

The Role of Profits and Income in the Statistical Discrepancy*

Dylan G. Rassier
U.S. Department of Commerce
Bureau of Economic Analysis
Washington, DC
202-606-9892
dylan.rassier@bea.gov

October 26, 2011

Draft for the BEA Advisory Committee

* *The views expressed in this paper are solely those of the author and not necessarily those of the U.S. Department of Commerce or the Bureau of Economic Analysis.*

Introduction

The National Income and Product Accounts (NIPAs) of the Bureau of Economic Analysis (BEA) include two alternative measures of economic output: gross domestic product (GDP) and gross domestic income (GDI). GDP is an expenditure-based measure and is estimated based on spending on final goods and services. GDI is an income-based measure and is estimated based on income generated in the production of goods and services. BEA prepares current quarterly estimates and annual estimates of GDP and GDI, each of which is subject to several revisions. Each revision yields a new vintage of estimates.¹ Each successive current quarterly vintage incorporates newly available source data. Each annual vintage incorporates newly available source data as well as improved estimating methodologies. In addition to revising annual estimates, an annual revision includes revisions to the corresponding quarterly estimates. Approximately every five years, BEA prepares a benchmark revision, which incorporates newly available comprehensive source data, improved estimating methodologies, and definitional changes.

In concept, GDP and GDI are equal and yield a true measure of economic output because expenditures by one party in the economy become income to another party. In practice, all vintages of GDP and GDI are estimated from largely independent and incomplete source data, so the errors in each measure are not the same. Vintages face tradeoffs between timeliness and accuracy. While current quarterly vintages offer the timeliest look at economic output, the accuracy of current quarterly vintages is affected more than later vintages by the completeness and reliability of the underlying source data. Annual and benchmark revisions improve accuracy, but the resulting vintages are less timely than the current quarterly vintages.² In addition to differences in source data, discrepancies between GDP and GDI are introduced through differences in the timing of quarterly seasonal adjustments and differences in interpolation and extrapolation techniques.

The difference between GDP and GDI is known as the statistical discrepancy. Both GDP and GDI provide a complete picture of economic output, so the statistical discrepancy provides an indication of net measurement error. In addition, changes in the degree and direction of the statistical discrepancy from one period to another derive from differences in the rates of growth between GDP and GDI. Internationally, statistical agencies generally choose one of two alternatives to handle the statistical discrepancy. One alternative is to publish a statistical discrepancy as a separate line item in the national accounts. A second alternative is to allocate the discrepancy to the components of national output where errors are most likely to exist.³ BEA

¹ There are three current quarterly vintages for each quarter: advance, second, and third. Advance, second, and third quarterly vintages are released approximately one, two, and three months, respectively, after the end of the reference quarter. Likewise, there are three annual vintages for each year: first, second, and third. Annual vintages are released at the end of July for the previous three years. The most recent vintage of annual estimates comes from the 2011 annual revision, which was released on July 29, 2011. The 2011 annual revision includes the first annual revision for 2010, the second for 2009, and the third for 2008. In addition, the 2011 annual revision was the first “flexible” annual revision, which includes revisions to current-dollar GDP and some components back to the first quarter of 2003.

² However, revision studies generally conclude that annual and benchmark revisions do not substantively change BEA’s measures of long-term growth, pictures of business cycles, and trends in major components of GDP (Fixler et al., 2011).

³ For the former alternative, the *System of National Accounts 2008 (SNA)* suggests, “...it is usual to attach [the discrepancy] to the variant of [national output] the office feels is least accurate. The aim is to show users something about the degree of reliability of the published data.” (*SNA* paragraph 18.16) For the latter alternative, the *SNA*

follows the first alternative and publishes a statistical discrepancy as a line item with aggregate GDI. The resulting double-entry accounts yield a breakdown by component of GDP and GDI in addition to an indication of the consistency between the two sides of the accounts. While BEA recognizes strengths and weakness of both GDP and GDI as sources to analyze economic activity and business cyclicalities, a decision ultimately has to be made regarding the side of the national accounts to record the statistical discrepancy. Thus, the decision to record the statistical discrepancy with GDI reflects BEA's experience and careful consideration of the reliability of the underlying source data and required adjustments.

Figure 1 shows the degree and direction of the statistical discrepancy for the period 1970 to 2010 using annual BEA data from the 2011 annual revision, which offers the most recent vintage of estimates. We choose the period 1970 to 2010 because it incorporates the six most recent business cycles as determined by the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). The period 1970 to 2010 also captures the period of increased volatility in the statistical discrepancy. Figure 1 shows the statistical discrepancy as it is published in the NIPAs as a line item with GDI. As shown in Figure 1, the statistical discrepancy is much larger in some years than others and negative in some years while positive in others. However, recent work shows the levels of GDP and GDI follow the same common trend and never drift far from each other (Greenaway-McGreevy, 2011).⁴

Despite BEA's experience with underlying source data, some recent work questions BEA's decision to record the statistical discrepancy with GDI and the resulting emphasis on GDP in news releases (e.g., Klein and Makino, 2000; Fixler and Nalewaik, 2009; Nalewaik, 2010). As a steward of the U.S. national accounts, BEA does not intend to promote one measure over another, and the recent work generally supports BEA's conclusion that both GDP and GDI are valid measures of output. However, how much each measure should be weighted in a combined measure and whether temporal variation should be assumed to indicate less reliability or more reliability is unresolved and, in some cases, may run contrary to related studies (e.g., Weale, 1992; Smith et al., 1998; Grimm and Parker, 1998; Fixler and Grimm, 2002, 2005; Greenaway-McGreevy, 2011). In addition, most of the work to date on combining GDP and GDI focuses on weighting aggregate measures rather than weighting the underlying source data. As an alternative, BEA is currently conducting research on weighting the underlying source data based on reliability in a model to distribute the statistical discrepancy prior to aggregating the component estimates (e.g., Chen, 2006; Chen, 2010). While weighting the underlying source data receives strong support from a theoretical perspective (e.g., Stone et al., 1942; Byron, 1978), the practicality and feasibility of weighting the underlying source data are yet to be determined.⁵

This article provides an overview of the factors that BEA considers most likely to contribute to the statistical discrepancy. In particular, we focus on the recent behavior of the statistical discrepancy and the relative reliability of underlying source data and adjustments for the components of GDI from corporate profits and from proprietors' and partnership income. The next section presents an accounting framework to describe the role of profits and income in the statistical discrepancy. We also discuss in the next section empirical evidence to justify our

suggests, "The alternative is for the office to remove the discrepancy by examining the data in the light of the many accounting constraints in the *SNA*, making the best judgment possible about where the errors are likely to have arisen and modifying the data accordingly." (*SNA* paragraph 18.17)

⁴ Greenaway-McGreevy (2011) shows that the statistical discrepancy is a mean-zero stationary series.

⁵ Weighting underlying source data in a statistical framework has been successfully implemented at BEA to reconcile and balance the gross operating surplus component of the 2002 input-output and GDP-by-industry accounts (Rassier et al., 2007).

focus on profits and income rather than other components of GDI as well as components of GDP. The third section identifies and explains the factors of profits and income that are most likely to contribute to the statistical discrepancy. The final section concludes.

Profits and Income and the Statistical Discrepancy

Accounting Framework

To provide some conceptual context, we follow Klein and Makino's (2000) construction of the national accounting identity.⁶ The expenditure-based measure of output can be written as the sum of consumer expenditures (C), investment (I), government expenditures (G), and exports (X) less imports (M). Likewise, the income-based measure of output can be written as the sum of wages (W), profits and income (P), rents and interest (R), and taxes on production (T) less subsidies (S). Thus, if all these variables are measured in accordance with economic accounting principles, the accounting identity for output is as shown in the following equation:

$$C^* + I^* + G^* + X^* - M^* = W^* + P^* + R^* + T^* - S^* . \quad (1)$$

The left side of equation (1) captures all final expenditures on goods and services in the economy, and the right side captures all income accruing to the input factors used for the production of the goods and services. The asterisks in equation (1) indicate components measured without error. In practice, each of the components in equation (1) is usually estimated from independent and incomplete source data. In addition, at least some of the components in equation (1) are estimated from source data that are not consistent with economic accounting concepts, which requires adjustments. Thus, the equality is inevitably not satisfied, resulting in a statistical discrepancy (SD) as follows:

$$SD = (C + I + G + X - M) - (W + P + R + T - S) . \quad (2)$$

In equation (2), asterisks are removed to reflect measurement error in each of the components.

Klein and Makino (2000) point out that firm-level profits and income (Π) are never directly estimable but are merely a residual between sales and costs as follows:

$$\Pi = Sales - Costs .^7 \quad (3)$$

From a financial accounting perspective, results for equation (3) may vary across firms because of flexibility in the application of financial accounting rules. Likewise, results for equation (3)

⁶ Klein and Makino (2000) argue that BEA's decision to record the statistical discrepancy with GDI is tenable but may result in nonrandom error in the NIPAs. As a result, the authors argue that the statistical discrepancy should be distributed among the components of GDP and GDI. While Klein and Makino's (2000) conclusions are themselves subject to question (Grimm, 2007), their analytic framework is uncontroversial and useful to explain BEA's decision to record the statistical discrepancy with GDI.

⁷ We use different notation for profits and income in equation (3) than profits and income in equation (1) because P in equation (1) denotes aggregate profits and income that are consistent with economic accounting concepts while Π in equation (3) denotes firm-level profits and income that are consistent with financial or tax accounting concepts.

may vary between financial and tax accounting records within a firm because of differences between financial and tax accounting rules.

From an economic accounting perspective, a measure of profits and income for equation (2) can be obtained by calculating the residual between the measured expenditure-based components and the measured income-based components other than profits and income as follows:

$$P = \underbrace{(C + I + G + X - M)}_{Sales} - \underbrace{(W + R + T - S)}_{Costs}. \quad (4)$$

As noted in equation (4), the expenditure-based components in the left-side parentheses correspond to sales in equation (3), and the income-based components in the right-side parentheses correspond to costs. If the economic accounting measure of profits and income is determined by equation (4), the statistical discrepancy is allocated entirely to profits and income, which is most likely incorrect.

Alternatively, a measure of profits and income for equation (2) can be obtained by aggregating profits and income for each firm j from equation (3) as follows:

$$P = \sum_j \Pi_j + Adjustments. \quad (5)$$

The adjustments in equation (5) are required in order to obtain an economic accounting measure of profits and income based on source data that can be inconsistent with economic accounting concepts. In contrast to equation (4), equation (5) provides a check on the accuracy of the other measured components in equation (2) and uncertainty remains as to the allocation of the statistical discrepancy.

Practical Considerations

In practice, GDP and GDI in the NIPAs are estimated from largely independent and incomplete source data. In addition, profits and income in the NIPAs are estimated according to equation (5) rather than equation (4). As summarized in equation (2), the statistical discrepancy reflects the completeness and reliability of the underlying source data and the consistency of the underlying source data with economic accounting concepts for each of the measured expenditure-based and income-based components. In equation (5), we make reference to adjustments required to manage incomplete and less reliable source data and source data that are inconsistent with economic accounting concepts. Adjustments are generally required for all expenditure-based and income-based components in the NIPAs, but all quarterly and annual vintages of GDI are generally subject to more adjustments than corresponding vintages of GDP (Grimm and Weadock, 2006; Holdren and Grimm, 2008). With some exceptions, the source data underlying current quarterly estimates and annual estimates of GDP are collected by the Census Bureau using a set of surveys that are designed to be consistent with economic accounting concepts. In contrast, the source data underlying current quarterly estimates and annual estimates of profits and income are generally collected from financial- and tax-based source data, which can be inconsistent with economic accounting concepts. In addition to conceptual inconsistencies, financial- and tax-based source data underlying profits and income

are less timely than source data underlying GDP. As a result, current quarterly estimates and first annual estimates of GDP are based on a more complete set of source data than estimates of profits and income for the same vintages.⁸ Given the important roles that profits and income play as components of GDI and the challenges adjusting financial- and tax-based source data for completeness, reliability, and economic accounting concepts, BEA chooses to record the statistical discrepancy with GDI in order to reflect the reliability of the source data and required adjustments underlying GDI relative to GDP.

Figure 2 includes the trend in the statistical discrepancy, corporate profits before tax (PBT), and proprietors' and partnership income (PI) for the period 1970 to 2010 using annual BEA data from the 2011 annual revision. The figure includes the three series as they are published as line items with GDI. As can be seen, the statistical discrepancy generally moves in the opposite direction of PBT and PI, which reflects the fact that GDI is subtracted from GDP to calculate the statistical discrepancy. In addition, the correlations of the statistical discrepancy with PBT and PI are -0.47 and -0.50 , respectively, which are moderately high and reflect in part an important role for profits and income in the statistical discrepancy.

To be clear, components of GDI other than profits and income also pose estimation challenges that likely contribute to the statistical discrepancy. Likewise, estimation challenges exist for components of GDP. With mixed results, related research uses aggregate BEA data and applies statistical analyses to determine the contributions of GDI components and GDP components to the statistical discrepancy. Klein and Makino (2000) use regression analysis to estimate the statistical discrepancy for the period 1947 to 1997 and find that in addition to profits and income, the discrepancy is affected significantly by exports and government expenditures. However, Klein and Makino's (2000) results are vitiated by more recent vintages of estimates (Grimm, 2007). Grimm (2007) uses regression analysis to estimate the statistical discrepancy for the period 1970 to 2004 and finds that the effect of any GDI or GDP component on the statistical discrepancy is indeterminate for the period given the presence of multicollinearity.

Additional related research yields mixed results and uses aggregate BEA data to determine whether GDI, GDP, or a combination of GDI and GDP offers a better measure of true economic output. Fixler and Nalewaik (2009) make the reasonable assumption that revisions to GDP and GDI add news to the estimates (Mankiw and Shapiro, 1986) and apply a revision decomposition for the period 1984 to 2005 to find that the idiosyncratic variation in GDI growth is higher than the idiosyncratic variation in GDP growth after revisions. Fixler and Nalewaik (2009) attribute the increased variation in GDI growth to news and conclude that GDI should be weighted higher than GDP in a combined measure of output without suggesting a combination of appropriate weights. Nalewaik (2010) applies statistical tests to determine whether growth in GDP or GDI better reflects business cyclicity in output growth for the period 1978 to 2009. Nalewaik (2010) concludes that GDI growth is a better measure of cyclicity and suggests an equally weighted measure of output without providing a rigorous analysis for the weights. Greenaway-McGrevy (2011) applies a Kalman filter to determine true economic output for the period 1983-2009 and concludes that the measurement error of GDP is smaller than the measurement error of GDI. Greenaway-McGrevy (2011) suggests that GDP should be weighted approximately 60 percent and GDI should be weighted approximately 40 percent in a combined measure of output.

Other related research uses disaggregated BEA data to determine the distribution of the statistical discrepancy to GDI and GDP components. Chen (2010) applies a GLS model to

⁸ See Grimm and Weadock (2006), Holdren and Grimm (2008), and Landefeld (2010) for further discussion.

distribute the statistical discrepancy in 2002 to the components of expenditure-based GDP in the NIPAs, the components of value-added in the income-based GDP-by-industry accounts, and the gross output and intermediate inputs of the input-output accounts based on the relative reliabilities of underlying source data in all the accounts. Chen (2010) finds that the optimal adjustments to gross output, intermediate inputs, and GDP components are relatively small, while the optimal adjustments to value-added are relatively large due to the relatively low reliability of tax-based source data and adjustments included in the gross operating surplus component of value-added.⁹ In earlier work, Chen (2006) applies a GLS model to distribute the statistical discrepancy in 1997 to the components of value-added in the income-based GDP-by-industry accounts, and the gross output and intermediate inputs of the input-output accounts. In contrast to Chen (2010), the components of expenditure-based GDP are held fixed in Chen (2006). Similar to Chen (2010), Chen (2006) finds relatively small adjustments to gross output and intermediate inputs and relatively large adjustments to value-added given the relative reliabilities of the underlying data.

In sum, the studies that use disaggregated data with statistical analyses have to date yielded a consistent set of results and conclusions, whereas studies that use aggregated data with statistical analyses have so far yielded a mixed set of results and conclusions. In other words, a bottom-up approach may be necessary to draw conclusions about the extent to which the statistical discrepancy is likely to be attributable to expenditure-based and income-based components. Thus, from a practical perspective, BEA must rely on its experience with underlying source data in the decision to record the statistical discrepancy with GDI.

Cyclicality

The behavior of the statistical discrepancy may look different on a quarterly basis than on an annual basis because quarterly variation is netted out in annual estimates.¹⁰ The behavior of the statistical discrepancy during cyclical turning points is particularly important to policymakers and other decision makers because differences between GDP and GDI can complicate the decision-making process. Likewise, when it comes to making real time decisions, current quarterly vintages of GDP and GDI are timelier than vintages based on annual and benchmark revisions. Regardless of the vintage, the cyclicality of underlying source data and required adjustments affecting GDP and GDI is important to consider in the decision about where to record the statistical discrepancy because source data and adjustments that are overly cyclical or not cyclical enough are likely to yield a less accurate measure of true economic output.

Figure 3 presents annual and quarterly estimates of the statistical discrepancy published in the NIPAs for the most recent five-year period from 2006 to 2010, which includes the recession during the period 2007:IV to 2009:II as determined by NBER's Business Cycle Dating Committee, using BEA data from the 2011 annual revision.¹¹ As shown in Figure 3, quarterly variation for all years except 2007 is relatively small. For 2007, the quarterly statistical discrepancy swung from relatively large and negative in the first two quarters to relatively large

⁹ Corporate profits, proprietors' income, and partnership income constitute a large proportion of gross operating surplus.

¹⁰ While first annual estimates are generally based on the same source data used for quarterly interpolations and extrapolations, second and third annual estimates are based on tax-based source data. Thus, quarterly variation related to the second and third annual estimates comes from the source data used for quarterly interpolations.

¹¹ The statistical discrepancy in Figure 3 is calculated as the difference between nominal GDP and nominal GDI levels.

and positive in the last two quarters. With the exception of the period 2006:I to 2007:I, the quarterly statistical discrepancy as a percent of GDP is less than 1 percent.

Figure 4 presents real GDP levels published in the NIPAs and real GDI levels.¹² Thus, the difference between the two series in Figure 4 reflects the variation in the statistical discrepancy as shown in Figure 3. As shown in Figure 4, real GDI was generally higher than real GDP previous to the third quarter of 2007 but relatively flat for the three quarters leading to the NBER peak in the last quarter of 2007. Real GDI increased slightly for the first two quarters of 2008 before decreasing significantly during the remaining quarters of the recession. At both the NBER peak and the NBER trough, real GDI is lower than real GDP. Real GDP increased for the three quarters preceding the NBER peak in 2007 and decreased slightly for the first two quarters of 2008 before decreasing significantly during the remaining quarters of the recession.

Figure 5 presents the percent changes from the preceding period in real GDP published in the NIPAs and real GDI. In contrast to levels shown in Figure 4, Figure 5 shows the percent change in real GDI generally increased for the quarters preceding and immediately after the NBER peak before decreasing significantly during the recession. The percent change in real GDP generally decreased for the quarters preceding and immediately after the NBER peak before increasing and then decreasing significantly during the recession. Thus, Figure 4 and Figure 5 show similar patterns for GDP and GDI for the last half of the recession but slightly different patterns for the quarters leading up to the NBER peak and immediately after the NBER peak.

Factors of Profits and Income that Contribute to the Statistical Discrepancy

Given the accounting framework and practical considerations and the patterns observed in Figures 3, 4, and 5 of the previous section, this section explains the following factors that require adjustments to convert financial- or tax-based source data into an economic accounting measure of profits and income: 1) misreporting, 2) capital gains/losses, 3) employee stock options, and 4) produced intangibles. BEA considers potential measurement error in the factors to be likely contributors to the statistical discrepancy regardless of economic cyclicity. However, some factors may be more likely than others to contribute to the statistical discrepancy during cyclical turning points because of cyclicity in the related measurement error. While ongoing work at BEA and other federal agencies attempts to address and mitigate measurement error in the adjustments, the work is limited by conceptual differences and regulatory reporting requirements underlying the financial- and tax-based source data.

Misreporting

Given the tax-based source data used to estimate profits and income for annual and benchmark revisions, adjustments are required for misreporting by taxpayers. BEA makes separate misreporting adjustments for corporate profits and for proprietors' and partnership income.

Misreporting data for proprietors' and partnership income come from two sources. First, the National Research Program (NRP) of the Internal Revenue Service (IRS) provides industry-level estimates of underreported taxable income based on a study conducted for the 2001 tax

¹² Real GDP and real GDI are determined with chained 2005 dollars. We deflate GDI using the implicit price deflator for GDP because there is no price deflator specifically for GDI.

year. Since 2001 is the most recent year for which NRP data are available for proprietors, BEA extrapolates underreporting amounts from the 2001 data. The second source of misreporting data is industry-level estimates of non-reporting provided by the Census Bureau based on annual exact-match studies. The non-reporting piece of the misreporting adjustment is small relative to the underreporting piece.

Misreporting data for corporate profits come primarily from annual IRS corporate audit reports, which provide estimates of the additional tax amounts found to be owed in audits. BEA supplements the audit reports with IRS tabulations of amounts actually collected versus amounts recommended in the audit reports. To determine misreported profits, BEA makes judgments regarding marginal tax rates. In addition, given the non-random nature of the audit sample, BEA makes judgments regarding the application of the audit amounts to the universe of corporations.

Given the patchwork of misreporting source data and the age of some misreporting source data, BEA considers the misreporting adjustments to be of relatively low reliability for assessing year-to-year changes. In addition, based on the NRP study for proprietors and the corporate audit studies, the misreporting adjustments comprise a significant amount of corporate profits and proprietors' and partnership income. Figure 6 shows the ratios of proprietors' and partnership misreporting adjustments to net profits for proprietors and partnerships reported on tax returns and proprietors' and partnership income in the NIPAs. We include the period 1970 to 2009 because data are unpublished for 2010. The misreporting adjustments for proprietors and partnerships have been approximately 75-90 percent of reported net profits in recent years and as high as just under 200 percent of reported net profits in early years. As a percent of proprietors' and partnership income in the NIPAs, the misreporting adjustments for proprietors and partnerships have been approximately 50 percent. The same ratios are shown for corporations in Figure 7. We include the period 1970 to 2008 because data are unpublished for 2009 and 2010. The misreporting adjustments for corporations have been as high as just under 80 percent of reported receipts less deductions in recent years but are generally less than 40 percent. As a percent of profits before tax in the NIPAs, the misreporting adjustments have generally been approximately 10-20 percent. Thus, the misreporting adjustments for proprietors are generally larger as a percent than the misreporting adjustments for corporations. In addition, the misreporting adjustments are generally more volatile as a percent of reported amounts than as a percent of amounts in the NIPAs.

Even though we know something about the cyclicity of profits and income, we do not assume the same cyclicity applies to misreporting because reporting behavior may be affected by cyclicity. However, given the small variation in misreporting adjustments relative to profits and income in Figure 6 and Figure 7, measured profits and income are too cyclical if misreporting is countercyclical and not cyclical enough if misreporting is pro-cyclical. In order to simulate the change in the statistical discrepancy in the case of countercyclicity during the most recent recession of 2007:IV to 2009:II, we assume a 10 percent increase in annual misreporting for 2008. If total misreporting increased by 10 percent in 2008, the statistical discrepancy would change from -\$2.4 billion to -\$73.3 billion and the percent change in real GDI would increase from -0.4 to 0.1. Likewise, if misreporting is pro-cyclical and decreased by 10 percent in 2008, the statistical discrepancy would change from -\$2.4 billion to \$68.3 billion and the percent change in real GDI would decrease from -0.4 to -0.9.

Capital Gains/Losses

Corporate Partners

Annual tax-based source data on both corporate profits and partnership income include partnership income attributable to corporate partners. To prevent double counting, BEA removes the corporate share from the NIPA measure of partnership income. Source data on the corporate share of NIPA partnership income are not available, but data on the corporate share of tax-based partnership income are available. However, the tax-based partnership income attributable to corporate partners includes capital gains/losses. In order to be consistent with NIPA partnership income, the capital gains/losses must be removed from the corporate share of tax-based partnership income because capital gains/losses do not reflect income arising from production.¹³ Thus, the adjustment to remove the corporate share from the NIPA measure of partnership income is determined by subtracting from the corporate share of tax-based partnership income an approximation of capital gains/losses.

Table 1 displays net capital gains attributable to partnerships as a proportion of net partnership income published by the IRS's Statistics of Income (SOI) for the recent ten-year period 1999 to 2008.¹⁴ Data for Table 1 are not available by type of partner. The proportion of net capital gains in Table 1 appears to be pro-cyclical with relatively high proportions in years preceding NBER peaks and relatively low proportions in years following NBER peaks. Given the unavailability of data by type of partner, BEA approximates the corporate share of capital gains/losses with a combination of SOI tabulations of capital gains/losses and assumptions regarding the corporate share of capital gains/losses. If capital gains/losses are disproportionately high relative to the chosen assumptions, the corporate partner adjustment would yield a measure of partnership income that is too high. If capital gains/losses are disproportionately low relative to the chosen assumptions, the corporate partner adjustment would yield a measure of partnership income that is too low. Thus, the measure of partnership income is subject to the pro-cyclical nature of capital gains/losses based on the corporate partnership adjustment.

Mark-to-Market Accounting

In addition to the adjustment to remove the corporate share of capital gains/losses attributable to partnerships, BEA adjusts financial- and tax-based source data to remove capital gains/losses attributable to all organization types. While the mischaracterization of capital gains/losses as ordinary income/loss and vice versa is possible, BEA has no evidence to support systematic mischaracterization in either financial- or tax-based source data. However, the characterization of capital gains/losses for economic accounting purposes as ordinary income/loss for financial or tax accounting purposes is possible for some types of income/losses

¹³ Capital gains/losses are included in tax-based partnership income as part of portfolio income/loss. In addition to capital gains/losses, portfolio income/loss includes interest, dividends, and royalties. BEA removes all portfolio income/loss. However, we focus here on the capital gains/losses portion because of the effect on partnership income.

¹⁴ Net capital gains include short-term and long-term capital gains and losses. More recent years have not yet been published by SOI.

and to the extent BEA cannot identify the income/losses, measured profits and income in the NIPAs may be affected.

Under mark-to-market accounting, an asset held at the end of a reporting period is treated as sold at its fair market value. As a result, holding gains or losses associated with the asset are recognized without actually selling the asset. While methods for valuing the asset may differ under tax accounting rules and financial accounting rules, the application of mark-to-market accounting may differ considerably under tax accounting rules and financial accounting rules. Regardless of financial or tax accounting rules, mark-to-market income/losses associated with the underlying asset reflect changes in prices rather than quantities or economic activity and should be excluded from profits and income for economic accounting purposes. However, BEA's adjustment for capital gains/losses may not include mark-to-market income/losses in some cases due to a lack of data.

Tax Accounting Rules. Under tax accounting rules, a taxpayer may elect mark-to-market accounting by the due date of the tax year prior to the tax year for which the election becomes effective. The characterization of the resulting income/losses as ordinary or capital depends whether the asset is part of a hedging transaction. Income/losses generated for hedging purposes in the ordinary course of business are generally required to be reported as ordinary income/losses for tax purposes. In addition to fees associated with hedging, which reflect real economic activity, hedging transactions reported for tax purposes may include mark-to-market income/losses related to underlying assets. Thus, hedging transactions may reflect capital gains/losses in part, but due to a lack of data, BEA's adjustment to tax-based source data for capital gains/losses does not include mark-to-market income/losses associated with hedging transactions.

IRS schedule M-3 is a recent information form required to be filed by corporations with \$10 million or more in assets. Schedule M-3 provides details not previously available regarding income and deductions reported on a corporate income tax return, and one of the line items on schedule M-3 is for hedging transactions. SOI has recently published tabulations of schedule M-3 for 2008, and the tabulation for hedging transactions is a loss of \$95.1 billion. Assuming hedging transactions include some mark-to-market income/losses, failing to adjust for the mark-to-market income/losses would yield an inaccurate annual measure of profits and income and contribute to the statistical discrepancy. However, without more data and further study, we have no direct evidence regarding the degree or cyclicity of the mark-to-market income/losses included in hedging transactions.

Financial Accounting Rules. Financial accounting rules apply to three classes of debt and equity securities including 1) debt securities intended to be held to maturity, 2) debt and equity securities bought primarily for short-term trading purposes, and 3) debt and equity securities that are available for sale but not classified with the previous two classes. Mark-to-market accounting is required for the second of the three classes—trading securities—and the third of the three classes—available-for-sale securities. In addition, trading securities include mortgage-backed securities that are held for sale in conjunction with mortgage banking activities. Mark-to-market income/losses associated with trading securities are required under financial accounting rules to be included in the income statement as ordinary income/losses with a separate disclosure for the amount. Mark-to-market income/losses associated with available-for-sale securities are required to be included in shareholder's equity rather than earnings. Given the

inclusion of mortgage-backed securities with trading securities and given additional rules applicable to finance-related activities, financial institutions are particularly affected by the financial accounting rules for mark-to-market accounting.

BEA uses financial-based source data for quarterly indicators of corporate profits in some industries. In particular, BEA uses Quarterly Financial Reports (QFRs) provided by Census Bureau for mining, manufacturing, wholesale trade, and retail trade industries. The QFRs include a sample of publicly owned and privately owned corporations and also include adjustments to remove capital gains/losses for use in the NIPAs. In addition, BEA uses Compustat data for some utilities, transportation, information, real estate, and finance and insurance industries. For the finance and insurance industries, quarterly indicators come from Compustat for non-deposit credit intermediaries, securities dealers, life insurance, and real estate investment trusts. Compustat only includes publicly owned corporations and does not provide a record of mark-to-market income/losses. Thus, for quarters with substantial changes in market values of securities, BEA can only resort to a sample of quarterly financial reports of individual corporations to adjust for mark-to-market income/losses. Assuming mark-to-market income/losses are pro-cyclical, over-adjusting based on the chosen sample would yield a quarterly measure of profits that is not cyclical enough, and under-adjusting based on the chosen sample would yield a quarterly measure of profits that is too cyclical.

Finance and Insurance Industries. Given the volatile impact the financial accounting rules for mark-to-market accounting have on financial statements during times of market volatility, the rules have been under increasing scrutiny since the most recent recession during the period 2007:IV to 2009:II and the related subprime mortgage crisis. For NIPA purposes, the removal of mark-to-market income/losses was particularly important but challenging in the finance and insurance industries leading up to and following the NBER peak in 2007:IV given the lack of adequate data on mark-to-market income/losses in Compustat data. Thus, declines in profits and income in the finance and insurance industries may reflect mark-to-market losses to the extent the losses were not identified.

Figure 8 presents annual and quarterly estimates of corporate profits with inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj) published in the NIPAs for the period 2006 to 2010. Separate series are shown for the finance and insurance industries and all other industries. In addition, we include a series that combines all domestic industries and, for reference to patterns of potential capital gains/losses, we include a series for the S&P 500 Index measured on the right-side axis.¹⁵

As shown in Figure 8, measured corporate profits with IVA and CCAdj generally dropped consistently from one quarter to the next for all domestic industries leading up to the NBER peak. The series for all domestic industries continued to decline during the recession but the decline was driven primarily by the finance and insurance industries, which dropped considerably more than the non-finance industries. In addition, for quarters other than during the recession, corporate profits in the finance and insurance industries were generally as high as at least 40 percent of corporate profits in non-finance industries; however, during the recession, corporate profits in the finance and insurance industries dropped to less than 5 percent of corporate profits in non-finance industries for some quarters. The S&P 500 Index increased

¹⁵ The S&P 500 Index series is determined by the monthly average closing value adjusted for dividends and stock splits.

steadily until 2007:III and then decreased steadily until it reached a low in 2008:IV and started another steady increase.

The variation in corporate profits in Figure 8 is highly correlated with the variation of potential capital gains/losses reflected by the S&P 500 Index. For the full period 2006:I to 2010:IV, the correlations between the S&P 500 Index and corporate profits in the finance and insurance industries and non-finance industries are 0.41 and 0.49, respectively. The correlation with all domestic industries is 0.52 for the full period. For the recessionary period 2007:IV to 2009:II, the correlations of the S&P 500 Index with finance and insurance and non-finance are 0.48 and 0.33, respectively. The correlation with all domestic industries is 0.79 for the recessionary period.

We do not conclude from Figure 8 that corporate profits include mark-to-market income/losses. However, the pattern of corporate profits in the finance and insurance industries over the period leads us to wonder whether mark-to-market income/losses play a role in the annual and quarterly pattern of the statistical discrepancy given the relatively high corporate profits in the finance and insurance industries leading up to the NBER peak and following the NBER trough and dramatically low corporate profits during the recession. In order to simulate the change in the statistical discrepancy in the case of inclusion of mark-to-market income/losses during the most recent recession of 2007:IV to 2009:II, we assume 10 percent of quarterly corporate profits are attributable to mark-to-market losses. If corporate profits increase by 10 percent for each quarter of the recession, the statistical discrepancy would improve for five of the seven recessionary quarters, and the difference between the percent change in GDP and the percent change in GDI would decline for five of the seven recessionary quarters. Further study is warranted to better understand how mark-to-market income/losses may be affecting corporate profits and the statistical discrepancy.

Employee Stock Options

Moylan (2008) provides a comprehensive discussion regarding the inclusion of stock options in measures of corporate profits and compensation.¹⁶ Differences between the measurement of stock options in source data can generate significant differences between stock options expense included in corporate profits and income from stock options included in wages and salaries. Financial-based source data for current quarterly estimates and quarterly interpolations of corporate profits generally measure stock options expense as the fair market value of the options allocated over the vesting period on the date options are granted. Tax-based source data for annual estimates of corporate profits generally measure the expense as the difference between the market price of the stock and the strike price of the options on the date options are exercised. Source data for wages and salaries for the first five months following a reference quarter come from the Current Employment Statistics (CES) program at the Bureau of Labor Statistics (BLS). The CES data exclude income from stock options. Five months after the reference quarter, BEA incorporates data into wages and salaries from the BLS's Quarterly Census of Employment and Wages (QCEW). The QCEW includes income from stock options measured consistently with the annual tax-based source data.

¹⁶ We focus here on non-qualified stock options (NSOs) rather than incentive stock options (ISOs) because NSOs are more common than ISOs and because NSOs give rise to ordinary income/losses while ISOs give rise to capital gains/losses, which are excluded from the NIPA concepts of corporate profits and compensation (Moylan, 2008).

Given the consistent measurement of stock options in the annual tax-based source data underlying corporate profits and the QCEW underlying wages and salaries, the measurement and timing differences should not affect the annual statistical discrepancy by the second annual revision because QCEW data and tax-based source data are fully incorporated into the NIPAs by the second annual revision. However, the measurement and timing differences are likely to contribute to the statistical discrepancy in current quarterly estimates, and the effect is likely to persist in quarterly interpolations after the first annual revision because stock options are measured inconsistently in quarterly financial-based source data and the QCEW. The pro-cyclical nature of stock prices and the incentive for employees to exercise stock options when stock prices increase as well as the disincentive when stock prices decrease may yield an overly cyclical measure of quarterly wages and salaries. In contrast, quarterly corporate profits as measured by financial-based source data would be less affected by changes in stock prices because stock options expense in quarterly financial data is measured when stock options are granted and distributed evenly over the vesting period. Thus, GDI may be overstated relative to GDP during stock market increases but understated during stock market declines.

Produced Intangibles

In the year produced intangibles are acquired, the seller of the intangibles recognizes revenue and the buyer recognizes expense for tax purposes when intangibles are not capitalized and depreciated. In this case, revenues offset expenses and the statistical discrepancy is unaffected. When produced intangibles are capitalized and depreciated for tax purposes, BEA adds the depreciation back to tax-based receipts less deductions, which is the starting point for profits and income, and includes the depreciation in consumption of fixed capital, which is BEA's measure of depreciation included in GDI. In the case of purchased computer software, BEA assumes a low rate of capitalization for tax purposes.¹⁷ As a result, the depreciation for produced intangibles that is added back to tax-based receipts less deductions includes only a small amount for software. In the year software is purchased, tax-based receipts less deductions overstates profits and income to the extent that software is capitalized and not depreciated for tax purposes beyond BEA's assumed rate of capitalization (i.e., aggregate receipts from software sales > aggregate deductions from software purchases). Thus, the statistical discrepancy may be affected. In the years software is depreciated, the statistical discrepancy is unaffected because the capital consumption adjustment absorbs the difference between the actual depreciation and the assumed depreciation. Assuming software purchases are pro-cyclical, failure to accurately adjust for capitalized software would yield a measure of profits and income that may be too high during cyclical upturns but less affected during downturns.

Summary and Conclusions

BEA's decision to record a statistical discrepancy with GDI reflects BEA's experience and careful consideration of the reliability of the underlying source data. Source data underlying GDP are generally consistent with economic accounting concepts and thus considered more reliable than source data underlying GDI. In contrast, data underlying the profits and income

¹⁷ Section 179 of the Internal Revenue Code allows taxpayers to deduct the cost in the year of acquisition rather than capitalize and depreciate the cost of qualifying property, including purchased computer software, subject to deduction limitations and other restrictions.

components of GDI are generally collected from financial- and tax-based sources, which can be inconsistent with economic accounting concepts and require adjustments for economic accounting purposes. While BEA works to reduce measurement error related to the source data and required adjustments, the work is limited by conceptual differences and regulatory reporting requirements underlying the financial- and tax-based source data. Thus, this paper provides an explanation of the significant role that profits and income play in BEA's decision to record the statistical discrepancy and an overview of the factors of profits and income that are most likely contributing to the statistical discrepancy.

Adjustments for misreporting are likely factors contributing to the statistical discrepancy, and the direction of the effect is ambiguous without further study. Capital gains/losses may be leaking into measures of profits and income and contributing to the statistical discrepancy through corporate partner adjustments and mark-to-market accounting practices, which would yield overly cyclical measures of profits and income. Measurement of profits and income in the finance and insurance industries was particularly challenging during the most recent recession. In addition, inconsistent measurement of stock options in source data for profits and income and wages and salaries may generate an overly cyclical measure of GDI relative to GDP. Finally, any error in assumptions regarding the capitalization rate of purchased software may overstate profits and income during cyclical upturns.

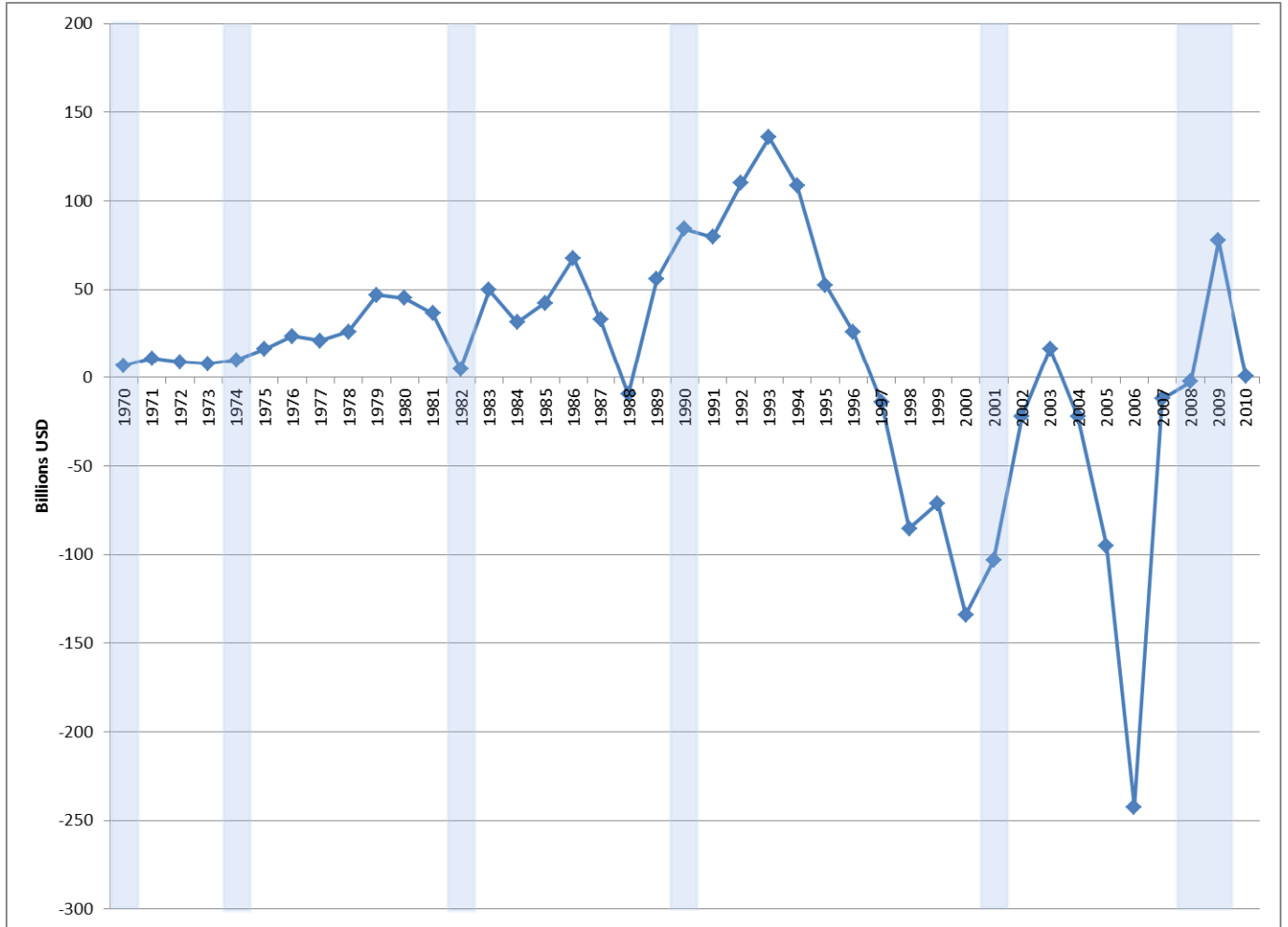
To date, our work supports BEA's practices of not promoting one output measure over another and of recording the statistical discrepancy in a transparent manner on the income side of the NIPAs. However, more attention should be given to describing the GDI estimates in a manner that will inform the public about this alternative source of macroeconomic information. Furthermore, additional research is warranted on factors contributing to the statistical discrepancy, on a framework for weighting underlying source data in an effort to distribute the statistical discrepancy, and on a framework and appropriate weights for a combined output measure.

References

- Byron, Ray P. 1978. "The Estimation of Large Social Account Matrices." *Journal of the Royal Statistical Society, Series A*, 141(3), 359-367.
- Chen, Baoline. 2006. "A Balanced System of Industry Accounts for the U.S. and Structural Distribution of Statistical Discrepancy." BEA working paper WP2006-8.
- Chen, Baoline. 2010. "Reconciling the System of U.S. Accounts and Distribution of the Aggregate Statistical Discrepancy." Unpublished working paper, BEA.
- Fixler, Dennis J. and Bruce T. Grimm. 2002. "Reliability of GDP and Related NIPA Estimates." *Survey of Current Business*, 81(1), 9-27.
- Fixler, Dennis J. and Bruce T. Grimm. 2005. "Reliability of the NIPA Estimates of U.S. Economic Activity." *Survey of Current Business*, 85(2), 8-19.
- Fixler, Dennis J. and Jeremy J. Nalewaik. 2009. "News, Noise, and Estimates of the "True" Unobserved State of the Economy." BEA working paper WP2010-04.
- Fixler, Dennis J., Ryan Greenaway-McGreevy, and Bruce T. Grimm. 2011. "Revisions to GDP, GDI, and Their Major Components." *Survey of Current Business*, 91(7), 9-31.
- Greenaway-McGreevy, Ryan. 2011. "Is GDP or GDI a Better Measure of Output? A Statistical Approach." Unpublished working paper, BEA.
- Grimm, Bruce T. 2007. "The Statistical Discrepancy." BEA working paper WP2007-01.
- Grimm, Bruce T. and Robert P. Parker. 1998. "Reliability of the Quarterly and Annual Estimates of GDP and Gross Domestic Income." *Survey of Current Business*, 78(12), 12-21.
- Grimm, Bruce T. and Teresa L. Weadock. 2006. "Gross Domestic Product: Revisions and Source Data." *Survey of Current Business*, 86(2), 11-15.
- Holdren, Alyssa E. and Bruce T. Grimm. 2008. "Gross Domestic Income: Revisions and Source Data." *Survey of Current Business*, 88(12), 14-20.
- Klein, L.R. and J. Makino. 2000. "Economic Interpretations of the Statistical Discrepancy." *Journal of Economic and Social Measurement*, 26(1), 11-29.
- Mankiw, N. Gregory and Matthew D. Shapiro. 1986. "News or Noise: An Analysis of GNP Revisions." *Survey of Current Business*, 66(5), 20-25.
- Moylan, Carol E. 2008. "Employee Stock Options and the National Economic Accounts." *Survey of Current Business*, 88(2), 7-13.

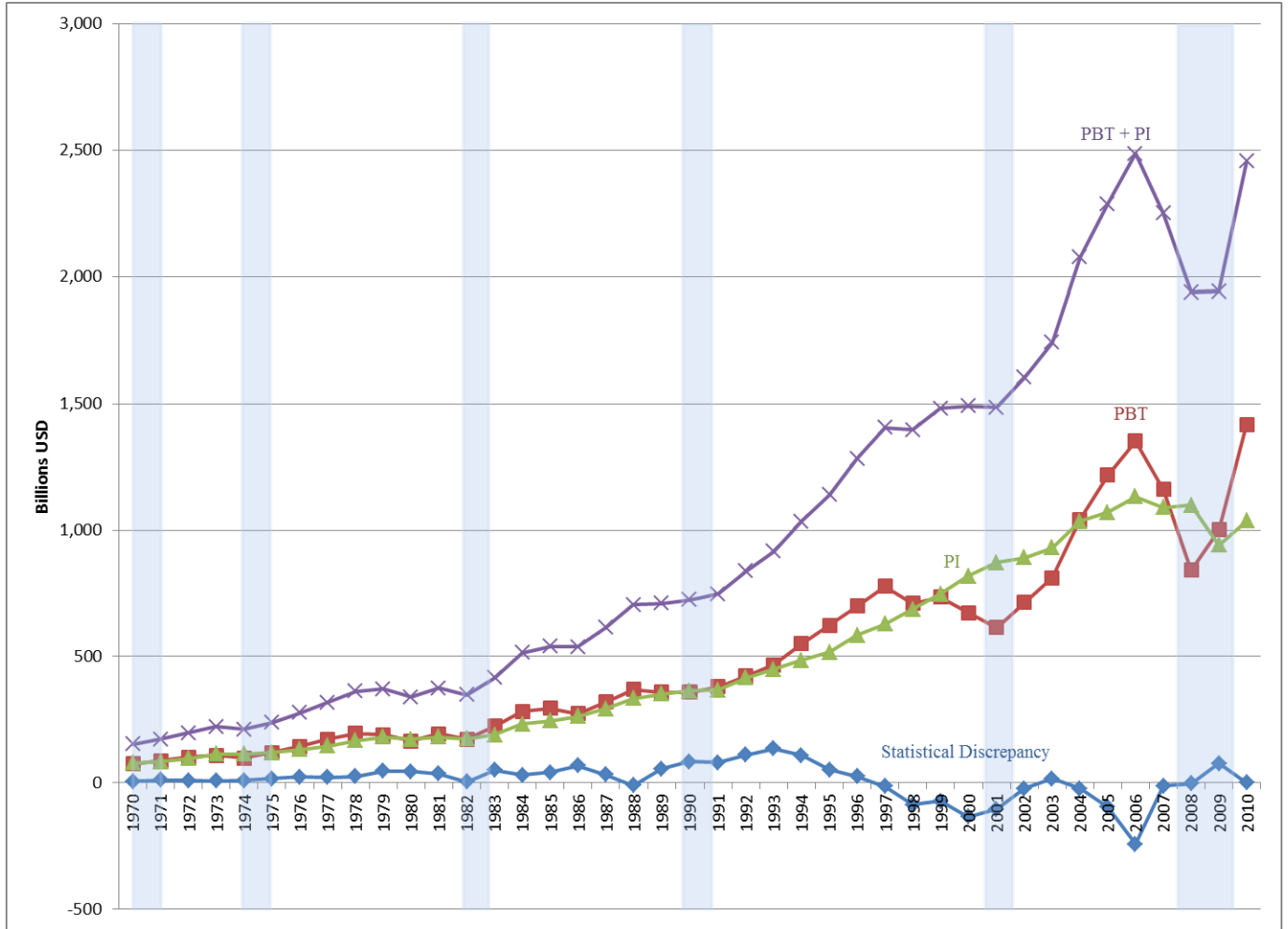
- Nalewaik, Jeremy J. 2010. "The Income- and Expenditure-Side Estimates of U.S. Output Growth." *Brookings Papers on Economic Activity*, 1, 71-106.
- Rassier, Dylan G., Thomas F. Howells III, Edward T. Morgan, Nicholas R. Empey, and Conrad E. Roesch. 2007. "Implementing a Reconciliation and Balancing Model in the U.S. Industry Accounts." BEA working paper WP2007-05.
- Smith, Richard J., Martin R. Weale, and Steven E. Satchell. 1998. "Measurement Error with Accounting Constraints: Point and Interval Estimation for Latent Data with an Application to U.K. Gross Domestic Product." *The Review of Economic Studies*, 65(1), 109-134.
- Stone, Richard, James E. Meade, and David G. Champenowne. 1942. "The Precision of National Income Estimates." *The Review of Economic Studies*, 9(2), 111-125.
- Weale, Martin. 1992. "Estimation of Data Measured with Error and Subject to Linear Restrictions." *Journal of Applied Econometrics*, 7(2), 167-174.

Figure 1: Statistical Discrepancy, 1970-2010



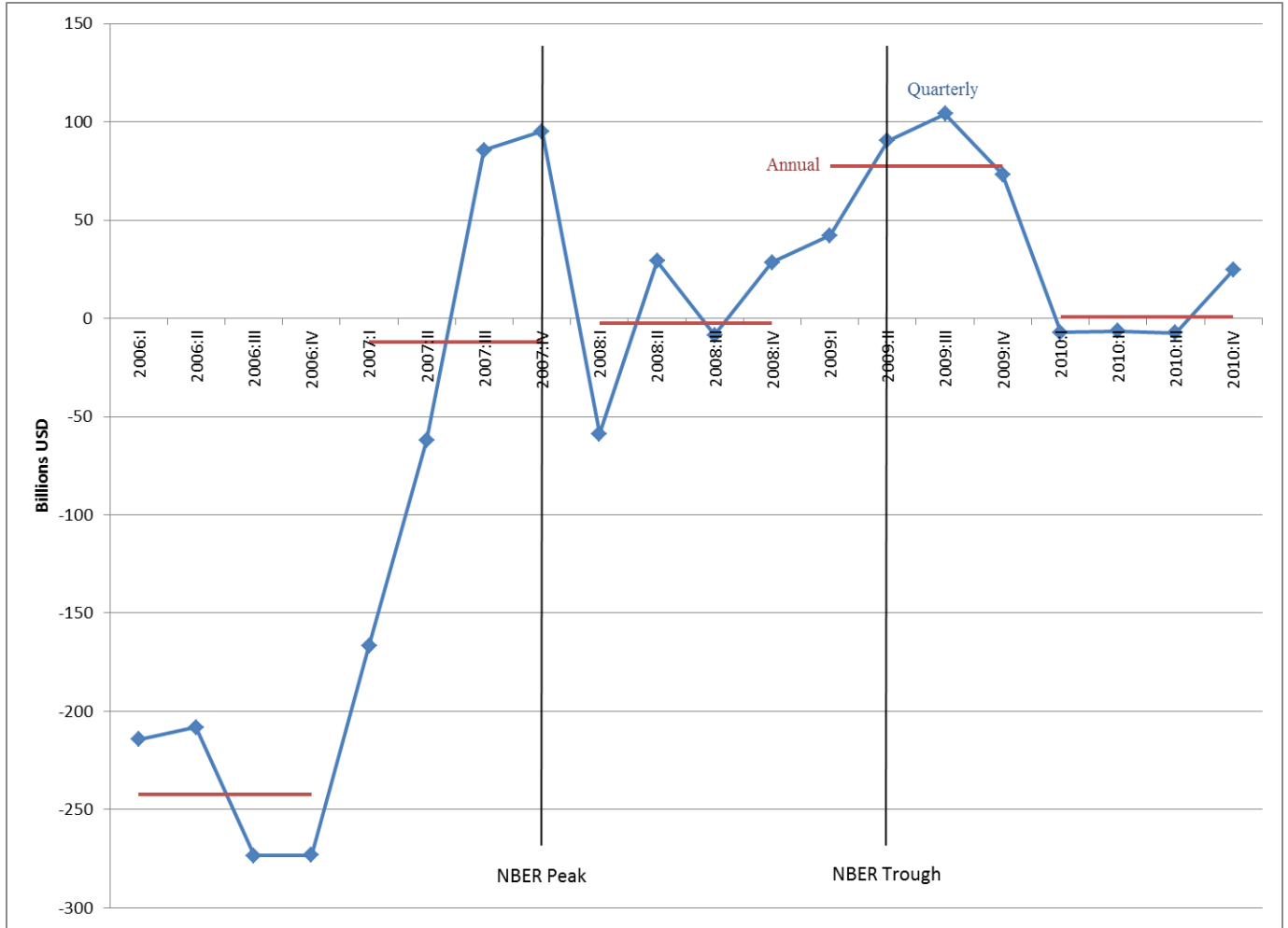
Note: Shaded areas indicate approximate dates of recessions as determined by NBER's Business Cycle Dating Committee. Data come from the 2011 annual revision.

Figure 2: Statistical Discrepancy and Profits, 1970-2010



Note: Shaded areas indicate approximate dates of recessions as determined by NBER's Business Cycle Dating Committee. Data come from the 2011 annual revision. PBT: corporate profits before tax. PI: proprietors' and partnership income.

Figure 3: Annual and Quarterly Statistical Discrepancy, 2006:I-2010:IV



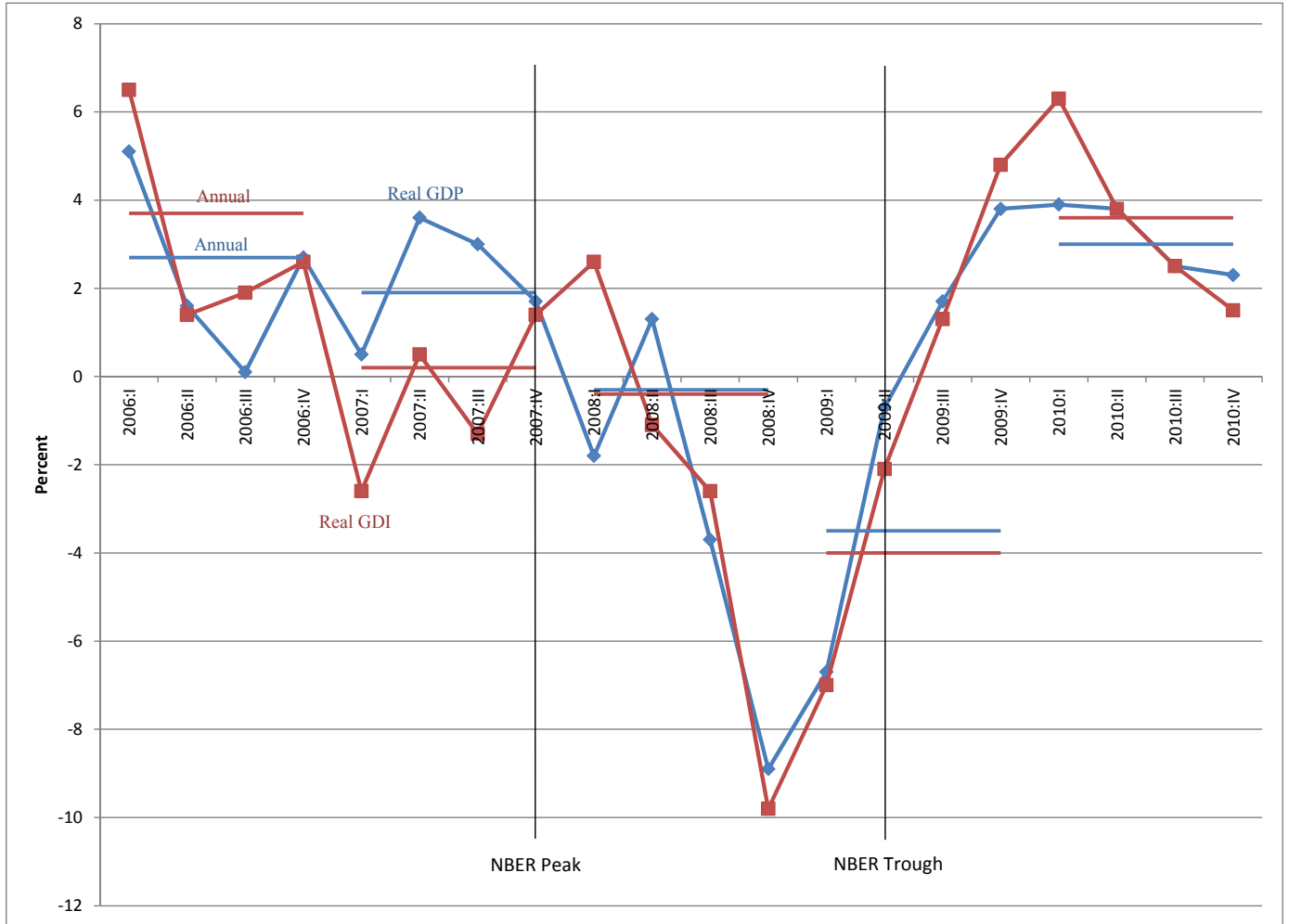
Note: The annual and quarterly statistical discrepancy is published in the NIPAs. Data come from the 2011 annual revision.

Figure 4: Real GDP and Real GDI Levels, 2006:I-2010:IV



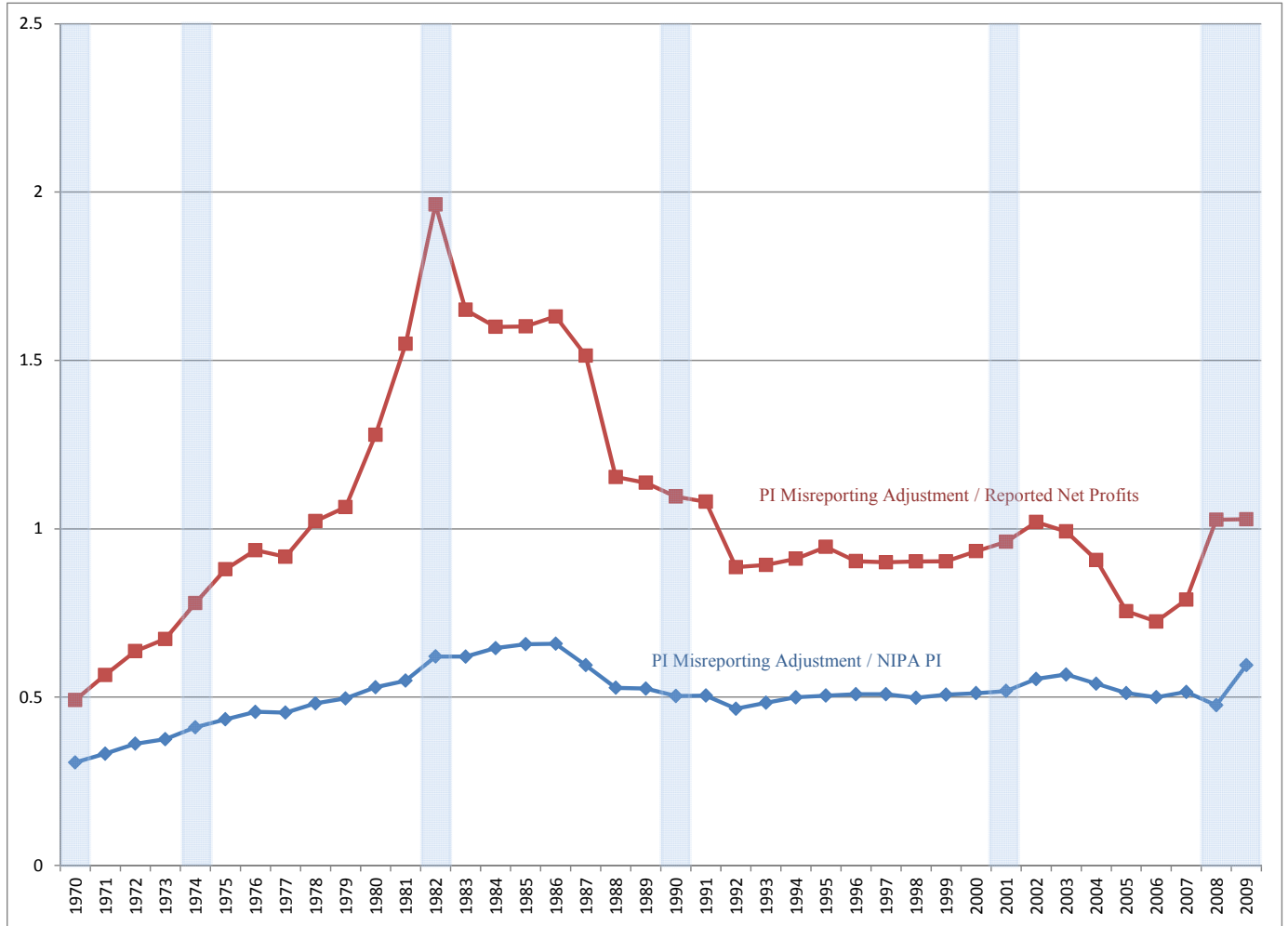
Note: Real GDP is published in the NIPAs. Real GDI is determined with the implicit price deflator for GDP. Data come from the 2011 annual revision.

Figure 5: Percent Change in Real GDP and Real GDI, 2006:I-2010:IV



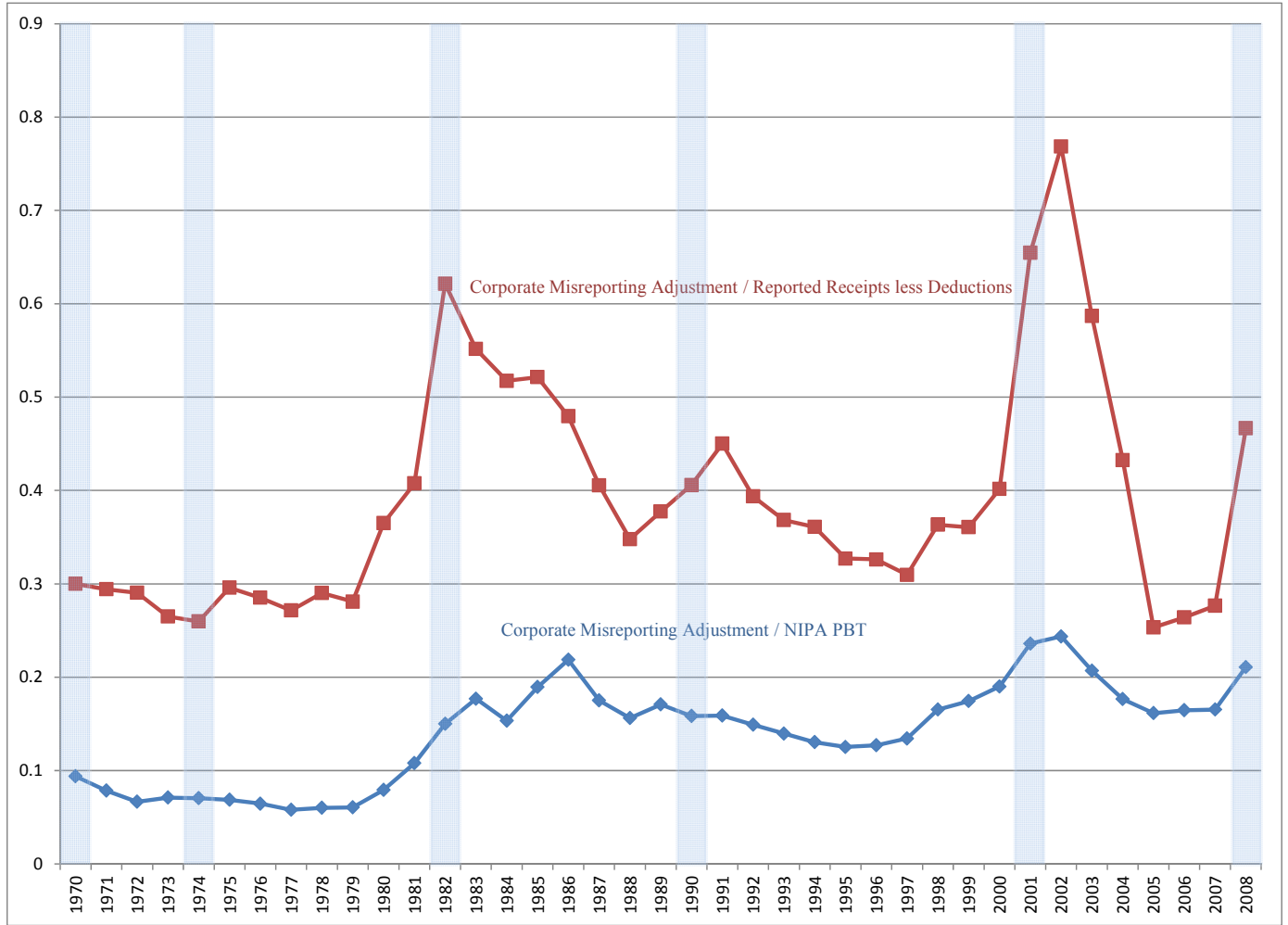
Note: Percent change in real GDP is published in the NIPAs. Percent change in real GDI is determined with the implicit price deflator for GDP. Data come from the 2011 annual revision.

Figure 6: Proprietor and Partnership Misreporting Adjustments, 1970-2009



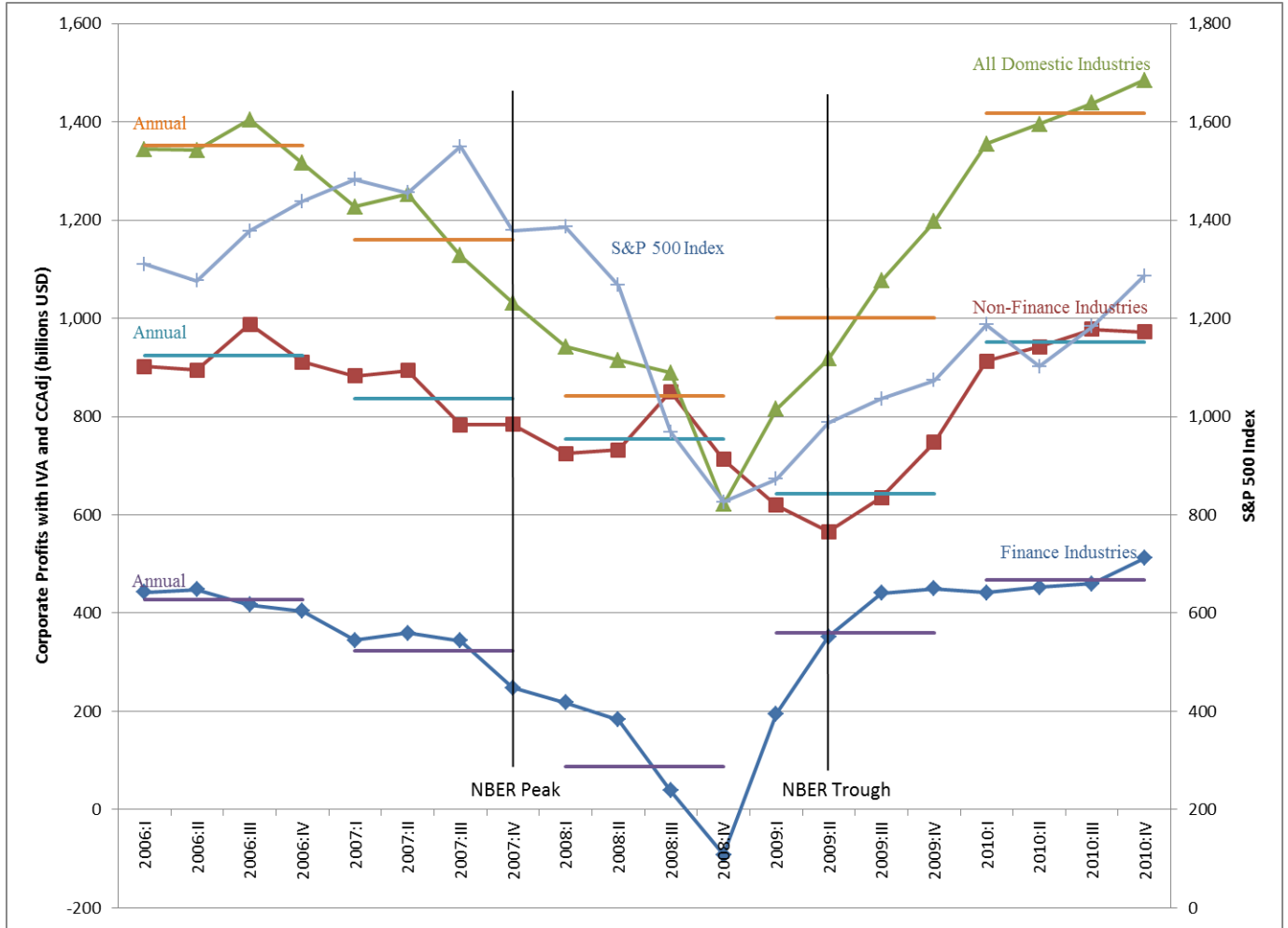
Note: Shaded areas indicate approximate dates of recessions as determined by NBER’s Business Cycle Dating Committee. Data come from the 2011 annual revision. PI: proprietors’ and partnership income.

Figure 7: Corporate Misreporting Adjustments, 1970-2008



Note: Shaded areas indicate approximate dates of recessions as determined by NBER's Business Cycle Dating Committee. Data come from the 2011 annual revision. PBT: corporate profits before tax.

Figure 8: Corporate Profits with IVA and CCAdj, 2006:I-2010:IV



Note: Corporate profits with IVA and CCAdj is published in the NIPAs. Data come from the 2011 annual revision. The S&P 500 Index series is determined by the monthly average closing value adjusted for dividends and stock splits.

Table 1: Proportion of Net Capital Gains in Net Partnership Income, 1999-2008

<i>Year</i>	<i>Net Capital Gains Proportion</i>
2008	1.6 %
2007	46.7
2006	39.3
2005	37.0
2004	34.9
2003	19.3
2002	1.6
2001	11.0
2000	37.4
1999	34.6

Note: Shaded areas indicate approximate dates of recessions as determined by NBER's Business Cycle Dating Committee. Data come from SOI. Net capital gains include short-term and long-term capital gains and losses.