Fading Stars

By Germán Gutiérrez and Thomas Philippon*

A large and growing literature emphasizes the role of large firms in the economy. Large firms dominate exports, foreign direct investment, and research and development. Previous research has shown that, over the past 20 years, US firms' profit margins have increased and U.S. industries have become more concentrated.[1] Two leading explanations have been proposed. One is that profits and concentration reflect the increasing efficiency of industry leaders (Autor et al., 2017). Another view is that domestic competition has decreased and that leaders have become more entrenched (Gutiérrez and Philippon, 2017). The two explanations are not mutually exclusive, in the sense that leaders can become more efficient and more entrenched at the same time – for instance if they use their superior information technologies and intangible assets as barriers to entry. Fundamentally, however, the two views have opposite implications for efficiency, growth, welfare and policy.

The optimistic view is based on the idea that superstar firms are indeed becoming larger and more productive than the rest. The actual evidence, however, is weaker and more indirect than commonly acknowledged. Andrews et al. (2015) document an increased dispersion in output per worker between global "frontier" firms and "laggard" firms. In their data, however, the average frontier firm in Manufacturing has about $50 million in revenues and 74 employees (see their Table 1b). The revenues of frontier firms in Services are about $80 million. These firms are not the superstars as commonly understood. Autor et al. (2017) show that the fall in the labor share is partly explained by a composition shift towards establishments with low initial labor shares. This, by itself, does not mean that superstar firms are becoming either larger or more productive.

We look directly at super star firms over the past 60 years in the US. What we find contradicts the common wisdom. We show that: (i) super-star firms have not become larger; (ii) super-star firms have not become more productive; (iii) the contribution of super-star firms to overall productivity growth has actually *decreased* by more than a third over the past 20 years.

I. Data

We use firm-level data from the CRSP-Compustat merged database, which covers all public and some private firms in the U.S. Economy. We complement these data with three additional sources.

First, we obtain Employment, as well as Gross Output quantities and prices from the BEA GDP by Industry accounts. These data cover 20 sectors since 1948 and 62 industries since 1977. We use these data to estimate industry-level labor productivity and to deflate Compustat sales when computing firm-level labor productivity.

Second, we obtain domestic and foreign sales at the industry-level from the BEA's Data on the Activities of U.S. Multinational Enterprises. Industry segments roughly follow the 62 industries in the GDP by Industry accounts. Last, we gather payroll, employment and sales for the top 4 firms in each industry and the industry as a whole from the U.S. Economic Census concentration accounts.

We map these industries to BEA segments

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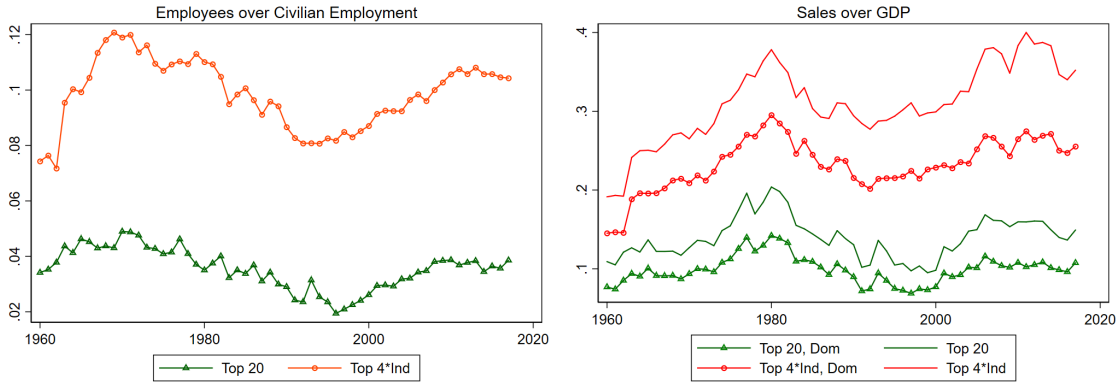
[1] Furman (2015) and Grullon et al. (ming) argue that concentration and profit rates have increased across most U.S. industries. Barkai (2017) finds an increase in excess profits. Gutiérrez and Philippon (2017) link the decline in competition to the decrease in corporate investment. Crouzet and Eberly (2018) link concentration with the rise in intangible investment.

FIGURE 1. FOOTPRINT OF THE STARS



Note: See text for definitions. For right panel, "Dom" means domestic sales, while "Top 20" means consolidated (global) sales of Top 20 firms by market value.

and use the data to compute the labor-quality adjustment and perform robustness tests on the contribution of stars. Gutiérrez and Philippon (2019) provides additional details on data sources and definitions.

II. Footprint of the Stars

We start with some simple descriptive statistics. Figure 1 shows the foot print of stars in the U.S. economy. We define star firms in two ways:[2]

1) **Top 20 firms by market value of equity in any given year (Top 20):** These are economy-wide stars. The industry composition varies significantly over time. The stars of the 1950s were often manufacturing firms (GM, GE). IBM appears in the 1960s. Microsoft and Walmart appear in the 1990s. And of course Google, Amazon and Facebook in recent years.

2) **Top 4 firms by market value of equity within each BEA industry (Top 4 by Industry)**: These are industry stars. By construction, the industry composition by number of firms is constant. These industry stars include most of the economy-wide stars unless a national star happens to be the fifth in an industry. This happens early in the sample, especially when including Oil.

The left panel of Figure 1 shows the shares of stars in civilian employment. The Top 20 employed about 4% of US workers in the 1960s. It decreased to about 2% in the late 1990s and grew back afterwards, essentially because of the arrival of Walmart among the stars. The Top 4 by Industry is relatively more stable around 10%. Clearly, as far as employment is concerned, the stars are not becoming larger.[3]

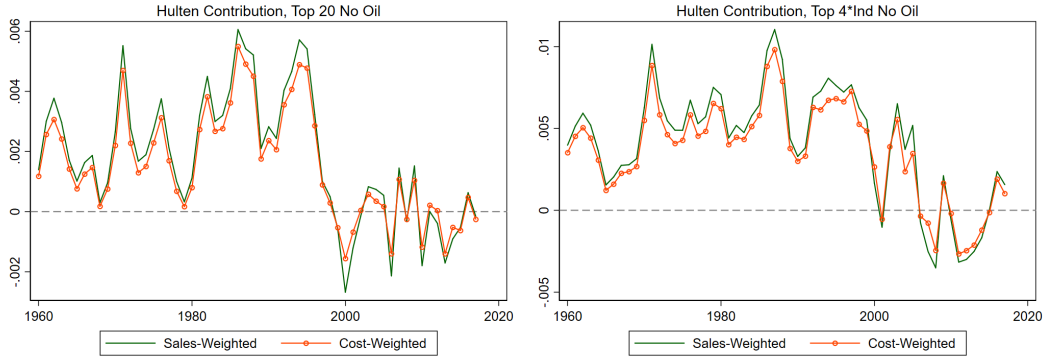
The right panel of Figure 1 shows the shares of stars in sales over GDP. For each group of stars, we report the consolidated sales and the domestic sales, computed by subtracting the industry average share of foreign sales. The figure shows that, contrary to common wisdom, the stars have not become larger in terms of sales. For the industry stars, the foreign sales adjustment is quantitatively important.[4]

[2]See Gutiérrez and Philippon (2019) for results using sales to define stars. Our conclusions remain stable.

[3]This is consistent with prior research (e.g., Autor et al. (2017) report stable employment concentration).

[4]Figure 1 in Gabaix (2011) reports that sales of the top 50 firms are 24% of GDP, while the sales of the top 100 firms are 29% of GDP. These are consolidated firms and about 1/3 are exporters. Moreover the share exported has grown over time, so we cannot rely on these numbers to assess the evolution of large firms. One should either scale global sales by global GDP, or domestic sales by domestic GDP, which is what we do in this paper.

FIGURE 2. HULTEN CONTRIBUTIONS OF THE STARS



Note: See text for definitions. Green line uses sales/GDP as Domar weight. Red line uses cost/GDP as Domar weight.

Fact 1. *The economic footprint of the stars has not increased.*

III. Hulten Contribution

The classic Theorem of Hulten (1978) – recently extended by Baqaee and Farhi (2018) – shows that the contribution of an individual firm to aggregate productivity growth equals its own productivity times its Domar weight. Figure 2 shows that the Hulten contribution of the stars has collapsed since 2000. The Hulten contribution is defined as the Domar weight times the firm level increase in log sales per employee. It is a "within" contribution since it uses the initial Domar weight times future productivity growth:[5]

$$g_t^{h*} \equiv \sum_{i \in S_t} \omega_{i,t} g_{i,t}^z,$$

where S_t denotes the set of star firms, as defined earlier. The Domar weight $\omega_{i,t}$ of firm i at time t is based on domestic sales: $\omega_{i,t} \equiv \frac{(1-e_{i,t})sales_{i,t}}{GDP_t}$, and $e_{i,t}$ is the share of sales of foreign affiliates. As a robustness check we also use total costs instead of sales. Productivity growth is averaged over 3 years:

$$\begin{aligned} g_{i,t}^z &\equiv (\Delta \log z_{i,t} + \Delta \log z_{i,t+1} + \Delta \log z_{i,t+2})/3 \\ &= (\log z_{i,t+2} - \log z_{i,t-1})/3, \end{aligned}$$

where $z_{i,t} \equiv \frac{sales_{i,t}}{q_{i,t} n_{i,t}}$ where sales are deflated using BEA gross-output price indices at the industry-level, n is the number of employees and q is a labor quality adjustment based on relative wages. We obtain the average wage of employees in the top 4 firms in each industry from the census and we define q as the ratio to the average wage in the industry. This adjustment makes only a small difference to the Hulten component, but it is important for the reallocation measure, and we introduce it here to be consistent.

Figure 2 shows that super stars have played a key role in making the economy grow. Historically, they have contributed half a percent to total labor productivity growth (based on industry stars, right panel). In recent years, however, their "within" contribution to total labor productivity growth has been essentially zero. The result is the same if we use sales or total cost (appropriate under market power) as Domar weights.

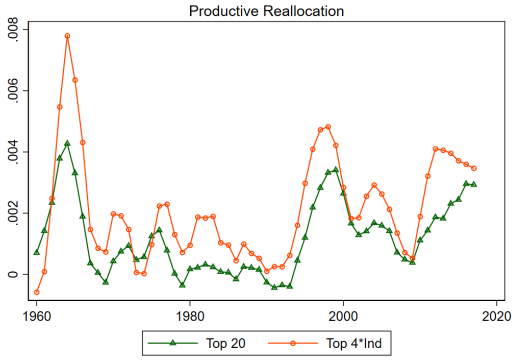
Fact 2. *The Hulten contribution of the stars has dropped from about 50 basis point per year to zero since 2000.*

IV. Reallocation

The Hulten contribution assumes that revenue productivities are equalized across firms. If the stars have higher revenue productivity than other firms, then they can contribute to productivity growth simply by drawing in more resources. This is what the

[5] Our results hold with or without oil companies, but oil shocks in the 1970s create a lot of noise in reallocation measures so we choose to exclude oil and gas in our benchmark figures.

FIGURE 3. REALLOCATION CONTRIBUTION OF THE STARS



Note: See text for definitions. Reallocation productivity defined as average of Compustat and Labor Quality Adjusted measures.

literature calls the reallocation effect, and the Hulten contribution would not capture it. We define the reallocation contribution of the stars as

$$g_t^{r*} \equiv \sum_{i \in S_t} (z_{i,t} - \bar{z}_{I,t})\, g_{i,t}^n,$$

where $\bar{z}_{I,t}$ is labor productivity in industry I at time t. The growth of employment is averaged over 3 years

$$\begin{aligned} g_{i,t}^n &\equiv (\Delta \log n_{i,t} + \Delta \log n_{i,t+1} + \Delta \log n_{i,t+2})/3 \\ &= (\log n_{i,t+2} - \log n_{i,t-1})/3. \end{aligned}$$

Recall that $z_{i,t} \equiv \frac{sales_{i,t}}{q_{i,t} n_{i,t}}$ is quality adjusted. Gutiérrez and Philippon (2019) discusses two possible quality adjustments in detail. One possibility is to control for wages at the top firms relative to their industries. Alternatively, we could assume that stars poach their extra workers from other large firms. For simplicity, we use the average of the two adjusted measures.[6]

Figure 3 shows the reallocation contribution of the stars. The reallocation contribution has become quite significant since the mid 1990s, bringing about 20 basis point of productivity growth on average. This happens at the same time as the Hulten contribution decreased.

Fact 3. *The reallocation contribution of stars has increased modestly.*

V. Total Contribution of Stars

Figure 4 shows the total contribution, Hulten plus reallocation, of the stars to US labor productivity growth. The blue and green lines are based on Compustat. From 1960 to 2000, it was about 72 basis point per year on average for the industry stars (33 bps for the Top 20). After 2000 the contributions are only 43 basis points (19 bps for the Top 20).

One might worry that large private firms are missing from Compustat. The gray line therefore uses the Census' Concentration series for non-manufacturing industries, which report sales and employment for the Top 4 firms by industry. The Census data exhibits similar patterns as the Top4*Ind Compustat series. The level of contributions is lower because it includes a subset of industries. In fact, restricting the Compustat sample to the industries covered by the Census, the series are very close to each other (see Gutiérrez and Philippon (2019)).

Fact 4. *The contribution of star firms to US labor productivity has decreased by about 40% since 2000, and it has shifted from within firm productivity growth to reallocation driven growth.*

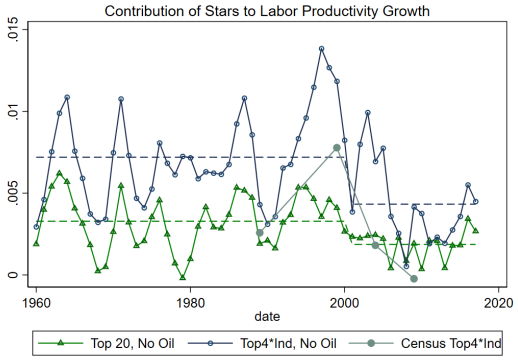
Of course, total labor productivity growth has also fallen. In Gutiérrez and Philippon (2019), we compare the contribution of stars and non-stars. Non-stars contributed more than twice as much as stars before 1975 and from ∼1990 to ∼2010 (about 200 bps), and slightly more than stars from 1975 to 1985 (about 100 bps). Since 2013, however, the contribution of non-stars also collapsed, resulting in the negligible aggregate productivity growth observed since.

VI. Conclusion

Our results challenge the common wisdom about the stars of the new economy. There

[6] One issue with this measure of growth through reallocation is that it does not distinguish between organic growth and external growth. In the case of M&A, it might not be valid to apply the initial productivity of the acquirer to the employees of the target, at least not in the short run. This can affect the decomposition of growth into the 'wihin' part and the 'between' reallocation part. We leave this question for future research.

FIGURE 4. TOTAL CONTRIBUTIONS OF THE STARS



Note: the figure plots the contributions of star firms to US labor productivity growth. The dashed lines show the averages for 1960-2000, and 2001-2016. Top 20 averages: 33 bps down to 19bps. Top 4 by Industry averages: 72 bps down to 43bps.

have always been star firms in the U.S., and they have always been large and productive. What we show is that today's stars are no match for yesterday's stars.

The next question, of course, is why star firms are not contributing as much as they used to. We do not have a definite answer but it is clear that something changed around 2000. Perhaps ideas are becoming harder to find as in Bloom et al. (2018). Or perhaps declining competition and rising barriers to entry allowed incumbents to reduce investment and innovation, as in Gutiérrez and Philippon (2017).

In Gutiérrez and Philippon (ress), we find that the free entry condition starts to break down around 2000. The elasticity of entry with respect to profits and/or Tobin's Q has declined over the past 30 years and is now zero. Davis (2017) argues that barriers to entry arise from excessively complex regulations. Indeed, we find rising barriers to entry from lobbying and regulations. We argue that large firms have effectively managed, via lobbying, to partly shield themselves from competition. Facing less competition, their incentives to invest and innovate decrease. Indeed, the investment rate of large and profitable firms has decreased, as their payout rate (dividends and stock buybacks) has increased. This is presumably part of the explanation.

REFERENCES

Andrews, D., C. Criscuolo, and P. N. Gal (2015). Frontier firms, technology diffusion and public policy: Micro evidence from oecd countries. *OECD Working Papers*.

Autor, D., D. Dorn, L. F. Katz, C. Patterson, and J. V. Reenen (2017). The fall of the labor share and the rise of superstar firms.

Baqaee, D. R. and E. Farhi (2018). The macroeconomic impact of microeconomic shocks: Beyond hulten's theorem.

Barkai, S. (2017). Declining labor and capital shares. University of Chicago.

Bloom, N., C. I. Jones, J. V. Reenen, and M. Webb (2018). Are ideas getting harder to find?

Crouzet, N. and J. Eberly (2018). Intangibles, investment, and efficiency. *AEA Papers and Proceedings*.

Davis, S. (2017). Regulatory complexity and policy uncertainty: Headwinds of our own making. Booth Working Paper.

Furman, J. (2015). Business investment in the united states: Facts, explanations, puzzles, and policies.

Gabaix, X. (2011). The granular origins of aggregate fluctuations. *Econometrica 79*.

Grullon, G., Y. Larkin, and R. Michaely (Forthcoming). Are us industries becoming more concentrated? *Review of Finance*.

Gutiérrez, G. and T. Philippon (2017). Declining competition and investment in the u.s.

Gutiérrez, G. and T. Philippon (2019). Fading stars: Measuring the contribution of superstars to productivity growth.

Gutiérrez, G. and T. Philippon (In progress). The failure of free entry.

Hulten, C. R. (1978). Growth accounting with intermediate inputs. *Review of Economic Studies 45*(3), 511–518.