Capturing the Effect of Taxes and Subsidies on Capital and Productivity: A Valuation Approach in the post-Covid Era

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ABSTRACT

The COVID-19 pandemic resulted in unprecedented subsidies in the U.S. economy, with subsidies increasing from $73 billion in 2019 to $698.5 billion in 2020 in the private business sector. This sudden massive increase in subsidies during the 2020-2023 period highlighted an opaque portion of Gross Domestic Product (GDP): taxes on production and imports less subsidies. The value of GDP corresponds to capital income, labor income, and the net cost of taxes on production and imports, less subsidies. In the productivity measurement framework, the value of GDP is assigned to capital and labor inputs. This allocation is obvious for the capital and labor income portions of GDP and previously has been an exercise in judgement for assigning the net taxes portion of GDP between capital and labor inputs. Fortunately, the recent unparallelled increase in subsidies has coincided with newly available data illuminating the composition of taxes and subsidies in the U. S. National Income and Product Accounts. This paper first advances the valuation framework underlying production accounts, and second, illustrates the implementation of this framework using novel product- and production-specific data on taxes and subsidies in the official BLS productivity measures. This valuation framework clarifies the dissimilar impacts product- and production-specific taxes and subsidies have on producer input and output costs, and by extension, on capital rental prices, capital services, and productivity measures. We find that the improved allocation of taxes and subsidies has little effect on total factor productivity but does have significant impacts on current dollar levels and unit cost measures.

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I. Introduction

Productivity measures compare growth in output to growth in inputs used in the production process, such as capital, labor, energy, materials, and services. Improving the data and concepts used in the estimation of the underlying outputs and inputs results in better measures of capital and productivity measures. In this work, we highlight improvements in capital and productivity measures that occur when using recently available data breaking out product-specific taxes and subsidies and production-specific taxes and subsidies from industry total taxes and subsidies. Bureau of Economic Analysis (BEA) enhancements to industry data in the 2018 comprehensive revision of the industry economic accounts, including the production of supply-use tables and the incorporation of additional concepts of the valuation of goods and services, have made this more refined treatment possible.[2]

Using this newly available tax and subsidy data, we construct revised capital and productivity measures for 61 detailed National Income and Product Account (NIPA) industries and the private business sector. We study the impact this more refined product- and production-specific tax and subsidy data has on BLS published measures of capital and productivity

[2] For further discussion, see Thomas F. Howells, Edward T. Morgan, Kevin B. Barefoot, Louis E. Feagans, Teresa L. Gilmore, and Chelsea K. Smith-Nelson, "Preview of the 2018 Comprehensive Update of the Industry Economic Accounts," Survey of Current Business, Volume 98, Number 8, August 2018. https://apps.bea.gov/scb/issues/2018/08-august/0818-industry-economic-accounts-preview.htm ; and Jeffrey A. Young, Thomas F. Howells III, Erich H. Strassner, and David B. Wasshausen, "BEA Briefing: Supply-Use Tables for the United States," Survey of Current Business, September 2015. https://apps.bea.gov/scb/issues/2015/scb-2015-september.pdf

II. Taxes and Subsidies in Productivity Measurement

Productivity is a measure of the efficiency with which an economy converts inputs into output in the production process. Measures of productivity growth related to a single factor of production, such as capital or labor, compare growth in output to the growth in a specific input, and capture gains in output that are not a result of growth in that input. For example, labor productivity growth reflects the increase in output that results from factors other than an increase in labor hours worked. Labor productivity growth can occur due to changes in capital investment, purchased materials and services, economies of scale, worker skills, and technologies used in production. Labor productivity is often used to evaluate labor's marginal product and is compared to trends in compensation.[3] Labor productivity growth is commonly expressed as:

$$(1) \qquad LP\ growth = \ Output\ growth - Labor\ Hours\ Worked\ growth$$

By comparison, total factor productivity (TFP), also referred to as multifactor productivity (MFP), is a measure of how efficiently multiple inputs are used in producing output. Inputs used in production can include capital (machinery and equipment, computers, structures, intellectual property products, inventories, and land), labor, energy, materials and purchased services. Because TFP measures the growth in output that is not a result of using additional inputs, TFP is often considered an indicator of technological progress. TFP reflects the effects of technical change, increases in general knowledge (for example, new scientific findings), adoption of better management techniques, and improved organizational structure.[4]

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[3] See, for example, Michael Brill, Corey Holman, Chris Morris, Ronjoy Raichoudhary, and Noah Yosif, "Understanding the labor productivity and compensation gap," *Beyond the Numbers*, June, vol. 6, no. 6, June 2017, https://www.bls.gov/opub/btn/volume-6/pdf/understanding-the-labor-productivity-and-compensation-gap.pdf; and Susan Fleck, John Glaser, and Shawn Sprague, "The compensation–productivity gap: a visual essay," *Monthly Labor Review*, January 2011, https://www.bls.gov/opub/mlr/2011/01/art3full.pdf.

[4] "Measuring Productivity: Measurement of Aggregate and Industry-Level Productivity Growth," (Paris: Organisation for Economic Co-operation and Development, 2001), p. 11, https://www.oecd.org/sdd/productivity-stats/2352458.pdf

Total factor productivity is commonly expressed as the difference between the growth rate of output and the weighted aggregate of the growth rates of each input in the production process:

$$(3) \qquad TFP\ growth = \ Output\ growth - \sum_i s_i \ \ Input\ growth_i$$

where s_i is the cost share weight for each input i. Originally developed by Robert Solow in 1957, this relationship assumes constant returns to scale. This implies that the value of output equals the total cost of all measured inputs and that cost shares sum to one.[5]

Output and Inputs

Estimating labor and total factor productivity requires first selecting and constructing appropriate output and input measures for the specific productivity analysis desired. Output may be defined as gross output, sectoral output, or value-added output.[6] Depending on the output concept selected, alternative measures of TFP can be constructed by relating gross, sectoral, or value-added measures of output to the

[5] Robert M. Solow, "Technical Change and the Aggregate Production Function," The Review of Economics and Statistics, vol. 39, no. 3, August 1957, pp. 312-20. Note that Solow's growth model assumes Hicks-neutral technical change and constant returns to scale.

[6] Gross output is the total value of goods and services produced by all firms in an industry or sector, regardless of whether they are sold directly to consumers or sold to other firms to become an input for further production. In this case, for a given industry or sector, an output is counted when it is sold and then counted again in the value of the product it was used to produce. Value-added output is a more narrowly defined concept of output that removes the value of all purchased intermediate inputs from the value of gross output. As such, value-added output reflects only the additional value of transforming intermediate inputs into outputs. Sectoral output, which lies between gross output and value-added output, is equal to gross output less only those intermediate inputs produced within that industry or sector, i.e., intrasectoral transactions. Intermediate inputs used in production that are purchased from outside the industry are not removed. Thus, sectoral output represents the value of output leaving the sector or industry. For further discussion, see Lucy P. Eldridge and Susan G. Powers, "The importance of output choice: implications for productivity measurement," Monthly Labor Review, September 2023. https://www.bls.gov/opub/mlr/2023/article/the-importance-of-output-choice.htm

corresponding set of inputs. For ease of exposition, we initially use the value-added output concept in explaining the role of taxes and subsidies in productivity measurement.

Output measures for major U.S. industries and sectors are obtained from the U.S. National Economic Accounts published by the BEA. The accounting concepts and principles used in the U.S. National Economic Accounts generally follow the international guidelines recommended by the System of National Accounts (SNA).[7] Within the national accounts, which include the National Income and Product Accounts (NIPA) and the Industry Economic Accounts, the primary output measure is gross domestic product (GDP).[8] GDP, defined as "the market value of the goods, services, and structures produced by the nation's economy in a particular period less the value of the goods and services used up in production," reflects market prices for these various products.[9]

GDP can be measured using information on production, income, or expenditures.[10] When measured using the income approach, output is the sum of incomes accruing to the owners of the factors of production and to governments, i.e., the sum of employee compensation, taxes on production and imports less subsidies, and gross operating

[7] Commission of the European Communities, International Monetary Fund, Organisation for Economic Cooperation and Development, United Nations and World Bank, *System of National Accounts 2008*. Brussels/Luxembourg, Washington, D.C., Paris, New York, 2009. United Nations Publication, Sales No. E.08.XVII.29. https://unstats.un.org/unsd/nationalaccount/sna2008.asp

[8] U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021, p. 1-2. https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/all-chapters.pdf.

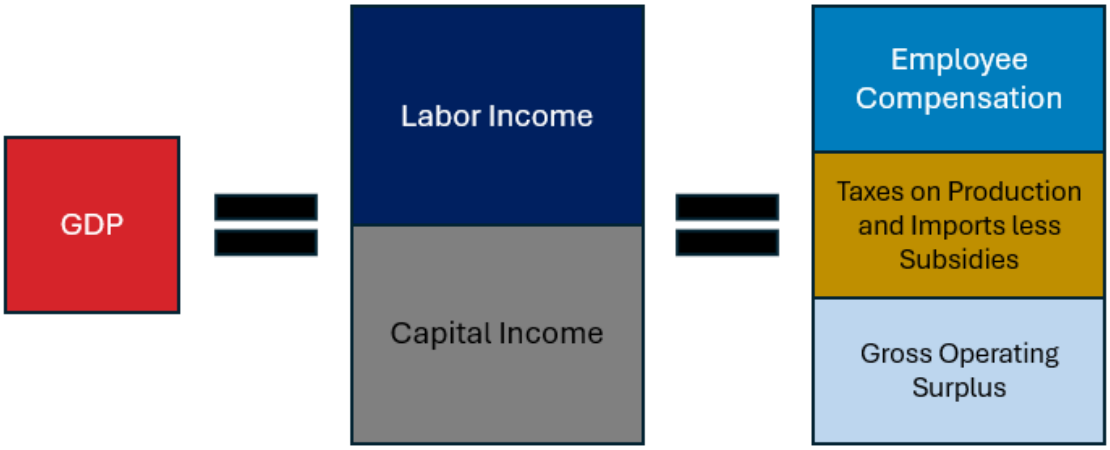
[9] U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021, Glossary: National Income and Product Accounts (Updated: November 2019), p. 32. https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/all-chapters.pdf.

[10] Under the production or value-added approach, GDP is measured as gross output less intermediate inputs, i.e., the sum of the value added during the production process. The expenditure approach measures GDP as the sum of purchases by final users including personal consumption expenditures, gross private domestic fixed investment, the change in private inventories, government consumption expenditures and gross investment, and net exports. U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021, Glossary: National Income and Product Accounts (Updated: November 2019), p. 2-7 – 2-11. https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/all-chapters.pdf

surplus.[11] Referred to as gross domestic income (GDI), the income approach assumes market prices reflect the incomes earned and costs incurred in production.[12] In theory, because the national accounts assume income earned from production equals the value of goods and services produced, GDP is equal to GDI and Gross Value-Added.[13]

From our earlier discussion of the Solow productivity model, the value of output is equal to the value of inputs. That is, value-added output or GDP is equal to the value of capital and labor inputs. Figure 1 illustrates this relationship between GDP, input incomes, and expenditures of produced value.

Figure 1. Relationship of GDP to capital and labor incomes and expenditures of produced value



GDP is equal to the sum of the income paid to capital and labor inputs used in producing this value-added output, and to the related expenditure components of the National Economic Accounts. The Solow productivity approach uses the equivalence to assign output value to inputs used in production. Employee compensation is readily treated as

[11] For further description, see U.S. Department of Commerce, Bureau of Economic Analysis, Measuring the Economy: A Primer on GDP and the National Income and Product Accounts," December 2015, p. 3-4.
[12] Ibid.
[13] U.S. Department of Commerce, Bureau of Economic Analysis, Measuring the Economy: A Primer on GDP and the National Income and Product Accounts," December 2015, p. 2.

income earned from labor inputs, while gross operating surplus (GOS) is income earned by capital inputs. The third piece of GDP, taxes on production and imports less subsidies (net TOPI) includes the value of taxes on production and imports remitted by producers, after adjusting for any subsidies received by producers.[14] Taxes and subsidies are typically identified with specific products and production activities rather than inputs to production. As a result, allocating the value of net TOPI to capital and labor inputs is less straightforward.

A Practical Problem: Assigning the Value of net TOPI

Taxes on production and imports include taxes collected during product transactions (such as federal excise taxes, customs duties, and state and local sales taxes) and other taxes on production, such as taxes related to the ownership of assets used in production (for example, local real estate taxes, motor vehicle licenses, severance taxes, and special assessments).[15] Subsidies are payments by government agencies to private businesses and government enterprises to support their current operations.[16] As such, their value is a

[14] Taxes on production and imports (TOPI) are defined as taxes payable on products when they are produced, delivered, sold, transferred, or otherwise disposed of by their producers (such as federal excise taxes, customs duties, and state and local sales taxes). This includes other taxes on production, such as taxes on ownership of assets used in production (for example, local real estate taxes, motor vehicle licenses, severance taxes, and special assessments). Personal and corporate income taxes and personal property taxes are not included. Net TOPI is the value of TOPI adjusted to remove the value of subsidies received by producers. For further information, see "Appendix: Summary National Income and Product Accounts," p. 2, in U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021. https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/all-chapters.pdf

[15] Other taxes on production include property taxes, payroll taxes, motor vehicle license taxes, and other license taxes. Property taxes comprised 90 percent of production taxes in 2021. Other license taxes was the second largest production tax category, at 7 percent, while Motor Vehicle License Taxes and Payroll Taxes were 2 percent and 1 percent of production taxes, respectively. Property, motor vehicle, and to a large extent, other license taxes are costs related to the use of capital in production. See "Appendix: Summary National Income and Product Accounts," p. 2, in U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021.

[16] Subsidies include "payments from government agencies to private business (for example, federal subsidies to farmers) and to government enterprises (for example, federal subsidies to state and local public housing authorities) to support their current operations. In contrast, payments associated with the acquisition or disposal of assets are classified as capital transfers." Subsidies may be direct or indirect in

transfer of value from the government rather than a value flowing from current production.[17] Because GDP and GDI are measures of the value of produced output, the value of subsidies is subtracted to remove this non-production value of subsidies. To accomplish this, taxes are offset by subsidies in the national accounts, creating a "TOPI less subsidies" or "net TOPI" measure that recognizes subsidies are transfer payments rather than payments to production.[18] With subsidies removed from TOPI, the remaining value of TOPI is produced value that, in theory, may be allocated among the factors of production. However, in practice it is unclear how to assign these taxes to a specific input due to the general nature of the taxes, fees, and assessments included in TOPI, as illustrated in Figure 2.

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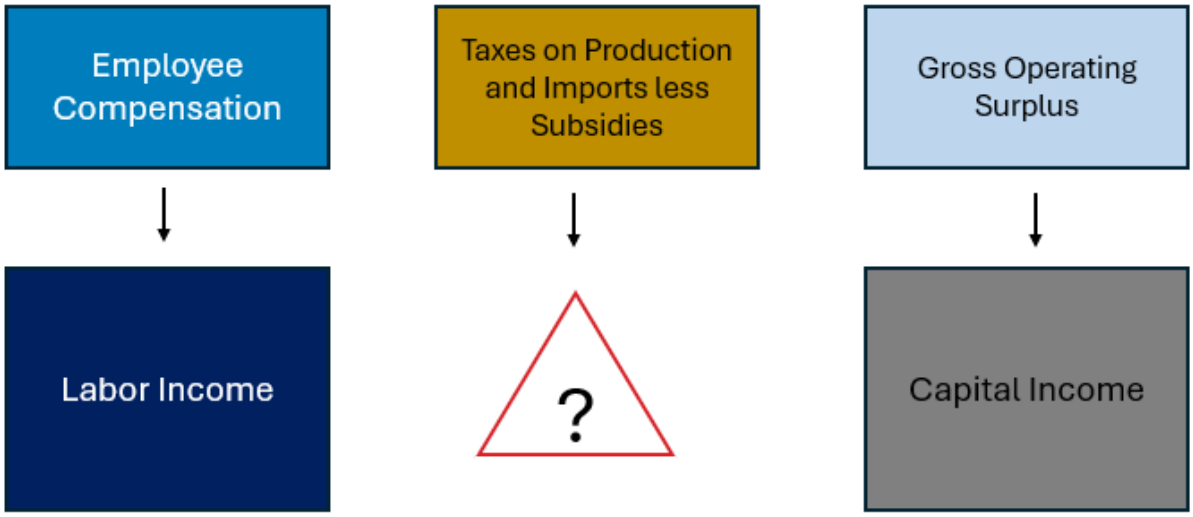
form. Direct subsidies involve an actual payment of funds toward a particular individual, group, or industry, while indirect subsidies do not have a predetermined monetary value or involve actual cash outlays. Instead, they may take the form of price reductions for required goods or services that are government-supported. This allows the needed items to be purchased below the current market price, resulting in savings for those the subsidy is designed to help. Examples of subsidies to individuals include welfare payments, unemployment benefits, and subsidized student loans; while subsidies to industries may include direct payments to airlines or milk price supports for the farm sector. Investopedia, Types of Subsidies, 2021 online article Subsidy Definition (investopedia.com)

[17] U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021, p. 2-10. The private business sector is comprised of all corporate and noncorporate private entities organized for profit and certain other entities that are treated as businesses in the national income and product accounts (NIPAs), including mutual financial institutions, private noninsured pension funds, cooperatives, nonprofit organizations that primarily serve businesses, Federal Reserve banks, federally sponsored credit agencies. See U.S. Department of Commerce, Bureau of Economic Analysis, Concepts and Methods of the U.S. National Income and Product Accounts (Chapters 1–13), December 2021, Glossary: National Income and Product Accounts (Updated: November 2019), p. 27. https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/all-chapters.pdf

[18] Because subsidies are a transfer of value to the production account from the government sector, this value is removed from the production account by offsetting the value of subsidies against taxes on production; in effect, subsidies are a negative tax by government. When the value of subsidies exceeds that of taxes paid, net TOPI is negative, and the value of the produced output is reduced to remove the extraneous nonproduced value of the subsidies. When the value of subsidies is less than that of taxes paid, net TOPI is positive and the value of produced output is increased, to reflect the producer's use of produced output to pay the excess of taxes beyond the value of subsidies.

Figure 2. Distribution of GDP components between capital and labor inputs



Because the value of taxes on production and imports less subsidies (net TOPI) can very widely, depending on NIPA industry, the assignment of net TOPI between capital and labor inputs.[19]

Prior BLS Treatment of Taxes and Subsidies – Sector and Industry Approaches

Previously, the BLS TFP measurement program had limited information available on the composition of net TOPI. While taxes and subsidies include both product- and production-specific taxes and subsidies, the data available did not distinguish between these. Recent refinements in BEA data now facilitate a better treatment of this third GDP component, introduced in the next section. However, before these new data became available, the BLS

[19] See Corby Garner, Randy Kinoshita, Susan G. Powers, and Jill Janocha Redmond, "Taxes, Subsidies, and Productivity Measurement in the Covid Era," U.S. Bureau of Labor Statistics, September 26, 2022, conference paper presented at the World KLEMS Conference, October 12-13, 2022. Available upon request.

total factor productivity program assigned employee compensation to labor cost and gross operating surplus primarily to capital cost.[20] Unfortunately, the third category, TOPI less subsidies, was more difficult to assign directly.[21]

At the onset of the BLS total factor productivity program, limited data was available on the composition of taxes and subsidies in net TOPI. After reviewing BEA's available National Accounts data for taxes on production and imports, some taxes included in TOPI, such as motor vehicle license fees and business property taxes, were clearly found to be related to capital. Other components of net TOPI, such as sales taxes and excise taxes, were related to the output of the paying industry. A decision was made to include only the value of those taxes clearly related to the use of capital or labor in production in capital or labor costs, to avoid incorrectly assigning net TOPI value to capital or labor income[22].

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[20] Gross operating surplus contains a value of proprietor mixed income, a portion of this income is assigned to labor cost. Mixed income, i.e., noncorporate income is allocated to labor and capital in each year using the following procedure: an initial estimates of proprietors' labor compensation is made by assuming that proprietors earn the same average hourly compensation as employed workers. That compensation per hour estimate is multiplied by the number of proprietors to arrive at an independent measure of proprietors' labor. In addition, BLS assumes that the proprietors' capital rate of return is the same rate of return as their industry corporate counterparts allowing for an independent measure of capital income for the proprietors' piece of capital income. After these two independent measures are computed, BLS scales the sum to the mixed income figure reported by BEA, evenly distributing any residual. See U.S. Department of Labor, Bureau of Labor Statistics, Handbook of Methods online, 2022, https://www.bls.gov/opub/hom/msp/concepts.htm.

[21] Only the value of those taxes clearly related to the use of capital in production - property taxes and motor vehicle license fees - was included in the cost of capital for the purpose of productivity measurement. To avoid incorrectly assigning the remaining net TOPI value to capital or labor income, this value was removed from total input costs for the purpose of calculating capital and productivity measures, rather than risk imposing a bias on the resulting capital rental prices, capital shares, capital services, and productivity measures by attributing these charges either to capital or labor factors with little supportive evidence. For further description of the previous BLS methodology, see Garner et. al. (2022).

[22] See US Department of Labor, Bureau of Labor Statistics. *Trends in Multifactor Productivity, 1948-81*. Bulletin 2178: Washington DC, September 1983, p. 52. This issue is also described in Organisation for Economic Co-Operation and Development, *Measuring Productivity: Measurement of Aggregate and Industry-Level Productivity Growth* (Paris: Organisation for Economic Co-Operation and Development, 2001), p. 79-81, http://www.oecd.org/sdd/productivity-stats/2352458.pdf and Commission of the European Communities-Eurostat, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank, Brussels/Luxembourg, "System of National Accounts 1993", New York, Paris, Washington, 1993, pp. 209-210. https://unstats.un.org/unsd/nationalaccount/docs/1993sna.pdf

At the private business sector level, removing the value of net nonfactor taxes generally had only a slight impact on the value of capital and labor shares, as the value of net nonfactor taxes was only around 7% of private business GDP For this reason, also removing the equivalent output value was determined to be unnecessary and potentially would have a larger impact given the minor effect on input shares. It was deemed better to simply remove the value of net nonfactor taxes that are not directly related to capital or labor inputs from total income, rather than risk imposing a bias on the resulting capital rental prices, capital shares, capital input, and productivity measures by attributing these charges either to capital or labor factors with little supporting evidence. This adjustment to total input cost only then led to a breakdown of the assumption that output equals inputs, as shown in Figure 3.

Figure 3. GDP compared to BLS capital and labor incomes and BLS measures of expenditures

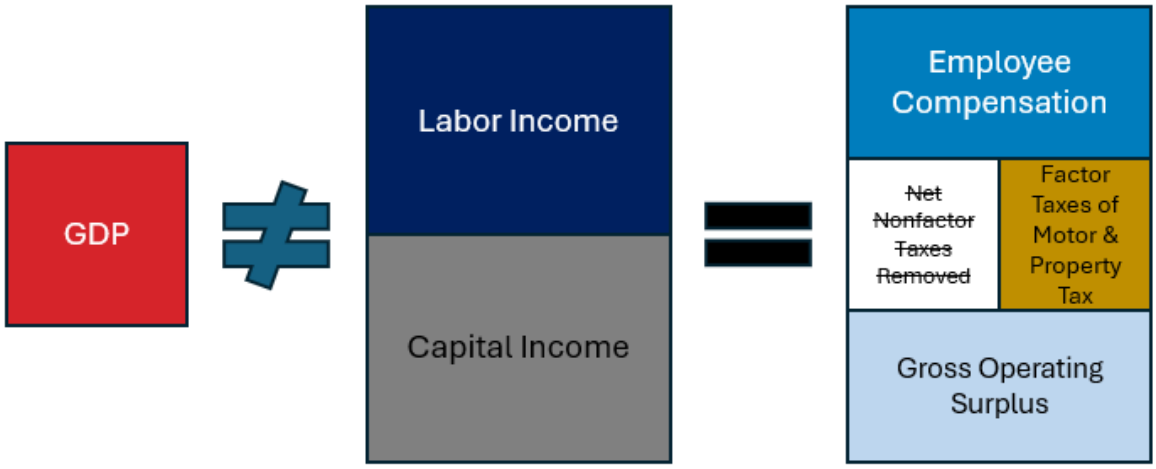
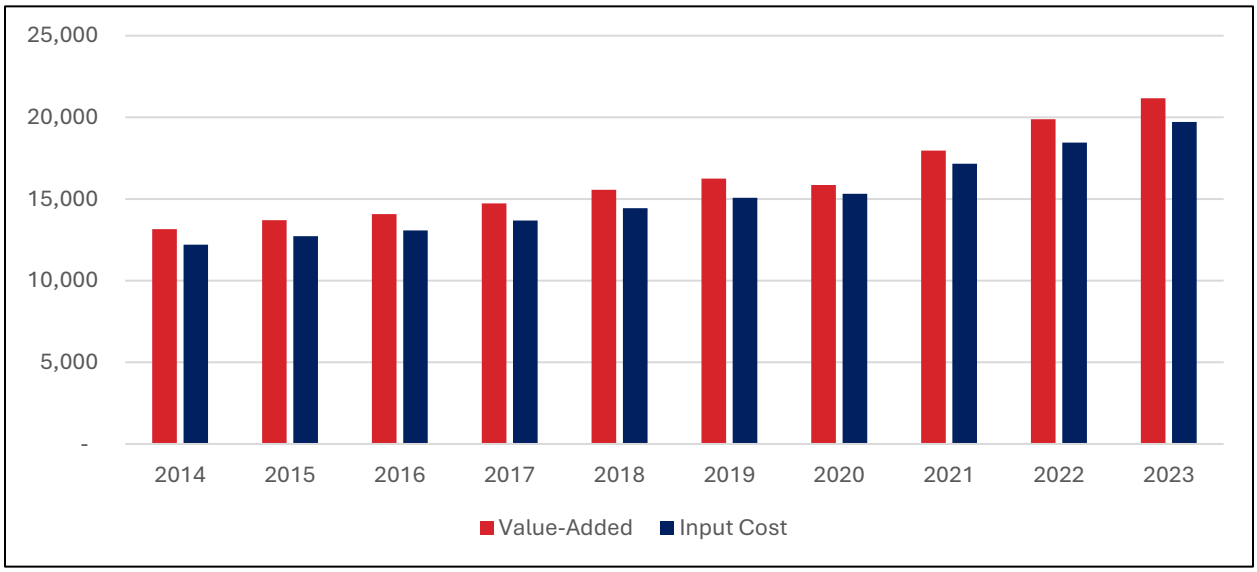


Chart 1 shows the discrepancy between value-added output for the private sector and sum of input costs with only direct taxes included.

Chart 1: Previous methodology output and input costs, private business Sector, 2014-2023

$Billions



This asymmetry between the value of output and inputs - with output value in excess of input value by the amount of the non-allocated taxes less subsidies– was adopted as a solution to the issue of unclear net TOPI assignments to factors of production when BLS TFP measures were first introduced in 1983. As productivity measurement matured, however, calculating industry contributions to aggregate levels of productivity growth became a valuable tool for economic growth analysis. With greater interest in understanding the productivity contributions of individual industries to aggregate sector productivity, finding the best solution to distribute net nonfactor taxes at both the sector and industry levels has become increasingly important.[23]

In our next section, we describe a new measurement standard that employs an additional feature of the underlying theoretical framework, and is made possible by the availability of

[23] For further discussion, see Organisation for Economic Co-Operation and Development, *Measuring Productivity: Measurement of Aggregate and Industry-Level Productivity Growth* (Paris: Organisation for Economic Co-Operation and Development, 2001), p. 81, http://www.oecd.org/sdd/productivity-stats/2352458.pdf.

more refined data on product- and production-specific taxes and subsidies. By distinguishing between market price-based GDP and basic price-based GDP, the new standard crafts a more accurate relationship between basic price-based GDP and capital, labor, and the value of production-specific taxes less the related subsidies. This new approach is easily implemented with the additional data on product and production net taxes now available in the national accounts' expenditure data. Finally, we discuss the optimal method for splitting the net value of production-related taxes less subsidies between capital and labor incomes when not enough information on the relationship between a particular production tax and input use is available.

III. A New Measurement Paradigm: Taxes and Subsidies

Pricing and the Mechanics of Taxes and Subsidies on Products and Factors of Production

In a competitive market economy, a producer seeks to maximize profit, defined as the value of revenue from sales of products less the production costs incurred when bringing these products to market. As shown previously in Figure 1, these production costs include payments to factors of production such as labor and capital, the remittance of product-specific net taxes to government bodies, and the payment of production-specific net taxes related to the use of factors of production in productive activities to various government bodies. That is, in addition to paying for the inputs used in production, producers are obligated to pay taxes at various points along the continuum from production activity to point of sale.

For example, producers are responsible for paying a variety of taxes incurred as a result of their engagement in production, including payroll taxes, business and professional

licenses, property taxes, motor vehicle licenses, and environmental taxes.[24] These "other taxes" related to production are paid at different points in time, depending on the nature of the tax. Producers also may be required by states to collect sales taxes, excise duties, taxes on specific services such as transportation, hotels, gambling or sporting events, and other product-specific taxes at the time of transaction, for future remittance to the government.[25] Similarly, producers may receive subsidies related to the inputs used in their productive activities on a quarterly, annual or other time schedule, as well as receiving subsidies targeted to specific products at the point of the sale, transfer or disposal transaction for that product.

Because taxes and subsidies on products are collected or received at the point of sale or transfer, the market price facing consumers incorporates both the per unit cost and the value of any product-specific taxes and subsidies. In other words, the market price is equal to the basic (before tax and subsidy) price of the product plus the per unit cost of tax on the product less the per unit value of the subsidy on the product:

(1) $$p_M = p_B + t_p - s_p$$

where p_M = market price received for a unit of output
p_B = basic price received for a unit of output
t_p = tax per unit of product sold
s_p = subsidy per unit of product sold

If no product-specific taxes or subsidies exist, then $t_p = 0$ and $s_p = 0$, and the price of the product in the marketplace is equal to the basic price. In this case, the profit function maximized by the producer is described as:

[24] Ibid.
[25] For further discussion of taxes on products, see United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank, System of National Accounts 2008. (New York: United Nations, 2009), p. 147-148. https://unstats.un.org/unsd/nationalaccount/sna2008.asp.

$$(2) \quad \pi = p_B Q(K, L) - p_L L - p_K K - t_L L + s_L L - t_K K + s_K K$$

Revenue at basic price

Direct input Cost

Cost of taxes on labor input, adjusted for any labor subsidies

Cost of taxes on capital input, adjusted for any capital subsidies

where π = profit; Q = output; L = labor input; p_L = price of labor; t_L = tax rate on labor input used in production; s_L = subsidy rate on labor input; K = capital input; p_K = the price of capital; t_K = the tax rate on capital input used in production; s_K = the subsidy rate on capital input

In this example, the basic price is established at a level that will cover the per unit cost of production. This includes the per unit cost of inputs used in production and taxes specific to factors of production such as payroll taxes or property taxes, less the value of subsidies related to factors of production.

If product-specific taxes such as a sales tax exist, they are collected by the producer when a product transaction occurs, and the market price will reflect both the basic price plus the per unit product tax. And, if the producer receives a subsidy for each unit of product sold, the producer will reduce the market price by the amount of this subsidy to remain competitive in the marketplace. The profit function maximized by the producer given both product- and production-specific taxes is described by the expression:

$$(2) \quad \pi = p_M Q(K, L) - t_p p_m Q(K,L) + s_p p_m Q(K,L) - t_L p_L L - p_L L + s_L p_L L - p_K K - t_K p_K K + s_K p_K K)$$

Revenue at market price, including tax per unit sold less subsidy per unit

Product taxes remitted to government

Government subsidy received per unit of product sold

Labor input costs including cost of labor input and taxes on labor input, adjusted for value of subsidies on use of labor input

Capital input costs including cost of capital input and taxes on capital input, adjusted for value of subsidies on use of capital input

Or, in expanded form, where $p_M = p_B + t_p - s_p$:

(3) $\pi = p_B Q(K, L) + t_p\, p_m\, Q(K, L) - s_p\, p_M\, Q(K, L) - t_p\, p_m\, Q(K,L) + s_p\, p_m\, Q(K,L) - p_L L - t_L L + s_L L - p_K K - t_K K + s_K K$

- $p_B Q(K, L)$: Revenue at basic price
- $t_p\, p_m\, Q(K, L)$: Tax collected on product at time of transaction
- $s_p\, p_M\, Q(K, L)$: Subsidy on product at time of transaction
- $t_p\, p_m\, Q(K,L)$: Product taxes remitted to government
- $s_p\, p_m\, Q(K,L)$: Government subsidy received per unit of product sold
- $p_L L - t_L L + s_L L$: Labor input costs including cost of labor input and taxes on labor input, adjusted for value of subsidies on use of labor input
- $p_K K - t_K K + s_K K$: Capital input costs including cost of capital input and taxes on capital input, adjusted for value of subsidies on use of capital input

The role of product-specific taxes and subsidies in the composition of a product's market price can be illustrated by the following example.[26] Suppose a farmer is selling eggs at a basic price of $2.00 per dozen in an economy with zero product-specific taxes and subsidies. If a 10% sales tax is introduced, the farmer will change the price of the eggs to $2.20 per dozen to collect the sales tax, as now required. If a subsidy for egg production is later introduced, with a value of $.10 per dozen, the farmer will have an incentive to sell the dozen eggs for $2.10 per carton to remain competitive in the marketplace. Note that the original basic price of $2.00 per dozen eggs was established to cover not only the labor and capital costs of egg production but also any net production-specific taxes related to the use of labor and capital in production, such as payroll taxes on employees, property taxes on the farmland or motor vehicle licenses for farm vehicles less any capital or labor specific production subsidies. These net taxes (taxes less subsidies) on factors of production are paid or received at particular intervals, rather than at the time of transaction.

From (3) above we see that, for each unit of product sold, the producer takes in the basic price plus the per unit tax collected at the time of the transaction, less the per unit subsidy received; pays out the per unit tax to the government; and retains the per unit subsidy value. The revenue retained by the producer, then, is equal to the basic price value of units

[26] See Corby Garner, Justin Harper, and Jon Samuels, "The Impact on Measuring Productivity and the Sources of Economic Growth," Bureau of Economic Analysis Working Paper Series, WP2024-3, June 2024, https://www.bea.gov/system/files/papers/BEA-WP2024-3.pdf

sold plus tax collected per unit during each transaction less the per unit price subsidy to consumers during transactions, less the product tax remitted to the government, plus the product subsidy from government to producer. Profit is equal to the producer's retained revenue less the total cost of capital and labor inputs, including the cost of input-related production taxes offset by input-related subsidies.

Under perfect competition, we know that the producer will select an output level, Q*, such that revenue received equals production costs:

$$(4)\quad \underbrace{p_M\, Q(K, L)}_{\text{Revenue at market price, including tax per unit sold less subsidy per unit sold}} = \underbrace{t_p\, p_m\, Q(K,L)}_{\text{Product taxes remitted to government}} - \underbrace{s_p\, p_m\, Q(K,L)}_{\text{Government subsidy received per unit of product sold}} + \underbrace{p_L\, L + t_L\, p_L\, L - s_L\, p_L\, L}_{\text{Labor input costs including cost of labor input and taxes on labor input, adjusted for value of subsidies on use of labor input}} + \underbrace{p_K\, K + t_K\, p_K\, K - s_K\, p_K\, K}_{\text{Capital input costs including cost of capital input and taxes on capital input, adjusted for value of subsidies on use of capital input}}$$

Also, notice that the optimal profit maximizing output value Q* will be the same when maximizing either the market price profit function (2) or the basic price profit function (3), since the revenue retained by the producer is identical.

By mapping the relationship described in (4), equating revenues received to funds paid out, to National Accounts data line items:

$p_M\, Q(K, L)$ Nominal GDP based on Market Prices (GDP_M)

=

$p_K\, K$	Gross Operating Surplus	
$+ p_L\, L$	Employee Compensation	
$+ t_p\, p_m\, Q(K,L)$	Taxes on Product	Taxes on Production and Imports
$+ t_K\, p_K\, K$	Other Taxes on Capital Inputs Used in Production	
$+ t_L\, p_L\, L$	Other Taxes on Labor Inputs	

	Used in Production	
$- s_p p_m Q(K,L)$	Subsidies on Product	Subsidies
$- s_K p_K K$	Other Subsidies on Capital Inputs Used in Production	
$- s_L p_L L$	Other Subsidies on Labor Inputs Used in Production	

it becomes clear that the traditional national accounts GDP measure, GDP_M, includes both the value of product- and production-specific taxes and subsidies. While this market-price based definition of GDP has many uses, employing this measure in production accounting leaves us with the problem of distributing the net value of taxes on production and imports between inputs to production.

Fortunately, the relationship between market price, basic price, and per unit taxes and subsidies of a product described by equation (1) allows for a constructive rearrangement of these national accounting items. This rearrangement, along with newly available data in the national accounts on product- and production-specific taxes and subsidies, eliminates the need to distribute the value of product-specific taxes and subsidies between inputs. The value of basic-price based output is fully distributed between capital and labor input costs, including the cost of production-specific taxes and subsidies:

$p_M Q(K, L) - t_p p_m Q(K,L) + s_p p_m Q(K,L) = p_B Q(K, L)$ Nominal GDP based on Basic Prices (GDP_B)

=

$p_K K$	Gross Operating Surplus	
$+ p_L L$	Employee Compensation	
$+ t_K p_K K$	Other Taxes on Capital Inputs Used in Production	Taxes on Inputs Used in Production
$+ t_L p_L L$	Other Taxes on Labor Inputs Used in Production	
$- s_K p_K K$	Other Subsidies on Capital Inputs Used in Production	Subsidies on Inputs Used in Production

$- s_L p_L L$	Other Subsidies on Labor Inputs Used in Production

Given taxes and/or subsidies on products, nominal GDP_M will differ from GDP_B, as will the related industry shares of aggregate nominal GDP. Recall, though, that we have shown that the profit maximizing level of output is independent of net product taxes, and in fact, BEA measures of real GDP_M will be equal to real output measured using basic prices, real GDP_B. BEA's industry accounts typically construct real market price-based GDP_M by deflating nominal GDP_M using producer price indexes (PPIs) as deflators. Because PPIs are based on the product prices found in the marketplace and these prices exclude any product-specific taxes that occur at the time of transaction, such as sales taxes, the BEA industry accounts first adjust each nominal GDP_M measure by removing the value of taxes on products. This adjusted GDP measure is then deflated using the appropriate PPI to obtain real GDP_M, or Q*, resulting in a real GDP measure purged of any product tax influence. Lastly, a national accounts' implicit price in market prices is constructed as GDP_M divided by Q*. This implicit price index differs from the respective PPI by the product tax rate. And, since the production account excludes the value of net product-specific taxes, a production account implicit price can be similarly derived by dividing GDP_B by Q*. This basic price-based implicit price deflator will differ from the national accounts market price-based implicit price deflator by the rate of net taxes on products.

Implications for BLS Capital and Labor Measures

When the value of net product taxes is removed from GDP in the process of constructing a basic price GDP for use in production accounting, the value of the expenditure side items is also reduced. Capital costs now include gross operating surplus plus only the value of net production taxes on the use of capital inputs, and similarly, labor costs include employee compensation and net production taxes on the use of labor inputs. This change in the value of capital and labor costs in turn will impact capital and labor input measures.

In the absence of well-developed capital rental markets, it is difficult to separate the value of capital services into price and quantity components. Typically, the consumer of a capital service is also the supplier of the service.[27] Christensen and Jorgenson (1969) note that the value of capital services can be separated into price and quantity components by recognizing that capital compensation is equal to the capital asset rental price multiplied by the asset productive capital stock quantity:

$$(5)\quad Y_t = \Sigma_i\, c_{it} k_{it}$$

where Y_t is total capital income in year t, c_{it} is the rental price of capital, k_{it} is productive capital stock, i represents the ith asset and t represents the year t.[28]

BLS estimates asset level productive capital stocks, for several types of capital assets, using a perpetual inventory method approach (also known as *vintage aggregation*) that cumulates past vintages of investment while adjusting for deterioration in the capital stock over time.[29] Asset level capital rental prices are constructed based on Jorgenson's neoclassical model of investment, which states that demand for a capital asset will be

[27] See Zvi Griliches and Dale W. Jorgenson, "Sources of Measured Productivity Change: Capital Input," American Economic Review, Vol. 56, No. 1 / 2 (March 1, 1966), pp. 50-61.

[28] See Laurits R. Christensen and Dale W. Jorgenson, "The Measurement of U.S. Real Capital Input, 1929-1967," Review of Income and Wealth, Vol. 15, December 1969, pp. 293-320; Zvi Griliches and Dale W. Jorgenson, "Sources of Measured Productivity Change: Capital Input," American Economic Review, Vol. 56, March 1966, pp. 50-61; and Robert E. Hall and Dale W. Jorgenson, "Tax Policy and Investment Behavior," American Economic Review, Vol. 57, June 1967, pp. 391-414.

[29] BLS capital services measures include 90 asset types for fixed business equipment, structures, inventories, land, and intellectual property products. The aggregate capital services measures are obtained by Tornqvist aggregation of the capital stocks for each asset type within each of the nineteen manufacturing North American Industry Classification System (NAICS) industry groupings using estimated rental prices for each asset type. Each rental price reflects the nominal rate of return to all assets within the industry and rates of economic depreciation and revaluation for the specific asset; rental prices are adjusted for the effects of taxes. Data on investment for fixed assets are obtained from BEA. Data on inventories are estimated using data from BEA and additional information from the Internal Revenue Service (IRS) Corporation Income Returns. Data for land in the farm sector are obtained from the United States Department of Agriculture. Nonfarm industry detail for land is based on IRS book value data. Current-dollar value-added data, obtained from BEA, are used in estimating capital rental prices.

maximized when the purchase price of a capital asset equals the discounted stream of future value from the asset.[30] That is, the rental price of an asset in a specific time period represents the value of the current flow of services from this asset. Note that the discounted stream of future value from an asset reflects revenues received less costs incurred, such as asset depreciation, taxes, and loss of capital gains from retaining the asset rather than selling it. Using this relationship between capital asset price and the discounted stream of future value from the asset, the following expression for the capital rental price can be derived:

$$(6) \qquad c_t = \frac{(1-u_t z_t)(p_{t-1} r_t + p_{t-1} d_t - \Delta p_{t-1})}{1-u_t} + p_{t-1} x_t$$

where:

u_t is the corporate income tax rate

z_t is the present value of $1 of tax depreciation allowances

r_t is the nominal (internal) rate of return on capital

d_t is the average rate of economic depreciation

p_{t-1} is the deflator for new capital goods

Δp_{t-1} is the revaluation of assets due to inflation in new goods prices

x_t is the rate of net taxes on the use of capital in production

and t = year t

From (6) we see that estimating capital asset rental prices requires data on the corporate income tax rate, the discount rate, asset depreciation rates, capital asset prices, the rate of net taxes on production, and the nominal internal rate of return. Empirical data is generally available for all except the internal rate of return. However, a theoretical expression for estimating the internal rate of return variable, r, can be derived from (6) by

[30] See Dale W. Jorgenson, "Capital Theory and Investment Behavior," American Economic Review, Vol. 53, No. 2, 1963, pp. 247-259.

assuming the condition described by (5), that capital income equals the sum of the value of capital services across all assets, is fulfilled. Substituting the rental price expression (6) into the capital income expression (5) yields an expression for the internal rate of return associated with the capital rental price that fulfills the capital income distribution requirement:[31]

$$(7) \qquad r_t = \frac{Y_t - x_t k_t p_{t-1} - k_t (p_{t-1} d_t - \Delta p_{t-1})(1 - u_t z_t)/(1 - u_t)}{k p_{t-1}(1 - u_t z_t)/(1 - u_t)}$$

where Y_t is nominal capital income and k_t is productive capital stock.

Because capital income is available at the industry level rather than the asset level, BLS estimates of r_t are computed jointly for all assets in a given industry.[32] By comparison, (6), the asset rental price expression, is computed for each asset type employed in a given industry using the rate of return implicit in the total flow of capital income in a given industry.[33] BLS then aggregates the productive capital stocks by asset type using a Tornquist formula, with asset-level capital rental prices as weights, to form a measure of the capital services derived from the physical capital stock, i.e., capital input, in each industry or major sector.

The effect of the new treatment of net taxes on products and production on BLS capital measures can be traced by reviewing the impact on each variable underlying these measures. *Productive capital stock*, measured using the perpetual inventory method and data on investment and asset depreciation rates, remains unchanged in the revised methodology. *Capital income* is redefined to include the net value of taxes paid and

[31] In practice, capital income data is only available at the industry level. As a result, the internal rate of return is estimated at the industry level, and assumed to be the same for all assets in an industry.

[32] For additional information on BLS estimation of the jointly estimated internal rate of return and calculation of asset-level rental prices, see Lucy P. Eldridge, Chris Sparks, and Jay Stewart, "The US Bureau of Labor Statistics Productivity Program," in The Oxford Handbook of Productivity Analysis, pp. 134-137. https://doi.org/10.1093/oxfordhb/9780190226718.013.3

[33] See Christensen and Jorgenson (1969), p. 301-304, for further discussion.

subsidies received for the use of capital in production. Previously, the BLS capital income measure included the direct cost of capital inputs plus the indirect cost of property taxes and motor vehicle license taxes. Under the revised methodology, capital income is equal to the direct cost of capital plus net production taxes related to the use of capital input, including *net* production taxes on property, motor vehicles, and "other" licenses.[34] Revised capital income now includes an additional production tax category, "other license taxes," and also directly adjusts for the role of taxes and subsidies in producer decisions on capital use by offsetting the value of capital-related production subsidies against production taxes on capital inputs.[35]

Total input cost under the revised methodology, equal to official nominal GDP less net product taxes or basic price-based GDP, includes the direct cost of capital and labor plus net capital- and labor-related production taxes. This compares to the prior BLS definition of total input cost, official (market price-based) nominal GDP less "net TOPI" plus the value of property taxes and motor vehicle license taxes.

The effect of the new tax and subsidy treatment is carried through into the BLS calculation of industry-level internal rates of return by the redefinition of both capital income and the tax rate on indirect capital costs. In equation (7), the productive capital stock, industry-level capital price deflator, depreciation rate, discount rate, and corporate income tax rate variables are unchanged under the new treatment, while the capital income and rate of indirect taxes variables are redefined. Previously, the rate of indirect taxes was the rate of

[34] Other license taxes include occupational and business licenses required of persons engaged in particular professions, trades, taxes on insurance companies based on value of their policies, and charges or fees related to inspection and marketing of commodities; public utilities licenses; franchise licenses including organization, filing and entrance fees and state and local taxes on property; alcoholic beverage licenses for the manufacturing, importing, wholesaling and retailing of alcoholic beverages; amusement licenses; state hunting and fishing licenses for commercial and noncommercial hunting and fishing permits; and other license taxes not elsewhere classified including per head levies on livestock, health permits, marriage licenses, building and equipment permits, registration fees on noncommercial aircraft and pleasure boats, impact fees paid in connection with building permits, and building and equipment permits.
[35] Similarly, labor compensation now includes direct compensation to labor inputs plus the indirect net production taxes related to labor.

taxes on property and motor vehicle licenses; with the new treatment of taxes and subsidies, this rate is the *net* rate of production taxes - including property, motor vehicle licenses, and other licenses - related to capital inputs. The resulting industry-level internal rates of return, as a result, incorporate changes in capital income and indirect tax values.

The revised industry-level rates of return from the revised methodology are in turn used to estimate asset-level capital rental prices. By reviewing equation (6) for asset rental prices, we can see that all variables remain unchanged under the new tax and subsidy treatment except the internal rate of return variable. Using the revised rate of return in calculating asset-level rental prices incorporates the impact production taxes and subsidies have on the optimal rental price a producer is willing to accept when faced with these net taxes. A producer faced with a decision to invest in the marketplace or in additional capital will weigh the gain from investing his funds at a rate of return available in the financial market against the gain from buying a capital asset and earning a rate of return from the use of this capital in production. Apart from the purchase cost of the asset, the producer will incur the cost of corporate income tax on earnings from use of the asset; an opportunity cost from holding and using the asset rather than reselling it; the cost of depreciation in the value of the asset; and the indirect cost of owning the asset in the form of property, motor vehicle, and other license taxes, offset by any subsidies that reduce the cost of purchasing the asset. Because the internal rate of return is estimated jointly for all assets and reflects the total flow of capital income in a given industry, the effect of net production taxes and subsidies in the industry is distributed proportionally among all assets according to their earnings contribution to the industry's total capital income. For an individual producer, a production subsidy appears on the books as additional income and flows out as an offset against the cost of capital it is used to purchase.

IV. Empirical Results: Effects of Improved Tax and Subsidy Treatment on Productivity and Related Measures

BLS publishes labor and total factor productivity measures for industries and subsectors of the U.S. business sector. Total factor productivity statistics incorporated the revised taxes methodology in November, 2024 and are available for the U.S. private business and private nonfarm business sectors, 21 major industries, and 61 underlying industries. Results in this section will focus on the private business sector and the accommodation and food services major industry. This major industry was chosen for analysis as it a person-to-person service industry hit hard by the COVID-19 pandemic, which resulted in substantial subsidies received. The analysis covers the long-run period of 1987-2023, and the current 2019-2023 business cycle where the effects of the revised methodology have the greatest impact. Selected results for private business and 21 major industries are available in the appendix.

Private Business Sector Net Taxes

Taxes on production and imports and subsidies are broken down into product and production classifications using the newly available BEA Input/Output data. Chart 2 below shows that prior to 2020, there are no reported subsidies on production for the private business sector and that taxes on product are the largest item within the value-added component of taxes on production and imports, less subsidies.

Chart 2: Taxes and subsidies, by product and production classification, for the private business sector, 2019-2023

$Billions

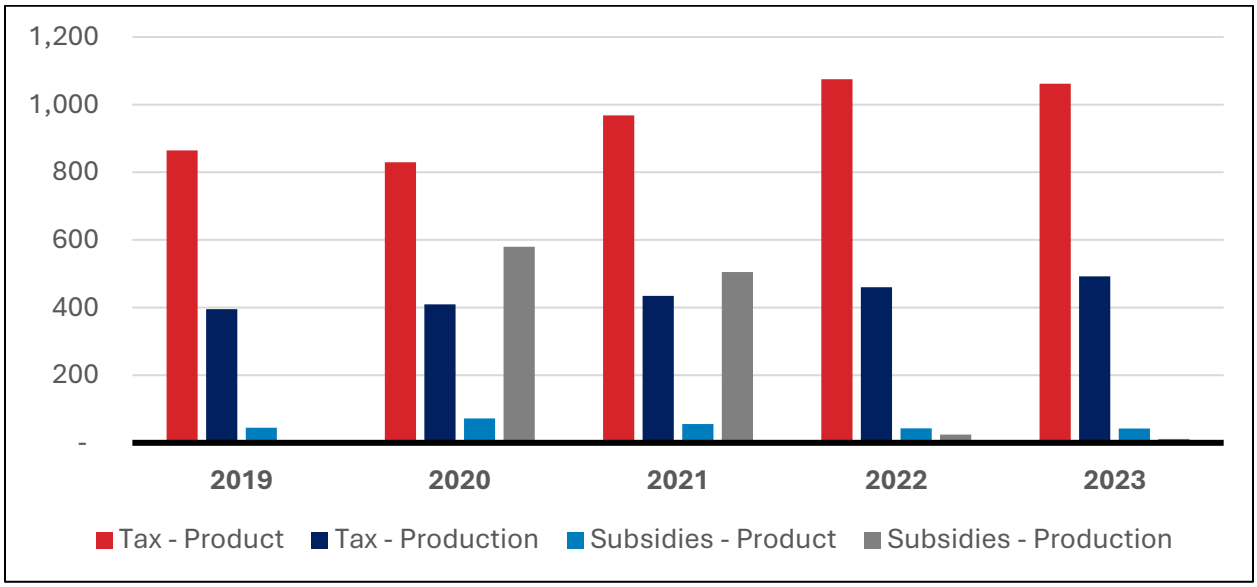
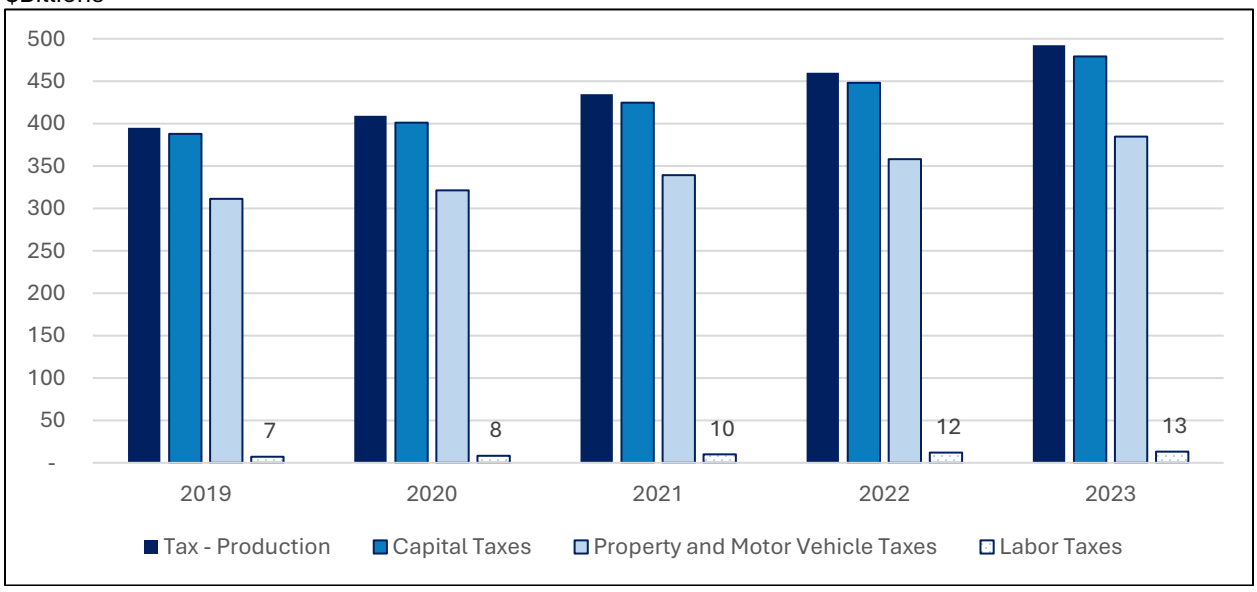


Chart 3 shows that taxes on production assigned to capital represent almost all taxes on production. Furthermore, the sum of motor vehicle and property taxes account for most of these taxes.

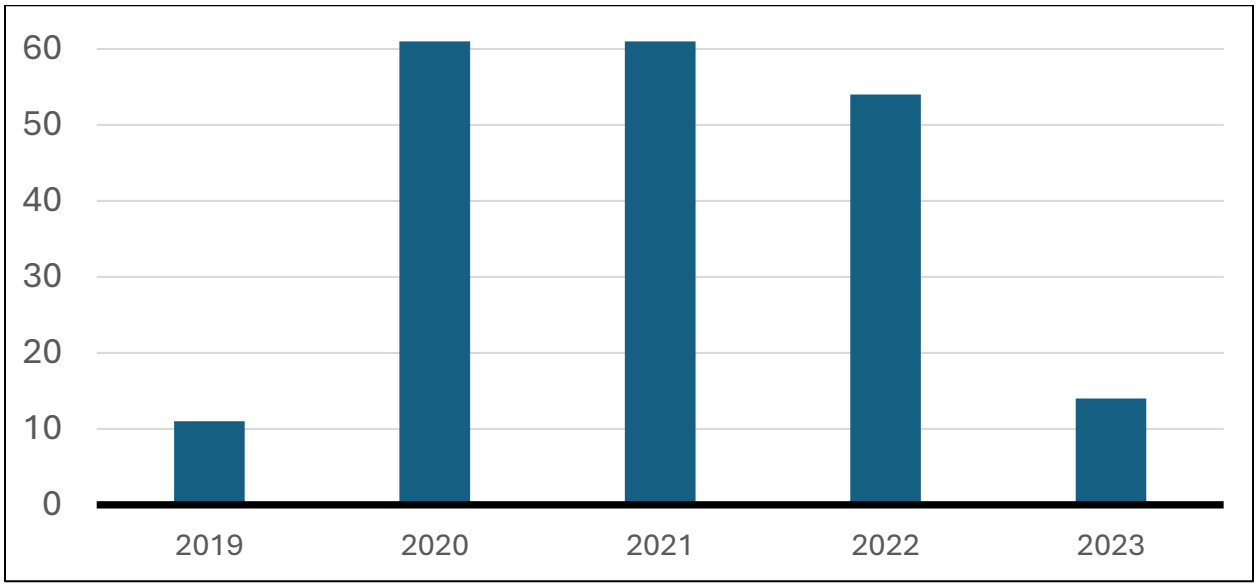
Chart 3: Taxes on production by type, private business sector, 2019-2023

$Billions



As highlighted in the introduction, the COVID-19 pandemic induced unprecedented subsidies in the U.S. economy. In 2019 only 11 of 61 industries within the private business sector received subsidies on product or production. In 2020 and 2021this number grew to encompass all industries within the aggregate private business sector, with the number of industries receiving subsidies declining in 2022 and 2023. See Chart 4.

Chart 4: Number of industries with subsidies in select years

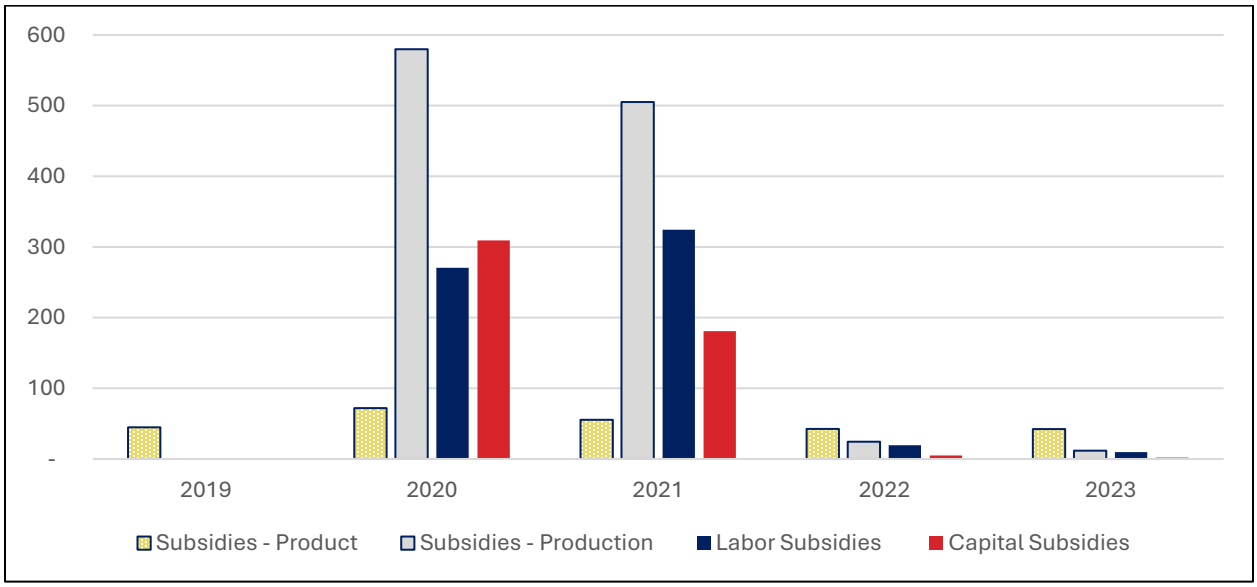


The recently released product and production lines in the NIPA Input/Output tables allow us to break down these subsidies into subsidies on product and production. Joint work by BEA and BLS allow for the allocation of these subsidies on production to the inputs of capital and labor.[36] Chart 5 shows the values of subsidies on product, as well as the assignment of subsidies on productions to capital and labor inputs.

[36] https://www.bea.gov/system/files/papers/BEA-WP2024-3.pdf

Chart 5: Product and production subsidies, 2019-2023

$Billions



Output

The issue of proper valuation of taxes and subsidies is embedded in the current dollars and prices for sector and industry output. It is important to note that real output is unaffected.

Private business sector

Private business value added is adjusted to remove net taxes on product (taxes on product less subsidies on product), around 5% of value added over the long run period 1987-2023 and $1,019 billion in 2023.

Table 1 below shows the growth of real output, current dollar value-added, and value-added price deflator for selected time periods. Over the long run period of 1987-2023, the new treatment of taxes results in no change in growth for the output related measures.

Table 1. Private business output related measures, percent change

	Real Output		Value Added		Output Price	
Period	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
1987-2023	2.9	2.9	5.0	5.0	2.0	2.0
2019-2023	2.6	2.6	6.9	6.8	4.2	4.2
2019	3.1	3.1	4.5	4.5	1.3	1.3
2020	(2.7)	(2.7)	(2.1)	(2.4)	0.5	0.3
2021	7.6	7.6	12.9	13.2	4.9	5.2
2022	2.4	2.4	10.6	10.7	7.9	8.0
2023	3.1	3.1	6.9	6.5	3.7	3.3

However, there is a small change in current dollar growth in the COVID included period of 2019-2023. Looking at the high COVID-subsidy years of 2020 and 2021, we can see that this difference increases, highlighting the effect of breaking out the GDP component of TOPI, less subsidies into net taxes on product and net taxes on production. In 2020 and 2023, the growth of net taxes and owner-occupied tax[37] is greater than that of private business value-added without the tax adjustment, leading to large growth in those years for the final current dollar output. See Table 2a and 2b.

Table 2a. Private business TOPI, less subsidies and net taxes on product, $billions

Measure	2019	2020	2021	2022	2023
Value-added, not net tax adjusted	16,253	15,862	17,960	19,880	21,168
Less net taxes on product	820	757	913	1,033	1,019
Less owner-occupied tax	65	67	71	75	81
Value-added, tax adjusted	15,368	15,038	16,976	18,772	20,068

[37] An additional improvement to private business and nonfarm private business is the removal of owner-occupied related taxes.

Table 2b. Private business TOPI, less subsidies and net taxes on product, percent change

Measure	2020	2021	2022	2023
Value-added, not net tax adjusted	-2.4%	13.2%	10.7%	6.5%
Less net taxes on product	-7.6%	20.5%	13.2%	-1.3%
Less owner-occupied tax	3.1%	7.0%	5.9%	7.4%
Value-added, tax adjusted	-2.1%	12.9%	10.6%	6.9%

Looking back at Table 2, we can see that the new level of current dollars for the sector leads to new growth of the private business output price deflator.

Industries

At the 61 industry and 20 major industry level of private business, the improved tax methodology has similar effects on industry output as it does on sector output. Real output is unchanged, with current dollar sectoral output and sectoral output prices revised. Previous BLS methodology removed all non-motor vehicle and non-property tax value from each industry's sectoral output value, thus, the improved methodology in non-COVID subsidies years is minimal. The only adjustment is to include the small additional taxes on production of state and local payroll tax and state and local other license taxes. Across all industries and year, these other production taxes account for an average of 13% of production taxes.

Looking at the accommodation and food services industry, an industry with substantial COVID-related subsidies, we can see that real sectoral output remains unchanged, but in the COVID years of 2020-2022, the growth of the current dollar output for the industry is revised with the updated taxes methodology.

Table 3. Accommodation and food services output related measures growth, percent change

	Real Output		Sectoral Value		Output Price	
Period	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
1987-2023	2.4	2.4	5.5	5.5	3.0	3.0
2019-2023	2.2	2.1	8.1	8.1	5.8	5.8
2019	2.5	2.5	5.4	5.4	2.8	2.8
2020	(21.9)	(21.9)	(22.3)	(17.1)	(0.5)	6.1
2021	25.1	25.0	32.5	36.4	6.0	9.1
2022	8.1	8.0	18.3	7.8	9.5	(0.2)
2023	3.1	3.1	12.1	12.1	8.7	8.7

With the newly available breakout of taxes and subsidies on product and production, BLS is able to more accurately remove net taxes on production. This is important in high COVID subsidy years. In the previous methodology, subsidies on production were added into the value of output as they lowered the indirect value of taxes that were removed. The table below shows the level of indirect taxes removed from output for the accommodation and food services industry compared to net taxes on product in the revised methodology.

Table 4. Accommodation and food services taxes and subsidies, 2019-2023, $billions

Year	TOPI, less subsidies	Direct Taxes	**Previous Indirect Taxes**	Taxes on Product	Taxes on Product	Subsidies on Product	Subsidies on Production	**Net Taxes on Product**
2019	95	10	**85**	84	11	-	-	**84**
2020	34	10	**24**	73	12	-	50	**73**
2021	6	11	**(4)**	92	12	-	98	**92**
2022	120	11	**109**	107	13	-	0	**107**
2023	127	12	**115**	113	14	-	-	**113**

Capital Measures

The effect of the revised taxes methodology on capital measures is more complex than the effect on output. Accurately assigning net taxes on production to capital will affect capital cost, which in turn will affect the industry rate of return and asset rental prices. The change

in asset level prices will affect the weighting of capital assets and lead to small changes in real capital input. As with output, it is the current dollar and price measures of capital that are most affected.

Private business sector

Capital input for the private business sector is an aggregation of capital input from 61 detailed industries within the sector. Thus, there are no rates of return or rental prices to be discussed for this sector.

Table 5 below shows that in the long run period of 1987-2023 capital growth is revised down 0.1 percentage point to 3.3 percent. Capital cost growth is unchanged but the revised real capital leads to an equal revision to the capital price. In the current business cycle that contains the COVID pandemic related subsidies, all measures of capital are slightly revised down over the 2019-2023 period, with 2020 and 2021 seeing the largest revisions across the period.

Table 5. Private business sector capital growth, percent change

	Real Capital		Capital Cost		Capital Price	
Period	Revised	Previous	Revised	Previous	Revised	Previous
1987-2023	3.3	3.4	5.7	5.7	2.3	2.2
2019-2023	2.6	2.7	8.9	9.0	6.1	6.2
2019	3.0	3.1	4.3	4.2	1.2	1.0
2020	2.8	2.7	(1.2)	3.9	(3.8)	1.1
2021	2.3	2.3	17.5	15.6	14.8	13.0
2022	2.8	2.9	11.6	8.6	8.5	5.6
2023	2.6	2.7	8.5	8.5	5.7	5.6

The change in sign of capital cost growth in 2020 can be attributed to the removal of subsidies assigned to capital. In the previous tax methodology, the direct taxes of motor vehicle and property taxes were assigned to capital and the subsidies related to capital were inherently left in the value of capital cost. The revised methodology now removes capital related subsidy value and lowers the cost of capital in 2020 and 2021. See table 6.

Table 6. Private business sector capital related taxes and subsidies, 2019-2023, $ Billion

Year	Capital Taxes on Production	Capital Subsidies on Production	Net Capital Taxes on Production	Direct Capital Taxes	Difference in Taxes added to Capital Cost
2019	388	-	388	311	77
2020	401	309	92	321	(230)
2021	425	181	244	339	(95)
2022	448	5	443	358	85
2023	479	2	477	385	93

Industries

At the industry level, the removal of subsidies on capital cost will have a more pronounced effect in industries with large production related subsidies. Table 7 below shows growth of the real capital index, capital cost, and capital price for the accommodation and foods services major industry. Over the long-run period of 1987-2023, the revised taxes methodology does not change growth. However, within the COVID-related years of 2019-2023 these measures see revisions.

Table 7. Capital-related measures growth for accommodation and food services, percent change

	Real Capital		Capital Cost		Capital Price	
Period	Revised	Previous	Revised	Previous	Revised	Previous
1987-2023	1.6	1.6	6.8	6.8	5.1	5.1
2019-2023	0.6	0.6	10.2	10.3	9.6	9.6
2019	(1.0)	(1.0)	8.6	8.6	9.7	9.7
2020	(2.0)	(2.3)	(31.4)	(11.2)	(30.0)	(9.1)
2021	3.0	3.3	74.2	74.1	69.1	68.5
2022	0.6	0.6	(4.9)	(26.4)	(5.5)	(26.9)
2023	0.9	0.9	29.9	30.1	28.8	28.9

Capital input for the accommodation and food services major industry is a Tornqvist aggregation of the underlying industries of accommodation; and food services and drinking places. To see the effect of revised capital cost, we must look at these two industries. Table 8 below shows capital cost, the internal rate of return, and capital input growth for

both industries. We can see that COVID-subsidies years of 2020 and 2021, capital cost is revised down, leading to a lower internal rate of return for both industries. The new rate of return has different effects on the accommodation industry capital index, as it increases growth in both years. In the food services and drinking places industry, the effect is mixed as capital growth is revised upward in 2020 but downward in 2021.

Table 8. Capital-related measures for Accommodation and Food services and drinking places

		Capital Cost		IRR		Capital Input Growth	
		$Billions		Rate		Annual Growth	
Industry	**Year**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Accommodation	2019	75	74	9.1%	9.0%	-3.9	-3.9
Accommodation	2020	34	41	4.5%	5.2%	-1.7	-2.1
Accommodation	2021	68	78	8.2%	9.2%	-1.3	-1.4
Accommodation	2022	90	90	12.4%	12.4%	0.6	0.6
Accommodation	2023	107	106	12.7%	12.7%	0.1	0.1
Food services and drinking places	2019	90	90	14.2%	14.0%	1.6	1.6
Food services and drinking places	2020	80	105	11.9%	16.4%	-2.2	-2.5
Food services and drinking places	2021	129	176	20.2%	27.8%	5.1	5.4
Food services and drinking places	2022	98	97	19.4%	19.2%	0.7	0.6
Food services and drinking places	2023	137	136	21.3%	21.2%	1.6	1.6

Labor Measures

The revised taxes methodology has little impact on labor at both the sector and industry level. Real measures of labor input (hours worked adjusted for changes in the composition of the workforce) are unaffected by taxes. Labor cost, calculated as employee compensation plus proprietor labor cost, will slightly change due to labor specific taxes and subsidies.

Private business sector

Previous BLS methodology did not assign any portion of TOPI, less subsidies to labor cost. However, in non-COVID subsidies years, net taxes on labor were insignificant, representing around 3% of taxes on production. Adding the labor-specific taxes to labor cost increases the measure by an average of 0.5% in 1987-20219. However, as with capital cost, high COVID subsidy years within the 2019-2023 period do see noticeable revisions to labor cost and price.

Table 9. Labor-related measures for private business sector

	Labor Input		Labor Cost		Labor Price	
Percent Change	Revised	Previous	Revised	Previous	Revised	Previous
1987-2023	1.4	1.4	4.6	4.6	3.2	3.2
2019-2023	1.1	1.1	5.6	5.6	4.4	4.4
2019	1.2	1.2	4.6	4.6	3.4	3.4
2020	(5.1)	(5.1)	(2.8)	0.2	2.4	5.6
2021	4.5	4.5	9.9	9.8	5.2	5.1
2022	4.1	4.1	9.9	6.9	5.5	2.6
2023	1.2	1.2	5.8	5.7	4.5	4.4

Table 10. Labor-related taxes for private business sector

$Billions	Labor Taxes on Production	Labor Subsidies on Production	Net Labor Taxes on Production
2019	7	-	7
2020	8	270	(262)
2021	10	324	(314)
2022	12	19	(7)
2023	13	10	3

Industries

In the accommodation and food services industry long run labor measures are unchanged but 2020-2022 saw revisions to labor cost and price. Again, the COVID-related subsidies account for this revision.

Table 11. Labor-related measures for accommodation and food services, percent change

	Labor Input		Labor Cost		Labor Price	
Period	Revised	Previous	Revised	Previous	Revised	Previous
1987-2023	1.6	1.6	5.4	5.4	3.7	3.7
2019-2023	(0.5)	(0.5)	6.2	6.2	6.7	6.7
2019	1.2	1.2	5.6	5.6	4.4	4.4
2020	(21.1)	(21.1)	(23.0)	(19.1)	(2.3)	2.6
2021	8.5	8.5	20.1	25.7	10.6	15.9
2022	10.1	10.1	26.1	14.6	14.6	4.1
2023	4.1	4.1	9.1	9.1	4.8	4.8

Table 12. Labor-related taxes for Accommodation and food services, $billions

Year	Labor Taxes on Production	Labor Subsidies on Production	Net Labor Taxes on Production
2019	374	-	374
2020	434	23,448	(23,014)
2021	525	59,418	(58,894)
2022	631	49	582
2023	696	-	696

Productivity Measures

As discussed above, the revised tax methodology results in no change to real output or labor input, and only minor changes to real capital and capital and labor cost. However, the revisions to capital and labor cost lead to changes in the weighting of combined inputs at both the sector and industry level, which then leads to revisions in TFP. Tables 13 and 14 show TFP and combined input growth for the private business sector and accommodation and food services industry.

Table 13: TFP and combined input, private business, percent change

	TFP		Combined Input	
Period	Revised	Previous	Revised	Previous
1987-2023	0.9	0.9	2.0	2.1
2019-2023	0.8	0.8	1.7	1.7
2019	1.2	1.2	1.9	1.9
2020	(0.6)	(0.5)	(2.1)	(2.2)
2021	3.9	3.9	3.6	3.6
2022	(1.1)	(1.1)	3.6	3.6
2023	1.3	1.3	1.8	1.8

Table 14: TFP and Combined Input Growth, accommodation and food services, percent change

	TFP		Combined Input	
Period	Revised	Previous	Revised	Previous
1987-2023	0.3	0.3	2.0	2.0
2019-2023	0.2	0.3	2.0	1.8
2019	1.4	1.4	1.1	1.1
2020	(5.6)	(5.8)	(17.2)	(17.0)
2021	10.5	11.0	13.2	12.6
2022	(1.7)	(1.5)	9.9	9.7
2023	(1.8)	(1.8)	5.0	5.0

The impact of the revised taxes methodology is greatest in the productivity measures of unit capital and labor unit costs. Unit costs are measured as input cost over the real level of output and can be used as indicator of inflationary pressures on producers. For the private business sector, the revised taxes methodology has a substantial impact on these measures in the high COVID subsidy year of 2020. The revised taxes methodology changes capital and labor cost to the point of lowering unit capital cost significantly and even reverses the sign of unit labor costs.

Table 15. Unit capital and labor cost, Private business sector, percent change

	Unit Capital Cost		Unit Labor Cost	
Period	Revised	Previous	Revised	Previous
1987-2023	2.7	2.7	1.6	1.6
2019-2023	6.2	6.3	2.9	2.9
2019	1.1	1.0	1.5	1.5
2020	1.6	6.8	(0.1)	2.9
2021	9.1	7.4	2.1	2.0
2022	8.9	6.0	7.3	4.3
2023	5.2	5.2	2.6	2.5

For the accommodation and food services industry, where COVID subsidies represented a much larger share of taxes on production and imports, less subsidies, the effect on capital and labor cost is more dramatic and covers the years of 2020-2022.

Table 16. Unit capital and labor cost, Accommodation and food services, percent change

	Unit Capital Cost		Unit Labor Cost	
Period	Revised	Previous	Revised	Previous
1987-2023	4.3	4.3	3.0	3.0
2019-2023	7.9	8.0	4.0	4.0
2019	6.0	6.0	3.0	3.0
2020	(12.2)	13.6	(1.4)	3.5
2021	39.3	39.3	(4.0)	0.6
2022	(12.0)	(31.9)	16.7	6.1
2023	26.0	26.1	5.8	5.8

V. Conclusion

Taxes and subsidies have routinely been an overlooked component of national accounting, specifically in reference to where they belong in measuring economic growth in the KLEMS

production account framework. This work seeks to unravel that question by introducing a new standard of tracking the taxes on production and imports, less subsidies component of value added by measuring the specific taxes and subsidies on a production or on product basis. This work shows that improving the fidelity of measuring taxes and subsidies opens the door to a new way of analyzing unit labor costs, productivity measurement, and capital input growth.

The pandemic subsidies shone a light on the gap in growth accounting that motivated this work on taxes and subsidies. The large subsidies played a striking role in supporting US industries during the economic shock the COVID pandemic brought in 2020. This work provides three important contributions to understanding economic growth during the most recent shock of COVID in 2020: 1) this work seeks to encourage national accountants to follow the US BEA approach to measuring taxes and subsidies on a more detailed basis to allow for a more complete accounting 2) this work finds important insights into how subsidies and taxes can play a significant role in measuring unit labor costs and unit capital costs and productivity during a shock and 3) not engaging the TOPI component of GDP has had an important limitation on growth accounting at the industry level.

Appendix

Table 1. Real measures of growth 2019-2023, TFP, output, capital, and labor

	TFP		Output		Capital Input		Labor Input	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	0.8	0.8	2.6	2.6	2.6	2.7	1.1	1.1
Agriculture, forestry, fishing, and hunting	0.9	0.9	0.2	0.2	1.9	1.9	-0.9	-0.9
Mining	3.6	3.7	2.0	2.0	-1.9	-1.9	-3.6	-3.6
Utilities	0.1	0.2	0.1	0.1	2.8	2.8	0.8	0.8
Construction	-1.5	-1.5	0.3	0.3	2.1	2.1	0.9	0.9
Manufacturing	-0.5	-0.5	-0.5	-0.5	1.8	1.8	0.4	0.4
Durable manufacturing	-1.1	-1.1	-0.7	-0.7	1.4	1.4	0.3	0.3
Nondurable manufacturing	0.2	0.2	-0.4	-0.4	2.2	2.2	0.7	0.7
Wholesale trade	-1.2	-1.2	1.0	1.0	2.4	2.4	0.6	0.6
Retail trade	-0.1	0.0	2.8	2.8	3.2	3.2	-0.3	-0.3
Transportation and warehousing	-0.8	-0.7	0.7	0.7	1.5	1.5	3.4	3.4
Information	2.0	2.0	6.4	6.4	6.4	6.4	1.5	1.5
Finance and insurance	-0.9	-0.9	2.0	2.0	3.3	3.3	1.2	1.2
Real estate and rental and leasing	1.5	1.5	4.4	4.4	1.1	1.0	1.7	1.7
Professional and technical services	2.7	2.7	5.6	5.7	6.0	6.0	2.1	2.1
Management of companies	3.3	3.3	4.9	4.9	0.4	0.3	1.1	1.1
Administration and waste services	1.2	1.2	2.3	2.3	4.6	4.6	1.0	1.0
Educational services	-0.4	-0.4	3.2	3.2	1.2	1.2	0.3	0.3
Health care and social assistance	0.7	0.7	3.1	3.1	2.6	2.6	2.2	2.2
Arts, entertainment, and recreation	0.1	0.2	3.3	3.4	2.0	2.0	1.4	1.4
Accommodation and food services	0.2	0.3	2.2	2.1	0.6	0.6	-0.5	-0.5
Other services, except government	-1.4	-1.4	1.9	1.9	2.3	2.2	0.6	0.6

Table 2. Current dollar growth 2019-2023, output, combined input, capital, and labor

	Output		Combined Input		Capital		Labor	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	6.9	6.8	6.9	6.9	8.9	9	5.6	5.6
Agriculture, forestry, fishing, and hunting	8.0	8.0	8.0	8.0	13.2	13.2	7.0	7.0
Mining	8.2	8.2	8.2	8.2	11.7	11.7	0.3	0.2
Utilities	5.4	5.4	5.4	5.4	10.2	10.3	2.6	2.6
Construction	7.8	7.8	7.8	7.8	12.2	12.2	4.8	4.8
Manufacturing	5.2	5.2	5.2	5.2	7.4	7.4	4.3	4.3
Durable manufacturing	4.5	4.5	4.5	4.5	5.0	5.0	4.3	4.3
Nondurable manufacturing	5.7	5.7	5.7	5.7	9.4	9.4	4.2	4.2
Wholesale trade	6.8	6.8	6.8	6.8	8.9	8.9	5.9	5.9
Retail trade	8.9	8.9	8.9	8.9	14.9	15.0	5.2	5.2
Transportation and warehousing	6.2	6.2	6.2	6.2	9.0	9.0	6.9	6.9
Information	7.1	7.1	7.1	7.1	6.9	6.9	7.0	7.0
Finance and insurance	5.4	5.4	5.4	5.4	5.1	5.1	5.0	5.0
Real estate and rental and leasing	8.8	8.8	8.8	8.8	9.2	9.2	5.7	5.8
Professional and technical services	7.4	7.4	7.4	7.4	12.6	12.6	6.6	6.6
Management of companies	5.6	5.5	5.6	5.5	5.0	5.0	5.6	5.6
Administration and waste services	5.9	5.9	5.9	5.9	11.8	11.9	6.3	6.3
Educational services	6.4	6.4	6.4	6.4	7.7	7.7	0.9	0.9
Health care and social assistance	6.1	6.2	6.1	6.2	6.8	7.0	6.0	6.2
Arts, entertainment, and recreation	6.8	6.8	6.8	6.8	6.8	6.8	5.1	5.1
Accommodation and food services	8.1	8.1	8.1	8.1	10.2	10.3	6.2	6.2
Other services, except government	7.3	7.3	7.3	7.3	9.4	9.5	5.0	5.0

Table 3. Price growth 2019-2023, output, combined input, capital, and labor

	Output		Combined Input		Capital		Labor	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	4.2	4.2	5.1	5.2	6.1	6.2	4.4	4.4
Agriculture, forestry, fishing, and hunting	7.8	7.8	8.8	8.8	11.1	11.1	8.0	8.0
Mining	6.1	6.1	9.9	10.0	13.9	13.9	4.0	4.0
Utilities	5.3	5.3	5.5	5.5	7.2	7.2	1.8	1.8
Construction	7.4	7.4	5.9	5.9	9.9	9.9	3.8	3.8
Manufacturing	5.7	5.7	5.2	5.2	5.5	5.5	3.9	3.9
Durable manufacturing	5.3	5.3	4.1	4.1	3.6	3.6	4.1	4.1
Nondurable manufacturing	6.2	6.2	6.4	6.4	7.0	7.0	3.5	3.5
Wholesale trade	5.8	5.8	4.5	4.5	6.3	6.3	5.3	5.3
Retail trade	5.9	5.9	5.8	5.9	11.4	11.5	5.6	5.6
Transportation and warehousing	5.5	5.4	4.7	4.6	7.3	7.4	3.3	3.3
Information	0.7	0.6	2.6	2.6	0.4	0.4	5.3	5.3
Finance and insurance	3.3	3.3	2.3	2.4	1.8	1.8	3.7	3.7
Real estate and rental and leasing	4.2	4.3	5.8	5.9	8.0	8.1	4.0	4.0
Professional and technical services	1.7	1.7	4.4	4.4	6.2	6.2	4.5	4.5
Management of companies	0.6	0.6	3.9	3.9	4.6	4.6	4.5	4.5
Administration and waste services	3.5	3.5	4.7	4.7	6.9	6.9	5.2	5.2
Educational services	3.1	3.1	2.7	2.7	6.4	6.4	0.6	0.5
Health care and social assistance	2.9	3.0	3.6	3.7	4.1	4.3	3.7	3.9
Arts, entertainment, and recreation	3.3	3.3	3.4	3.6	4.7	4.7	3.7	3.7
Accommodation and food services	5.8	5.8	6.0	6.1	9.6	9.6	6.7	6.7
Other services, except government	5.3	5.3	3.8	3.8	7.0	7.1	4.4	4.4

Table 4. Real measures of growth 2020, TFP, output, capital, and labor

	TFP		Output		Capital Input		Labor Input	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	-0.6	-0.5	-2.7	-2.7	2.8	2.7	-5.1	-5.1
Agriculture, forestry, fishing, and hunting	0.7	0.7	7.1	7.1	0.1	0.1	0.6	0.6
Mining	9.7	9.4	-14.8	-14.9	-5.8	-5.7	-23.1	-23.1
Utilities	3.4	3.5	-2.9	-2.8	3.0	3.0	-0.6	-0.6
Construction	0.7	0.7	2.1	2.1	4.9	4.9	-5.7	-5.7
Manufacturing	-0.9	-0.9	-7.4	-6.9	1.9	1.9	-5.5	-5.5
Durable manufacturing	-2.0	-2.0	-8.7	-8.2	1.3	1.3	-7.4	-7.4
Nondurable manufacturing	0.5	0.5	-5.1	-5.0	2.4	2.4	-2.0	-2.0
Wholesale trade	2.6	2.6	-4.9	-4.9	0.9	0.9	-5.4	-5.4
Retail trade	-0.6	-0.6	-0.2	-0.2	3.5	3.5	-3.6	-3.6
Transportation and warehousing	-4.7	-5.4	-11.1	-11.7	1.8	1.8	-2.4	-2.4
Information	1.5	1.5	3.7	3.7	5.4	5.4	-4.6	-4.6
Finance and insurance	-0.9	-0.9	1.1	1.1	4.9	4.9	2.1	2.1
Real estate and rental and leasing	-0.9	-0.8	-1.1	-1.1	2.5	2.5	-5.6	-5.6
Professional and technical services	1.8	1.8	1.5	1.5	7.2	7.2	-3.4	-3.4
Management of companies	2.4	2.4	2.1	2.1	0.3	0.2	-1.9	-1.9
Administration and waste services	-0.5	-0.5	-6.4	-6.4	5.9	6.0	-6.2	-6.2
Educational services	-6.5	-6.5	-14.7	-14.7	0.6	0.6	-8.1	-8.1
Health care and social assistance	-2.4	-2.5	-6.9	-6.9	1.7	1.7	-2.2	-2.2
Arts, entertainment, and recreation	-11.4	-11.5	-29.3	-29.3	1.4	1.5	-24.5	-24.5
Accommodation and food services	-5.6	-5.8	-21.9	-21.9	-2.0	-2.3	-21.1	-21.1
Other services, except government	-1.1	-1.1	-10.5	-10.5	1.4	1.3	-12.3	-12.3

Table 5. Current dollar growth 2020, output, combined input, capital, and labor

	Output		Combined		Capital		Labor	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	-2.1	-2.4	6.9	6.9	-1.2	3.9	-2.8	0.2
Agriculture, forestry, fishing, and hunting	8.7	10.6	8.7	10.6	9.4	15.1	7.8	10.2
Mining	-32.3	-31.4	-32.3	-31.4	-36.4	-34.4	-20.6	-19.7
Utilities	-4.5	-4.2	-4.5	-4.2	4.2	4.8	5.8	6.3
Construction	4.5	8.3	4.5	8.3	27.8	45.2	-6.2	-1.8
Manufacturing	-9.9	-8.5	-9.9	-8.5	-7.9	-4.7	-2.7	-0.6
Durable manufacturing	-8.1	-6.3	-8.1	-6.3	-6.4	-1.8	-3.9	-1.8
Nondurable manufacturing	-11.0	-10.1	-11.0	-10.1	-9.1	-7.2	-0.4	1.7
Wholesale trade	-4.1	-2.7	-4.1	-2.7	6.9	11.1	-0.6	1.1
Retail trade	4.4	7.4	4.4	7.4	15.8	23.8	-1.0	2.7
Transportation and warehousing	-10.7	-7.8	-10.7	-7.8	-10.6	-6.5	-6.9	-0.7
Information	4.0	4.5	4.0	4.5	2.7	3.7	4.9	5.7
Finance and insurance	2.2	2.6	2.2	2.6	-2.6	-1.3	7.4	7.9
Real estate and rental and leasing	0.8	1.5	0.8	1.5	3.8	5.5	-4.2	-3.3
Professional and technical services	2.0	4.8	2.0	4.8	0.9	11.7	1.0	4.0
Management of companies	1.1	1.5	1.1	1.5	-0.8	1.3	-0.4	-0.1
Administration and waste services	-5.0	-2.7	-5.0	-2.7	-2.9	8.5	-3.2	-0.3
Educational services	-13.1	-10.9	-13.1	-10.9	-19.4	-12.3	-14.9	-11.0
Health care and social assistance	-5.2	-0.4	-5.2	-0.4	-1.7	19.7	-4.3	1.7
Arts, entertainment, and recreation	-28.0	-25.8	-28.0	-25.8	-40.4	-33.0	-28.2	-25.4
Accommodation and food services	-22.3	-17.1	-22.3	-17.1	-31.4	-11.2	-23.0	-19.1
Other services, except government	-7.9	-4.3	-7.9	-4.3	4.0	20.8	-10.1	-4.8

Table 6. Price growth 2020, output, combined input, capital, and labor

	Output		Combined		Capital		Labor	
Industry	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**	**Revised**	**Previous**
Private business sector	**0.5**	**0.3**	**-0.1**	**3.8**	**-3.8**	**1.1**	**2.4**	**5.6**
Agriculture, forestry, fishing, and hunting	1.5	3.3	2.2	4.0	9.2	15.0	7.2	9.5
Mining	-20.5	-19.4	-12.8	-11.8	-32.5	-30.4	3.3	4.5
Utilities	-1.6	-1.4	1.7	2.0	1.2	1.7	6.4	6.9
Construction	2.4	6.1	3.0	6.9	21.8	38.4	-0.6	4.2
Manufacturing	-2.8	-1.7	-3.6	-2.6	-9.6	-6.5	2.9	5.2
Durable manufacturing	0.7	2.1	-1.4	0.1	-7.6	-3.1	3.8	6.0
Nondurable manufacturing	-6.1	-5.5	-5.7	-5.0	-11.2	-9.4	1.6	3.8
Wholesale trade	0.8	2.3	3.4	4.9	5.9	10.0	5.1	6.9
Retail trade	4.6	7.6	3.9	6.9	11.9	19.6	2.7	6.5
Transportation and warehousing	0.5	4.5	-4.2	-1.2	-12.2	-8.2	-4.6	1.7
Information	0.3	0.8	1.8	2.3	-2.6	-1.7	10.0	10.8
Finance and insurance	1.0	1.4	0.1	0.5	-7.1	-5.9	5.3	5.7
Real estate and rental and leasing	2.0	2.6	1.1	1.8	1.2	2.9	1.5	2.5
Professional and technical services	0.5	3.2	2.3	5.1	-5.8	4.2	4.6	7.7
Management of companies	-0.9	-0.6	1.5	1.8	-1.0	1.1	1.6	1.9
Administration and waste services	1.5	3.9	1.0	3.4	-8.3	2.4	3.2	6.2
Educational services	1.9	4.5	-4.7	-2.3	-19.9	-12.8	-7.3	-3.1
Health care and social assistance	1.8	7.0	-0.6	4.3	-3.4	17.7	-2.2	3.9
Arts, entertainment, and recreation	1.8	5.0	-9.7	-7.1	-41.2	-34.0	-4.9	-1.2
Accommodation and food services	-0.5	6.1	-6.1	-0.1	-30.0	-9.1	-2.3	2.6
Other services, except government	2.9	7.0	1.8	5.8	2.6	19.2	2.5	8.5