The Rise of Market Power and the Macroeconomic Implications: Comment [*]

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Abstract

De Loecker et al. (2020) (DLEU) estimate that average markups in the United States *tripled* between 1980 and 2016, rising from 21% above marginal cost to 61%. This striking result is sensitive to unreported sample restrictions that drop 27% of the available observations. In the full sample, markup increases are more muted until late in the sample period, and are almost entirely driven by Finance and Insurance firms. We conclude that the DLEU methodology and data, as they are described in the article, do not support the claim of a dramatic, economy-wide rise in market power over this period.

1 Introduction

De Loecker et al. (2020) (henceforth, DLEU) seeks to estimate how markups—a possible proxy for market power—have evolved in the United States economy between 1955 and 2016. The article's headline result is that the average markup, as measured by the ratio of price to marginal cost, increased from 1.21 in 1980 to 1.61 in 2016 (DLEU Figure I). DLEU indicates that "...the increase in market power occurs in all sectors and industries," and that this holds under many alternative specifications. The results have been widely cited in both academic and popular settings, and are a leading piece of evidence supporting the hypothesis that market power increased in the United States over recent decades.[1]

Based on the published supplementary materials and additional necessary replication code provided by one of the DLEU authors, we have identified that these results were obtained using sample restrictions that are not stated in the article or its online appendix. These restrictions excluded an additional 27% of the observations from the Compustat data used for the main results.[2] In this comment, we apply the methodology of DLEU, as described in the article and implemented in the replication code, to the "full" Compustat data sample without the unstated restrictions, and examine whether the results still hold. We also reexamine the DLEU analysis of Census data.

We provide two main results (see Figure 1). First, using the full sample, markups follow a markedly different trajectory.[3] While DLEU reports that the average markup increased rapidly throughout the 1980s and 1990s, the full sample reveals more gradual increases through 2008, followed by a sharp rise in the final years. Both samples converge to similar levels in 2016. Second, the markup increase in the full sample is driven almost entirely by a single sector: Finance and Insurance (F&I).[4] When the F&I sector is excluded from the full sample, average markups increase only modestly, from just below 1.30 in the mid-1980s to approximately 1.35 in 2016. Furthermore, even with F&I included, the markup increase reflects an accounting artifact: interest income is counted as revenue, but interest expenses are typically excluded from Cost

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[1]Syverson (2019); Philippon (2019); Berry et al. (2019); U.S. Department of the Treasury (2022); Council of Economic Advisers (2022); Shapiro (2021)

[2]The sample restrictions do appear in the code included in the supplementary materials.

[3]Throughout this comment, we use the term "full sample" to refer to the Compustat data sample after applying only the sample restrictions stated in the article. Precise details are provided in Section 3 and Appendix B.1.

[4]Although the DLEU sample results are robust to excluding F&I, this is because the unstated sample restrictions exclude 89% (sales-weighted) of the F&I observations. The full sample restores these observations.

of Goods Sold. We conclude that the results from the full Compustat sample do not support DLEU's conclusions that "there has been a steady rise [in markups] since 1980" and that "the increase in market power occurs in all sectors and industries."

We also revisit selected supplementary results from DLEU. Most notably, when we decompose markup changes in the full sample excluding F&I, one of DLEU's central findings is reversed: we find that average within-firm markups have *decreased* over time. This matters because DLEU has been widely interpreted as evidence that markets have grown less competitive over time, perhaps due to weakening antitrust enforcement. The pattern of declining within firm markups is inconsistent with that conclusion.

On the other hand, a third key finding is maintained in the full sample: there has been reallocation of economic activity from low-markup to high-markup firms. The overall picture is therefore more nuanced than what is presented in DLEU. While existing firms have seen their markups fall on average, economic activity has shifted toward higher-markup firms and industries. These two forces together produce a modest increase in the aggregate average markup. DLEU's finding that the upper tail of the markup distribution has fattened over time also survives in the full sample.

We also revisit DLEU's robustness analysis that attempts to verify their results by comparing estimates from the Census to the main estimates from Compustat. Contrary to DLEU, we argue that their Census estimates do not align with the Compustat estimates.

The authors' reply to this comment, De Loecker et al. (2025), does not contest our findings. Instead, it claims that results from the full sample are unreliable due to the presence of certain pharmaceutical firms that are included in the full sample but excluded from their restricted sample:

> "...the findings in BMY are entirely driven by outliers in one four-digit NAICS industry 3254 (Pharmaceutical and Medicine Manufacturing)."

We demonstrate that this claim is incorrect. Specifically, when we drop all observations from sector 3254 completely (from all parts of the analysis), it makes little difference to the results: markup growth follows the same pattern that we describe above. Therefore, our results cannot be driven by outliers in sector 3254. Rather, the results obtained in the authors' reply result from selectively excluding only the low-markup observations within sector 3254.

Our comment contributes to the substantial literature on the DLEU data and methodology (e.g. Bond et al., 2021; Foster et al., 2024; Raval, 2022; Edmond et al., 2023; Doraszelski and Jaumandreu, 2024; Shapiro and Yurukoglu, 2026). However, our com-

ment differs in spirit from this literature. We argue that the findings reported in DLEU are not an accurate representation of what would result from a faithful application of the described methods and data. When we generate results using the article as a guide and using the same Compustat data, we find that they differ fundamentally from those reported in the article and, moreover, do not support the article's main conclusions.

As an additional contribution, we provide a complete replication package for DLEU's main results.[5] Furthermore, we provide in our appendix complete documentation of the exact specification and estimation of the production function that DLEU uses to obtain markup estimates.[6]

2 Methods and Data Requirements

DLEU recovers markups using the "production approach." Cost minimization and other assumptions imply that the markup equals the output elasticity of the production function with respect to a freely adjustable variable input, multiplied by the ratio of gross revenue to expenditure on that variable input. If COGS is assumed to be a freely-adjustable variable input, as it is in the baseline DLEU specification, the markup estimate for firm i in period t is given by

$$\mu_{it} \equiv \frac{P_{it}}{MC_{it}} = \theta_{it} \times \frac{\text{Sales}_{it}}{\text{COGS}_{it}} \tag{1}$$

where P_{it} and MC_{it} are price and marginal cost, respectively, and θ_{it} is the output elasticity with respect to COGS from the production function.[7] DLEU calculates the average markup as a sales-weighted mean across firms.

The markup calculation requires knowledge of the output elasticity. For the baseline Compustat analysis, DLEU estimates a production function in which the output elasticity varies across years and 2-digit sectors (see Appendix A). DLEU uses variables for Sales, COGS, Capital, and Investment (which enters a control function) in estimation. Sales and COGS, along with the output elasticities, are then used to obtain markups. Markups are calculated for many firms that have valid Sales and COGS data, but are excluded

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[5]All code necessary to replicate both DLEU's original results and our results is publicly available on our websites. The replication package uploaded with the original DLEU article is incomplete and does not replicate the results in the article. For completeness, Appendix B.2 also documents two additional discrepancies in the figures in DLEU.

[6]These details were omitted in the original DLEU article.

[7]There are some details omitted here with respect to how output and inputs are measured, that we believe are important but outside the scope of this comment. See Bond et al. (2021) and De Ridder et al. (2026) for details.

from estimation for other reasons (e.g., because Investment is missing). DLEU states that, to recover markups, "a firm-year observation requires information on both sales and COGS."

3   Main Results

We begin by examining the results DLEU obtains with the baseline model, which uses Compustat data. We focus on two discrepancies between the data sample described in the DLEU article and that created by the replication code provided by the authors: (i) the code drops observations that have missing values for Capital, and (ii) the code drops observations that have missing values for Selling, General, and Administrative (SG&A) expenses. Neither of these two restrictions is reported in the article, but they are each substantial. If applied in order, the restriction on Capital drops 33,422 observations, and the restriction on SG&A drops a further 63,572 observations. Together, the two restrictions reduce the sample size by 27.4%. The two sample restrictions also have a large effect on the main results in DLEU.

3.1   Results: The Rise of Markups

Figure 1 plots three estimates of the average markup over time. The solid red line is the estimate provided in DLEU. The dashed green line is what we obtain from the full sample—i.e., without dropping observations with missing values for Capital or SG&A. Finally, the dash-dot black line is what we obtain with the full sample excluding the Finance & Insurance sector.

Using the DLEU sample, the average markup increases rapidly throughout the 1980s and 1990s, pauses in the 2000s, then increases rapidly again in the final few years of the sample. In the full sample, the average markup increases more gradually through 2008. It then sharply increases in the last few years of the sample, ending at a level similar to that in the DLEU sample. Moreover, unlike the DLEU results, which are robust to the exclusion of individual sectors, in the full sample, the increase in markups at the end of the sample is driven almost entirely by a single sector: Finance & Insurance. Excluding F&I, the average markup increases only modestly, from just below 1.30 in the mid-1980s to about 1.35 in 2016.
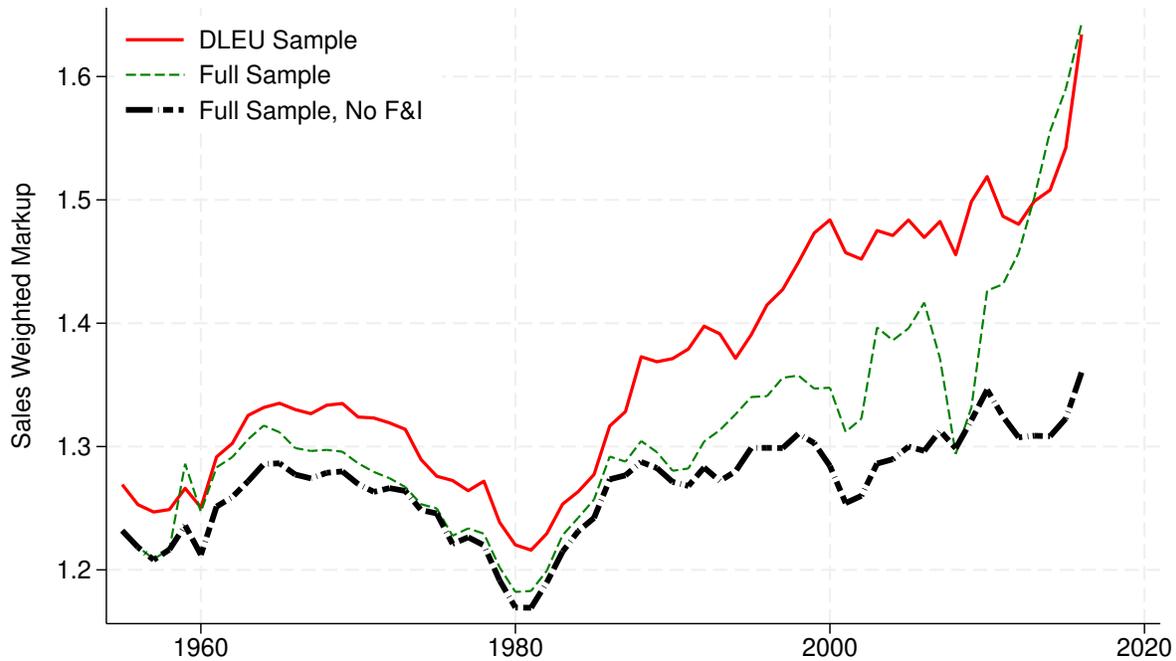
Figure 1: Markups Obtained with the DLEU Sample and the Full Sample

Notes: The figure plots estimates of the sales-weighted average markup (the ratio of price to marginal cost) over time. The solid red line is a replication of Figure I of DLEU, which uses a restricted sample. The dashed green line uses the full sample. The black dash - dot line uses the full sample except for the F&I sector.

3.1.1 Selection on Missing SG&A

Of the two unstated sample restrictions, the omission of observations with missing SG&A values is the one that causes the results to change. Table 1 shows regressions of log(Sales) and log(COGS) on an indicator for a missing SG&A value, the same indicator interacted with a de-meaned time trend, and industry and time fixed effects (first and third columns). The second and fourth columns repeat the analysis adding firm fixed effects. The regressions show that observations with missing SG&A tend to have lower Sales, and higher COGS, and hence lower markups than other observations. These relationships are statistically significant both across firms and within firms over time. They also strengthen over the sample period. Omitting observations with missing SG&A therefore leads to a trended upward bias in the markups estimates.

Given the large impact of the sample restrictions on the markup estimates, one might reasonably wonder whether there are good reasons to exclude observations with missing SG&A values from the analysis. We have not been able to identify any. SG&A is not needed to estimate markups, and does not otherwise factor into the main results of the

Table 1: Regression Analysis of Observations with Missing SG&A Values

	Dependent Variable			
	log(Sales)	log(Sales)	log(COGS)	log(COGS)
SG&A Missing	-0.142	-0.445	0.442	0.211
	(0.050)	(0.029)	(0.048)	(0.030)
SG&A Missing × Trend	-0.006	-0.007	0.009	0.004
	(0.002)	(0.001)	(0.002)	(0.001)
Firm Fixed Effects	no	yes	no	yes
R^2	0.094	0.907	0.108	0.903

Notes: This table reports the results of OLS regressions of log Sales and log COGS on an indicator for missing SG&A and its interaction with a demeaned time trend. All regressions include year and industry fixed effects. The industry fixed effects are at the 2-digit NAICS level. There are 348,176 firm-year observations. Standard errors are in parentheses.

article, so there is no practical reason to exclude these observations from the analysis. There is also no reason to believe that observations where SG&A is not reported are of low quality. SG&A are not required to be reported as a separate line item under U.S. GAAP. Companies are required to report Operating Expenses, but the precise breakdown is discretionary.[8] A close inspection of SG&A reporting in the Compustat data also does not reveal any systematic data quality issues with firm-year observations where SG&A is not reported. SG&A reporting is much higher in some sectors than others[9] but, since 1970, the fraction of public firms reporting SG&A has held steady at around 80% (see Figure C.1). Many large well-known firms have not consistently reported SG&A, including Aetna Inc, Citigroup, Delta Airlines, Ford Motor Co, HCA Healthcare, and United Parcel Service (UPS). On the other hand, if we are interested in learning what happened to average markups across the entire US economy, then it would seem important to include all of the data in this calculation.

3.1.2 Finance & Insurance Accounting

Figure 1 shows that, for the full sample, the inclusion of finance firms has a large impact on the average markup, particularly after 2010. This result stands in contrast to DLEU's Appendix 10 which shows that, in their sample, excluding the F&I sector does

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[8]The same is also true under International Financial Reporting Standards (IFRS).

[9]Weighted by Sales, Utilities(94%), Transportation and Warehousing (54%,/79%) and Finance and Insurance (50%) have the most missing values for SG&A – see Table C.1

not change the results[10], and Appendix 15, which shows the results by sector.

There are two reasons for the differences in the full sample. One is that 89% (sales-weighted) of F&I sector observations in Compustat are missing either Capital or SG&A. Thus, after imposing these two sample restrictions, the F&I sector is *already* largely excluded from DLEU's main analysis. This fact helps explain why the DLEU results are robust to excluding F&I. It also provides further insight into the differences between the three lines in Figure 1. The dash-dot black line, which shows markups in the full sample excluding all F&I observations, is perhaps better compared to the red DLEU sample line, which also excludes 89% of F&I observations. The difference between these two lines shows, approximately, the effect of removing the sample restrictions on the markup estimates for the rest of the economy minus F&I. The dashed green line then shows the effect of adding the F&I observations back into the sample.

In addition, there are accounting issues in the way that Compustat compiles annual reports data that have a large impact on the estimated markups for F&I firms in particular when using DLEU's approach. Compustat includes interest income in Sales, but typically does not include interest expense in COGS. Using DLEU's approach, this practice produces markup estimates for financial firms that are high and volatile. For example, the estimated markup of the Federal National Mortgage Association (Fannie Mae) rises from 267% in 2011 to 2130% in 2016. In combination with this effect, an increase in overall financial activity can mechanically generate rising markup estimates. The Finance & Insurance sector accounted for only 1% of the sales in Compustat in 1955, but more than 15% in 2016. In the appendix, we reproduce the main results but including interest expense in COGS for F&I firms, and show that, with this change, the increase in the economy-wide average markup is significantly more modest even when the F&I sector is included (see Figure C.2).

3.1.3 Decomposing the Difference Between the Full Sample and the DLEU Sample

The markup equation (1) has two components—the output elasticity and the Sales-to-COGS ratio—and changes to the sample can affect estimated markups through either channel. As a final exercise, we decompose the difference between the full sample and the DLEU sample into the contributions of the two channels. Figure 2 plots the sales-weighted markup from the full sample (black dash-dot line) alongside the DLEU estimates (solid red line) and a third line that uses the Sales-to-COGS ratios from the full

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[10]DLEU's Appendix 10 also excludes the Real Estate sector, but in the full sample, excluding Real Estate has very little impact on any results.
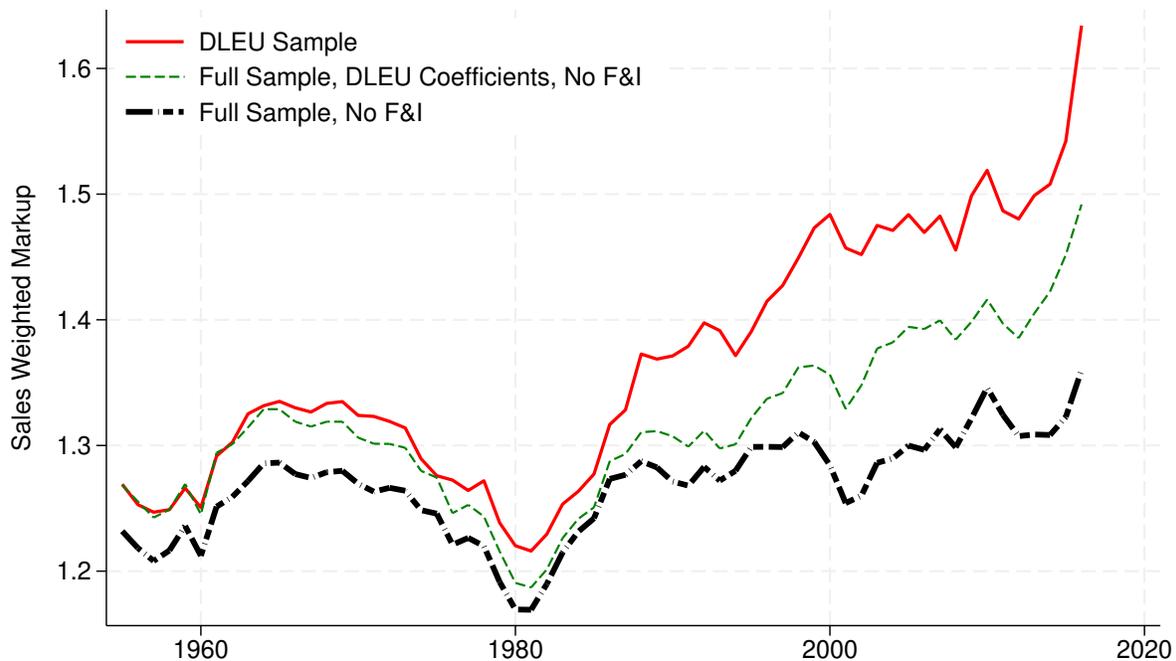
Figure 2: Breakdown of the Difference in Markups with the DLEU and Full Samples

Notes: The figure plots estimates of the sales-weighted average markup over time. The solid blue line is a replication of Figure I of DLEU, which uses a restricted sample. The black dash - dot line uses the full sample except F&I. The dashed green line uses the same full sample except F&I, but with the output elasticities of DLEU.

sample but holds the output elasticities constant at the DLEU values (blue dashed line). The graph shows that the two channels contribute roughly equally to the difference in markups between the two samples.

3.2 Other Headline Results

In addition to documenting the rise in average markups, DLEU contains two other headline findings: it decomposes the changes in the average markup into changes in markups for existing firms and reallocation of economic activity across firms, and it documents long-term changes in the distribution of markups.

3.2.1 The Reallocation of Economic Activity

DLEU decomposes changes in the average markup since 1980 into three economic forces: within-firm changes in markups, net entry, and reallocation of sales between firms. DLEU finds that within-firm markups account for about one-third of the total
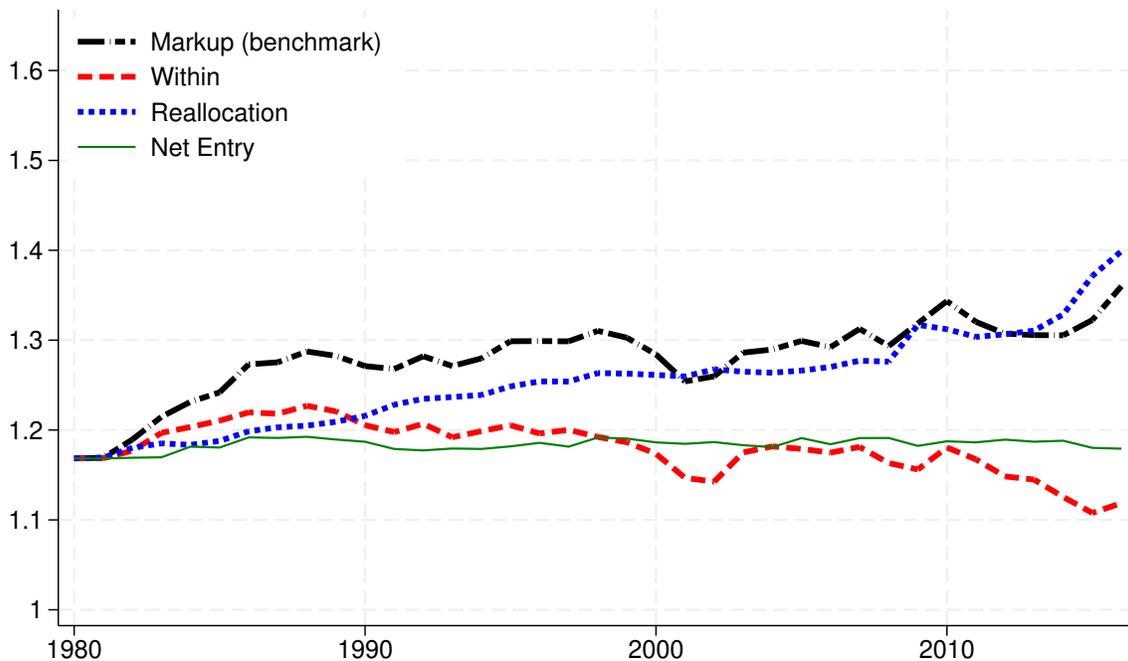
Figure 3: Decomposition of Estimated Markup Growth

Notes: The figure recreates Figure IV of DLEU using the full sample excluding the F&I sector. The black dot-dash line shows the sales-weighted average markup from our main results. The red dashed line represents the contribution of within-firm markup changes, the green solid line represents the contribution of entry and exit, and the blue dotted line represents the contribution of reallocation.

increase in average markups, while reallocation between firms accounts for the remaining two-thirds. DLEU states that the within-firm result is "an indication of the change in pricing power of firms."

Figure 3 replicates DLEU's Figure IV using the full sample excluding the F&I sector. In contrast to the DLEU findings, within-firm markups in the full sample decrease over time. Under the logic stated in DLEU, we obtain the opposite conclusion: the result would indicate a *decrease* in the pricing power of existing firms over time. As in DLEU, in the full sample, there is also a reallocation of sales to higher-markup firms that more than offsets the decrease in within-firm markups. Taken together, these two findings seem less supportive of the conclusion that the overall increase in markups was driven by a decline in competition, perhaps due to declining antitrust enforcement. They are more supportive of a shift toward either new technologies that are more capital intensive, or new markets that are less competitive.
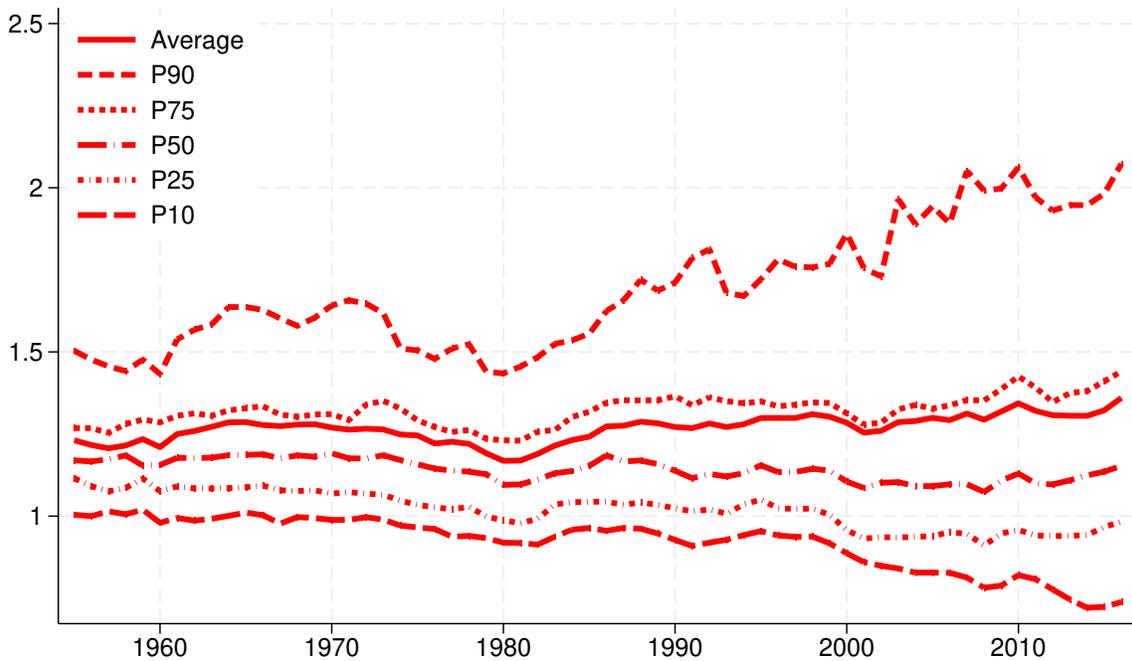
Figure 4: Markup Percentiles

Notes: The solid line is the sales-weighted average from Figure 1. Each of the dashed lines corresponds to a sales-weighted percentile.

3.2.2 The Distribution of Markups

DLEU finds that the median markup has not changed over time. The rise in the estimated average markup is instead driven by an increase in the upper tail of the markup distribution. These results are somewhat conserved in the full sample, at least in spirit. Figure 4 replicates Figure III(B) from DLEU using the full sample and excluding the F&I sector. In the full sample, it remains true that the upper tail of the markup distribution has become fatter, though the magnitude of the increase in the upper decile is approximately halved. The median markup decreases slightly over time in the full sample.

4 Census Analysis

In addition to the Compustat analysis, DLEU provides an analysis based on establishment-level Census data for the manufacturing, retail, and wholesale sectors. DLEU motivates the analysis as a "robustness exercise," noting that it can "verify the

extent of selection bias" in the Compustat data.[11] Together, these sectors account for about 25% of GDP, on average, over 1997-2016.[12][13]

DLEU takes a different approach for the output elasticities used in the Census analysis. For all three sectors, DLEU uses a cost-shares based approach that requires stronger assumptions. For retail and wholesale, DLEU also rescales the markup estimates obtained from the Census by the time-varying output elasticity estimates obtained from Compustat (see DLEU Appendix 13). This process contaminates the Census results for these two sectors with the same missing data issue as before.[14]

Figure 5 summarizes the results for the manufacturing sector only. Because the levels of the Census markup estimates are much higher than those from Compustat, in the figure we rescale all three markup series to equal one in 1980, which allows us to instead compare how the markup estimates change over time. The solid red line shows changes in the average markup from the DLEU Compustat sample, and the dash-dot black line shows changes in the average markup from the full Compustat sample. The gap between the two is due to the inclusion of firms with missing SG&A values.

Similarly to Figure 1 for all sectors, using the full Compustat sample for manufacturing, the average markup increases somewhat from 1980 to 1990, and then is roughly flat, and the overall rise is much smaller than what is obtained with the DLEU sample. The dashed green line shows the changes in the average markup that DLEU obtains for manufacturing using the Census data. The changes in markups from the Census estimates appear to more closely track those of the full Compustat sample than those of DLEU's restricted sample.

We now turn to the markup estimates for the wholesale and retail sectors, for which we rely on figures taken from the published DLEU article. Recall that these estimates also rely on the same Compustat estimates obtained earlier, and are thus subject to the same missing data issues as before. This issue makes the comparison less meaningful.

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[11]Compustat includes only publicly-traded firms and includes their international sales, whereas the economic census covers all employer establishments, including private firms and excluding international sales.

[12]Our calculation is based on publicly available data from the Bureau of Economic Analysis.

[13]We do not have access to either the Census data or replication code for the Census analysis. Thus, in order to replicate this analysis, we extract the DLEU Census results from Figure VI of DLEU and compare them to both DLEU's baseline Compustat results and also the full sample Compustat results. DLEU reports Compustat results for the manufacturing, retail, and wholesale sectors in Figure 12.1 of the Online Appendix. The manufacturing sector comprises NAICS codes 31, 32, and 33. DLEU reports markups for these codes separately; we combine them in our analysis.

[14]Foster et al. (2024) also estimates markups using the full production approach on the Census data, estimating output elasticities using a production function, and finds markup increases that are more muted than those reported in DLEU.
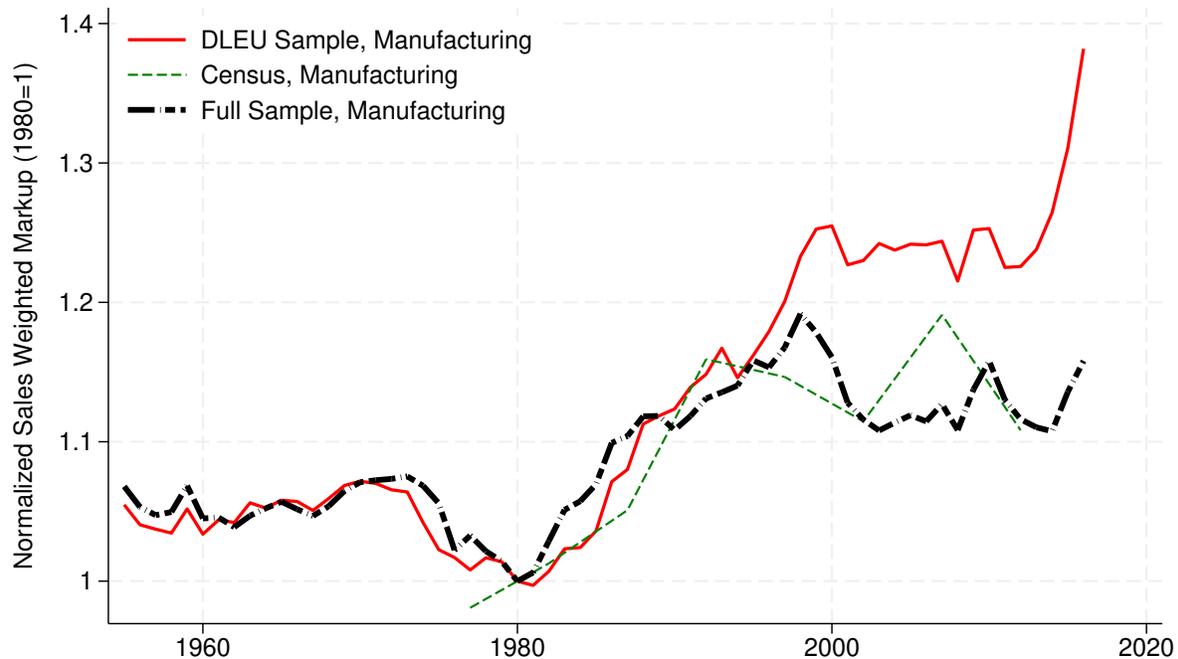
Figure 5: Comparison to DLEU Census Results for Manufacturing

Notes: The figure compares the changes in markups over time from three sets of estimates: (1) the DLEU Compustat sample, (2) the DLEU computed estimates for manufacturing from the economic census, and (3) the full Compustat sample. Because the levels of the Census estimates are much higher than those from Compustat, all three series have been rescaled to equal one in 1980. The solid red line is the DLEU sample replication for NAICS sectors 31, 32, and 33. The dashed green line is derived from DLEU's Figure VI for manufacturing. The black dash - dot line is the full sample for NAICS codes 31, 32, and 33.

Nevertheless, in both cases we find that the Census estimates are quite different from the Compustat ones. For wholesale, DLEU estimates that markups decrease from 14.00 in 1982 to 6.00 in 2012 in the Census (that is, 1400% to 600%, DLEU Figure VI(E)), while in Compustat, their markups estimates are much lower in level, and are roughly flat at around 1.15 (115%, see DLEU Appendix 12.1). We therefore respectfully disagree with the assertion that "figures for wholesale are again in line with the series obtained from our analysis in the Compustat sample." The comparison for retail is similar, if less stark: DLEU estimates a large increase in markups in the Census analysis from around 2.00 to over 3.00, (DLEU Figure Vi (C)), while they estimate markups in Compustat that are broadly decreasing (DLEU Appendix 12.4).

Our conclusions from this analysis are therefore different from those of DLEU. We conclude that the Census estimates do not generally support the DLEU Compustat estimates. For manufacturing, the changes in markups over time from DLEU's Census analysis better match those from the full Compustat sample than they do those from

DLEU's restricted sample. For retail and wholesale, the estimated markups from the Census do not generally match those from Compustat.

5 Rejoinder: The Role of Pharmaceuticals

The authors' reply to this comment, De Loecker et al. (2025), does not contest our findings. Instead, the reply raises a concern that the results from the full sample are unreliable due to the presence of some small pharmaceutical firms in sector 3254 — possibly bio-tech startups — that are included in the full sample but not included in their restricted sample. The reply focuses specifically on firms in this sector with low sales and, therefore, low markups.[15] It characterizes these firms as outliers:

> "[W]e show that the findings in BMY are entirely driven by outliers in one four-digit NAICS industry 3254 (Pharmaceutical and Medicine Manufacturing)."

We now demonstrate that this claim is incorrect. The dashed green line in Figure 6 shows markups obtained from the full sample after completely excluding all observations in sector 3254 (from all parts of the analysis). Removing this sector makes little difference to the results: markups obtained after removing sector 3254 are nearly identical to those obtained from the full sample excluding F&I. We conclude that the markup estimates from the full sample cannot be driven by outliers in sector 3254.

What explains the discrepancy between the results in the authors' reply and the results above that omit sector 3254? The Compustat data for sector 3254 contain outliers in both directions. The results in the authors' reply are driven by selectively excluding only the low-markup observations within sector 3254, while leaving high-markup outliers in place. In an exercise estimating markups, it seems inappropriate to us to arbitrarily exclude observations by screening on markups. Dropping the entire sector – as we do here – avoids subjective determinations about what constitutes an "outlier."[16] Moreover, surely if broad-based, economy-wide increases in markups are present, they should still show up if a single four-digit sector is excluded from the analysis.

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[15]De Loecker, Eeckhout and Unger (2025) have not made replication code available, so we do not have a precise definition of these firms beyond the language used in the reply.

[16]The original DEU paper also used a generic screen for outliers in both directions. It states, "we eliminate firms with reported cost-of-goods to sales and SG&A to sales ratios in the top and bottom 1%." We also used this screen when developing our full sample results.
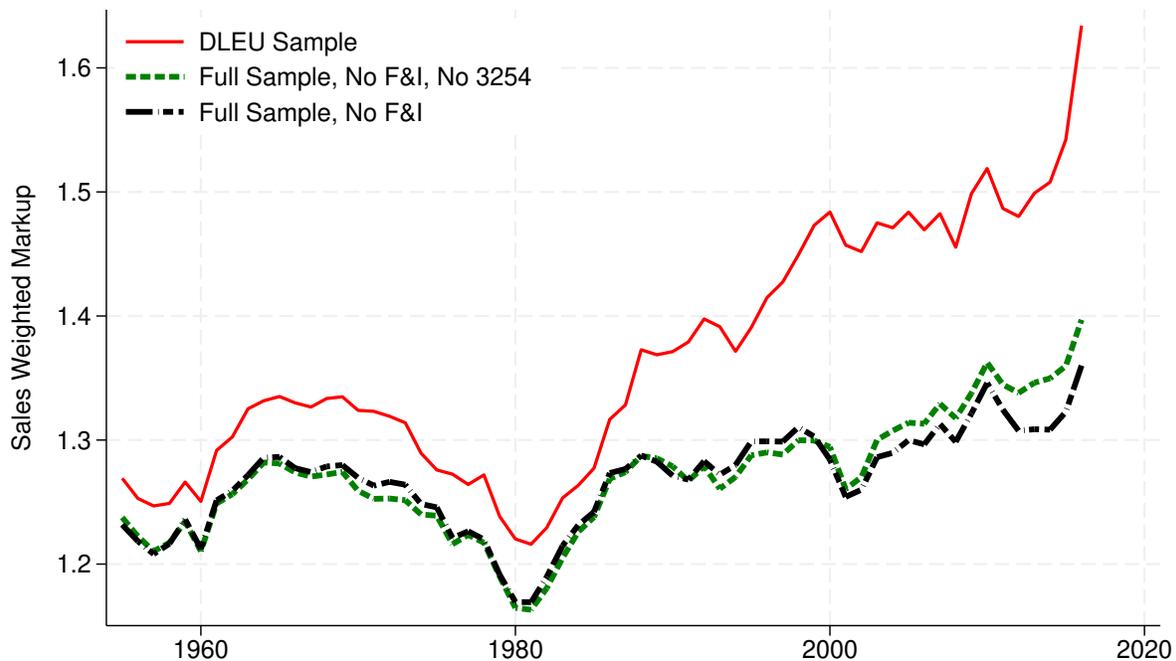
Figure 6: Results without the NAICS Code 3254

Notes: The figure plots estimates of the sales-weighted average markup over time. The solid red line is a replication of Figure I of DLEU, which uses a restricted sample. The dashed green line is the full sample excluding F&I and NAICS code 3254. The black dash - dot line is the full sample excluding F&I.

6   Conclusion

Whether the US economy has become less competitive over time is a fundamental question in economics, with real policy implications. A leading piece of evidence in this regard is the striking finding of DLEU that markups in the United States have tripled since 1980. This finding has shaped a large body of subsequent research, generated widespread media coverage, and influenced policy debates – helping to form a conventional wisdom that competition in the US economy has declined significantly, and leading to calls for more antitrust enforcement.

In attempting to replicate these results, we found that they are highly sensitive to an unstated data sample restriction that excludes 27% of the available observations. When we modify the DLEU code to include these observations, the conclusion that average markups have dramatically increased, economy-wide, no longer holds. The apparent rise in markups turns out to be driven almost entirely by a single sector, and even there it stems largely from an accounting artifact that distorts the estimates for firms in that sector. When this sector is excluded, the increase in average markups is modest.

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There is a large and growing body of literature that critiques the methods and assumptions in DLEU, generally finding smaller markup trends after applying various proposed methodological corrections (Traina, 2018; Edmond et al., 2023; Foster et al., 2024; Demirer, 2025). Given the magnitude of DLEU's original findings, one might expect some increase in markups to survive these corrections. This paper takes a different approach: rather than challenging DLEU's methods, it applies them as-is to the full, unselected dataset that DLEU describes. This change dramatically reduces DLEU's baseline finding, suggesting that, in the full sample, the proposed methodological corrections in this literature may be sufficient to overturn the finding of rising markups altogether. To take one concrete example, Edmond et al. (2023) argues that weighting by input costs (rather than sales) produces a more correct measure of the average markup. When we apply input-cost weights to the full sample, we find little to no change in markups (see Figure C.3).

Contrary to DLEU, the full Compustat sample also reveals that within-firm markups have been declining over time – a pattern inconsistent with a broad deterioration in competition, and instead suggesting that competition has been intensifying for existing firms. Instead, increases in the average markup have been driven by a reallocation of economic activity toward higher-markup firms and industries. An external robustness analysis using Census data for the manufacturing sector also fails to support a large increase in average markups. Taking all of these findings together, we conclude that the DLEU methodology and data, properly applied as described in the original article, do not support the claim that market power has dramatically increased, economy-wide, in recent decades.

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Appendix Materials

A   Production Function Estimation

To recover markups, we estimate production functions using the regression model of
DLEU. The key parameters of interest are the elasticities of output with respect to COGS.
The regression model for estimating these parameters is described in the DLEU ap-
pendix, but the publicly provided replication package does not contain estimation code
for this purpose – instead, the public replication package takes as given the estimated
output elasticities, which are treated as data. Thus, we also rely on additional code
provided to us by one of the authors that estimates these parameters. In this appendix,
we describe the model and its implementation.

To start, DLEU specifies a Cobb-Douglas production function for the baseline speci-
fication. For firm i and year t,

$$q_{it} = \theta_t^V v_{it} + \theta_t^K k_{it} + \omega_{it} + \epsilon_{it} \tag{A.1}$$

where q_{it}, v_{it}, and k_{it} are log output, the log quantity of the variable input, and log
capital, respectively, ω_{it} is a persistent productivity shock that is known to the firm
when it chooses v_{it}, and ϵ_{it} is a productivity shock that is realized after input decisions
are made. The parameters, θ_t^V and θ_t^K are output elasticities.

Compustat provides revenue and expenditures, rather than quantities. Adding and
subtracting prices obtains the following conversion:

$$p_{it} + q_{it} = \theta_t^V \left(p_{it}^V + v_{it} \right) + \theta_t^K \left(p_{it}^K + k_{it} \right) + \omega_{it} + \epsilon_{it}^* \tag{A.2}$$

where the left-hand side is log revenue ($p_{it} + q_{it}$), the right-hand side depends on log
expenditures ($p_{it}^V + v_{it}$ and $p_{it}^K + k_{it}$), and the unobservables include a wedge between
the output and input prices, as $\epsilon_{it}^* \equiv \epsilon_{it} + p_{it} - \theta_t^V p_{it}^V - \theta_t^K p_{it}^K$.

DLEU maintains the assumption of Markov transitions for the persistent productivity
shock: $\omega_{it} = g(\omega_{it-1}) + \xi_{it}$. They also assume that investment is monotonic in produc-
tivity and capital, allowing for the expression: $\omega_{it} = h_t(i_{it}, k_{it}, z_{it})$, where $h_t()$ is referred
to as the control function, and z_{it} contains control variables that DLEU states are in-
tended to control for the wedge between input and output prices.[17] In the code that we

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[17]Appendix A (p. 632) states, for z_{it}, "we consider market share, measured at various levels of aggre-
gation (two, three, and four digit), to take into account additional variation in output and input markets."

were supplied, control variables are not used in the baseline specification. We therefore omit z_{it} from the model hereafter. We also omit ϵ_{it}^* in order to better track the DLEU regression model though, absent z_{it}, it should still be present.

Placing these restrictions into equation (A.2), and substituting variable names, the model then becomes:

$$\log(Sales_{it}) = \theta_t^V \log(COGS_{it}) + \theta_t^K \log\left(Capital_{it}\right) + \beta_{1t} \log\left(Investment_{it-1}\right)$$
$$+ \beta_{2t} \log\left(Capital_{it-1}\right) + \beta_{3t} \log\left(Capital_{it-1}\right)^2 + \xi_{it} \quad \text{(A.3)}$$

where the control function is specified as being linear in investment and quadratic in capital. DLEU estimates the production function of equation (A.3) using 2SLS, treating COGS as an endogenous regressor. The excluded instrument is lagged COGS. The orthogonality conditions are provided in equation (27) of DLEU Appendix A.

As we have specified the model, the coefficients are time-varying, and DLEU also lets them vary across 2-digit NAICS sectors. Depending on the sector, constant coefficients are imposed before either 1972 or 1985. For each subsequent year, the regression samples are constructed using observations from within two years, i.e., they use 5-year rolling samples. The 2SLS regression is then estimated separately on each of these samples.

B   Additional Issues and Discrepancies

B.1   Sample Restrictions

In addition to the two discrepancies described in the main text, we have identified two additional discrepancies between the sample restrictions described in the article and those used in the code. They do not meaningfully affect the results, but we report them for completeness. First, the DLEU article states that observations in the top and bottom percentiles of the ratios of COGS to Sales and SG&A to Sales are dropped. Only the former screen appears in the code. We use both screens in our full sample results. Second, the DLEU code drops observations in the top and bottom percentiles of the ratios of COGS to variable cost and COGS to total cost, where variable cost is defined as the sum of COGS and Capital and total cost is defined as the sum of COGS, Capital, and SG&A. These screens are not described in the article, and we do not use them for our full sample results.

Even with the replication package and the additional code provided by one of the authors, we are unable to precisely replicate the main results of DLEU without relying on an additional dataset provided by one of the authors that lists explicitly the firm-years included in their analysis. The additional dataset features approximately five thousand fewer firm-year observations than what we obtain using the code that ostensibly creates the dataset. Specifically, the replication code generates a dataset with 248,390 observations, while the article claims 247,644 observations (Table B.1 in DLEU), and the dataset provided by the authors contains 242,645 observations.

B.2   Figures in DLEU

We identified two mistakes in the code used to generate figures. First, Figure A.1 in DLEU reports that the OP and ACF output elasticities are similar. However, the line labeled "ACF" erroneously provides the baseline OP output elasticities and the line labeled "OP" provides output elasticities using the same OP approach, but with a more flexible control function. While the ACF code we were provided does not provide reasonable estimates for a few years, the overall pattern across the years is similar to the baseline model.

Second, Figure XVIa in DLEU examines COGS-weighted average markups. The code that generates the figure contains an error. Specifically, the code averages the cost-share based markup estimate rather than the baseline estimate. The dashed purple line in Figure C.3 contains the corrected COGS-weighted average markup for the DLEU sample. It increases by about five percentage points less than what is reported in DLEU.

C Additional Figures and Tables
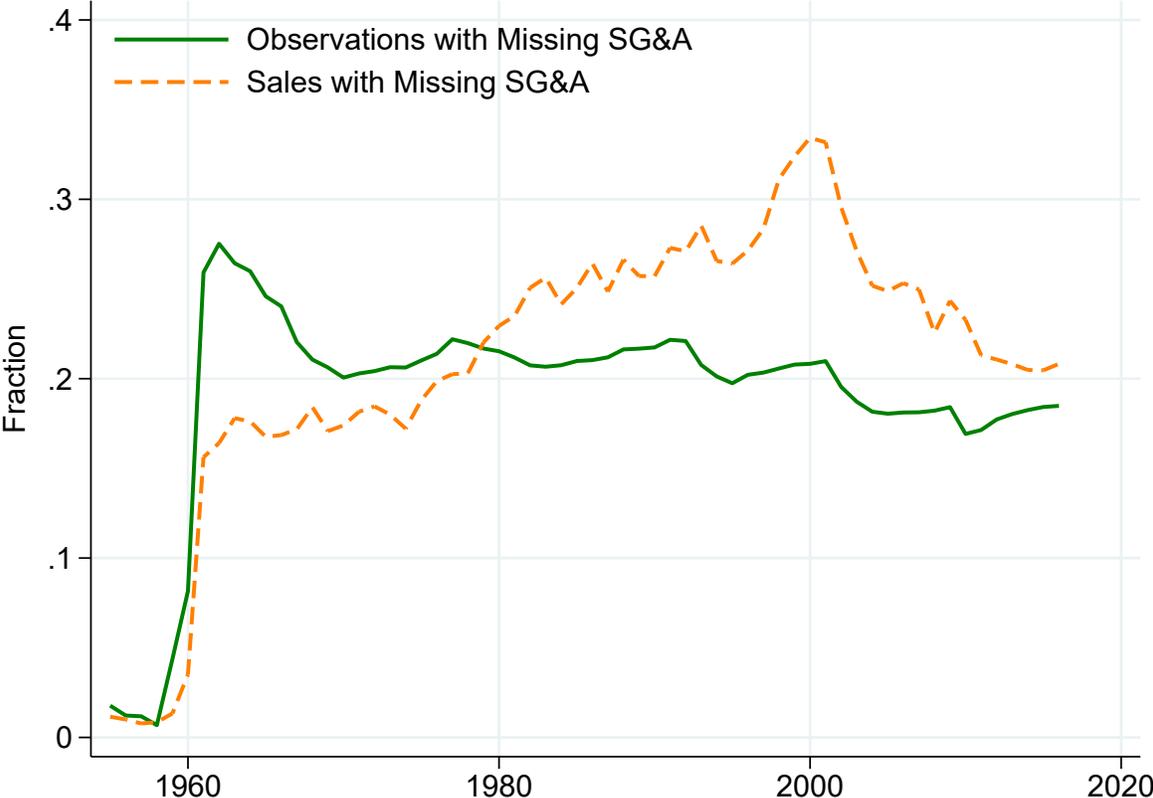
Figure C.1: Summary of Missing SG&A Values over Time

Notes: The figure plots the fraction of otherwise usable observations have missing values for SG&A over the sample period, both unweighted (solid green line) and weighted by sales (dashed orange line).
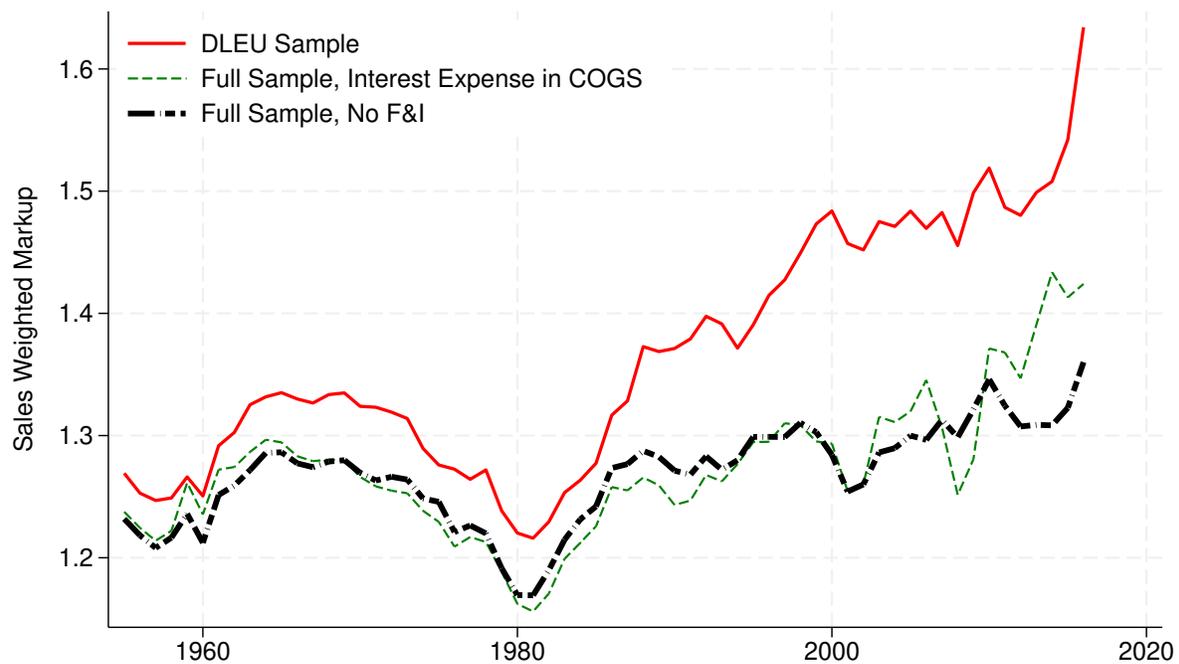
Figure C.2: Markups Estimates that Incorporate Interest Expense in COGS

Notes: The figure plots estimates of the sales-weighted average markup over time. The solid red line is a replication of Figure I of DLEU, which uses a restricted sample. The black dash - dot line uses the full sample except for the F&I sector. The dashed green line uses the full sample, including F&I, but incorporates a data correction that adds interest expense to COGS.
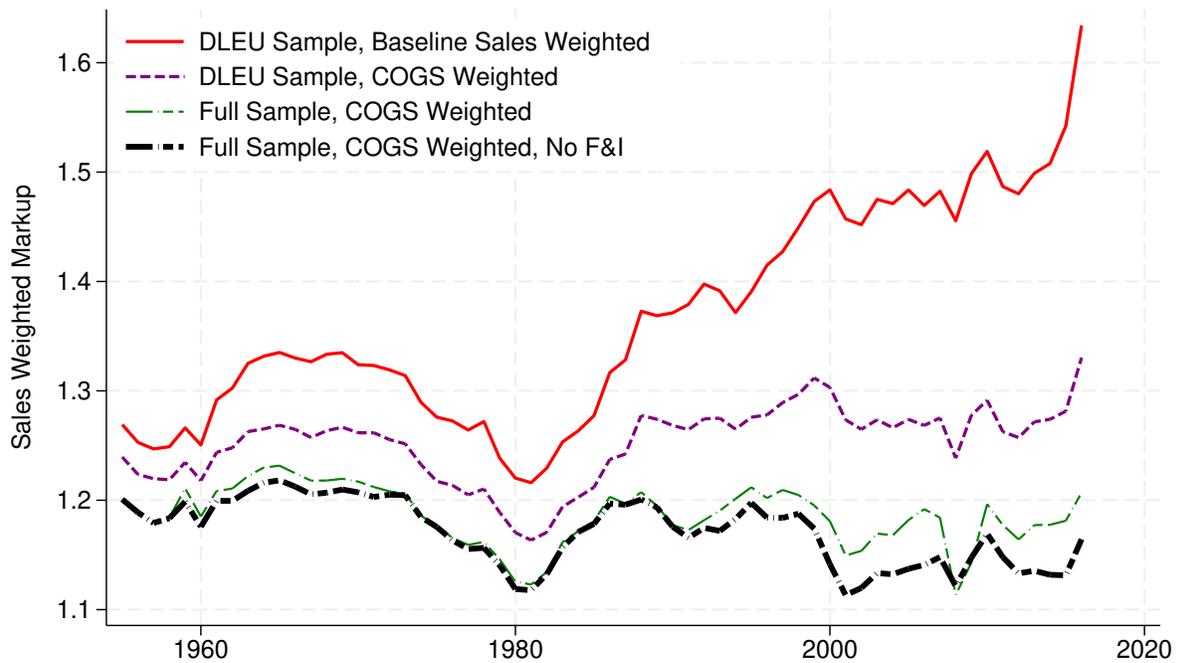
Figure C.3: COGS-Weighted Average Markups

Notes: The figure plots estimates of the sales-weighted and COGS-weighted average markup over time. The solid red line is a replication of Figure I of DLEU, which uses a restricted sample. The dashed purple line is the DLEU sample with COGS weighting (corrected version of Figure XVI(A) of DLEU). The green dash - dot line uses the full sample with COGS weighting. The black dash - dot line is the full sample excluding F&I, with COGS weighting.

Table C.1: Summary of Missing SG&A Values by 2-Digit NAICS Code

NAICS	Definition	Share of Sales (%)	Missing SG&A (%)	
			Observations	Sales
11	Agriculture, Forestry, Fishing and Hunting	0.15	12.19	1.83
21	Mining, Quarrying, and Oil and Gas Extraction	3.56	9.09	23.27
22	Utilities	5.65	90.82	94.37
23	Construction	0.55	10.93	7.77
31	Manufacturing	4.97	4.97	8.42
32	Manufacturing	18.13	15.50	7.32
33	Manufacturing	20.22	4.27	8.44
42	Wholesale Trade	4.06	7.38	5.82
44	Retail Trade	3.95	8.45	9.74
45	Retail Trade	4.91	5.33	6.50
48	Transportation and Warehousing	3.07	41.40	54.35
49	Transportation and Warehousing	0.66	31.78	79.06
51	Information	8.69	19.61	32.60
52	Finance and Insurance	15.23	38.85	50.40
53	Real Estate and Rental and Leasing	0.70	41.60	34.05
54	Professional, Scientific, and Technical Services	1.34	11.53	8.94
56	Administrative and Support and Waste Management and Remediation Services	0.61	11.12	7.64
61	Educational Services	0.08	5.63	2.14
62	Health Care and Social Assistance	0.83	24.20	28.64
71	Arts, Entertainment, and Recreation	0.11	26.36	9.61
72	Accommodation and Food Services	0.81	14.75	21.89
81	Other Services (except Public Administration)	0.08	6.74	2.93
99	Unclassified	1.63	17.75	18.20

Notes: Compustat assigns each firm-year observation to a 2-digit NAICS code. The table provides, for each code, (1) the share of total Compustat sales accounted for by firm-year observations assigned to the code, (2) the fraction of firm-year observations assigned to the code for which SG&A is missing, (2) and the proportion of all sales of firm-year observations assigned to the code that are DLEU to firms-year observations for which SG&A is missing.