MEASUREMENT ISSUES ARISING FROM THE GROWTH OF GLOBALIZATION

CONFERENCE SUMMARY

November 6-7, 2009, Washington DC

Susan N. Houseman, W.E. Upjohn Institute for Employment Research
Kenneth F. Ryder, Jr., National Academy of Public Administration

AUGUST 2010

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The conference was funded with grants from
the Alfred P. Sloan Foundation and the U. S. Bureau of Economic Analysis

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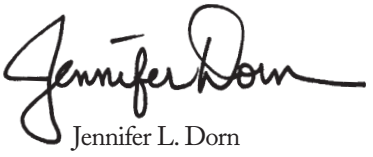
FOREWORD

The rapid pace of globalization poses significant challenges and opportunities for the U.S. economy and its workforce. The opportunities for economic growth and prosperity presented by increased trade are well known. So too are the challenges for businesses and workers, who must adjust as the location of specific economic activities among trading partners shifts and domestic industries restructure. The benefits and costs of expanding globalization, and their distribution among industries, workers, and regions have been debated in economic literature and the popular press for decades. Less well understood, however, are the challenges globalization presents to the collection of economic data and the construction of reliable economic statistics. We need more and better data to understand these effects and to formulate effective policy responses to domestic and international issues.

To improve our understanding of the impact of globalization on the adequacy and accuracy of current economic statistics, the Bureau of Economic Analysis (BEA) and the Sloan Foundation sponsored new economic research for a conference on the *Measurement Issues Arising from the Growth of Globalization,* where these papers were presented and discussed. The results of that conference, held at the National Academy of Public Administration, are summarized in this volume. The individual conference papers are available in a separate technical appendix and on the BEA, W.E. Upjohn Institute, and National Academy of Public Administration websites.

The research papers highlight critical data gaps and deficiencies that impede our ability to measure accurately the economic impact of globalization on the U.S. economy, and its workers. A number of papers examine the limitations of our currently constructed price indexes; others identify data gaps that impede our ability to measure the extent of services off-shoring and the impact of such activity on the U.S. labor market. Key recommendations emerging from the conference include pilot testing an input price index and improving data sharing, particularly micro-level data, among the federal statistical agencies.

We thank the Planning Group, consisting of economists from academia and the three major federal statistical agencies, for their guidance in defining the scope of the conference and the papers to be presented. Thanks also to the project co-directors, Susan Houseman and Kenneth Ryder, and other project staff for their efforts to coordinate the work of the various authors and discussants at the conference and to present the results of that conference. Finally, we extend our deep appreciation to the BEA and the Sloan Foundation, for their generous support of this important effort.



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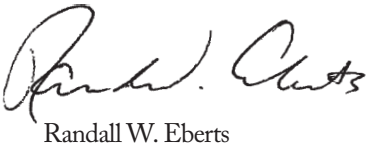

Randall W. Eberts
President
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Over the past decade a rapid shift in the sourcing of consumer products and intermediate inputs to low-wage countries, most notably China, has occurred. As currently constructed, price indexes generally do not capture price declines, often large, associated with such shifts in sourcing. This and related problems in the construction of import prices have prompted concerns that the real (constant dollar) growth in imports has been understated and domestic productivity and real output growth have been overstated.

New research commissioned with funding from the Bureau of Economic Analysis and the Alfred P. Sloan Foundation examined three aspects of the issue: 1) What is the precise nature of the price measurement problem? 2) Is there concrete evidence of biases to price indexes and to output and productivity measures? and 3) What are the solutions?

The fact that price indexes generally fail to capture price declines associated with a shift in sourcing to low-cost suppliers—whether domestic or foreign—is widely recognized. Although a large body of research has examined biases to the Consumer Price Index (CPI) resulting from the growth in discount retail chains, biases to price indexes resulting from the growth of imports from low-wage countries had not been previously considered. The increased import penetration in consumer goods and intermediate inputs and the large price differentials between domestic and foreign suppliers—as documented in the research papers—have increased the possibility that some economic statistics are significantly biased.

Research uncovered anomalies in recent price index trends, providing concrete evidence of a problem. In instances where import penetration in consumer goods has grown significantly, import price indexes generally have risen faster than consumer price indexes, suggesting that the import price indexes have not accurately captured the lower prices that have prompted many retailers and consumers to shift from domestic to imported goods. Similarly, although manufacturers increasingly have been sourcing intermediate inputs from low-cost foreign suppliers, the import materials price deflator has been rising faster than the domestic materials price deflator, indicating that these price indexes often fail to capture the cost savings driving manufacturers' offshoring.

If the growth of import prices is overstated, then the growth in imports in real terms will be understated. Moreover, an understatement of the real growth in imports implies that domestic productivity and real output growth will be overstated. Although the size of any bias to productivity and output measures for the aggregate economy is unknown, evidence in the research papers points to the possibility of sizable biases in some sectors, including manufacturing and construction.

The Bureau of Labor Statistics has proposed a new input price index to help address this fundamental problem in industry statistics. Currently, input price deflators are constructed from surveys of domestic producers and importers of inputs and may miss a price decline when businesses shift to a low-cost supplier for their inputs. The proposed index would directly survey the purchasers of inputs, who could report the price change of a given item irrespective of its source. Congress should provide modest funding for a pilot of the proposed index to determine its feasibility.

The bias to price indexes from offshoring is one of many serious challenges facing statistical agencies as a result of globalization. Because the destination of imports to final consumers, industry, and government is not tracked, agencies must make assumptions about how imports are used in the economy in the construction of statistics. This coupled with long lags in updating information on the structure of U.S. industry (from benchmark input-output tables) may have resulted in significant inaccuracies to economic statistics in recent years, a period characterized by rapid globalization and changing supply chains. In addition, trade in services is

rapidly expanding, reflecting the role of the Internet and other technological developments in communications. The lack of industry detail in domestic services and services trade data, of data on export and import service prices, and of longitudinal occupational data for the U.S. economy seriously hamper accurate measurement of these trade flows and analysis of their impacts on the U.S. economy and workers.

The pace of globalization is unlikely to abate in the near future; our need to assess the impact of this continued expansion will similarly increase. Filling these data gaps is critical for such assessments and will require at least modest increases in funding for international statistics. In some cases, information gaps could be filled by linking existing data collected by various federal statistical agencies. The efficient use of existing data, however, is greatly limited by the remaining legal restrictions on sharing microlevel data among agencies. Congress should modify the Confidential Information Protection and Statistical Efficiency Act to allow the sharing of business tax data and thereby realize the original goals of that act.

CONFERENCE SUMMARY

The rapid pace of globalization greatly complicates the collection of economic data and the construction of reliable economic statistics. At the same time, the growth of globalization underscores the need for reliable economic statistics to understand its effects and formulate policy responses. New research sponsored by the Bureau of Economic Analysis (BEA) and by the Alfred P. Sloan Foundation was presented at a conference on *Measurement Issues Arising from the Growth of Globalization*, held in Washington, D.C., November 6–7, 2009, to address these concerns.[1]

Research supported by the BEA focused on potential biases to import and input price indexes and their consequences for domestic output and productivity measures. Eight of the 15 research papers presented at the conference dealt entirely or in part with potential biases to input price indexes arising from the growth of imports and the implications for measures of productivity and output growth in aggregate and industry statistics. Collectively, these papers

- explained the theoretical nature of the price measurement problem and formally characterized the bias to price indexes;
- provided a variety of direct and indirect evidence of the scope of the bias to prices, productivity, and output statistics;
- proposed the construction of an input price index based on a survey of input purchasers to address the problem.

The first section of this report synthesizes the findings from these papers.

New research presented at the November conference also addressed data gaps and other serious measurement issues that arise from the growth of globalization and that affect policymakers' ability to assess the impact of globalization on the U.S. economy and American workers:

- *Services offshoring.* Papers reviewed recent progress and remaining gaps in measuring trade in business and professional services and proposed alternative ways to survey businesses on offshoring activities.
- *Import comparability assumption.* Because surveys do not track the destination of imported goods and services to private industry, government, and consumers, BEA assumes in the construction of its statistics that industries use a particular imported product in proportion to their overall use of that product in the economy. Papers considered evidence that this proportionality assumption is violated and the resulting biases to statistics from that violation.
- *Measuring the labor market impacts of services offshoring.* Papers identified data needed to track the labor market effects of services offshoring.

The conference paper findings pertaining to this set of measurement issues are summarized in the second part of this report. Recommendations are presented in the concluding section.

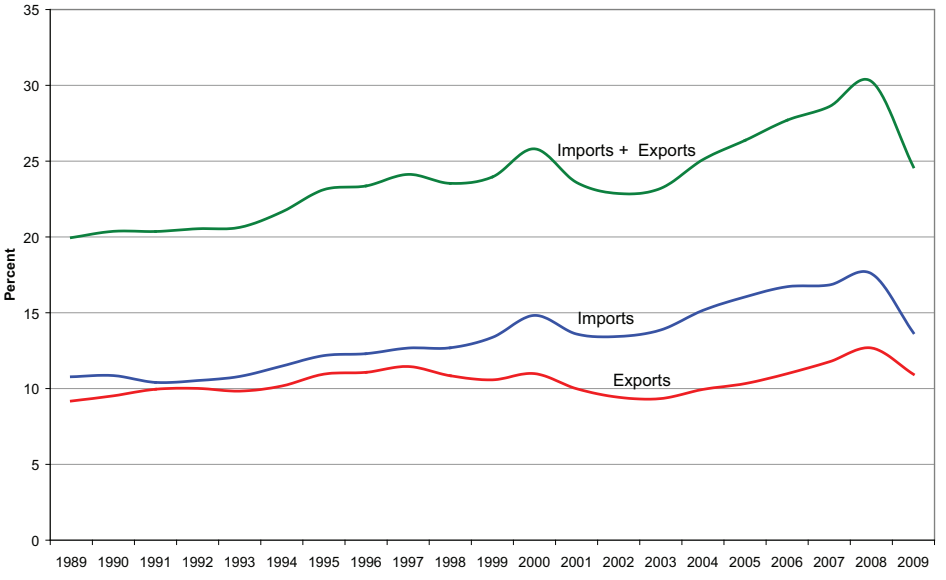
I. OFFSHORING: SHIFTS IN SOURCING AND BIASES TO IMPORT AND INPUT PRICE, PRODUCTIVITY, AND OUTPUT MEASURES

Background

Among the most important developments in the U.S. economy in recent years has been the rapid growth of trade. Accurately accounting for the growth of trade in the U.S. economy is critical to accurately measuring key economic indicators such as gross domestic product (GDP) and productivity measures. Accurately measuring trade is also important for understanding the likely effects of globalization on employment patterns and on the distribution of income in the United States.

[1] The final conference program appears in Appendix A.

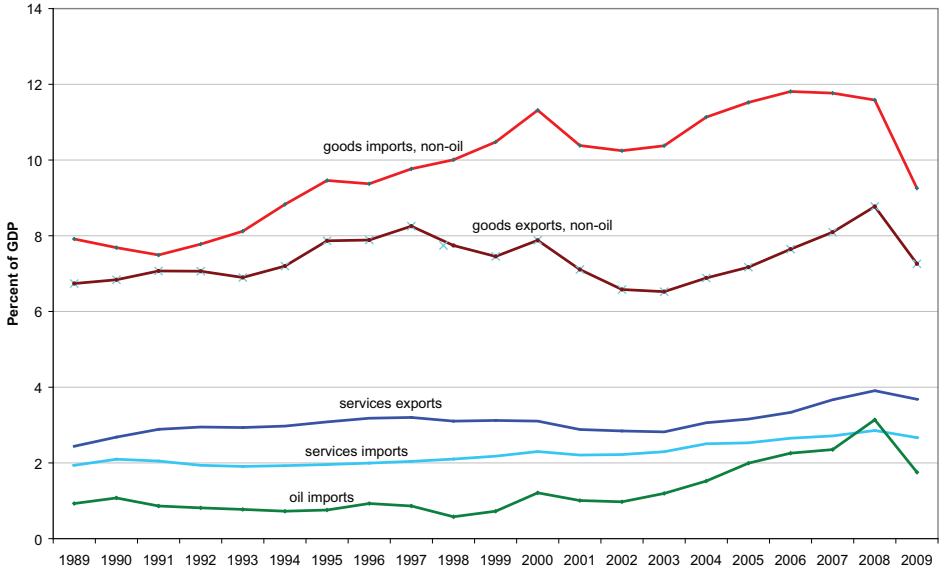
Figure 1: Imports and Exports as a Percent of GDP



Source: Bureau of Economic Analysis, National Income and Product Accounts.

Figure 1 illustrates the dramatic increase in the size of U.S. trade relative to that of the domestic economy. In 1989 the total value of imports plus exports of goods and services was equivalent to 20.0 percent of GDP in the United States. By 2007, the year prior to the onset of the current recession, that figure had risen to 28.8 percent, and almost all of the increase was attributable to an increase in the relative value of imports. The gap in the growth in imports relative to exports resulted in the widening trade deficit.

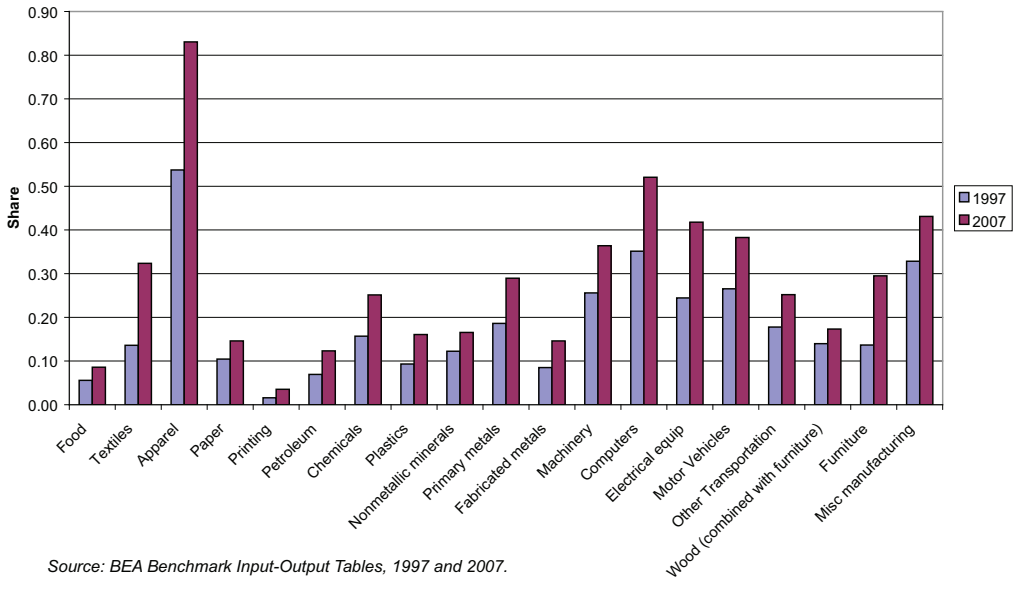
Figure 2: Goods and Services Imports and Exports as a Percent of GDP



Source: Bureau of Economic Analysis, National Income and Product Accounts.

The most important contributor to the relative increase in imports during this period was the growth of non–oil goods imports (Figure 2, p. 4). Non–oil goods imports—largely manufactured goods—accounted for almost half of total import growth, while oil accounted for about a third and services for the remainder (16 percent) of the growth. In the decade preceding the current recession, the import share of domestic consumption of manufactured goods (in final consumption and as intermediate inputs) grew in all industries, and the growth in apparel, textiles, machinery, computers, electrical equipment, motor vehicles, and furniture exceeded 10 percentage points (Figure 3).

Figure 3: Import Share of Domestic Consumption, Manufactured Goods, 1997 and 2007



Source: BEA Benchmark Input-Output Tables, 1997 and 2007.

This research and conference project was motivated by concerns that economic statistics were significantly biased on account of measurement problems associated with the rapid shift in sourcing of consumer goods and intermediate inputs overseas, particularly to low-wage countries. A special focus of the research and of this part of the report is import prices. If import price indexes fail to capture the lower prices underlying much of the shift in sourcing, then, all else being the same, U.S. industry and aggregate output and productivity statistics will be overstated.

To see the connection between imports and measures of domestic output, consider the following identities for Gross Domestic Product (GDP):[2]

$$(1) \qquad GDP = C + I + G + X - M;$$

$$(2) \qquad GDP = \sum_{i} (Si - Ni);$$

[2] This exposition follows Alterman (2009).

In official statistics, GDP is measured from the expenditure side as in Equation (1): *GDP* equals the sum of personal consumption expenditures *(C)*, private investment *(I)*, government expenditures *(G)*, and net exports (exports minus imports, $X - M$). To compute the real growth of GDP, all of these values must be deflated by the appropriate price index. If the import price index fails to capture the true price declines associated with offshoring, the real growth of imports will be understated. In other words, the real growth of imports, as measured, will not fully reflect the real value of domestic items displaced from offshoring. And if the growth in the real value of imports is understated, the real growth in GDP will be overstated.

Alternatively, GDP may be computed as the sum of value-added—sales of all products less intermediate inputs $(S_i - N_i)$ across all industries in the economy. To measure the real growth of industry value-added, sales and input costs must be deflated. Currently, input price deflators are constructed indirectly from producer price indexes (which are based on output prices) and import price indexes. The growth rate of GDP may be computed as a weighted average of the real growth in value-added across industries. Any overstatement of the input price index, as would occur if import price indexes fail to capture price declines associated with shifts to lower-cost foreign suppliers of intermediate inputs, will result in an understatement of the real growth of intermediate inputs and an overstatement of the real growth of industry value-added and GDP. Any understatement of real input growth also will directly lead to an overstatement of multifactor and labor productivity growth. Conceptually, multifactor productivity for an industry or sector represents the part of the growth in real gross output that cannot be explained by the growth in real inputs (capital, labor, energy, materials, and services). If real input growth is understated because input prices do not capture declines associated with shifts in sourcing to low-wage countries, then multifactor productivity will be overstated. Labor productivity is measured as industry or sector value-added or GDP divided by labor input. If the measure of the growth of real value-added or GDP is inflated because of offshoring, then the growth of labor productivity will be overstated. In other words, to the extent that price declines associated with shifts in sourcing to low-wage countries are not captured, offshoring will be manifested, in part, as an increase in multifactor and labor productivity.

Overview of Price Measurement and Shifts in Sourcing to New, Low-Cost Suppliers

The Bureau of Labor Statistics (BLS) is responsible for collecting price data and constructing price indexes that are used to deflate purchases made by consumers, businesses, and the government sector in the construction of various statistics published in the industry and national income accounts. The survey underlying the Consumer Price Index (CPI) samples prices of items at retail outlets, the Producer Prices Program surveys establishments for the prices producers receive for a sample of goods and services sold, and the International Prices Program surveys importers and exporters on the prices they pay or receive for a sample of items imported or exported. Diewert and Nakamura (2010, pp. 4–6) provide a more detailed discussion of each of these price programs.

In examining biases in price indexes arising from the growth of globalization, papers supported by this project focus on price problems associated with new suppliers: biases resulting from the rapid shift in sourcing to low-cost countries. In addition, there is some consideration of inadequate adjustment for product quality in the construction of international price indexes, particularly in high-technology products and services.

To understand the cause of the former bias, it is important to appreciate that the BLS takes great care to ensure that it is pricing the same item over time, and thus that price indexes are based on "apples to apples" comparisons. Conceptually, each observation used in the construction of a particular price index represents the period-to-period price change of an item as defined by very specific attributes and reported by a specific establishment.

In constructing the CPI, suppose BLS samples the month-to-month price change of, for instance, a 14-ounce box of Honey Nut Cheerios at a particular Wal-Mart store and the price change of the 14-ounce box of Honey Nut Cheerios at a mom-and-pop grocer across town. The BLS would then take some weighted average of these and other observations on local breakfast cereal price changes for constructing the lower-level CPI index for that item and geographic area. Importantly, the BLS would not compute the price change for Honey Nut Cheerios as the difference in the average price of Honey Nut Cheerios sold at the two stores in one month and the average price of Honey Nut Cheerios at the two stores the next month.

If the Wal-Mart offers systematically lower prices than the mom-and-pop grocer and its lower prices attract more shoppers to the Wal-Mart over time, then the CPI would not capture price drops enjoyed by consumers as they switch outlets. The problem has been dubbed "outlet substitution bias" in the CPI literature (Diewert 1998; Greenlees and McClelland forthcoming; Hausman 2003; Hausman and Leibtag 2006; Reinsdorf 1993).

More generally, a consequence of efforts to carefully control for product attributes in the collection of price data is that price indexes are not designed to capture price reductions resulting from the entry and market share expansion of low-cost suppliers. Although this problem has been widely discussed in the literature on the CPI, until recently, the implications for other price indexes have received relatively little attention. As with the CPI, input price indexes, as currently constructed, would often fail to capture the price reductions businesses realize when they shift purchases to low-cost suppliers. Consider the case of semiconductor wafers examined in Byrne, Kovak, and Michaels (2010). The authors find that semiconductors with observationally identical specifications are produced in the United States and in countries such as Japan, Taiwan, Singapore, and China. The producer price index (PPI) for semiconductors is constructed from observations on period-to-period price changes, as reported by sampled domestic producers, for wafers with precise specifications. The import price index (MPI) for semiconductors is constructed from period-to-period changes in the prices, as reported by sampled importers, for wafers with precise specifications

To illustrate the circumstances in which the price indexes likely will and will not capture price declines as businesses shift their input purchases to low-cost suppliers, suppose that China enters as the new low-cost supplier of a specific semiconductor wafer and competes against higher priced suppliers in Japan and the United States. If an importing establishment switches from the Japanese to the Chinese supplier of the wafer, that importer should be able to accurately report the price change, irrespective of country of origin; thus the MPI should capture the price decline. If instead, the user of the wafer—for example an electronics firm—shifts its sourcing from the Japanese supplier, which it obtained from one wholesale importer, to the Chinese supplier, which it obtains from a different wholesale importer, the price drop would be missed by the MPI. The import prices program samples importing establishments and neither importer could report the price change experienced by clients that shift from one to the other.

Similarly, if the user of the wafer input shifted from the U.S. supplier to the Chinese supplier, neither the PPI nor the MPI would capture the price decline. As a result, the input price index, constructed from the PPI and MPI, would be upwardly biased. This last scenario is illustrated in a schematic diagram in Houseman, Kurz, Lengermann, and Mandel (2010, Figure 4).

Alterman (2009, p. 2) provides a numerical illustration of this problem. In his example of chair production, Chair A is always produced domestically, Chair D is always produced abroad, but the production first of Chair B and then of chair C shifts from domestic to overseas. The respective prices of the domestic chairs and foreign chairs are assumed to be fixed over the period at $10 and $5. Thus, a shift from domestic to foreign sourcing results in a $5 drop in the price of the chair. When a shift in sourcing from domestic to foreign

producers occurs, the price change for the imported chair cannot be constructed—it was not in the preceding period—and the proper price change would be the difference between the domestic and the imported chair, negative $5. In this numerical example, the input price index, as measured, is constructed as a weighted average of the Producer Price Index (PPI) and the import price index (MPI) and does not change, because neither domestic prices nor import prices change over the period. However, the true input price index falls by 29 percent as firms shift their purchases to lower-cost foreign suppliers. No amount of reweighting of the PPI and the MPI in the construction of the input price index or improved sampling of domestic and import prices will capture the drop in prices as firms shift their purchases from domestic to foreign suppliers.

It is commonly believed that biases to price indexes from the introduction of new goods or—what is observationally equivalent in the data—the entry of a new supplier of existing goods, are not large, because at any point in time the number of new goods or new suppliers is small, and because the market share of new products or new entrants is small.[3] With respect to the first point, however, recent research shows extraordinarily high product turnover in the import data (Besedes and Prusa 2006; Broda and Weinstein 2006; Nakamura and Steinsson 2009).

The second point—that biases to price indexes are small because market shares of new products or new entrants are small—assumes that subsequent growth in market share of new goods or new suppliers will be the result of subsequent relative price changes, which may be measured. The theory implicitly assumes that firms and consumers adjust purchases instantaneously to changes in relative prices and thus are always on their long-run demand curve. Because information and other adjustment costs are likely to be sizable in the short run, however, it is plausible that persistent and even large differences in price levels would exist, particularly during dynamic periods characterized by large structural shifts in global production.[4]

Recent studies based on the microdata from the import prices program suggest that much of the dynamic in import prices may be missed in the BLS indexes. In addition to evidence of high levels of product replacement—in which case there is a new product or a new supplier and the price change is missing—Nakamura and Steinsson (2009) find considerable rigidity in the prices reported by the IPP. In particular, Nakamura and Steinsson report that 45 percent of items in the IPP register no price changes during the entire period they are in the sample, and more than 70 percent have two price changes or fewer.

Whatever the reason for the rigidity in import prices, the stylized fact is important because if the import price for a particular product registers most of its relative price change after entering the U.S. market, such a dynamic, in theory, might be picked up by the IPP. The growth in market share of low-cost imports from developing economies no doubt reflects continual productivity gains in those countries, quality improvements, and declines in quality-adjusted product prices. Yet the combination of high rates of product replacement and price rigidity in ongoing products suggests that the import price index will not pick up all of this dynamic. Diewert and Nakamura (2010) formally characterize the bias to the input price index at the elemental level from shifts in sourcing:

$$(3) \qquad B_0 = P_L - P_T = (1+i)\, sd,$$

where the bias to the input price index from shifts in sourcing (B_0) equals the difference between the measured index (P_L) and the true index (P_T). This bias is proportional to the percentage discount the low-cost supplier

[3] See Aizcorbe, Corrado, and Doms (2003) for an exposition of this argument.

[4] Byrne, Kovak, and Michaels (2010) discuss the situation in the semiconductor industry, in which firms may respond to new opportunities to produce at lower average cost overseas with a long lag because they have large sunken costs in existing facilities.

offers relative to the high-cost supplier (*d*), to the growth in the low-cost supplier's market share (*s*, measured as a physical, not an expenditure, share), and to the underlying growth in prices (*i*). The characterization of the bias to the input price index in Equation (3) is identical to the characterization of the bias to the CPI from outlet substitution (Diewert 1998). In other words, it is the same underlying price measurement problem manifested in a different index.[5]

Note that Equation (3) does not impose the assumption that all market adjustment occurs instantaneously and hence that markets are always in equilibrium.[6] Some period of adjustment is fully consistent with optimizing behavior in the presence of information and other adjustment costs. However, as noted, the bias to the input price index at any point in time will be larger as the change in share held by the low-cost provider becomes larger.

The Potential for Problems in Price Indexes: Evidence on Growth in Import Shares and Price Discounts

Equation (3) illustrates the fact that biases to the input price index from shifts in sourcing overseas will be larger, the larger the growth in foreign suppliers' share and the larger the discount they offer relative to domestic suppliers. A number of papers examined whether these preconditions for significant biases to input and other price indexes have existed in recent years.

Several papers charted the rapid growth of imported intermediate inputs used in manufacturing and private industry (Eldridge and Harper 2009; Houseman, Kurz, Lengermann, and Mandel 2010; Strassner, Yuskavage, and Lee 2009). Under the assumption that an industry's use of a specific imported product is in proportion to its overall use of that product (the import comparability assumption), the share of imported material inputs used by manufacturers increased from under 17 percent in 1997 to 25 percent in 2007. Reflecting this rapid shift in sourcing, manufacturers' use of domestically produced material inputs is estimated to have fallen over the decade for manufacturers overall and within most manufacturing industries. Moreover, at the same time that imported material inputs were increasing overall, there was a substantial shift in sourcing away from advanced countries towards low-wage countries, especially China (Houseman, Kurz, Lengermann, and Mandel 2010). The share of all imported intermediate inputs rose from about 8 percent to 10 percent between 1998 and 2006 for all private industries and from about 13 percent to 20 percent for manufacturing (Eldridge and Harper 2009).

Reflecting the large shift in sourcing of intermediate inputs, Eldridge and Harper (2009) estimate that, from 1998 to 2006, the growth in foreign intermediate inputs accounted for 14 percent of labor productivity growth in nonfarm private business and for 23 percent of labor productivity growth in manufacturing. The growth in imported material inputs accounted for most of that contribution.

Case studies examined shifts in sourcing in two important manufacturing industries: semiconductor production and auto parts. Using detailed proprietary industry data, Byrne, Kovak, and Michaels (2010) discuss the movement of semiconductor wafer production toward the low-cost countries of Taiwan and, especially, China in recent years. Klier and Rubenstein (2009) document the shift in the composition of imported auto parts from 1996 to 2008 away from high-wage countries, particularly Canada, toward low-wage countries.

These case studies also provide some hard data on the magnitude of the cost savings from shifts in sourcing—i.e., the discount, *d*, in Equation (3). Byrne, Kovak, and Michaels (2010) find evidence of sizable cross-country

[5] Although the focus of this study is on biases arising from shifts in sourcing overseas, biases to price indexes also will arise from shifts in sourcing from high-cost to low-cost domestic suppliers. Indeed, outlet substitution bias in the CPI is an example of such a bias.

[6] Similarly, Diewert's characterization of the bias to price indexes arising from the introduction of new goods allows for the share of the new good to increase even if relative prices do not change (Diewert 1998).

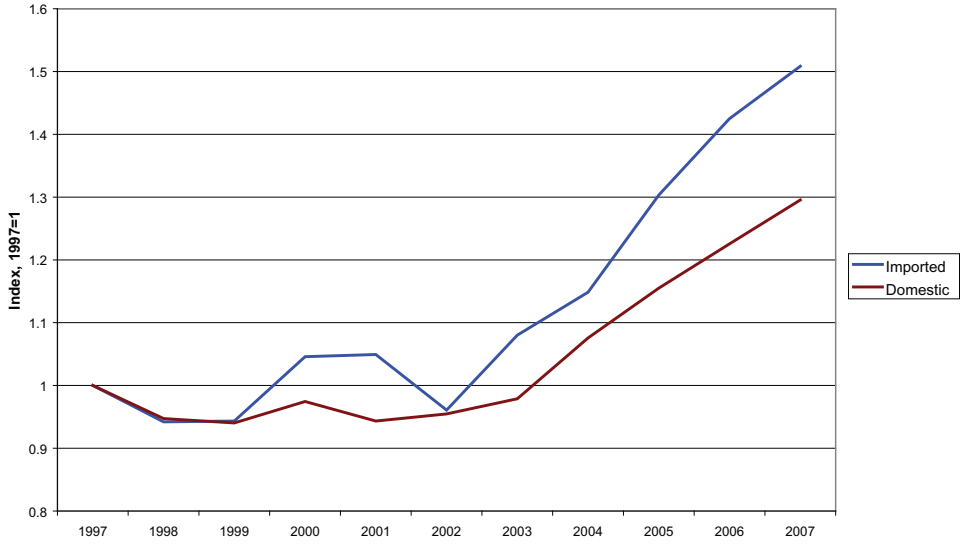
differences in the prices of identical semiconductor wafers. On average, they find that, compared to prices of semiconductor wafers produced in U.S. foundries, prices were about 40 percent lower in China and about 25 percent lower in Singapore (Byrne, Kovak, and Michaels, Table 7).[7] Klier and Rubenstein (2009) collected data on the offshoring of aluminum wheel production to Mexico; they find that overall costs were 19 percent lower and that savings on processing costs were 36 percent.

Using import price data to proxy for the discount from offshoring of goods production, Houseman, Kurz, Lengermann, and Mandel (2010) find large, systematic price differences between imports from advanced, intermediate, and developing countries, controlling for detailed product code (HS10), importer, and time period. Large discounts remained, even after using various methods to control for possible heterogeneity within the narrow product codes.

The magnitudes of the discounts found in research presented at this conference are consistent with reports of large discounts in the business literature. For example, *BusinessWeek* (2004) reported that prices of imported goods from China typically were 30 to 50 percent lower than the prices for comparable products produced in the United States, and that the discounts were sometimes higher. Estimates of the savings from offshoring auto parts production to Mexico are generally in the range of 20 to 30 percent (Kinsman 2004). The National Association of Manufacturers (NAM) and the Manufacturers Alliance (MA) provide periodic estimates of the labor costs, adjusted for productivity differences, of manufacturing in the major U.S. trading partners as compared to the United States. Between 2002 and 2009, productivity-adjusted labor costs were estimated to be 58 to 72 percent lower in China and 22 to 62 percent lower in Mexico. Although the figures from NAM do not directly show discounts for product prices, large labor cost savings are consistent with the large product discounts reported in research and in the business press.

Evidence of Biases to Price Indexes and Simulations of Biases to Productivity and Output Growth

Figure 4: Materials Price Deflators



Source: Houseman, Kurz, Lengermann and Mandel, 2010.

[7] Their estimates are from coefficient estimates in a regression equation and are expressed as logarithmic differences. They have been converted to percentage differences.

Given the large and rapid shifts in sourcing of intermediate inputs and final consumer goods to low-wage countries, and given evidence that this shift in sourcing was driven by large price differentials, import and input price indexes and productivity and output growth may be significantly biased. Figure 4, which depicts the import and domestic materials price deflators over the 1997-to-2007 period, strongly suggests that the import price indexes are not capturing price declines associated with offshoring. In spite of the tremendous market share gain by imported intermediate inputs over the period, the imported materials input price index grew *faster* than the domestic materials input price index. The higher growth of the import materials price index relative to the domestic price index is especially apparent beginning in 2002, coincident with the rapid expansion of imports from China. Similarly, anomalous patterns in price indexes are observed for final consumer goods. The price index for personal expenditure goods rose faster than the import price index for consumer goods after 2002, suggesting that import price indexes may have missed price declines associated with widespread shifts in sourcing of consumer goods to suppliers in China and other low-wage countries in recent years (Reinsdorf and Yuskavage 2009, Figure 2).

Houseman, Kurz, Lengermann, and Mandel (2010) use a growth accounting framework, with detailed data on commodities and prices to simulate the effects of biases to the input price index on productivity and output growth in manufacturing. They classify U.S. trading partners as developing (e.g., China), intermediate (e.g., Mexico) or advanced (e.g., Canada), according to the country's GDP per capita. Their estimates are based on changes in shares accounted for by imported material inputs and on assumptions about the size of the discounts (*d*) from shifts in sourcing that are consistent with evidence in the research and business literature. In the decade preceding the commencement of the recession in 2008, failure to measure price drops associated with shifts in sourcing to foreign suppliers of intermediate materials inputs could have led to an overstatement of average annual multifactor productivity growth by 0.1 to 0.2 percentage points and real value added growth by 0.2 to 0.5 percentage points. The latter represents about 10 to 20 percent of real value added growth in manufacturing. Excluding the computer sector, which accounts for a small share of manufacturing value added, the bias from offshoring may have accounted for a fifth to a half of the growth in real value added in the rest of the sector.[8] They estimate that the biases to value-added may have been sizable for other goods-producing industries such as construction as well.

Their estimates do not incorporate effects on manufacturing productivity and output measurement owing to any mismeasurement of service input prices or of capital prices from offshoring. With respect to the latter, the import shares of computers and machinery, which, for the most part, are treated as capital goods, have grown rapidly. Mismeasurement of capital prices could result in significant additional distortions to estimates of productivity and output in manufacturing and other sectors; this potential problem should be explored in future research.

While Houseman, Kurz, Lengermann, and Mandel (2010) point to potentially sizable biases in the manufacturing statistics, Reinsdorf and Yuskavage (2009) provide some corroborating evidence in an examination of consumer goods. They hypothesize that price declines associated with shifts in purchases from domestic to foreign sources will not be captured in either the PPI or the MPI, but, to the extent that the price drops are passed along to consumers, should be captured in the CPI. They construct price indexes for "suppliers" and "purchasers" for selected consumer goods from the PPI and the MPI and compare these to the CPI. Systematic evidence that the CPI grows more slowly than their constructed indexes is consistent with a problem in price measurement due to offshoring. For most consumer goods that they examine (textiles and

[8] From 1997 to 2007 average annual growth in real value-added for computer and related electronic equipment was 22 percent, compared to less than 1 percent for the rest of manufacturing, which accounts for 90 percent of value-added and employment. The extraordinary growth in real value-added in the computer industry to a large degree reflects prices that when adjusted for product improvements fall, sometimes rapidly.

apparel and all durable goods except motor vehicles), they do, in fact, find this pattern. The productivity growth for trade and distribution services implied by differences in growth rates of price indexes is implausibly large for many products. Notably, the consumer goods for which they find inconsistencies appear to coincide with goods for which import penetration from developing countries has been substantial.

Reinsdorf and Yuskavage (2009) also argue that, particularly with the rapid shifts in sourcing of consumer products observed in recent years, markets are likely to be in temporary disequilibrium, allowing those who engage in early offshoring to earn excess profits. In support of this hypothesis, they find that growth in import penetration is positively related to growth in wholesale and retail distribution margins.

Conference research did not produce estimates of the size of the bias to productivity and output measures from shifts in sourcing to low-cost foreign suppliers for the aggregate economy. Biases may have been less pronounced in many service industries than in manufacturing and other goods-producing industries. If services offshoring expands rapidly in the near future, as some predict, the absence of accurate price deflators could impart significant biases in industries, particularly service industries, where service inputs are heavily utilized.

Correcting the Bias Through a Buyer's Index

Alterman (2009) proposes a straightforward solution to the bias to the input index from shifts in sourcing: construct a true input price index based on a survey of buyers. In principle, the purchaser of the inputs should be able to report price changes in products irrespective of the source. In other words, the discount d in Equation (3) could be directly measured through a buyers' survey.

Although this is conceptually a straightforward solution, Alterman (2009) acknowledges that there may be practical impediments to conducting a survey of input purchasers. Of particular concern is whether purchases of inputs will be too infrequent to support the construction of an input index in this way for some products. The feasibility of constructing a true input price index by surveying purchasers can only be determined through a pilot study, which has been proposed by BLS.

The immediate benefits of addressing this bias to the input price index are improved statistics in the BEA industry accounts. As noted above, simulations indicate that the estimated growth in manufacturing real value-added may have been significantly lower in the decade prior to the current recession if such an index had been used. It should be emphasized that constructing an input index from a survey of purchasers should also capture price changes associated with the market entry and expansion of low-cost domestic as well as foreign suppliers.[9]

The input price index proposed by Alterman (2009) will not directly address biases to GDP, as measured by Equation (1), from shifts in sourcing. In principle, GDP could be constructed using the value-added approach, though the expenditure-side approach is preferred because the quality of the data needed for its construction is generally better. If a new input price index is implemented, research should explore ways in which information from this index can be used to inform the statistical agencies about the bias to GDP.

The consensus among conference participants was that constructing an input price index from a survey of buyers is, in principle, desirable. Michael Horrigan, Keith Hall, and Erwin Diewert favored moving forward with a pilot study of such an index. A recent report of the American Economic Association (Feenstra and Lipsey 2010) also advocates the introduction of an input price index. Katharine Abraham, Barry Bosworth,

[9] The proposed survey likely would not distinguish whether purchased inputs originated from domestic or foreign sources because businesses may purchase inputs from intermediaries and thus not know the country of origin.

and Steve Landefeld expressed reservations, primarily out of concern over the costs of implementing a new price program (an estimated $10 million to $11 million annually) in light of already tight budgets at the statistical agencies.

Special Issues Related to Prices for High-Technology Goods and Services

Rapid technological improvement in computers, semiconductors, and related electronic equipment renders measuring price changes for these commodities especially difficult. The statistical agencies have long recognized the sensitivity of industry and aggregate measures of output and productivity to the degree to which import, export, and domestic prices of high-tech goods and services are adjusted for quality changes.[10] Several papers and the conference discussion flagged these prices as an area of special concern.

One issue is whether the statistical agencies in general are adequately adjusting prices to take into account quality improvements. Using hedonic methods to adjust for improvements to semiconductor wafers, Byrne, Kovak, and Michaels (2010) argue that the BLS's PPI and its import and export series for semiconductors prices fall far too slowly.

Another issue concerns whether the statistical agencies consistently adjust prices for changes in product quality across goods and services and between imported and domestic high-tech goods. Mann (2009) points to potentially large inconsistencies in the pricing of information, communications, and technology services exports. Computers and related equipment account for a large share of imported commodities, and failure to consistently adjust domestic and traded goods may result in significant distortions to national and industry accounts data. Houseman, Kurz, Lengermann, and Mandel (2010) find that growth in real value-added for manufacturing from 1997 to 2002 may have been overstated by 13 percent because the hedonic methods used to adjust prices for domestic ICT materials inputs (primarily semiconductors) were not consistently used to adjust import prices. Reinsdorf and Yuskavage (2009) find that import prices for computers and related products fall much more slowly than the PPIs for matched, domestically produced products and than the CPIs for matched consumer goods, in spite of a large increase in import penetration in this product area. Use of hedonic methods to adjust domestic producer prices but not for import prices for selected commodities may explain the large discrepancy. Although the BEA has taken important steps recently to address problems of inconsistent price adjustment for imports and exports of telecommunications equipment,[11] the consensus among conference participants was that the pricing of ICT goods and services warrants further, careful study.

[10] See, for example, Grimm (1998).

[11] As part of the 2010 annual revision of the National Income and Product Accounts, BEA used price indexes developed by the Federal Reserve Board to adjust for changes in the quality of communications equipment (specifically enterprise and home voice equipment; transmission, local loop, and legacy central office equipment; and wireless system equipment) into the estimates of communication equipment within private fixed investment and into the estimates of "other" capital goods within exports and imports of goods. In addition, the Federal Reserve Board's price index for data networking equipment, which was previously used in the estimates of communication equipment within private fixed investment, is now being used in both private fixed investment and in the estimates of "other" capital goods within exports and imports of goods.

II. PAPERS ON SERVICES OFFSHORING, LABOR MARKET IMPACTS OF GLOBALIZATION, AND OTHER MEASUREMENT ISSUES

Papers presented in the other sessions of the November 6–7, 2009 conference addressed a different set of measurement issues arising from the growth of globalization. These papers examined the adequacy of current data and analytical techniques for overcoming specific data gaps in assessing the impact of globalization on the U.S. economy and labor market. Several previous studies—GAO (2004), Norwood et al. (2006), and Sturgeon et al. (2006)—had encountered significant data impediments in their efforts to examine the growth in services offshoring and assess its impact on the U.S. economy, particularly the labor market. Two conference papers examined progress towards filling the identified data gaps. Two other papers focused directly on the potential domestic labor market impacts of services offshoring and reviewed data and analytical alternatives for improving future labor market impact assessments. Three papers reviewed the reliability of the assumption used in the construction of the industry accounts statistics—the "import comparability assumption" or "proportionality assumption"—to allocate imported goods and services among domestic industries and final consumption. Another paper used new information from the 2007 Economic Census to examine the offshoring of transformation functions by domestic manufacturers.

All of these papers cited the need for additional research with better or more detailed data to identify the extent and impact of offshoring activities, especially services offshoring. Most of the papers indicated the need to use micro, firm-level data in particular to analyze these offshoring activities and their effects on U.S. workers, incomes, and economic growth. A number of alternatives for improving existing data were identified and evaluated. But, conference participants also recognized that resources for new data collections were likely to remain substantially restricted by the currently adverse federal fiscal outlook. Given that perspective, all the participants in the concluding conference panel urged greater access to existing microlevel data among the federal statistical agencies and improved data-sharing capabilities among those agencies. One of the Canadian participants recommended consolidation and merger among the current federal statistical agencies to create a "Stats USA," comparable to Statistics Canada, to overcome current data-sharing impediments among these independent agencies and to utilize the limited funds available for economic statistics more efficiently.

Data Gaps Impeding Assessments of Services Offshoring

Both Jensen (2009) and Sturgeon argue forcefully for the collection of more detailed data on services trade, service inputs to domestic production processes, and other service-sector activity. Citing his own research on the impact of trade on manufacturing firms, Jensen notes the substantially greater detail and scope of data on manufacturing firms and their trade and production operations relative to service firms, even though the service sector accounts for a growing and substantially larger share of employment and economic activity. Jensen cites the Sturgeon et al. (2006) study finding that manufacturing trade had more than 16,000 detailed product codes in 2006, whereas there were only 29 descriptive categories for services trade that year. And these 29 service categories[12] reflect a substantial increase over the 17 categories available in 2001 (Jensen 2009, p. 29). Sturgeon makes the same comparison but also notes that this lack of detail for services is not unique to U.S. data—Statistics Canada collects only 28, and the OECD publishes only 11 categories of service imports and exports (Sturgeon and Gereffi 2009, p. 18). In contrast, the ComTrade database contains 8,000 product codes for traded commodities.

[12] BEA staff note that the latest (2010) BEA trade data now contain 45 descriptive categories for services trade.

Jensen (2009) points out that BEA has improved services trade data by implementing several of the recommendations from the Norwood et al. (2006) and Sturgeon et al. (2006) reports—eliminating the inconsistency between categories of affiliated and unaffiliated services trade and improving its sampling frame for identifying firms importing services. But, he notes that sampling issues remain, in part because BEA is unable to access the business register and the more detailed sampling frames maintained by the Census Bureau.[13] Although services only account for about 30 percent of U.S. exports and 17 percent of U.S. imports, services trade, like commodity trade, has grown rapidly and is increasing relative to the size of the U.S. economy (Figure 2, p. 4). The likelihood that these trends will continue only underscores the need for more detail on the types of services being traded in order to understand the implications of that trade.

Jensen (2009) also notes the disparity in the level of detail available on manufactured inputs (6,000 codes) relative to service inputs (fewer than 100 codes) to domestic production processes. The completion of the North American Product Classification System (NAPCS) by the Census Bureau and its use at the establishment level in the Economic Census will help mitigate this disparity, but the gap now exists. Given the need for more detailed services-sector and services-trade data, the growing importance of the services sector and services trade, the sampling frame issues BEA still faces in collecting services-trade data, and other data integration issues arising from collection of trade and business statistics by separate, independent agencies, Jensen suggests that the costs and benefits of shifting the collection of foreign direct investment and international services data from BEA to the Census Bureau be investigated.

The completion of NAPCS should provide a better basis for the collection of more detailed data on the types of services—particularly intermediate services—used in internal production processes. However, Sturgeon identifies a more fundamental data gap: the lack of information on the roles of firms, regions, and even countries in the evolution of complex global value chains that underlie the very rapid expansion in trade of intermediate goods, products, and services. Sturgeon maintains that existing product and services codes and industry classifications are inadequate for capturing global value chains. He notes that a number of entities have begun to define generic business functions that are embedded in these global value chains, and Brown and Sturgeon (2009) propose a list of 12 functions for future consideration. The Census Bureau has also recognized the need for more direct information on changes in the supply chains of manufacturing firms; this need results from both increased use of purchased intermediate goods and services (outsourcing) and increased trade in these intermediate goods and services (offshoring).

The rapid growth in services trade, particularly in the category of business services, underscores the need not only for more detailed data on the value of traded services but also for price data to properly deflate those services. Owing in large part to budget cuts in 2007, the International Prices Program at BLS does not collect any data on prices of imported and exported business services. This represents a major hole in international statistics, and several conference participants urged that funding be restored to support the development of import and export price indexes for business services.

Jarmin, Krizan, and Tang (2009) link new information from the 2007 Census of Business that identifies such changes in manufacturing and wholesaling firms' production processes with existing longitudinal business microdata maintained at the Census Bureau to develop more direct measures of the extent of outsourcing and offshoring by U.S. manufacturing firms. One measurement concern that these new data might help resolve is whether globalization is increasing the offshoring of production processes (offshoring of transformation), thereby creating a greater incidence of business misclassifications. Jarmin, Krizan, and Tang (2009, p. 9) find that "most establishments' activity is consistent with their industry classification" and that differences among

[13] This issue is discussed later in the section on microlevel data access and data sharing.

firms were no greater than the normal reclassifications that occur between economic censuses. These new data reveal that the vast majority of manufacturing firms did not engage in either outsourcing or offshoring, and outsourcing among manufacturing firms was substantially greater than offshoring, a finding similar to results reported by the National Academy of Public Administration (NAPA) in Norwood et al. (2006) and by other studies. Jarmin, Krizan, and Tang do note that those manufacturing firms that were offshoring activities were more likely to be large firms and were likely to import more than other manufacturing firms.

To help address concerns that data available on service industry activity are insufficiently detailed, the Census Bureau received additional funding in FY 2009 to expand its annual and quarterly surveys of service industries. Although the service industries, excluding wholesale and retail trade, now account for about 55 percent of GDP, the Services Annual Survey (SAS) only covered service industries accounting for 30 percent of GDP, while the Quarterly Services Survey (QSS) covered even less—about 17 percent of GDP. With this new initiative, both the QSS and SAS will cover the entire services industry—the full 55 percent of GDP.

The Reliability of the Import Comparability Assumption

As previously noted, statistical agencies do not track the destination of imported goods and services in the U.S. economy. To overcome this data limitation, in constructing industry and input-output statistics the BEA assumes that the economy-wide average of a good or service's import share is the same for all industries using that input. These publicly available data are widely used to conduct various economic analyses at the federal, state, and local levels and, recently, to assess the economic effects of offshoring[14] Inaccuracies in the allocation of imported goods and services among industries could significantly affect the accuracy of the many analyses employing these BEA data.

Three papers presented at the conference use different techniques to assess the validity of that assumption. Winkler and Milberg (2009) employ input-output data from Germany that differentiates domestically produced from imported inputs, thereby allowing a direct measure of imported inputs by industry. Their direct measure varies significantly from the imputed measure using the comparability (or proportionality) assumption, with the greatest differences occurring for services. Feenstra and Jensen (2009) use firm-level data on imports and production to construct essentially firm-level input-output tables. Industry-level offshoring estimates reflect the aggregation of offshoring among firms in the industry. Feenstra and Jensen find the alternative measure varies from the comparability assumption estimates in a number of industries. Strassner, Yuskavage, and Lee (2009) use BEA multinational corporation (MNC) data to develop direct estimates of offshoring. On average, the estimated import share of material inputs for manufacturing industries is 4 percentage points lower for the comparability assumption than MNC-based estimates. However, the researchers find sizable discrepancies for some industries, most notably oil and gas extraction and computer and electronic products manufacturing. The authors of all three papers highlight the need for additional research.

A closely related issue concerns the timeliness of the benchmarking of the input-output tables. Benchmarking—in which detailed data are collected on the inputs used by industries—is conducted every five years. However, it may take years to incorporate benchmarking data fully into official statistics. BEA does produce annual and quarterly industry accounts to update production relationships between these more

[14] Use of micro-level data linking services trade with domestic production data for specific firms would provide a more direct measure of firm decisions to substitute imported services for domestic service inputs. But, access to these micro-level data has been limited. Consequently, much of the research on services offshoring has relied on industry level data and the accuracy of the import comparability assumption. Feenstra and Hanson (1999) represents the first such study of services offshoring using industy level input-output data and the import comparability assumption.

detailed benchmark updates. While annual data are available to update industry gross output, expenditures, imports, and major inputs such as labor compensation and taxes, annual data on other intermediates are not available. The annual I-O accounts are produced by updating the benchmark I-O accounts assuming that each industry's use of real intermediate inputs relative to the industry's real gross output has not changed since the last available benchmark (Strassner, Yuskavage, and Lee 2009; Diewert and Nakamura 2010).

As a result, the structure of production assumed in the construction of industry and sectoral statistics may reflect the situation existing 5 to 10 years previously. Additionally, as Eldridge and Harper (2009) note, the import matrix tables for the annual input-output accounts are developed using the import comparability assumption. With rapid offshoring of activities, this situation could result in significant biases to estimates of industry and sectoral productivity and value-added.

Together, inaccuracies of the import comparability assumption and lags in the integration of benchmark data suggest a high degree of caution should be used in drawing policy conclusions from estimates of offshoring based on assumptions in the input-output tables. In addition, inaccuracies have potentially important implications for the wide variety of other analyses based on the input-output data, including forecasting and economic impact assessments conducted by private businesses and state and local governments. [15]

Labor Market Impacts from Offshoring

While there is an extensive literature examining the impact of trade on manufacturing employment, concerns about employment effects from services offshoring are more recent . As Kletzer (2009) notes, services were once considered "nontradable," but the literature on the employment effects from services offshoring is expanding. Kletzer observes that one stream of analysis of employment impacts from services offshoring attempts to define job characteristics that are "potentially off-shoreable." This analysis endeavors to establish a set of characteristics that are present in work activities that need not be performed directly at the work site. These types of characteristics can encompass jobs associated with activities that have been or can be outsourced by a domestic firm.

Outsourcing activities may change the occupational mix of employment within the firm engaging in outsourcing as well as the overall employment level. Changes in the occupational mix may be more significant for labor market adjustments than total employment changes, and the occupational distribution of employment is an important determinant of wages, productivity, and educational requirements for the future U.S. workforce. Kletzer observes that a focus on occupational changes and job characteristics distinguishes recent analyses of the labor market impacts of services offshoring from the previous literature on the labor market impacts of trade in manufactured goods. These analyses also draw attention to a critical labor market data gap—the lack of longitudinal data on employment by occupation. The BLS does produce detailed cross-sectional data on occupation and wages from its Occupational Employment Statistics (OES) survey, but the BLS is clear that these data should not be used for time series or longitudinal analysis given the structure of the OES sample.

Abraham and Spletzer (2010) explore alternatives for transforming the OES sample design to develop a longitudinal survey. While an OES longitudinal database can be developed, it requires additional resources to

[15] For example, the multiplier effects of a state or local economic development incentive will depend on the degree of import leakage. Thus, economic impact analyses of incentives may be compromised if the import comparability assumption used to construct input-output statistics is highly inaccurate for key industries in the region.

accomplish. Moreover, the costs of developing the new data will vary substantially with the types of analyses the data will need to support. Although the OES collects data from individual business establishments, the sample design and costs for developing a reliable longitudinal survey at the firm level will be much larger than at a more aggregated industry or regional level. Unfortunately, as the NAPA report (Norwood et al. 2006) and Kletzer (2009) note, analyses of the occupational changes associated with services offshoring or services outsourcing require firm-level detail, not just industry or regional aggregates of occupational changes. Abraham and Spletzer (2009) confirm that meeting this analytical need would require a costly restructuring of the current OES sampling design.

Microlevel Data Access and Data Sharing

The NAPA report (Norwood et al. 2006) represents one of the first efforts to use micro-level production and trade data on services from the BEA's MNCs to develop estimates of services offshoring. Moreover, it was the first by a nongovernmental entity to attempt to link microlevel data across agencies. Since that initial effort to link the BEA's MNC data with BLS employment and occupational data, other researchers, including statistical agency staff and outside academics, have begun to follow similar paths. But the path is not easy. As many of the conference papers demonstrate, analyses of microlevel data are critical to a better understanding of the extent of services offshoring and domestic services outsourcing and of their implications for firm survival, U.S. economic growth, and the labor market. From the perspective of both statistical agency staff and outside researchers, access to linked microlevel data provides deeper, broader, and more useful data for analyzing issues related to services offshoring. From the perspective of the statistical agencies, maximizing the use of currently available data by linking data sets within and across agencies is an effective use of limited resources in meeting their statistical and research missions.

Such efforts are also consistent with the public policy goals established with the enactment of the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) in 2002. That act intended to establish consistent protections for confidential information collected by the individual statistical agencies and to provide increased opportunities to share these data for statistical purposes among the agencies, pursuant to protections of confidential, information-specific written agreements. Each of these agencies collects microlevel data from different entities to meet its own unique statistical missions. Each agency also maintains different systems for identifying business firms or establishments within its own jurisdiction. Linking these micro-level data requires a common, consistent business identifier. The Census Bureau maintains a business register that includes basic organizational information, industry classification, and operating data for each establishment, firm, or company, and for each major intracompany organizational unit. But these data also contain information from tax records—e.g., the employer identification number (EIN)—and the data from tax records were not covered by CIPSEA.

As Jensen (2009) emphasizes, legislation is needed to amend section 6103(j) of Title 26 of the U.S. Code, which governs the use of federal tax information. Without this legislation, the Census Bureau, for example, is unable to share with the BEA or BLS its sampling frames with the business identifiers, even though this would improve the design of BLS and BEA surveys. As noted at the outset of this section, all the participants on the concluding conference panel, including the current heads of two of the three major statistical agencies, agreed on the need to improve data-sharing capabilities among the agencies. Improving access to microlevel data among the statistical agencies is a critical first step for utilizing all available microlevel data to better understand the extent and impact of services offshoring. It is time to reclassify certain common and nonsensitive data elements of tax data as exempt from 6103(j) provisions so that the full potential envisioned by CIPSEA can be realized.

III. RECOMMENDATIONS

Below is a summary of key recommendations, which echo some of those contained in a recent American Economic Association report on international statistics (Feenstra and Lipsey 2010).

- **Pilot-test input price index proposed by BLS**. Current methods of constructing price indexes implicitly assume that sourcing of inputs is stable or that it changes slowly over time. Such assumptions are at odds with current business practices, characterized by global supply chains and rapid shifts in sourcing. Research presented at the conference suggests that some economic statistics may have been significantly biased, because current price indexes are not designed to capture this dynamic. As trade expands, particularly to services, biases could become more important in the future. Ultimately, it would be preferable for the BLS to base the input price index on a survey of buyers, if that is deemed feasible to implement. In the short term, the BLS should receive a modest increase in funding to pilot-test such a survey.

- **Improve measurement of product quality changes in import and export price indexes.** Industry and even aggregate statistics are sensitive to the degree to which prices are adjusted for improvements in quality, particularly in the area of high-tech goods and services, where technical change is rapid. Preliminary evidence presented at the conference suggests that hedonically adjusting domestic, but not import, prices may have resulted in significant biases in economic statistics. The pricing of ICT goods and services warrants further study, and the BEA and BLS should continue their efforts to improve data collection and methods in order to ensure the adequacy and comparability of quality adjustment of domestic and traded goods and services prices.

- **Collect more detailed data on domestic and traded services and on prices for services imports and exports.** The shift from the Standard Industrial Classification (SIC) to the North American Industrial Classification System (NAICS) provided some expansion in the number of service industries identified. The implementation of the North American Product Classification System (NAPCS) by the Census Bureau should also increase the detail for service-sector inputs. The BEA will have to implement changes to its surveys of services trade to take full advantage of the NAPCS. Price data on imports and exports of business services, the most rapidly growing category of services trade, are nonexistent. The development of price indexes to deflate imports and exports of business services should accompany the collection of more detailed and better data on services trade.

- **Collect longitudinal data on employment by occupation through a modification of the Occupational Employment Statistics (OES) program survey.** Abraham and Spletzer (2010) indicate this is feasible but would require a substantial investment, particularly if these time series data are to be constructed in a way that permits linking with other microlevel firm data. Abraham notes that the substantial cost involved with this transformed OES survey—roughly $7.7 million annually—would be hard to justify based on only improved understanding of offshoring effects. However, she notes that these time series data would have other significant uses, including more complete assessments of the impact of structural changes on domestic labor markets and improved projections of changing demands for specific occupations. These other uses, in conjunction with a better assessment of the labor market effects of offshoring, would justify this type of investment.

- **Improve data-sharing, especially of microlevel data, among statistical agencies and with outside researchers.** Fiscal restraints on statistical agency budgets dictate that agencies share their data to address issues arising from globalization as well as other fundamental economic issues. An understanding of offshoring and its effects also requires use of linked trade and industry microlevel data. A major goal of CIPSEA was to facilitate such linking and data sharing. However, this goal has been impeded by restrictions on the sharing of confidential tax data. Legislation by Congress to redefine what truly represents confidential tax data is an essential next step.

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APPENDIX A

Final Conference Program

CONFERENCE AGENDA

MEASUREMENT ISSUES ARISING FROM THE GROWTH OF GLOBALIZATION*

November 6-7, 2009
Washington, DC

W.E. Upjohn Institute for Employment Research
and the
National Academy of Public Administration
900 7th Street NW, Suite 600
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(202) 347-3190

FRIDAY NOVEMBER 6

SESSION 1: SERVICES OFFSHORING

Chair: Kenneth Ryder (NAPA)

Measuring the Impact of Trade in Services: Prospects and Challenges, J. Bradford Jensen (Georgetown University and Peterson Institute for International Economics)

Measuring Success in the Global Economy: International Trade, Industrial Upgrading, and Business Function Outsourcing in Global Value Chains, Timothy Sturgeon (Massachusetts Institute of Technology) and Gary Gereffi (Duke University)

Discussant: Torbjorn Fredriksson (UNCTAD)

SESSION 2: MEASURING THE IMPACT OF OFFSHORING ON THE LABOR MARKET

Chair: Janet Norwood (NAPA)

Addressing the Demand for Time Series and Longitudinal Data on Occupational Employment, Katharine Abraham (University of Maryland) and James R. Spletzer (Bureau of Labor Statistics)

Understanding the Domestic Labor Market Impact of Offshore Services Outsourcing: Measurement Issues, Lori Kletzer (University of California-Santa Cruz and Peterson Institute for International Economics)

Discussant: Timothy Sturgeon (MIT)

SESSION 3: MEASUREMENT IMPLICATIONS OF TRANSFORMATION OFFSHORING AND IMPORTED INTERMEDIATE INPUTS

Chair: Ned Howenstein (Bureau of Economic Analysis)

Outsourcing, Offshoring, and Trade: Identifying Foreign Activity across Census Data Products, Ron Jarmin, C. Krizan, and John Tang (U.S. Census Bureau)

Effects of Imported Intermediate Inputs on Productivity. Lucy P. Eldridge and Michael J. Harper (Bureau of Labor Statistics)

Discussant: John Haltiwanger

SESSION 4: OFFSHORING AND PRICE MEASUREMENT: INDUSTRY CASE STUDIES

Chair: Jon Steinsson (Columbia University)

Offshoring and Price Measurement in the Semiconductor Industry, David Byrne (Federal Reserve Board), Brian Kovak (University of Michigan), and Ryan Michaels (University of Michigan)

Measuring IT Software and Services: Implications for Real Trade Flows, Catherine Mann (Brandeis University and Peterson Institute for International Economics)

Imports of Intermediate Parts in the Auto Industry—A Case Study, Thomas H. Klier (Federal Reserve Bank of Chicago) and James M. Rubenstein (University of Miami, Ohio)

Discussant: Kimberly Zieschang (IMF)

SATURDAY NOVEMBER 7

SESSION 5: MEASUREMENT OF IMPORT PRICES

Chair: Michael Horrigan (Bureau of Labor Statistics)

Bias Due to Input Source Substitutions: Can It Be Measured? Erwin Diewert (University of British Columbia) and Alice Nakamura (University of Alberta)

Are there Unmeasured Declines in Prices of Imported Final Consumption Goods?, Marshall Reinsdorf and Robert Yuskavage (Bureau of Economic Analysis)

Discussant: Barry Bosworth (Brookings Institution)

SESSION 6: MEASUREMENT OF IMPORT AND INPUT PRICES

Chair: Julia Lane (National Science Foundation)

Offshoring and the State of American Manufacturing, Susan Houseman (Upjohn Institute), Christopher Kurz (Federal Reserve Board), Paul Lengermann (Federal Reserve Board), and Benjamin Mandel (Federal Reserve Board)

Producing an Input Price Index, William Alterman (Bureau of Labor Statistics)

Discussant: Emi Nakamura (Columbia University)

SESSION 7: MEASUREMENT OF IMPORT PRICES AND IMPORT USES: EVIDENCE OF BIASES

Chair: Carol Corrado (Conference Board)

Imported Inputs and Industry Contributions to Economic Growth: An Assessment of Alternative Approaches, Erich Strassner, Robert Yuskavage and Jennifer Lee (Bureau of Economic Analysis)

Evaluating Estimates of Materials Offshoring from U.S. Manufacturing, Robert C. Feenstra (University of California-Davis) and J. Bradford Jensen (Georgetown University and Peterson Institute for International Economics)

Discussant: William Milberg (New School for Social Research)

Errors from the Proportionality Assumption in the Measurement of Offshoring: Application to German Labor Demand, Deborah Winkler and William Milberg (Schwartz Center for Economic Policy Analysis, The New School for Social Research)

PANEL DISCUSSION: PRIORITIZING STEPS FOR THE STATISTICAL AGENCIES

Chair: Susan Houseman (Upjohn Institute)

Panel members: Katharine Abraham (University of Maryland), Erwin Diewert (University of British Columbia), Robert C. Feenstra (University of California-Davis), Keith Hall (Bureau of Labor Statistics), and Steven Landefeld (Bureau of Economic Analysis)

CONCLUDING COMMENTS AND ADJOURNMENT

Susan Houseman and Kenneth Ryder

APPENDIX B

STAFF

Lena E. Trudeau, *Vice President*—Ms. Trudeau leads the National Academy's service delivery organization, supervises the conception and execution of strategic initiatives, opens new lines of business and drives organizational change. In addition, Ms. Trudeau is a founder of the Collaboration Project, an independent forum of leaders committed to leveraging web 2.0 and the benefits of collaborative technology to solve government's complex problems. Ms. Trudeau's previous roles include: Program Area Director, National Academy of Public Administration, Vice President, The Ambit Group; Marketing Manager, Nokia Enterprise Solutions; Principal Consultant, Touchstone Consulting Group; Consultant, Adventis Inc.; and Associate, Mitchell Madison Group.

Susan N. Houseman, *Co-Project Director and Senior Research Economist*, *W.E. Upjohn Institute* for Employment Research and a Research Affiliate at the National Poverty Center, the University of Michigan. She is a labor economist whose recent research has focused on labor market implications and measurement issues associated with of outsourcing and offshoring. Prior to joining the Upjohn Institute in 1989, she was an assistant and associate professor at the School of Public Affairs at the University of Maryland and a visiting scholar at the Brookings Institution. Dr. Houseman received a Ph.D. in economics from Harvard University.

Kenneth F. Ryder, Jr.*, *Co-Project Director and Fellow, National Academy of Public Administration*— Consultant, Ryder Analytics Consulting,. Former Executive Director, Research and Analysis, Office of Thrift Supervision, U. S. Department of the Treasury. Former positions with the U.S. Office of Management and Budget: Deputy Associate Director, Housing, Treasury and Finance Division; Deputy Associate Director, Special Studies Division, Economics and Government; Branch Chief, Housing Branch, Treasury, Commerce and Housing Division; and Senior Management Associate, Management Division, National Security and International Affairs. Former Staff Economist, The Rand Corporation; Economist, Manpower Requirements, Directorate, OASD.

Lillian Vesic-Petrovic, *Senior Research Analyst, W.E. Upjohn Institute for Employment Research.* She joined the Upjohn Institute in 1997 and has worked on projects concerning outsourcing and offshoring, temporary agency employment, and pension and retirement policies, obtaining data from different government agencies, using SAS and STATA or LIMDEP to create and manipulate the data sets and perform statistical analyses.

Sue A. Berkebile, *Administrative Assistant, W.E. Upjohn Institute for Employment Research,* joined the Upjohn Institute in 1997 and has facilitated many projects for several senior economists over the years.

Morgan Clark, *Research Associate*—Former National Academy of Public Administration; project staff on prior Academy Study of Office of Environmental Management; Focus Group Research Assistant, Peter D. Hart Research Associates.

Martha S. Ditmeyer, *Senior Program Associate*—Marty has been with the National Academy Staff since 1996 and has been involved with over 60 Academy Studies, providing technical assistance with graphics and reports. Prior to joining the National Academy she spent ten years at the Massachusetts Institute of Technology in a variety of positions including the Regional of the Alumni Association and Associate Director of MIT's Undergraduate Opportunities Program (UROP). She also worked at the Communications Satellite Corporation in its Geneva, Switzerland and Washington, DC. offices.

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