THE MEASUREMENT OF CONSTANT PRICE AGGREGATES IN CANADA*

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This paper is in part directed towards a partial examination of Canadian concepts and methods used in the deflation of constant price estimates of gross domestic product from both an expenditure and industry-of-origin point of view, and in part toward certain problems arising in the development of a conceptually balancing set of accounts in real terms. It also provides reference material to allow the reader to pursue the detailed methodology and data underlying the Canadian constant price accounts.

THE INDUSTRY OF ORIGIN APPROACH

The Historical Record

Indexes of real output in an Index of Industrial Production context have been published by the Dominion Bureau of Statistics (D.B.S.) since January 1926 and extend back to January 1919.[1] These early indexes were based on selected physical commodity output only and the first change along current methodological lines occurred in the year 1952, when a much improved Index of Industrial Production was released.[2] In this revision the 1948 Standard Industrial Classification of Industries[3] was adopted as the industry framework and 1935–1939 as the weight and reference base.

Some of the main features of the 1952 revision included the development of annual benchmark indexes from comprehensive and detailed data derived from the annual censuses of industry. Emphasis was placed on obtaining a volume index of net output for as many industries as possible using the "double deflation" method. Monthly indexes[4] were based on such monthly data as production, shipments, materials or manhours. Weights used at the major industry division level were based on Gross Domestic Product at factor cost in the 1935–1939 period while sub-group or component industry weights were based on "census value added," i.e., shipments adjusted for changes in finished goods and goods-in-process inventory, less materials, fuel and electricity used. Commodities within industries were combined using gross value of production weights. The new monthly index and its components were adjusted for calendar variation but no attempt was made to remove the influence of seasonal fluctuations. The

[1]For a complete monthly and annual record of production pertaining to this early period see the May 1963 Annual Supplement to D.B.S. publication 61–005, *Monthly Index of Industrial Production*, Queen's Printer, Ottawa.

[2]*Revised Index of Industrial Production, 1935–1951 (1935–1939 = 100)*, D.B.S. Reference Paper No. 34, Ottawa, 1952.

[3]*Standard Industrial Classification Manual*, D.B.S. 1948.

[4]For a detailed description of content see Appendix B, of D.B.S. Reference Paper No. 34.

*The opinions expressed in this paper are the responsibility of the authors alone and do not necessarily represent the official position of the Dominion Bureau of Statistics.

1935–1939 based monthly indexes were also adjusted to the annual benchmark levels.

The next major revision to the Index of Industrial Production was released in 1959.[5] It retained the 1948 S.I.C. and introduced a 1949 weight and reference base. In the 1949-based index, special output-per-manhour adjustments were developed for industries measured monthly by manhours. These output-per-manhour adjustments were applied to the monthly manhour indexes in order to correct them to an output concept.

Another feature of the 1949-based index was the introduction of new seasonal adjustment factors,[6] calculated by the Census Method II programme for nearly 100 individual series.

There was also a substantial improvement in the 1949 industry weighting system. Gross Domestic Product at factor cost was derived for 31 manufacturing classifications, 6 mining industries and 2 electricity and gas components. For individual industries below these levels, weights continued to be based on "census value added."

The table below shows the type of indicator used for both the bench-mark and monthly 1949-based indexes.

TYPES OF INDICATORS AS A PERCENTAGE OF 1949
GROSS DOMESTIC PRODUCT AT FACTOR COST: INDEX OF INDUSTRIAL PRODUCTION

	Benchmark Indexes (percentage)	Monthly Indexes
Net Output	42	—
Gross Output	45	62
Labour Input	2	33
Material Input	11	5
Total Index of Industrial Production	100	100

In December 1961, the monthly Index of Industrial Production was released for the first time in a new D.B.S. monthly report[7] which contained data for more than 80 individual industry series and aggregates on both a seasonally unadjusted and seasonally adjusted basis.

The most recent up-dating of the Index of Industrial Production was released in May, 1966.[8] The bulk of this revision originated in manufacturing. Annual 1949-based levels were established for the year 1959 for all manufacturing industries but only for selected years and industries in the intervening period. For those industries for which no benchmarks were calculated for the 1950–1958 period, the annual levels were estimated by interpolation on the trend of monthly indexes. It should be noted that the year 1959 was chosen as the cut-off point in

[5]For complete details of this revision see *Revised Index of Industrial Production 1935–1957 (1949 = 100)*, D.B.S. Cat. No. 61–502, Ottawa, 1959.

[6]Seasonal adjustment by major industry groups for the 1935–1939-based index had been carried out by hand methods and published in the *Canadian Statistical Review*, beginning February, 1956.

[7]*Index of Industrial Production*, D.B.S. Cat. No. 61–005, monthly, Queen's Printer, Ottawa.

[8]*1966 Annual Supplement to the Monthly Index of Industrial Production*, D.B.S. Cat. No. 61–005.

this latest revision because it was the last year for which the Census of Manufacturing was based on the 1948 S.I.C.

After the publication of Reference Paper No. 34 in 1952, work was also begun on the development of a system of annual and quarterly real Domestic Product by industry of origin measures for the remainder of the economy. At this time an historical document for the National Accounts containing annual Gross National Expenditure estimates in base year dollar terms had just been published.[9] Internally at D.B.S. progress was being made in the preparation of quarterly estimates for deflated G.N.E. and some check on the validity of these data was being sought. When the industry results first became available in 1953, it was found that they substantiated the deflated G.N.E. estimates.[10] Subsequently, the then unpublished industry indexes were prepared each quarter in conjunction with the quarterly National Accounts. Although initially used primarily as a check on the deflated G.N.E. data, the industry indexes soon became established in their own right and, after the publication of the revised Index of Industrial Production in 1959, a concentrated effort to refine them for publication purposes was initiated.

The resultant reference document "Indexes of Real Domestic Product by Industry of Origin, 1935–1961" was released in May 1963 and provided 1949-based quantity indexes of real domestic product at factor cost on an annual basis from 1935 and on a quarterly basis from 1946. Annual benchmarks were calculated up to 1958 for industries outside the coverage of the Index of Industrial Production. Methodology used was similar to that used in the Index of Industrial Production, which became an integral part of the broader aggregate.

The types of indicators used for the annual and quarterly indexes of real Gross Domestic Product, inclusive of the Index of Industrial Production components, are shown below.

TYPES OF INDICATORS AS A PERCENTAGE OF 1949 GROSS DOMESTIC PRODUCT AT FACTOR COST

Benchmark Indexes	Percentage	Quarterly Indexes	Percentage
Net Output	30		—
Gross Output	51	Gross Output:	
		Physical units	35
		Value deflation	36
Labour input	15	Labour input:	
		Adjusted man-hours	11
		Unadjusted labour input	11
Material input	4	Materials and other	7
Total Gross Domestic Product	100	Total Gross Domestic Product	100

The quarterly indexes of Real Domestic Product by industry were updated in 1963 and have been published on a continuing basis since mid-1963. Since March 1964 they have been included in the monthly publication of the Index of Industrial Production.

[9]D.B.S. Occasional Paper *National Accounts, Income and Expenditure, 1926–1950*, Queen's Printer, Ottawa, 1951.

[10]This has generally been the case ever since.

Current Updating and Revision Work

In this section revisions that are planned for 1968 and 1969 are described. As background it might be useful to comment briefly on basic revisions that have been made to the industry data base in D.B.S. in recent years.

Of prime importance to the industry of origin real output system have been the revisions made to the S.I.C. in 1960.[11] Revisions introduced at that time were two-fold: firstly, the industrial classification itself was changed and this had a particularly upsetting effect on component manufacturing industries although there were important changes between and within other major industrial divisions as well. Secondly, the definition of the unit to be classified, i.e., the establishment, was also changed to encompass all revenue-producing activities of the establishment, whereas formerly only the main activity was covered.

In the annual manufacturing censuses the new industry classification was introduced in 1960 while the broader establishment concept was introduced in 1961. In 1961 too, most other industry data, with the notable exceptions of agriculture, construction, and mining, reflected the new industry classification as well as the broader concept of the establishment. For example, the 1961 decennial census of merchandising and services over-lapped the new "establishment" concept and classification system with the "location and main activity" classification and concept formerly used, thus providing a link between the two systems in that year.

Manufacturing presented a difficult problem. In order to update the manufacturing indexes to 1961 and to set the stage for a rebasing of the entire real domestic product system to a 1961 weight base it was necessary to calculate a "classification only" link in 1959. This was accomplished by retabulating the census of manufacturing returns for that year for about 60 industries that were severely upset by the classification changes. These industries were retabulated on a basis comparable to 1960 and then real output "main activity" indexes were computed on a 1961 weight base back to and including 1959. The results of this computation will be published in 1968 and will permit a classification link in 1959 with the previously published 1949-based benchmarks.[12] At the same time the results of the 1961 decennial census and of other censuses and surveys not yet incorporated into the 1949 weight-based pre-1961 real domestic product record will be computed in order to provide final benchmarks, as well as final sub-annual estimates, up to 1961.

The revision planned for 1968 will also include a weight-base change to 1961 for the sub-annual industry measures, i.e., the monthly Index of Industrial Production and the quarterly Real Domestic Product data. To accomplish this a set of 1961 Gross Domestic Product (GDP) at factor cost weights derived from a preliminary 1961 input-output table will be used. Once this 1968 revision is completed attention will be turned to this benchmark updating and to the more difficult tasks of introducing the "total activity" concept throughout the industry system, to the introduction of improved methodology and timing, to the development of establishment-based total activity data wherever these are now weak or

[11] *Standard Industrial Classification*, D.B.S. Cat. No. 12–501, Queen's Printer, Ottawa, 1960.

[12] The link between 1949 weight-based indexes and the new 1961 weight-based measures will be made in 1961 for all non-manufacturing industries.

lacking, and to reconciliation studies with the income and expenditure accounts and with input-output tables made possible by the revisions to, and integration of, all three systems.

Basic Methology

A double deflation method has been used wherever possible to derive the real domestic product industry annual or benchmark measures. Formulae used in the preparation of these indexes are of the base-weighted Laspeyres type and are described in the occasional papers referred to earlier.

In the case of the current monthly or quarterly indexes gross output measures are generally used. Intermediate input data are not available on a current basis except in a few isolated cases. In regard to sub-annual measures for manufacturing, extensive, use has thus far been made of output-per-manhour trend adjustments based on historical relationships where manhours have to be used as output proxies on a monthly or quarterly basis. Calendar variation adjustments are used throughout the system wherever relevant. Seasonal adjustment is done by electronic computer methods and at the finest industrial level possible. Monthly indexes are now adjusted to annual or benchmark levels and smoothed using a computer method developed by the U.S. Federal Reserve System, which is designed not to upset basic seasonal patterns.[13]

The use of deflation methodology is becoming more prevalent and may eventually become the most used approach as suitable specified price indexes for deflation purposes become available. This road to improvement is highly desirable since it is clear that it is much more economical and practical to sample for price change than to attempt adequate coverage of the many different commodity quantities. Indeed our current experience with the use of presently available specified price indexes for deflation purposes and planned price survey extensions in both the manufacturing and non-manufacturing areas indicates that there can be a substantial increase in the percentage of aggregate industry real output represented by value added indicators over the next few years. Intermediate input price indexes are not yet directly prepared or collected although some reshuffling of output price series has been done for a few manufacturing industries. Such input price proxies have not been used very much and at the present time deflation of intermediate inputs using average unit values remains the general rule.

The Basic Production Concept

It is not our intention to present here a detailed discussion of concepts[14] but

[13]This and other detailed methodology points are discussed in some detail in the previously noted occasional paper *Indexes of Real Domestic Product by Industry of Origin, 1935–1961.*

[14]Detailed descriptions of methodology and concepts used have been given in D.B.S. Occasional papers 61–502, *Revised Index of Industrial Production, 1935–1957*, Queen's Printer, Ottawa, 1959, and 61–505, *Indexes of Real Domestic Product by Industry of Origin, 1935–1961*, Queen's Printer, Ottawa, 1963. A detailed and up-to-date discussion of concepts, methods, problems and plans was covered in a paper by Gordon J. Garston and David A. Worton on *Problems in the Estimation of Industry Output in Current and Constant Dollars in Canada* prepared for the December 1966 Conference on Research in Income and Wealth sponsored by the National Bureau of Economic Research and to be published by the N.B.E.R. in volume 32 of its Income and Wealth series.

merely to outline the basic concepts used in the industry of origin measures. To date the particular concept of economic production adopted for the industry measures has been that of Gross Domestic Product at factor cost. This concept has been considered to be the most appropriate and practical for Canada due mainly to the nature of basic industrial statistics available for measurement purposes, but also due to user requirements (especially those relating to productivity, potential output and resource cost).

In discussing this concept of economic production considerable emphasis must be placed on the idea of creating value or adding value to already existing commodities as opposed to earlier ideas of "work done," "fabrication processes" or "activity" which can be largely divorced from value creation concepts. In deflation work relating to real domestic product measurement for an industrially-advanced country such as Canada, product mix is often far too great for the use of physical quantities as a means of projecting real output. One must ensure that all aspects of product mix such as product variety, bulk or individual sales, wholesale or retail sales of establishments, delivered or undelivered goods, etc., are reflected and, although value series will reflect these attributes, it is not generally feasible to collect the range of quantum detail necessary to reflect changes in these quantity attributes properly. The increasing emphasis by D.B.S. on deflation methodology using specially designed specified price indexes is both a recognition of this fact and an attempt to factor values into price and quantity on a more realistic basis.

There are other implications worthy of note stemming from a creation of value concept of economic production. For example, this concept restricts the boundary of economic production to the production process itself. No further imputation such as a valuation of the consumer's own time should be read into it. Again of great importance to the proper measurement of this concept are the questions of precisely where, i.e., in what industry (or region if this aspect is to be isolated) and when, i.e., in what month, quarter or year, economic value (or production) has in fact been created.

Costs encountered in creating economic production provide a good basis for judgment. From this point of view, a net domestic product (or domestic income) concept could be considered to be the best of a number of possible choices. This concept of economic production measures the price boundary of the factors of production. Factor costs accumulate in the individual production processes and, when summed across industries, yield an unduplicated measure of aggregate economic production. In Canada capital consumption allowances have been included in the industry measures, thus modifying the concept to that of gross domestic product at factor cost. (The constant price form, with which the industry indexes have thus far been mostly concerned, measures current year output in terms of a base period valuation but current year technology.)

The desired gross domestic product at factor cost measure can be derived in current dollar terms either by deducting intermediate goods and services inputs from shipments (adjusted for finished goods and goods-in-process inventory changes) or accrued operating revenue, —or by summing accrued factor incomes earned and capital consumption costs incurred in the production process. The former approach makes operationally possible the calculation of gross domestic

product in constant prices by the double deflation method, which is the basic method adopted for the Canadian industry of origin measures.

To return to the basic production concept, the production process is a function of the factors of labour, capital and entrepreneurship working in combination over a period of time which can vary considerably in length, according to the nature of the product. The valuation of the resultant product, however, is determined at a point in time, i.e., when the market transaction takes place.

The cost of intermediate goods and services, and all labour costs (or returns) have to be paid for as they are acquired at prevailing market rates. Also capital consumption allowances have to be met. The returns to entrepreneurship and capital, on the other hand, are determined residually when the product or service is finally sold. An excess of revenue over related costs results in profit, but if the entrepreneur has not gauged the market properly, he may have to pay a penalty in the form of a loss. Such a loss reflects negative factor income (and thus a reduction in net worth), the effect being to offset the production which was contributed by other factors at an earlier stage of the production process.

When measuring production on an annual basis, the actual duration of the production process is of lesser importance since the full process is, in most instances, completed within a year. The areas of production which overlap annual periods are usually not significant, except in cases such as construction where progress payments are made. When the period of measurement is shortened however, as in the case of monthly or quarterly industry measures of economic production, differences of timing between the accrual of factor and intermediate costs and the recognition of the resultant value created attain major significance. Failure to measure separately sales and inventory change (finished goods and goods-in-process) leads to timing errors in an output measure, and the use of indicators based only on quantities or physical units produced during a particular period must always be deficient from an economic production point of view.

The basic point is well illustrated in agriculture, where the costs incurred by a farmer in ploughing and seeding generally have no marketable value until the crop is harvested and sold. It is true, of course, that the factor and other inputs used such as hired labour, seed, gasoline, etc., all have economic value as reflected in their purchase price, but whether their combination as reflected in the potential crop will have value or not cannot be determined until the crop is sold. The only value added at the time of marketing is the return to the farmer for assuming risk in combining these inputs, since the value of the intermediate inputs themselves would have been previously accounted for and determined by other industries or by imports. If, just prior to marketing, the crop is destroyed by accident then, at that time, all accumulated costs must be written off. In this latter case the factor costs accrued earlier in other industries producing the materials and services used as well as accrued labour and other costs incurred by the farmer are nullified by a negative entry in farm net income. In this case, the production of earlier time periods was destroyed in a later time period.

The other question of *where* economic production actually originates raises a number of very basic problems requiring more extensive treatment than is possible here. It may be noted, however, that it makes a substantial

difference to industry of origin measures for factor income and capital consumption allowances to be accrued to "using" industries rather than "owning" industries in cases where the use and ownership of assets are not synonymous. It can be argued that it is desirable that the "owning" industry concept be followed for industry of origin economic production measurement purposes, although the "using" industry concept could also clearly be very useful for many purposes. The choice of concept here directly affects the industrial origin of such important items as capital consumption allowances and net rents. In the case of capital consumption allowances, for example, it is not normally possible for a using industry to report these allowances unless it is also the owning industry.[15] What is needed to clarify these issues is a thorough re-examination of basic concepts relating to the industrial origin and definition of factor income.

Some Problems Affecting the Industry of Origin Measures

Most of the major problems confronting the industry of origin measurement approach have been fully discussed in the Garston–Worton paper previously referred to and there does not seem to be much point in repeating these in detail here. It would, however, be useful briefly to indicate the nature of some of these problems as a means of stimulating further discussion and obtaining the advice of real output experts outside of D.B.S. and Canada.

(*a*) *Factor income valuation and the double deflation approach to constant price measurement*

Although it has generally been accepted in Canada and in many other countries that factor cost production measures are to be preferred for industry of origin, or supply side analysis, there are still a number of troublesome conceptual issues originating with both the basic definition of factor income and the methodology used to derive its constant price equivalent.[16]

In regard to the definition of factor income (or factor cost) in current dollar terms, problems of where factor income originates, i.e., in what industry, have already been mentioned. The distinction between direct and indirect taxes, and the implications of this distinction on the aggregate levels of national or domestic income, need further thorough review by economic theorists.

There are some valid criticisms regarding the concepts of the double deflation approach to a factor cost industry measure where constant price intermediate

[15]Two D.B.S. Occasional Papers, *Fixed Capital Flows and Stocks, Manufacturing, Canada 1926–1950*, Catalogue No. 13-522—*Methodology* and 13-523—*Statistical Supplemen*- were prepared at D.B.S., by Professor T. K. Rymes, now with Carleton University, and published by Queen's Printer, Ottawa, 1967. These documents give a comprehensive survey of the conceptual problems involved in obtaining estimates of fixed capital stocks, and present, along with other data, estimates of constant dollar capital consumption allowances for five sets of assumed asset lives.

[16]For some views on these problems see J. L. Nicholson, "National Income at Factor Cost or Market Price?", *The Economic Journal*, June, 1955; Richard Stone, *Quantity and Price Indexes in National Accounts*, O.E.E.C., November, 1956; Paul David, "Measuring Real Net Output: A Proposed Index," *The Review of Economics and Statistics*, November, 1966; *Report of the Working Group on National Accounts and Balances*, Conference of European Statisticians, Statistical Commission and Economic Commission for Europe, May 9, 1967.

inputs valued at purchasers' prices are deducted from constant price gross output valued at producers' prices. There can be little doubt as to the theoretical desirability of using consistent input and output price and factor income valuation boundaries throughout the industry of origin framework and of carefully isolating industry current and constant price indirect tax, subsidy, trade, transportation and other service input margins over time. This ideal state of statistical affairs is more easily stated than achieved, given the statistical data base in Canada. Even if it could be accomplished in an industry of origin context it is questionable whether the industry factor cost measures now derived would be significantly different. D.B.S. intends to undertake further research into this very difficult area but believes that, given presently available data, its present double deflation approach to industry factor cost measurement provides the most useful and practical measures for industrial analyses.

It should be noted that in Canada the use of a double deflation approach based on the "census value added" definition results in the exclusion of indirect taxes levied on the final products (gross output) of each industry. Intermediate inputs on the other hand include all indirect taxes levied up to that point. The residual value added thus still includes those indirect taxes that are levied on an industry's own assets. Altogether about one-third of total indirect taxes are included in the census value added residual. The major portion of these taxes is based on property while the remainder comes from such sources as licence fees, permits, and the use of public domain resources. Canada's factor cost industry measures would be improved if these indirect taxes could be deflated and removed from each industry's projector. It is believed that this could be done in the case of public domain taxes which are directly related to quantities such as tree stumpage or barrels of oil. Property taxes, on the other hand, present more serious problems and the deflation of these is discussed in a later section of this paper under the heading, "Certain of the Problems Inherent in the Deflation of Indirect Taxes and Subsidies."

Finally there remains the problems of developing "true" factor cost estimates as outlined by R. Stone and G. Jaszi. This problem is also discussed in a later section of this paper under the heading, "Certain of the Problems Involved in Obtaining a Balancing System in Real Terms."

(*b*) *Publication in constant prices and/or index number form*

Thus far D.B.S. has only published the constant (1949) dollar industry estimates in index number form. Although constant price equivalents have been calculated these data have thus far only been released to meet special requests or purposes such as the O.E.C.D. constant price tables. Generally D.B.S. has been reluctant to publish the industry estimates in constant price form because of the uneven quality of the industry estimates. Users tend to view index numbers with more caution than constant price series.

Until the full range of gross output and intermediate input data become available, or can be estimated, it will not be possible to achieve a long-run D.B.S. goal, namely to construct a complete set of gross output, intermediate input and net output industry data in both current and constant price terms.

(*c*) *Rate adjusted and unadjusted sub-annual data*

Sub-annual measures of industry real output in Canada are published on both a calendar-adjusted basis and on a complete seasonally adjusted basis. Generally the release of the calendar adjusted series has been a tradition, having started with the Index of Industrial Production before that series was seasonally adjusted. The practice has been continued in the real domestic product estimates. The original idea of a calendar adjusted series was to express each month's data on such a basis that months could be compared without the irregular and distorting effect of a varying number of working days. This is an attempt to rate-adjust the sub-annual data. With the use of the computer and more sophisticated seasonal adjustment techniques, rate adjustments inclusive of both calendar variation[17] and seasonal adjustments have become the norm, leaving the calendar adjusted data in an "in between" position that reflects neither true rate nor true basic or "raw" change.

Calendar variation adjustments *per se* are an important aspect of seasonal adjustment even in the case of quarterly data. For example, differences of as much as 2 percentage points on a quarter-to-quarter change in industry and commodity components can occur between two aggregate production measures if one is calendar adjusted and the other not. The authors believe that some further attention could usefully be given to this problem and to the desirability of publishing basic raw data estimates sub-annually.

(*d*) *Real output measures for the non-commercial industries*

Commercial industries both sell their products and purchase their intermediate inputs in the market; thus the basic data from which current and constant price net output can be derived are either available or can be obtained, given the necessary resources. Non-commercial industries do not operate primarily for the purpose of making a gain. Examples are charitable organizations, public schools, hospitals, and most notably, public administration and defence. Some non-commercial establishments do charge the user for their services, but this charge usually falls short of covering expenses and may not be related to the specific service rendered in each case. Establishments classified to the public administration and defence industries do not operate for gain and are also included with the non-commercial group of industries. Non-commercial establishments usually have no transactions which uniquely define the cost to the user of the individual service being produced. They do, of course, have records of labour costs, some purchased goods and services, and some capital consumption allowances which permit the derivation of current dollar aggegates for national accounting purposes and industry of origin estimation. But any attempt to measure output in constant price terms founders on the lack of meaningful product detail because the output of these industries is not marketed. Even if the products were known it would still be necessary to derive an appropriate weighting pattern. Since output cannot be evaluated at present, it cannot be properly measured, and a primary cost (consisting of labour income and depreciation) convention has generally been used which necessarily has a limited meaning.

[17]Calendar variation includes not only working day adjustments but also shopping day, travel day and other known influences related to the calendar and economic behaviour. In general calendar variation can be said to have both irregular and seasonal components.

In Canada, the industry of origin real output measures for non-commercial industries follow the concepts laid down for the current dollar national income and expenditure series. In these, the contribution to gross domestic product of public administration and defence and most other non-commercial industries is measured by current and constant price salaries, wages and supplementary labour income. In a few cases such as public hospitals, labour costs are supplemented by depreciation charges. In the deflated final expenditure categories approach, these primary costs are supplemented by the deflated value of all purchased materials and services. In the industry of origin approach, the latter are not included since to do so would cause duplication, such inputs being measured as the products of other industries.

The procedure of measuring the real output of the public administration and defence and other non-commercial industries by deflated labour costs leaves much to be desired but seems preferable to presently available alternatives. However, the importance of developing useful output and efficiency measures for these industries is becoming increasingly recognized by governments and others, and it is also becoming increasingly important for purposes of international comparisons. In turn, this is leading to improved data on programme costing and eventually might well permit some breakthrough in output quantity measurement for these industries by providing the basic data necessary to approximate "activity" productivity in important portions of public administration and related industries.

(*e*) *Real output measures for the commercial service industries*

Historically the problems of measuring service industry production have been relatively neglected. A major reason for neglect has been the difficulty encountered in defining and measuring services. It has always been easier to understand (and thus measure) the output of goods, simply because they are tangible.

What has been accomplished to date in the measurement of service industry output cannot be described as ideal, although it does help to gauge the requirements of an adequate data system. Output measures for the goods-producing industries have generally been prepared in an atmosphere of relative understanding. This has not been the case with the service industries.

Before a really adequate data base can be developed for the service industries, it is necessary to understand clearly what should be measured, how it can be measured and, what is perhaps even more significant, the importance of measuring it. In Canada, for example, the major portion of the labour force is now engaged in the services-producing industries (57 per cent in 1966). Indeed in recent years the increases in the labour force have mainly taken place in the service industries, with the labour force in some goods-producing industries, such as agriculture and forestry, actually declining.

When the creation of market value is synonymous with an act of physical transformation, and value data for both output and input can be factored into quantity and price components, the measurement of constant price value added is greatly simplified. However, the lack of such data in certain durable goods industries is just as serious an obstacle to measurement as it is in the great majority of

service industries, despite the fact the physical transformation is clearly evident in the one case and not in the other. The primary problem is thus one of recognizing the identity of measurement requirements throughout the whole industry of origin system.

Notwithstanding these difficulties, it has been possible to prepare real output measures on a basis roughly equivalent in quality to those in the goods-producing industries for about one-third of the service-producing industries, concentrated for the most part in trade and transportation. Another third have serious data problems but these could be overcome without great difficulty by initiating statistical surveys designed to fill gaps and clarify ambiguities. The remaining commercial service industries, such as insurance, financial intermediaries and business services, pose a much greater challenge from a conceptual point of view.

(*f*) *Own account versus public or contract carrier transportation*

The general Canadian and international practice of excluding transportation charges made by common or contract carriers for outward freight in census of industry establishment data while including own account transportation costs gives rise to a number of problems in the measurement of industry real net output. Present instructions to report products delivered by the producing establishment's own transportation facilities inclusive of such delivery costs while excluding payments made to common or contract carriers results in confusion concerning value and price boundaries. It should be recognized that the exclusion of outward common or contract carrier freight charges from revenue and the failure to report these as service inputs means that an unknown amount of bias is introduced into the deflated net output of the producing establishment. The product of an establishment that is shipped via contract carrier, and for which the charges are met by the producing establishment, would show up on the purchasing establishment's books at the delivered cost (as it should). In current dollar terms the common or contract carrier transportation charges met by the establishment producing the product for delivery and the delivery (charge) revenue that it receives from the purchasing establishment may or may not cancel depending on company policy, competition, etc. There is certainly no reason to believe that these transportation flows will always cancel. Even where they do cancel in current dollars, expression of the product value flows using present census data expressed in constant prices will almost certainly result in some non-cancelling effects.

(*g*) *Intermediate service inputs*

A major data gap still exists in Canada in regard to purchased services in most industries. Again it appears to be more a matter of tradition in the censuses of industry and many other annual or periodic censuses and surveys which have either concentrated on deriving a census value added concept, i.e., shipments or sales adjusted for inventory change less materials, fuel and electricity used, or have otherwise failed to obtain adequate detail or coverage. It has thus been impossible to carry the double deflation approach to the point of deriving annual real domestic product estimates for these industries.

A major deterrent has existed to the collection of service input data related to multi-establishment companies. It was not clear whether component establishments of multi-establishment companies could report all service inputs, the problem being that many services are paid for by the company on behalf of its establishments and therefore cannot be meaningfully allocated or reported on an establishment basis. However, an experiment in collecting intermediate service inputs for Canada was undertaken in conjunction with the work on the 1961 input-output table. Questionnaires were sent to a representative panel of company head offices (covering largely manufacturing, mining, construction, and to some extent trade) requesting them to provide the required information for each of the constituent establishments of the company. It was found that at least one-half of the returns were completed on an establishment basis, the remainder consisting of pure company or partial company and partial establishment returns. This problem is being given considerable attention in D.B.S., both in regard to the possibilities of collecting further detail and to an extension to other industry areas. It now seems likely that at least periodic surveys of service costs will be undertaken for purposes of future input-output tables. Even this will go a long way toward purifying the double deflation derived industry measures of any trend biases caused by changing gross output/intermediate service input relationships.

(*h*) *Company-establishment reconciliation*

Greatly facilitating the filling of data gaps in the area of service inputs and output of the establishment-derived industry real output measures will be a current D.B.S. project to reconcile company and establishment reporting.

In the process of preparing both an input-output table and a new set of base year industry weights for the real domestic product indexes for the year 1961, considerable attention has been given to methods of estimating establishment gross operating surplus from multi-establishment company returns. With the adoption of a total activity establishment concept for industry censuses and the gradual extension of these censuses to such industry areas as construction, merchandising and services, such a task should become easier in the future. Of course, insofar as establishment gross output and intermediate input boundaries are arbitrarily drawn up by the company to which they belong, the allocation of company operating surplus to its establishments will run into trouble. However, a systematic company-establishment reconciliation should help to clarify these difficulties with the establishment as a reporting unit, so that, in time, they can be reduced.

One of the major problems encountered in the breakdown of multi-establishment company data has been the lack of complete coverage of the affected component establishments in D.B.S. industry surveys. Other problems encountered, particularly in the early stage of this work, included some confusion in establishment valuation boundaries between industries such as manufacturing and merchandising and, occasionally, actual duplication of establishments. Such problems largely have been eliminated, however, through such administrative devices as a central list of establishments and integrated company-establishment files. A considerable amount of attention is now being given to the preparation of

matched company-establishment records which in turn should permit the eventual derivation of integrated and matched value-volume-price data for gross domestic product by industry of origin on an annual basis. The attainment of this goal may take a number of years, but there is general agreement that it should be pursued as rapidly as resources permit.

(*i*) *The construction industry*

Some major industry divisions or sectors are still completely or mainly on an activity basis. The most important of these is construction. Construction is, of course, a most difficult industry to survey, as evidenced by the fact that most countries do not have proper censuses of their construction industries. Some of these survey problems may be the result of attempting to measure the construction industry as a whole rather than breaking it down into a substantial number of relatively homogeneous sub-industries as in other major industry divisions. The identification of establishments for this industry and a clear distinction between activity or commodity surveys and industry surveys might also help to overcome some of the present problems. Commodity-type statistics can be derived by summing gross output data relating to construction as a primary and secondary activity from the entire spectrum of establishment-based industry surveys. There does not appear to be any reason for treating the construction industry differently from manufacturing and distribution. For certain analytical purposes it may be useful to consider construction as an activity, thus deleting from the gross output of industries affected, own-account construction. However, within an establishment concept the disaggregation of most inputs in respect to own-account construction presents intractable problems.

What must be accepted here, as indeed for all other industries if studies of structure, value added, growth, productivity, etc., are to be developed, is the principle of using reporting units of the establishment type. Activity-based statistics for construction that incorporate "own account" construction by non-construction reporting units can never yield these measures because it is generally impossible properly to match related output and input elements. The traditional approach to census value added as a measure of gross domestic product is less satisfactory in the case of the construction industry because of the wide prevalence of sub-contracting and use of services.

The use of physical measures to project real output in the construction industries should be avoided because of the difficulty of assessing quality change in construction industry products. A better approach to quantity measurement may be through value deflation using specially constructed price indexes. Ideally such prices should be based on construction products or projects but this is difficult to accomplish because of their complexity and uniqueness. A compromise approach based on pricing product or project components such as heating and air conditioning, landscaping, electrical, plumbing, steel or masonry sub-contracting may be worthwhile exploring. Of course such an approach to the construction industries would not be as useful in a final expenditure category approach where other than pure construction costs might be large, as for example architect and design fees, legal costs, land assembly, etc.

(j) Deflation problems

Probably the most significant area of recent statistical advance in Canada relevant to industry of origin real output measures is the development of industry selling price indexes[18] and matching of value and price boundaries for establishments. Progress in these areas will have significant and direct effects on the quality of the industry real output measures, with the initial impact concentrated for the most part in the area of manufacturing industries, followed by the distribution and transportation industries. The development of price indexes for construction, which is covered in another portion of this paper, represents a particularly difficult area as do heavy durables and a broad range of service industries.

The use of the presently available industry selling price indexes is not without its problems, even in manufacturing where development to date has been largely concentrated. However, studies and revisions now in progress or planned will eliminate many of these. For example, the weighting system used for the industry selling price indexes has thus far been derived from the annual industry establishment totals for commodity shipments and does not necessarily permit the regrouping of component commodity relatives on an establishment weight basis. Some expanded commodity detail and an integrated establishment-commodity weighting system would facilitate annual commodity value deflation and monthly establishment shipment value deflation, —thus providing the best of both annual and monthly deflation worlds. This type of improvement is planned for industry of origin purposes and will be made as soon as resources permit. There are also certain conceptual inconsistencies between the published industry selling price indexes and the value data of the census of manufactures. For instance, in recognition of other important uses, the price quotations on which the indexes are based refer to new orders rather than to shipments. Apart from the particular effects in those industries where there is a characteristic lag between the receipt of an order and its shipment, there may also be a general effect which varies in a cyclical fashion according to the degree of pressure on productive resources. Furthermore, the annual industry selling price indexes are unweighted arithmetic averages of monthly data, so that their use for the deflation of annual value totals would distort the resultant output measure in a situation where there were seasonal patterns in sales and the related transactions prices. It is also the case that census of manufactures returns are occasionally based on the fiscal year of the reporting entities whereas the annual price indexes are on a calendar year basis. Problems of this type are, however, generally amenable to testing for their incidence and importance and can generally be dealt with by adjustments and recompilations of either the basic pricing data or the value data.

The new "total activity" establishment concept requires that each establishment be coded to only one industry, that its survey return should cover all its activities and that its shipments be valued "f.o.b. establishment." A problem of consistency now exists between the current dollar shipments data of the census of manufactures and the presently published corresponding industry selling price indexes. For a given industry, the former now reflects a particular "marketing mix" which can change from year to year as a result of organizational changes

[18]See D.B.S. Occasional Paper No. 62–515, *Industry Selling Price Indexes, 1956–1959*, Queen's Printer, Ottawa, 1961, for the initial stage of this development.

within component establishments, and thus cannot be related to the present price indexes which are based on a uniform "f.o.b. plant" valuation covering manufacturing activity only. The forthcoming revisions to the industry selling price indexes for manufacturing, in which a 1961 weight and reference base will be adopted, are, however, also designed to reflect the new establishment concept by adjusting pricing boundaries to the corresponding valuation practices.

When average unit values are used as deflators (alternatively stated as base year value projectors using physical units) problems originating with product quality change such as new varieties, vertical integration from fabrication to distribution, changed materials or other technical innovations affecting product components, longevity or usefulness, etc., tend to be glossed over and improperly reflected. This is so because it is impossible to collect physical data for all the varieties, market boundaries, sales conditions, and so on, that affect values and average unit prices. The specified price data on the other hand permit the capture of most quality (quantity) changes with a minimum of sample detail by using a convention. This convention seeks to measure quality change between two product varieties by a comparison of the direct current period quantities of both labour and material inputs of the new model with that of the old under the same price and technological conditions.[19] This approach has some obvious shortcomings. The implied assumption about the parallel movement of other costs (including profits) in this comparison may introduce some unknown element of bias and should also be taken into account. This, of course, is very difficult to do on an operational basis. However, to the extent that the industry selling price indexes reflect the proper adjustments, their use as deflators of value data at appropriate levels of detail will yield quantity measures which also reflect quality change. In spite of the obvious limitations, this approach is clearly preferable to average unit value deflation which completely fails to solve the problem.

The Expenditure Approach

Present Approaches and Practices

Gross national product at market prices is at the present time the concept central to the Canadian income and expenditure accounts. Subsidiary concepts employed are gross domestic product at market prices and gross domestic product at factor cost. The expenditure approach is designed to provide constant price estimates of GNP at market prices while the industry of origin approach provides an index of constant price GDP at factor cost. At the present time both estimates are published annually and quarterly. Their year-to-year movements, generally speaking, diverge only slightly, but quarter-to-quarter differences show a wider variation. A considerable amount of work has been done on reconciling the two estimates to the same conceptual basis, but much work remains to be done before any formal publication of reconciled estimates can be considered.

The expenditure approach to constant price estimates basically follows a deflation procedure. That is to say that current period values are deflated at a

[19]The mechanics of this convention are explained in *Industry Selling Price Indexes, 1956–1959*, D.B.S. Catalogue No. 62–515, Queen's Printer, Ottawa, 1961.

fine level of detail with price indexes. Quantity extrapolators are used only in a limited number of cases, most of these being in the categories of government expenditure, change in farm inventories and inventories of grain in commercial channels.

Deflation of the various components of the expenditure accounts at a fine level of detail results in an approximation to both the desired Paasche price index and to the Laspeyres quantity index.

A description of the deflation procedures used in the Canadian expenditure estimates is contained in the Dominion Bureau of Statistics publication, "National Accounts, Income and Expenditure, 1926–1956."[20] The Canadian accounts are currently being revised in order to include data such as those obtained from the 1961 Census of Merchandising and Services, as well as to improve such areas as the sector accounts. A description of the revised constant price estimates will be included in a forthcoming publication which may be expected some time late in 1968.

Two important basic changes have occurred in the deflation of certain expenditure items following the publication of the 1926–1956 reference document. The first deals with prices of capital goods. The constant price series from 1956 incorporate data resulting from improved price indexes for highway construction,[21] and machinery and equipment. In the case of the latter an important start has been made at D.B.S. in the collection of final product price indexes suitable for the deflation of machinery and equipment expenditure by using industries.

Because of problems relating to commodity content and coverage, together with the difficult conceptual problems of pricing unique goods, D.B.S. has not as yet published these machinery and equipment indexes. However, with some supplementary information, they have been used to deflate capital outlays of using industries on machinery and equipment. Regardless of the aforementioned problems, it was decided that the industry using indexes were much superior to the former method used, an important part of which consisted of a labour and material price proxy to a price index for domestically produced, non-agricultural, non-vehicular equipment.

The second area in which some significant improvement has been made is in respect to the deflation of merchandise exports. At the outset, it should be noted that the improvements are regarded as interim measures and that further work needs to be undertaken by D.B.S. staffs familiar both with pricing problems and with problems relating to external trade in commodities.

The existing published price indexes for both exports and imports are on a 1948 time and weight base. Annual Paasche price indexes have been calculated on a 1948 as well as on a 1957 base, but these are deficient in two respects. First, they exclude items which were insignificant in terms of trading patterns in 1948, but have now become important. Second, they rely to a large extent on unit value price indexes. Unit value price indexes can change for many reasons other than "pure" price change, e.g., commodity mix and points of shipment.

[20]D.B.S. Catalogue number 13–502, Queen's Printer, Ottawa, 1958.

[21]*Price Indexes of Highway Construction in Canada*, D.B.S. Catalogue No. 62–520, Queen's Printer, Ottawa, 1962.

For these reasons, the merchandise export price index used in expenditure deflation was revised beginning in 1961. Many unit value indexes were dropped and specified price indexes were substituted.[22] Commodities that were not priced in the 1948 index were introduced in the 1961 up-dating. Deflation was carried out at a fine level of detail on a quarterly basis, both on a seasonally adjusted and unadjusted basis. Concurrently, a 1961 base-weighted price index was calculated.[23]

Special Pricing Problems

There are pricing problems both in the government and capital goods areas; however, there is a basic conceptual difference between the pricing of capital goods and the pricing of the output of government and private non-profit institutions that should be noted. In the case of capital goods the output is marketed,[24] and the transaction can be observed. Because so many capital goods are unique the problem in this area becomes one of pricing output, and due to these pricing problems, D.B.S. has in the past, with respect to construction, resorted to the use of so-called incomplete cost indexes of labour and materials unadjusted for changes in productivity and profit margins.

In the case of government and private non-profit institutions output is not marketed in the normal way. In current value terms output is equated with purchases, and the same procedure is applied to constant price estimates. Purchases of the services of labour are deflated with wage-rate proxies, with the assumption, similar to that used in capital goods pricing, that productivity has not changed. The role of government within most countries has been increasing in terms of the proportion of services it provides. For these reasons, as well as for purposes of international comparisons, serious consideration may need to be given to the desirability of adjusting, for the time being, constant price GNP series, using possible productivity ranges in respect to government, in order to demonstrate the effects of these adjustments on the aggregates. This should be accompanied by considerable research into output proxies, preferably on the basis of a purpose breakdown, as well as on a kind of economic activity breakdown, as outlined in the U.N. document E/CN.3/345.[25]

Returning to capital goods pricing, where the output is marketed, but where there are extremely difficult problems involved in disentangling "pure" price and quality change, it may be useful to give a summary of progress made in this area at D.B.S. together with proposals for future adjustments.

Mention has already been made of the system of machinery and equipment price indexes designed to deflate purchases of capital goods by using industries.

[22]It is recognized that prices in the domestic market may in some cases diverge from those for the same commodities destined for foreign markets. This is one of the reasons for regarding the up-dating of the export price index as an interim measure. The present merchandise export price index contains a few true export indexes, and thus may be regarded as a mixture.

[23]Because of rapidly shifting trade patterns, such as those that followed the Canadian-American Automotive Agreement, together with those that may follow the results of the Kennedy Round of tariff reductions, annual chaining of export and import price indexes should be seriously considered for purposes of price analysis.

[24]Other than own-account construction.

[25]*Proposals For Revising the SNA, 1952*, June, 1966.

Despite the aforementioned problems in connection with coverage, commodity content, and pricing adequacy, it is felt that these indexes represent a substantial step forward in the field of capital goods pricing. However, they still require a considerable amount of developmental work, both in the area of basic research into quality problems and coverage, and in the area of improved price sampling in regard to commodity content.

The improvement in the pricing for construction price indexes is being approached from two directions. The first and the most desirable approach is to attempt to price specific construction projects. In 1962, D.B.S. published both base and currently weighted indexes of highway construction,[26] based on bid prices for specific elements of projects let by provincial governments. In 1967, another occasional paper was published in the area of capital goods price indexes, "Price Indexes of Electric Utility Construction."[27] In connection with electric utilities, model pricing was attempted for certain non-standard custom-made commodities,[28] while bid prices from the highway price index were used for such components as excavation and crushed gravels. However, because of unique and intractable problems connected with the complex aggregations of commodities and services forming electric utility facilities, the basic approach used was one of inputs.

In the area of capital goods pricing it will probably be necessary in most cases to compromise between the theoretical ideal and that which is practically possible. The examples described above contain varying elements of compromise. It is the intention of D.B.S. to continue to pursue the pricing of capital goods on a project basis and it is thought that bridge, water and sewer construction will be amenable to this kind of analysis. It may also be possible to derive suitable estimates of price change by classifying selling prices of structures into homogeneous groups for which costs per square foot are calculated in successive years. This approach will be tested for housing, schools and some standardized types of stores and office buildings within the next few years. Also to be tested is the ability of tract-house builders, who build the same model of house for several successive years, to report selling prices for houses in a fashion similar to the way in which manufacturers report selling prices.

However, it cannot be too strongly emphasized that the pricing of unique goods requires the closest co-operation between the respondents and the statistical agency. In the case of the highway index close liaison was maintained with engineering staffs in the highway departments forwarding contract data. In the case of the electric utility construction indexes, utilities belonging to the Canadian Electrical Association, as well as manufacturers producing goods used in such construction, made unusually large contributions of specialists' time without which the project could not have been undertaken.

The second approach to construction goods pricing is much more aggregative, and should be regarded as an interim approach, designed to provide overall

[26] *Op. cit.*

[27] D.B.S. Catalogue Number 62-526, Queen's Printer, Ottawa, 1967. This report was prepared under the supervision of Mrs. C. M. Jones.

[28] It is recognized that model pricing may miss such discounts or markups that would take place during actual transactions.

corrections for certain biases pending the successful pricing of further construction type projects.

As has already been mentioned, the construction price indexes now used to deflate expenditure estimates are, with the exception of highway construction, based on incomplete cost indexes of wage rates and building material prices, unadjusted for changes in productivity and profit margins.

In the third annual review[29] of the Economic Council of Canada mention was made of investigations undertaken on behalf of the Council[30] that suggested that the upward bias in the implicit price indexes for construction, because of failure to introduce an adjustment for productivity change, could be in the order of 1.5 per cent a year. In the historical revision of the income and expenditure accounts, an attempt will be made to correct for changes in productivity, and possibly, for changes in gross profit margins. The time period for which these corrections will be made has not yet been determined.

The basic approach to the productivity adjustment will be that which was originally developed by the U.K. Board of Trade,[31] and which has been elaborated by Dacey.[32] In order to calculate unit labour costs, it is essential to be able to measure real gross output for a given commodity, or a grouping of similar commodities. Because of the pricing problems connected with unique goods, materials used, which are generally capable of being deflated, are taken as a first proxy to output of construction for each of the various types, such as housing, engineering (other than highways and portions of electric utilities) and non-residential building construction. Deflated materials used are therefore taken as a proxy to constant price construction put in place.[33] From these data are calculated productivity changes in order to convert wage rate data to unit labour cost indexes. (In the industry of origin approach, the value added by industries producing materials to be used by the construction industry should reflect changes resulting from increasing efficiency.)

The gross profit margin adjustment, if it is decided to include it, will be less well founded. In fact, the ratios should be related to capital stock. Lacking estimates of real capital stock for the construction industry, gross profits per unit of output are calculated, using once again the deflated materials proxy for output.

It is well recognized that aggregative adjustments for changes in productivity and profit margins such as those described above will produce results which will contain a degree of ambiguity. However, it can be argued somewhat forcefully that failure to account for changes in productivity and profit margins imparts a long-term upward bias and a degree of cyclical insensitivity to the present construction price indexes. Therefore, aggregative adjustments such as those described should be regarded as an improvement over the existing system of construction price indexes.

[29]Third Annual Review: *Price, Productivity and Employment*, Economic Council of Canada, November, 1966, page 85.

[30]These investigations received the fullest degree of co-operation and support from D.B.S.

[31]*Board of Trade Journal*, May, 1956.

[32]"A Price and Productivity Index for a Non-homogeneous Product," Douglas C. Dacey, *American Statistical Association Journal*, June, 1964.

[33]To the extent that increasing use is made of off-site prefabricated materials, the proxy output measure will be too high, as will be the correction for productivity.

Let us conclude by reiterating that the long-run solution to the problem lies in extensive research with specific projects such as that already undertaken in the fields of highway and electric utility construction.

Base-Weighted Price Indexes of Gross National Product

The implicit price index of GNP measures the market prices of all goods and services produced by Canadian residents. It is both comprehensive and unduplicated and thus is used as a measure of price change for the economy as a whole. It is recognized, however, that it suffers as a measure of price change for time series analysis inasmuch as the weights are current, and thus quarter-to-quarter or year-to-year changes in price may be affected not only by changes in price, but also by shifting expenditure patterns both within and between components. The distortions introduced by these weighting shifts become more significant as the degree of price dispersion increases. For example, if the price of wheat relative to the base period has declined, while the price of newsprint relative to the base period has increased, there can be a significant, but misleading, movement in the implicit price index for wheat and newsprint combined, if there are significant shifts in exports of wheat vis-à-vis exports of newsprint. An arithmetic example follows in which there is no change in the price of either wheat or newsprint as between periods T_n and T_{n+1}, but the implicit price index shows a decline of 14 per cent.

MILLIONS OF T_0 DOLLARS

		T_n	T_{n+1}	Per cent change T_n to T_{n+1}
Wheat	C[a]	$450	$900	+100.0
	P[b]	90	90	—
	K[c]	$500	$1,000	+100.0
Newsprint	C	$600	$300	− 50.0
	P	150	150	—
	K	$400	$200	− 50.0
Total	C	$1,050	$1,200	+ 14.3
	P (Implicit)	116.7	100.0	− 14.3
	K	$900	$1,200	+ 33.3

[a]Current Dollars.
[b]Price Index, $T_0 = 100$.
[c]Constant T_0 dollars.

It is interesting to note that, had the series been re-based to the year $T_n = 100$, the change in both current and constant prices would have been + 14 per cent. Thus dispersion in prices, relative to the base period, is an important indication that the constant price series of the current period are not being valued in terms of a price structure realistic to those values which the economy currently places on the various commodities and services that it produces. From this one would draw two conclusions. First, constant price series should be re-based whenever price dispersion becomes significant. Second, the constant price series should be produced in terms of a number of time periods, to each of which is applied a price structure appropriate to the market values for that particular time period.

Published in index number form these time periods can be shown on a single time basis if a linked Laspeyres type quantity index is published for each major group and sub-group as well as for total GNP. Shown in constant price form, adjusting entries will be necessary because the correctly linked major components will not necessarily sum to the aggregate which has also been correctly linked.

In order to disentangle the effect of weight shifts from that of price change in the implicit price indexes, a base-weighted price index of GNP has been calculated by D.B.S. on a quarterly basis, since 1954. This index has proved to be very useful analytically, both in terms of its isolation of the price change component and in terms of assessing the applicability of the base period price structure to the valuation of production in the current period. In fact, the existence of the Laspeyres GNP price index was partially responsible for re-basing the constant price expenditure series to the year 1957 in the year 1960. For various reasons this index cannot be published at the present time but our long-run intentions are to publish it and therefore we would agree with the following statement contained in the Economic Council's Third Annual Review:[34]

"It would obviously be desirable to move towards the construction of a price index for Gross National Product which would not be affected by changing expenditure patterns, and which would represent a measure of the pure price change in the Gross National Product:"

Reconciliation Between Constant Price Estimates of Gross Domestic Product at Factor Cost and Expenditure on Gross National Product at Market Prices

While recognizing that there are problems in obtaining so-called pure factor cost estimates of value added by industry of origin in constant prices, Canada has nevertheless decided to produce such estimates because factor cost weights are considered to be more rational for purposes of an industrial allocation of the factors of production as well as for measurements of productivity changes. Because market prices can, in most cases, be readily observed, market price estimates of final expenditure can be much more readily constructed than, for example, factor cost estimates of final expenditure. Furthermore, a market price weighting scheme is considered to be desirable in constructing a series of constant price estimates of expenditure on gross national product insofar as market prices can be taken as crude approximations to marginal utility.

Given that different constraints have resulted in two constant price estimates of production that are conceptually different, it was considered to be desirable to conduct a statistical reconciliation between the two estimates. Such a reconciliation was conducted on an annual basis for the years 1950 to 1959, and it is planned that an annual reconciliation will be made on a continuing basis once the 1961 input-output table is completed and the two constant price estimates are both on a 1961 time and weight base. The basic approach is to adjust constant price expenditure on gross national product at market prices first to a domestic concept and second to a factor cost concept.

Given present Canadian national accounting practices the conversion from a national to a domestic basis is a relatively simple matter. Payments and receipts

[34] *Op cit.*, page 84.

of interest and dividends to and from abroad, each of which has been explicitly deflated, are added to and deducted from gross national product to derive an estimate of expenditure on gross domestic product at market prices. In this instance it may be noted that, because deflation of non-commodity flows such as interest and dividends can yield ambiguous results, the exclusion of these constant price entries in data based on the domestic concept reduces the element of arbitrariness in the expenditure estimates.

The conversion from a market price to a factor cost method of valuation is a complex statistical operation that relies heavily on an input-output table that must be of the same year as the time and weight base for each of the constant price production estimates.

The procedure used is to derive constant price net indirect tax data separately for each of taxes on commodities flowing to final demand and for other indirect taxes.[35] These data are then deducted from constant price expenditure on gross domestic product at market prices to arrive at a factor cost estimate via the expenditure approach. For a given year, the concept of constant price indirect taxes used is the value of indirect taxes that would have been yielded had the components of this year's expenditure on gross domestic product been produced at the prices prevailing in the base year and had they been taxed at the base period tax rates.[36]

For the years 1950 to 1959[37] inclusive, Canadian 1949 constant price expenditure data (on a market price basis) were converted to a factor cost basis in order that they could be compared with the constant price estimates of gross domestic product at factor cost by industry of origin. The methods used are described in Appendix "D" of the D.B.S. publication, "Indexes of Real Domestic Product by Industry of Origin."[38]

The methodology will be summarized here only briefly. Estimates of personal expenditure for the Canadian expenditure accounts are, for the most part, based on retail trade data, while estimates of business spending on plant and equipment are based on surveys of capital spending of the using industries.

[35]In an input-output table sense, "direct-indirect" taxes are considered to be those taxes levied on goods and services after the final stage of physical production, i.e., taxes on commodities flowing to final demand. Other indirect taxes, sometimes called "indirect-indirect" taxes, are all those indirect taxes levied on commodities and services, as well as on physical assets, prior to the final stage of physical production.

[36]If it is necessary to deflate indirect taxes, the appropriate price index, where the taxes are *ad-valorem* rather than specific, is a combination of tax rates and price indexes appropriate to the taxed commodities. Taxes in the current period that were not in existence in the base period present a problem, in that the appropriate price index would seem to be infinity. On the other hand, where taxes were in existence in the base period, but have been dropped in the current period, the appropriate deflator to convert zero taxes in the current period to a positive constant price series is indeterminate. For these reasons, as well as others, even if a base-weighted price index of taxes were to be chained annually, there would be serious conceptual problems in its calculation.

[37]Following publication of the 1959 "National Accounts, Income and Expenditure" report, D.B.S. constant GNP expenditure estimates were converted to a 1957 time and weight base for the period from 1956. Because the technique used for the derivation of constant price indirect taxes required an input-output table of the same time and weight base as the constant price estimates, no further attempts at reconciliation could be made. However, reconciliations will again be attempted using the 1961 input-output table.

[38]*Op. cit.*

Government expenditures on goods and services are based on data contained in the various public accounts. As a result of the methodology used to obtain estimates of expenditure on GNP, detailed commodity flow estimates are virtually non-existent, in contrast to national accounting practices in many other countries. For these reasons, "reverse" commodity flow estimates were made at a fairly fine level of detail for all the components of expenditure on GNP. The starting point for each of the many commodity flow estimates was the retail value of constant price expenditures on a given commodity, whether domestically produced or imported. The direct import content was estimated using deflated external trade data. Work sheets underlying the 1949 input-output table yielded ratios for measuring separately, and for each commodity, import duties on direct imports, other net indirect taxes on commodities, and trade and transportation margins, all expressed in constant prices.[39]

The deductions from final expenditure data of direct imports, together with transport and trade margins, and net indirect taxes, yielded estimates on a commodity basis of "total industry gross output" flowing to final demand, valued at producers' prices. The base period input-output table ratios were again used to allocate each of these commodity values to their industry of origin. With each of the various commodity series so allocated it was then possible, by summing over industries, to obtain for a given year the value of total "gross output" by industry of origin flowing to final demand. Ratios obtained from an inversion of the input-output table were then applied to each year's constant price gross output mix by industry in order to estimate net indirect taxes levied before the final stage of physical production.[40] These net indirect-indirect taxes, when summed with net commodity indirect taxes, yielded total constant price indirect taxes. This enabled the calculation of constant price expenditure on GDP at factor cost.

Measuring the Impact of Changes in Indirect Taxes on Changes in the Price Component of GNP

In its Third Annual Review[41] the Economic Council of Canada made reference to an area which it noted had not received a great deal of attention, and that was the extent to which indirect taxes have affected costs and prices. As discussed in the immediately preceding section the reconciliation study will produce the basic data for deriving constant price net indirect taxes. Through these procedures it is possible to derive, within a generally consistent system, information in both current and constant prices for each of gross domestic product at factor

[39]The use of the 1949 input-output table to provide constant price trade and transport margins implicitly assumed that there had been in aggregate no change in location of the population vis-à-vis the producers as between the base period and the current period. If automobiles were produced in eastern Canada in both the base period and the current period and if there was a shift in population from eastern to western Canada as between the base period and the current period, the constant price transport margins obtained using a base period input-output table would be understated and the value of the automobiles at constant price producers' prices would be overstated. (The original final expenditure data, being based on retail trade estimates, would presumably reflect the increase in transportation resulting from the population shift.)

[40]The use of the base period input-output table implies the application of taxes that would be generated under conditions of base period technology.

[41]*Op. cit.*, page 103.

cost and at market prices, together with net indirect taxes in both current and constant prices. These measures will yield currently weighted price indexes which can be compared one with the other in order to determine factors such as the price component of indirect taxes, together with the impact of such tax changes on the change in aggregate market prices.

In view of the Canadian tax structure such studies are of considerable importance. For example, in the year 1966, indirect taxes less subsidies constituted 13½ per cent of GNP as compared with 8½ per cent in the United States and 12½ per cent in the United Kingdom.[42]

The question of the incidence of so-called indirect taxes, or for that matter of such so-called direct taxes as personal and corporate income taxes, presents serious problems. It is probably a fair statement to say that problems such as these cannot be disentangled within the framework of a macro-economic system such as the national accounts. Two further statements could be made. First, market prices for individual commodities by and large represent prices as determined in the market by specific demand and supply conditions, by demand and supply conditions pertaining to related or substitutive commodities, and finally by conditions of aggregate demand and supply. The imposition of indirect taxes together with the payments of subsidies will doubtless cause shifts in production functions and in demand curves for individual commodities, on a micro basis, and these shifts will affect and be reflected in aggregate demand and supply functions. They will play a part in determining such factors as resource allocation. They will also affect aggregate demand within an area such as consumer expenditure, as well as competing demands for gross available supply such as the personal, the business and the government sectors. In summary, market prices for given commodities, for final outlays by various sectors of the economy, and for total GNP reflect the market valuation placed on production, given, as one of many important factors, a certain tax structure.

When all net indirect taxes are deducted from GNP at market prices there is no implication to the effect that the entire incidence of these taxes has been on final purchasers. The resulting factor cost estimates are simply a residual representing those gross[43] payments to the various factors of production which result from the inter-action of many economic factors *including* the tax structure.

Let us return to the question of measuring the impact of changes in indirect taxes on the general level of prices. The methodology followed in Canada has been outlined. As between the years 1950 and 1959 a comparison of the implicit prices obtained by comparing current and constant price data for expenditure on gross domestic product at market prices and at factor cost indicated that the impact of net taxes was negligible. The implicit price index on a market price basis rose by 36.0 per cent, while the implicit price index on a factor cost basis rose by 35.8 per cent.

Since the year 1959 the difference would probably be more pronounced inasmuch as since that period, certain important Canadian provinces have entered the sales tax field, property tax rates have changed and there have been rate and coverage changes in federal sales taxes.

[42]Data for the U.K. are for the year 1965.

[43]In the sense that the operating surplus is inclusive of capital consumption allowances.

Another approach to the measurement of the impact of changes in indirect taxes on the general level of market prices may be described as follows. Each of the various components of GNP such as labour income, corporate profits, and net indirect taxes, are, in their current price terms, compared with GNP in constant prices for any given year. (In each year the ratios so obtained for each of the various factor payments, plus indirect taxes, plus capital consumption allowances, will add to the implicit price index for GNP for that particular year.)[44] A comparison as between years, say 1960 and 1965, can then be made for each of the ratios so calculated, and various price implications can be inferred from the comparison. For example, between the years 1960 and 1965 the ratio of indirect taxes to real GNP increased by over 4 per cent per annum while the overall GNP deflator increased by 1.9 per cent. The inference would be that increases in indirect taxes had had a significant effect on the increase in aggregate prices.

Such conclusions are only valid to the extent that the following assumption holds. The assumption implicit in the use of ratios per unit of constant price output when such ratios are used for price analysis is as follows. It is assumed that the constant price equivalent to each of such factor payments as labour income, corporate profits, as well as indirect taxes, moves in a manner identical to that of constant price GNP. This may be an unreliable assumption, and price inferences drawn from ratios that have been so calculated may also be unreliable.

Certain Problems Inherent in the Deflation of Indirect Taxes and Subsidies

Mention should be made of some further and serious conceptual problems in developing directly constant price data for indirect taxes and subsidies. Footnote (36) discussed the pricing problem relating to taxes that are in existence in the current period but were not in existence in the base period, as well as the converse problem of taxes that were in existence in the base period but not in the current period. These are relatively simple problems—relating to *ad-valorem* taxes on commodities. More serious problems relate to areas such as property taxes. The working solution to this problem in Canada, as well as to the problem of customs duties on imports *not* flowing to final demand, is the application of ratios obtained from an inversion of the base period input-output table to derived industry estimates of "gross output" flowing to final demand. Essentially this applies base period technological relationships relating both to taxes on capital goods as well as to indirect-indirect import duties in the base period.

The solution to a problem such as property taxes might seem to be in the area of base period property tax rates times current period capital stock constant price estimates. But there are problems in determining property tax rates as well as problems in developing good capital stock estimates by industry. Further, certain ambiguities would still remain in the resulting estimates.

[44]The various factor payments, plus capital consumption allowances plus indirect taxes add to current price GNP. Total current price GNP divided by total constant price GNP will yield the implicit price index for GNP. It follows that when the same denominator, i.e., constant dollar GNP, is applied to all of the various current price numerators which in themselves sum to current price GNP, the sum of the individual ratios so obtained of necessity have to sum to the overall GNP implicit price index.

Certain subsidies pose problems in obtaining constant price estimates. Generally these are subsidies that cannot be associated directly with commodities, an example of which would be a subsidy paid to a railroad properly classified to the business sector, the purpose of which was to maintain freight rates at a lower level than they otherwise would be. The solution to this problem may lie in a crystal ball.

In the following section some consideration will be given to the desirability of using base-period technology assumptions where taxes are levied on goods which do not flow to final demand, but are inputs into another industry.

Certain of the Problems Involved in Obtaining a Balancing System in Real Terms

In the publication by Richard Stone,[45] reference is made on pages 24 and 25 to the argument that, where the relationship of indirect taxes and subsidies to price is very different for different commodities unit costs should be restricted to those which compose the gross remuneration to the factors of production. "This can be done if the market price for each commodity is adjusted by the subtraction of *accumulated* indirect taxes, and the addition of *accumulated* subsidies per unit of that commodity." (The stressing of the words "accumulated" was done by the authors.)

The authors are indebted to Mr. G. Jaszi of the Office of Business Economics in the United States who, in an internal note directed to the U.N. Statistical Office, indicated certain of the problems involved in obtaining a balancing set of accounts if one wished to obtain industry data on a true factor cost basis.[46] These problems are essentially those outlined in the above-mentioned publication by Richard Stone.

In Mr. Jaszi's basic example a two-industry economy was envisaged in which the entire output of the coal industry was used by the electricity industry which, in its turn, sold all of its output to the final consumer. As between time periods "0" and "1" a technological regress occurred such that twice as much coal was required to produce the same amount of electricity. Thus the ouput of the coal industry doubled, as did the material inputs into the electricity industry. However, the output of the single final product of this two-industry economy remained unchanged as between the two time periods.

The problem that arises in the constant price estimates is basically attributable to the fact that, in the base period, an indirect tax was levied on an *intermediate* product. In this example it was on the output of the coal industry. Given that there was an indirect tax levied on the intermediate product, and given that a technological change occurred between two time periods, problems arose in attempting to value gross domestic product in constant prices.

Estimates of GDP at market prices, whether arrived at by the final expenditure approach or by the double deflation by industry of origin procedure, yielded identical results, showing no change between the two time periods. If accumulated indirect taxes in the Stone sense, that is the indirect tax content in

[45] *Quantity and Price Indexes in the National Accounts*, Richard Stone, OECD, Paris, 1956.

[46] Mr. Jaszi has given his permission to the authors to use the internal note mentioned above.

respect of coal inputs as embodied in the electricity industry's gross outputs, are removed, GDP at factor cost also shows no change. (In this sense those accumulated indirect taxes that are removed are based on base period technology.)

The Canadian double deflation approach to obtaining factor cost estimates, that is the deduction from deflated industry gross output (exclusive of taxes levied on the products of the industry's output) of deflated materials used, etc., valued at purchasers' prices, yields a decline in real GDP at factor cost. Similarly, if current period technology is applied in order to extract accumulated indirect taxes from the output of the electricity industry, the decline in GDP at factor cost is identical to that obtained by the normal double deflation approach. Finally, if current period technology is used to evaluate the gross output of the coal industry at market prices, in terms of accumulated tax content, the market price estimates of GDP will show an increase.

From this one could conclude that only the use of base period technology, in respect to the removal of "indirect-indirect" taxes from industry gross outputs and intermediate inputs will yield a balancing system of accounts in real terms, measured on a factor cost basis. A further conclusion could be that such constant price estimates of "indirect-indirect" taxes may yield somewhat paradoxical results.

Mr. Jaszi's example, elaborated on to some extent, follows:

	t_0 (current dollars)	t_1 (current dollars)	t_1 (constant t_0 dollars)
COAL INDUSTRY			
1. Gross output (excluding tax)	50	100	100
2. Non-factor inputs	—	—	—
3. Tax on coal	50	—	100
Constant Price Net Value Added			
4. Factor cost	50	100	100
5. Market Price	100	100	200
ELECTRICITY INDUSTRY			
6. Gross output (excluding coal tax)[a]	250	300	250[a] 200[b]
7. Gross output (including coal tax)[c]	300	300	300
8. Non-factor inputs (excluding coal tax)	50	100	100
9. Non-factor inputs (including coal tax)	100	100	200
Constant Price Net Value Added			
10. (6[a]–8) Factor cost[a]	200		150
11. (6[b]–8) Factor cost[b]	200		100
12. (7–9) Factor cost[c] [d]	200		100
13. (7–9) Market price	200		100
CONSTANT PRICE GROSS DOMESTIC PRODUCT			
Final Expenditure Approach			
14. (7) Market prices	300		300
Industry Approach			
15. (5+13) Market prices	300		300
16. (4+10) Factor cost[a]	250		250
17. (4+11) Factor cost[b]	250		200
18. (4+12) Factor cost[c] [d]	250		200

[a]Excludes accumulated indirect taxes in terms of base period technology. The base period valuation of output exclusive of accumulated taxes was $250. Inasmuch as the gross output of

In the main the taxes which present the problem in obtaining factor cost estimates of output which will balance with those obtained by either market price double deflation methods or deflation of final product are those levied on products prior to the final stage of physical production. In terms of the Canadian tax structure, such taxes, generally speaking, are limited to customs import duties on goods not flowing directly to final demand and property taxes.

There has been a considerable amount of internal discussion at D.B.S. in regard to what properly constitutes an indirect tax. Some points of view would favour classifying as direct taxes all taxes which were levied prior to the final stage of physical production, while other points of view would hold to the present classification of indirect taxes. However, this paper is not the proper vehicle in which to elaborate or consider these discussions in depth.

Given the existing international definitions as to what constitutes an indirect tax, some research at D.B.S. is indicated following the production of the 1961 input-output table.

First it should be borne in mind that input-output table base period weights by industry yield a true factor cost base period weighting system for estimates of GDP by industry of origin. Second, the double deflation techniques may be subject to some distortion because the quantity changes in such "indirect-indirect" taxes as customs import duties, and real property taxes are not consistently removed from both outputs and inputs in the sense that Stone meant when he referred to the subtraction of accumulated indirect taxes. In fact, property taxes are at the moment left in real GDP projectors, although their content in inputs may not correspond with their content in output, again in the Stone sense, in those cases where materials used have a property tax component.

However, the industries where such property tax effects are important may not be large in terms of numbers of industries. (For example, the bulk of real property taxes is confined to the finance, insurance and real estate industry.)

The basic issue seems to be the requirements for purposes of both aggregative and individual industry productivity measures. If industry GDP measures are

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electricity remained unchanged as between the periods t_0 and t_1, constant price output of electricity, less accumulated indirect taxes, therefore also would remain unchanged.

[b]Constant price indirect taxes for the coal industry were $50 in period t_0. It would seem reasonable to regard constant price indirect taxes on coal, *per se*, as $100 in period t_1. The constant price gross output of electricity, footnoted as (2), therefore excludes $100 worth of indirect taxes on coal. One could push this argument one step further, arguing that current period technology should apply to the output of the electricity industry including accumulated coal taxes. In this case, valuation in terms of market prices for the electricity industry as shown in line 7 would be $350 in time period 1, and a further divergence as between market prices and factor costs would emerge. From these varying results it would seem to follow that only the use of base period technological relations, in respect to the accumulated indirect tax content of gross output and to the accumulated indirect tax content of intermediate inputs themselves will yield a balancing system in real terms.

[c]There is no tax on the product of the electricity industry. These data may therefore be viewed as market price data for the electricity industry, as well as factor cost data for the electricity industry in the sense described below, under footnote [d].

[d]Traditional double deflation approach results: deflated gross outputs excluding any taxes levied on the output of the industry minus deflated non-factor inputs valued at purchasers' prices.

calculated on a market price basis in many countries the bulk of commodity taxes would have to be shown in the retail trade industry. (In Canada, this at present would not be the case with the federal manufacturers sales tax on commodities flowing to final demand. However, if the recommendations of the Royal Commission on Taxation[47] are implemented the federal sales tax would be applied at the retail trade level rather than at the manufacturer's level.) The inclusion of such taxes in the retail trade industry could produce significant changes in aggregate productivity calculations. For example, GDP for the retail trade industry would be significantly higher in constant prices. A simple shift in the proportion of the labour force employed in retail trade vis-à-vis all other industries might result in an increase in productivity for the economy as a whole. In summary, GDP estimates by industry of origin valued at market prices may distort both individual industry and aggregate productivity measurements.

Research is needed in order to assess, first, the magnitude of the distortion introduced into GDP estimates at factor cost which result from failure to remove accumulated net indirect taxes in the various projectors, and second, the distortions that would be produced in productivity measures should the industry GDP estimates be calculated on a market price basis.

Some Other Requirements for a Balancing System of Accounts in Real Terms

There has been a lengthy discussion of the way in which two measures of real production based on slightly different concepts can be reconciled. That is to say, estimates of expenditure on GNP at market prices can be converted to estimates of expenditure on GDP at factor cost in order that these estimates may be directly compared with estimates of GDP at factor cost by industry of orgin. It should also be noted that when there is a direct correspondence between industry of origin estimates and expenditure estimates for specific entries such as the labour content of the public administration and defence industry, identical treatment should be followed in both approaches to the measurement of constant price GDP.

There remain other problems relating to the requirements for a balancing system of accounts in real terms, some of which are conceptual in their nature while others are concerned with statistical integration. In conclusion we would like to mention two problem areas.

As has already been noted, constant price estimates of GDP by industry of origin are going to rely more heavily on deflation of censuses of industry and other value data with industry specified price indexes. The expenditure approach has always relied extensively on the deflation approach. From this it would follow that price data, for commodities at wholesale, at retail, aggregated by industry, and by final demand sectors such as personal, government, etc., should be constructed within a conceptually integrated framework. However, this should not be taken to mean that integration requirements should supersede all other requirements. For example, a balancing system of accounts would presumably call for both industry outputs and non-factor inputs to be valued in terms of

[47] *Report of the Royal Commission on Taxation, 1966,* Queen's Printer, Ottawa.

producers' prices.[48] However, in some instances, better actual transaction prices on materials used may be obtained from purchasers rather than from producers.[49] The requirement for an integrated and balancing system of accounts in real terms should not be monolithically applied, if it means that its application will result in a deterioration in the quality of price data (and a resulting deterioration in the quality of the constant price data).

Another interesting aspect relating to the problems of a balancing system of accounts in real terms concerns the treatment of quality change. The first point to be made is that adjustments for quality change for a given commodity should be handled in a similar way throughout the pricing system. The statement of this principle may sound simple but its application may prove complex basically because of transport, trade and other service margins between the manufacturer of a product and the price of the product at retail.

Given that we have a product "A" on the market in time period "0", a variant of the product "A" called "A_1," which together with "A" is on the market at the same time in time period "1," and finally product "A_1" which is the only product marketed in time period "2." We thus have the required period of overlap, both at the level of the retailer and the manufacturer, to enable us to make an adjustment for quality change.[50] Suppose further that in time period "1," the period of overlap, the difference in price between "A_1" and "A" at the manufacturer's level is $200, while at the retailer's level it is $250. The problem is essentially this: should the level of $200 be used to evaluate quality change at the retail level as well as the manufacturers' level, and should any mark-up on the so-called "quality" change at retail be treated as price or as quantity change?

Manufacturer	t_0	t_1	t_2
A	$2,000	$2,000	
A_1		$2,200	$2,200
Price index	100	100	100
Retailer			
A	$2,500	$2,500	
A_1		$2,750	$2,750
Price index	100	100	100

The price indexes shown in the above arithmetic example represent what is believed to be the traditional pricing approach in a situation such as this.

[48]There are certain important implications that follow from these requirements in regard to final expenditure data. It can be argued that adjustments for changes in transportation between the producer and the *final* consumer should be explicitly made to the final expenditure data in those cases where the consumer remains fixed in place and the producer moves. It also can be argued that in cases such as these the retail trade industry should be adjusted and the final expenditure data left unchanged. That is to say that any change in transportation charges resulting only from the movement of the producer should be treated, at retail, as a price change.

[49]*Government Price Statistics*, Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee of the Congress of the United States, Eighty-ninth Congress, Second Session, May 24, 25, and 26, 1966; page 59.

[50]Assuming that the overlapping difference between A and A_1 represents and continues to represent the quality valuation placed on the two products by the final consumer.

On the one hand it may be argued that the $250 difference in time period "1" at the retail level is a measure of the increase in utility as evaluated by the market at that period of time. On the other hand it may be argued that if the "quality" difference is related to some factor such as operating efficiency, no additional services are added at retail to "A_1," as compared with "A," and the $50 difference should therefore be treated as a price increase at the retail level.