Alternative Price and Volume Measures for Commercial Bank and Fund Management Services

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Abstract

In the U.S. National Income and Product Accounts, commercial bank and fund management services grew modestly or declined in volume terms after 2008, despite substantial increases in the levels of assets and liabilities managed by these businesses. These estimates of limited growth result partly from the chosen estimation methods of the Bureau of Economic Analysis (BEA), which differ from those of several other countries. For the volume estimates of implicit services of commercial banks, BEA relies mainly on the banking output index from the Bureau of Labor Statistics, which counts numbers of loans, deposit accounts, and transactions. For personal consumption expenditures for the management of mutual funds and other regulated investment companies, BEA uses an input cost index that mainly reflects hourly wages, and that may not reflect some recent innovation. For personal consumption expenditures for the management of pension funds and other portfolio management, BEA relies partly on the producer price index for portfolio management, which counts upward asset revaluation as a price increase. While BEA can cite strong reasons for its methods, other countries measure trends in financial services volumes based on trends in inflation-adjusted balances of assets and liabilities. For the years after 2008, BEA's methods result in lower estimates of growth in service volumes and higher estimates of price increases than methods based on deflated balances. These contrasting results reflect unresolved measurement differences that should be kept in mind when making international comparisons of trends in financial services.

Keywords

Financial services

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Introduction

In the National Income and Product Accounts (NIPAs) produced by the Bureau of Economic Analysis (BEA), inflation-adjusted financial services grew far more slowly than the rest of the economy or declined after 2009. From 2009 to 2018, the volume measures of personal consumption expenditures (PCE) for the implicit services of commercial banks fell, while PCE for the sum of implicit services of other depository institutions, regulated investment companies (RICs), and pension funds rose only slightly.[2] PCE for portfolio management and investment advice also fell. The volume measures of gross value added declined for two key industries: 1) federal reserve banks, credit intermediation, and related activities and 2) securities, commodity contracts, and investments. This limited growth or decline occurred despite substantial increases in the financial assets and liabilities managed by these businesses. During these years, prices for these services rose faster than overall prices, despite ongoing innovation and technological changes. How does BEA estimate these trends? Are there other ways to measure financial services?

This paper uses U.S. data to compare alternative methods for measuring volumes and prices of some important financial services. It extends previous research by comparing alternative volume estimates of commercial bank services in more recent years, following the financial crisis. It also compares different estimates of service prices, a topic that seems underemphasized in previous work. In addition, this paper presents alternative estimates of volumes and prices of other financial services, such as the management of investment funds and pension funds as well as other portfolio management. The goals of the paper are to assess how much the choice of method matters empirically, improve the transparency of BEA's estimates, inform cross-national comparisons of the financial sector, and encourage more discussion about how best to measure these financial services.

The estimation of volume measures of implicit commercial bank services, known as financial intermediation services indirectly measured, or FISIM, remains controversial in national accounts. The previous literature offers two broad options. BEA and the Bureau of Labor Statistics (BLS), following Inklaar and Wang (2012) and Basu and Wang (2006), measure volume based on the number of accounts, loans, and transactions. Other countries in the European Union and elsewhere, consistent with Eurostat (2016) and Fixler and Reinsdorf (2006), measure volume based on inflation-adjusted balances of loans and deposits. The *System of National Accounts, 2008* (*SNA 2008*) and other national accounts manuals do not collectively express a clear preference for the "output indicator method" or the "deflated balances method," to borrow terms from the European Central Bank (2015).

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2. In this paper, I try to follow *System of National Accounts, 2008* (*SNA 2008*) terminology (paragraphs 15.98–15.100) and use the term "volume measures" rather than "real measures" to refer to aggregate, chain-linked, or quality adjusted measures of "inflation-adjusted" services. Also, the numbers in this paper are based on NIPA estimates from early 2019, before the 2020 NIPA annual update. The use of latest, revised numbers would not change the general conclusions of the paper.

After 2008, the numbers of bank deposit accounts and transactions grew modestly while the inflation-adjusted balances of bank deposits grew more rapidly. Because of these trends and additional adjustments BEA makes to its estimates, the output indicator method used for the NIPAs results in slower estimates of the growth in the service volumes and faster estimates of price increases than the deflated balances method. In previous periods, however, the opposite result appears, and the output indicator method results in relatively faster growth in service volumes, a result also found by Inklaar and Wang (2016).

Similar differences arise for the measurement of PCE for investment funds management, specifically the funds of RICs. The United States estimates the price of this service using an input cost index that is tied to the rising average hourly wages of the fund management industry. Other countries use a deflated balances approach, in which increases in inflation-adjusted balances—resulting from both the purchase of additional shares and upward asset revaluation—result in increases in the volume of services. In recent years, the assets managed by RICs have risen while expenses as a share of assets (expense ratios) have fallen. As a result, BEA's method results in slower growth in the volume of services and faster price increases than the deflated balances method.

For the management of pension funds and other portfolio management, BEA uses the BLS producer price index (PPI) for portfolio management and other price measures. For this PPI, asset revaluations and changes in expense ratios appear as price changes, but net contributions of assets to the fund appear instead as increases in service volume. There are compelling reasons for the U.S. approach: asset revaluations arguably do not reflect a change in the volume of services provided, and the national accounts classify holding gains as a revaluation rather than as an increase in the volume of output. But others offer reasons to prefer the deflated balances method. A challenge for this PPI is that it is very difficult to measure all the recent, rapid movement of assets to lower-cost funds, and so this PPI may in practice overstate price increases. Even if this problem is minimal, the use of this PPI results in lower estimates of the growth in service volume than the deflated balances method, which counts all increases in inflation-adjusted assets as increases in service volume.

To summarize, volume measures of financial services in the NIPAs display limited growth or declines in recent years partly because BEA's chosen methods result in lower estimates of growth than the deflated balances approach used by other countries. The main point of this paper is that, because of several trends in recent years, such as rising commercial bank deposit and loan balances, substantial upward asset revaluations, rising wages for fund managers, and low overall inflation, these alternative methods can produce very different estimates of trends in financial service volumes and prices. These contrasting results complicate international comparisons of trends in financial services.

The question of which method is "best" remains unresolved: BEA has strong reasons for its methods, and the deflated balances method has limitations, but one could also conclude that the NIPAs underestimate growth in financial services in recent years. These measurement differences continue to be relevant, partly because of rapid shifts in financial assets and liabilities that result from the effects of COVID-19 and related economic policies, and partly because of the need to measure growth in expanding "fintech" services, non-bank financial intermediation services, and other innovations.

To explain these differences in more detail, this paper begins with a summary of the literature on the measurement of commercial bank FISIM because most of the literature on financial services in national accounts focuses on banks, and many of its themes are relevant for other financial services. The next section describes alternative estimates of commercial bank services. The following sections describe alternative measures of some fund management services and offer some conclusions.[3]

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3. To be clear, this paper focuses on measures of commercial bank services, investment fund management services (for regulated investment companies or RICs), pension fund management services, and portfolio management services. This paper does not study insurance services.

1. Overview of Methods for Estimating Commercial Bank Services

Banks provide a range of services as they receive funds from depositors and lend them to borrowers, reducing transactions costs for both parties.[4] Banks provide services to depositors by making funds available for withdrawal, making or receiving payments or transfers, check clearing, safekeeping deposits, and bookkeeping. Similarly, banks provide services for borrowers related to the provision of credit that overcome problems of asymmetric information and transfer risk to the bank. The payments to the bank for these services may be explicit, through fees, or implicit, through the setting of interest rates.

1.1 Current Price Estimates

Under the user cost or reference rate method, the banks' implicit services to depositors are equal to deposit balances multiplied by the spread between the reference rate on a risk-free asset and the interest received by depositors. The reference rate represents the pure cost of borrowing funds and does not reflect a risk premium or any intermediation services. If depositors could invest their money in risk-free securities that earn the reference rate, but instead deposit their money in a bank and earn the lower deposit rate, then this interest rate spread is the price paid for the bank's services. Similarly, the banks' implicit services to borrowers are equal to loan balances multiplied by the spread between the interest paid by borrowers and the reference rate. This spread equals the implicit price the bank charges to provide financial services, which include the cost of bearing and managing different types of risk. In a competitive market, these interest rate spreads, or user cost prices, must equal the banks' marginal cost to provide the implicit services. Total output of the services produced by banks include FISIM plus explicit charges for priced services or other fees. The services covered by FISIM and charges have changed significantly over time.

The user cost approach is supported by the *SNA 2008*, the *European System of Accounts 2010* (ESA 2010), *The Handbook of National Accounting: Financial Production, Flows and Stocks in the System of National Accounts* from the United Nations and the European Central Bank (ECB 2015), and other national accounts manuals.[5] It is used by the United States and several other countries, although other methods have also been proposed.[6]

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4. Descriptions of the services of commercial banks can be found in Fixler, Reinsdorf, and Smth (2003), Moulton and Seskin (2003), Hood (2013), Fixler and Reinsdorf (2006), Inklaar and Wang (2011 and 2012), and Royster (2012).

5. See the *SNA 2008* (paragraphs 6.163–6.169), ESA 2010 (paragraphs 3.64–3.72), ECB2015 (paragraphs 3.23–3.40).

6. Papers by Basu, Inklaar, and Wang (2011), Wang, Basu, and Fernald (2008), and Wang and Basu (2005), and others argue that the reference rate should be adjusted so that bank output does not include risk bearing, because borrowers will pay the risk premium regardless of whether they borrow from banks or from capital markets. Fixler and Zieschang (2010), on the other hand, argue that bank loan premia do reflect the assumption of risk, consistent with the position of national accounts manuals. Triplett and Bosworth (2004) propose a different strategy for measuring bank output, and suggest treating interest paid by borrowers as a payment for the service of the loan provision, and some of this service arises from the resale of a service purchased from depositors; the purchase price is the interest and the value of the implicit services they receive. In this paper, I accept the user cost approach with a risk-free reference rate for nominal estimates and focus on measures of service volumes.

1.2   Volume Estimates and Prices

More controversy exists over how to estimate implicit financial services volumes and prices because there is no clearly defined unit of output. Under the output indicator, counts-based, or transactions-based method, the volume of services is based on direct measures of service flows, such as numbers of transactions or accounts, and the price is an implicit price deflator (IPD). Under the "deflated balances method" or the "user cost method," the volume of services is based on balances of loans and deposits deflated by and appropriate price index (usually a general price index), and the service price varies with this price index and the user-cost price (or is an IPD.) Under both methods, a separate price index is used to deflate fees. Ideally, when payments move from implicit to explicit charges, total output volumes and prices should not change.

The national accounts manuals more frequently mention the deflated balances method, but one can find passages to support both methods. The *SNA 2008*, ESA 2010, and the *Handbook on Prices and Volume Measures in National Accounts* (Eurostat 2016) support the deflated balance method.[7] ECB 2015 describes both the output indicator and deflated balances methods as possible options for measuring FISIM (paragraphs 3.70 and 3.71, 78; I have borrowed their terminology for this paper). It does not explicitly prefer either, although it does state that the output indicators approach requires very detailed data and describes the deflated balances approach as operationally simple, and "given its less demanding data requirements...may be... preferable to the output indicator method," (ECB 2015, 79). The International Monetary Fund (IMF) *Producer Price Index Manual* (IMF 2010) describes the U.S. PPI for the banking industry, a version of the output indicator approach, but is unclear whether these indicators should be used as output measures or as factors for quality adjustment. This manual also discusses user cost prices as service prices, similar to the deflated balances approach, and does not seem to clearly recommend either approach.[8] This lack of a clear recommendation reflects a lack of consensus in the literature on the measurement of FISIM.

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7.   Paragraph 15.114 of the *SNA 2008* states "...A particular case is those of margin industries including financial services. Output of a margin industry is usually calculated as the margin rate times the value of a transaction. To determine a volume figure the base year rate is applied to the value of the transaction suitably deflated to base year values. In the case of FISIM, the reference rate and the rates of bank interest are used in conjunction with figures of loans and deposits deflated by the general price increase since the base year." Paragraph 14.14 of ESA 2010 states "Volume estimates of FISIM are calculated using stocks of loans and deposits deflated to base period prices using a general price index such as the implicit price deflator for domestic final demand." (Eurostat 2016, 104) supports the deflated balances approach as a "B" (adequate) method.

8.   From the IMF PPI manual "10.215 For both asset and liability products, it also may be useful to collect indicators of activity, such as number of accounts, number of automated teller machines, or indicators of the average utilization of specific service dimensions on each account, such as transaction processing, statement generation, assessment of creditworthiness via loan applications, and applications for letters of credit, as applicable to the type of account. Variations in these other indicators of service would indicate variations in the quality or nature of service across accounts and institutions...10.216 In fact, one could consider the account as the primary unit of output for a financial institution; the output would be expressed in terms of the numbers of accounts, and the user cost prices above would be multiplied by the average balance in each type of financial product."

1.3   The Output Indicator Method

The case for this approach is made in Inklaar and Wang (2011 and 2012), Basu and Wang (2006), and other papers. "The core function of banks is to screen and monitor borrowers...to reduce information asymmetry in lending, and to provide payment services to depositors and borrowers," Inklaar and Wang (2011, 1–4). A "key implication of this theory for output definition is that... these *funds per se* are not the banks' output. Rather, the role of these funds can be thought of as analogous to that of the goods transported and marketed by wholesalers and retailers." "Consequently... to measure bank output one should try to estimate the flow of services directly, just as one estimates services of consulting and accounting firms." Accordingly, "bank output should be measured in terms of indices of quality-adjusted counts of different categories of banking transactions. This approach amounts to assuming that each transaction within a suitably defined category, such as a conforming mortgage loan origination or a deposit withdrawal, corresponds to a constant flow of services..."

These papers argue that there is no clear theoretical relationship between the quantity of services and the level of deposit balances. For example, technological changes or other factors that affect decisions to move funds to and from deposit accounts can lead to changes in deposits levels even if the number of transactions (the measure of services) does not change (Basu and Wang 2006). If two banks have equal levels of deposits but the first bank offers better services, then the deflated balances method would show that the two banks provide equal services volumes but a quality adjusted output indicator would correctly show that the first bank offers a higher volume of services. The quantity of services such as check clearing may be unrelated to the values of the checks.

Similarly, flows of services for borrowers may not be closely related to loan balances. For mortgage markets, banks may provide screening, bookkeeping, and payment services, but some banks may keep these loans on their balance sheets, while others may move the loans off their balance sheets through mortgage-backed securities, so two banks that had performed similar services could have different loan balances. Originating ten $100,000 mortgages is arguably a greater service than originating a single $1 million mortgage. If house prices rise faster than general prices, and equal numbers of persons of equal credit-worthiness buy similar but increasingly expensive houses over time, a quality-adjusted output indicator approach (which counts similar mortgage loans) would reasonably show constant service volumes over time, while the deflated balances approach (which divides loan balances by a general price index) would show rising service volumes over time.

Inklaar and Wang (2012) and Wang and Inklaar (2011) use U.S. data on commercial banks for 1987 to 2008 to show that the number of transactions grew faster than deflated deposit balances, and the number of commercial and industrial loans grew faster than deflated loan balances. They

concluded that the deflated balances method understated the true output growth of these services and advocated for the use of the output indicator method. They also found that the differences between the two measures of residential mortgage loan services can be reduced by deflating loan balances with a house price index (a price index well matched to the underlying asset) rather than a general price index such as the consumer price index (CPI).

1.4 The Deflated Balances Method

This method, as described by Fixler (2009), Fixler and Reinsdorf (2006) and other papers, is supported by models of deposit demand by Feenstra (1986) and Sidrauski (1967). In these models, depositors need deposits to make transactions, so banks provide a service by holding these deposits, which enter into depositors' utility functions. The volume of services is proportional to balances deflated by a general price index that reflects the purchasing power of money, such as the CPI.

Under this method, larger deposit balances imply more services, such as more bookkeeping and safekeeping, even with constant numbers of accounts or transactions. In recent years, depositors often get a number of free transfers per month, and so the growth of real balances over time can reasonably be assumed to reflect the growth in transactions, incomes, population, and hence, service volumes (Fixler and Reinsdorf 2006). If the quality of services changes over time (with more ATMs or apps, for example), the user cost price, like other prices, can also be quality adjusted accordingly.

Similarly, larger loan balances imply more services to borrowers—more bookkeeping, risk assumption, and so on—even if the number of loans is constant. If some banks move loans off their balance sheets through mortgage-backed securities, then they are assuming lower levels of risk and therefore providing a lower level of implicit services. One could argue that a single $1 million loan provides a service roughly similar to ten $100,000 loans.

These papers conclude that the deflated balances method, if imperfect, may provide a relatively better approximation of service volumes, partly because a limited set of output indicators may not reflect a sufficiently detailed breakout of the full range of bank services. From Fixler (2009, 263): "Measuring services by quantity extrapolation focuses on the observable aspect of the transaction and thus may miss unobservable aspects of the service that is being purchased. For example, an individual is purchasing more deposit services with a deposit of ten thousand dollars than with a deposit of one hundred dollars—more safekeeping and record-keeping are being purchased. In the transaction approach, one would only count the deposit and there would be no recording of the amount deposited." From ECB 2015, 78: "one problem with this method is that it is very data

demanding …each type of loan and deposit may be associated with a number of activities... for example, the services associated with a single demand deposit account may include cheque clearing, ATM services, bill payment services, bookkeeping services, safe keeping, etc... The indicator method will only be valid if a single indicator serves as a good proxy for all the activities carried out by a deposit-taking corporation that are associated with a particular type of loan or deposit."[9]

1.5   Data and Quality Adjustment Issues

Both estimation methods should adjust for service quality. Over the past decades the quality of banking services has improved with the introduction of ATMs, debit cards, 24-hour access, internet and mobile banking, computerized lending risk assessment models, and other innovations. Eurostat (2016, 104) mentions a need for quality adjustment based on measures such as the number of opening hours, proximity of branches, access to services, and the quality of investment advice. Some of these indicators are, however, becoming less appropriate: for example, the role of branches may be changing and the number of branches may be closing, yet activity is increasing. In supporting the output indicator approach, Inklaar and Wang (2012, 26) also state that "there remains room for improvements. It is important to gather more detailed information on the number and characteristics— including the exposure to risks—of each category of loans granted, the costs of different types of deposit transactions, the prices of various nontraditional bank activities, and how much of the charges are due to risk."

In practice, both methods, as they are typically implemented, fall well short of adjusting for all dimensions of service quality. In theory, an output indicator that is based on complete counts of activities, produced at an appropriate level of detail and fully quality adjusted, will provide a better measure of service volume, but measuring all dimensions of service quality is a major challenge. The deflated balances method may capture an additional dimension of service quality or volume: very large deposits or loans surely reflect more services than the smallest deposits or loans. But deflated balances measures also fail to capture many other dimensions of service quality. In short, both methods provide insightful but imperfect measures of service volumes and prices.

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9. It is worth noting that the output of the Central Bank, albeit small, is estimated differently in current prices. See *SNA 2008*, page 114. The output of central banks is not considered in this paper.

2.   The Estimates of Commercial Bank Services in the NIPAs

As the previous section explains, opinions about the best way to estimate the volume of commercial bank service remain divided. The U.S. NIPAs use an output indicator method while Australia, Canada, and many countries in the European Union (EU) use a deflated balances method. How much does the choice of method matter empirically? The U.S. data can be used to compare estimates of service volumes and prices based on the two methods for the years after the financial crisis and for previous periods. This section describes the details of BEA's current price and volume estimates, and then compares alternative estimates of volumes and prices. In the years after the financial crisis, the two estimates produce different pictures of the growth of commercial bank services.

2.1   Current Price Estimates

For BEA's user cost estimates of current price FISIM, the main data source for estimates of loan and deposit balances and interest paid and received are the quarterly Federal Financial Institutions Examination Council (FFIEC) Call Reports. These high-quality regulatory data are audited by the Federal Insurance Deposit Commission (FDIC). To allocate services to households, government, and businesses, the NIPAs use the FFIEC data and data from the Financial Accounts, from the Federal Reserve Board, and some judgment.[10]

The call reports collect separate data for several types of loans and deposits that can have different trends in user costs and balances. For loans, separate data are available for real estate, agricultural, commercial and industrial, lease financing, consumer credit card, other consumer, and other loans. For deposits, separate data are available for demand deposit accounts (non-interest-bearing checkable deposits), other checkable (interest bearing) deposit accounts, savings accounts, large time deposit accounts, and other time deposit accounts. The call reports provide data on net federal funds and repurchase agreements; banks have a net liability position in these instruments so the NIPAs treat these as deposits.[11] The call reports also record cash in the process of collection and net interbank transactions, which the NIPAs net out in the aggregation of depositor services.[12]

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10. For more information, see the NIPA Handbook, Chapter 5, and Fixler, Reinsdorf, and Smith (2003). BEA adjusts balances upward to include balances in U.S. offices of foreign banks. With the 2013 comprehensive update, the estimates of commercial bank output were improved by limiting the relevant assets and liabilities to mainly loans and deposits, removing from borrower services an estimate of expected losses as a result of borrower default, and refining the reference rate to reduce the volatility in borrower and depositor services. See Hood (2013). With the 2018 comprehensive update, the same improvements were made to the estimates for other depository institutions—credit unions and savings and loan institutions. See Chute, McCulla, and Smith (2018).

11. Although the *SNA 2008* specifies that only loans and deposits should be used to compute implicit services, federal funds and securities repurchase agreements are also included in the U.S. estimates because they usually involve direct contact with a customer, suggesting the provision of a service (See Reinsdorf 2011).

12. "Cash items in process of collection," in an accrual-accounting framework, belong to the payee, not the check writer. Net interbank transactions consist of some other deposits and interest-bearing balances at other depository institutions, less balances held at the Federal Reserve. See Fixler, Reinsdorf, and Smith (2003).

Total services of banks in the NIPAs also include fee-based services. These charges include fees for deposit account services, ATM and electronic transaction fees, credit card fees, consumer loan fees, and safe deposit box rental charges. BEA estimates these charges using data from the call reports, the Census Bureau's Economic Census, and other sources.

2.2 Service Volumes and Prices

BEA's volume estimates of bank output are based on the BLS banking output index and some additional adjustments. The BLS output index is an aggregation of indexes of the implicit services of several types of deposits and loans, and indexes of several types of explicit fees. BLS uses the same Call Report data and other sources to produce these indexes. The types of loans, deposits, and fees that are included in the BLS output index are similar (but not quite identical) to those that make up BEA's estimates of current price services. More detailed breakouts of deposits or loans may be useful but are currently unavailable.

The BLS output index uses six indexes to measure depositor and borrower FISIM. The demand deposit index measures the output of non-interest-bearing checking accounts based on the number of transactions, equal to the number of checks written and the number of electronic funds transfers. A single time and saving deposit index measures the number of interest-bearing checkable deposit accounts, time and savings accounts, large time deposit accounts, and other time deposit accounts. Four loan indexes measure the numbers of real estate, commercial and industrial, consumer credit card, and other consumer loans.

The five BLS fee indexes are based on nominal fees divided by a price index (PPIs or CPIs). The BLS service charge index measures fees related to deposits. The loan securitization index measures fees for loans that banks no longer hold on their balance sheets but continue to service. Two other indexes measure fees for investment banking and insurance. The index for other non-interest income measures remaining fees, such as ATM fees and safety deposit box rentals.[13]

Two points about the BLS index are worth noting. First, the BLS index does not count the services of all the loans and deposits BEA includes in its current price FISIM estimates. The BLS index does not capture federal funds and repurchase agreements, cash in the process of collection, net interbank transactions, agricultural or lease financing loans, or other loans, which include loans to depository institutions and to nondepository financial institutions, obligations of states and political subdivisions, and any other loans. BLS has strong reasons for these omissions: it creates this index for its own estimates of productivity, consistent with its own widely understood conventions

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13. See Royster (2012) for details about the BLS output indexes. The investment banking fee index measures fees banks earn from investment portfolio management, financial planning services, and the brokering and dealing of financial instruments. The insurance fee index measures fees banks earn from the sale of insurance and annuities.

and definitions.[14] Thus, while the BLS index typically reflects over 90 percent of the loan and deposit balances reflected in BEA's current price FISIM measure, the two measures have a slightly different scope and definition. Second, the BLS indexes are counts of transactions, accounts, and loans, with no adjustments for service quality.

BLS estimates the total BLS banking output index, or any other aggregate index, using a Törnqvist formula. For this formula, the weights are based in revenue shares. To estimate revenue shares for the implicit services measured by each loan and deposit index, BLS uses a reference rate method, similar to BEA's method.

To produce its own measures of service volumes and prices, BEA starts with the BLS banking output index but also makes additional adjustments to reflect a different choice of component weights and other factors. Because of these additional adjustments, the BLS and BEA estimates of the output of commercial banks display similar but not identical trends. BEA also produces its own volume estimates of fee-based services, although the BEA and BLS estimates are based on the same data sources and are very similar. BEA, unlike BLS, also needs to allocate portions of priced and unpriced services of banks to major sectors, including households (for PCE) and businesses and government (as part of intermediate services.) For this sector allocation, BEA relies on data from the FDIC, the financial accounts, other sources, and some judgment.

2.3   Methods for Alternative Estimates

Some equations may help explain how BEA's data and methods can be used to derive alternative estimates of commercial bank service volumes and prices. For both the output indicator method and the deflated balances method, current price borrower (equation 1) and depositor (2) FISIM are equal to BEA's existing estimates, based on the user cost formulas. In these equations, UC_{Lit} is the user cost price for borrower FISIM for loan type i in period t, and UC_{Dit} is the user cost price for depositor FISIM for deposit type i in period t. The estimates of total borrower (3) and depositor (4) FISIM are equal to the product of user cost prices and average balances for each type of loan ($Loans_{it}$) and deposit ($Deposits_{it}$) and summed over types of loans and deposits. Current price implicit gross output (IGO_t) equals the sum of depositor and borrower FISIM (5) and total gross output (GO_t) equals the sum of implicit gross output and the sum of j types of fees F_t (6).

(1) $$UC_{Lit} = r_{Lit} - \text{reference rate} = \left[\left(\frac{Interest\ income}{average\ loan\ balance} \right) - reference\ rate \right]$$

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14. See the BLS website: www.bls.gov/mfp/mprtech.htm.

(2) $\quad$ UC_{Dit} = reference rate − r_{Dit} = $\left[reference\ rate - \left(\dfrac{Interest\ income}{average\ deposit\ balance} \right) \right]$

(3) $\quad$ $BServ_t = \sum_i UC_{Lit} Loans_{it}$ $\qquad\qquad$ (4) $\quad$ $DServ_t = \sum_i UC_{Dit} Deposits_{it}$

(5) $\quad$ $IGO_t = BServ_t + DServ_t$ $\qquad\qquad$ (6) $\quad$ $GO_t = IGO_t + \sum_j F_{jt}$

Under the output indicator method, the volume of implicit borrower services ($QBServ_{it}$) and depositor services ($QDServ_{it}$,) can be estimated by type of deposit or loan by setting the level equal to current price levels in the reference year and extrapolating with changes in the BLS output indicator (7, 8). The prices are estimated as IPDs.

(7) $\quad$ $QBServ_{it} = QBServ_{it-1} \times OI_{it} / OI_{it-1}$; $\;OI$ = output indicator

(8) $\quad$ $QDServ_{it} = QDServ_{it-1} \times OI_{it} / OI_{it-1}$

Under the deflated balances method, services volumes can be estimated for each type of deposit or loan by setting the level equal to current price services in the reference year and then extrapolating with the change in inflation-adjusted balances, deflated with a general price index (PI_t) that proxies for the general purchasing power of money (in this paper I have chosen the CPI[15]). Equation 9a below shows this calculation for a type of loan (borrower services). This estimate of services in year t is equivalent to multiplying the reference year user cost price (UC_{LiBY}) by the deflated balances in year t (9b). It is also equivalent to dividing current price FISIM in year t by the general price index in year t, and then multiplying this result by the ratio of the reference year user cost price and the user cost price in year t (9c):

(9a) $\quad$ $QBServ_{it} = QBServ_{it-1} \times (Loans_{it} / PI_t) / (Loans_{it-1} / PI_{t-1})$

or

(9b) $\quad$ $QBServ_{it} = (Loans_{it} / PI_t) \times UC_{LiBY}$

or

(9c) $\quad$ $QBServ_{it} = (BServ_{it} / PI_t) \times (UC_{LiBY} / UC_{Lit})$ because $BServ_{it} = Loans_{it} \times UC_{Lit}$

Under the deflated balances method, the prices for borrower services are estimated as an IPD. Prices can also be estimated as the product of the general price index and the ratio of the user cost price in the current year to the user cost price in the reference year (10). With this formula, general increases in prices appear as price changes rather than as volume changes. The equations for

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15. The results in this paper are very similar if the IPD for gross domestic purchases was used instead of the CPI.

volume and price estimates for depositor services are similar. The volume estimates for fee-based services are estimated separately by simple deflation.[16]

(10) $\quad$ **PBServ$_{it}$ = (PI$_t$) x (UC$_{Lit}$ / UC$_{LiBY}$)**

These formulas for each type of loan or deposit do not reflect changes in revenue shares of types of deposits, loans, or fees. To estimate aggregate volume measures, such as gross output, under both methods, taking into account any changes in revenue shares over time, volume indexes for each type of loan, deposit, or fee, based on the above formulas, are aggregated using the Törnqvist formula, with weights set equal to revenue shares (11).

(11) $\quad$ $$TQ_t = \frac{Qt}{Qt-1} = \prod_{i=1}^{n} \left(\frac{qit}{qit-1} \right)^{1/2(S_{it-1} + S_{it})} \; ; \; \textbf{S}it = \textbf{Revenue share of I and t}$$

The Törnqvist formula, like the Fisher formula BEA uses, allows expenditure weights to change over time; the Törnqvist aggregation in dollars will differ from a simple summation of constant price estimates of the components. With the Törnqvist formula, changes in the interest rate spread (the user cost price) for the implicit services appear as changes in the expenditure shares, and changes in fees can appear as changes in both the output index for fees and the expenditure shares. In this paper, I have used the same estimates of fee-based services for both methods to isolate the differences in estimates of implicit services.

For both methods, these aggregate volume indexes are used to estimate aggregate service volumes (QGO$_t$) by extrapolating from the current price estimate in the reference year (12). The aggregate price (PGO$_t$) is an IPD (13). BEA's published estimates are based on aggregate estimates derived from the BLS output indicators plus some adjustments.

(12) $\quad$ **QGO$_t$ = QGO$_{t-1}$ TQ$_t$** $\qquad\qquad\qquad$ (13) $\quad$ **PGO$_t$ = GO$_t$ / QGO$_t$**

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16. It is also possible to estimate a price index for FISIM in which the market interest rate is equal to the sum of interest income plus fees divided by loan balances (for loans) or interest payments less fees divided by deposits (for deposits). See Eurostat-OECD, chapter 9, page 246. BEA and BLS estimate fees and FISIM separately.

## 2.4   Some Simple Comparisons of Output Measures

Total current price annual estimates of bank services (figure 1, based on equations 3, 4, and 6) tended to increase after 1987, except in or near recession years. Since the financial crisis, both depositor and borrower FISIM increased, while total charges were flat, indicating that the relative revenue shares changed over time. Average annual bank deposit and loan balances deflated by the CPI (figure 2) increased in most of these years but fell during the crisis; growth resumed after 2011. The BLS total output index also tended to rise over time. After the crisis, however, the BLS total output index, unlike deflated bank balances, rose very little: the aggregate borrower FISIM output index rose but the aggregate depositor FISIM output index and the fee index did not. These simple trends suggest that the two methods imply different growth rates for depositor service volumes after the crisis.

Figure 1. Current Price Estimates of Commercial Bank Services, NIPA Estimates (Billions of dollars)
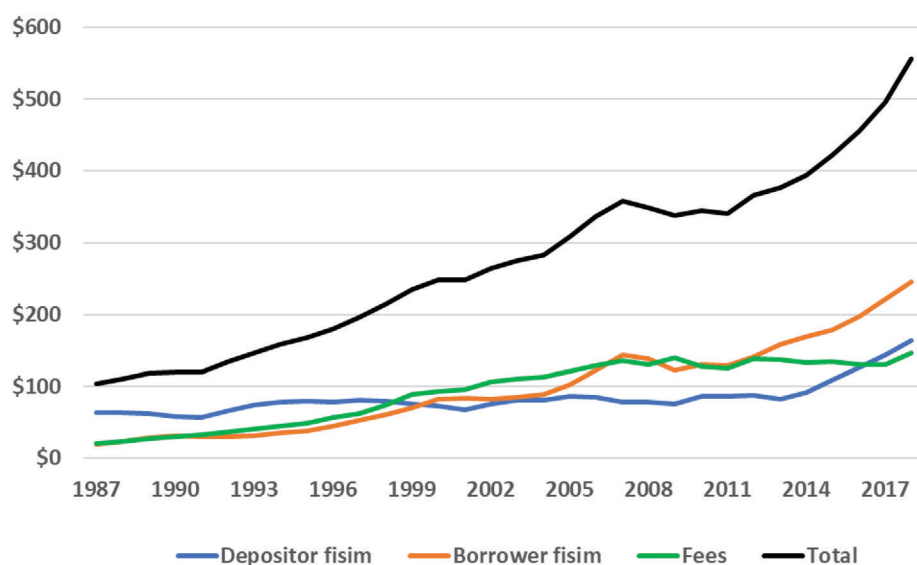
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 2. Deflated Balances of Commercial Bank Loans and Deposits, and the Bureau of Labor Statistics Banking Output Index

Deposit and loan balances of commercial banks, deflated with the CPI, current prices, billions of dollars

BLS output index (2012=100)
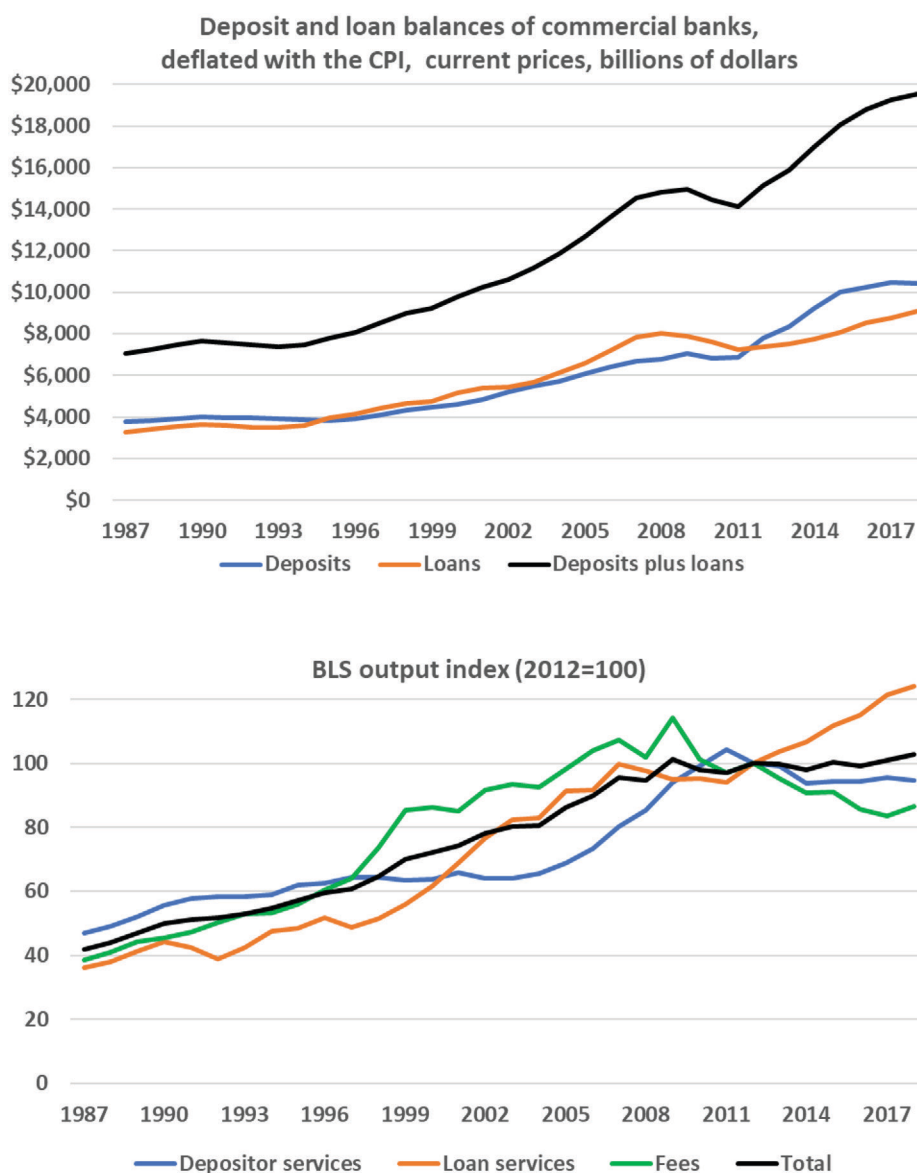
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

To examine these trends in more detail, table 1 and figure 3 present comparisons of volume measures of implicit services of several types of loans and deposits that are included in both the BEA estimate of current price FISIM and the BLS output index. These estimates are based on equations 7–9, extrapolating from the current price estimate for the 2012 reference year. While these simple comparisons do not reflect types of loans and deposits that are omitted from the BLS index, or changes in revenue shares of types of loans, deposits, or fees, they reveal some key differences between the two measures.

Table 1. Trends in Volume Measures of Commercial Bank Services, by Type of Deposit and Loan, Based on Alternative Methods

|	1987–1997		1997–2008		2008–2018	
	BLS output indicator	Deflated balances	BLS output indicator	Deflated balances	BLS output indicator	Deflated balances
Implicit services by type of deposit and loan						
Demand deposits	$4.8	−$1.0	−$2.1	−$3.5	$0.6	$14.5
Time and savings deposits	$11.4	$1.7	$21.8	$26.6	$7.4	$55.8
Commercial and industrial loans	−$6.2	$1.7	$12.0	$7.4	$6.2	$8.1
Real estate loans	$18.9	$12.3	$34.0	$40.6	−$4.4	$1.8
Credit card loans	$6.7	$5.0	$11.5	$0.7	$21.4	$14.9
Other consumer loans	−$5.8	−$0.6	$5.6	$2.9	$5.1	$2.4
Sum	$29.9	$18.9	$82.8	$74.7	$36.3	$97.5
Total charges for fee-based services	$35.5	$35.5	$52.1	$52.1	−$20.9	−$20.9

The sum of implicit services is a simple addition of implicit services by type of loan and deposit and not a Tornquist aggregation. The total charges are estimated the same way for both methods.

From 2008 to 2018, the volume of implicit services grew faster based on the deflated balances method than based on the output index, mainly because of trends in depositor services. The implicit services of demand deposits, in volume terms, grew by $14.5 billion based on the deflated balances method but only by $0.6 billion based on the BLS index. The services from time and savings deposit accounts grew by $55.8 billion based on deflated balances but only by $7.4 billion based on the BLS index. Deposits grew substantially during these years, following low levels in 2008, but numbers of transactions and accounts grew much more slowly.

From 2008 to 2018 the picture for loans is more mixed. The implicit services from real estate loans grew by $1.8 billion based on deflated balances but decreased by $4.4 billion based on the BLS index. The implicit services from commercial and industrial loans grew about $2 billion faster based on the deflated balances index. The volume measures of implicit services from consumer credit card loans and other consumer loans, on the other hand, together grew about $9 billion faster based on the output indicator method.[17]

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17. Inklaar and Wang (2012) argue that a more appropriate price index for residential mortgage loans is a price index for residential assets rather than the CPI. Following this point, my estimate of residential loan balances of commercial banks, deflated by the house price index compiled by the Federal Housing Finance Agency (this measure excludes nonresidential loans), fell by about 13 percent from 2008 to 2018, confirming that the choice of deflator affects the results, although for most of these loans and deposits, a general price measure seems appropriate.

Figure 3. Measures of Commercial Bank Services, by Type of Deposit or Loan, Current Prices (Billions of dollars)
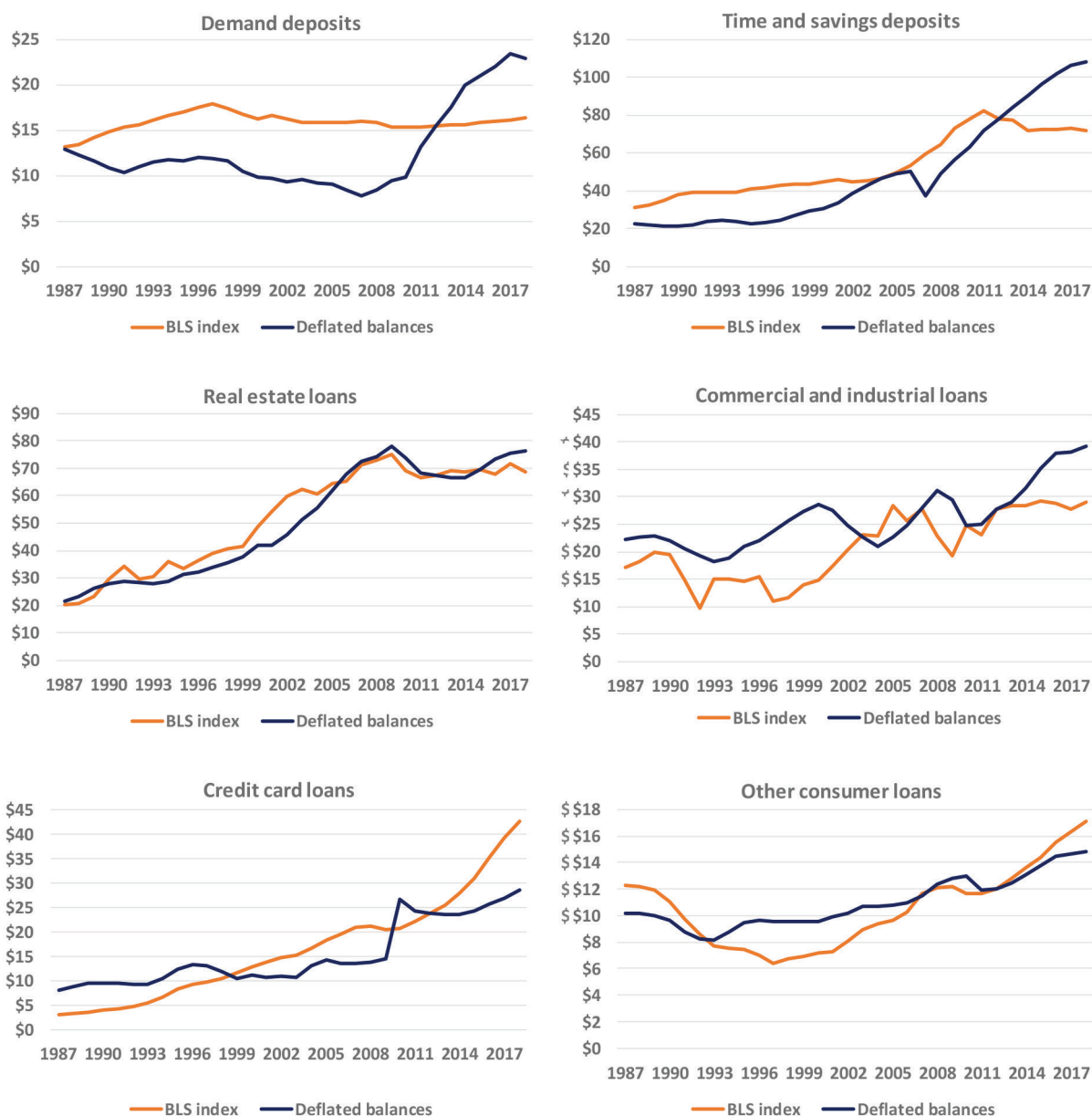
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

From 1997 to 2008, service volumes grew faster based on the output indicator method although the two methods produce fairly similar results. The deflated balances method implies faster growth in the implicit services from time and savings deposits and real estate loans. The output indicator method implies faster growth in the implicit services from commercial and industrial, credit card, and other consumer loans. These results partly reflect some abrupt movements of both measures in the years of the financial crisis.

For the period from 1987 to 1997, the output indicator method implies relatively faster growth in service volume. The BLS index indicates faster growth in the services from demand deposits, time and savings deposits, real estate loans, and credit card loans; these results were partly offset by differences in the estimates for commercial and industrial loans and other consumer loans. As these results show, the differences in estimates from the two methods depends on the period selected and the type of loan or deposit.
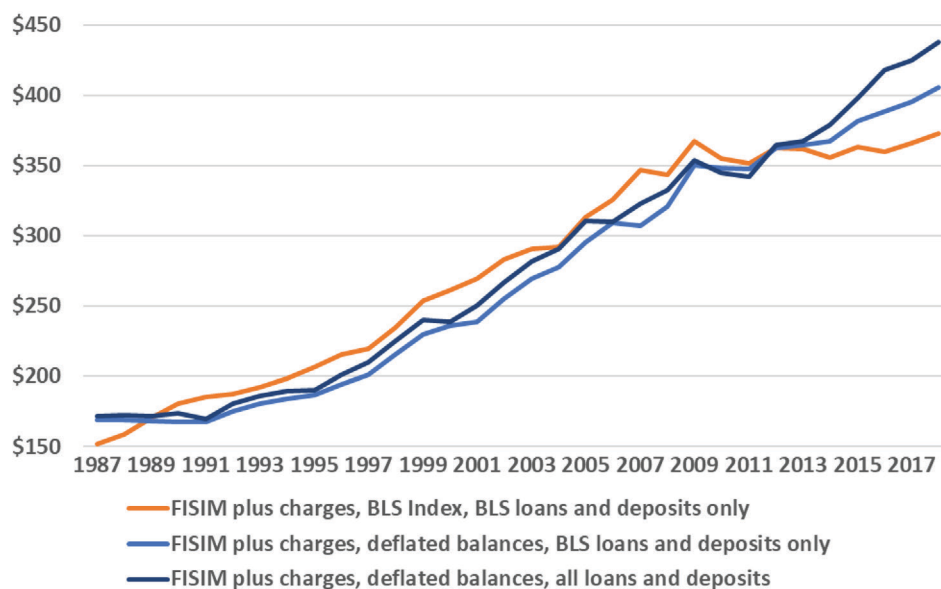
2.5   Output and PCE

From 2008 to 2018, output also grew faster based on the deflated balances method (see table 2 and figure 4). Volume measures of gross output based on a Törnqvist aggregation (equations 11–13) are more complete measures of service volume because they take into account changes in revenue shares over time, and so the estimated changes differ somewhat from the simple sums of the components. For the subset of types of loans and deposits that are included in both the BLS output index and the BEA current price FISIM estimate, the total volume of implicit services grew by $50.2 billion using the BLS index but by $105.3 billion using the deflated balances method.

Table 2. Trends in Volume Measures and Prices of Gross Output, Commercial Bank Services, Based on Alternative Methods

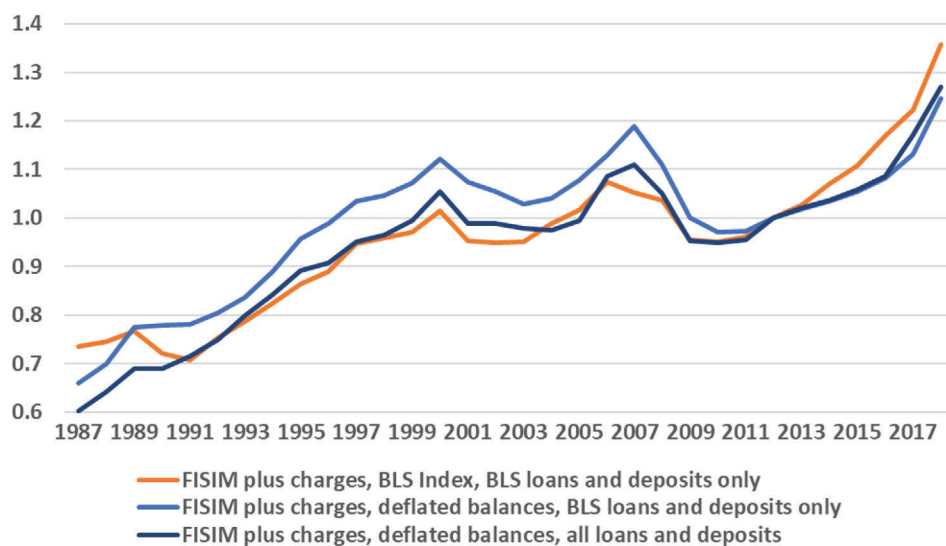|	1987–1997	1997–2008	2008–2018	1987–2018
Changes in volume measures of total gross output (FISIM plus fees), billions of 2012 dollars				
Deposits and loans in the BLS output index, plus fees				
Output indicator method	$68.1	$123.7	$29.0	$220.8
Deflated balances method	$32.3	$119.3	$84.8	$236.4
All deposits and loans, plus fees, deflated balances method	$38.4	$122.3	$105.8	$266.5
Percent changes in prices, total gross output (FISIM plus fees)				
Deposits and loans in the BLS output index, plus fees				
Output indicator method	28.8	9.4	31.0	84.6
Deflated balances method	56.6	7.4	12.3	89.0
All deposits and loans, plus fees, deflated balances method	57.9	10.5	20.9	111.0

These changes and percent changes are total changes over each period rather than average annual changes.

Figure 4. Gross Output, Volume Measures, Commercial Banks (Billions of 2012 dollars)

- FISIM plus charges, BLS Index, BLS loans and deposits only
- FISIM plus charges, deflated balances, BLS loans and deposits only
- FISIM plus charges, deflated balances, all loans and deposits

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 5. Prices, Gross Output Measures, Commercial Banks

- FISIM plus charges, BLS Index, BLS loans and deposits only
- FISIM plus charges, deflated balances, BLS loans and deposits only
- FISIM plus charges, deflated balances, all loans and deposits

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

If one includes all loans and deposits that BEA includes, then the total volume of implicit services, based on the deflated balances method, grew by $126.3 billion from 2008 to 2018. The deflated balances estimate grew faster partly because balances fell to a trough in 2008 and partly because this estimate was over $60 billion higher than the estimate based on the BLS output index in 2018. The services and balances of other loans, which the deflated balances estimate includes but the BLS index omits, grew after 2008. Fees decreased by $21 billion in volume terms during these years. The volume of total gross output (FISIM plus fees) rose by $29.0 billion based on the BLS index but by $105.8 billion based on the deflated balances method for all loans and deposits.

The differences in estimates of the growth in the total volume of services vary over time. From 1997 to 2008, the two estimates are very similar. From 1987 to 1997, the Törnqvist measure of total gross output grew about $30 billion faster based on the BLS index than based on the deflated balances index.

The differences in gross output price trends obtained with the two methods mirror the differences in gross output volume trends (see table 2 and figure 5). From 2008 to 2018, gross output prices rose more slowly under the deflated balances method. For 1987 to 1997 gross output prices rose more slowly under the output indicator method.[18]

BEA's estimate of gross output and prices for commercial bank services starts with the BLS output index and adds additional adjustments. In BEA's estimates, the output of commercial banks is a major part of BEA's published estimate of the gross output of the industry, Federal Reserve Banks, credit intermediation, and related activities, which also includes savings and loans, credit unions, as well as Federal Reserve banks and nondepository institutions. From 2008 to 2018, gross output for this larger industry (in 2012 chain dollars) fell by $19 billion; after 2010 chain-dollar value added fell while intermediate inputs rose (figure 6). If BEA used the deflated balances method, the estimates of chain dollar gross output growth for 2008 to 2018 would be revised upward. For this industry from 1997 to 2008, BEA's published estimates for chain dollar gross output grew rapidly although most of this growth occurred before 2003; these trends reflect other factors in addition to the BLS index.

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18. BLS produces a PPI for the commercial banking industry that is based on user cost prices and prices for fees, consistent with the deflated balances method, without an adjustment for the CPI. This price index was flat from 2008 to 2018, roughly consistent with this paper's underlying estimates for the deflated balances method. See www.bls.gov/ppi/ppibanking.htm. At this point, BEA does not directly use this PPI.

Figure 6. BEA Estimates of Gross Output, Value Added, and Intermediate Inputs: Federal Reserve Banks, Credit Intermediation, and Related Activities (Billions of 2012 chain dollars)
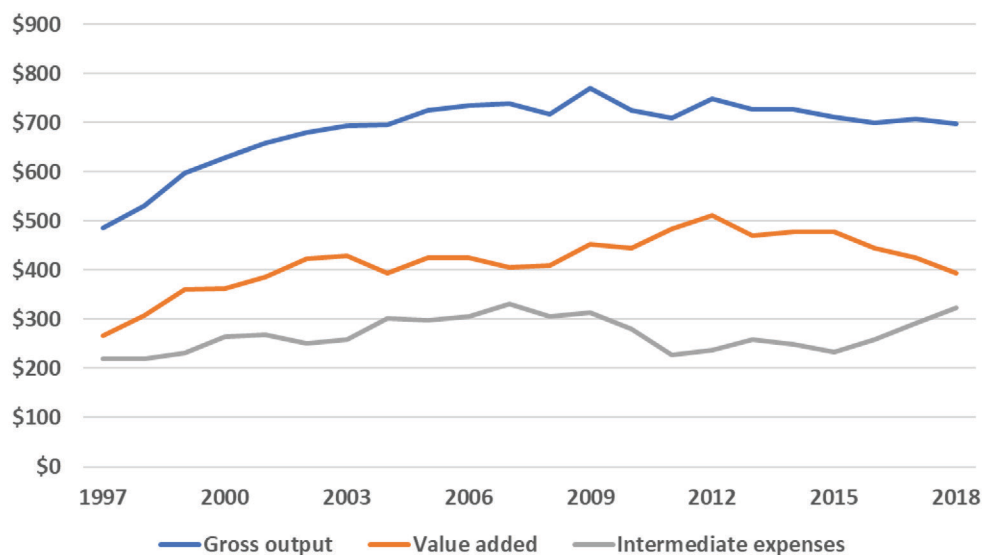
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

The comparison of estimates of PCE for commercial bank services shows roughly similar results (table 3 and figures 7–8). BEA's estimates of PCE for implicit bank services are based on the BLS indexes plus additional adjustments and estimates of shares of output assigned to the household and nonprofit institutions serving households (NPISH) sector. The deflated balances estimate for PCE is an approximation based on shares of loans and deposits for households and NPISH derived from asset shares in the financial accounts. For both methods, the PCE estimates of fee-based bank services are BEA's published estimates. From 2008 to 2018, PCE for the volume of total bank services (fee based plus implicit) fell by $6.9 billion in BEA's published estimates but rose by $41.5 billion based on the deflated balances method. From 1997 to 2008, the deflated balances estimate of service volume growth are also higher. From 1987 to 1997, BEA's published estimates of service volume growth are relatively higher. As expected, BEA's published estimates of PCE price growth are relatively higher from 2008 to 2018 and from 1997 to 2008, and relatively lower from 1987 to 1997.[19]

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19. The deflated balances estimate of PCE for bank services is an aggregation of shares of services from demand deposit and time and savings deposit accounts, credit card loans, and other consumer loans. With the Törnqvist aggregation of gross output and PCE, the aggregate changes differ from simple sums of components because revenue shares change over these years. With the 2020 annual update of the NIPAs, PCE for implicit bank services was revised up $7 billion in 2018; current price estimates and prices were also revised up. For the industry "Federal Reserve Banks, credit intermediation, and related activities," the 2018 volume estimate of gross output was revised little; gross value added was revised up about $30 billion and intermediate inputs was revised down. These revisions do not change the general conclusions of this paper.

Table 3. Trends in Volume Measures and Prices of PCE, Commercial Bank Services, Based on Alternative Methods

	1987–1997	1997–2008	2008–2018	1987–2018
Changes in volume measures of PCE, billions of 2012 dollars				
Financial service charges and fees, published PCE estimates	$6.2	$30.1	−$14.8	$21.5
Total services (FISIM plus fees)				
Published PCE estimates	$31.0	$35.8	−$6.9	$59.9
Alternative PCE estimate (deflated balances method)	$5.3	$49.9	$41.5	$96.7
Percent changes in prices, PCE measures				
Total services (FISIM plus fees)				
Published PCE estimates	6.8	15.7	66.5	105.8
Alternative PCE estimate (deflated balances method)	46.8	−10.3	15.3	51.9

Figure 7. PCE for Commercial Bank Services, Volume Measures (Billions of 2012 dollars)
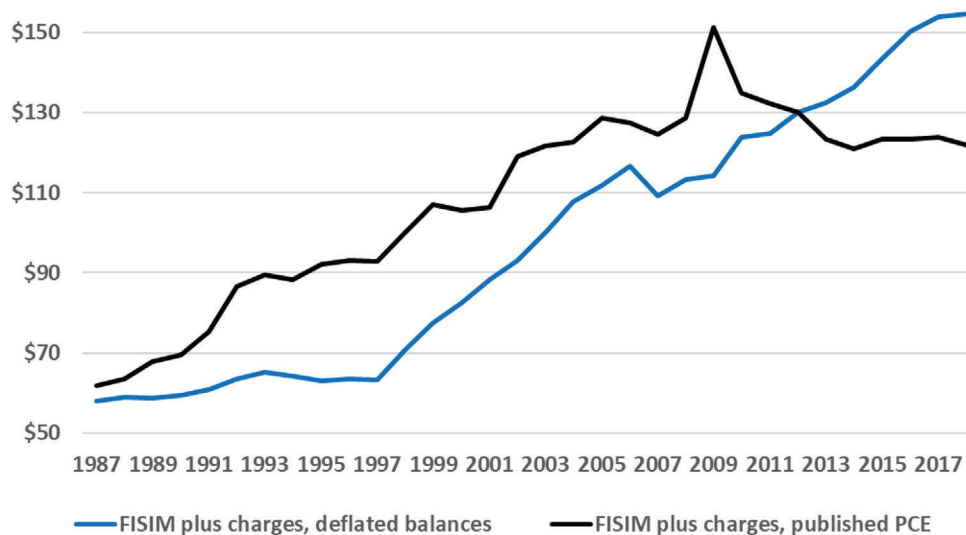
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 8. Prices, PCE for Commercial Bank Services
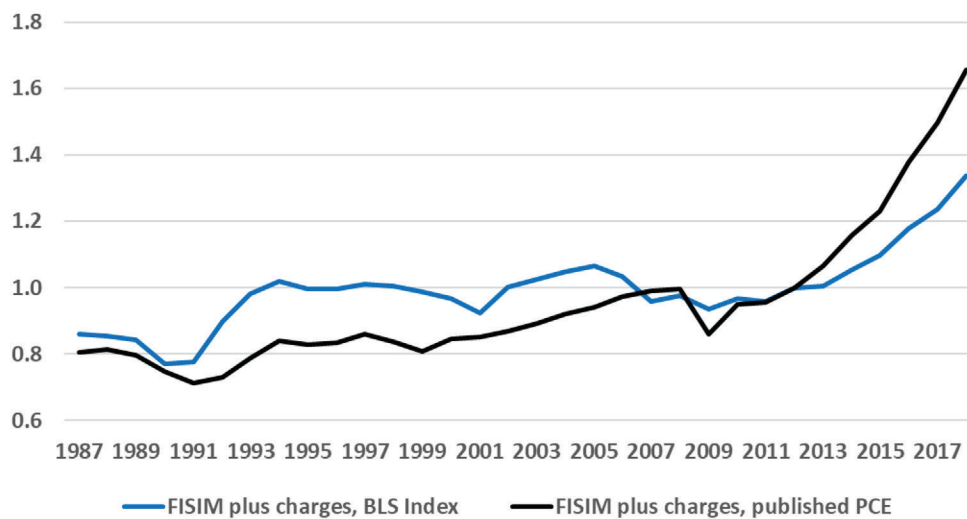
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

As these comparisons indicate, the deflated balances and the output indicator methods can imply substantially different estimates of changes in volumes and prices, but the differences vary over time. In the years after the financial crisis, the deflated balances method implies faster growth in service volumes and slower growth in prices than the output indicator method. Which estimate is "right" remains a matter of controversy.

3.   Investment Fund Management

While the literature on measuring financial services has focused on the services of banks, similar questions arise for the service of the management of investment funds, including RICs. In the United States, RICs include mutual funds, exchange-traded funds (ETFs), closed-end funds, and money market mutual funds.[20] Because of tax rules for RICs, their services consist almost entirely of funds management. RICs offer tax advantages for investors because they can pass through the taxes on capital gains, dividends, or interest earned through investments to investors, avoiding double taxation of both the company and the investors. To attain these tax advantages, RICs must meet requirements to ensure that they are pass-through institutions that invest in relatively diversified, liquid portfolios of assets, derive almost all of their income from these investments, and distribute almost all of this income to shareholders (or be taxed on the remaining income). In recent years, alternative methods for estimating volumes and prices of the fund management services of RICs produce substantially different results.

3.1   Current Price Measures of the Services of RICs

In the NIPAs, the management of the assets of RICs is an implicit service measured by their expenses. RICs mainly fund their expenses indirectly, through a reduction in shareholders' returns, rather than through fees. In a competitive market, these implicit payments will equal expenses incurred. RICs do not have employees or fixed assets and purchase fund management services as an intermediate input. For RICS, which are classified in North American Industry Classification System (NAICS) industry 525 (funds, trusts, and other investment vehicles), the NIPAs impute a value for gross output equal to these purchased intermediate services, so that value added is close to zero. The value added from the fund management services appears in NAICS 523 (securities, commodity contracts, and investments).

BEA has excellent annual data on RIC expenses, income, distributions to shareholders, and taxes from the Internal Revenue Service (IRS) Statistics of Income (SOI), compiled from submissions of Form 1120-RIC, which all RICs are required to submit. BEA also receives data from the Investment Company Institute (ICI), a widely respected authority on RICs. BEA allocates about 85 percent of the services of RICs to households (as PCE) and the rest to other sectors based on shares of assets in the financial accounts and other sources.

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20. A mutual fund is a pool of funds collected from investors for the purpose of investing in stocks, bonds, and other financial assets. ETFs issue shares that are traded on stock exchanges at market prices that reflect the performance of their underlying assets. A closed-end fund does not issue additional shares after an initial public offering; its shares are traded at market prices. While these RICs invest in relatively longer-term securities and equities, money market mutual funds invest in short-term, liquid, low-risk assets that pay shareholders returns that reflect short-term interest rates and are close substitutes for bank deposits.

Current price annual, quarterly, or monthly measures of these services can be volatile because the funds pay fund managers fees that are set (by contractual arrangements) equal to the product of an expense ratio (say, $1 per every million dollars of assets) and the market value of the funds' assets. These payments may occur on a daily basis or at other frequent intervals. The expense ratios are publicly stated for investors and change gradually over time. In the short term, the stated expense ratios tend to be fixed and current price services tend to move in step with the market value of asset balances, which may be volatile in a turbulent market.

3.2   Recent Trends in Current Price RIC Assets and Services

In recent decades, the annual expenses of RICs (see figure 9) and the financial assets managed by RICs (figure 10) have increased substantially, except for some years of recession and declines in stock market valuations. Most of the growth in assets comes from mutual funds, and, in recent years, from ETFs. But while assets and expenses have increased, the annual expense ratios have fallen dramatically (figure 11). The BEA estimates of these expense ratios are derived from BEA estimates of expenses based on SOI data and BEA adjustments, and from asset balances reported by the financial accounts. Figure 11 also shows asset-weighted expense ratios for equity and bond funds, reported by ICI. The BEA estimates of expense ratios are more volatile than the ICI-reported expense ratios and spike upward in some years, such as 2001 and 2008, in which reported expenses rose or asset balances fell.[21] All these expense ratios nevertheless tend to decline over these years.
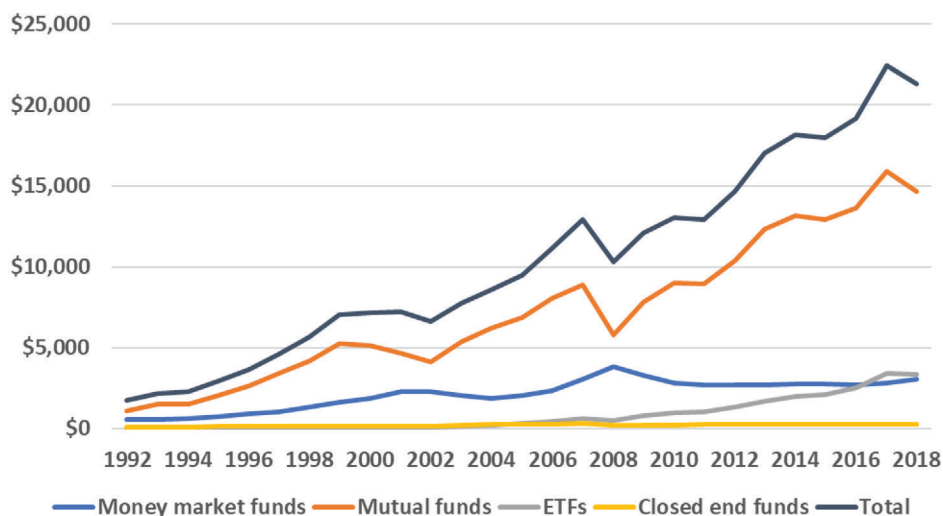
Figure 9. Expenses, Regulated Investment Companies, Current Prices (Billions of dollars, BEA estimates)
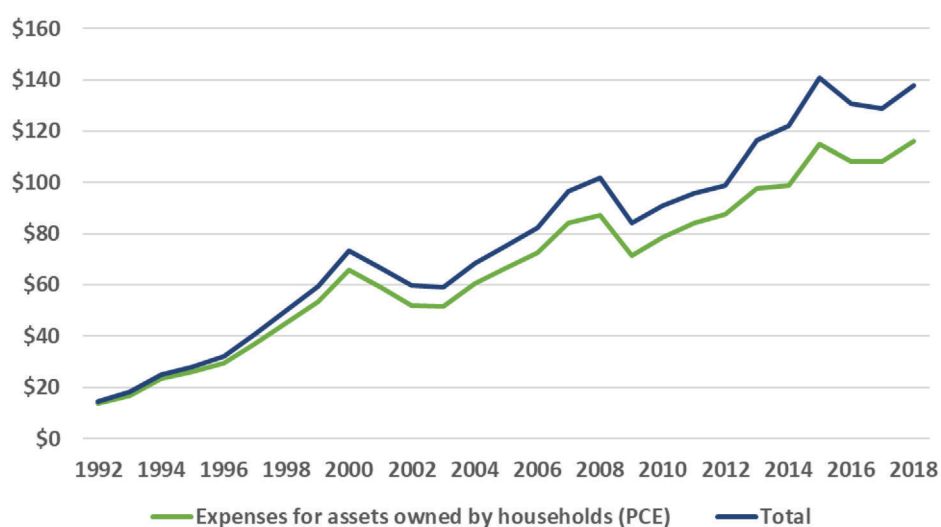
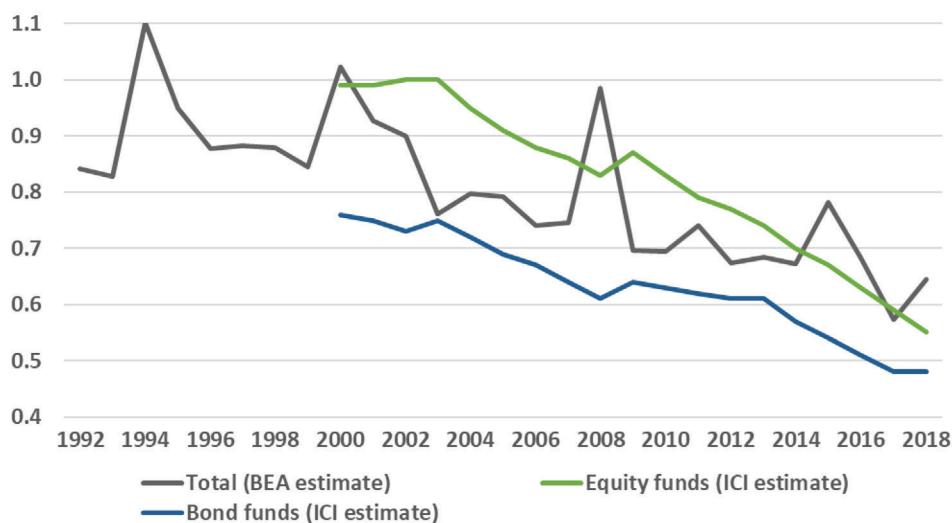Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

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21. BEA's data on expenses reflect some adjustments of the SOI data and expenses financed by some fees that are not necessarily included in the calculation of reported expense ratios. The expense ratios reported by ICI can be found in the *2019 Investment Company Factbook* from ICI, figure 6.1.

**Figure 10. Financial Assets, Regulated Investment Companies,
Current Prices (Billions of dollars)**

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 11. Expense Ratios, Regulated Investment Companies (RICs)

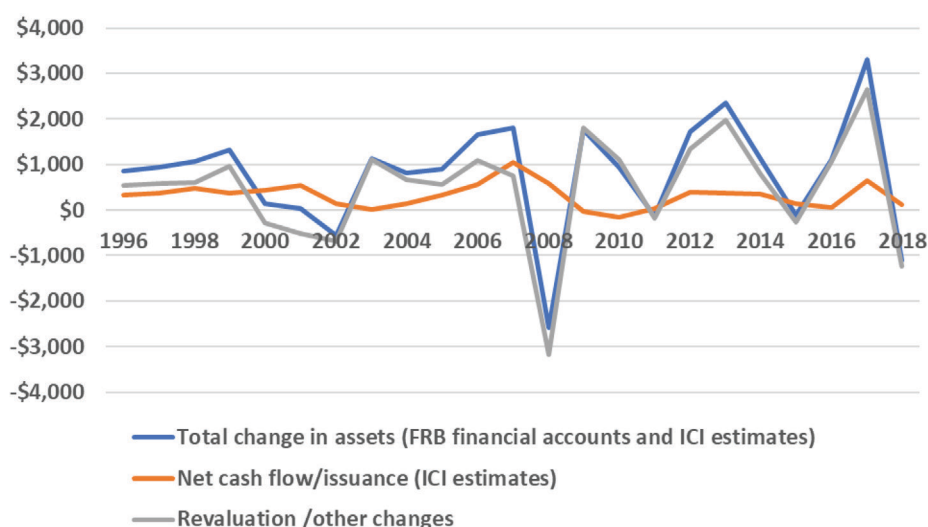Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

ICI summarizes the factors behind the decline in the expense ratios of RICs.[22] Competition for market share from new lower-cost funds and the emergence of lower cost ETFs have led to declines in expense ratios. Funds have shifted more toward "no-load share classes," which are less costly to investors. Expense ratios tend to decline as asset balances increase because funds realize

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22. *2019 Investment Company Factbook* from ICI, chapter 6.

scale economies, as they spread their fixed costs across a larger pool of assets. Another key reason for the decline in expense ratios is the increasing use of index funds, which buy and hold a representative sample of assets to replicate the returns of a specified index, such as the S&P500. This "passive management" of funds results in lower expense ratios than more actively managed funds, although the expense ratios of both actively and passively managed funds has declined. Over time, investors have moved a growing share of their assets to lower-cost funds.

This growth in assets reflects both net contributions from investors and upward revaluations of assets. Figure 12 shows changes in total assets (current prices) of RICs as well as net contributions to RICs based on data from ICI and the financial accounts. For mutual funds and money market funds, net contributions are defined as net cash flow, the value of new sales minus redemptions combined with net exchanges. For closed-end funds and ETFs, net contributions are defined as net issuance of shares, the value of gross issuances minus gross redemptions.[23] Net contributions have contributed a substantial share of the total increase in assets. From 2003 to 2018, assets rose $13.5 trillion, while the sum of net contributions over these years was $4.6 trillion. The remaining increase in assets presumably results mainly from revaluation.

Figure 12. Annual Changes in Financial Assets, RICs, Current Prices (Billions of dollars)

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

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23. See the *2019 Investment Company Factbook* from ICI, table 17 (mutual funds), table 38 (money market mutual funds), table 13 (ETFs), and table 10 (closed end funds).

3.3   Volume Measures

For national accounts, these sometimes-volatile changes in current price estimates of services need to be separated into changes in volumes and prices. The *SNA 2008* and other national accounts handbooks and manuals can be interpreted as supporting a deflated balances approach. The *SNA 2008* (Paragraph 15.114, 308) states "...A particular case is those of margin industries including financial services. Output of a margin industry is usually calculated as the margin rate times the value of a transaction. To determine a volume figure, the base year rate is applied to the value of the transaction suitably deflated to base year values."

Similarly, Eurostat (2016, 104–105) describes "financial intermediation outside FISIM: "Apart from [commercial bank] FISIM, output of financial intermediation services consists of selling products for which fees or commissions are charged directly to the customers, just as for other products. Fees and commissions can take a number of forms, such as... a fee based on the value of a transaction stock or flow, i.e. ad valorem charge. For example, the fee for the management of an investment fund is likely to be linked directly to the value of the fund... For ad valorem charges it is possible to construct price indices that reflect both changes in the percentage charged and the changes in value of the underlying asset (stock or flow) to which this percentage rate is applied. This is an A [preferred] method... For money funds, using the amounts managed deflated by a price index that measures the change in the underlying purchasing power of money (as described...for FISIM) is a suitable volume indicator."

With a deflated balances approach, employed by several countries in the EU as well as Canada, the growth in the volume of services depends on the growth in inflation-adjusted asset balances (similar to equation 9, with expense ratios instead of user cost prices). An increase in inflation-adjusted fund balances, occurring either by net contributions or by upward revaluation, implies a parallel increase in the volume of fund management services. Managing a large account of a major investor is a greater service than managing a minimum-size account; sustained increases in asset balances imply more fund management services. The price will be related to the funds' expense ratios and the general inflation rate (similar to equation 10, again with expense ratios instead of user cost prices). Reductions in expense ratios, all else equal, will lead to reductions on the price of services.

One can also reject the idea that the service of fund management, or even its price, should be measured by the size of asset balances, and instead argue for the use of some sort of direct measure of service flows. The service of the management of a fund, such as an S&P 500 index fund, is in many ways the same regardless of the size of the fund. This discussion is similar to the discussion about whether services from a commercial bank deposit should vary with the size of the deposit. The correct volume measure depends on the chosen unit of service. It should be noted that, because

current price services of RICs unavoidably move with the market value of assets, the changes in asset balances must appear as changes in either volumes or prices.

A related challenge for the deflated balances approach for RICs is the treatment of revaluation, including short-term volatility. One can reasonably question whether increases in fund expenses that arise solely through asset revaluation, such as an increase in stock prices, should be treated as an increase in the volume of a service. In national accounts, asset price changes appear in the revaluation account rather than in the current account. Accordingly, some may not want revaluations in equities and perceived asset "bubbles" to lead to changes in the volume of output. Others may find it hard to argue that short-term volatility in, say, equity values that occur over a matter of days or hours, reflects a genuine change in service volume. One option is to smooth services over time with moving averages, but some volatility will remain.

A second option for the price for fund management services is to allow prices to vary with expense ratios and asset revaluations, but not with net contributions from investors. With this price, service volumes rise with net contributions but not with upward asset revaluation, and prices still fall with declines in expense ratios. The BLS PPIs for mutual fund management and for private portfolio management are consistent with this approach.[24] As the BLS states, "price movements for this index are based on changes in the amount of revenue a mutual fund manager receives for providing investment advice. To track price movement for the index, data on management fees are collected. The management fee is most often based on a percentage of assets under management or a certain number of basis points (FEE = BP*FV, where FEE is the management fee, BP is basis points, and FV is fund value). The basis points charged by mutual fund management firms tend to be list prices that are fully published in prospectus documents. A basis point is equal to 1/100th of a percent, or 0.0001. A mutual fund's assets are held fixed from the beginning of the reporting period, not allowing any inflows or outflows, and are updated by the rate of return on a quarterly basis."As one might expect, changes in this PPI are in many (but not all) quarters related to changes in stock market valuations seen in broad measures such as the Wilshire 5000 index (figure 13). The NIPAs use this price index for the output of funds management industries, and PCE for pension fund and other portfolio management, but not for PCE for the services of RICs.

Another option, currently used in the NIPAs for deflating PCE for RIC management services, is an input cost index. This index is a weighted average of the average hourly earnings for employees of the portfolio management industry (NAICS 523920, about 70 percent weight) and PPIs for printing, electric power, office rent, and phones. The unit of output is essentially an hourly labor

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24. The BLS PPI for portfolio management of mutual funds tracks expenses for a sample of mutual funds, ETFs and money market mutual funds. For this PPI, the price of services at the start of period equals the product of the expense ratio and the asset balance. The price at the end of the period equals the product of the expense ratio and the asset balance, after removing any inflows or outflows to the portfolio. BLS also factors in performance fees. See www.bls.gov/ppi/ppiinvestadvice.htm for more information.

cost with overhead expenses. Input cost indexes are frequently employed in national accounts, especially for the measurement of services. As figure 13 shows, this price index is less volatile than the PPI for funds management. The input cost price index, which has risen faster than inflation, implies slower growth in service volumes and faster price increases than the deflated balances method. The difference in price changes based on this input cost index and the PPI will depend on the comparison of changes in revaluation and expense ratios relative to changes in labor costs.

Figure 13. Quarterly Percent Changes, Price Measures for Porfolio Management, RICs (Quarterly rates, not seasonally adjusted)
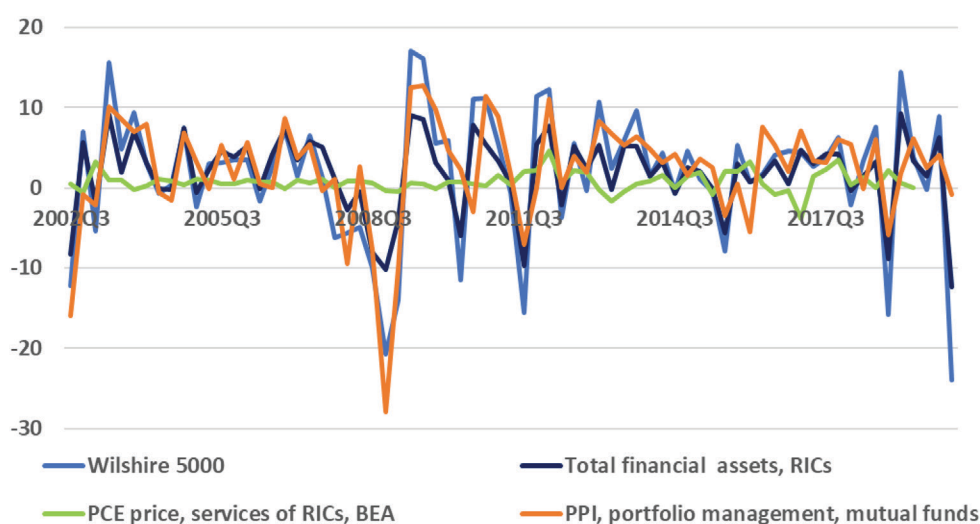
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Still another option for estimating a price for these services, used by the Australian Bureau of Statistics, is to deflate fund expenses by the CPI. With this method, changes in expense ratios, all else equal, will appear as changes in volume. For those who want to limit the effect of asset revaluation on service volumes, this method may be preferred in a situation in which, say, assets are revalued upward while expense ratios decline (because of scale economies) to limit the rise in expenses.

Quality adjustment is a challenge for all these options. One issue for quality adjustment is whether the movement from actively managed funds to passively managed funds, such as index funds, results in lower service quality as well as lower prices. This paper does not attempt to resolve this important but difficult question.

3.4   Alternative Estimates of Service Volumes and Prices

For the period from 2008 to 2018, the alternative price measures display very different trends (table 4 and figures 14–15). BEA's price measure, based on the input cost index, rose 35 percent. The price index based on the deflated balances measure, which reflects increases in the CPI and offsetting decreases in expense ratios, fell by 28 percent. The PPI for portfolio management of mutual funds, which counts upward revaluations as price increases, rose 118 percent.

### Table 4. Trends in the PCE for the Implicit Services of Regulated Investment Companies, Based on Alternative Methods

	2003–2008	2008–2018	2003–2018
Changes in volume measures of PCE for the services of RICs, billions of 2012 dollars			
BEA estimates	$32.6	−$1.4	$31.2
Based on deflated balances	$5.1	$54.5	$59.6
Based on BLS PPI for portfolio management, mutual funds	$11.1	−$42.0	−$31.0
Based on experimental price measure	$15.0	$5.8	$20.8
Percent changes in PCE prices for the services of RICs			
BEA estimates	13.5	35.1	53.3
Based on deflated balances	55.7	−27.8	12.5
Based on BLS PPI for portfolio management, mutual funds	51.7	118.8	231.9
Based on experimental price measure	38.9	24.6	73.1

Figure 14. Annual Volume Measures of PCE for the Implicit Services of RICs (Billions of 2012 dollars)
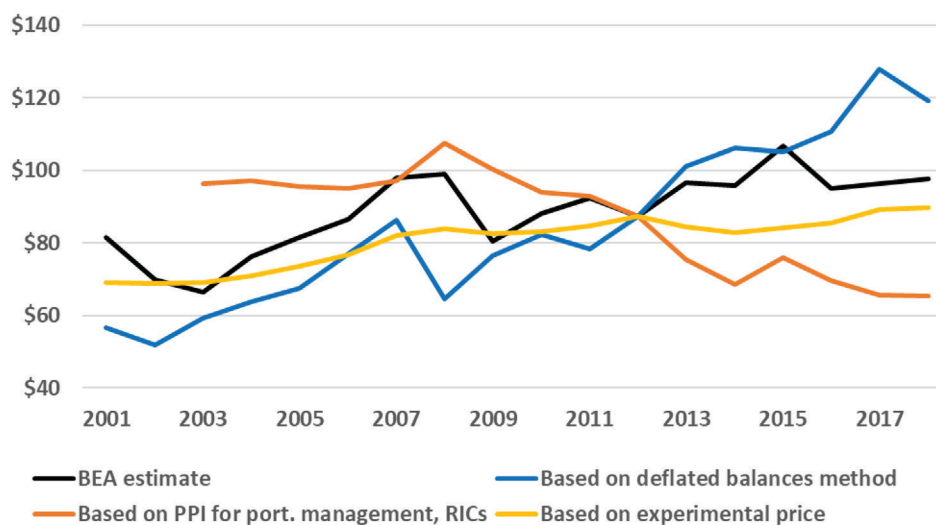
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 15. Annual Price Measures, PCE for the Implicit Servces of RICs (2012 = 100)
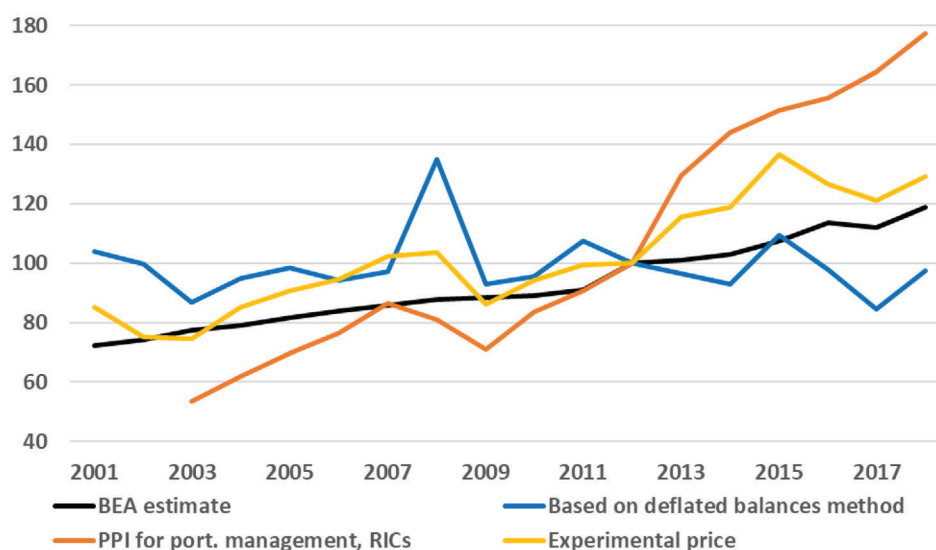
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

As one would expect, these different price trends produce different estimates of the growth of service volumes. From 2008 to 2018, the volume measure of this service was essentially flat based on BEA's price index but rose by $55 billion based on the deflated balances method and fell by $42 billion based on the PPI for portfolio management of mutual funds. These contrasting trends result from differences in the estimates in both 2008 (when the deflated balances method produces the lowest estimate) and 2018 (when it produces the highest estimate). In 2018, the estimated volume of services is $98 billion based on BEA's estimates, $119 billion based on the deflated balances method, and $65 billion based on the PPI for portfolio management.

From 2003 to 2008, the deflated balances method instead yields the fastest price increase and the lowest growth in services volume, so these comparisons again depend on the period chosen. Service volume rose by $5 billion with the deflated balances method but by $11 billion using the PPI and $32 billion using BEA's price measure. These results are sensitive to the choice of years since 2008 was clearly unusual, with a large decrease in asset balances.

Over the 2003 to 2018 period, for which we have data on all these price measures, the deflated balances method still produces the lowest price increases and the highest increase in service volumes. Prices rose 13 percent based on this method, in contrast to 53 percent based on BEA's price index and 232 percent based on the PPI. The estimated volume of services increased by $60 billion based on the deflated balances method, in contrast to an increase of $31 billion based on BEA's price

index and decrease of $31 billion based on the PPI. As the figure shows, the time paths of output growth also vary by the chosen deflator.

The increases in the BLS PPI for portfolio management of mutual funds are strikingly large. Figure 16 shows trends in this PPI and the total assets (in current prices) of RICs from the financial accounts, both expressed as indexes with the reference year set to 2000. In recent years the PPI rises as rapidly if not more rapidly than asset balances. This result is surprising because the BLS methodology removes the effect of net contributions from the price, and because the price should also reflect declines in expense ratios. Accordingly, one would expect the PPI to rise more slowly than assets. The BLS methodology for the PPI tracks a representative, fixed sample of funds obtained in the base year over seven years, then tracks a new representative sample of funds over seven years, and so on. Tracking price changes in this extremely dynamic market is a major challenge, and it is possible that the BLS method does not fully capture the rapid movement of trillions of assets to newer, lower-cost funds, such as ETFs and index funds.

Figure 16. PPI for Portfolio Management, RICs
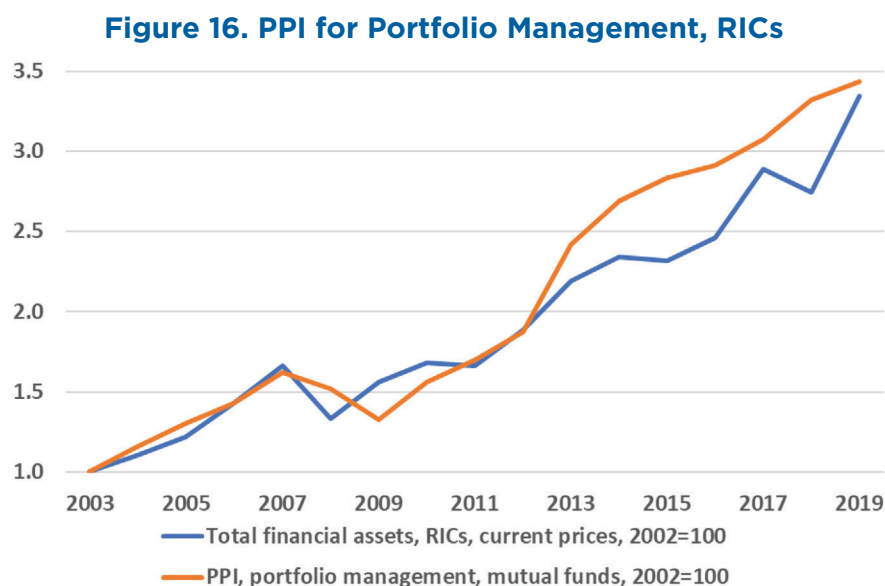
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

To explore this issue, table 4 and figures 14–15 also include results based on an admittedly rough annual "experimental price index" that seeks to approximate the BLS methodology and includes revaluations and changes in expense ratios in the price and seeks to capture the entire market in RICs. To estimate rates of return, this index removes annual net contributions (based on ICI data) from changes in annual total assets.[25] The experimental index then factors in the decrease in expense ratios based on BEAs estimates. This experimental price index rose more slowly than the BLS PPI. The implied increase in service volume is $6 billion from 2008 to 2018, $15 billion from 2003 to 2008, and $21 billion from 2003 to 2018. These are only rough estimates meant to encourage future research but suggest that the PPI may be overstating price increases.

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25. This "back of the envelope" experimental index implies an average annual return from 2003–2018 (a period that includes the crisis) of about 5 percent. An analysis of mutual funds from Morningstar produces average annual rates of return during these years of about 6 percent, and this study appears to exclude money market funds, which would have lower returns.(See www.thebalance.com/what-is-the-average-mutual-fund-return-4773782.) For rough intuition, the price measure for 2008–2018 should rise more slowly than the 106 percent increase in total current price RIC assets because expense ratios declined by over one-third and because net contributions account for over 20 percent of the increase in assets.

4.   Other Fund Management Services

The estimates of service volumes and prices for pension fund management and other portfolio management are also sensitive to the chosen method, the level at which deflation is applied, and the quality of the data available. For a different type of financial service—securities trading—the unit of output is generally a representative transaction rather than an account or an asset balance, so the price trends for securities commissions are very different from price trends for other financial services. These results highlight how the definition of the unit of output can have major effects on measures of service volumes and prices.

4.1   The Management of Pension Funds

In the NIPAs, defined benefit (DB) and defined contribution (DC) pension plans for private, federal government, and state and local government employees charge participants an implicit fee that is included in PCE and equal to the plans' administrative expenses for the imputed services provided.[26] The pension plans pay fees and incur expenses for accounting and bookkeeping, actuarial, legal, valuation and appraisal services; fees and expenses for trustees; fees for managing clerical operations (for example, handling membership rosters and claims payments); and fees to manage the plan's investments. The expenses for pension plans thus cover a wider range of services than the expenses for a mutual fund.

BEA has reliable data on the annual expenses of these plans. For private plans, the expenses are mainly based on BEA tabulations of annual report data (Form 5500) from the Department of Labor's Employee Benefits Security Administration. For the federal plans, the estimates are based on data from the Department of Treasury's "Monthly Treasury Statement." For state and local government plans, the estimates are based on data from plans and from the Census Bureau's Annual Survey of Government Finances.[27]
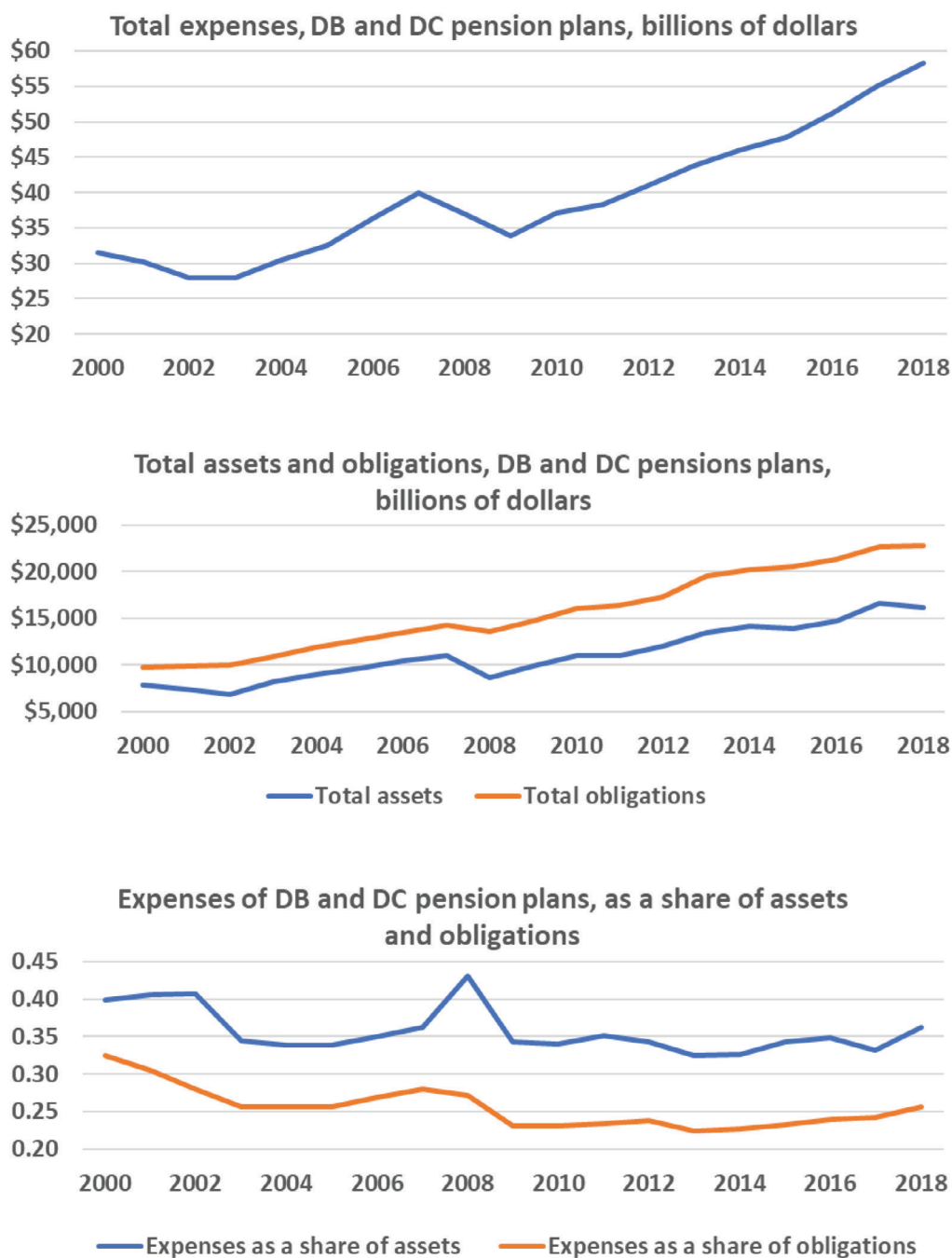
Total pension fund expenses have increased over time (figure 17). Pension fund assets (from the financial accounts) have also increased over time because of both net contributions and upward revaluations. For pension plans, unlike RICs, expenses as a share of assets have not declined over time, perhaps because these expenses cover several activities beyond fund management.[28]

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26. As part of the 2013 comprehensive update of the NIPAs, the treatment of pension plans was improved by recording the transactions of defined benefit pension plans on an accrual basis and by recognizing the costs of unfunded liabilities. See "Preview of the 2013 Comprehensive Revision of the National Income and Product Accounts," *Survey of Current Business* 93 (March 2013), 21–25. As a part of the 2014 annual update of the NIPAs, the transactions of defined contribution pension plans were included in the pension subsector. See McCulla, Holdren, and Smith, "The 2014 Annual Revision of the National Income and Product Accounts," *Survey* 94 (August 2014), 1–33.

27. These estimates of expenses also include explicit and implicit payments for securities commissions; these estimates are described later in this paper. See Chapter 5 of the NIPA handbook for more information.

28. One could also define "balances" as obligations, which include assets plus unfunded obligations. The general trends and results of this section are similar if obligations are used instead of assets. Assets are arguably more relevant because the expenses pay for the management of actual assets.

Figure 17. Trends in Pension Fund Management Services and Pension Fund Assets (Current prices)

Total expenses, DB and DC pension plans, billions of dollars

Total assets and obligations, DB and DC pensions plans, billions of dollars

— Total assets   — Total obligations

Expenses of DB and DC pension plans, as a share of assets and obligations

— Expenses as a share of assets   — Expenses as a share of obligations

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

In the NIPAs, the volume estimates of PCE for pension plans are prepared by deflation, using an input cost index that reflects the range of services provided. The index consists of the PPI for portfolio management and investment advice (39 percent weight), which reflects asset revaluations as described above. The index also reflects the CPI for all items less food and energy (36 percent), hourly wages for the portfolio management industry (3 percent), and several PPIs for the services of depository credit intermediation, insurance, lessors of buildings, lawyers, accountants, and management consultants.

One alternative approach is to measure the price of the portion of pension fund services dedicated to funds management using a deflated balances method, in which price changes are related to the general inflation rate and to changes in "expense ratios," and volume changes are related to changes in deflated asset balances. In periods of upward revaluations of assets (above general inflation), this approach will produce faster growth in service volume than the PPI, although this effect will be diminished because less than half of the pension service price reflects portfolio management.

From 2008 to 2018, the alternative price measure that relies on the deflated balances method results in faster increases in estimated service volumes than BEA's existing method (table 5 and figures 18–19). Service volume increased $2.5 billion under BEA's existing method and $13 billion under the alternative method. Prices increased 49 percent under the existing method but only 17 percent under the alternative method.[29] From 2003 to 2008, on the other hand, the two methods produce roughly similar results.

Table 5. Trends in PCE for the Service of Pension Fund Management, Based on Alternative Methods

|	2003–2008	2008–2018	2003–2018
Changes in volume measures of PCE for the implicit service of pension fund management, billions of 2012 dollars			
BEA estimates	$1.4	$2.5	$3.9
Based on adjusted price, using deflated balances	−$0.2	$12.9	$12.7
Percent changes in PCE prices for the implicit service of pension fund management			
BEA estimates	27.6	48.9	90.1
Adjusted price, using deflated balances	32.8	16.6	54.8

29. If we relied solely on the deflated balances method, the volume of services would increase $19 billion from 2008–2018. This estimate is most likely an upper bound because some of the pension expenses fund services unrelated to asset balances. If we used the experimental price that was mentioned in the previous section and that attempts to adjusts for movement to lower-cost funds, the volume of services increases about $9 billion.

Figure 18. PCE for Pension Fund Management, Annual Volume Measures (Billions of 2012 dollars)
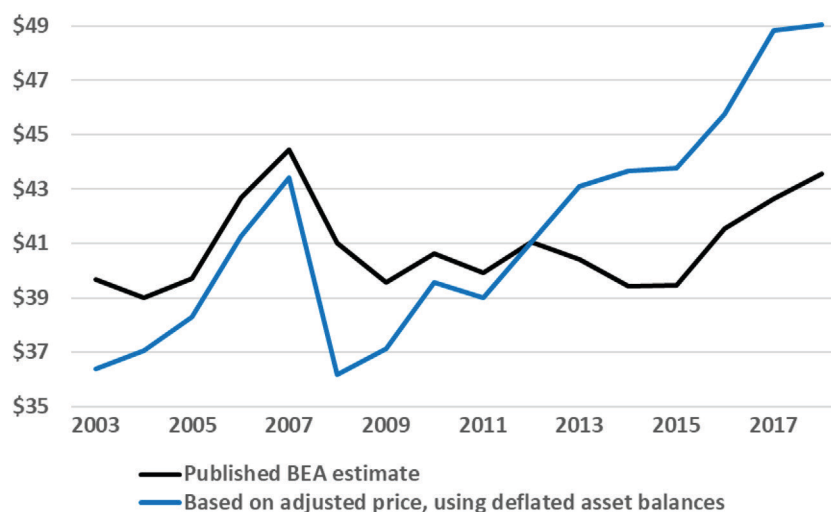
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 19. Annual Prices, PCE for Pension Fund Management (2012 = 100)
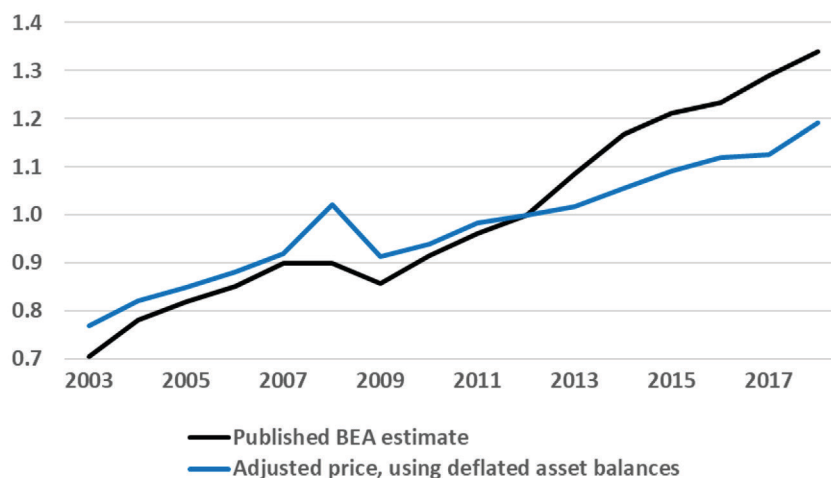
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

4.2   Portfolio Management and Investment Advice

PCE for "portfolio management" is a portion of output of NAICS 523920 that consists of fund management services not already classified as the services of depository institutions, RICs, or pensions. These portfolios can be tailored to a specific person or an organization and may include personal investment or other trusts, private equity, or foundations. The management fees are often calculated based in expense ratios. Providers of PCE for "investment advice" (NAICS 523930) give

clients advice on financial matters on a fee basis, but do not have the authority to execute trades or manage portfolios directly. The fee may be based on hours of work, the length of a document, or a flat rate.

BEA's current price estimates of these services are based on the Census Bureau's Service Annual Surveys and Quarterly Services Surveys for these NAICS industries. BEA separates spending for these services from spending for the management of RICs and pensions, and then allocates services to households and businesses based on information from the 5-year Economic Census and other sources. The volume estimates for total portfolio management and investment advice are prepared by deflation with a single price index, which is a weighted average of the BLS PPI for portfolio management and the PPI for investment advice. The PPI for portfolio management (about 80 percent weight) is similar to the PPI used for RICs and reflects changes in expenses that arise from revaluations and expense ratios but not net contributions. The PPI for investment advice measures changes in the typical cost of this activity and is relatively smoother.[30]

Because financial assets generally experienced upward revaluation in the years after the crisis, a deflated balance approach would probably imply faster growth in service volume and slower growth in prices than BEA's existing approach. The calculation of alternative measures based on asset balances is, however, not straightforward because these services, unlike the services of banks, RICs, or pensions, are not clearly tied to well-defined pools of assets in the financial accounts. Additionally, the price of investment advice is not specifically tied to a level of assets at all.

To gain an approximate sense of trends in assets that may be managed by these portfolio managers, one could assume that trends in these assets are correlated with trends in total financial assets owned by the household sector, or trends in household assets other than those managed by depository institutions, RICs, or pensions. Both series generally rose over time in recent years (figure 20).[31] Under the assumption that the assets managed by these portfolio managers are correlated with total financial assets owned by households and NPISH, an IPD based on the deflated balanced method can be calculated for the portfolio management portion of this series. An alternative price measure for total portfolio management and investment advice can be estimated as a weighted average of the PPI for investment advice and this IPD, assigning the IPD the same roughly 80 percent weight used for BEA's existing price measure.

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30. BLS also has other price measures that are related to the percentage of assets in nondiscretionary accounts.

31. These data are available from the Federal Reserve's financial accounts, table B.101. With the 2020 annual update of the NIPAs, PCE for portfolio management and investment advice, in current price and volume terms, was revised down several billion, so this revision does not change the general conclusions here.

Figure 20. Financial Assets, Households and Nonprofits (Trillions of dollars)
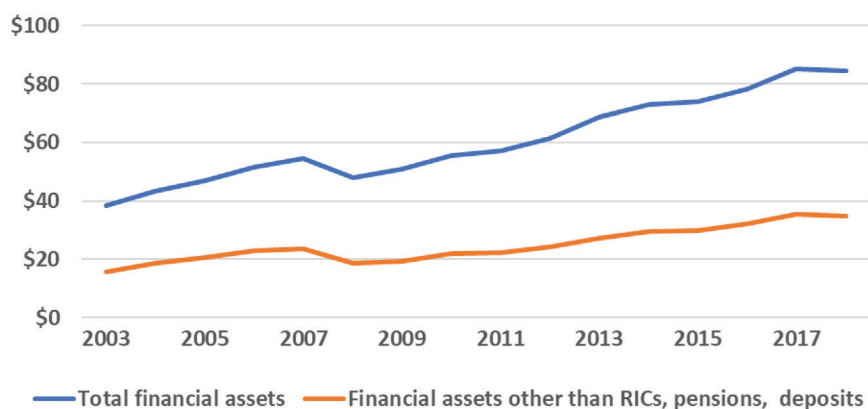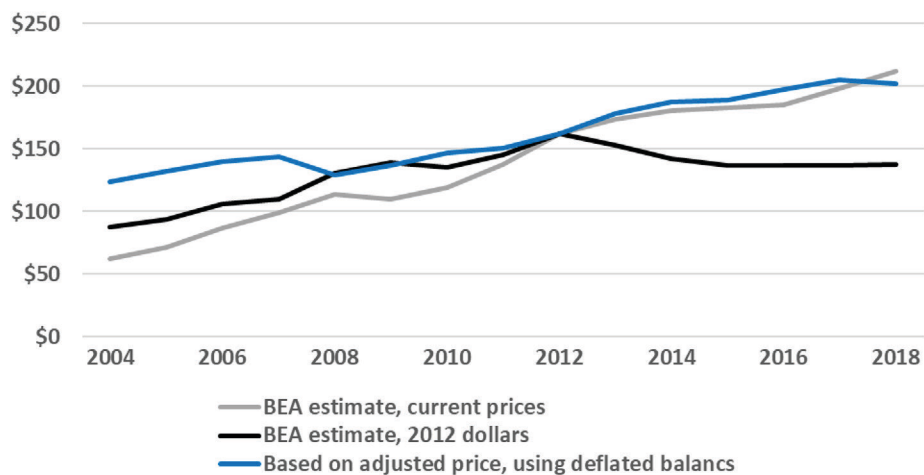

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

As one would expect, this alternative price measure implies faster growth in service volume than BEA's existing price measure (table 6 and figures 21–22). For the period from 2008 to 2018, the volume estimate of PCE for portfolio management and investment advice increased by $7 billion based on BEA's estimate but by $73 billion based on the alternative price measure. For the prior period, 2004 to 2008 (years for which we have complete data), BEA's estimates imply faster growth in service volumes. The alternative price measure rises faster from 2008 to 2018 and more slowly from 2004 to 2008, so these comparisons are again sensitive to the period chosen. As the figure shows, the deflated balances estimate is especially low in 2008. Over the period from 2004 to 2018, the estimated growth in service volume remains about $38 billion higher based on the alternative measure. These estimates, while speculative, suggest that a deflated balances approach again implies faster growth in periods of upward asset revaluation, but only if one accepts that these deflated balances are a reasonable proxy for service volumes.

Table 6. Trends in PCE for Portfolio Management and Investment Advice Services, Based on Alternative Methods

	2004–2008	2008–2018	2004–2018
Changes in volume measures of services, billions of 2012 dollars			
BEA estimates	$42.8	$7.0	$49.9
Based on adjusted price, using deflated balances	$4.9	$73.1	$78.0
Percent changes in services prices			
BEA estimates	22.8	77.1	117.5
Adjusted price, using deflated balances	75.8	19.1	109.3

Figure 21. PCE for Portfolio Management and Investment Advice (Billions of dollars)

Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

Figure 22. PCE for Portfolio Management and Investment Advice (BEA price index)
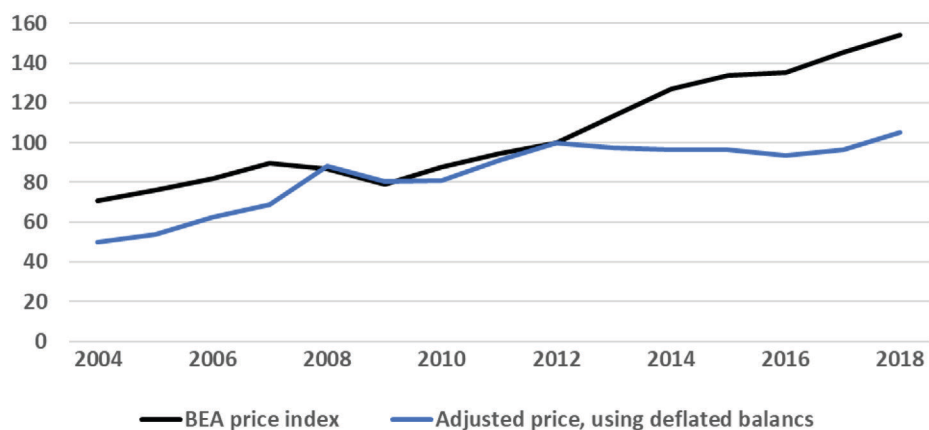
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

4.3   Securities Commissions

Prices for this service, which are based on BLS PPIs, have been flat since 2002. Direct (explicit) commissions are paid to brokers for equities transactions and for all other securities transactions. For these price measures, BLS tracks both flat fees and value-based commissions, although fees have become more common. Competition and technological improvements have kept these fees flat or declining over time; in recent months, these prices have fallen even more after some brokerages reduced or eliminated fees for these services. Indirect commissions are charged implicitly by dealers as a result of acquiring securities at a price lower than the price at which the securities

are subsequently sold to their customers. BLS measures these prices as bid-ask spreads, calculated in dollars as the difference between the bid price and the ask price for a security. In general, decreases in trading volume, increases in volatility, and increases in prices of traded securities lead to increases in these bid-ask spreads. The relevant unit for all these prices is more like a transaction than an account, fund, or asset balance, and so these price indexes are not applicable to the other financial services. These prices are briefly described here to highlight the importance of defining the appropriate unit of output for the measurement of volumes and prices of services.[32]

4.4   NAICS Industry 523

Gross output and value added for industry 523—securities, commodities, and investments—in volume terms has been flat or falling after 2008.[33] These estimates (figure 23) partly reflect the PPI for portfolio management services. Based on this paper's results, alternative price measures using deflated balances would have produced higher estimates of growth in gross output and value added, although opinions remain divided over the correct method.

Figure 23. BEA Estimates of Gross Output, Value Added, and Intermediate Inputs: Securities, Commodity Contracts, and Investments (Billions of 2012 chain dollars)
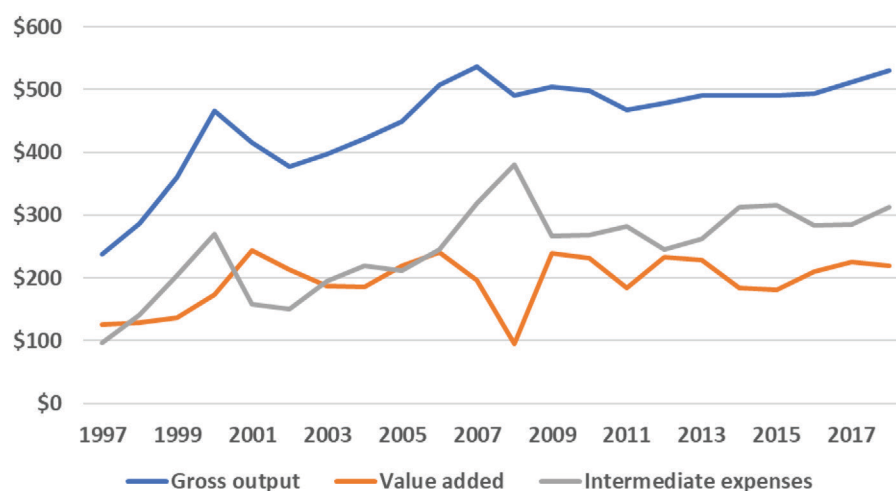
Source: Author's calculations based on data from the U.S. Bureau of Economic Analysis.

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32. The price index for direct commissions on exchange-listed equities is the BLS PPI for brokerage services, exchange-listed equities; the price index for direct commissions on OTC equities and on debt transactions is the PPI for brokerage services, all other securities. The price index for OTC equities commissions is PPI for dealer transactions, market-making in over-the-counter equities; the price index for other indirect commissions is the BLS PPI for dealer transactions, debt securities, and all other trading. The estimates of another service, broker charges on mutual fund sales, are derived by quantity extrapolation, using mutual fund sales deflated by the all-items CPI.

33. In the 2020 annual for this industry. the 2018 volume estimate of gross output was revised down about $20 billion; intermediate inputs was revised down and revisions to gross value added were minor.

5.   Conclusions

In the NIPAs, several measures of financial services in volume terms declined or increased only slightly after 2008, even though the assets and liabilities managed by these service providers rose over these years. For these years, BEA's estimation methods result in lower estimates of growth in financial services volumes than methods that are used in other countries and that are based on trends in inflation-adjusted balances of financial assets and liability. As a result of several recent trends, including rising average commercial bank deposit and loan balances, substantial upward revaluations of investment funds, and low overall inflation, these alternative methods can produce very different results. These contrasting methods reflect controversies about how to measure financial services volumes and prices and complicate international comparisons of these services.

For volume measures of the implicit services of commercial banks, BEA relies mainly on the BLS banking output index, which measures numbers of transactions, accounts, and loans, and several additional adjustments. While these measures of services have considerable theoretical support in the literature on FISIM, they are not quality adjusted for the levels of assets or liabilities or for other factors, and may not reflect the changing services of the banking industry. Other countries measure service volumes based on the deflated balances of bank loans and deposits. From 2008 to 2018, the deflated balances of deposits increased faster than the numbers of accounts and transactions, and so BEA's estimation methods produce limited growth in service volumes and rapid price increases, while the deflated balances method would have produced faster growth in service volumes and slower growth in prices. For the period from 2008 to 2018, based on a rough estimate, the use of the deflated balances method would have led to an upward revision of $48 billion to the total growth in the volume of PCE for bank services and a downward revision of total price growth from 67 percent to 15 percent. In earlier periods, however, the output indicator method results in similar or faster estimates of the growth in service volume, so the comparison depends on the period chosen.

For PCE for the management of the funds of RICs, BEA deflates the expenses of these funds using an input cost index, which mainly captures rising hourly wage rates of employees of the fund management industry. Other countries employ a deflated balances method for estimating these services. From 2008 to 2018, the average hourly wages of these employees rose, while the expense ratios of the funds (expenses per million dollars of assets) fell and deflated asset balances rose considerably. As a result, BEA's estimation method results in a flat trend in the volume of PCE for these services and a 35 percent increase in prices during these years, while the deflated balances method would have resulted in a $55 billion increase in volume growth and a 28 percent decrease in prices.

For PCE for the management of pension funds and other portfolio management, BEA uses the BLS PPI for portfolio management and some other prices. This PPI reflects changes in expense ratios and asset revaluation, but not net contributions from investors, so these net contributions, all else equal, result in increases in fund service volumes. A challenge for this PPI is that it is difficult to measure all the rapid movement of assets to lower-cost funds, so this PPI may overstate price increases. Regardless of this possible measurement problem, the use of this PPI results in lower estimates of the growth in service volumes than the deflated balances method, which counts all increases in deflated assets as increases in volume. The use of the deflated balances method for the 2008 to 2018 period leads to an upward revision of $10 billion to the growth in the volume of PCE for pension fund management services, and, as a rough estimate, an upward revision of $67 billion to the growth in the volume of PCE for portfolio management and investment advice.

Two recent developments highlight the importance of these measurement controversies. The first is the recent COVID-19 pandemic, which has resulted in abrupt shifts in the valuation of equities and other assets, and in the size of asset and loan balances. In the United States, the level of bank deposits grew from $13.4 trillion in February 2020 to $15.6 billion in August 2020—an unprecedented increase—as the U.S government provided assistance to households and businesses, as some consumers limited spending.[34] Does this increase in deposits imply an increase in the volume of bank services, or an increase in service prices? The second development is the proliferation of new fintech services, such as internet banking and funds management.[35] These new services may lead to large changes in asset and liability balances and rapid changes in the costs to manage a given level of assets and may pose challenges for the measurement of financial services.

The question of which method is the best way to measure financial services volumes and prices remains unresolved. On the one hand, one can argue that BEA's measures understate the growth in service volume and that the deflated balances method is a reasonable approach. For bank services, BEA's measures, based on the output index and additional adjustments, are not quality adjusted, and one dimension of quality or service volume is the size of assets and liabilities: larger balances imply more bookkeeping, safekeeping, risk management, and other services. For funds management, a price based on hourly labor costs does not capture the full effects of falling expense ratios on prices, and one could choose to define the unit of service to be an inflation-adjusted level of assets. Some aspects of BEA's adjustments to these estimates and measurement issues with the PPI for portfolio management may result in downward-biased estimates of service growth. Based on this paper's results, if BEA used a deflated balances approach for all these services, the total growth

34. www.federalreserve.gov/releases/h8/current

35. www.imf.org/en/About/Key-Issues/Fintech

in PCE service volume from 2008 to 2018 would be revised up by as much as $170 billion, and the average annual increase in the PCE price index would be revised down by as much as roughly 0.15 percentage points per year.

On the other hand, BEA has strong reasons for its chosen approach. One can argue that the unit of output for financial services should be a measure of service flows and not simply the level of inflation-adjusted balances, and that asset revaluations should not change output volume. Based on these arguments, other countries may overstate increases in the volume of financial services in periods with rising balances. Further research should continue to refine the methods for measuring these services. For international comparisons of trends in financial services, it is important to recognize that in some periods, such as periods of substantial changes in levels of financial assets and liabilities, these alternative methods can produce markedly different estimates of service volumes and prices.

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