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# The Impact of Capitalizing Data on Productivity Growth in the U.S.

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**Abstract** The System of National Accounts 2025 revision recommends treating own-account data as an intangible capital asset. This study explores the impact of this recommendation on the sources of economic growth for the U.S. economy from 2002 to 2024. We use experimental estimates for own-account data and databases to modify the BEA-BLS Integrated Industry-Level Production Accounts (ILPA). The adjustments to the ILPA include changes on the output side of the accounts to capture new gross fixed capital formation. On the input side, data provides a capital service to all industries that use data. We find that including own-account data as an asset raises the contribution of IT-related capital assets to GDP growth by about one-third between 2002 and 2024, but the effects differ significantly across industries.

**Keywords** Data assets, System of National Accounts, IPPs, digital economy

**JEL Code** E01, E22, O34, O51

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# 1. Introduction

This study examines the impact of a new asset class, own-account data and databases (OAD), on sources of economic growth in the U.S. economy from 2002 to 2024. Modern economies have developed ways to use data as part of their core business models, whether as inputs to artificial intelligence or to support auxiliary activities such as advertising, pricing, forecasting, and logistics. The impact of data on economies and societies continues to evolve, with potential broad macro impacts like increasing productivity of businesses, influencing the demand for different types of worker skills, affecting diverging firm sizes (Jones and Tonetti 2020), and explaining the reasons for the availability of "free" goods and services (Farboodi and Veldkamp 2021; Soloveichik 2025).

The addition of this new asset class expands the production boundary of gross domestic product (GDP). Investment reflects new additions to the asset class, whereas value added and capital services represent the economic returns generated by those additions. We examine the impact of including OAD on both the output and input sides of the BEA-BLS Integrated Industry-Level Production Account (ILPA). In real terms, the addition of OAD is new real value added, and on the input side, the addition is a new real flow of capital services; the difference between real output growth, including the production of new investment in data and databases, and real input growth, including data and databases capital services, is total factor productivity (TFP) growth adjusted for the production and use of OAD. Growth accounting enables us to update the measured contributions of capital and labor across industries to reflect the available data.[1]

Section 2 explains the effect of capitalization of own-account data compared to the current implementation of the National Income and Product Accounts (NIPAs) and how the accounts are adjusted to reflect the production and use of data. Section 3 describes the process to update the ILPA based on the revised industry-level data to make it suitable for exploring the sources of economic growth. Section 4 describes the method for obtaining the rental prices of assets for capital services and deriving the TFP measures for each industry and aggregates. Section 5 presents results from a simplified capital and productivity model and compares them with current estimates. These include the sources of economic growth, such as changes in the composition and quantity of capital, value added, and productivity patterns. Section 6 concludes by describing how the increased 7.1 basis point faster average growth is attributed to more rapid growth in capital (11.2 bps), particularly intangibles and information and communication technology, and a lower observed productivity growth (2.4 bps).

[1] Own-account data and databases enter as a new capital input, but the contributions of all inputs change after including data because each input's value share in production changes. Under neoclassical assumptions, these value shares correspond to elasticities, so that one interpretation of our exercise is that adjusted value shares to include data is essential to correctly measure elasticities of output with respect to all inputs, not just OAD.

## 2. A new asset class: own-account data and databases

The U.S. Bureau of Economic Analysis (BEA) publishes the National Income and Product Accounts (NIPAs) based on the System of National Accounts (SNA) 2008 version (United Nations 2009). One significant change in the 2025 revision to the SNA was the recommendation to capitalize own-account data (Intersecretariat Working Group on National Accounts 2025). One motivation for this change was to address an inconsistency between the data used for research and development (R&D) or purchased data, which is treated as an asset, and own-account data, which was not. Purchased data exists across accounts, such as in R&D or embedded in software databases. For example, a firm that performs geospatial photo and image acquisition services and compiles a database that is then purchased by other firms would have those transactions recorded in the Economic Census commodity data, such as under "outright sale of rights to intellectual property works," and captured in the methodology for estimating purchased software. In the SNA 2025, own-account data are capitalized to reflect that such data are often long-lived and provide capital services for more than one year. Similar to the recommended approach for own-account software, the valuation method is based on a sum-of-costs approach. This is because there is no market transaction for own-account data.

The new asset class, own-account data and databases, is defined as digital recordings of observable phenomena, organized in a resource-efficient manner, used in a production process for more than a year, and generating economic benefit. The asset class excludes purchased data, data used in R&D activities, and data that do not meet the criteria for an asset because they lack continuous or repeated use in production or economic benefit. The valuation based on the sum of costs includes the allocated resources for planning, recording, digitizing, organizing, and storing, but excludes use or analysis activities. In addition to excluding non-digital recordings, the asset class excludes data that are byproducts of other activities, except for those that require additional intentional effort to render them suitable for production use.

Santiago Calderón (2026) describes the proposed methodology and accounting for OAD on the output side of the production account and on the capital stock. These experimental estimates include (1) industry annual gross fixed capital formation (GFCF) in current dollars, (2) prices that are used to deflate the nominal values, (3) volume estimates in constant dollars, (4) net productive stocks of the asset in constant dollars, (5) consumption of fixed capital (CFC) in current dollars, and (6) the impact across the accounts in terms of the fixed assets and value added by industry. Flow estimates for GFCF and prices are provided from 1997 to 2024, enabling estimation of quantity movements from 2002 to 2024 for all industries and the economy as a whole. One limitation of using the perpetual inventory method (PIM) to estimate net stock is that it relies on a benchmark level of capital stock, which influences patterns in the first years. The net stock series is required to obtain the measures of productive stock and CFC. These are important for translating investment into capital services and for estimating the value added of government fixed assets, because government output is valued at cost. Thus, the flow estimates for GFCF cover 1997 to 2024, but the capital services and productivity impacts cover only 2002–2024.[2]

To illustrate the effect of capitalizing own-account data and databases on value added, we track the impact of investments in private fixed assets and government fixed assets. Considering the KLEMS framework for value added by industry, equation 1 denotes the components of value added, which include gross operating surplus (net operating surplus and consumption of fixed capital), compensation of employees, and net taxes on production.

$$\begin{aligned} \text{Value added} = {} & \text{Compensation of employees} + \\ & \text{Taxes on production and imports less subsidies} + \\ & \text{Net operating surplus} + \\ & \text{Consumption of fixed capital} \end{aligned} \tag{1}$$

After capitalizing the new asset class, the impact on the industry is described in equation 2

$$\text{VA}_0 + \text{GFCF} = \text{CoE}_0 + \text{NT}_0 + \text{CFC}_0 + \text{CFC}_{\text{OAD}} + \text{NOS}_0 + \Delta \tag{2}$$

where GFCF increases value added on the output side, and on the income side, CFC is increased by the CFC associated with additional stock of own-account data, and net operating surplus is adjusted to maintain the identity. In the case of government fixed asset investment, the impact is described in equation 3

$$\text{VA}_0 + \text{CFC}_{\text{OAD}} = \text{CoE}_0 + \text{NT}_0 + \text{CFC}_0 + \text{CFC}_{\text{OAD}} + \text{NOS}_0 \tag{3}$$

where the CFC increases the output-side as well as the income-side through a higher combined CFC. General government includes additional restrictions on certain terms due to the valuation basis (i.e., at cost), while those are more relaxed for government enterprises. The adjustments to value added arising from capitalizing a new asset that was previously treated as an expenditure reflect joint production. With joint production, the same amount of factors of production, including labor and intermediate inputs, is recognized as having produced additional (previously unrecognized) output, which is the same treatment applied to own account software (Parker and Grimm 2000).

[2] The latest release of the ILPA ends in 2024, and thus 2024 is the last year in scope for the productivity impact calculations.

## 3. Modified integrated industry-level production account

The ILPA provides a consistent accounting of inputs and outputs with the NIPAs (Eldridge et al. 2020). The purpose of the framework is to support growth accounting, which requires identifying changes in the quantities of each factor of production and in output. For example, labor input adjusts not only for the number of hours worked but also for the distribution of those hours across education, experience, and industry, reflecting the changing composition of the workforce. In terms of capital, rental prices are used to estimate the composition of capital services across asset classes and the rate of return to capital within each industry. The purpose of the composition adjustments to labor and capital is to differentiate between the accumulation of inputs with potentially higher marginal products and shifts in total factor productivity. In the ILPA, net taxes on production are allocated to labor or capital, depending on the type of tax. Proprietors' income is also divided and allocated between labor and capital, which differs from the NIPAs and the GDP by industry accounts.

To conduct growth accounting using the experimental estimates, we recreate a version of the ILPA based on the modified GDP by industry data described in section 2. Our goal is to approximate the effect of capitalizing the new asset on productivity. Therefore, we depart from the official methodology used in the published product and take a simplified approach. The underlying capital data comprises approximately 100 disaggregated assets, enabling hyperbolic asset profiles that use vintage capital accounting. In this research article, we track aggregate assets and use a weighted-average geometric depreciation profile to provide a tractable approach to approximating official data. For this research exercise, to approximate the published data as closely as possible without fully implementing the method, the capital data are designed to focus on fixed assets, excluding land and inventories, and to encompass structures, intellectual property products (IPPs), and equipment. The 10 asset classes are: four types of IPPs, (1) R&D, (2) software, (3) entertainment, literary, and artistic originals (ELAO), and (4) own-account data and databases; five types for equipment, (5) communications, (6) computer hardware, (7) instruments and office equipment, (8) transportation, and (9) others; and one type for (10) structures. These correspond to the standard nine capital asset categories augmented by the new asset class. The dataset is constructed at the summary level sectors with complete data for 63 industries, noting that the experimental estimates show no investment in the own-account data assets by farms due to data limitations (i.e., the Occupational Employment and Wage Statistics (OEWS) program does not cover wage and salary workers in farm establishments).

## 4. Simplified productivity model

The simplified productivity model we employ estimates annual asset rental prices based on net stock distribution across industries, their depreciation rates, and the industries' residual capital costs, which inform the industry rate of return. The residual capital cost is calculated as the industry value added minus labor costs (including an estimate of self-employed labor). The nominal capital services are used to calculate a rate of return, and then industry-asset-specific service prices. The price and quantity (productive stock) provide the asset-level inputs to a Törnqvist-Theil quantity index of capital. The capital index is computed for a version with no own-account data or databases to match the currently published national economic accounts, and for a modified version incorporating the experimental estimates. Each factor of production index is computed at the 63-industry level, along with the associated value-added and gross output quantity indices. The combined input cost index aggregates the factors of production, including capital, labor for value added, and intermediate inputs. At the industry level, TFP is defined as the ratio of the quantity index of gross output to that of total inputs.

By applying the growth accounting model, we can examine the drivers of economic growth. The approach assigns a contribution to each component of labor and capital, and together with TFP growth, these contributions sum to GDP growth. For each of the 61 summary private industries, we compute the gross output change and the change in the quantity of inputs, such as in equation 4

$$\Delta \text{ln}_{\text{TFP}} = \Delta \text{ln}_{\text{GO}} - \sum_{j} w_j \left( \Delta \text{ln quantity of input}_j \right) \tag{4}$$

where $w_j$ are the Törnqvist-Theil compensation shares for each capital asset, labor component (college and no college), and intermediate input (energy, materials, services).

The value added for government industries is adjusted to match the combined input cost, reflecting that the output is valued at cost; thus, the general government has zero TFP growth by definition. An additional aspect of the productivity impact analysis is estimating each industry's contribution from each source of economic growth to total economic growth (i.e., to total real value-added growth). These contributions are calculated using the Domar aggregation method. In this context, productivity growth is value-added growth not accounted for by changes in the growth rates of capital and labor inputs, with the inputs aggregated across industries.

## 5. Results

The results highlight the impact of capitalizing own-account data and databases on the growth rates of capital input, value added, and productivity across industries and selected aggregates. Due to the data availability issues discussed above, these tabulations cover the U.S. economy from 2002 to 2024.

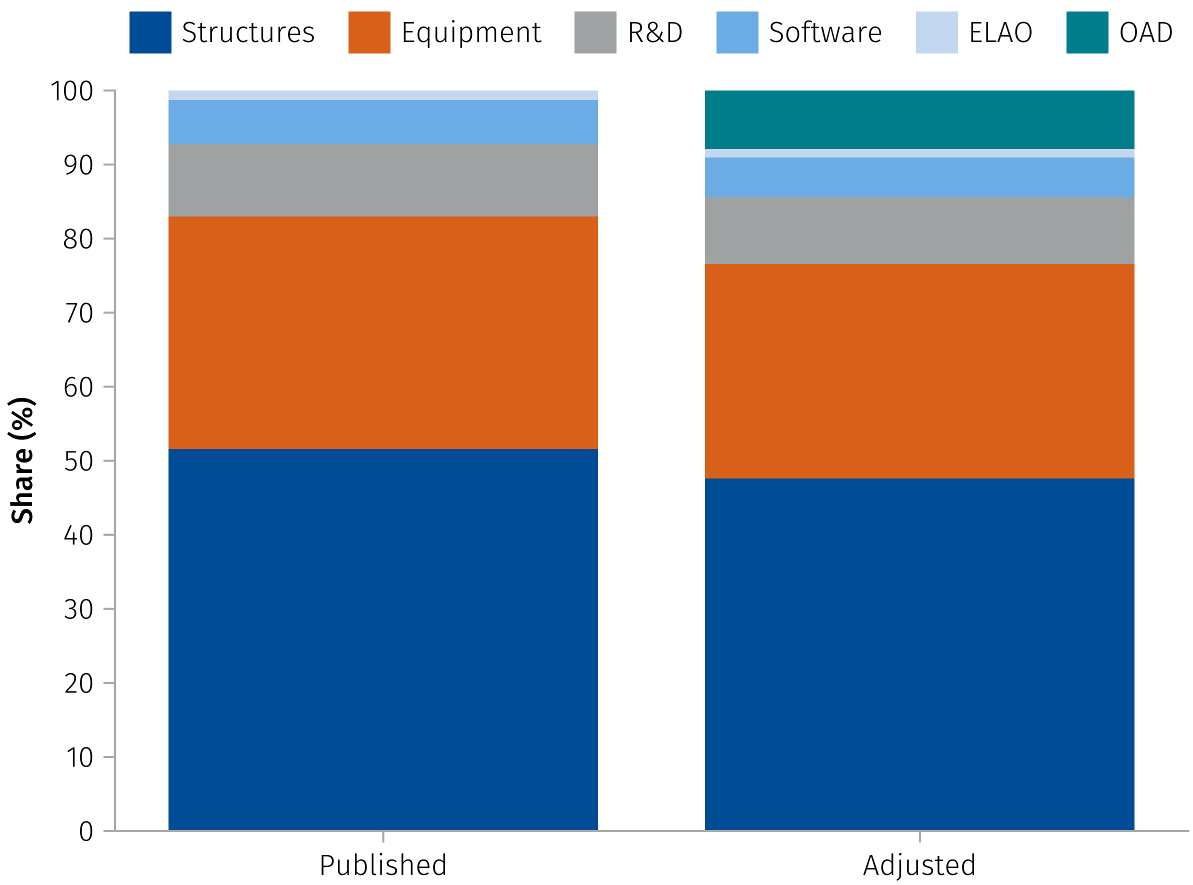
## 5.1. Capital

Capital has been a vital component of the U.S. economy, driving economic growth. Understanding its role and interaction with other sources of economic growth can explain patterns such as postwar U.S. economic growth (1948–1979) (Jorgenson 1988) and how and why different industries experience divergent economic growth patterns (Jorgenson and Stiroh 2000). Other fundamental questions concern the types of assets that drive economic growth in modern economies, which tend to favor intangible assets over tangible ones (Allen, Gu, and Macdonald 2025; Corrado, Haskel, Jona-Lasinio, et al. 2022). Improved economic measurement enables research into how changes in capital composition, such as the inclusion of data assets, interact with productivity (Corrado, Haskel, Iommi, et al. 2024). This section will address two aspects: (1) the composition of capital and (2) the growth of capital input.

### 5.1.1. Assets

When analyzing the impact on the composition of capital for the economy, we consider the following asset classes: (1) structures, (2) equipment, and the various IPPs: (1) ELAO, (2) R&D, (3) software, and (4) own-account data and databases (OAD). Figure 1 shows the share of capital attributed to each asset class on average from 2002 to 2024, as well as how it changes when OAD is capitalized using the experimental estimates. The shares are computed from nominal estimates of capital services for each asset, aggregated across industries. The share for OAD averaged 7.85% over the period, with a low in 2010 at 6.79%, a high in 2022 at 8.63%, and the latest value in 2024 at 8.01%. The share of IPPs increases from 17% to 23%, representing a 6.4 percentage points increase. If we define own-account data and databases as part of information and communications technology (ICT), the difference in the share of capital between the published accounts and those derived from experimental estimates increases on average from 11.58% to 18.33%, an increase of 6.75 ppts. The change reflects an observed phenomenon in the U.S. economy, which has transitioned to a greater focus on intangible assets and greater reliance on digital technology.

**Figure 1. Composition of Capital from 2002 – 2024**



### 5.1.2. Growth

We report the impact in terms of the difference in average growth rates of capital input from 2002 to 2024 at the 20 sectors level and private industries and total aggregates in figure 2 and at the 63 industry level in figure 3. Capital input measures the flow of capital services in the production process. While OAD is a long-lived asset, the annual service flows are important for tracking the contributions of productive stocks to industry and GDP growth in each period. The inclusion of OAD as an asset has the greatest impact on measured capital input growth for the management of companies and enterprises, as well as for educational services, finance and insurance, and professional, scientific, and technical services (PST). One widely used application of own account data and databases is to improve management decisions for firms. It is not surprising that the industry performing this activity has been investing in OAD assets, indicating a broader revision to its capital growth patterns. Another well-known use of data is to improve prediction and forecasting, which are highly relevant activities in finance, insurance, and PST. The revision to the capital growth of the administrative and waste management services sector was smaller. The main drivers for finance and insurance were insurance carriers, and for professional, scientific, and technical services were computer systems design and related services.

**Figure 2. Change in average capital growth from 2002 – 2024**

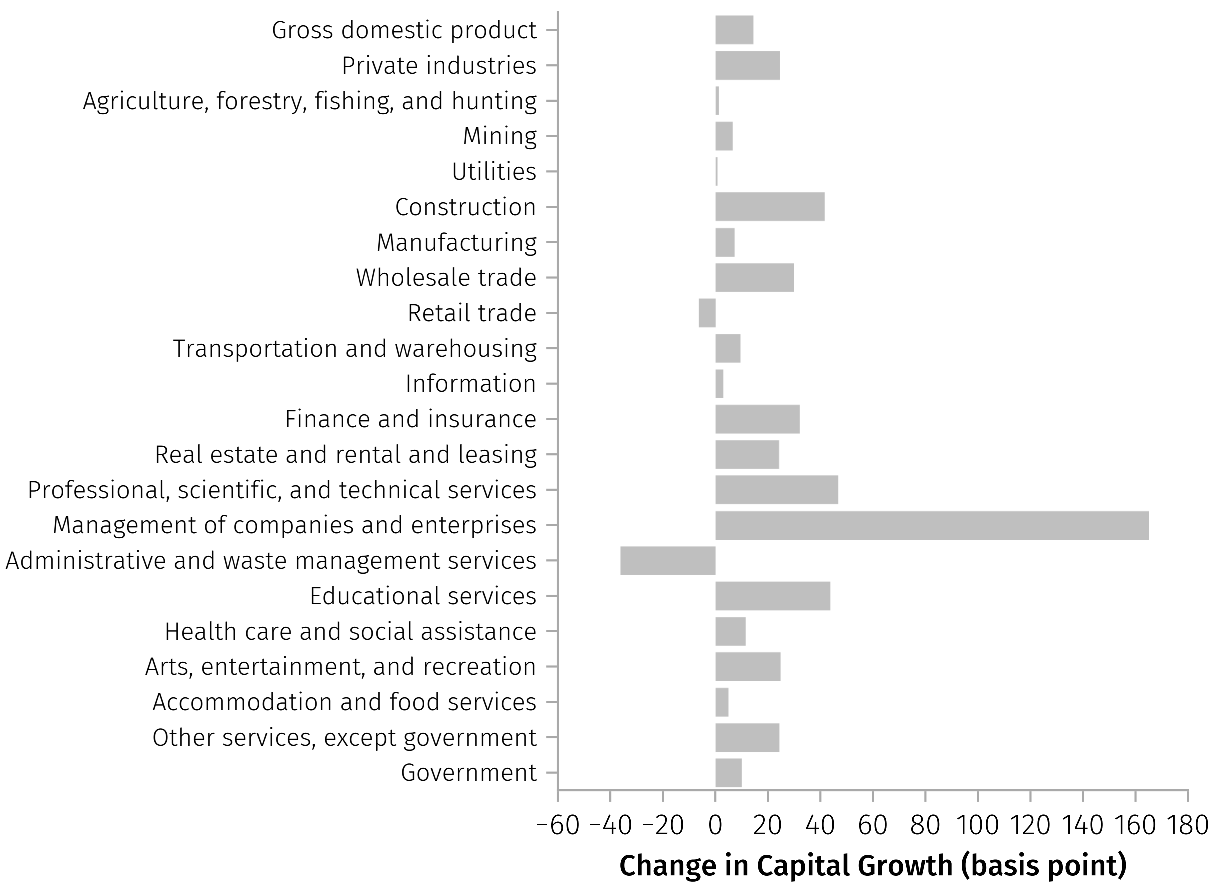
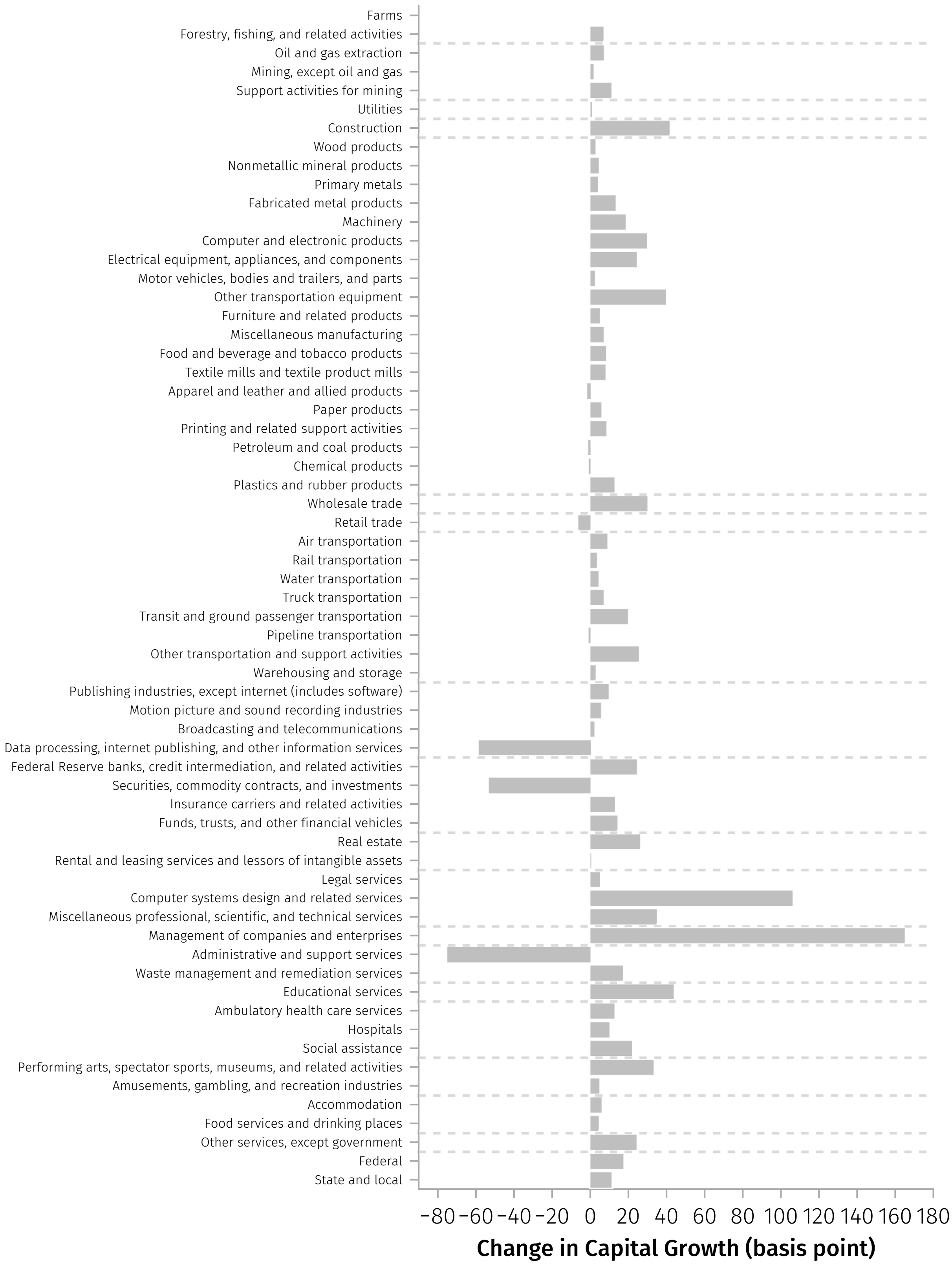


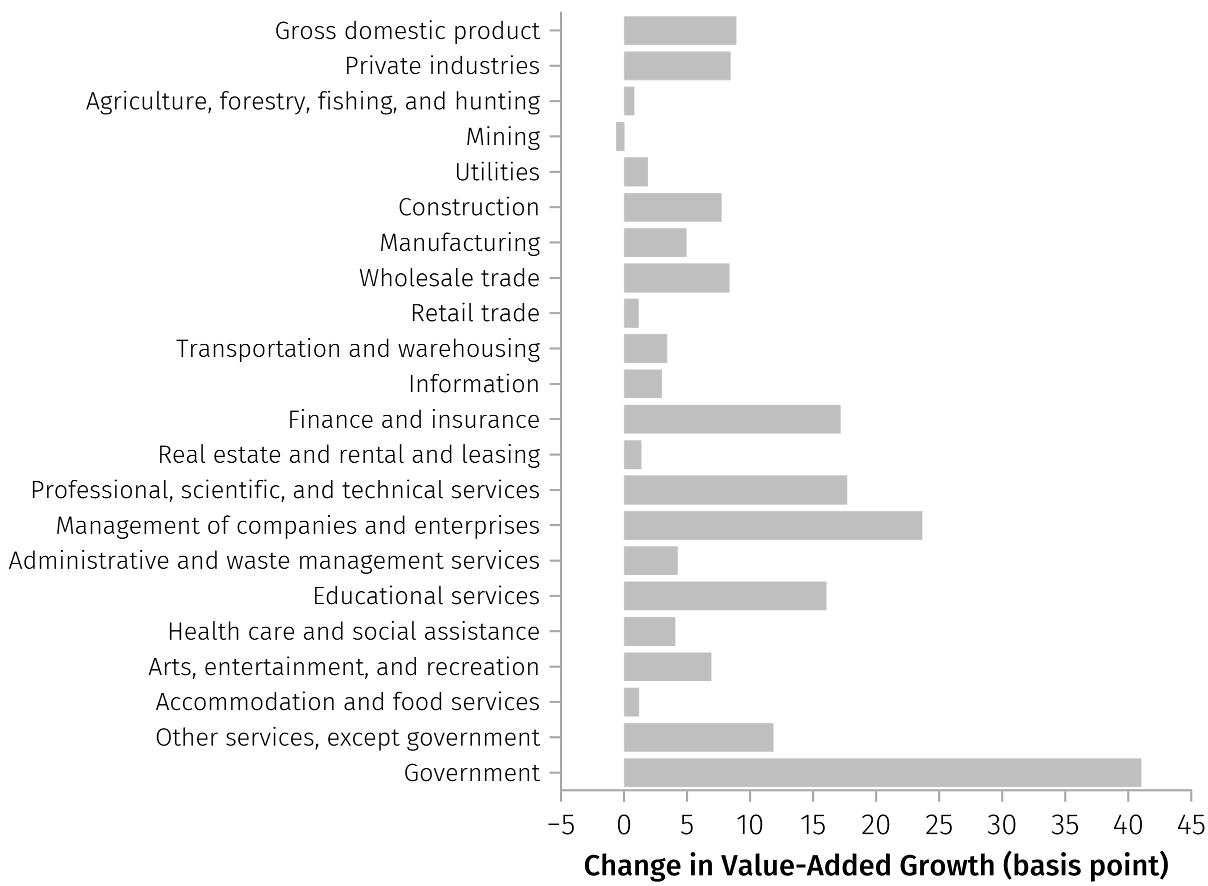
**Figure 3. Change in average capital growth from 2002 – 2024**



## 5.2. Value added

We report the impact of capitalizing OAD in terms of the difference in average growth rates of value added from 2002–2024 at the 20 sectors level and private industries and economy-wide aggregates in figure 4 and at the 63 industry level in figure 5. The sectors with the greatest impact include management of companies and enterprises, professional and technical services, finance and insurance, and educational services. In the finance sector, a substantial contribution comes from securities, commodity contracts, and investments. Lower growth-rate revisions were applied to the computer and electronics, publishing, and computer system design and related services industries, which can be explained by differences in adoption rates: early adopters accumulated capital early and experienced slower growth throughout the period.

**Figure 4. Change in average value-added growth from 2002 – 2024**



## Figure 5. Change in average value-added growth from 2002 – 2024

## 5.3. The sources of economic growth, including data

The contributions for the 10 asset classes, labor, and productivity for the total economy from 2002 to 2024 are shown in table 1. The impact of capitalizing OAD on value-added growth is a higher capital contribution of 11.2 basis points (bps) relative to accounting without data, including 15.3 bps from the new asset. In the sources of growth, including data, the measured contributions for other assets are lower than in the version without data. The lower contributions from labor and TFP offset the increased contribution from capital, resulting in an average net effect of 7.1 basis points of faster growth in value added. The lower contributions of assets other than data stem from their smaller value shares, given OAD.

**Table 1. Contribution to growth by source for GDP from 2002–2024**

| Source | Adjusted | Published | Δ |
|---|---|---|---|
| Capital | 1.076 | 0.964 | 0.112 |
| IT Capital | 0.513 | 0.380 | 0.133 |
| Communications equipment | 0.118 | 0.123 | -0.005 |
| Computer hardware | 0.059 | 0.063 | -0.003 |
| Software | 0.182 | 0.194 | -0.012 |
| Own-account data and databases | 0.153 | 0.000 | 0.153 |
| R&D | 0.159 | 0.166 | -0.007 |
| Entertainment, literary and artistic originals (ELAO) | 0.004 | 0.005 | 0.000 |
| Other Capital | 0.400 | 0.414 | -0.014 |
| Instruments and other office equipment | 0.001 | 0.001 | 0.000 |
| Structures | 0.187 | 0.193 | -0.006 |
| Transportation equipment | 0.051 | 0.054 | -0.003 |
| Other equipment | 0.161 | 0.166 | -0.005 |
| Labor | 0.594 | 0.610 | -0.017 |
| College | 0.617 | 0.635 | -0.017 |
| No College | -0.024 | -0.024 | 0.001 |
| Total factor productivity (TFP) | 0.605 | 0.629 | -0.024 |
| Total | 2.275 | 2.203 | 0.071 |

We can also explore the revisions to industry average growth rates of total factor productivity from 2002–2024 at the 61 industry level in figure 6, which are used to compute the aggregates in table 1. The most significant revisions are negative for oil and gas extraction, computer systems design and related services, computer and electronic products, and the publishing industry. These are industries that could have relied on OAD to increase their production capacity, but the mismeasurement of their capital inputs led to the effect being misattributed to productivity gains. On the other hand, service industries such as education, legal, and other services, which tend to rely more heavily on labor than on capital relative to non-service sectors, appear to realize greater gains from incorporating OAD assets.

**Figure 6. Change in average total factor productivity growth from 2002 – 2024**

# 6. Conclusion

The capitalization of own-account data and databases increases measured capital deepening, as industries have employed more capital per unit of labor. It also increases measured real output. Because the capital deepening effect exceeds the output impact, the measured total factor productivity was slightly lower in the aggregate after including data; this suggests that including data as an asset correctly reallocates gains from TFP to capital accumulation. However, service industries that rely more on labor experienced productivity gains from the inclusion of OAD. The accounting entry is that the newly recognized output of data from these sectors grew faster than the newly recognized combined inputs. The revised capital composition is rebalanced toward intangibles and digital technologies, with a larger share allocated to IPPs and ICT asset categories. Overall, treating data as an asset leads to faster economic growth, with a positive impact on value added, but lower measured total factor productivity gains in the aggregate. Impacts vary by industry, underscoring the need to account for industry heterogeneity in data production and use when assessing the effects of data on productivity.

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