11 New Goods from the Perspective of Price Index Making in Canada and Japan

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11.1 Introduction

This paper takes a fresh look at the treatment of new goods in official index number making. It is a paper about a project that changed directions as the research progressed. We set out to document the treatment of new goods in the price statistics of Canada and Japan. We saw this as an incremental effort, building on common knowledge concerning the construction of national price indexes. We also had a preconceived notion of what new goods are: goods that have come into being recently because of technological advances. One reason we were interested in the project is that productivity growth is measured at the national and regional levels using price indexes to control for price-related changes in the values of output and input goods. To the extent that price inflation is overestimated because of the failure to account for new goods appropriately in the construction of price statistics, the estimates of productivity growth will be downward biased. The extent of the bias could differ over time and among countries owing to differences in the treatment of new goods.

As the project progressed, we found that, on the whole, the new goods in the price indexes for Canada and Japan are not the sorts of goods we had had

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in mind. We came to recognize also that the nature and treatment of new goods in official statistics is bound up with specific aspects of the selection of the goods to be priced, and that these selection processes are less known and less documented than we had expected. Nor are they standardized for all of the price indexes of a given country. For this reason, we narrowed our investigation to the main producer price indexes for Canada and Japan. Our notions about the measurement of productivity growth and how this relates to the treatment of new goods in price statistics also changed.

We begin in section 11.2 with an overview of some of the different ways of defining new goods that have been suggested in the economics index number literature, by national statistical agencies, and by those interested in using price indexes to measure economic productivity. We go on to examine the operational treatment of new goods in the Canadian Industrial Product Price Index (sections 11.3–11.5) and the Japanese Domestic Wholesale Price Index (sections 11.6–11.8). There has been relatively little published about the price statistics of either Canada or Japan. Thus this descriptive material is important in its own right as well as in the context it provides for considering the treatment of new goods in national price statistics. Concluding remarks are presented in section 11.9.

11.2 Alternative Definitions and Treatments of New Goods in National Price Statistics

Economists have made ongoing representations to their national statistical agencies concerning the need for more rapid inclusion of new goods in official price statistics. New goods are a common topic as well in the reports of national statistical agencies. But is the term "new goods" being used in the same way in these different circles? It seems important to address this question before going on to examine operational aspects of the treatment of new goods in the producer price statistics of Canada and Japan.

What we see as alternative definitions of new goods used by economists and index makers are summarized in subsections 11.2.1 and 11.2.2. Subsections 11.2.3–11.2.5 deal with the conceptual relationships of new goods, evolving goods, and new and evolving processes for producing goods and services.

11.2.1 New Goods in the Economics Index Number Literature

Like several other economists who have written on this topic, Diewert sums up the new-goods problem as one of missing prices: "Obviously, the quantity of a 'new' good produced or consumed in the period before its introduction is zero. However, the economic theory of index numbers requires a price to go along with this zero quantity—what should this price be?" (1993a, 25). The suggested solutions that Diewert reviews provide further clarification of the underlying definition of a new good in much of the economics literature. One solution is to ignore a new good in the first pricing period in which it is introduced and to bring it into the market basket in the second period using the chain approach. Marshall (1887) is credited with suggesting this. A second approach involves imputing the missing price for a new good for the period prior to when it first appeared. To do this, a conceptual characterization of the missing price must be developed. Diewert sums up Hicks's (1940) characterization of the unobservable price of a new good before its introduction: "(i) from the viewpoint of a consumer or producer buying units of the 'new' good in the first period that it makes its appearance, the price in the previous period should be that price which would have been just high enough to have driven the purchaser's demand down to zero and (ii) from the viewpoint of the producer of the 'new' good, the price in the previous period should be that price which would have been just low enough to have induced the producer to supply zero units" (1993a, 25). In sketching out the stream of research that Hicks's insights inspired, Diewert (1993b, 62) notes that Hofsten (1952) used Hicks's approach, and adapted it for dealing with disappearing goods; Fisher and Shell (1972) laid out the formal algebra for the construction of Hicksian "demand reservation prices"; and Diewert (1980, 498–503) used the Fisher price index as a context for exploring the consequences of incorrectly setting the demand reservation prices to zero versus the alternative of ignoring the existence of new goods in the first period in which they are introduced (Marshall's method).

The imputed prices approach recommended by economists such as Hicks and Diewert implies the following *market behavior* definition of new goods:

DEFINITION 1. *A new good is a good that is available in the present period for which there was no demand in the previous period because potential customers believed it could not be supplied at any price they would be willing to pay and for which there was no supply because potential producers believed it could not be sold at any price for which they would be willing to produce the good.*

Marshall's suggested approach to the missing prices problem of ignoring new goods in the first period of their existence suggests a simpler definition of new goods based on *availability*:

DEFINITION 2. *A new good is a good that is available in the present period and that was not available in the previous period.*

Definition 2, which encompasses definition 1, would allow for goods that no one had thought of prior to their appearance, so that potential purchasers and suppliers had given no thought to their reservation prices.

However, both definitions 1 and 2 are incomplete without clarification of what is meant by a good being "available" and what a "good" is. For example, is a good available in the present period if producers could, or perhaps did, produce it and could, or would, sell it for a price consumers would pay, but consumers have not yet discovered this due to a lack of advertising? Is a good available if it could be purchased elsewhere and transported at a cost that local customers would pay, but no business is bringing it into the local market? Is a new model of an old good a new good?

11.2.2 A Traditional Index Maker's Definition of a New Good

Our research suggests that the *de facto operational definition* of a new good for many agencies producing official statistics is fundamentally simpler than definition 1 or even definition 2:

DEFINITION 3. *A new good is a good that is included (or being considered for inclusion) in an index number basket in the current period for this index but that was not included in previous periods, or a previously included good for which the pricing status has been, is going to be, or some feel should be, upgraded.*

Using definition 3, questions like those posed above must then be answered. In many situations, the "answers" are an outcome of case-by-case operational choices made by those responsible for the production of price indexes. Notice that definition 3 in some respects encompasses definitions 1 and 2.

11.2.3 Quality Change as a Source of New Goods

The treatment of quality change for successive varieties of a good is inextricably interrelated with the treatment of new goods even though, to most of us, new models of cars and new styles of clothes and shoes are not "new" goods. There are a number of established methods used by statistical agencies for relating new varieties of goods to ones they were previously pricing.

Direct comparison is used when the new variety is viewed as the same, in terms of quality, as the old one. The entire price difference is treated as a pure price increase or decrease. The other methods allow for changes in quality. If both the new good or variety and the old one were available in the same pricing period and if the price difference between them can be viewed as solely reflecting the quality difference, then relative prices for the goods at a point in time can be used in *linking* the price for the new good or variety to the price for the old one. A second method makes use of *cost evaluation* information for stated quality changes. Usually the cost information comes from the reports of manufacturers on the quality changes instituted in their products and the costs of making these changes. A third approach is to use available prices for different models of the good of interest and information about the characteristics of these models deemed to affect prices to estimate the values of the characteristics. In this *hedonic approach,* the estimates of characteristic values are then used to allow for quality differences in relating the price for a new model to the price for the old one.

All of the above approaches involve relating new varieties of goods to old goods. A different type of approach is to treat new varieties as distinct goods: in particular, as new goods. Triplett comments on this approach in the context of the old Wholesale Price Index (WPI) for the United States:

> A traditional method for handling the quality problem in index numbers has been to convert it into the (supposedly) more tractable product-mix problem: different varieties are treated as if they were different products and carried along in the index separately. In the WPI, for example, prices may be collected for several varieties of an item of machinery and separate components published for each of them. Then, when the quality of machines improves, it may be possible to allow for the change by shifting the weights attached to each of the separate subcomponents. (1971, 199)

The choices about when to quality-adjust, when to ignore changes in goods for pricing purposes, and when to treat changed goods as new goods are the operational reasons that the treatment of new goods is interrelated with the treatment of quality change in official price statistics.

New varieties of old goods that are treated as new goods may be new either in the sense of market behavior or availability, as in definitions 1 or 2, or in the operational sense of definition 3.

11.2.4 The New-Goods Problem in the Context of Hedonic Pricing

In the hedonic approach to pricing, sellers and buyers are viewed as transacting characteristics of goods. That is, goods are viewed as bundles of marketable characteristics. Theoretically at least, this approach makes it possible to deal with many more goods that are new in an operational sense—and perhaps in market or availability respects as well—as quality-adjusted varieties of goods that were already included in the index. Nevertheless, there are at least two ways in which a new-goods problem can arise in this context. The first is the appearance of goods with new characteristics. These characteristics could be new in a market or availability or in a de facto operational sense in the terms of definitions 1, 2, and 3, respectively. The second is the combination of old characteristics in a new way that cannot be represented using a hedonic equation estimated with data for the previously available goods and their characteristics.

The growing use of the hedonic approach to quality-adjust vehicles and electronic goods (but very little else), and the greater flexibility of this approach compared to the more traditional ones for dealing with quality change, have been further blurring the boundary between how quality change and new goods are dealt with. This complicates price comparisons over time within individual countries and among countries.

11.2.5 New Ways of Producing Goods and Services

Remarks in the preface of Robert Gordon's 1990 book, *The Measurement of Durable Goods Prices,* suggest yet another possible way of thinking about new goods. Gordon writes about the production process for his own book and how it changed over time:

> Since this is a book about quality change and technological progress in durable goods, a word is in order about the change in the production technology

> of this book between the 1974 and 1988 versions. The draft of the first version was typed on a Smith-Corona portable typewriter and retyped in its entirety, often several times, by a secretary using an IBM [S]electric typewriter. Any change that I might have contemplated, particularly an extra paragraph early in a chapter, required extensive retyping by the secretary and a difficult cost-benefit calculation as to whether it was really worth it. Technology was a barrier to improvements in substance. In contrast, the new chapters written in 1988 were composed and printed at the level of professional typesetting inside my home by a 386 "clone" personal computer, a Hewlett-Packard laser printer, and WordPerfect 5.0. Revisions could be made instantly and chapters reprinted at the rate of eight pages per minute, all without any involvement of a secretary. (xvi)

In the case study laid out in the above quotation, there are two processes for producing printed manuscript pages: a typewriter-based "process A," and a personal computer–based "process B." Each process involves a specified input collection. Input collection A for process A consists of a Smith-Corona portable typewriter, an IBM Selectric typewriter, and a secretary to operate the IBM Selectric typewriter. Input collection B consists of a 386 "clone" personal computer, a Hewlett-Packard laser printer of a given vintage, and WordPerfect 5.0. (For convenience, Professor Gordon's typing time is ignored as a free input good.)

Suppose that each of the inputs to the above production processes for printed pages could be priced over the entire 1974–88 period, and that a price index was computed over these years using some but not all of this information. Suppose, in particular, that the personal computers were omitted until the early 1980s because the models were constantly changing and furthermore the quantities transacted were fairly small until then. If price movements for personal computers were proxied in the index by the price movements for the typewriters until the early 1980s, and if prices fell much more dramatically for the personal computers, then there would be a new-goods bias in the price index relative to the true price movements for all of these inputs considered together because of the omission of the personal computers. This bias problem could have been lessened by adopting hedonic methods to cope with the frequent model changes for the personal computers, and introducing the price information for them into the price index sooner. (This is essentially what statistical agencies in countries like Canada and Japan are striving to do now with goods like this.) But this still might not properly account for the impact of the new good—the personal computer—on the cost of the printed pages.

Printed pages are not a new good at any point over the 1974–88 period, by any of our above definitions. Rather, they are an "old" good for which, like light (for which Nordhaus studies price movements over time in chap. 1 in this volume), the price has been falling because of the declines in price and related spreading adoption of new machinery. The impacts of the new machines on prices might be sorted out more appropriately if the personal computer were treated as a quality-adjusted typewriter, perhaps using printed pages as the basis for making this adjustment, much as MIPS (millions of instructions per second) are sometimes used in quality-adjusting new models of computers. However, quality adjustment between dissimilar goods like typewriters and personal computers would place a much heavier burden on statistical agencies, and it is not being attempted for any of the price index systems examined in this paper.

Alternatively, statistical agencies might go further in making available price information for individual categories of goods. This information, together with information on the alternative technologies in use for producing the outputs of interest and on the prevalence of the various technologies, could then be used by other researchers to compute and explain price movements for particular output goods, much as Nordhaus traces changes over time in the price of light. This would be an output-good-specific, microsimulation sort of an approach to studying price changes and their sources. At present, however, this is not being done either, except in Nordhaus's chapter.

11.3 The Canadian Industrial Product Price Index

In order to understand details of how new goods are dealt with in any given official price statistics system, it is first necessary to know the basics of the production of those price statistics. Some of these details have important implications for the sorts of goods that end up being treated as new for the construction of specific price indexes.

11.3.1 Origins of the Industrial Product Price Index

The Canadian Industrial Product Price Index (IPPI) is a product-based aggregative index that is produced by Statistics Canada and is intended to measure price changes for the universe of commodities sold by Canadian manufacturers. This index (with 1981 = 100) replaced Statistics Canada's Industry Selling Price Index (ISPI).

The initial 1956-based ISPI covered only a limited set of industries and excluded most machinery manufacturing. For example, office-machinery and -equipment production was not covered. In the 1961 update of the ISPI, basket shares were assigned to all industries in manufacturing, though some of the categories were very broad. For instance, office machinery and equipment was in a general category called "other machinery industries." Moreover, many product classes within the designated industry categories were not directly surveyed, and, in aggregating up, price changes for the nonsurveyed product classes were treated as being the same as the subindexes for the respective industries in which the nonsurveyed goods were included.

11.3.2 The IPPI Today

At present, the Canadian IPPI is constructed from price indexes for 1,314 principal commodity groups (PCGs) of outputs defined in the 1986 input-output tables. About 50 PCGs are further split into two or more elemental indexes, defined by destination of shipments (domestic market or export), finer detail on commodities, region of manufacture, or some combination of these criteria. In the remaining cases, the PCG indexes are the elemental indexes.

The weights used to aggregate the elemental indexes are taken from the output of the Make matrix for the input-output system, which provides an integrated set of commodity values for all manufacturing industries. The Make matrix in turn is derived from the 1986 values of the Canadian Annual Survey of Manufactures.

For the IPPI, which is a product-based aggregative index, the entire universe of manufacturing products is conceptually covered. Contrary to the practice that was in use in the old ISPI, where prices of goods not directly surveyed were assumed to change with those of the industry to which they were assigned, the current IPPI assigns specifically chosen proxy indexes to all elemental groups not directly surveyed.

Directly surveyed commodities are supported by either a formal probability sampling or an incomplete judgmental sampling procedure, and a quality rating is presented for the pricing results. If a formal probability sampling procedure is used, then certain important producers are identified as "must-take" respondents and a random selection is taken from the smaller producers. Such samples are redrawn on a regular cycle as dictated by changes in the market. The normal cycle varies between three and four years.

About 700 of the 1,314 PCGs in the manufacturing sector are accommodated by direct survey and these account for about 85 percent of the value of manufacturing output in 1986. The price movements for the remaining 600 PCGs are estimated indirectly either from other directly priced PCGs or through borrowing price movement from other price series.

11.3.3 The Treatment of New Goods in the IPPI

In terms of the weighting of the IPPI, a new good is either a new product class within an existing elemental index or a new elemental index. All manufacturing shipments reported in the Survey of Manufactures data on which the weights are based are represented in the IPPI weights. In this sense, weighting gaps in the IPPI due to new goods are taken care of as rapidly as the information is picked up in the Survey of Manufactures and the weights are updated. However, for many new goods, they would at first simply be included in the weights for existing elemental indexes.

In terms of pricing coverage, a new good can be viewed as one for which direct pricing has been, or is considered to be, instituted; for which there has been a change from incomplete to full probability sampling of prices; or for which proxy or direct pricing has just begun. For example, a product class was assigned to integrated circuits and crystals within PCG 6365, "electronic equipment and components," when the initial price sample for that PCG was drawn. There had been no commodity index for integrated circuits in the ISPI. They were represented in the overall ISPI by the series for electrical products industries. Optical fiber cables are being considered for this sort of upgrading of status in the IPPI. They were represented in the overall ISPI by the series for nonmetallic mineral products industries. They are now part of PCG 4750, "glass products, not elsewhere specified." At present, the IPPI elemental index is a proxy; there is no direct pricing for fiber-optic cables. Along with the switch to a 1992 base period in 1994, a new elemental index for PCGA 4758, "optical fiber cable," will be defined. (The PCGAs [Principle Commodity Group Aggregates] will be the successors to the PCGs as of 1994. These will be based on the new Standard Classification of Goods, Statistics Canada's elaboration on the international Harmonized System.)

There are gaps in the pricing of manufacturing goods for the IPPI. There are several reasons for these gaps. One is that a prices census for all transactions between Canadian manufacturers and their clients would obviously be prohibitively expensive, in terms of both operational costs for Statistics Canada and response burden for the manufacturers. Even pricing all of the PCGs would be hard to justify in cost-benefit terms. Within an elemental index, once a sample of manufacturers is drawn for pricing, the probability of drawing a price quote from a given product class is proportional to its share of the manufacturer's shipments. If there is no pricing in a product class for a PCG, then its share of manufacturing shipments is probably small. This is consistent with the IPPI sampling procedures of excluding the smallest firms, which together account for less than 10 percent of shipments for an elemental group. (But there can be a problem if a good, say a new good, is produced mainly or exclusively by manufacturers below the 90 percent cutoff, so that the good has almost no weight in the sample grid above the cutoff, even though it represents a substantial share of shipments for the elemental group.)

Another cause of pricing gaps is related to the technical complexity of some of the products included in the IPPI and to the difficulty of pricing high-technology items which have substantial research and development embedded in them or short life cycles. The response burden on the manufacturer of supplying quotes for these sorts of items is substantially greater than for most products. Also, a high-tech manufacturer is more likely to regard prices and production-cost information for its products as proprietary and to be unwilling to provide this information to statistical agencies, even with stringent guarantees in place against disclosure of such information to third parties. This is the principal reason that the IPPI for telephone and telegraph apparatus and equipment is still a proxy series, although it represents about a sixth of the IPPI basket for electrical and communications products and is in fact one of the ten largest PCGs in the IPPI. Prices for digital switching equipment and other high-tech telephone equipment that are used in the deflation of the Canadian System of National Accounts estimates of investment in machinery and equipment come not from the Industry Price Survey, but from purchase price indexes compiled by the telephone carriers themselves. Some of the pricing gaps of this second sort involve products and producers for which production values have become quite large. In the early 1980s, this was the case for microcomputers.

11.3.4 Goods Changing Pricing Status from 1981 to 1986

A better understanding of the sorts of pricing gaps that there have been, and the nature of the new and emerging versus the old and declining goods in the IPPI, can be gained by examining the elemental indexes that changed pricing status from the 1981 to the 1986 index basket. Such a comparison is shown in table 11.1. In the table, an E stands for directly surveyed with a full probability sample, an S for directly surveyed from an incomplete judgmental sample, a P for proxied, and a — for not priced at all and not covered by the index. The indexes are organized by the change in their pricing status. For example, changing from an E or an S for 1981 to a P or a — for 1986 represents a downgrading of pricing status. These are the disappearing goods for the IPPI (1986 = 100). On the other hand, from a — for 1981 to a P for 1986, or from a P for 1981 to an S or an E for 1986 represents an upgrading of pricing status. Those goods for which the pricing status has been upgraded are the new and emerging goods in the IPPI from a pricing perspective. For example, from panel A of table 11.1, we see that umbrellas and walking sticks are "new goods" in the sense that the pricing status was upgraded from — (for not included) to P (for proxied). Similarly, we find that the pricing status of lawn and garden tractors has also been upgraded from — to P. Of course, these goods are not new in a market (definition 1) or an availability (definition 2) sense. They do not represent the cutting edge of technological change. And certainly they are not new in the sense in which we had thought of new goods before beginning this project. They are only new, or recently new, in the operational sense of definition 3.

11.4 Computers in the Canadian IPPI

Of course, there *are* high-tech and other newly invented goods in the IPPI, of the sort that are the focus of most of the economics literature on the treatment of new goods in price statistics. Some of these have been introduced into the IPPI as new elemental indexes, but others have been treated as quality-adjusted versions of goods already included. Computers are an example of a family of high-tech goods for which quality adjustments have been important.

Actual pricing development at Statistics Canada for electronic computing equipment did not begin until the early 1980s, concurrent with the development of the IPPI. As already noted, the ISPI which the IPPI replaced had virtually no pricing for computing equipment. At that point, other countries, including the United States, also largely ignored electronic computing equipment in the construction of their national price statistics.

Table 11.1 **Principal Commodity Groups Whose Pricing Status Changed from 1981 to 1986**

PCG Number	PCG Title
A. PCGs for which the pricing status was upgraded from — to P	
4389	Coal and coal briquettes
5511	Lawn and garden tractors
4453	Oil-drill pipe, steel
3914	Corn oil, crude
7064	Optical lenses and parts
7859	Umbrellas and walking sticks
6855	Globes and reflectors for lighting fixtures
2554	Nickel (nickel-copper) matte
4194	Heterocyclic compounds, NES
3419	Wood pulp, NES
2450	Natural fibers
B. PCGs for which the pricing status was upgraded from P to S	
3944	Soybean oil, deodorized
5250	Parts, chain saws
7865	Other apparel, knitted, not knitted
3378	Wooden fruit and vegetable boxes
634	Corn starch
631-14	Whole wheat and graham flour, domestic
5296	Chemical and pharmaceutical products machinery
4796	Sand lime bricks and blocks
4743	Laminated glass
4473	Plates, steel, fabricated
7866	Apparel accessories, NES
5219	Parts, petroleum refining machinery
4914	Artificial abrasive grains
5218	Petroleum refining machinery
4675	Solder-type pipe fittings
5092	Parts, packaging machinery
5193	Miscellaneous material-handling equipment
4073	Sodium phosphates
C. PCGs for which the pricing status was upgraded from P to E	
4791	Gypsum plasters
4311	Aviation gasoline
4732	Refractory cements, mortars
D. PCGs for which the pricing status was upgraded from S to E	
5112	Parts, conveyors and conveying systems
7314	Commercial dishwashers
3652	Thread, of man-made fabrics
2563	Refined gold bullion
5414	Soil preparation machinery
4535	Copper wire and cable, not insulated
7853	Gloves and mittens
4279	Compound catalysts

(*continued*)

Table 11.1 (continued)

PCG Number	PCG Title
8543	Tableware, plastic
8114	Hollow-ware, flatware, and cutlery
4092	Heavy water
5421	Farm dairy machinery and equipment
E. PCGs for which the pricing status was downgraded from E to S	
8311	Sporting equipment
4015	Sulfuric acid
7312	Vending machines
4114	Ethylene
5247	Veneer and plywood forming equipment
4382	Creosote, carbolic
6876	Wiring devices
7715	Accounting machines
4722	Glazed floor and tiles, clay
4744	Glass in basic shapes
4723	Sewer pipes, drain tile, and fittings
5235	Metal-cutting machine tools
9411	Brushes excluding personal care
4068	Sodium carbonate (soda ash)
5121	Elevators and escalators, excluding conveying and mining
4751	Asbestos linings and facings
5813-12	Trucks, domestic, medium
5216	Oil and gas field equipment
4711	Natural stone, basic products, structural
5811-21	Automobiles, export, station wagons
5813-32	Trucks, goods purchased for resale, medium
5023	Hydraulic turbines
4132	Methyl alcohol
4171	Adipic acid
4163	Acetic anhydride
6865	Power circuit breakers
6316	Radio and TV broadcasting equipment
4794	Thermal insulation, NES
6873	Switchgear cutouts and protective equipment
6812	Magnet wire, insulated
4812	Film and sheet, cellulosic plastic
6822	Electrical conduit and tubing
6517	Air heaters, electric, fixed, permanent
4859-20	Hard plastic automobile parts
5712	Railway rolling stock, railway service
4837	Tracks for snowmobiles
5711	Locomotives, railway service
5916	Pleasure and sporting craft sold
5721	Self-propelled cars
4122	Vinyl chloride monomer
5935	Subassemblies, parts, etc., for ships
7061	Medical and related instruments

Table 11.1 (continued)

PCG Number	PCG Title
5241	Welding machinery and equipment
8511	Kitchenware, metal or metal enamel
5417	Combines, self-propelled and pull
3655	Baler and binder twine
3013	Glove and garment leather
3019	Leather other than upper
3051	Leather shoe findings
3635	Filament yarn, excluding nylon polyester
3673	Broadwoven fabric, cotton/polyester
3684	Double-knit fabrics
3657	Twine, NES
8413	Curtains and draperies, textile
4899-10	Rubber products
8416	Textile bedding, NES
7837	Knit dresses, suits, shirts, slacks
7831	Coats, textile, women's
7833	Dresses and blouses, not knitted
7835	Skirts, not knitted
7862	Uniforms, occupational clothing
5513	Wheel tractors, excluding lawn and garden, agricultural
4899-30	Rubber and plastics products, NES
4820-30	Foamed and expanded plastics, other
3311-20	Lumber and ties, hardwood, export
3915	Soybean oil, crude
320-22	Fish fillets, steak, export, other
330-12	Fish canned, export, salmon
920-10	Potato products, frozen
1591-40	Complete feeds, farm domesticated animals, NES
631-20	Wheat flour, export
642-10	Pies, cakes, and pastries, fresh baked or unbaked frozen
1049	Sugar preparations, NES
636	Malt
4820-20	Foamed & expanded plastics, polyurethane
637	Rice, milled
1450	Food preparations, NES
4819	Rubber, chemically blown, sponge
4822-30	Plastic pipe, ABS
4822-40	Pipe pipe, other
4834-20	Pipe fittings, other than ABS
4814	Plastic film, sheet and layflat
7860	Belts
7863	Beachwear
3312-42	Lumber, softwood, other, Prairies
3345	Veneer, softwood
2569	Cobalt
4420	Blooms, billets, slabs, alloy steel

(continued)

Table 11.1 (continued)

PCG Number	PCG Title
4432	Plate, alloy steel, not fabricated
4497	Engine-block castings, cast iron
4531	Copper wire rods
2565	Platinum-group metals
2567	Magnesium
2570	Refined metals, NES
3416	Wood pulp, mechanical
6511	Heating boilers, steam generation
4611-30	Hermetically sealed window units, metal
4625	Bottle caps, metal
4661	Rods, wire, and electrodes, metal
320-21	Fish fillets, steaks, domestic, other
8512	Kitchenware, plastic
9018	Office supplies, NES
4419	Blooms, billets, slabs, carbon steel
3415	Wood pulp, sulfite, unbleached
2325-60	Pulpwood, chips, B.C. coast
3365	Roof trusses, wooden
3371-10	Prefabricated wood buildings, Atlantic
3371-20	Prefabricated wood buildings, Quebec
3371-30	Prefabricated wood buildings, Ontario
3371-40	Prefabricated wood buildings, Prairies
2325-20	Pulpwood chips, Quebec
2325-50	Pulpwood chips, B.C. interior
528	Milk, evaporated
7423-20	Furniture components, NES
3377	Pallets, wooden
3391	Shingles
F. PCGs for which the pricing status was downgraded from E to P	
4390	Petrochemical feed stocks
7818	Sleepwear, men's, youths', and boys'
5233	Metalworking machine tools
7711	Typewriters
5813-22	Trucks, export, medium
G. PCGs for which the pricing status was downgraded from S to P	
9428	Gaskets, NES
4145	Phenol
6917	Personal care appliances
6918	Heating pads and electric blankets
4222	Reclaimed rubber
6311	Domestic TV and other receiving sets
6840	Lamps, residential type, incandescent
6312	Radio receiving sets, automotive type
3665	Broadwoven fabric, wool mix, apparel
4118-20	Other hydrocarbons, NES
6844	Automotive-type lighting fixtures
3692	Tire fabrics, other

Table 11.1 (continued)

PCG Number	PCG Title
4753	Asbestos products, NES
6615	Heating elements for electric appliances
635	Starches, cereal, NES
3946	Peanut oil, deodorized
7712	Parts, typewriters
6314	Phonograph records
8112	Costume jewelry
6515	Air heaters, electric, portable
3664	Broadwoven fabric, wool, apparel
7065	Optical instruments
8810	Medical and surgical apparatus
6913	Sewing machines, domestic type
8214	Timers, NES
H. PCGs for which the pricing status was downgraded from E to N	
6912	Flatirons, domestic type

Source: Statistics Canada (1986, 1991).

Notes: E stands for directly estimated from a full probability sample of prices. S stands for directly estimated from an incomplete (nonprobability) sample of prices. P stands for proxied. — stands for not priced and not included in the IPPI. NES stands for not elsewhere specified.

11.4.1 The Use by Statistics Canada of U.S. Price Indexes for Computing Equipment

In early 1986, the U.S. Bureau of Economic Analysis (BEA) released price indexes for computing equipment extending back in time to 1969 and made the decision to use these in the revision of the U.S. national accounts system. This spurred developmental work within Statistics Canada on a quality-adjusted indicator for electronic computing equipment that could be used for the Canadian system of national accounts.

New deflators were produced by Statistics Canada for domestic production, exports, imports, and the final demand categories of electronic computing equipment using the original BEA historical figures as proxies for price movements in Canada. In particular, the composition of domestic Canadian production at that time led Statistics Canada to choose as a price indicator for domestic production and exports for the period 1971–81 the BEA index for video displays. From 1981 to 1990, the BEA figures for price movements for various types of electronic computing equipment were used together with weights reflecting the composition of domestic Canadian production. On the import side from 1971 on, because of the broad mix of products being imported into Canada, Statistics Canada used the BEA index figures for various types of electronic computing equipment weighted according to import data and also adjusted for exchange rate fluctuations, tariffs, and federal sales tax (and more recently for the Goods and Services Tax).

11.4.2 The Move to Actual Pricing of Computing Equipment

The selection of manufacturers for the first Statistics Canada pricing sample for computing equipment was based on the Census of Manufactures data for 1979. As noted above, at that time the bulk of Canadian production was concentrated in video displays and, to a lesser extent, communication-interface equipment. Pricing development at Statistics Canada reflected that situation. Microcomputers were still of minute value in the overall scheme and, as such, were not part of the first pricing sample for electronic computing equipment.

A second sample was developed using 1981 Census of Manufactures data. It included microcomputer pricing with mostly 286-type machines. A third sample was developed using 1985 Census of Manufactures data. By then, major changes had occurred in the composition of the product mix: printers had become the dominant computing-equipment product produced in Canada, with video displays having become relatively less important. Microcomputers were also beginning to be a significant portion of the production mix, as well as communication-interface computing equipment. The question of quality adjustment for these products was viewed as a critical issue by Statistics Canada.

11.4.3 The Move to Hedonic Pricing

In 1990 and 1991, Statistics Canada embarked on the development of hedonic pricing for computers. This step was taken because several national statistical agencies around the world had become concerned about the need to publish reliable measures of price change for microcomputers as well as for larger members of the computer family. Leading the way was the U.S. BEA. The BEA commenced publication of price indexes for mainframes, minicomputers, and peripherals in 1986. Shortly after the release of the BEA indexes, the Bureau of Labor Statistics (BLS) launched a research and development program to tackle the measurement of price change for microcomputers and related peripherals. A series of experimental price indexes based on alternative quality-adjustment methods was developed. The version known as the "composite," which combines hedonic and conventional quality-adjustment techniques, was selected as the official measure. Statistics Canada is one of the national statistical agencies now following in the footsteps of the United States. (See MacDonald 1991.)

11.5 Consequences of the Late Inclusion of Computers in Canadian Producer Price Indexes

As has already been noted, prices for electronic computing equipment are included in the IPPI but were not included in the ISPI. It would be interesting to know how the producer price movements measured using the old ISPI would have been affected if computing equipment had been included earlier with proxy pricing.

11.5.1 The Impact of Excluding Computing Equipment over 1956–1970

In the IPPI, computing equipment is incorporated into the office- and store-machines group. From this perspective, the inclusion of computing equipment in the IPPI could be viewed as an extension of earlier efforts to include machinery produced for offices and stores in the ISPI. We noted previously that machinery production of this sort was not covered at all in the initial ISPI (base 1956 = 100). The 1961 = 100 ISPI series assigned basket shares to all industries in the manufacturing sector, though office machinery and equipment was treated as part of a general category, "other machinery industries," and pricing was by proxy.

For the 1956–70 period, the lack of coverage, and then the pricing by proxy only, for machinery for offices and stores probably was a serious gap in the coverage of producer prices in Canada. However, at least in the earlier part of this period, the lack of coverage for the electronic computing equipment portion of office and store machinery may not have been important. For the ISPI as a whole, using 1961 shipments data, the production of electronic computing equipment would have constituted less than 0.1 percent of the index basket. In 1953, the basket share would have been even smaller.

It is true that, just confining attention to the aggregate for machinery industries (except electrical), computers would have had more than five times their weight in the total ISPI. But even within this aggregate, electronic computing equipment would have accounted for no more than 0.5 percent of the relevant portion of the index basket in 1961.

However, the following decade witnessed a rapid expansion of the production of electronic computing equipment in Canada. In fact, as discussed below, Canadian production was sufficiently important that Japan was pricing Canadian-made electronic memory for computers over the period 1965–70 as part of its efforts to track the movements of import pricing for electronic computing equipment. (See subsection 11.7.1.) This suggests that, even over the course of the 1960s, the failure to include electronic computing equipment in the ISPI may have become a more serious problem. In the following subsection, we examine this problem empirically for the decade that followed.

11.5.2 The Impact of Excluding Computing Equipment over 1971–1980

From 1971 to 1980, the ISPI series pertaining to computers was the index for office and store machinery (D535601, see Statistics Canada 1978). This index did not include electronic computing equipment in its pricing even though this equipment accounted for 7.5 percent of the office- and store-machinery basket according to 1971 manufacturing shipment values. At that time, the office- and store-machinery series was based on pricing for typewriters, accounting machines, and cash registers. There was substantial production of typewriters and cash registers in Canada in the 1970s which faded away by the mid-1980s. Thus, price movements for computing equipment sales, which were characterized by rapid growth, were being proxied by price movements for other types of office and store machinery, some of which were declining in sales. This makes the 1971–80 period a particularly interesting one for more carefully examining the impact on the old ISPI of the exclusion of computing equipment, as is done in the following subsection.

Recomputing the ISPI with Computing Equipment Included

For the 1971–81 period, the Canadian domestic production of computer equipment was geared heavily toward display units: particularly dumb terminals. (A dumb terminal lacks an internal microprocessor and cannot perform even rudimentary data processing without resort to its host computer.) For this reason, we use the BEA series for display units adjusted for U.S. exchange rates as a proxy series for domestic production over this period. Except for the years 1972–73, the BEA series declines steadily from 1972 to 1981, falling on average by 5.9 percent per year. Over the same period, the American dollar gained relative to the Canadian dollar, so that the exchange rate–adjusted series drops on average by only 4.3 percent per year. From the results displayed in table 11.2, we conclude that if this BEA series had been used to represent price movements for the production of computing equipment and parts in the ISPI, the index for office and store machinery would have risen on average by 1.6 percent per year from 1971 to 1981 rather than by 1.9 percent as the official series does.

At higher levels of aggregation, the difference resulting from using the BEA series as a proxy for computing-equipment price movements becomes negligible. The machinery industries index recomputed to include computers is only 0.6 index points lower by 1981 than the official index, and the total ISPI recomputed with computers included is the same as the official index to one decimal point of accuracy. Perhaps this result is not surprising given that, in 1971, electronic computing equipment still constituted only 0.8 percent of the output of the machinery industries and less than 0.05 percent of total manufacturing shipments.

Taking Account of Changing Basket Shares

There is a caveat concerning the table 11.2 results on which the above conclusions are based. The differences between the official series and the series computed using the BEA proxy are so small partly because the same 1971 basket-share weights are used for the entire period even though this was a period of rapid growth in the volume of production for computing equipment in Canada. This is in line with actual practice for the production of the ISPI, but not with current practices for the IPPI.

The current policy at Statistics Canada for the IPPI is to update the basket weights every five years. This policy was instituted with the 1991 updating of

Table 11.2 Industry Selling Price Indexes for Canada

	Computers[a]	Computers: Exchange Adjusted	Office & Store Machinery Including Computers	Office & Store Machinery: Official	Office & Store Machinery: Chain Index	Machinery Industries: Official	Machinery Industries Excluding Office & Store Machinery: Official	Machinery Industries Including Computers	Machinery Industries Including Computers: Chain Index	Total ISPI: Official	Total ISPI Excluding Office & Store Machinery	Total ISPI Computers	Total ISPI Including Computers: Chain Index
Adjustment of official series to include computer indexes in 1971 basket													
Industry share		7.5	100.0	92.5									
Total share		0.042	0.553	0.553		4.162	3.609	4.162		100.000	99.447	100	
1971	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0	100.0	100.0
1972	101.7	99.8	102.1	102.3	102.1	103.2	103.3	103.2	103.2	104.4	104.4	104.4	104.4
1973	101.9	100.9	109.4	110.1	109.4	108.5	108.3	108.4	108.4	116.1	116.1	116.1	116.1
1974	98.9	95.8	113.5	114.9	113.5	123.9	125.3	123.7	123.7	138.1	138.2	138.1	138.1
1975	91.3	92.0	118.5	120.7	118.5	142.7	146.1	142.4	142.4	153.7	153.9	153.7	153.7
1976	83.4	81.4	117.2	120.1	117.2	151.3	156.1	150.9	150.9	161.6	161.8	161.6	161.6
1977	82.5	86.9	112.4	114.5	112.9	158.9	165.7	158.6	158.0	174.3	174.6	174.3	174.2
1978	73.4	82.9	112.7	115.1	112.9	168.8	177.0	168.5	167.3	190.4	190.8	190.4	190.3
1979	63.9	74.2	114.7	118.0	114.4	186.7	197.2	186.3	184.1	217.9	218.5	217.9	217.8
1980	56.6	65.6	115.3	119.4	114.6	207.9	221.5	207.4	204.0	247.2	247.9	247.2	247.0
1981	54.6	64.8	116.9	121.2	116.1	233.1	250.2	232.5	228.0	272.4	273.2	272.4	272.1
Annual rate of price change	−5.9	−4.3	1.6	1.9	1.5	8.8	9.6	8.8	8.6	10.5	10.6	10.5	10.5
Adjustment of series to include computer indexes in hypothetical 1976 basket													
Industry share		8.7	100.0	91.3									
Share of machinery industries			15.1			100.0	84.9						
Total share		0.052	0.598	0.598		3.953	3.355	3.953			99.402		
1976		100.0	100.0	100.0		100.0	100.0	100.0			100.0	100.0	
1977		106.7	96.3	95.3		105.0	106.2	104.7			107.9	107.8	
1978		101.8	96.4	95.8		111.6	113.4	110.8			117.9	117.8	
1979		91.1	97.6	98.3		123.4	126.4	122.0			135.0	134.8	
1980		80.5	97.8	99.4		137.4	141.9	135.2			153.2	152.9	
1981		79.5	99.0	100.9		154.1	160.3	151.1			168.8	168.4	

Source: Statistics Canada (1978 and various issues).

[a]This is the BEA index for displays reexpressed in Canadian dollars with 1971 = 100.

Table 11.3 **Relative Importance of Electronic Computer Equipment in an Office- and Store-Machinery Manufacturers Aggregate**

	Value of Shipments of Goods of Own Manufacture				
	1971 (1971 prices)	1976 (1976 prices)	1971 (1976 prices)	1976 (1971 prices)	1976 index (1971 = 100)
Electronic computer equipment	14,163	36,017	11,529	44,247	81.4
Total office and store machinery	187,911	412,017	220,023	351,550	117.2
Percentage share	7.5	8.7	5.2	12.6	

Sources: Statistics Canada (1971, 1976).

the IPPI to a 1986 basket (see Statistics Canada 1991). Consistent with that policy, table 11.2 also shows what the chain index for the office- and store-machinery category, with computers included, would look like with a 1976-based Laspeyres series linked to the 1971-based Laspeyres series at 1976. (Only the basket shares of computers within the office and store ISPI and of the office and store ISPI within the machinery and total ISPIs were adjusted for in this exercise.) The chain index for machinery industries and for the total ISPI were similarly calculated as weighted averages of the office- and store-machinery series and the remainder of each given aggregate.

The impact of the chain calculation is to lower the 1981 value of the office- and store-machinery aggregate by 0.8 index points, changing the average annual growth rate for 1971–81 to 1.5 percent. The 1981 value for the chain index for machinery industries is 4.5 index points lower than the direct index, so that it shows an 8.6 percent average annual increase from 1971–81: 0.2 percentage points lower than for the official index. For the total ISPI, the recomputed index numbers from 1977 forward until the index ceased to be produced now differ at the first decimal place from the official series, although the average annual increase is still 10.5 percent.

For all manufacturing shipments, the 1971 share of computing equipment was 7.5 percent versus 8.7 percent for 1976 (see table 11.3). It may at first seem surprising that such a modest increase in basket share should have an appreciable impact, but the two percentages are not properly comparable since they are based on different price structures. The relative importance of computers in the direct index in 1976 (that is, its basket share evaluated at 1976 prices) is only 5.2 percent. This is significantly lower than the corresponding 1971 basket share because computer prices fell between 1971 and 1976, though prices of other office and store machines rose. In fact, at 1971 prices, the output of computing equipment in 1976 accounts for better than an eighth of production by office- and store-machinery manufacturers, which is much above its 1971 output share.

One would expect most new goods to follow a similar pattern, falling in price while established goods increase in price and showing a much higher rate of output growth than established goods. An interesting consequence of this is that even if a Laspeyres index does contain pricing for a new good from the time of its introduction, the relative importance of that good will tend to decline after the base period. By the same token, in a Laspeyres volume series the relative importance of a new good will tend to increase with time.

Changing Production Processes

Even if ignoring computing equipment in the Canadian producer price indexes had little impact on their values, this does not mean that the effects of the price declines for computing had little impact on the prices of consumer and producer goods, in subsequent time periods at least. The early price declines for computing equipment, when sales volumes were small, undoubtedly led many producers to shift in *subsequent* time periods to labor-saving and materials-saving computer-based technologies.

11.6 The Japanese Domestic Wholesale Price Index

It is interesting to compare the Canadian treatment of new goods, including electronic computing equipment, in the IPPI with the Japanese official producer price statistics. The Japanese Domestic Wholesale Price Index (DWPI) is one of a family of producer price indexes put out by the Bank of Japan. These include four wholesale prices indexes: the domestic WPI (DWPI), the export WPI (EWPI), the import WPI (IWPI), and the overall WPI (WPI). In addition, the Bank of Japan prepares indexes for input-output prices for the manufacturing sector. We focus on the DWPI in this and the following sections. However, there is considerable similarity in the methods of construction for this whole family of price indexes produced by the Bank of Japan.

The DWPI covers goods transacted at the interfirm level, *excluding* services, fresh produce, fish, shellfish, weapons and munitions, ships, and land and buildings. The reasons given for the exclusions come down to pricing difficulties. For example, it is stated that fresh produce (fruits and vegetables), fish, and shellfish are excluded because the seasonal price and quantity changes are volatile and hard to measure on a national basis. There are other indexes covering fresh produce, fish, and shellfish. In the case of services purchased by firms, many of these are now covered by the separate Corporate Service Price Index (CSPI), which starts in January 1985 and is also produced by the Bank of Japan. There appears to be a preference for monitoring price movements for goods viewed as hard to price with separate indexes as opposed to bringing these into the DWPI.

Basic details of the construction of the DWPI are provided in the following subsection. We review the choice of goods to be priced, the selection of firms from which price quotes are obtained, and the calculation of index weights. The market basket that is priced and the weights for the DWPI are updated every five years using the chain method. The updating discussed here is for 1990. Concerns about potential new-goods bias problems are one of the reasons given for the regular updating process. The new goods introduced in the 1990 updating are the topic of subsection 11.6.2. Subsection 11.6.3 focuses on the weight changes that took place in 1990. The treatment of evolving goods in the Japanese DWPI is briefly discussed in subsection 11.6.4.

11.6.1 Basic Features

The basic pricing principle for the DWPI is essentially the same as for the Canadian IPPI. It is to collect continuing price series for goods, controlling for any changes in transacting conditions, quality, brands, or other attributes of goods that appear to affect their prices. The stated objective is to measure pure price movements over time for unchanged goods.

The basic criterion for choosing goods for the DWPI market basket is that the transaction values are at least 0.01 percent of the total value of covered goods transacted at the interfirm level. The threshold level for the 1990 updating was 26.7 billion yen. This threshold rule for bringing "new" goods into the Japanese DWPI essentially means that none of these new goods are new in the market or availability senses (definitions 1 or 2 in section 11.2). Almost any good with a large transaction value in the present period would have existed in the previous period: these are new goods only in the operational sense of definition 3.

Basic transaction figures are computed as shipment values minus exports. The shipment values are based on survey information from the Ministry of International Trade and Industry (MITI) for manufactured goods and on a variety of other government and industry sources for the nonmanufactured goods. Goods which are not explicitly excluded from the DWPI, and for which the transaction values exceed the threshold but which are not priced due to various problems, are termed "goods not adopted for WPI." Imputed weights for the goods not adopted are added to the weights for similar sorts of goods that are adopted.

An effort is made to measure "customary prices" at the level where interfirm transactions are most intensive. This is usually the first-tier wholesale level. For most of the goods shipped directly from manufacturers to users, shipment prices are measured taking account of usual pricing practices. Rebates and other discounts are incorporated where these can be identified with specific goods. For each good adopted, prices are measured in at least two firms.

For the 1990 updating of the DWPI, there were 945 adopted goods, accounting, in terms of value, for 77.3 percent of all of the goods covered by (i.e., all of the goods not excluded by definition from) the DWPI market basket. A total of 3,164 price quotes are collected trimonthly for the adopted goods from 1,284 firms. About 80 percent of the prices are measured in the Tokyo area.

The selected brands of goods and specified transaction conditions, including the form of payment, are based on transaction-volume data and industry consultations. The intent is to select the brands that are most prevalent and to price these for the most common transaction conditions at the selected measurement sites.

The weights for the DWPI are also based on transaction-share estimates. When new goods are added or goods are deleted in the updating process, the weights for the remaining old goods are adjusted accordingly.

11.6.2 New Goods Introduced in 1990

In the 1990 updating, 69 goods were deleted and 102 new goods were added. The 102 new goods represent 10.8 percent of the 945 adopted goods. One of the added goods is computer peripherals, with a 1990 weight of 11.6 (out of a total for the DWPI of 1,000). In addition, the 1985 specification of "computers (main parts)" which only included personal computers was changed in the 1990 updating to include mainframe computers as well. Table 11.4 summarizes these changes and lists the new goods together with their 1990 weights. The category of "computers (main parts)" is also included in this list because of the important change in specification.

The information in table 11.4 on new goods in the DWPI illustrates the observation made in the previous subsection that none of the new goods in the DWPI are new as economists have defined new goods. Not only were the quantities consumed of all of these goods nonzero in the pricing period prior to their introduction in 1990, due to the threshold selection criteria, but in general, the quantities were also nonzero in 1985, the next most recent point at which the DWPI was updated and rebased. Products such as corn oil, roasted pork, and hamburgers have been used in Japan for a very long time, and mochi is a traditional rice product used in the manufacture of a wide variety of foodstuffs. Even for electrical machinery, much of which has probably been subject to technological change, it is obvious that items such as clothes dryers and halogen lamps have long been available in Japan.

Recall also that a relatively substantial number of goods were deleted in 1990. There were 69 deleted goods versus 102 added goods. However, the deleted goods are not disappearing goods in the sense of theoretical discussions. These goods were still available, and prices could still be observed for them, in the period after they were dropped from the DWPI market basket. In fact, many of the new goods are modifications of deleted goods, which is one reason why we include the deleted goods in this paper. It is simply that no quality-adjustment linkage was made between these old and new goods. Again we see that the treatment of quality change is an essential determinant of how new goods are defined in index number making. The threshold transaction criterion for the inclusion of a good in the DWPI market basket ensures that the new goods added will not be very new and the goods dropped will still be commercially available.

Table 11.4 New Goods Added in the 1990 Updating and Their 1990 Weights

Added New Goods (1985 weight = 0)	Weights
Food, manufactured (17 added with total weight of 6.5)	
Corn oil	0.2
Roasted pork	0.1
Hamburgers	0.2
Milk drinks (not including milk)	0.3
Smoked seafood products	0.5
Pickled seafood	0.3
Sauce for meat	0.3
Sauce for soba or udon	0.3
Chazuke, furikake	0.3
Macaroni, spaghetti	0.2
Deep-fried food	0.5
Mochi (rice cake)	0.2
Bread crumbs	0.2
Nonfat coffee cream powder	0.1
U-ron cha, u-ron cha in container	0.3
Coffee, coffee in container (excluding instant coffee)	2.0
Sport drink	0.5
Textile products (8 added with total weight of 3.3)	
Towel material	0.7
Blouse	0.3
T-shirt	0.2
Women's suits	0.6
Skirt	0.6
Ready-made kimonos, obis	0.2
Floor mat	0.5
Textile-based footwear	0.2
Pulp/paper products (2 added with total weight of 0.4)	
Raw paper for building material	0.1
Paper products for ceremonial purposes	0.3
Lumber/wood products (4 added with total weight of 1.3)	
Northern pine flat board	0.4
Spruce board	0.5
U.S. hemlock spruce board	0.3
U.S. pine board	0.1
Chemical products (14 added with total weight of 5.1)	
Dioxidized hydrogen	0.2
Potash salt	0.3
Oxidized propylene	0.5
Aniline	0.2
Polycarbonate	0.3
Saturated polyester resin	0.3
Medicine for animals	0.5
Live medicine	0.8
Surface active agent	1.1
Detergent for industrial use	0.1
Mud pack	0.1

Table 11.4 (continued)

Added New Goods (1985 weight = 0)	Weights
Hair rinse	0.3
Hair dye	0.2
Chemicals for photography	0.2
Electrical machinery (24 added with total weight of 36.0)	
Control instruments	4.3
Power distributor	0.5
Relay equipment	0.4
Industrial heating equipment	0.3
Circuit breaker	0.9
Ignition coil	0.4
Computer peripherals	11.6
Computers (main parts)[a]	8.3
Fixed-station communication equipment	1.0
Videodisc player	0.4
Speaker	0.9
Electric carpet	1.1
Electric jar (pot)	0.4
Clothes dryer	0.2
Magnetic disks	0.2
thermostat	0.1
Relays for communication equipment	0.7
Magnetic heads	2.1
Crystal oscillator	0.4
Halogen lamp	0.1
High-intensity discharge lamp	0.3
High-voltage discharge lamp equipment	0.1
Traffic signal maintenance system	0.7
Lead frames for integrated circuits	0.5
Precision equipment (5 added with total weight of 2.2)	
Industrial length scale	0.2
Precision measurement device	0.8
Measurement equipment	0.3
Separation/distillation device	0.5
Optical lens (excluding lenses for cameras and glasses)	0.4
General machinery (12 added with total weight of 10.3)	
Gas welding equipment	0.4
Ultrahard steel tools	1.4
Industrial robots	2.4
Rough-terrain crane	1.1
Asphalt paving equipment	0.2
Chemical fiber producing equipment	0.3
In-water pump	0.9
Toothed wheel	1.0
Washing machine for industrial use	0.3
Wrapping equipment	1.4
Packaging equipment	0.3
Pipe products	0.6

(continued)

Table 11.4 (continued)

Added New Goods (1985 weight = 0)	Weights
Iron/steel products (2 added with total weight of 0.4)	
Bar in coil	0.2
Carbon steel wire for ordinary steel cold press	0.2
Metal products (3 added with total weight of 1.6)	
Material for piping	0.8
Metal nameplate	0.5
Metal heat-processing equipment	0.3
Nonferrous metal (4 added with total weight of 1.2)	
Copper for copper alloy	0.1
Zinc for zinc alloy	0.4
Aluminum casting	0.2
Copper rough wires	0.5
Agriculture, seafood (1 added with weight of 0.2)	
Dried horse mackerel	0.2
Other manufactured goods (7 added with total weight of 4.3)	
Wooden-frame kitchen sink set	1.5
Religious ceremony tools	0.7
Lacquerware furniture	0.4
Lacquerware kitchen and dinner sets	0.4
Metal shelf	0.3
Video records	0.6
Room unit	0.4

Source: Bank of Japan (1992, 96–100, 111, app. table 2).
Note: Weights do not sum to totals due to rounding error.
[a]The 1985 weight for computers (main parts), which included only personal computers, was 2.1.

11.6.3 The 1990 Weight Changes

For Japan, we were able to get weight information by product group. Based on this information, shown in table 11.5, it can be seen that the weight changes at the time of the 1990 updating were substantial. A "Paasche check" was carried out by the statistical agency. The percentage difference was computed between a Paasche-type index for 1990 evaluated with the 1990 weights and a Laspeyres-type index for 1990 evaluated using the old 1985 weights, with the difference standardized by the Laspeyres index value. This percentage figure was −2.0 percent. This figure is compared with the value of −1.7 percent for the Paasche check for the 1985 updating from 1980 weights. These are small-percentage figures.

It is interesting to examine some of the goods for which the 1990 weights did, and did not, change from the 1985 weights. For example, the price of Japanese word processors, which are personal computers specifically designed for Japanese word processing, fell by 48.4 percent between 1985 and 1990, while the number of units produced in 1990 was 8.3 times the number pro-

Table 11.5 Changes in Weights from 1985 to 1990

	1990 Weights	1985 Weights	Change from 1985 to 1990
Manufactured goods	919.1	893.8	+25.3
Food, manufactured	97.5	102.1	−4.6
Textile products	35.8	42.6	−6.8
Pulp/paper products	30.0	32.7	−2.7
Lumber/wood products	17.1	18.3	−1.2
Chemical products	73.7	78.9	−5.2
Electrical machinery	148.1	118.5	+29.6
Precision equipment	12.1	11.5	+0.6
General machinery	113.9	97.9	+16.0
Iron/steel products	54.8	59.8	−5.0
Metal products	46.5	40.4	+6.1
Nonferrous metal	25.5	25.2	+0.3
Other manfuactured goods	83.2	79.1	+4.1
Plastic products	38.3	36.0	+2.3
Ceramics products	36.0	35.8	+0.2
Petroleum/coal products	30.3	59.1	−28.8
Transport	76.3	55.9	+20.4
Agricultural/forestry products	30.9	40.0	−9.1
Agriculture; seafood	27.7	35.9	−8.2
Nonfood	3.2	4.1	−0.9
Mineral products	9.3	8.9	+0.4
Electricity, city gas, and water	37.1	52.0	−14.9
Scrapped materials	3.6	5.3	−1.7
Total	1,000.0	1,000.0	0.0

Source: Bank of Japan (1992, 13, table 3).

duced in 1985. The weight for Japanese word processors increased from 1.2 in 1985 to 3.9 in 1990. Another example is video cameras. While the number of video cameras produced in 1990 was 2.6 times that for 1985, their price fell by 40.2 percent between 1985 and 1990. Because of these offsetting changes, the weight for video cameras changed little: from 0.5 in 1985 to 0.6 in 1990.

11.6.4 Dealing with Evolving Goods

In the construction of the DWPI for Japan, when new goods are recognized as modifications of old adopted goods, the direct-comparison pricing approach is used as long as the difference between the new and the old good are not thought to relate materially to the quality of what is being purchased.

For some of the cases where the direct-comparison approach is deemed to be inappropriate, quality adjustments are carried out. When the decision is made that the observed price difference between a new good and an old good is entirely due to changes in quality, a method which the Japanese call *consistency processing* is used. An imputed unit price for the new good is related to the unit price for the old good using the ratio of the observed prices for the new and old goods in the linking period. This is the method of quality adjustment called linking by statistical agencies in other countries such as the United States and Canada.

The Japanese also make use of cost-evaluation quality adjustments in the DWPI. In fact, this is probably the main quality-adjustment method used. However, it is stated that the agency has been relying less on this method in recent years, in part because, with rapid technological change and new and more flexible design and production methods, it is believed that producers are often unable to isolate the costs of production associated with quality changes. Instead, the Bank of Japan is making more use of the hedonic method for valuation of quality differences. Use of the hedonic approach is the stated reason that computer peripherals could be brought into the DWPI and the "computer (main parts)" specification could be broadened in the 1990 updating, as is discussed in the following section. An apparent implication of the shift to greater use of hedonic quality adjustment is that more goods will probably be brought into the DWPI as new variants of older goods included in the index rather than as new DWPI goods.

11.7 Computers in the Japanese DWPI

11.7.1 General History

The first Bank of Japan price index in which computers were included was an import price index, but not the modern day IWPI.[1] Electronic computers were introduced into that index in the 1965 revision as a separate commodity in the "office equipment" category, which also included other commodity groups such as electric calculators and accounting machines. Two types of electronic computing equipment were priced for the old import price index, with the type specifications changing in 1970. Up through June 1970 these two types were (1) U.S.-made small digital computers, and (2) Canadian-made electronic memory. After June 1970, they were (1) U.S.-made medium-sized digital computers, and (2) West German–made electronic memory.

The supply of Japanese-made computers rose rapidly over the 1965–75 period, and foreign import sales fell. Because of this, computers were dropped from the old import price index in the 1975 revision. After that, it was a decade before electronic computing equipment was again introduced into Bank of Japan price indexes. The pattern of reintroduction reflected the revision cycle for the main price indexes produced by the Bank of Japan.

Every five years, the Bank of Japan first revises its wholesale price indexes and then its input-output price indexes (IOPI). Electronic computing equip-

1. Note that the WPI system during this period included imported and exported goods but did not cover computers. The import price index mentioned here was not part of the WPI system.

Table 11.6 The "Standard" Personal Computer

Characteristics	No. of Notebook Types	No. of Desktop Types
Display	2 (monochrome liquid crystal and STN color liquid crystal)	1 (color CRT)
CPU	2 (386 and 486)	1 (486)
RAM	5 (1MB, 1.6MB, 2MB, 4MB, 11.6MB)	2 (1.6MB, 4MB)
Hard-disk drive	4 (0, 20MB, 40MB, 80MB)	3 (100MB, 170MB, 340MB)
Floppy-disk drive	2 (1 drive and 2 drives)	2 (1 drive and 2 drives)
Total types	$2 \times 2 \times 5 \times 4 \times 2 = 160$	$1 \times 1 \times 2 \times 3 \times 2 = 12$

Source: Bank of Japan, internal memorandum.

ment was first brought into the WPI system with the 1985 revision (published beginning in December 1987). The only type of computing equipment covered in the WPI system at that time was personal computers. Computers were first included in the IOPI in the 1985 revision also (published beginning in December 1989). For the IOPI, the type of computing equipment covered was specified to be general-purpose computers.

Coverage of different types of computing equipment was expanded for the WPI in the 1990 revision, published in December 1992. It was also expanded in the 1990 revision of the IOPI.

11.7.2 Pricing Methods

Standard-Model Pricing in the DWPI

When personal computers were first included in the DWPI in 1985, a standard-model pricing approach was used. The "standard" personal computer was represented by 160 types of notebook computers and 12 types of desktop computers with combinations of characteristics as shown in table 11.6. As for mainframe computers, at the time of the 1985 revision it was decided that more research was needed on possible pricing methods that could account for changing model types and optional special features included as part of purchase agreements. Until 1990, mainframe computers were not even included in the sample of goods used in determining weight values. The shipment value of mainframe computers was *not* allocated to other commodities or commodity groups adopted for the DWPI.

Hedonic Pricing in the DWPI

The Bank of Japan adopted hedonic pricing methods for computers in the 1990 revision of the DWPI, and the types of computers being priced were expanded to include mainframe computers. A double-log functional form is used for the hedonic equation. The characteristics included are processing speed, memory size, the number of channels, size dummies (large, medium, small), and year dummies.

In general, for all other categories of goods, the Bank of Japan has had a policy of trying to collect transaction prices. When the computer category was broadened and hedonic pricing was adopted in 1990, a decision was also made to use list (or catalogue) prices for this commodity category as the basic price information. Thus, it is the log of the list price that is the dependent variable for the computer hedonic equation. There are several reasons this decision was made. One is that computers and their accessories, and also associated software, are often transacted as parts of a system. It is difficult to collect data on and to allow fully for system differences, even using a hedonic approach to adjust for quality differences. A second reason is that producers of computers often provide discounts based on guesses about customers' future purchases of related equipment and services. Information on these discounts is difficult to obtain. Moreover, the grounds for these discounts are not *product* characteristics; rather, they are characteristics of the purchasing enterprise.

The Determination of Weights in the DWPI

Another important issue is the determination of weights to be assigned to specific items (products) which represent individual commodities. We are grateful to the Bank of Japan for outlining for us the procedures used for determining weights for computer products. First, the values of domestic shipments for various computer products are calculated by subtracting export figures from the values of production for seven types of goods: (1) analog computers, (2) digital computers, (3) external memory, (4) input/output (I/O) devices, (5) business remote terminals, (6) other peripheral support devices, and (7) parts and attachments (see table 11.7).

After calculating the values of domestic shipments, shipment values of goods in each category are calculated or allocated to the goods listed on the right-hand side of table 11.8. For example, the value of domestic shipments for external memory is 751 billion yen and includes magnetic tape units, magnetic drum units, magnetic disk units, and other devices. In table 11.8, the values for these goods are allocated to the following three goods categories: "magnetic disk units," "flexible disk units," and "other goods." Similar allocations of shipment values are carried out for other categories.

In table 11.9, the value for "other" categories of goods are allocated to specific product types. For example, 133 and 195 billion yen of other computers in category (2) are allocated to "general-purpose computers" and "personal computers," respectively. (The reason for this particular division of the 328 billion yen is not known to us.) A similar allocation of the shipment values of "other goods" in categories (3) and (4) is carried out, as indicated in table 11.9. The goods for which prices are monitored for DWPI are general-purpose computers and personal computers, magnetic disk units and flexible disk units, printers and displays, remote terminals, and other goods in category (7).

One difference in the sampling frame used for computer products between

Table 11.7 Calculating Domestic Shipment Values for Computer-Related Products: Detailed Calculation for 1990

Six-Digit Code	Goods Group	Total Shipments (billion yen)[a]	Included Goods
(1) 305111	Analog computers (incl. hybrid type)	0 (0)	
(2) 305112	Digital computers (CPU)	2,252 (389)	General purpose, large General purpose, medium General purpose, small Personal computers Work stations
(3) 305113	External memory	1,253 (502)	Magnetic tape unit Magnetic drum unit Magnetic disk unit, etc.
(4) 305114	I/O devices	1,320 (803)	Keyboards Line printers Optical readers and scanners
(5) 305115	Business remote terminals	1,313 (0)	Point-of-sale terminals Automated teller machines
(6) 305119	Other peripheral support devices	271 (64)	
(7) 305121	Parts and attachments	1,473 (965)	
Total[b]		7,883 (2,724)	

Source: Bank of Japan, internal memorandum and personal communication.

[a]Numbers in parentheses are export values.

[b]Shipment values do not sum to total due to rounding error.

Japan and the U.S./Canada is that, for Japan, computers and their accessories are mostly in the electronic and communication machinery subgroup, which in turn is part of the electric machinery group. The general machinery group contains the office and household machinery subgroup which includes the office machines class (DWPI 1990 weight = 11.6), which in turn includes table-top electronic calculating machines (1.3), copying machines (6.2), cash registers (0.2), and Japanese word processors (3.9). Given that the 1990 DWPI combined weight for computers and their accessories is about 20, the office machines commodity class is small relative to computers. Japanese word processors, which are microcomputers specifically tailored for Japanese word processing, would likely be called computers in North America. As with personal computers, the DWPI started to include Japanese word processors in 1985. In Canada, as in the United States, computers are part of a broad office, computing, and accounting machinery group (the office machines and equipment group for Canada).

Table 11.8 First-Stage Inputting by Goods Group (1990)

Six-Digit Code	Goods Group	Domestic Shipments (billion yen)	Included Goods	Allocated Production Value
(1) 305111	Analog computers (incl. hybrid type)[a]			
(2) 305112	Digital computers (CPU)	1,863	General-purpose computers	902
			Personal computers	633
			Work stations	328
(3) 305113	External memory	751	Magnetic disk unit	486
			Flexible disk unit	101
			Other goods (imputed)	164
(4) 305114	I/O devices	516	Printers	376
			Displays	102
			Other goods (imputed)	39
(5) 305115	Business remote terminals	1,313	Remote terminals	1,313
(6) 305119	Other peripheral support devices[b]	206	Auxiliary devices	
			Other goods (imputed)	
(7) 305121	Parts and attachments	509	Programs	715
			Other goods (imputed)	
Total[c]		5,160		5,160

Source: See table 11.7.
[a]Imputed into category (2).
[b]Imputed into category (7).
[c]Shipment values do not sum to totals due to rounding error.

Representative-Model Pricing in the IOPI

As stated above, the Bank of Japan introduced computing equipment into their IOPI system as well as into their WPI system in the 1985 revision cycle. For the IOPI, both producers' buying and selling prices must be measured. Some goods cannot be adopted for the IOPI because of a lack of either input- or output-price information. Also, the selection criteria for adopting a good into a commodity group for the IOPI are somewhat different from those for the WPI. Price information for about 750 goods is collected specifically for the IOPI, and is used in conjunction with price information for approximately 1,240 more goods from the Bank of Japan's WPI production operation.

When electronic computing equipment was first introduced into the IOPI, three types of items were priced: (1) a large general-purpose mainframe computer, (2) a medium-sized general-purpose mainframe computer, and (3) a personal computer. With the cooperation of industry, representative models were selected for these three types of electronic computing equipment. When one of the representative models had to be changed, a linking procedure was used. This linking procedure focuses on the unit price per million instructions per second (MIPS) before and after a representative model change. It could be

Table 11.9 Second-Stage Inputting by Goods Group (1990)

Six-Digit Code	Goods Group	Domestic Shipments (billion yen)	Included Goods	Allocated Production Value: Plus Imputed Value for Other Goods	Allocated Production Value: Total[a]
(1) 305111	Analog computers (incl. hybrid type)[b]		General-purpose computers	902[c] + 133	1,035 (3.9)
(2) 305112	Digital computers (CPU)	1,863	Personal computers	633[c] + 195	828 (3.1)
			Other	328[d]	
(3) 305113	External memory	751	Magnetic disk unit	486[c] + 136	622 (2.3)
			Flexible disk unit	101[c] + 28	129 (0.5)
			Other goods (imputed)	164[d]	
(4) 305114	I/O devices	516	Printers	376[c] + 30	406 (1.5)
			Displays	102[c] + 9	111 (0.4)
			Other goods (imputed)	39[d]	
(5) 305115	Business remote terminals	1,313	Remote terminals	1,313[c]	1,313 (4.9)
(6) 305119	Other peripheral support devices[e]	206			
(7) 305121	Parts and attachments	509	Other goods (imputed)	715[c]	715 (2.7)
Total[f]		5,160			5,160 (19.4)

Source: See table 11.7.

[a]Numbers in parentheses are 1990 DWPI weights, where 1 point = 267 billion yen.

[b]Imputed into category (2).

[c]Prices for the goods are monitored.

[d]Allocated to other goods in this category.

[e]Imputed into category (7).

[f]Values do not sum to totals due to rounding error.

viewed as a hedonic adjustment taking into account only one product characteristic (MIPS).

The 1990 revision of the IOPI also makes use of hedonic pricing for computing equipment. However, we could not obtain details of the hedonic equations used.

11.8 Consequences of the Delayed Inclusion of Computers in the Japanese DWPI

The relative share of the value of shipments of computer products in the category "all commodities" (for which the 1990 DWPI weight is 1,000) or in the category "manufacturing industry products" (for which the 1990 DWPI weight is 919.1) is negligible, given the 1990 DWPI weight of about 20 for computer products. This is consistent with the Canadian case discussed in section 11.5.

The share of computer products in the category "electrical machinery," for which the 1990 DWPI weight is 148.1, is 13.5 percent. That is, the value of domestic shipments of computer products was 13.5 percent of the domestic production of electrical machinery. This ratio of the shipment value of computer products to that of electrical machinery increased gradually from a plateau of about 5 percent throughout the 1970s to about 6 percent in the early 1980s, to above 10 percent by the late 1980s, and to 13.5 percent in 1990.

Computers were not included in the Japanese WPI system until 1985, but subindexes for semiconductors and integrated circuits (produced by all the computer producers in Japan) were included prior to 1985. Table 11.10 shows the substantial price declines for transistors and integrated circuits in Japan over the last two decades. Since transistors and other semiconductors, and also integrated circuits, are used widely in many manufactured goods, it is not possible to relate computer prices directly to the prices of these components. (The combined 1990 weight for semiconductor devices and integrated circuits was 16.3 compared to about 19.9 for computers and related accessories.) It seems likely, however, that the downward movements in the prices of semiconductors and integrated circuits partially explain the downward price movements for Japanese computers, for which we have price information only since 1985.[2] (See table 11.11.)

In Japan, superiority in the production of semiconductors and integrated circuits was viewed as vital to the longer-run success of the domestic computer industry, and many of the computer manufacturers also produced semiconductors and integrated circuits. Like computers, the production of semiconductors and integrated circuits became increasingly large relative to the total value of shipments for electrical machinery: 3.3 percent in 1975, 7.3 percent in 1980,

2. It is well known that semiconductors, integrated circuits, and computers were among a number of technology-based projects supported by the Japanese industry and government.

Table 11.10 **DWPI Subindexes for Electrical Machinery, Transistors, and Integrated Circuits**

	Electrical Machinery	Transistors	Integrated Circuits
1970	100.0	100.0	100.0
1971	96.8	93.7	59.8
1972	95.0	88.7	47.0
1973	96.7	81.7	44.8
1974	114.8	84.0	47.1
1975	118.0	73.7	36.7
1976	116.3	72.2	32.5
1977	115.7	70.2	29.3
1978	112.7	65.8	25.9
1979	113.0	62.1	23.5
1980	116.1	61.8	23.7
1981	117.4	60.9	22.3
1982	115.5	57.7	20.6
1983	113.7	54.7	19.2
1984	112.5	56.0	19.5
1985	110.3	53.8	14.2
1986	103.5	49.1	10.7
1987	97.4	40.5	9.7
1988	93.4	37.0	10.0
1989	91.9	37.7	10.1
1990	89.6	37.1	8.8
1991	86.5	36.7	7.7
1992	85.0	36.7	6.9
1993	83.0	36.7	6.5

Source: Bank of Japan, *Price Index Annual,* various years.

12.0 percent in 1985, and 11.0 percent in 1990 for semiconductors; and 2.6 percent in 1975, 4.2 percent in 1980, 9.3 percent in 1985 and 9.1 percent in 1990 for integrated circuits.

Suppose that the Japanese subindexes for transistors or for integrated circuits had been used as a proxy for computer prices over the 1970–89 period. Our calculations show that using the prices of transistors as the proxy series for computing equipment, the price index for electrical machinery (1970 = 100) would have been lower than the official value by 4.7 percent in 1989. Using the prices of integrated circuits as the proxy series, the price index for electrical machinery (1970 = 100) would have been lower by 7 percent.

11.9 Conclusions

We have examined the treatment of new goods in both the Canadian Industrial Product Price Index (IPPI) and the Japanese Domestic Wholesale Price Index (DWPI). For both indexes, most of the new goods introduced in recent

Table 11.11 **Price Indexes for Computer Products and Electronic Parts (1985 = 100): Japan, 1985–1992**

	Domestic Wholesale Price Index			Input/Output Price Index[a]		
	Personal Computers	Semiconductors	Integrated Circuits	Computers[b] (main parts)	Computer Accessory Devices	Japanese Word Processors
Weight (1985 base)[c]	2.1	14.2	11.0	15.00	27.70	5.94
1985	100.0	100.0	100.0	100.0	100.0	100.0
1986	83.8	78.0	74.6	94.1	98.7	90.3
1987	72.1	69.9	68.5	79.1	97.9	75.2
1988	70.1	70.3	70.7	74.5	84.5	56.2
1989	71.8	71.1	71.5	74.5	82.7	53.4
1990	71.5	63.8	62.3	73.7	81.9	51.6
1991	65.1	60.1	57.8	63.6	81.9	48.9
1992	—	—	—	52.9	81.9	48.6

Source: Bank of Japan, *Price Index Annual,* various years.

[a]The input and output price indexes for 1985–92 are identical for the commodity groups reported here. These indexes are gross-weight based.

[b]The basket for this commodity group consists of large- and medium-sized general-purpose computers and personal computers.

[c]Component weights for the DWPI sum to 1,000.

revisions are not new in a market or an availability sense. They are simply goods that were not included before because of the basket selection procedures. These selection procedures make it unlikely for goods to be included that had low transaction values in the previous period, and people rarely begin to buy large amounts of goods with which they have had no previous experience. Most of the exceptions that come to mind are goods that, in fact, are related closely enough to older goods that people feel familiar with them and their uses.

There *are* some high-tech goods like computers that were ignored, even after their transaction values were quite high. But this is because these goods are difficult to price; not because there were no prices for previous periods. These are goods which have many different variants because of technological improvements over time, or which are commonly sold as part of customer-specific package deals. Both Canada and Japan are using hedonic quality-adjustment methods to try to deal with these problems. This is lessening the gaps in pricing coverage. One undesirable consequence, however, is that the pricing treatment of computing equipment is qualitatively different than that for most of the other included goods, which are still being priced using a matched-models approach. Also, since many details of the hedonic pricing are not public, this further complicates the problem of making comparisons of price changes over time or among countries.

Despite the delay in introducing computing equipment into the producer price indexes for Canada and Japan, we find that these omissions had small effects on the overall values of the Canadian and Japanese producer price indexes. This is in contrast to others' findings for U.S. indexes, where production values for computing equipment were much larger over the period for which computers were excluded from the Canadian and Japanese price statistics. It is important to note that this finding does not mean that downward movements in the producer prices for computing equipment were economically unimportant. These declines undoubtedly led many producers to begin efforts to shift to computer-based technologies in *subsequent* time periods that, in turn, led to downward movements in the costs of production and prices for large numbers of goods and services.

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Comment Robert Summers

This paper focuses on a spatial dimension of the new-goods price index problem, and my remarks about it flow from a particular United Nations International Comparison Programme (ICP) point of view about interspatial comparisons. (Generically, ICP refers to the set of organizations and individuals worldwide concerned with national-accounts comparisons across countries.) In a dynamic world in which new goods are constantly being introduced, the construction of a price index that takes account of their availability is thought of primarily in one-dimensional, *temporal* terms. For most purposes, the concentration is on a particular political subdivision—say, a country or region or city—and a way to take into account the utility changes there that result from both changes in the availability of new goods and changes in prices. All of the emphasis is on the price index *time series.*

In recent years various kinds of economic comparisons across political subdivisions have become more common. Greater interdependence of national economies and globalization of financial markets has increased the need for international comparisons of prices and price changes. Clearly, the new-goods problem arises in this area also, but with a small subtlety. In the construction of a space-time system of national accounts (SNA) covering most of the countries of the world, an endeavor in which I am involved, differences in the availability of goods across countries is a problem not unrelated to the new-goods problem. A good not present in one country but present in another at an identifiable price is like a good not available in one period but available subsequently. Making price-level comparisons for particular goods categories, across countries at a point in time, may be straightforward even if particular goods in the category vary in vintage from country to country. However, estimating differential price changes across countries escapes none of the new-goods headaches.

A vexing problem encountered almost immediately in a thoughtful construction of a space-time SNA is the reconciliation of estimates of countries' relative gross domestic products at different dates that are derived from successive ICP benchmark studies with estimates of their relative intervening growth rates

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as measured by the countries' own price statisticians. Because of the difficulty of matching goods of identical quality across dissimilar countries, interspatial price comparisons are generally thought to be less accurate than intertemporal ones. Full consideration of the intertemporal new-goods problem makes this less obviously true. By matching types of new investment goods in the various countries, it is at least arguable that at a point of time some kinds of goods are valued more accurately than are changes in goods over time.

It should be clear that my somewhat parochial national-account viewpoint is by no means the only one for thinking about spatial comparisons. An example: international macroeconomists attempting to make unemployment and potential-output comparisons across countries would be frustrated by significant differences in the way the countries measure their unemployment rates. Similarly, they would find it difficult if not impossible to describe, much less understand, the international dynamics of price movements and resulting estimated quantity changes if countries do not use a fairly uniform price index methodology. Do they?

If I were drafted to begin a research effort to understand better the new-good impact on the ICP numbers or more generally the macroeconomic issues, I would start by asking what reporting countries do in this area, and I would check on what organizations that have a stake in this investigation are already doing. (The European Union Statistical Office has been concerned for some time with harmonizing the statistical activities of the European Union countries.) I would want to know whether the countries do the right things, of course, but almost as significant would be, right or wrong, whether they all do the same things. I would probably first look at the actual practices of a couple of important countries. The statistical offices of developing countries are not likely to be at the methodological cutting edge, so I would pick advanced countries, preferably not closely related culturally. I would start by writing down what I thought the countries *ought* to do and then see what they *in fact* do. In the course of this I would pay particular attention to some product area where the new-good problem is most prevalent. Being painfully aware of the impact of obsolescence, as distinct from wear-and-tear, on my computer budget, I probably would choose some part of the electronics industry as the basis of a case study. In the end I would call the resulting paper something like "The New-Goods Problem from the Perspective of Price Index Making in Countries X and Y," after trying to get, say, Canada and Japan to serve as X and Y. How nice that I've been spared the need to defect to Canada to avoid this draft. To run the metaphor into the ground, how ironic that Canadians have done my work for me already.

There is so much ground to cover in seeing how countries handle the new goods problem that it would be mean-spirited to complain if the authors did something different from what I would have done. Since consumption is considerably larger than investment, I probably would have started with the Consumer Price Index. (That would have the advantage of enabling me to apply my favorite index number test that really goes with improved rather than new goods but it comes to much the same thing: If it costs no more to produce yellow tennis balls than white ones but playing with yellow ones is universally regarded to be better than playing with white ones, does the price index calculation properly reflect the ıeduction in cost of playing enjoyable tennis?) Since working with producers' goods is necessary before the whole job is done, perhaps which is taken up first is only a matter of taste and ease.

As I look at the whole paper, I see many questions left open, but that is exactly what should be expected at the beginning of a long-term effort. Beginnings excite less attention than endings, but in fact may be harder to carry out. Long journeys begin with many small steps, and Rome wasn't built in a day.