Producer Price Index Aggregation Models and the Expansion Into the Service Sector

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Abstract

The paper presents an overview of three aggregation models either in use or proposed by various countries. Each model is evaluated in terms of its utility for accommodating the expansion of a goods oriented Producer Price Index to encompass goods and services. The paper concludes with a discussion of alternatives to publishing an economy-wide goods and services aggregation. The paper should prove useful in providing insights into the issues and problems in index aggregation caused by expanding coverage into services.

The views expressed are those of the author and do not reflect the policies of the U.S. Bureau of Labor Statistics.

I. Introduction

The Producer Price Index Programs (PPI) in most countries calculate an index that is limited in scope to measuring prices received by the goods producing sector for direct sale of their output. The goods producing sectors generally refer to agriculture, forestry, mining, manufacturing, and public utilities. The PPI is meant to achieve two goals: 1) Provide price indexes for use in the deflation of gross domestic product data; and 2) Provide a general measure of inflation. The PPI is usually one of a number of price programs produced by statistical agencies in each country. Other indices include: 1) The Consumer Price Index which measures price change for households; and 2) International price indices that measure price change for imports and exports. This still leaves a large price data gap for non-goods output producing activities sold to other businesses. In national income accounting terminology, this gap includes intermediate demand output for the transportation, communications, business services, and trades sectors.

The deflator use largely focuses on detailed PPI indices. The use of the PPI as a general inflation indicator introduced the issue of index aggregation. It is highly desirable to calculate a summary statistic that gives a general measure of price inflation. Different solutions have been put forward including: 1) An all item summary statistic similar to the CPI; 2) Commodity or industry-based stage of processing models; and 3) Stage of production or transaction flow models. More and more countries are now actively pursuing an expansion of the PPI into what is loosely termed “services”. But as the sectoral coverage of the PPI expands, its utility as a general measure of inflation also increases. This makes the index aggregation question ever more central. What price experts are discovering is that the solution to the index aggregation question has very major implications for a host of critical objectives for the PPI index and for the methodologies to be employed in surveying activities. It is becoming clear that a resolution to the index aggregation problem should be the starting point for any PPI expansion into the service sector.

This paper will provide a general overview of the different approaches to PPI index aggregation that have been discussed or implemented in various countries. Strengths, weakness, and problems with the various approaches will be discussed. It is hoped that this paper will prove useful for statistical agencies faced with the problem of integrating services coverage into a broader aggregate index structure. The paper is divided into five sections. The first section sets forward general principles that define and/or bound the activity of PPI surveying. The second section presents the alternative aggregative models. The third section discusses problems associated with the various aggregative models. The fourth section discusses various sectoral coverage alternatives. The fifth section provides a brief summary.

II. PPI General Principles

Before delving into the substance of this paper, a discussion of alternative aggregative models, a brief discussion of PPI principles and survey methods is in order. This should serve to minimize any misunderstandings. These principles are generally applicable internationally, but they may not be strictly applicable universally. This section will touch on the following four topics: definition of the PPI, pricing and quality adjustment methodology, aggregation problems, and demand based or supply based index structure.

A. PPI Definition

The Producer Price Index measures the change in price received by the producer of marketed domestic output. The output concept conforms to the appropriate national income accounting definition. Non-output generating activities, such as the sale of used capital equipment, are out of scope. Exports are included and imports are excluded from the scope of the PPI. Output generating activities that do not entail a market price or close proxy for a market price are out of scope. The major such exclusions are public administration and owner occupied dwellings. Thus, the scope of the PPI is extremely broad. Finally, adherence to national income accounting output definitions requires measuring many transactions on a margin basis. Such sectors include retail and wholesale trade and transportation.

B. Pricing and Quality Adjustment Methodology

The pricing methodology requires surveying for net transaction prices representing the shipment price. The net transaction price is the effective price received by the producer of the good or service at the time the good or service is made available to the initial customer. The initial customer need not be another business entity, but could be a householder, government entity, or foreign purchaser. As the theoretical PPI covers all market transactions, the buyer could be classified in either intermediate or final demand. Quality adjustment should reflect a producer cost basis for holding the inputs constant and not a consumer utility approach. This is tied to the theoretical model behind the PPI, which is the Fixed-Input Output Price Index. This model requires that the index represent fixed quality, which holds inputs constant. Therefore, any product substitution requires quality adjustment to factor out any change in inputs between the obsolete good and the newly substituted replacement good.

C. Index Aggregation

The primary issue underlying index aggregation is the need to avoid multiple counting effects that distort price movement analysis. This effect was painfully obvious in the 1970's when crude petroleum prices rose very dramatically in 1973-74 and again in 1978. The United States PPI published an "All Commodities" aggregation as its leading inflation indicator. This aggregation encompassed the pricing and weighting effects of crude petroleum, refined petroleum, and products whose chief material input was petroleum based. This accorded undue weight for the petroleum price shock at the All Commodities level and overstated the inflation rate. It did this by the multiple counting of the price impact at all stages of processing.

Multiple counting problems are a function of employing improper weights when constructing the index aggregate. Many of the models discussed in Section III eliminate the problem by avoiding the All Commodities approach. Another alternative is to apply a net weighting approach. This reduces the weight of any product line to its revenue weight as it leaves the aggregation. In this case, the weight of crude petroleum would be reduced to only reflect government purchases and exports as all other revenue weight is consumed as a material input in the production of processed goods. Applying net weighting to an All Commodities aggregation totally nets out all intermediate demand and leaves only final demand. As we shall soon see, this is identical to the last stage in both the stage of processing and stage of production models.

D. Demand Based or Supply Based Structure

The statistical office has two sets of decisions to make relating to demand versus supply based indices. The first set of decisions revolves around frame creation and sampling. Does the statistical agency survey the provider of the good or service, which is industry or supply based, or the purchaser of the good or service, which is demand based. The frame construction and sampling decision may or may not dictate the second set of decisions on whether to publish a supply based or demand based index. With the availability of accurate Input/Output data from the national income accountants, a demand based index structure can be achieved while surveying the producers of goods and services. Pricing methodology is only an issue for the varying treatment of indirect business taxes and freight charges to bring the goods to market. These should be the only cause of differences if net transaction prices are collected from either the producer or customer.

Ideally, a demand based structure follows the principle of substitutability of products. In practice, commodity based index structures have been created in many countries that accommodate similarity in end use, which is demand based, but may also distinguish between differences in material composition, which may well violate the demand based principle. Undoubtedly, it is more difficult to realize a conceptually strong version of a demand based structure than a supply based structure. Frame sources to permit the efficient sampling of buyers for a broad range of goods and services are generally missing. Also, the task of operationalizing the concept of substitutability for defining commodity categories is extremely difficult.

III. Alternative Aggregate Models

Three models have been identified that can be constructed in a manner consistent with the general principles discussed in Section II. These models are: 1) Stage of processing, 2) Stage of production or transactions flow, and 3) Final demand/intermediate demand I/O. In practice, these models have generally been operationalized as commodity indices. That does not preclude using a supply based approach at least in some instances such as stage of processing. I/O data support either approach.

A. Stage of Processing Models

Stage of processing models are built on the notion that output production occurs on a linear basis. The farming sector grows and harvests wheat. The wheat goes to a flour mill and is processed into flour. The flour is sold to a commercial bakery which manufactures cookies. The cookies are sold at retail to the ultimate consumer. The primary identity relationship derives from the I/O and is, therefore, empirically observable. The last stage is defined as input to final demand, and captures the last of the fabrication activity. The assembly of an automobile is the last stage of processing. Whereas automobile engine manufacturing or parts manufacturing represents an earlier stage.

Of most popularity currently are three stage models. Generally the stages are crude, semifinished, and finished. Services have not, as yet, been integrated into these models. So the terminology used is usually related to the goods sector. I/O data only distinguish between final demand and intermediate demand flows. Final demand identifies the finished goods stage, but some additional decision rule is necessary to distinguish between crude and semifinished products. One very popular approach is to use an economic definition to anchor the crude stage and have the residual commodities fall into the semifinished stage. Another approach is to utilize a mathematical algorithm based on forward flow data extracted from the I/O. This can be accomplished utilizing a supply side approach.

An industry approach to stage of processing assigns the entire output of an industry to a specific stage based on some empirical rule. For example, if 75 percent of the output of an industry goes to final demand then the industry is classified in finished goods. The industry based approach introduces an economic actor into the model. The industry is an aggregation of homogeneous economic decision units. The commodity based model treats commodity flows as phenomenon unrelated to any economic decision unit. The latter approach limits the utility of the model analytically as it prevents integration into a broader model incorporating other key economic variables such as wages.

The primary advantage of the stage of processing model is its ability to largely avoid the multiple counting problem while displaying data for the entire goods sector. All output revenue is included in the model, but since it is apportioned across many stages it reduces the multiple counting effect. As the model approximates the flow of goods in the economy, it presents insights into how goods price movement affects prices at latter stages. This gives the model limited predictive capabilities. But demand influences at later stages and labor input costs may well work to moderate material input cost pressures, thereby greatly limiting the predictive power of the stage of processing model.

B. Transactions Flow Models

Stage of production or transactions flow models are quite similar to stage of processing models. The major difference comes from following a single decision rule in determining where any transaction falls within the defined stages. A forward flow with

no skips decision rule is followed. Our wheat to flour to cookie example will show the difference between transaction flow and stage of processing. In our stage of processing model we define the first stage of crude goods as products of nature that have not undergone any processing. Semifinished goods is the stage where processing occurs, but the good is not in its final fabricated form yet. Finished goods is the stage where the good is completely fabricated. The sale of wheat would map into crude, whether it was shipped to a flour mill for further processing or directly exported.

In the transactions flow model, some sales transactions of wheat would be classified in the first stage of production. This would be wheat that becomes flour, that becomes a cookie. Some wheat would be classified in the second stage. This would be wheat which becomes flour and is then sold at retail for use in the home. Some wheat would be classified in the third stage of production. This would be wheat sold directly at export. In the transactions flow model one would classify looking at how many transformations occurred working back from final demand and not allowing any skipping of a later stage of production.

Unlike the stage of processing model, the transactions flow model always requires empirical data to identify what portion of sales of any given commodity map into a specific stage of production. Stage of Processing models usually fall back on an economic definition for the first or crude stage. As with stage of processing models, multiple counting problems become less severe as the number of stages of production increase. Theoretically, any number of stages can be specified.

This model has the same advantage as the stage of processing model in its ability to largely avoid the multiple counting problem while displaying data for the entire goods sector. It solves the export problem in a non-arbitrary way by always placing such goods in the last stage of production as the sale goes to final demand. The stage of processing model faces a dilemma for a product such as wheat. It is a crude good and therefore should map into that stage, but it is not further processed domestically, so it meets the finished goods definition. The primary limitation of the transactions flow model is that the various stages of production cannot be given an economic definition beyond the last stage, which accommodates an input to final demand concept.

C. Final Demand/Intermediate Demand Models

This approach utilizes the national income accounting concepts of final and intermediate demand to create two separate categories for classifying goods and services. A summary statistic for input to final demand would avoid any multiple counting problem. However, a summary statistic for intermediate demand would be substantially distorted due to multiple counting. The model that the United States is proposing, which encompasses the goods and services sectors, would not have an intermediate demand summary statistic. The two-stage crude and semifinished goods aggregations would be preserved from the stage of processing model. Services would be a separate aggregation as would the distribution sector.

This model could either be supply or demand based. As the model clearly relates to the Input/Output table, it appears preferable to make this demand based in accordance with the I/O structure. This is an accounting model and not an economic model. It is implicit in this model that an economy-wide stage of processing model is not achievable. The primary difficulty is in incorporating services meaningfully in the stage of processing model. They are not material inputs, but are consumed by all businesses at all stages and by all final demand sectors. It is quite unappealing to label something a crude or semifinished service when in fact the service will not be further modified. Should all services map into finished goods as they are not to be further processed? Or should they all map into crude as they are consumed by all goods producers, although not transformed in the process and incorporated in the fabricated good.

The advantage of this model is its ability to allow for a final demand aggregate index inclusive of services and without any multiple counting. It displays data on an economy-wide basis, but does not permit the creation of an integrated model for intermediate demand.

IV. Model Limitations

Any aggregative model chosen should be evaluated against a criteria to determine the strength and desirability of such a model. The criteria proposed would be as follows: 1) The model would maximize forward flows and minimize skips, internal flows and backflows, 2) The model would facilitate integration with other non-price statistics, such as labor costs, 3) The model would facilitate economic interpretability of changes in prices in the economy.

A. Skips, Backflows, Internal Flows and Forward Flows

The aggregate model maximizes its utility by minimizing skips, backflows and internal flows. These are defined as follows:

1. Skips are transactions that would jump from one stage, such as from crude goods, to a much later stage, such as to finished goods while skipping intermediate goods. Wheat is a crude good and would be classified in the first or crude goods stage. If it is processed into flour and then sold at retail to households it skips the intermediate processing stage and goes directly to the third or finished goods stage. Skips make interpretation of price movements ambiguous as we expect price movements at the earlier stage to be a measure of material input prices for the very next stage.
2. Backflows are transactions from a later stage, such as finished goods, to an earlier stage. Gasoline is a finished good as it will not be further processed before being consumed. Yet the gasoline sold to a farmer to operate his tractor is an input to the crude goods stage. Backflows reverse the direction of price change causality and greatly confuse analysis.
3. Internal flows are transactions that fall within a stage. A steel mill manufacturing steel sheets is classified in the intermediate processing stage. The steel sheet is shipped to an automobile stamping plant for fashioning automobile hoods and fenders. This too is an intermediate processing activity. Transactions occurring

within a stage are, in fact, instances of multiple counting and can distort aggregate price measures greatly.

4. Forward flows are shipments from an earlier stage to a later stage. The wheat produced in the crude stage is shipped to the flour mill in the intermediate stage and then to the commercial bakery in the finished goods stage. The flows are all forward from the first stage to the second and to the third. As there are no skips, backflows or internal flows in this example, the model provides an unambiguous picture of price change as a flow through the economy.

The three models have varying success at maximizing forward flow and minimizing the other flows.

a. Stage of Processing

This model generally defines the final stage first and then works backwards to define the earlier stages. The final stage can either be defined as finished goods or input to final demand. This may or may not be the same thing and is also dependent on the decision rules used to make the determinations. An entire industry output or commodity category could be mapped into a single stage based on some type of majority rule. Wheat is mapped into the crude or first stage if most of wheat is shipped to a domestic flour mill for processing. If most of wheat is sold as an export, wheat would map into finished goods or the last stage. If Input/Output weights were used to map commodities without any majority rule, wheat sold in the export market would map into the last stage and wheat sold domestically to flour mills would map into the first stage. In practice, the term finished goods has been used by statistical agencies to mean that the good is not further processed by domestic industry. Wheat sold at export may well be further processed abroad and government purchases may well be subject to further processing.

While the final stage can be defined to eliminate the multiple counting problem, by eliminating internal flows, it is much more difficult to define the remaining stages. A three stage model generally causes a significant internal flow problem. Many sophisticated goods require far more than three stages of production to fabricate the final good. Tracing the path of steel in manufacturing an automobile provides an example. Iron ore is mined and shipped to a blast furnace. The steel sheet is shipped to an automotive stamping plant. The stamped body part is shipped to the automotive assembly plant. This encompasses four stages.

Another facet of the internal flow problem is evidenced by looking at a fabricated intermediate product and the inputs required for its fabrication. An automobile engine is an intermediate good as the finished good is the assembled car. Inputs to the engine include aluminum and steel based intermediate products. A serious backflow problem exists for a good such as gasoline, which is a finished good but is used as an input to run machinery and equipment by earlier stage farmers and manufacturers. Skips occur for our wheat sold to flour mill sold to retailer case. The intermediate goods stage is skipped as wheat is classified in the crude stage and the flour is in finished goods as it is sold to

retailers without further processing. As we increase the numbers of stages in the model, skips become an ever greater problem.

b. Stage of Production

This model is similar to stage of processing models in how it sets the final stage. The earlier stages are constructed to eliminate the skip and backflow problems. This model either must define a significant number of stages in order to eliminate the internal flow problem or remains as subject to internal flows as the stage of processing model. By eliminating the backflow and skip problems, the stage of production model does not permit meaningful economic definitions for each stage earlier than the last stage. In a three stage model, wheat would appear in the second stage in our wheat to flour to retail trade example. Wheat would appear in the first stage in our wheat to flour to baked goods to retail trade example. This prevents labeling the first stage crude goods as we could in the stage of processing model. Similarly with wheat classified in the second stage, we could not classify the second stage as intermediate goods. Therefore, all but the final stage cannot be given user friendly definitions and make interpretation by data users extremely difficult.

c. Final Demand/Intermediate Demand

Unlike the other two models, this is strictly limited to two stages as defined by the Input/Output concepts of final demand and intermediate demand. The final demand stage avoids multiple counting, backflow and skip problems by adhering to the output concepts for final demand. This requires that all distributive trades, such as retail trade and transportation, be treated as margin industries where the output is defined as the value added and not gross sales price. If the distributive trades were valued at gross sales price, there would be an internal flow problem. The finished good leaving the manufacturing sector and the good sold at retail would involve an internal flow and multiple counting if both were measured at gross sales price. By treating the distributive trades as margin, the output of retail trade is strictly the value added for marketing the good and is defined as retail sales price minus vendor acquisition cost.

The intermediate demand aggregation most certainly is seriously affected by internal flows and multiple counting problems. The problems are serious enough to question whether an aggregate index for intermediate demand has any economic meaning. This strongly suggests that this approach does not yield a two-stage model. Rather, we have an unambiguous aggregate measure of inflation for output sold to final demand, a number of useful aggregations that constitute intermediate demand, but without an aggregation labeled intermediate demand.

B. Model Expansion and Integration

Two issues are of importance in evaluating the benefits of each model. The first issue is the ability to expand the model beyond the goods sector to encompass an economy-wide

measure. The second issue is the utility of the model to concord with other economic variables to allow for more powerful economic analysis.

1. Expansion to an Economy-Wide Model

Historically, PPI indices covered the goods producing sectors. The aggregation issue and solutions to the aggregation challenge have been restricted to the goods producing sectors. While some countries, notably Japan, have a series of output indices covering both goods and services, no country as yet is publishing an aggregate PPI index inclusive of goods and services. The question facing those countries with an aggressive service sector expansion program underway is how to present aggregate goods and services data to users. One solution, to be discussed in more detail in the next section, would be to publish separate indices for services apart from the PPI for goods. This section of the paper will briefly explore issues related to expanding our three basic models to encompass all output generating activities that are associated with a market or proxy for market pricing (exclusive of public administration and owner occupied structures).

The stage of processing and stage of production models have the same basic limitation when expanded to be economy-wide. The underlying concepts of flow of transaction and stage of processing relate to an input/value added/transformed output process. The wheat, the material input, is transformed into flour by a value added manufacturing process. Once services are introduced into the model we have a flow of inputs that are not incorporated in the output product. A pharmaceutical manufacturer may hire a law firm to assist with product liability claims filed against the company. Legal services would appear as an input to pharmaceutical manufacturing. But the service is not an incorporated activity in the further manufacture of a specific product. Yet in the transactions flow model and in the stage of processing model it would need to be mapped into a particular stage; but where and on what basis?

A parallel argument can be made for capital equipment. It is not consumed in the production process, but it is a necessary precursor before any production can occur. In the I/O accounts, capital equipment is viewed as a finished good and mapped into final demand because it is not consumed directly in the production of goods. Services similarly have no further transforming activity occurring to further modify them, but they are consumed when purchased. As a result, the I/O maps them into final or intermediate demand based on whether the customer is government/household/foreign buyer or a domestic business. Should we violate the I/O concept and consider a service a “finished” service similar to a finished good in that no further processing will occur to change it and map the service into our last stage in the transactions flow or stage of processing model? If that is inappropriate, how do we distinguish which earlier stage it belongs in as it is not directly tied to the material input/transformation process when producing goods? We seem to have a major problem with both models when we attempt to extend them to be economy-wide measures.

The Final demand/intermediate demand model has no such problem with mapping services. It strictly follows the I/O definition of final versus intermediate demand. For

the same reasons as discussed above, it would not be meaningful to aggregate services in intermediate demand with goods. Please refer to Appendix A showing the proposed economy-wide aggregate model for the United States. The aggregates proposed for intermediate demand differentiate between crude goods, intermediate goods, services, and distribution. The crude goods and intermediate goods aggregates are similar to the first and second stages in a goods only PPI stage of processing model. The model makes no attempt to integrate services and distribution, freight transportation and wholesale/retail trade, with goods.

2. Model Concordance With Other Economic Data

There are two reasons for valuing model concordance with other economic series: 1) The ability to use other economic data to either weight the index or assign goods and services to the appropriate stage or sector, and 2) The ability to introduce other economic variables into the model to expand the model's analytical or predictive power. Input/output data are the primary source for weight assignment and stage assignment. The final demand/intermediate demand model, by definition, is perfectly compatible with the I/O. The other two models are compatible with the I/O for determining and weighting the last stage. The stage of production model presents real problems for weighting and stage assignment. The I/O is not designed to provide such information directly. Imperfect solutions are obtainable from I/O data by attempting to triangularize the I/O matrix mathematically. Similar problems are associated with the stage of processing model if it is industry-based. A commodity based stage of processing model is largely compatible with the I/O, given that the crude or first stage is based on an economic definition and not an empirical determination.

Data users expect any multi-stage model to have predictive powers to determine the impact of any price shocks at an earlier stage on the later stages. This expectation overlooks the important impact of value-added related costs, especially for labor, and the impact of demand conditions on price. Productivity effects and return on capital investment are other key variables that could affect price. This suggests real value if our PPI indices could be integrated with other available economic data to aid in the analysis of price transmission through the economy. This suggests that an industry-based model is best suited to this goal. The stage of processing model is the only one of the three that could be meaningfully formulated on an industry basis. The other models, including the commodity-based stage of processing model, look at commodity flows and do not identify an economic operator (the business entity). This makes it impossible to concord the PPI model with data for labor, capital, or productivity. However, this does not preclude providing such industry specific data as a separate set of PPI indices to complement the aggregate model indices. This is precisely what is done in the United States.

C. Economic Interpretability

The aggregative model should provide the user with insights into how price movements are affecting the overall economy. The multiple counting phenomenon associated with a gross weighted all commodities aggregation compromises the utility of such a model in measuring macro economic price effects. Index distortions caused by such phenomena as the crude petroleum price shocks in the 1970s could lead to inappropriate public policy decisions. While all three models greatly reduce the multiple counting problem, they do not totally eliminate it.

Both the stage of processing and stage of production models are subject to some multiple counting problems at one or more stages. This is inevitable unless a very large number of stages are defined, which largely negates the usefulness of such a model. Can we define a three stage model such that all inputs to an airplane map into the three stages without any internal flows at all? That is rather unlikely given that we would be progressing from mining, to smelting and refining, to extrusion, to the fabrication of subsystems, to the fabrication of systems, to the final assembly of the airplane. Undoubtedly, given the prevalence of outsourcing, it is quite a bit more involved than a six stage process. But creating a five, six or seven stage model presents a new array of problems.

Essentially, data users expect an aggregate model to convey useful information beyond what looking at disaggregate industry or product line data could tell them. The aggregation structure must either provide useful summary data on the overall inflation rate and what is primarily driving the aggregate level price change or it must show the transmission of price change through the economy.

All three models do equally well at summarizing inflation as an input to final demand. The stage of processing model for the goods sector does the best job at showing overall inflation at the various economically meaningful stages. The stage of production model creates various stages, but does not provide for economic definition to any but the last stage. This makes economic interpretation extremely problematical. The final demand/intermediate demand model is as useful as the stage of processing model in supporting the creation of goods aggregates identical to the crude and intermediate stages in the stage of processing model.

The three models are all capable of showing price transmission through the economy when restricted to the goods producing sectors. On an economy-wide basis only the final demand/intermediate demand model accommodates service sector integration on a limited basis. The other models provide no guidance on how service sector outputs should be mapped.

V. Sectoral Coverage Options

Publication of a single economy-wide model is not the only alternative available to the statistical agency. Each country has its own traditions, historical statistical products, unique uses and users with their embedded preferences, unique sets of data needs, unique economies, available resources, access to reliable data, etc. The decision on what statistical product to produce must be driven by all these concerns. This section of the

paper will present another alternative and discuss the respective advantages and disadvantages of both approaches.

A. Economy-Wide Model

This approach requires the most widespread surveying activity. In remaining consistent with our pricing and quality adjustment general principle, we could not use data from other price programs such as the CPI in conjunction with PPI data. A consistent economy-wide model requires pricing following output concepts for determining net transaction prices and quality adjustment. Output pricing in retail trade requires using margin prices and not retail sales prices as does the CPI. Producer cost yields very different quality adjustments in many sectors than would a consumer utility approach. The out of pocket concept in the CPI could lead to a different price as for insurance. The PPI would include premium and rate of return on invested portion of premium in the price for insurance. The CPI would only include premium as the price.

Sufficient coverage of the various sectors of the economy would need to be achieved prior to publishing an economy-wide aggregate. This would require directly surveying most of the domestic economy and require considerable resources. It would involve redefining the scope of the PPI, which would require a major educational initiative to explain this change to data users. Of no small concern would be the need to deal with the perception that the economy-wide PPI was very similar to the GDP deflator. Any differences between the two series would generate media interest and user confusion. As the two series are quite different in scope, differences in measured rates of change would be quite common.

A final concern involves the potential for competition between the input to final demand PPI index and the CPI all items index. Both indexes cover the vast majority of final demand and could be expected by users to behave similarly. The reality is that weighting differences alone could lead to significantly different index movement. PPI weights would include government purchases and exports, not just consumer purchases. The CPI includes owner occupied housing, while the PPI would not. The PPI includes capital equipment, while the CPI does not. With both indexes reflecting very broad coverage, it would be difficult to explain to users which measure is most appropriate for which use. Presently, data users are conditioned to view the PPI as a leading indicator for the CPI. The two indexes would become coincident indicators.

B. Corporate Services Price Index

One extremely attractive alternative to expanding the PPI to encompass services is to create an independent index comprised solely of services. This approach avoids much of the user confusion caused by introducing an economy-wide PPI. This approach has been pioneered by the Bank of Japan. They publish a PPI that covers the goods producing sectors only and a Corporate Services Price Index (CSPI) that covers the intermediate demand component for finance, business services, transportation, communication, and real estate. The sectoral coverage for a CSPI could be as broad as all non-goods

producing activities marketed to domestic businesses (intermediate demand). This would include the margin generated by wholesale trade. It could be more narrowly focused to exclude either trade only or more narrowly to exclude all distributive activities. The exclusion of wholesale trade only is quite appealing. Wholesale trade is a large sector and would greatly influence index movement at the aggregate level. As it would be a margin measure, it would be difficult to interpret for data users.

The creation of a CSPI to complement the well-established PPI for the goods producing sector provides much broader coverage of the economy. This focuses all the statistical agency's scarce resources on filling a major gap in current price data without duplicating CPI coverage. For example, the PPI would survey commercial banking only while the CPI covered consumer banking; the PPI would survey business services for telecommunication services while the CPI covers residential services. In the economy-wide model, the PPI would be duplicating coverage of consumer and residential services in the two above examples.

This approach maintains the relationship of the PPI to both the CPI and GDP deflator. The PPI and CSPI retain the focus on business related economy activity and not consumer related activity. The CSPI would not broaden the PPI coverage of final demand and it would reinforce the perception of the PPI (and CSPI) as a leading indicator for the CPI. This also obviates the need to formulate an aggregate model that integrates goods and services. And we have seen how difficult and challenging a task that can be.

On the other hand, this strategy is not as cost effective as one might think. If the statistical agency is sampling suppliers rather than buyers, then the incremental cost of including consumer purchases when surveying for commercial purchases is rather small. Certainly, there are economies to be realized by expanding the survey to include all transactions rather than duplicate surveying of the same providers for consumer and business transactions. Joint CPI/PPI efforts are even possible and have been conducted in the United States. Of course, any such coordination must accommodate differences in pricing methodology and quality adjustment required by the different goals of the two programs. Additionally, the PPI can provide much more product line detail than the CPI. This has proved highly useful to our data users.

VI. Conclusion

The statistical agency either has determined to engage in an ad hoc expansion of its pricing activities into services with no goal for creating an aggregate index to include services, or has determined to create meaningful aggregate indexes that include services. This paper has attempted to demonstrate that how one forms the aggregate index essentially dictates which sectors should be surveyed and whether all transactions should be included, even to households. Beyond that, there is a real problem with formulating an aggregate model that encompasses services. The above discussion should prove useful in helping statistical agencies focus on the issues inherent in PPI aggregation.

Appendix A

Proposed New Aggregate PPIs

Producer price indexes for domestic outputs supplied to final demand

All outputs for final sale

Goods
- Agriculture, forestry, fishery
- Mining
- Utilities
- Manufacturing
  - Nondurable
    - Foods
    - Petroleum and coal
    - Other
  - Durable
    - Machinery
    - Computer and electronics
    - Transportation
    - Other

Construction

Distribution
- Goods transportation and warehousing
- Trade

Services
- Information and communications
- Finance and insurance
- Real estate & rental and leasing
- Professional, scientific, and technical
- Health care and social assistance
- Hospitals
  - Ambulatory
  - Other
- Accommodation and food
- Passenger transportation
- Other

Special groupings

Investment expenditures

Producer price indexes for domestic outputs supplied to intermediate demand

Services
- Information and communications
- Finance and insurance
- Real estate & rental and leasing
- Professional, scientific, and technical
- Administrative and support
- Accommodation and food
- Passenger transportation
- Other

Unprocessed goods
- Agricultural, forestry, fishery
  - Crop production
  - Animal production
  - Other
- Mining

Processed goods
- First stage
- Second stage

Distribution
- Goods transportation and warehousing
  - Motor freight
  - Other
- Trade
  - Wholesale
  - Retail

Special grouping

Business services