods and Services and Transfer Payments in Canada 1961-1985*, Input-Output Division, Statistics Canada, Reprint from *Canadian Economic Observer*, May 1990.
- (25)
Siddiqi, Y., and Murty, P.S.K., *Commodity Indirect Taxes in the Canadian Input-Output Accounts, 1984-1986*, Input-Output Division, Statistics Canada, February 1990.
- (26)
Durand, R., *Growth Accounting and the Quality Adjustment of the Capital Stock*, Input-Output Division, Statistics Canada, February 1990.

- (27)
Durand, R., and Salem, M., *On a Dynamic Productivity Index Number Formula*, Input-Output Division, Statistics Canada, revised version February 1990.
- (28)
Diaz, A., *The 1989 increase in Labour Compensation per Person: Was it caused by wage demands?*, Input-Output Division, Statistics Canada, June 1990.
- (29)
Murty, P.S.K., *Federal Goods and Services Tax and the Canadian System of National Accounts*, Input-Output Division, Statistics Canada, October 1990.
- (30)
Effective tax rates and net price indexes/Les taux de taxe actuels et les indices de prix net, Feature Article/Etude spéciale, Canadian Economic Observer/L'observateur économique canadien, November 1990/novembre 1990.
- (31)
Salem, M., *Documentation of Capital Input and Capital Cost time series for Multifactor Productivity Measures*, Input-Output Division, Statistics Canada, reviewed and updated by R. Fortin and Y. Sabourin, December 1990.
- (32)
Siddiqi, Y., and Murty, P.S.K., *Federal Sales Tax in the Canadian Input-Output Accounts*, Input-Output Division, Statistics Canada, July 1989. Draft. Out of Print.
- (33)
Murty, P.S.K., *New Paradigm to Analyze Government Transfer Payments with special reference to Canada*, Input-Output Division, Statistics Canada, Draft, January 3, 1991.
- (34)
Durand, R., *Productivity Analysis and the Measurement of Gross Output Net of Intra-Industry Sales*, Input-Output Division, Statistics Canada, January 1991.
- (35)
Murty, P.S.K., and Siddiqi Y., *A New Paradigm to Analyze Commodity Indirect Taxes and Subsidies, 1986-1989*, Input-Output Division, Statistics Canada, April 5, 1991.
- (36)
Généreux, P., *The Input-Output Structure of the Economies of the Yukon and Northwest Territories, 1984*, Input-Output Division, Statistics Canada, May 1991.
- (37)
Généreux, P., *La structure par entrées-sorties des économies du Yukon et des territoires du Nord-Ouest, 1984*, Division des entrées-sorties, Statistique Canada, mai 1991.
- (38)
Durand, R., *An Alternative to Double Deflation for Measuring Real Industry Value-Added*, Input-Output Division, Statistics Canada, June 1991. Out of Print. Now published in Review of Income and Wealth, Series 40, Number 3, september 1994.
- (39)
Généreux, P., *I/O Tables in constant prices: Revised deflation process and analysis of the machinery and equipment sector*, Input-Output Division, Statistics Canada, September 1984. Reprint July 1991.
- (40)
Murty, P.S.K., and Siddiqi, Y., *Government subsidies to industries/Les subventions gouvernementales accordées aux industries*, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, Reprint from Canadian Economic Observer/Réimprimé de l'observateur économique canadien, May 1991/mai 1991.
- (41)
Diaz, A., *Alternative Concepts of Output and Productivity*, Input-Output Division, Statistics Canada, Catalogue 15-204, 1989 issue; July 1991.
- (42)
Durand, R., *Aggregation, Integration and Productivity Analysis: An Overall Framework*, Input-Output Division, Statistics Canada, Catalogue 15-204, 1989 issue; July 1991.

(43)

Diaz, A., *The Statistics Canada Concepts and Measures of Productivity*, Input-Output Division, Statistics Canada, July 1991. Discontinued

(44-E)

Dionne, M., *Measuring Capital Depreciation*, Input-Output Division, Statistics Canada, July 1991. Discontinued

(44-F)

Dionne, M., *Mesure de la dépréciation du capital*, Division des entrées-sorties, Statistique Canada, novembre 1991. Discontinuer

(45)

Murty, P.S.K., and Siddiqi, Y., *Scope of Public Grants Economy in Canada*, Input-Output Division, Statistics Canada, December 6, 1991.

(46)

Murty, P.S.K., et Siddiqi, Y., *Portée de l'économie des subventions publiques au Canada*, Division des entrées-sorties, Statistique Canada, le 6 décembre 1991. Projet.

(47-E)

Gill, K., and Larose, M., *Sources and Methods of Estimating Employment by Input-Output Industries for the years 1961 to 1989*, Input-Output Division, Statistics Canada, November 1991, revised February 1993.

(47-F)

Gill, K., et Larose, M., *Sources et Méthodes d'estimation de l'emploi par industries entrées-sorties de 1961 à 1989*, Division des entrées-sorties, Statistique Canada, novembre 1991, révisé février 1993.

(48)

Murty, P.S.K., and Siddiqi, Y., *Transfer Payments in National Accounts and Grants Economics*, Input-Output Division, Statistics Canada, May 25, 1992.

(49)

Interprovincial and International Trade Flows of Goods 1984-1988/Flux du commerce international et interprovincial des biens 1984-1988, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, June 1992/juin 1992. Cost/Coût=\$500.00. Out of Print/épuisé

(50)

Messinger, H., *Canada's Interprovincial Trade Flows of Goods, 1984-89/Flux du commerce interprovincial des biens au Canada 1984-1989*, Input-Output Division/Division des entrées-sorties, Statistics Canada/Statistique Canada, January 1993/janvier 1993. Forthcoming/A venir. Cost/Coût=\$800.00

(51)

Webber, M., *Estimating Total Annual Hours Worked from the Canadian Labour Force Survey*, Labour and Household Surveys Analysis Division and Input-Output Division, Statistics Canada, April 1983.

(52-E)

Statistics Canada's input-Output Model: General description, Critical Analysis of Partially Closed Version and Alternative Solutions, Input-Output Division, Statistics Canada, June 1991

(52-F)

Le modèle d'entrées-sorties de Statistique Canada: présentation générale, analyse critique de la version avec fermeture partielle et solutions de rechange, Division des entrées-sorties, Statistique Canada, juin 1991.

(53)

Murty, P.S.K., *A New Approach to Analyze Public Sector Grants: A Case Study of Canada*, Input-Output Division, Statistics Canada, January 1993.

(54)

Murty, P.S.K., *Scope of the Public Sector Grants in the Canadian Economy Revisited*, Input-Output Division, Statistics Canada, January 1993. (59)

Murty, P.S.K., *A System of Grant Accounts*, Input-Output Division, Statistics Canada, September 1993.

(55)

Murty, P.S.K., *A Blueprint for the System of Grant Accounts*, Input-Output Division, Statistics Canada, February 1993.

(56)

Murty, P.S.K., *The Need for a System of Grant Accounts*, Input-Output Division, Statistics Canada, March 1993.

(57-E)

Siddiqi, Y., and Salem, M., *Estimating More Timely Input-Output Accounts: A Synthetic Approach*, Input-Output Division, Statistics Canada, March 1993.

(57-F)

Siddiqi, Y., et Salem, M., *Estimation des comptes d'entrées-sorties dans des délais raisonnables : une méthode synthétique*, Division des entrées-sorties, Statistique Canada, mars 1993

(58-E)

Poole, E., *A Guide to using the Input-Output Model of Statistics Canada*, Input-Output Division, Statistics Canada, June 1993.

(58-F)

Poole, E., *Guide d'utilisation du modèle d'entrées-sorties de Statistique Canada*, Division des entrées-sorties, Statistique Canada, juin 1993, révisé le 18 octobre 1993.

(59)

Murty, P.S.K., *A System of Grant Accounts*, Input-Output Division, Statistics Canada, September 1993.

(60-E)

Allard-Saulnier, M., *Comparability of Multifactor Productivity Estimates in Canada and the United States*, Input-Output Division, Statistics Canada, February 1993.

(60-F)

Allard-Saulnier, M., *Comparabilité des estimations de la productivité multifactorielle au Canada et aux Etats-Unis*, Division des entrées-sorties, Statistique Canada, février 1993

(61-E)

Maynard, J-P., *Hours Worked: A New Measure of Labour Input for Multifactor Productivity Estimates*, Input-Output Division, Statistics Canada, February 1993

(61-F)

Maynard, J-P., *Les heures travaillées: une nouvelle mesure de l'entrée de travail pour la productivité multifactorielle*, Division des entrées-sorties, Statistique Canada, février 1993.

(62)

Murty, P.S.K., *A New Approach to Analyze Grants Economy*, Input-Output Division, Statistics Canada, October 21, 1993.

(63)

Messenger, H., *Interprovincial Trade Flows of Goods and Services/Les flux du commerce interprovincial des biens et des services*, Feature Article/Etude spéciale, Canadian Economic Observer/ de l'observateur économique canadien, October 1993/octobre 1993.

(64-F)

Durand, R., *Le programme de productivité multifactorielle de Statistique Canada*, Etude spéciale, L'Actualité économique, Revue d'analyse économique, vol.69, n°4, Division des entrées-sorties, Statistique Canada, décembre 1993

(65)

Durand, R., *Statistics Canada Multifactor Productivity Program*, Based on "Le programme de productivité multifactorielle de Statistique

Canada", *Actualité Economique*, 69 (4) , décembre 1993, pp.313-330 and Feature Article, *Measuring Agricultural Productivity and Related Data for Regional, National and International Comparisons Proceedings*, (S. Narayanan and J. King eds.) , Agriculture Canada, 1994

(66)

Durand, R., *On the Measurement of Capital Services and Economic Efficiency*, Input-Output Division, Statistics Canada, September 1993, revised March and September 1994.

(67-E)

Durand, R., *The Canadian Productivity Accounts: Interpretation and Analytical Uses*, Input-Output Division, Statistics Canada, November 7, 1994.

(67-F)

Durand, R., *Les comptes canadiens de la productivité: interprétation et utilisations analytiques*, Division des entrées-sorties, Statistique Canada, le 7 novembre 1994.

(68)

Durand, R., *New Alternative Estimate of Real Industry Value-Added for Canada*, Input-Output Division, Statistics Canada, December 1994.



ORDER FORM

Input-Output Division

MAIL TO:
Publication Sales
Statistics Canada
Ottawa, Ontario, K1A 0T6

(Please print)
 Company _____
 Department _____
 Attention _____
 Address _____
 City _____ Province _____
 Postal Code _____ Tel. _____

FAX TO: (613) 951-1584

A Fax will be treated as an original order. Please do not send confirmation.

METHOD OF PAYMENT

Purchase Order Number (please enclose) _____

Payment enclosed \$ _____

Bill me later (max. \$500)

Charge to my: MasterCard VISA

Account Number _____

Expiry Date _____

Signature _____

Client Reference Number _____

Catalogue Number	Title	Frequency/ Release Date	Annual Subscription or Book Price			Qty	Total \$
			Canada \$	United States US\$	Other Countries US\$		
15-201	System of National Accounts: The Input-Output Structure of the Canadian Economy, 1987	Annual 02/91	60.00	72.00	84.00		
15-204E	System of National Accounts: Aggregate Productivity Measures, 1989	Annual 07/91	40.00	48.00	56.00		
15-510	System of National Accounts: The Input-Output Structure of the Canadian Economy, 1961-1981	Occasional 01/88	66.00	79.00	79.00		
15-511	System of National Accounts: The Input-Output Structure of the Canadian Economy in Constant Dollars, 1961-1981	Occasional 01/88	66.00	79.00	79.00		

Version française de ce bon de commande disponible sur demande



