

Intangibles, Investment, and Efficiency

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The severity of the global financial crisis tended to obscure lower frequency macroeconomic trends over the last several decades. Recent work examining the slow recovery from the financial crisis emphasizes trends in productivity and investment that predate the crisis itself (Gutiérrez and Philippon 2017*b*, Alexander and Eberly 2017, Fernald et al. 2017). In particular, weakening investment amid strong cash flow and valuation is a feature of both the early 2000s and the post-crisis period. At the same time, the distribution of economic activity seems to be changing, as evidenced by increasing concentration of business output and the falling labor share (Autor et al. 2017).

Many of these trends manifest with particular strength in the retail sector. Retail accounts for a large share of the increase in concentration; as shown in Figure 1, excluding retail firms nearly eliminates the upward trend in aggregate concentration among publicly traded firms.¹ As in the rest of the economy, capital investment in retail remains weak relative to the strength in cash flow and valuations. Yet the retail sector has invested heavily in new business practices, such as inventory management and logistics, that have led to enhanced productivity (Foster, Haltiwanger and Krizan 2006). We show that intan-

gible capital, in particular, is associated with this higher productivity, both over time and across sub-industries. This intangible capital may reflect the adoption of more efficient business practices, as well as the growing value of brands. Both of these changes can improve business performance (cash flow and valuation) without the installation of new physical capital. The contribution of intangible investment to productivity growth may thus help explain the apparent contradiction between strong cash flows and valuations, on one hand, and weak capital investment on the other. In addition, the efficiency gains associated with intangible investments may drive greater industry concentration, particularly if these gains are largest among industry leaders. Hence, the retail sector is a prominent example of an industry in which efficiency gains associated with intangible investments could account for both the ongoing weakness of physical capital investment and the rise in business concentration.

I. Concentration, productivity and markups in the retail sector

The retail sector is a key contributor to the well-documented increase in economy-wide concentration in the United States (Autor et al. 2017). From 1995 to 2015, the Herfindahl Index (HHI) of public firms' sales in the Fama-French retail sector rose from 0.13 to 0.36, as shown in Figure 2.² In the online appendix we document that this phenomenon is not driven by a particular sub-sector, but instead occurs across

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¹In our measure of concentration — the sales-weighted average HHI of sales across NAICS 3-digit sectors, as in (Gutiérrez and Philippon 2017*b*) — a large part of the remaining increase in concentration is accounted for by the oil and gas sectors. These changes are largely driven by a few mergers and acquisitions. See the online appendix for more detail on the oil and gas sector.

²The Fama-French retail sector is primarily comprised of firms in the NAICS 2-digit sectors 44 and 45. These 2-digit sub-sectors accounted for over 99.9% of total sales in the Fama-French retail sector in 2010. In that year, the Fama-French retail sector accounted for 18.4% of total sales of US public firms, the single largest contributor to total sales in the Fama-French 49 industrial classification.



FIGURE 1. CONCENTRATION AMONG PUBLICLY TRADED US FIRMS.

Note: The figure reports the average HHI of sales across NAICS 3-digit sectors, weighted by their respective share of total sales. The data is from the Compustat-CRSP merged database and thus contains only publicly traded firms; see online appendix for details on the sample construction. The retail sector are firms belonging to retail group in the Fama-French 49 (FF-49) industrial classification; oil and gas are firms belonging to the FF-49 petroleum and natural gas group.

most NAICS 3-digit sub-sectors within retail. For instance, the sales HHI for General Merchandise retailers (big-box stores, such as Walmart) doubled over these two decades, and tripled for non-store retailers (online stores, such as Amazon).

Two broad interpretations for the economy-wide rise in concentration have been put forward. One focuses on market power: higher concentration could reflect a decline in competitiveness within US industries (Gutiérrez and Philippon 2017a, De Loecker and Eeckhout 2017). The other interpretation focuses on productivity. Differences in productivity between firms may lead to a reallocation of demand toward the highest-productivity firms as goods become more substitutable (Autor et al. 2017). Alternatively, rising productivity differences within industries could also lead to higher concentration.

The former hypothesis suggests that the rise in concentration is worrisome, as it may be associated with higher markups and lead to low investment. The latter hypothesis, by contrast, suggests that concentration may be the efficient byproduct of un-

derlying technological changes. The tension between market power and efficiency is particularly relevant to the retail sector, which sets prices for a large number of consumer goods, and has also undergone substantial technological and organizational changes over the period (Foster, Haltiwanger and Krizan 2006).

The top row of Figure 2 reports trends in two measures of productivity among publicly-traded (Compustat) firms in the retail sector, over the period coincident with the rise in concentration. The top left panel shows the average increase in revenue per employee, a proxy for labor productivity, across sub-sectors in retail. The average ratio is first computed within sub-sectors (weighting by firms' sales), and then averaged across sub-sectors (weighting by the sub-sector's share of total retail sales). Expressed in 1990 prices, this ratio rose from approximately \$120 000 to \$200 000 per employee, a two-thirds increase over the period. Moreover, this increase persists through the Great Recession. Concurrently, sector-wide measures of overall productivity (reported in the top right panel) also rose by almost half over the same pe-

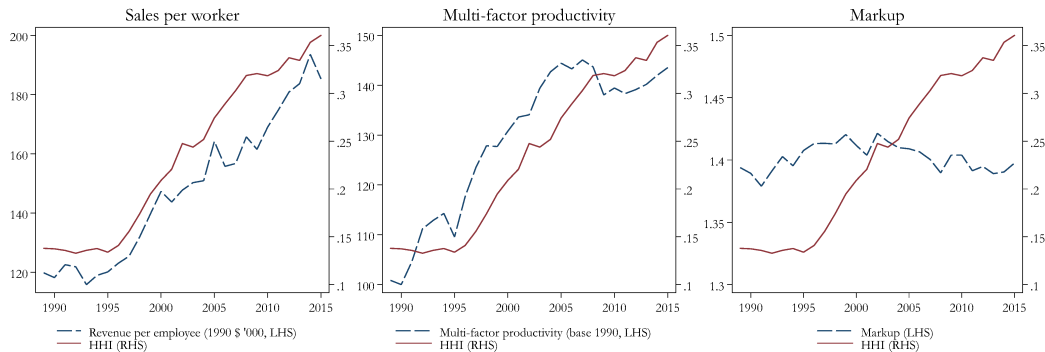


FIGURE 2. CONCENTRATION, PRODUCTIVITY AND MARKUPS IN THE RETAIL SECTOR.

Note: Revenue per employee, markups and inventory turnover are obtained from Compustat data. Multi-factor productivity is obtained from the BLS KLEMS database. The sample contains only firms from the retail sector. See online appendix for details on the sample construction and on the construction of the variables; inventory turnover, in particular, is defined by the ratio of the inventory stock to the monthly sales.

riod, far outpacing productivity gains in other sectors of the economy over the same period.³ These increases in productivity closely track the increase in concentration: the simple correlation between multi-factor productivity, and the average HHI of sales (the two lines of the top right panel) is 0.89; the correlation between average revenue per employee and the average HHI of sales is 0.97 (the top left panel).

While these efficiency measures increase along with concentration, average retail markups at publicly traded firms — measured, in the bottom right panel of Figure 2, as the ratio of sales to cost of goods sold, following the work of De Loecker and Eeckhout (2017) —, by contrast, show no upward trend. This measure of markups has been fairly stable since the early 1990’s, despite the more than two-fold increase in sales concentration. As shown in the online appendix, markups at the largest retail firms have, if anything been somewhat declining since the late 1990’s, increasingly so in specific sub-sectors such as online retailers.

II. Efficiency and the investment gap

At first blush, the data thus seem consistent with the view that in the retail sec-

³Multi-factor productivity for the retail sector is obtained from KLEMS.

tor, increased concentration might simply reflect higher productivity. We next show that the story is not that simple.

The increase in measured productivity is the consequence, at least in part, of important logistical and organizational changes at large retail chains. For example, as the bottom left panel of Figure 2 indicates, inventory needs (measured as the ratio of balance sheet inventory to annual sales, expressed in months), dropped substantially in the early part of the sample, from approximately 1.8 to 1.3 months, and stabilized since. During this period, the distribution of goods in the retail sector also evolved in several waves, starting with the rise of big-box stores (Walmart), followed by online retailing and marketplaces (Amazon).

While the evidence for productivity improvements appears compelling, the question remains: if productivity rose in retail, why has capital investment been so sluggish? As recently pointed out by Gutiérrez and Philippon (2017b) and Alexander and Eberly (2017), the economy-wide investment rate has been low, both relative to historical levels and relative to measures of investment fundamentals, such as cash flow and Tobin’s Q.

Figure 3 shows that the retail sector is characterized by the same phenomenon of sluggish investment. The figure reports the

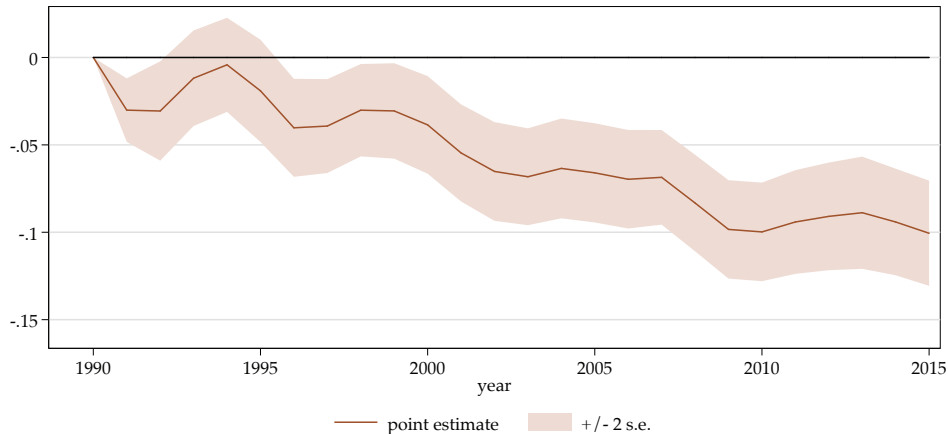


FIGURE 3. THE SHORTFALL OF PHYSICAL INVESTMENT IN THE RETAIL SECTOR.

Note: See text for a definition of the investment shortfall measure. Standard errors are clustered at the firm level. The sample contains only firms from the retail sector under the Fama-French 49 classification. The data is from the Compustat-CRSP merged database; see appendix for details on sample selection criteria and variable definitions.

estimated time effects in the OLS regression:

$$y_{i,t} = \alpha_i + \delta_t + X'_{i,t}\beta + \epsilon_{i,t},$$

where i is a firm, t is a year, $y_{i,t}$ is the ratio of capital expenditures to assets, and $X_{i,t}$ is a vector that contains the ratio of cash flow to assets and a measure of Tobin's Q , both lagged one year. The time effects are a measure of the shortfall of investment, relative to the level implied by Q and cash flows (and firm fixed effects). Roughly at around the time that concentration starts rising, around 1995, the shortfall in investment increases. By the end of the sample, it amounts to a cumulative 10 percentage point gap, relative to the levels of the early 1990's. If, as the behavior of markups suggests, this investment gap is not due to a "wedge" between marginal and average (Tobin's) Q induced by rising market power, what other mechanisms could account for it?

III. Intangibles and efficiency

While physical capital investment remained sluggish as productivity rose, intangible capital rose markedly. The left panel of Figure 5 shows that the increase in rev-

enue per employee in the sector occurred in lockstep with a large increase in the share of intangible to total assets at retail firms. Here, the share of intangible assets is computed using intangibles reported on balance sheet by firms, averaged across firms in the retail sector. Intangibles went from 5 percent to 18 percent of total assets of the sector, an increase of 13 percentage points.

The right panel of Figure 4 repeats the exercise within retail sub-sectors. An observation is a NAICS 3-digit sub-sector/year. For each observation, both the ratio of revenue per employee, and the intangible share are a sales-weighted average across firms in that NAICS 3-digit sub-sector/year. The simple correlation between the log of these two ratios is 0.49; a simple OLS regression with industry-clustered standard errors indicates that this correlation is significant even within sub-sectors in retail.⁴

As an accounting measure, the increase in

⁴The online appendix reports the share of capitalized R&D expenditures and capitalized SG&A expenditures in total assets, as constructed by Peters and Taylor (2017), as an alternative measure of intangible investment. The former measure shows a sharp increase over the sample period. The latter is declining, which may in part reflect the lower labor share among large retail firms, as some firms allocate their wage expenses to SG&A, instead of cost of sales.

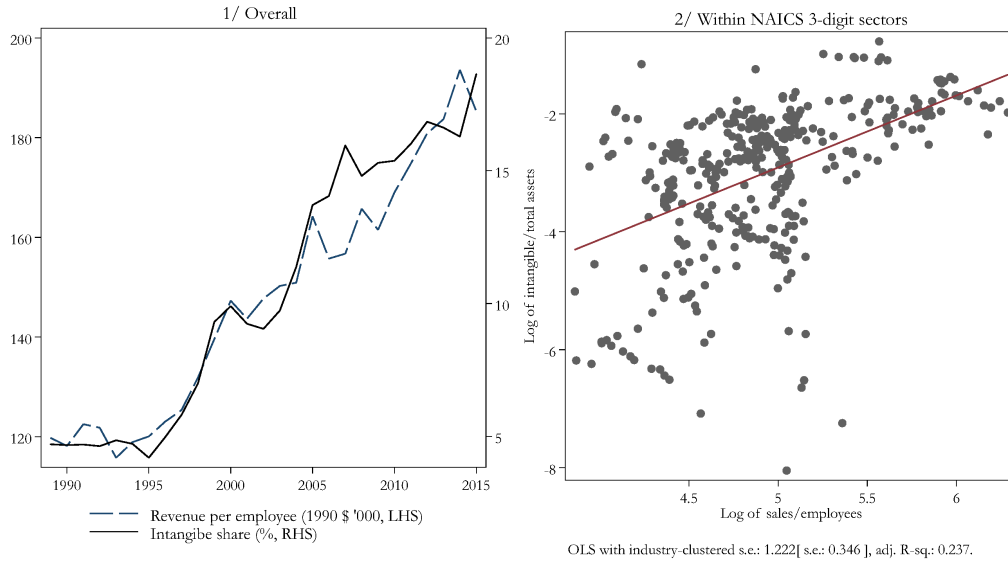


FIGURE 4. INTANGIBLE INVESTMENT AND EFFICIENCY IN THE RETAIL SECTOR.

Note: The left panel overlays the average increase in the ratio of employee to sales across NAICS 3-digit retail sectors, with the increase in the ratio of intangible to total assets. The right panel is a scatterplot of the ratio of employee to sales against the ratio of intangible to total assets. The data is from the Compustat-CRSP merged database; see appendix for details on the sample construction and on the construction of regression variables.

the (real) value of the *stock* of intangibles must reflect acquisition activity by incumbent retail firms, since acquisitions drive the realization of intangible capital on the balance sheet. But the rise in the *share* of intangibles, as a fraction of total assets, indicates that acquisitions during this period involved an increasing realization of intangibles. In the online appendix, we show that if firms in retail had kept paying the same multiple of book value for their targets as they did in the 1990-1995 period, the implied increase in the intangible share would have been 2 percentage points, rather than the 13 actually observed. Thus, over the 1995-2015 period, balance sheet intangible capital in the sector rose as acquisition values included a larger share of recognized intangible assets.

Figure 5 indicates a strong correlation between the importance of intangible capital, and the rise in productivity. However, this is not evidence of causality running from intangible investment to higher productivity. In fact, the correlation of Figure 5 may be best interpreted as resulting from an omitted variable. The nature of this omitted

variable is at the root of the question. Investment in new designs of supply and distribution networks might, as argued in the previous section, have led to productivity gains. The full value of these innovations may not be reflected in book capital assets, and instead only manifest in acquisition prices. Similarly, brand value may have become an increasingly important asset of retail firms. Brand value is costly to develop, and for accounting purposes, its value is only recognized upon acquisition by another firm. Both are examples of an omitted variable driving a link between intangible investment and efficiency. In both cases, much as certain technologies are embodied in physical assets — such as computing technology embedded in machine tools — an underlying innovation (a brand, a distribution method) may be embedded in the creation of intangible capital.

The growing role of intangible capital helps shed light on the weakness of physical investment. Increases in intangible capital may not be associated with commensurate increases in physical capital, especially if some intangibles act as substitutes

for traditional capital. (For example, Amazon’s local delivery lockers coupled with innovations in logistics displace the more burdensome creation of a retail store, complete with cashiers, floor space and warehousing facilities). In fact, aggregating intangible investment — measured as the sum of acquisitions, and R&D and advertising expenditures — together with traditional capital expenditures, the estimated investment gap reported in Figure 3 declines, from 10.0 percentage points to 2.7.⁵ More than a straightforward measurement problem, this view sees intangibles as a “missing factor” of production and revenue, measured only intermittently, but whose growing importance may be central to productivity and the rise in concentration.

IV. Conclusion

In some key respects, the experience of the retail sector since the mid-1990’s mirrors that of the economy as a whole: traditional investment has been weak relative to valuations, and concentration has been rising. In retail, these trends have been accompanied by a rise in productivity, as the sector adopted technology-driven changes in business practices. This rise in productivity coincided with the rise in concentration, suggesting that concentration might be a by-product of efficiency gains among industry leaders. Moreover, both over time, and across sub-groups of the sector, higher productivity is associated with a growing importance of intangible capital. Future research will examine more precisely the relationship between intangible investment and efficiency gains.

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⁵The formal assumption underlying this estimation is that intangible and traditional investment are perfect substitutes. This may not accurately capture the role of intangibles in production and revenue; more research is needed to articulate the predictions of investment theory for intangible investment.