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A SIMPLE APPROACH TO VALUING INTANGIBLES AND RENTS

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ABSTRACT

We decompose the gap between a firm's market and book values into capitalized-intangible-assets and a residual, consisting of value of capacity-adjustment-costs, economic-rents and potential mispricing. Our estimated parameter-values for capitalizing expenditures creating intangible-assets are consistent with values reported in the literature, even though we use a different approach. Firms with higher residuals have higher profitability and markups, lower labor share, face fewer product market threats, exhibit less sensitivity of investment to traditional as well as intangibles-adjusted Tobin's Q, and benefited more from globalization during this century. This is consistent with there being a significant ex post rents-component in the residual.

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1. Introduction

Valuation of a firm's securities has been a central topic in finance and economics. In general, as Hall (2001) notes, the market value of securities reflects the value of a firm's productive assets, which comprise of both tangible assets and intangible assets like customer/supplier relations, know-how etc. Intangible assets do not appear on the firm's balance sheet (book) except to the extent they belonged to another company that the firm acquired. To some extent, the intangible assets of a firm can be replicated by competitors through SG&A and R&D investments. The value of such replicable intangible assets can be estimated by capitalizing expenditures that create them and providing for their depreciation over time.

This motivates our decomposition of the gap between a firm's market value and the book value into two components: capitalized intangible assets, and the valuation residual. The residual consists of economic rents, capacity adjustment costs, and potential mispricing. Economic rents include the value of a firm's higher (lower) productivity relative the average productivity implicit in capitalized intangible assets.[1] Capacity adjustment costs can create positive (negative) values during periods of shortages (surpluses). Our findings are consistent with the view that economic rents is an important component of the valuation residual.

Economic rents can emerge ex post, even in industries without entry barriers. For instance, when firms compete to develop a new drug through R&D expenditures the first firm to discover the drug typically will get a patent grant, with potential to generate large positive economic rents.[2] Even when not successful, R&D spending may create knowledge and know-how, a form of intangible capital, that may lead to profitable business opportunities in the future. While such intangible capital does not appear on the balance sheet of the firm, it is reflected in the market

[1] Belo, Gala, Salomao, and Vitorino (2022) break down firm value into components including physical capital, knowledge capital, brand capital, and their associated capacity adjustment costs, as well as costs related to labor force changes, and assume that there are no economic rents, or if there are economic rents they will be captured by capacity adjustment costs.

[2] The example simplifies the drug development process for the ease of exposition. In practice, a firm must be granted the key product patent first, and then get approval from the FDA for the new drug, a process that is lengthy and time-consuming, before experiencing any economic benefits. See Chemmanur, Li, Tseng, and Wang (2025) for more details.

prices of the firm's securities. Note that the value of economic rents could be large and positive for some firms. It can also be negative for some firms.[3]

We estimate intangible assets by capitalizing and depreciating R&D expenditures (knowledge capital) and a portion of SG&A expenditures (organization capital). The value of these assets depends on the depreciation rate for knowledge capital (δ_{KC}), the portion of SG&A contributing to organization capital (λ), and its depreciation rate for organization capital (δ_{OC}). We estimate the parameters $(\delta_{KC}, \lambda, \delta_{OC})$ by minimizing sum of squared log residuals.[4]

Our estimated depreciation rates for knowledge capital (δ_{KC}) in Healthcare, High-tech, and all firms, at 17%, 20%, and 19% respectively are within the 15% to 20% range commonly assumed in the literature for capitalizing and depreciating R&D expenditures. Similarly, our estimated depreciation rates for organization capital (δ_{OC}) for Healthcare, High-tech, and All firms, of 13%, 25%, and 17% respectively, are within the 15% to 20% range used in the literature. We estimate industry-level values for λ, the investment portion of SG&A expenditures, and our average estimated value of 37% is not too far from the values of 30% used in the literature. To our knowledge, we are the first to estimate industry-level values for, δ_{KC}, λ, and δ_{OC} simultaneously in a unified model.[5]

Using industry-specific parameters, we construct firm-level time series of knowledge and organization capitals, which together constitute capitalized intangible assets. Our market value decomposition methodology enables the measurement of valuation residual (VR) at the firm

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[3] To see why, suppose there are 100 firms engaged in R&D for developing a drug. The firm that finds the drug first will get the patent that provides economic rents with a net present value of $10 million. Other firms will each lose $0.101 million, i.e., the value of their economic rents, ex post will be negative. The average value of economic rents across the 100 firms will be 0. Ex ante, there are no economic rents, but the winning firm will earn huge economic rents ex post.

[4] Our estimation of intangibles from capitalized expenditures assumes the same depreciation rates and λ within an industry. Some firms may be more efficient in building intangibles and therefore requiring less expenditures in the form of R&D and SG&A and the assets may have a longer life. Further there can be productivity differences across firms. For example, Dell may create a better supply chain than competing firms. Such differences across firms are captured as part of their residuals.

[5] Ewens, Peters, and Wang (2024) estimate industry-level values for λ. Their method relies on an assumed depreciation rate for SG&A and uses market prices from exiting firms (via mergers and acquisitions, liquidation, or bankruptcy) to value intangible capital. Our estimates are consistent with Ewens et al. (2024) in demonstrating that the portion λ of SG&A varies across industries.

level by incorporating these measured capitalized intangible assets alongside observed market values, tangible assets, and book intangible assets. The extensive finance literature suggests that VRs are unlikely to have significant persistent mispricing components, as market inefficiencies are typically small on average and not widespread. Moreover, Crouzet and Eberly (2023) demonstrate that capacity adjustment costs are small relative to economic rents. Hence, VRs are likely to have significant ex-post economic rents components. Our proposed VR measure offers an advantage over traditional rent measures as it can be readily constructed from observable data, and does not require taking a stand on production technologies, household preferences, and the structure of the markets.

When we rank firms based on their valuation residuals, we find Coca-Cola, 3M, and IBM ranked high in the 1980s, while Apple, Amazon, and Netflix ranked high in recent years, consistent with VRs being reasonable proxies for brand value. Over time, in the aggregate, the share of valuation residuals as a percentage of the market value of firms has increased from almost nothing in 1976 to 45% in 2020, with capitalized intangible assets contributing consistently around 10%. The rising share of residuals in the market value of firms is mainly driven by large firms, consistent with the findings in Autor, Dorn, Katz, Patterson, and Van Reenen (2020). Our estimated share of capitalized intangible assets and residuals in the market value of firms for various industries is close to the share of the value of economic rents and capitalized intangible assets in firms' market values in Crouzet and Eberly (2023).

Lee, Shin, and Stulz (2021) observe, "in the industrial organization literature, q is mostly used as a measure of monopoly and Ricardian rents." They say, "Thus, we should expect this free cash flow and Tobin's q to be positively related." Since the valuation residual, VR (relative to market value of the firm), by definition equals $1 - 1/(Total\ Q)$, where $Total\ Q$ is constructed by including capitalized intangible assets, we would expect firms with higher VR to have higher profitability.

Indeed, we find that VR significantly predicts firm profitability even after controlling for various firm characteristics. This predictability holds for multiple profitability measures: the Lerner index (1934), the gross profitability (Novy-Marx, 2013), and our intangible-adjusted profitability. The predictability is also economically important. When a firm's scaled VR (adjusted for firm size, industry, and time effects) increases from the 25th to 75th percentile, profitability rises by 6% to 12.5%, depending on the measure used. Further, we find that with higher VR exhibit higher markups (De Loecker, Eeckhout, and Unger, 2020) and face reduced product market threats (Hoberg, Phillips, and Prabhala, 2014), consistent with market power being a driver of the positive association between VR and profitability.[6] Specifically, when a firm's scaled VR moves from the 25th to 75th percentile, its markup increases by 15.5% above the median. While high-VR firms tend to pay higher wages, they allocate a smaller share of their revenues to employees consistent with the findings in the literature that wage share declines with market power (Autor et al., 2020; Barkai, 2020). Using firm-level threshold regression analysis, we find that the investment-Q relationship varies across different Q regions, consistent with the IO-q theory predictions in Abel and Eberly (2011). Additionally, we document positive correlations among VR, Total Q, decreased investment-Q sensitivity, and market power indicators, suggesting that VR contains significant economic rent related components.

International trade literature suggests that firms with competitive advantages benefit disproportionately from market expansion (Bernard and Jensen, 1999). We exploit an exogenous shock: the U.S. Congress granting Permanent Normal Trade Relations status to China in October 2000 and China's subsequent WTO entry in December 2001. This event intensified domestic competition for U.S. firms while improving their access to Chinese markets (Pierce and Schott, 2016). Consistent with the literature, we find that U.S. firms with stronger competitive advantages, as measured by Hoberg et al.'s (2014) product market fluidity measure, experienced significantly higher valuation residuals after 2000.

Finally, we examine the mispricing component within VR. For a given level of VR, the mispricing component is likely to be higher and the economic rents component is likely to be lower for the firm with lower profitability, and the firm is more likely to be overpriced. To the

[6] Our findings are consistent with Lee, Shin, and Stulz (2021), who show that Tobin's Q rises with share repurchases rather than capital expenditures, indicating that high Q often reflects rents rather than investment opportunities.

extent pricing errors converge towards zero over time, we should expect the firm's stocks to earn negative risk adjusted returns on average. To examine this empirical implication, we sort stocks based on firm size, profitability, and VR. Our results show that only portfolios of small-cap stocks with low profitability and high VR have negative Fama and French Five Factor model (Fama and French, 2015), suggesting potential mispricing component in the VR of some small firm stocks. Our findings add to the empirical asset pricing literature on the importance of off-balance sheet intangible assets (e.g., Gulen, Li, Peters, and Zekhnini, 2024; Jagannathan, Korajzyk, and Wang, 2023).

The rest of the paper is organized as follows: Section 2 describes the econometric method we use for estimating capitalization parameters and measuring residuals. Section 3 describes the data and discusses the parameter estimates we obtain. Section 4 provides empirical support for the valuation residuals having a significant economic rents component, and the implications in corporate finance and international finance. Section 5 investigates stock return anomaly using asset pricing tests with the interaction between profitability and valuation residual. We conclude in Section 6.

2. A Decomposition of Firm Value

In this section, we describe our decomposition of a firm's market value into three components: Book Value of Assets (tangible assets plus intangible assets plus goodwill on the balance sheet of firms), Capitalized Intangible Assets, and Valuation Residual and how we estimate the parameters associated with constructing capitalized intangible assets.

2.1 Decomposing Firm Value

Our firm value decomposition is related to Hall et al. (2000), Belo et al. (2022), and Crouzet and Eberly (2023), hereafter referred to as HCL, BGSV, and CE, respectively. HCL separates firm market value into four components: physical capital, e-capital, and their associated adjustment costs. BGSV expands this framework, decomposing firm value into physical capital, knowledge capital, brand capital, their related capacity adjustment costs, and costs linked to labor force changes. CE's approach allows for multiple types of tangible and intangible capitals, their respective adjustment costs, and the economic rents associated with each capital type.

Our framework incorporates two types of intangible capital alongside physical capital, aligning with BGSV and CE's approaches. We introduce a composite term called the valuation residual (VR), which encompasses capacity adjustment costs for both physical and intangible capital, labor force change costs (as in BGSV), economic rents value (as in CE), and potential mispricing. We categorize intangible assets into two groups: book intangible assets (including goodwill) reported on firms' balance sheets, and capitalized intangible assets derived from capitalizing and depreciating expenditures that generate intangible assets. This framework leads to the following decomposition of a firm's market value:[7]

$$\begin{aligned}\text{Market value of assets} &= \text{Tangible assets} + \text{Book intangible assets} \\ &\quad + \text{Capitalized intangible assets} + \text{Valuation residual}\end{aligned} \tag{1}$$

We write the capitalized intangible assets as the sum of knowledge capital and organization capital to get:[8]

$$\begin{aligned}&\text{Market value of assets} \\ &\quad = \text{Tangible assets} + \text{Book intangible assets} \\ &\quad + (\text{Knowledge capital} + \text{Organization capital}) + \text{Valuation residual}\end{aligned} \tag{2}$$

We assume that knowledge capital (KC) is created through research and development expenditures (R&D) and organization capital (OC) is created through selling, general, and administrative expenditures (SG&A). Further, we assume that all R&D spending contributes to creating KC, whereas only a portion of SG&A spending contributes to creating OC.

Following the literature, we use the perpetual inventory method to capitalize and depreciate R&D and SG&A expenditures to construct KC and OC. We assume that KC evolves over time

[7] The book intangible assets are identifiable intangible assets and goodwill associated with mergers and acquisitions and asset purchases that appear in the balance sheet. The reason for including book intangible assets is because our capitalization excludes intangible creating expenditures of acquired firms, prior to the acquisition.
[8] We follow the literature in constructing capitalized intangible assets as the sum of knowledge capital and organization capital. See Corrado, Hulten, and Sichel (2009), Corrado and Hulten (2010), Peters and Taylor (2017), and Falato, Kadyrzhanova, Sim, and Steri (2022). Knowledge capital is emphasized in some of the literature (e.g., Lev and Sougiannis (1996)), while organization capital is emphasized in others (e.g., Lev and Radhakrishnan (2005), Eisfeldt and Papanikolaou (2013, 2014)).

according to this equation:

$$KC_{i,j,t} = KC_{i,j,t-1}\left(1-\delta_{KC,j}\right) + (1-\tau_{i,j,t})R\&D_{i,j,t} \tag{3}$$

where $KC_{i,j,t}$ is the stock of knowledge capital of firm *i* in industry *j* at the end of year *t*, $\delta_{KC,j}$ refers to an industry *j*'s depreciation rate for knowledge capital that is constant over time, $R\&D_{i,j,t}$ is firm *i*'s R&D expenditure during year *t*, and $\tau_{i,j,t}$ is the effective tax rate of firm *i* in industry *j* in year *t*.[9] The effective tax rate is computed as the ratio of the total provision for income taxes by firm *i* in year *t* divided by the pre-tax income in year *t*. Therefore, $(1-\tau_{i,j,t})R\&D_{i,j,t}$ is the after-tax cost of R&D.[10] This after-tax cost of R&D expenses to shareholders is on par with expenditures involved in creating physical capital through capital expenditures that are not generally deductible as an expense for tax purposes.

Similarly, we assume that OC evolves over time according to the following equation:

$$OC_{i,j,t} = OC_{i,j,t-1}\left(1-\delta_{OC,j}\right) + \lambda_j \times (1-\tau_{i,j,t})\, SG\&A_{i,j,t} \tag{4}$$

where $OC_{i,j,t}$ is firm *i*'s stock of organization capital in industry *j* at the end of year *t*, and $\delta_{OC,j}$ is the depreciation rate for organization capital. $SG\&A_{i,j,t}$ is firm *i*'s SG&A expenditure during the year *t*, and λ_j is the portion of SG&A expenses that contribute to organization capital. Both $\delta_{OC,j}$ and λ_j are time-invariant but industry-specific measures.

If the initial stock of KC and OC are known, we can construct KC and OC at time *t* using Equations (3) and (4) as follows:

$$KC_{i,j,t} = KC_{i,j,0}\left(1-\delta_{KC,j}\right)^t + \sum_{s=0}^{t-1}\left(1-\delta_{KC,j}\right)^s (1-\tau_{i,j,t-s})R\&D_{i,j,t-s}, \text{ and}$$

$$OC_{i,j,t} = OC_{i,j,0}\left(1-\delta_{OC,j}\right)^t + \sum_{s=0}^{t-1}\left(1-\delta_{OC,j}\right)^s \lambda_j \times (1-\tau_{i,j,t-s})SG\&A_{i,j,t-s} \tag{5}$$

Since we do not know the initial stock of KC and OC, we assume that a firm's R&D and SG&A expenditures had a constant perpetual growth rate ever since the firm's initial point in

[9] Note that the tax law for capitalizing R&D was changed by the Trump administration in 2017. However, we believe this will not significantly affect our findings because the law did not take effect immediately. The material impact on R&D capitalization is expected with the Section 174 revision in 2022. Source: Thomson Reuters.

[10] The average effective tax rate during our sample period (1976-2020) for the full sample is 26%. Healthcare and High-tech industries have lower effective tax rates of 14% and 22% respectively.

time, and that these growth rates correspond to the average growth rates for R&D and SG&A in the firm's industry in our sample. With these assumptions, a firm *i*'s initial stock of KC and OC are given by:

$$KC_{i,j,0} = (1-\tau_{i,j,1})R\&D_{i,j,1}/\left(\delta_{KC,j} + g_{\text{R\&D-growth},j}\right), \text{ and}$$
$$OC_{i,j,0} = \lambda_j \times (1-\tau_{i,j,1})SG\&A_{i,j,1}/\left(\delta_{OC,j} + g_{\text{SG\&A-growth},j}\right) \qquad (6)$$

in which $g_{\text{R\&D-growth},j}$ and $g_{\text{SG\&A-growth},j}$ are the average annual growth rates of R&D and SG&A expenditures, respectively, in industry *j* in our sample.[11] By substituting the expressions for KC and OC into Equation (2), we obtain the following expression for market value of assets, as a function of the model parameters:

$$\begin{aligned} MV_{i,j,t} = TA_{i,j,t} + BIA_{i,j,t} & \\ & + \left(\left((1-\tau_{i,j,1})R\&D_{i,j,1}/\left(\delta_{KC,j} + g_{\text{R\&D-growth},j}\right)\right)\left(1-\delta_{KC,j}\right)^t \right. \\ & \left. + \sum_{s=0}^{t-1}\left(1-\delta_{KC,j}\right)^s (1-\tau_{i,j,t-s})R\&D_{i,j,t-s} \right) \\ & + \left(\left(\lambda_j \times (1-\tau_{i,j,1})SG\&A_{i,j,1}/\left(\delta_{OC,j} + g_{\text{SG\&A-growth},j}\right)\right)\left(1-\delta_{OC,j}\right)^t \right. \\ & \left. + \sum_{s=0}^{t-1}\left(1-\delta_{OC,j}\right)^s \lambda_j \times (1-\tau_{i,j,t-s})SG\&A_{i,j,t-s} \right) \\ & + VR_{i,j,t} \end{aligned} \qquad (7)$$

where $MV_{i,j,t}$, $TA_{i,j,t}$, and $BIA_{i,j,t}$ denote its market value of assets, tangible assets, and book intangible assets respectively.[12]

As discussed earlier, *Valuation residual*, VR has three components: capacity adjustment

[11] We thank an anonymous referee for pointing out typographical errors in Equations (5) and (6) of the earlier version of the paper. They do not affect the empirical findings.

[12] The sum of the value of tangible assets and book intangible assets is the book value of the asset. Book intangible assets are those that appear on the books (financial statements) of the firm (i.e., identifiable intangible assets and goodwill associated with mergers and acquisitions and asset purchases).

costs, value of economic rents, and mispricing. The findings in CE[13] suggest that adjustment costs related components are of second order in importance when compared to economic rents component in $VR_{i,j,t}$.

2.2 Estimation

We estimate the capitalization parameters ($\delta_{KC,j}$, $\delta_{OC,j}$, and λ_j) in Equation (7) using non-linear least squares by minimizing the squared sum of log residuals of for each industry j.

Note that $MV_{i,j,t}$, $TA_{i,j,t}$, $BIA_{i,j,t}$, $R\&D_{i,j,t}$, and $SG\&A_{i,j,t}$ are directly observed from firms' financial statements filed with the SEC. We pool firm-level data and estimate the parameters which are the same for all firms within each industry j.[14] Using the definitions of knowledge capital $KC_{i,j,t}$ and organization capital $OC_{i,j,t}$, we rewrite Equation (7) as follows:

$$MV_{i,j,t} = TA_{i,j,t} + BIA_{i,j,t} + KC_{i,j,t} + OC_{i,j,t} + VR_{i,j,t} \quad (8\text{ i})$$

We define the total capital as $K_{i,j,t} \coloneqq TA_{i,j,t} + BIA_{i,j,t} + KC_{i,j,t} + OC_{i,j,t}$. Then, we divide $K_{i,j,t}$ on both sides of Equation (8 i) and take the natural logarithm to get:

$$ln\left(MV_{i,j,t}\right) - ln\left(K_{i,j,t}\right) = ln\left(\frac{MV_{i,j,t}}{K_{i,j,t}}\right) = ln\left(1 + \frac{VR_{i,j,t}}{K_{i,j,t}}\right) \quad (8\text{ ii})$$

We estimate the parameters of model in Equation (8 ii), $\delta_{KC,j}$, $\delta_{OC,j}$, and λ_j, by minimizing the sample analogue of $E\left[\left[\ln\left(MV_{i,j,t}\right) - \ln\left(K_{i,j,t}\right)\right]^2\right]$, given below:

$$\min_{\delta_{KC,j},\delta_{OC,j},\lambda_j} Average\left[\ln\left(MV_{i,j,t}\right) - \ln\left(K_{i,j,t}\right)\right]^2 = \min_{\delta_{KC,j},\delta_{OC,j},\lambda_j} Average\left[\ln\left(1 + \frac{VR_{i,j,t}}{K_{i,j,t}}\right)\right]^2 \quad (8\text{ iii})$$

Our estimator of the parameters belongs to the class of "Extremum Estimators" discussed in Newey and McFadden (1994). We assume that the stochastic process generating $\ln\left(\frac{MV_{i,j,t}}{K_{i,j,t}}\right)$

[13] In Table 1 of CE, Adjustment costs = marginal $q - 1$ = Average Q – Investment Gap (IG) – 1 = 0.144 (1985-2000) and 0.004 (2001-2017) for the Compustat (R&D) sample. As a percentage of IG = intangible assets plus economic rents from tangible and intangible assets, adjustment costs are 23% (1985-2000) and 0.3% (2001-2017). In contrast, economic rents as a percentage of IG are 86% and 85% respectively.

[14] By definition, $\delta_{KC,j}$, $\delta_{OC,j}$, and λ_j should be between zero and one. We use the logit transformation to constrain these parameters. We first take logit, logit(x) = ln{x/(1-x)}, and then take the inverse logit, invlogit(x) = exp(x)/{1 + exp(x)}.

satisfies the sufficient conditions given in Newey and McFadden (1994) for "Extremum Estimators" to be consistent in large samples.

In particular we assume that that $Negative\ of\ E\left[[\ln(MV_{i,j,t}) - \ln(K_{i,j,t})]^2\right]$ has a unique maximum at the true parameter values; and the sample average across time and firms of $\ln\left(\frac{MV_{i,j,t}}{K_{i,j,t}}\right)$ converges to $E[\ln\left(\frac{MV_{i,j,t}}{K_{i,j,t}}\right)]$ uniformly in probability. As Newey and McFadden (1994) mention, "For consistency, it can be a bad idea to treat an extremum estimator as a solution to first-order conditions rather than a global maximum of an objective function, because the first-order condition can have multiple roots even when the objective function has a unique maximum."

Our motivation for the minimization problem in (8 iii) is based on the view that product markets are competitive and economic rents are difficult to obtain and maintain, firms with negative economic rents are more likely to go out of business, and capital markets are on average informationally efficient. While rents (as well as mispricing) can take on negative values for the reasons we discussed earlier, they are bounded below by the condition that market value cannot be negative. Using the logarithmic transformation brings the magnitude of negative and positive values of valuation residuals closer in magnitude and get similar weights in the minimization problem in (8 iii).

2.3 Valuation Residual as a Measure of the Value of Economic Rents

Once we estimate industry-specific intangible capitalization parameters (see details in Section 3.2), we compute firm-specific time-series of knowledge capital and organization capital based on Equations (5) and (6). We then plug our measured intangible capitals and the observed values of MV, TA, and BIA (see detailed data description in Section 3.1) into Equation (7) to get an estimate of the valuation residual at the firm-year level as given by:

$$
\begin{aligned}
\widehat{VR}_{i,j,t} = {} & MV_{i,j,t} - TA_{i,j,t} - BIA_{i,j,t} \\
& - \left(\left((1-\tau_{i,j,1})R\&D_{i,j,1}/\left(\hat{\delta}_{KC,j} + g_{\text{R\&D-growth},j}\right)\right)\left(1-\hat{\delta}_{KC,j}\right)^{t} \right. \\
& \left. + \sum_{s=0}^{t-1}\left(1-\hat{\delta}_{KC,j}\right)^{s}(1-\tau_{i,j,t-s})R\&D_{i,j,t-s} \right) \\
& - \left(\left(\hat{\lambda}_{j} \times (1-\tau_{i,j,1})SG\&A_{i,j,1}/\left(\hat{\delta}_{OC,j} + g_{\text{SG\&A-growth},j}\right)\right)\left(1-\hat{\delta}_{OC,j}\right)^{t} \right. \\
& \left. + \sum_{s=0}^{t-1}\left(1-\hat{\delta}_{OC,j}\right)^{s}\hat{\lambda}_{j} \times (1-\tau_{i,j,t-s})SG\&A_{i,j,t-s} \right)
\end{aligned}
\tag{9}
$$

We use the estimated VR as a proxy for the value of economic rents.

In Online Appendix Section 1, we compare our measured valuation residual with Crouzet and Eberly (2023)'s economic rents. They decompose the gap between observable Tobin's Q and marginal q, attributing differences to economic rents and omitted capital, focusing on sectoral differences. Despite methodological differences, our measured valuation residuals align with Crouzet and Eberly's rent estimates in portfolio-level analysis.

3. Data and Estimated VR (a Proxy for Economic Rents)

3.1 Data

We use financial information from Compustat-CRSP for U.S. firms and require that firms be incorporated in the U.S. and have ordinary common shares (CRSP share codes 10 and 11) that are traded on major stock exchanges (NYSE, AMEX, and NASDAQ) (CRSP exchange codes 1, 2, and 3). We exclude firms in the finance industry (SIC codes between 6000 and 6999) and firms that are categorized as public service, international affairs, or non-operating establishments (SIC codes between 9000 and 9999). Our data start in 1976 to allow firms one year to comply with the Federal Accounting Standards 2 (FAS2) mandates that required reporting R&D expenditures, and our data end in 2020.

We measure the market value of assets as the sum of the market value of equity and total liabilities reported in the balance sheet. We follow the literature and assume that a firm's book value of debts is about the same as the market value of debts. We obtain tangible assets (TA) from the difference between book value of total assets and book intangible assets (BIA) (i.e., identifiable intangible assets plus goodwill), directly from the observed data in the balance sheet. In terms of knowledge capital, we use reported R&D expenditures (Compustat item: *xrd*) less in-process R&D expenses (Compustat item: *rdip*) to represent the R&D expenditure to measure knowledge capital. We remove *rdip* from *xrd* in Compustat since *rdip* is a write-off and should not be interpreted as an investment.[15] Using Compustat data to measure SG&A is not straightforward. While firms typically report SG&A and R&D separately, Compustat adds these two items together in the variable labeled "Selling, General, and Administrative Expense." Specifically, Compustat item *xsga* includes SG&A and R&D (after excluding *rdip*). We therefore subtract *xrd (*after deducting *rdip*) from *xsga* to isolate the SG&A that companies report.[16] We then replace missing R&D or SG&A values with zeros.[17] We exclude firms with missing or negative total assets. In Appendix A, we provide a detailed description of our variables.

Our final sample consists of 176,005 firm-year observations from 16,532 unique firms. Table 1 reports the summary statistics of the variables for our estimation. The average (median) market value is \$2,545 million (\$192 million), suggesting the presence of some very large-sized firms.

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15 Specifically, Compustat item *xrd* includes: (1) R&D expenses reported by companies and (2) R&D acquired by companies that is deemed to not have alternative future use (data item *rdip*: In-Process R&D Expense). See Belo et al. (2022) for details.

16 In 4.4% firm-year observations, *xsga* is smaller than *xrd-net-rdip*. This is puzzling since Compustat records *xrd-net-rdip* as a component of *xsga*. To understand this puzzle, we manually collected several annual reports and compared the reported R&D and SG&A with those data in Compustat. We found that in some cases R&D expenditure is much larger than SG&A expenditures suggesting that R&D expenditures were included in cost of goods sold. In these cases, Compustat coded R&D expenses in item *xrd*, but did not include *xrd* in *xsga*, and we do not subtract *xrd-net-rdip* from *xsga*.

17 The U.S. Statement of Financial Accounting Standards No.2 (SFAS2) requires a firm to disclose its material R&D expenditures. Accounting Series Release 125 (1972) uses 1% of sales as the materiality threshold, which suggests that missing R&D expenditures occur in firms with zero or immaterial corporate R&D. Koh and Reeb (2015) document that 30% of articles in the Journal of Finance use R&D and code missing R&D as zero. However, another interpretation of missing R&D values is that a firm might consciously decide not to separate R&D expenses from other reported expenses (see McVay, 2006). We report a 43% of missing R&D observations (see Online Appendix Table OA1) in our sample, consistent with the finding in Koh and Reeb (2015) that half of firms do not report R&D expenditures.

SG&A expenses are larger than R&D expenses across all statistics.

<Insert Table 1 Here>

3.2 Estimated Capitalization Parameters

We classify firms into five industries based on the classification of Fama-French five industry: (1) Consumer, (2) Manufacturing, (3) High-tech, (4) Healthcare, and (5) Other. We estimate Equation (8) for each of the five industries separately and obtain industry-specific estimates of δ_{KC}, δ_{OC}, and λ by solving the minimization problem in (8iii). The model fit (Pseudo-R^2) is assessed by computing the percentage improvement in the exponentiated root mean squared error generated by the full model in Equation (8) relative to a model that includes only a constant. We calculate the standard errors by bootstrap, re-drawing observations with replacement and with 1,000 iterations at the firm-level.[18] Table 2 presents the estimated values of the valuation residual model parameters for each industry and for the full sample.

<Insert Table 2 Here>

The estimated depreciation rate for knowledge capital (δ_{KC}) is 19% in the full sample and varies from 14% to 20% across industries.[19] Our estimate of the depreciation rate for organization capital (δ_{OC}) is 17% in the full sample and varies from 13% to 25% across industries. Table 3 (Panel A) provides a comparison of capitalization parameters used in the literature with our estimated parameter values. Prior studies do not estimate the depreciation rate

[18] We compute the bootstrapped standard error in the following way. Let *N* denote the number of firms in our sample. We draw *N* firms at random with replacement from firms in our sample to get a bootstrap sample. We estimate the model parameters for this bootstrap sample. We then repeat the procedure 1,000 times. We use the standard deviations of the parameters in the 1,000 bootstrap estimates as the bootstrap standard errors. The bootstrap does not account for the endogeneity of firm characteristics and their cross-sectional and time series dependence. To assess the stability of our estimated parameters, we conduct a subperiod analysis by splitting the sample into two periods: 1976-2000 and 2001-2020. Our subperiod estimates show that δ_{KC} is larger whereas δ_{OC} is smaller in the second subperiod; λ is relatively stable across the two subperiods (see Online Appendix Table OA2). Then, we use the estimates for each subperiod to re-compute KC and OC, and compare the times series of the ratio of aggregate capitalized intangible assets to the market value of assets with the corresponding time series obtained using the estimated parameters for the full sample. In this comparison, we find that the two series are close to each other (see Online Appendix Figures OA2-4), even though the estimated capitalization parameters are slightly different.

[19] Chan, Lakonishok, and Sougiannis (2001), Hall, Jaffe, and Trajtenberg (2005), Bloom, Schankerman, and Van Reenen (2013), and Tseng (2022) assume a depreciation rate of 15%. Hirshleifer, Hsu, and Li (2013, 2018) assume a depreciation rate of 20%.

for organization capital obtained by capitalizing and depreciating SG&A expenditures; rather, they assume a depreciation rate of 15% or 20% SG&A.[20] Our study provides some support for the parameters assumed in the literature as well as some guidance for using parameter values in future studies. The estimated portion of SG&A investment contributing to organization capital (λ) is 37% in the full sample, which is a bit higher than the 30% value assumed in the literature (Hulten and Hao, 2008; Eisfeldt and Papanikolaou, 2014). Our estimates vary significantly across industries—Consumer 22%, Manufacturing 31%, High-tech 49%, Healthcare 57%, and Other 31%. This variance highlights why it is necessary to use industry-specific capitalization parameters when constructing measures of OC. Our estimates align with findings in the literature, such as those by Ewens et al. (2024), who estimate the portion of SG&A using a capitalization model based on market prices from exiting firms (mergers & acquisitions, liquidation, or bankruptcy) for intangible capital valuation. Their estimated λ ranges from 20% in the Consumer industry to 51% in Healthcare industry.[21]

<Insert Table 3 Here>

Li and Hall (2020, LH) estimate the R&D depreciation rate using a structural model based on the BEA-NSF dataset. While the estimated depreciation rates are widely used in literature, the model that LH use is often not the same or nested within the models in the literature. For example, CE and BGSV models do not nest the LH model.[22] Further, LH's estimated depreciation rates depend heavily on discount rates, which are imprecisely estimated. Therefore, there is a need for alternative methods for estimating the parameters used for capitalizing expenditures that create intangible assets. Our paper fills that need to some extent.

[20] Eisfeldt and Papanikolaou (2013) assumes a depreciation rate of 15%. Hulten and Hao (2008) and Eisfeldt and Papanikolaou (2014) assume a depreciation rate of 20%.
[21] We also estimate the depreciation rate of R&D and SG&A by setting $\delta_{KC} = \delta_{OC}$ in Equation (8), and then re-estimate the parameters for each of the five industries. Our results are included in Online Appendix Table OA3. The estimated depreciation rates fall within the range of 15%−26%, and the estimated values of λ fall within the range 24%−61% for the different industries. The Healthcare industry has a relatively low depreciation rate (15%) and a higher portion of SG&A (61%), which helps a firm build organization capital.
[22] LH's model uses a profit function based on sales rather than current-period capital stock, and does not explicitly incorporate capital adjustment costs. While LH considers adjustment costs through their profit function specification, their approach differs structurally from the frameworks developed in Peters and Taylor (2017), Belo et al. (2022), and Crouzet and Eberly (2023).

Empirically, LH use the BEA-NSF dataset that records R&D expenditures at industry-level, which is aggregated from firm-level R&D expenditures among firms that have at least 5 employees. In contrast, we use Compustat data, and our sample contains publicly traded firms only. We compare our estimates with the estimates in LH for four R&D intensive industries (Pharmaceuticals, Semiconductor, Computers and Peripheral Equipment, and Software) in Table 3 Panel B.

Even though we use a different approach, our estimated depreciation rates for capital built using R&D expenditure are close to those reported in LH. For example, both estimates are the same (11%) for pharmaceuticals. An advantage of our approach is that we are able to simultaneously estimate the parameters involved in transforming SG&A expenditures into organization capital. We find that capital built using SG&A expenditure generally depreciates at a slower rate. The portion of SG&A that contributes to building organization capital is about 30% for firms in the Semiconductor and Computers & Peripheral Equipment industries and about 57% for firms in the Pharmaceuticals industry.

We analyze the criterion function value for different capitalization parameters across various industries. We estimate the capitalization parameters (δ_{KC}, δ_{OC}, and λ) using a sample balanced by year, industry, and firm size. Online Appendix Table OA4 compares our model's estimates with those of Peters and Taylor (2017) and Ewens et al. (2024). Panel B presents the estimated parameters, while Panels C and D report the criterion function values for the estimation and validation samples, respectively. Our model's estimates generally show lower criterion function values, indicating some improved performance in capturing intangible asset capitalization across different industries.

3.3 Capitalized Intangibles and Valuation Residual

Our model enables us to measure capitalized intangible assets (CIA)—the sum of knowledge capital and organization capital, and the estimated valuation residual (VR). We provide summary statistics of these measures in Table 1 Panel B. We find that on average about a quarter of total capital is the capitalized intangibles, and firms in the Healthcare and High-tech industries exhibit much greater knowledge capital, consistent with the literature.[23]

The VR has a median value of $5.27 million and a mean value of $671 million. To the extent that VR is a reasonable proxy for the value of economic rents, our estimates indicate that the distribution of VR is highly right skewed with a few firms having large positive values. Across Fama-French five industries, the VR vary substantially. We find that High-tech and Healthcare industries have significantly larger VR (see Online Appendix Table OA5), consistent with Crouzet and Eberly (2023) that find the fast-growing industries experience rising rents on rising intangible assets.

Figure 1 Panel A illustrates the average VR among firms over time. The nominal VR has increased dramatically, from nearly zero in 1976 to approximately $7 billion in 2020. Adjusting for inflation using the CPI index (1982-1984=100), the VR reaches about $3 billion in 2020. Our method's advantage lies in calculating a VR for each firm, allowing us to analyze the distributional changes in VR.

<Insert Figure 1 Here>

A key finding is that the increase in average VR stems entirely from firms in the top half of the distribution (see Figure 1 Panel B). The median (P50) and lower percentiles remain invariant over time. Notably, the negative value at the 25th percentile (P25) indicates that one-quarter of firms consistently experienced negative VR each year. The 90th percentile (P90) shows the most pronounced increase, especially post-2010, rising from about $3 billion to $11 billion between 2010 and 2020.

This trend, coupled with the declining number of publicly traded firms in recent decades, suggests that the increased VR is driven by a few large firms with significant market power. This

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[23] We analyze the intangible assets decomposition in Online Appendix Figures OA5 and OA6. Particularly, we find that a positive aggregate amount of book intangibles first appeared in 1988 and had a large increase in 2001, potentially due to a change in accounting standard. The adoption of the Statement of Financial Accounting Standards (SFAS) No. 142 changed accounting for goodwill dramatically and was effective after Dec. 15, 2001. Among three components of intangibles (book intangibles, knowledge capital, and organization capital), the aggregate ratios show that the intangible assets decomposition was stable after 2002 with 50% of book intangibles, 20% of knowledge capital, and 30% of organization capital. For the concern of missing R&D, we estimate our capitalization parameter separately for firms reporting R&D and firms without. We find that the intangible capital composition under this specification for R&D firms is consistent with our baseline specification.

shift aligns with the phenomenon of rising rents and markups primarily driven by larger firms (Autor et al., 2020; De Loecker et al., 2020). Appendix B provides examples of firms with the largest average VR in dollars over a five-year horizon. For instance, Apple Inc. tops the list with an average annual VR of $366.9 billion (CPI-adjusted) during 2016-2020.

Economic rents are likely to be persistent. For example, patent protections may last for several years, and network externalities are not easy to replace and habits that give rise to preference for products die slowly. If VR has a significant rents component as we argued, then the time series of VR should exhibit persistence. We examine the time series persistence of VR by building a one-year transition frequency matrix, in which for each year and within an industry, we rank firms based on the quartile of VR and then compute the probability from one rank to another in the next year across ranks, conditional on an assigned quartile in the current year. Our result shows that a firm with low VR is likely to retain low VR in the next year and vice versa for a firm with high VR (see Online Appendix Table OA6). For a longer-term persistency analysis, we find that 48% of high-VR-rank firms consecutively remain the same rank in the future five years, whereas it is only 34% for low-VR-rank firms, suggesting an asymmetric phenomenon between firms with high and low VR.[24]

3.4 Market Value Decomposition

Figure 1 Panel C shows that total market value significantly increased since 1976 and reached $45 trillion in 2020, in which VR amounted to $21 trillion, followed by tangible assets, book intangible assets, and capitalized intangible assets with $14 trillion, $5.5 trillion, and $4 trillion in this order. We then examine the market value decomposition by computing the ratios of each component to market value in the aggregate across all firms and in each year. Figure 1 Panel D shows that the ratio of tangible assets decreased from 80% to 40% over 1976-2020,

[24] We formally examine the dynamic autocorrelation of VR by repeatedly estimating the coefficient on lagged VR (relative to total capital) in the autoregressive model with the order one every year (Online Appendix Figure OA7). Our result shows that the autocorrelation of VR was positive and close to one for most of the time, except for years 2001, 2002, and 2008, suggesting that unexpected crises may incur short-term deviation from persistency due to a temporary redistribution of VR across firms. In addition, we find that large firms exhibit greater VR autocorrelation than other firms do.

whereas the ratio of book or capitalized intangible assets gradually increased to about 10% over the same period. This finding indicates a compositional shift in both internal inputs associated with R&D and SG&A investment flows and externally purchased intangibles associated with identifiable intangibles and goodwill. Notice that valuation residuals were negative until 1984, consistent with the observations in Modigliani and Cohn (1979) and Cohen, Polk, and Vuolteenaho (2005) that U.S. stocks were undervalued in the late seventies and early eighties due to money illusion. Importantly, the ratio of VR dramatically increased in the recent two decades with 45% in 2020, highlighting that our measured valuation residual (as a proxy for economic rents) contribute to a large share of the aggregate market value.

We further explore the size effect on the market value decomposition in the subsamples split by size for large firms (top 10% size firms) and other firms (bottom 90% size firms), in which size is classified based on firm market value of assets within an industry and in a year. Figure 2 shows that large firms significantly contribute to aggregate VR with almost $20 trillion in year 2020, whereas other firms contribute $5 trillion. We note that the size effect does not drive the market value composition for intangible assets as we observe a similar pattern between large and other firms.[25]

<Insert Figure 2 Here>

To examine the industrial heterogeneity, we plot the aggregate market value decomposition by industry in Figure 3. We find that intangible assets contribute more to a firm's market value, and VR is on average larger and exhibits a significant variation across years in High-tech and Healthcare industries. In contrast, tangible assets significantly decreased across all industries. Taken together, our results highlight that intangible assets as well as VR (a proxy for economic rents) are important components to fast growing sectors.

<Insert Figure 3 Here>

[25] We further compare *aggregate* ratio and *average* ratio and find that these ratios stay close over time between large firms and other firms when we look at tangible assets or book intangible assets. These findings imply that tangible assets and book intangible assets are not related to size. In contrast, for capitalized intangible assets and valuation residuals, we observe that capitalized intangible assets are largely driven by smaller firms and that valuation residuals are significantly driven by large firms (See Online Appendix Figure OA8).

4. VR as a Proxy for Economic Rents

Our valuation residual measure encompasses rents, along with potential mispricing deviations.[26] In this section, we provide empirical supports for the valuation residual having a significant economic rents component, and the implications in corporate finance and international finance. Towards that end, we first show that firms with higher share of their market value from economic rents will have higher profitability.

4.1 Economic Rents and Profitability

We establish the relationship between VR and profitability within the model in Crouzet and Eberly (2023) in Proposition 1 below, although we believe that the result of the proposition holds more generally. Detailed proofs are in Online Appendix Section OA2.1.

Proposition 1. *Consider the balanced growth model in Crouzet and Eberly (2023, Section I.C, Result 2):*

$$MV_t = q_{1,t}K_{1,t+1} + \frac{\mu-1}{r-g}R_1K_{1,t+1} + q_{2,t}K_{2,t+1} + \frac{\mu-1}{r-g}R_2K_{2,t+1} \tag{10}$$

where MV_t *is the market value of the firm,* $K_{1,t}$ *is the physical capital,* $K_{2,t}$ *is the capitalized intangible capital,* $q_{n,t}$ *is each capital's marginal q,* r *is the discount rate, and* g *captures the growth rate for the exogenous process of* A_t *in the profit function* $\Pi_t = A_t^{1-1/\mu}K_t^{1/\mu}$ *of total capital* $K_t = K_{1,t} + K_{2,t}$. *In addition,* $R_n = (r-g)\Phi_n'(1+g) + \Phi_n(1+g)$ *is each capital's user costs, where* $\Phi_n(\cdot)$ *is each capital's investment cost function.*

Substituting this expression for MV_t *in the definition of* VR_t *in our framework gives:*

$$VR_t = (q_{1,t}-1)K_{1,t+1} + (q_{2,t}-1)K_{2,t+1} + \frac{\mu-1}{r-g}R_1K_{1,t+1} + \frac{\mu-1}{r-g}R_2K_{2,t+1} \tag{11}$$

Define a firm's profitability as earnings to total capital, $Profitability_t \equiv \frac{\Pi_t}{K_{t+1}}$. *Assume* $\Pi_t \geq 0$, $K_{n,t} \geq 0$, $MV_t > 0$, $K_t > 0$, $r > g$ *and* $\mu \geq 1$. *The parameter* μ *captures economic rents to the firm, with* $\mu = 1$ *corresponding to no economic rents, and* $\mu > 1$ *corresponding to*

[26] We do not relate or decompose economic rents into components that can be attributed to labor or other types of capital. In addition, if we assume the market is sufficiently efficient, or that any potential mispricing is adequately captured by firm and year fixed effects in our regression specification, then a firm's share of economic rents with respect to its market value is likely to be a reasonably precise measure of the firm's relative market power.

positive rents. Then, an increase in μ *will increase* $Profitability_t$ *as well as* VR_t/MV_t*, resulting in a positive relation between a firm's valuation residual and its profitability.*

4.1.1 Empirical Evidence

To empirically test Proposition 1, we construct a scaled version of VR as VR/MV may be noisy at the firm level when MV is small. Our scaled VR measure, ranging from 0 to 1, normalizes VR by firm size within industries and years:

$$Scaled\ VR_{i,j,d,t} = (Rank\ VR_{i,j,d,t})/N_{j,d,t} \tag{12}$$

where $Rank\ VR_{i,j,d,t}$ stands for an ordinal rank based on a firm *i*'s VR within each industry *j* (Fama and French five industry classification, *j*=1, 2…,5), within each size-decile group *d* (*d*=1, 2…,10), in year *t*. The size-decile group *d* is classified based on the decile firm market value within an industry *j* in year *t*. $N_{j,d,t}$ is the number of firms in each industry *j* in each size-decile group *d* in year *t*. For parsimony, we drop subscripts *j*, *d* and use $Scaled\ VR_{i,t}$ as the baseline measure of VR for the firm *i* in year *t*.

Following Fama and French (2006), we estimate profitability regressions augmented with our Scaled VR:

$$Profitability_{i,t+1} = \alpha_0 + \delta_1 Scaled\ VR_{i,t} + \alpha\mathbf{X}_{i,t} + c_t + \xi_{i,t+1} \tag{13}$$

where $Profitability_{i,t+1}$ represents one-year ahead of the profitability, including Lerner index (capturing the monopoly profits/rents from market power; see Gutiérrez and Philippon (2017a, 2017b)), gross profitability (immune to tax and capital structure effects; see Novy-Marx (2013)), and intangible-adjusted profitability (returns on total capital including capitalized intangibles). Control variables ($\mathbf{X}_{i,t}$) follow Fama and French (2006), including Log BE/ME (book-to-market equity ratio). While VR mechanically relates to BE/ME, we address their relative profitability prediction power in Section 4.1.2. Appendix A provides detailed variable definitions and Table 1 Panel C presents summary statistics. All regressions include year fixed effects, with standard errors clustered by firm and year.

Table 4 shows that the estimated coefficient of Scaled VR is positively and significantly associated with next-year profitability across all measures and specifications. The economic magnitude is substantial: when Scaled VR increases from the 25th to 75th percentile, the Lerner index rises by 12.5% above its median value.[27] Similar calculations for other profitability measures show approximately 6% increases above their respective medians. These results support Proposition 1, suggesting VR contains significant rents components reflecting higher profitability potential. Robustness checks using Fama-MacBeth estimation[28] and industry subsamples (Online Appendix Tables OA7 and OA8) confirm our baseline findings.

<Insert Table 4 Here>

4.1.2 VR versus Book-to-Market Ratio in Explaining the Cross Section of Profitability

Our valuation residual (VR) is measured as market equity (ME) minus book equity (BE) minus capitalized intangible assets (CIA). Given similar cross-sectional CIA-to-ME ratios among firms, VR mechanically relates to the BE/ME ratio, raising concerns about whether VR merely captures BE/ME's known effect on profitability. For example, Fama and French (1993) argue that high-BE/ME stocks earn higher returns to compensate for low profitability, noting that "low-BE/ME firms have persistently high earnings and high-BE/ME firms have persistently low earnings," suggesting that BE/ME returns capture "variation through time in a risk factor that is related earnings performance" (p. 53).

We therefore empirically examine the relative predictive power of VR/MV versus Log BE/ME through tests with results reported in Online Appendix Table OA9. While VR/MV shows correlation with BE/ME, it exhibits distinct explanatory power. Specifically, the regressions using VR/MV achieve higher adjusted *R*-squares compared to those using Log BE/ME for the cases of Lerner index (10.2% versus 4.0%) and intangible-adjusted profitability (8.1% versus 7.7%). Importantly, VR/MV maintains significantly positive coefficients even after controlling for Log BE/ME.

Our findings demonstrate that higher VR predicts significantly higher firm-level

[27] The calculation procedure is detailed as follows. The estimated coefficient of Scaled VR on Lerner index in Table 4 Column 2 is 0.015; the Scaled VR moves from the 25th percentile to the 75th percentile increase 0.015×50% = 0.0075; the median of Lerner index 0.06 indicates 12.5% (0.0075/0.06= 12.5%) above the median.
[28] Our results show that using Fama-MacBeth estimation (with Newey-West standard errors of lag 3) yields qualitatively similar results to our baseline results, consistent with the theoretical discussion in Petersen (2008).

profitability, even after controlling for various firm characteristics including BE/ME ratio, supporting VR's role as a measure of rents. This analysis extends Fama and French (2006) by showing that while VR/MV and BE/ME share a mechanical relationship, VR's predictive power for profitability remains distinct and significant, operating through separate economic channels.

4.2 Markup, Product Market Threat, and Labor Share

This section evaluates the relevance of VR as an indicator of a firm's market power. We expect that firms with higher rents will exhibit higher markups, face lower product market threats, and have lower labor shares. We assess the association between markups and Scaled VR using the following OLS regression:

$$Markup_{i,t} = \alpha_0 + \delta_1 Scaled\ VR_{i,t} + \alpha \mathbf{X}_{i,t} + c_i + c_t + \xi_{i,t} \tag{14}$$

where $Markup_{i,t}$ is a markup measured following De Loecker et al. (2020) for firm *i* in year *t*. $Scaled\ VR_{i,t}$ is firm *i*'s scaled VR in year *t*. $\mathbf{X}_{i,t}$ includes control variables, which are the logarithm of firm market capitalization, logarithm of firm age, and scaled capitalized intangible variable (Scaled CIA). c_i and c_t are firm and year fixed effects. Standard errors are clustered at the firm level.

Table 5 Column 1 presents our results. We find a positive association between VR and markups, which is both economically and statistically significant. When a firm's scaled VR moves from the 25th percentile to the 75th percentile, the markup increases by 0.045 (a 15.5% increase over the median markup, (Price – Marginal Cost)/(Marginal Cost), of 0.29). Although markups alone do not directly indicate market power, as high markups may indicate a high overhead and fixed costs, we find that both markups and profitability (shown in the above section) increase with VR, suggesting that firms with high VR indeed possess market power.

<Insert Table 5 Here>

To assess product market threats, we employ the Hoberg et al. (2014) product market fluidity measure, capturing annual changes in rivals' product overlaps with a firm's own product line based on unique words in product descriptions in firms' 10-K filings. Firms facing higher product market fluidity measures encounter elevated product market threats. We investigate the relation between VR and product market threats using the following regression:

$$Product\ market\ threat_{i,t} = \alpha_0 + \delta_1 Scaled\ VR_{i,t} + \alpha\mathbf{X}_{i,t} + c_i + c_t + \xi_{i,t} \tag{15}$$

Table 5 Column 2 demonstrates a strong negative association between product market threats and VR. A firm in the 75th percentile of Scaled VR faces a 3.4% lower product market threats, as measured by the Hoberg et al. (2014) measure, compared to firms in the 25th percentile.

The literature documents the decline in labor share, attributing it to the rise of superstar firms (Autor et al., 2020). Similarly, Barkai (2020) documents a negative relationship between labor share and industry concentration. To explore this, we examine the relationship between labor share and VR:

$$Labor\ share_{i,t} = \alpha_0 + \delta_1 Scaled\ VR_{i,t} + \alpha\mathbf{X}_{i,t} + c_i + c_t + \xi_{i,t} \tag{16}$$

where $Labor\ share_{i,t}$ is measured as total staff expense divided by the sum of staff expenses and earnings, following Autor et al. (2020). Note that in this analysis, we face the limitation in using the Compustat data that the wage bill is reported by a smaller number of firms. Table 5 Column 3 reveals a negative and significant association between labor share and VR, albeit for smaller sample sizes. Firms in the 75th percentile of Scaled VR have a 7.1% lower labor share compared to firms in the 25th percentile. We further ensure the robustness of our findings by conducting industry-specific analyses, detailed in Online Appendix Table OA10.

In summary, we find firms with higher valuation residuals have higher markups, face reduced product market threats, and exhibit lower labor shares of income. Our analysis affirms the validity of the valuation residual as an indicator of firms' market power—the driving force of economic rents documented in the literature.

4.3 Investment-Q Relation, Intangibles, and Rents

Standard Q-theory models assume competitive product markets with free entry, where market values deviate from replacement values only due to capacity adjustment costs. Under these models, positive demand shocks increase prices, benefiting firms with existing assets and driving their market values above replacement values (Q greater than one). Lindenberg and Ross (1981) show that Q can exceed unity when firms possess monopoly power. While rising Q traditionally signals shortage pricing and prompts capacity expansion, this relationship may not hold when firms earn economic rents. To see why, consider a firm producing hydroelectric power. When electricity demand increases, prices and firm market values rise, elevating Q. However, the hydroelectric power firm cannot expand its capacity to meet this increased demand. The higher market value purely reflects increased economic rents, weakening the investment-Q relationship.

Traditional Q measure ignores intangible assets that do not appear on the balance sheets of firms. This could also attenuate the relationship between investment rate and Q. We therefore use Total Q defined as Market Value / Total Capital, following Peters and Taylor (2017), but using our estimated capitalized intangible assets.

In what follows, using the model in Crouzet and Eberly (2023), which allows for both intangible capital and economic rents, we show in Proposition 2 below that the total investment rate is an increasing but concave function of Total Q. Detailed proofs are provided in Online Appendix Section OA2.2.

Proposition 2. *Assume that a firm's market value follows the balanced-growth model in Proposition 1 and substitute the expression in the definition of* $Total\ Q_t = MV_t/K_{t+1}$. *Define total investment* I_t *as the sum of the physical investment* $I_{1,t}$ *and the intangible investment* $I_{2,t}$, *where* $I_{n,t} \equiv K_{n,t+1} - K_{n,t}(1-\delta_n)$ *with* δ_n *representing each capital's depreciation rate. Set the convex investment costs as* $\Phi_n(x) = \delta_n + (x-1) + \frac{\gamma_n}{2}(x-1)^2$ *with* $\gamma_n > 0$. *Suppose that each capital is strictly positive* $(i.e., K_n > 0)$, *the depreciation rate as well as the proportion of capital type n to total capital ratio,* $(K_{n,t}/K_t)$, *does not change for every capital type n when the firm decides on the total investment rate* (I_t/K_t), *then the total investment rate will be an increasing concave function of* $Total\ Q_t$.

Further,

(i) When the rents parameter $\mu = 1$ *(no rents),* I_t/K_t *will be increasing and linear function of* $Total\ Q_t$.

(ii) When the rents parameter $\mu > 1$ *(positive rents),* I_t/K_t *will be a strictly increasing and concave function of* $Total\ Q_t$.

The key empirical implication is that, with the presence of rents, total investment rate is characterized by a concave function of Total Q, which is *nonlinear* and rents will reduce the sensitivity of investment to Q.[29] We empirically test these empirical implications below.

4.3.1 Total Q Explains Investments Better than Standard Q

To being with, we examine a classical investment-Q linear relation examined in the literature given below:

$$I_{i,t+1}/K_{i,t+1} = \alpha_0 + \delta_1 Total\ \ Q_{i,t} + \alpha\mathbf{X}_{i,t} + c_i + c_t + \xi_{i,t+1} \tag{17}$$

in which $I_{i,t+1}$ is a firm *i*'s total investment—the sum of physical investment and intangible investment (R&D plus a portion (λ) of SG&A) in year *t*+1; $K_{i,t+1}$ is its total capital measured as the firm's sum of total capital employed (TCE) plus capitalized intangible assets (CIA) at the beginning of year *t*+1. Total Q is calculated as a firm *i*'s market value in year *t* divided by $K_{i,t}$. $\mathbf{X}_{i,t}$ includes the controls for firm size and firm age. c_i and c_t are firm and year fixed effects. Standard errors are clustered at the firm level. Appendix A provides detailed variables construction.

Table 6 Column 1 shows a positive and statistically significant coefficient for Total Q, consistent with prior literature. In comparing Total Q with Standard Tobin's Q (market value divided by physical capital), we find that adjusting Q for intangible capital strengthens the investment-Q relationship.[30] This finding aligns with Peters and Taylor (2017), despite our different approach to estimating intangible capitals—we use our valuation residual model rather than assumed capitalization parameters. This consistency further validates our measurement of capitalized intangible assets. Note that Peters and Taylor (2017) highlight that some important

[29] Proposition 2 shows that the investment-Q relation is linear when there are adjustment costs but no rents. In Belo et al. (2022)'s model, the estimated adjustment costs may be affected by the omission of rents effects. Notably, this potential measurement difference primarily influences the magnitude of the investment-Q sensitivity in the linear relation, while the sensitivity itself remains constant across different levels of Q (see Online Appendix Section OA2.3 for Proposition 3 with its corresponding proof).

[30] Online Appendix Table OA11 details these results. For physical investment, the baseline model with firm and year fixed effects explains 34% of variance (Column 1). Adding Standard Q or Total Q increases explained variance by 9% and 12%, respectively (Columns 2 and 3). For total investment, the baseline model explains 51% of variance, with Standard Q increasing explained variance by 5% (Column 5) and Total Q by 11% (Column 6).

caveats for the *linear* investment-q model: "The theory requires that physical and intangible capital are identical in all ways except for their quadratic adjustment-cost parameters. Outside our simple theory, alternative explanations could exist for the pattern we find in q-slopes across firms." In the following section, we test the IO-q theory by examining the *nonlinear* relationship between investment and Total Q.

<Insert Table 6 Here>

4.3.2 Investment-Q Relationship is Increasing, Concave, not Linear

Given concerns about linear specification misrepresenting the investment-Q relationship, we employ a threshold regression allowing investment response to Q to vary across different Q regions. Following Barnett and Sakellaris (1998), we specify three regions:

$$\begin{aligned} I_{i,t+1}/K_{i,t+1} = {} & \beta_{L0} + \beta_{L1}\left(Total\ Q_{i,t} \times LTQ_{i,t}\right) + \beta_{M1}\left(Total\ Q_{i,t} \times MTQ_{i,t}\right) \\ & + \beta_{H1}\left(Total\ Q_{i,t} \times HTQ_{i,t}\right) + \beta_{M0} MTQ_{i,t} + \beta_{H0} HTQ_{i,t} \\ & + \alpha \mathbf{X}_{i,t} + c_i + c_t + \xi_{i,t+1} \end{aligned} \tag{18}$$

where $LTQ_{i,t}$ ($HTQ_{i,t}$) is an indicator variable that equals one if a firm *i*'s Total Q is below (above) the 50th (90th) threshold of Total Q among all firms within an industry (Fama-French five industry classification) in year *t*. The 90th percentile of threshold of Total Q is an empirical choice that maps to our earlier stylized fact that VR contains rents especially for large firms.[31] $MTQ_{i,t}$ equals one for observations when $LTQ_{i,t}$ or $HTQ_{i,t}$ are zeros. We interact these indicators with Total Q, resulting in interaction variables of $Total\ Q_{i,t} \times LTQ_{i,t}$, $Total\ Q_{i,t} \times MTQ_{i,t}$, and $Total\ Q_{i,t} \times HTQ_{i,t}$. These interactions serve to distinguish the sensitivity of investment to Total Q across low, medium, and high Q regions. We estimate the regression with an OLS estimation. To support the IO-q theory, we would expect the estimated coefficients to be positive and follow the order of $\beta_{L1} > \beta_{M1} > \beta_{H1}$.

Table 6 Column 2 confirms this pattern: all coefficients are positive, with sensitivities

[31] In Barnett and Sakellaris (1998), their threshold regression allows for the breakpoints between regions to be endogenously estimated. The goal of our paper is not on the estimation of thresholds. Interestingly, their study finds that the high Q threshold is the 90th percentile of Q for Manufacturing industry, supporting our choice of high Q threshold.

decreasing monotonically from low-Q (0.06) to medium-Q (0.031) to high-Q regions (0.015), compared to the linear specification's uniform coefficient of 0.023 (Column 1). Industry-specific analysis (Columns 3-6) reveals the weakest investment-Q sensitivity in high-Q firms within Healthcare and High-tech industries, consistent with these sectors' greater reliance on rents and intangibles.[32] These results support the IO-q theory: after accounting for intangibles, high Q does not necessarily signal investment opportunities, as rents can weaken investment incentives at high Q values.

4.3.3 Market Power, VR, and Investment Sensitivity to Total Q

In this section we empirically examine how VR varies with Total Q; market power measures (Lerner index and markup) vary with Total Q; and how the sensitivity of investment to Total Q varies with VR. Towards this end, we expand our earlier threshold regression analysis, dividing the data into 20 regions based on 5th percentiles of Total Q within each industry-year. This approach yields twenty Q-5th percentile indicators and their corresponding interaction terms with Total Q. The regression estimates provide the sensitivity of total investment to Total Q across these twenty groups. For each group, we calculate mean values of Total Q, VR/MV, Lerner index, and markup. To ensure robust results, we exclude the minimum and maximum Total Q (or VR/MV) observations when creating scatter plots.

Our analysis reveals several key patterns. First, examining the relationship between investment-Q sensitivity and Total Q (Figure 4 Panel A), we find no clear pattern in low-Q regions. However, in high-Q regions, the sensitivity demonstrates a significant downward trend as Q increases. Second, VR/MV shows a strong positive correlation with Total Q (Panel B). Third, both market power indicators, Lerner index and markup, exhibit strong positive

[32] We repeat Table 6 by replacing Total Q with Standard Q and replacing total investment with physical investment. We report results in Online Appendix Table OA12.We find the wedge of the sensitivity between low Q and high Q region is narrower compared to the case when we examine total investment and Total Q. The size of this wedge matters: the sensitivity of investment-Q between low-Q region and high-Q region is 0.045 in the total-investment-to-Total Q specification, and it is 0.015 in the physical-investment-to-Standard Q specification. The wedge is particularly noticeable in High-tech industry (0.059 vs. 0.021) and Healthcare industry (0.057 vs. 0.012). Given that Total Q that accounts for intangibles partly mitigates the concern of measurement error in Standard Q, our findings sharpen the empirical evidence supporting the IO-q theory.

relationships with Total Q (Panel C and D), supporting IO-q theory's prediction that higher Q correlates with greater market power.

<Insert Figure 4 Here>

The relationship between investment-Q sensitivity and VR/MV (Panel E) reveals that VR explains the weakened investment-Q relationship, aligning with the IO-q literature and suggesting that VR incorporates economic rents. Notably, we identify VR=0 (conceptually equivalent to Total Q=1) as a potential threshold for investment behavior: negative VR values show relatively flat sensitivity, while positive VR values show decreasing sensitivity as VR increases. This novel finding warrants further theoretical and empirical investigation.

We also conduct separate analyses for early (1976-2000) and late (2001-2020) periods. Panel F shows investment-Q sensitivity across Q-5th percentile groups for both periods. The IO-q theory finds support in both subperiods, with generally lower sensitivity in the later period—an expected result given the increasing importance of rents in recent years. Industry-specific analyses (Online Appendix Figure OA9) reveal considerable cross-industry variation in investment-Q sensitivity. High-tech and Healthcare industries show more pronounced reduced sensitivity in recent years, while Manufacturing shows mixed results across subperiods.

In conclusion, our findings demonstrate that incorporating intangible capital strengthens the linear investment-Q relationship, validating our measurement of capitalized intangible assets. Firms with higher Q (adjusted for intangible capitals) show reduced investment sensitivity to Q, supporting IO-q theory. We characterize the nature of the empirical relationships among VR, Total Q, reduced investment-Q sensitivity, and market power. Our findings support the view that for firms with strong franchises (i.e., moats protecting profits), a rise in the value of Q and VR do not necessarily represent increased investment opportunities within such highly profitable franchises.

4.4 China and Economic Rents

In this section, we examine how China's entry into the WTO affects a firm's valuation residual. In 2000, the United States Congress granted Permanent Normal Trade Relations (PNTR) status to China, reducing tariffs and uncertainty on Chinese imports. This PNTR status reduced investment uncertainty for U.S. firms in China and incentivized shifting business development and operations to China (Pierce and Schott, 2016; Antràs, Fort, and Tintelnot, 2017). As a result, U.S. direct investment in China increased from $9.6 billion in 2000 to $53.9 billion in 2018.[33]

Literature suggests that when new markets open, firms with a competitive advantage benefit the most (Bernard and Jensen, 1999). U.S. firms faced more domestic competition from foreign firms, and foreign firms faced more competition from U.S. firms in their home markets. This implies that U.S. firms with competitive advantages would benefit more from market openings, assuming their advantages in the U.S. carry over to foreign markets. We expect these firms to experience a larger increase in their economic rents following China's WTO entry.

Following Pierce and Schott (2016), we define exposure to the China shock using the industry-level NTR (Normal Trade Relationship) gap, which is the difference between non-NTR and NTR tariff rates. The NTR gap measures industry exposure to the China shock, with larger gaps indicating greater impacts from changes in U.S. import policy. We use the 1999 NTR gap for our analysis.[34]

We analyze the effect of the China shock on U.S. manufacturing economic rents using a generalized OLS difference-in-differences (DID) specification, examining whether the increase in VR is larger in industries with higher NTR gaps post-PNTR. We restrict our sample to U.S. manufacturing firms (SIC 2000-3999) from 1990 to 2007. We estimate the following equation:

$$Scaled\ VR_{i,t} = \alpha_0 + \delta_1(NTR\ gap_i \times\ Post_t) + Post_t + \alpha\mathbf{X}_{i,t} + c_j + c_t + \xi_{i,t}, \qquad (19)$$

where $NTR\ gap_i$ is the industry-level (4-digit SIC) NTR gap in 1999; $Post_t$ is an indicator for the post-PNTR period (i.e., from year 2001 forward); $\mathbf{X}_{i,t}$ includes the same control variables in other regressions; and c_j and c_t are industry and year fixed effects. Standard errors are clustered at the industry level.

[33] Data source: UN Comtrade database and the U.S. Bureau of Economic Analysis.

[34] NTR Gap is measured at the SIC-4 digit industry level with 128 unique industries in this analysis. The percentile distribution of NTR Gap shows that the10th (25th, 50th, 75th, and 90th) percentile is 0.12 (0.24, 0.35, 0.40, and 0.47), which confirms the presence of industrial heterogeneity and affects firms differently after China WTO shock.

Table 7 presents our DID estimates. We find significantly positive coefficients on the interaction term, indicating that firms more affected by the shock experienced greater increases in rents post-PNTR. When separating the sample into high and low pre-shock competitive advantage groups using Hoberg et al. (2014) product market fluidity measure, the effect is only present in firms with high competitive advantages. This suggests that China's WTO entry provided U.S. firms with local competitive advantages the opportunity to expand their economic rents.

<Insert Table 7 Here>

5. Mispricing Component of Valuation Residual

As we discussed earlier, valuation residual VR has several components. In this section we provide some evidence to the effect that the mispricing component of VR is likely to be small.[35]

Recall that VR is defined as:

$$VR = MV - (TA + BIA + KC + OC) \quad (20)$$

Define $MV \equiv MV^{*} + Mispricing$, where MV^{*} is unobserved and represents the MV in the absence of mispricing. Substituting this expression for MV and replacing $TA + BIA + KC + OC$ by Total Capital in the definition of VR gives:

$$VR = MV^{*} + Mispricing - Total\ Capital \quad (21)$$

Hence VR could be high when MV^{*} is high or *Mispricing* is high or both, for a given level of Total Capital. We divide total capital for both left- and right-hand side of Equation (21):

$$VR/Total\ Capital = (MV^{*}/Total\ Capital) + (Mispricing/Total\ Capital) - 1 \quad (22)$$

Assuming a firm's profitability refers to profits generated by per unit of book value of capital, all else equal, more profitable companies should command a higher stock price, and thus a higher $MV^{*}/Total\ Captial$. When both $VR/Total\ Capital$ and profitability are high, VR is likely to be high due to MV^{*} being high, and *Mispricing* will be low. In contrast, when

[35] The literature in market efficiency is vast, and so is the literature on asset pricing anomalies. Our reading of the literature suggests that the market is generally efficient, to a first order. As Lewellen and Shaken (2002) observe, "Returns might appear predictable to an econometrician, or appear to deviate from the Capital Asset Pricing Model, but investors can neither perceive nor exploit this predictability."

$VR/Total\ Capital$ is high but profitability is low, VR is likely to be high due to *Mispricing* being high and thus overvalued.

We posit that smaller firms are more likely subject to mispricing than larger firms. Smaller firms typically receive less investor attention, disclose less information which in turn makes their intangible assets difficult to assess, potentially exacerbating mispricing. Therefore, we conjecture that smaller firms with low profitability and high valuation residual are likely be overvalued and their stock price, earning lower returns when corrections occur in the market. This motivates constructing managed portfolios of stocks by sorting on profitability and VR controlling for firm size.

5.1 Sorting Stocks based on Firm Size, Profitability, and VR

We sort firms into five industries using Fama and French classification, and then into small and large firms based on median NYSE market capitalization in each industry. Within each industry and size group, we independently double sort firms based on their (1) Profitability and (2) Normalized VR, NVR = VR/Total Capital, into three categories each: low, medium, and high.[36] This sorting scheme results in 18 groups: 9 groups of small-cap stocks and 9 groups of big-cap stocks. There are a variety of profitability measures. Our theoretical framework implies that *MV** represents the profits generated by all types of capital, including capitalized intangible assets, and therefore we use the intangible adjusted profitability as the profitability measure. Portfolios are rebalanced annually in June of year *t*, with value-weighted monthly returns computed from July of year *t*+1.

Table 8 Panel A reports the descriptive statistics for the characteristics of each portfolio in each month. The results reveal a significant variation in profitability and NVR across categories.

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[36] Our measured VR encompass both hidden rents and potential mispricing components at firm-year level. These mispricing components are likely to be more pronounced at firm level rather than sector level. Asness, Porter, and Stevens (2000) demonstrate that the value effect is substantially stronger within industries than across industries, suggesting that the identification of misvalued firms could be more effective within specific industries. Our industry-specific approach aligns with the notion that firms within the same industry often share similar operational characteristics, competitive landscapes, and regulatory environments. Consequently, comparing a firm's intangible-adjusted profitability and VR to those of its industry peers may provide more accurate insights into potential mispricing than broad, cross-industry comparisons.

For example, for the three portfolios that are small-cap stocks and have low-profitability, the high-NVR portfolio has -2% intangible-adjusted profitability (annual, value-weighted average), whereas the low-NVR portfolio has 3%.

<Insert Table 8 Here>

Panel B presents the results of double-sorting portfolio asset pricing tests. We find that the portfolio of small-cap stocks with low profitability and high NVR delivers negative average excess returns (monthly return on portfolios in excess of the Treasury bill rate), while other groups deliver positive excess returns. Conditional on high NVR, a strategy of a long position in the portfolio with high-profitability and a short position in the portfolio with low-profitability yields 13.8% per annual (1.15%×12) excess returns.

We then estimate abnormal returns of these portfolios relative to the CAPM model and the five-factor model of Fama and French (2015) (FF-5-faceotr model). These estimated alphas are net of exposures to market risk and risk premia related to size, book-to-market, profitability, and investment. We find that smaller firms that have low-profitability and high-NVR firms displays a significantly negative alphas estimated from both the CAPM and the FF-5-factor model. The economic magnitude is substantial. When we use the FF-5-factor alphas, it is -0.89% per month and -10.68% (-0.89%×12) per annual abnormal stock return. We do not see significantly negative alphas for high-NVR firms conditional on high-profitability firms, or for big-cap stocks.[37]

We further conduct a subperiod analysis and find the mispricing for small firms with low-profitability and high-NVR consistently exists across subperiods with significant economical magnitudes: the annual negative alpha (FF-5-factor model) is -12.24% (-1.02%×12) in the early period (1976-2000) and -9.36% (-0.78%×12) in the late period (2001-2020). For robustness, we use other measures of profitability, including Lerner index, gross profitability, and alternative measure of VR scaled by firm market value. The results remain hold (see Online Appendix Table OA13). These findings indicate that our measured valuation residuals may contain mispricing

[37] Since there are 9 big firm portfolios, we use the Bonferroni corrected significance level of 0.56% (=0.05/9) for the conventional two tailed 5% significance level, corresponding to a *t*-value of 2.77.

component only for small firms.[38]

6. Conclusion

Our study examines the gap between the market values of firms and their book values, decomposing this gap into two primary components: capitalized intangible assets and valuation residual that could originate from capacity adjustment costs, economic rents, potential mispricing, or a combination of these. By analyzing financial statement data and market prices of publicly traded U.S. firms from 1976 to 2020, we estimate the capitalization and depreciation parameters for R&D expenditures and SG&A expenditures and measure the valuation residuals. Our estimation method does not require assumptions regarding firms' production technologies or the structure of product market competition. Our estimated intangible capitalization parameters align with previous findings (Li and Hall, 2020), and our aggregate measures of capitalized intangibles are consistent with Crouzet and Eberly (2023)'s empirical results.

We show that our estimated valuation residuals have a significant economic rents related component. Firms with higher valuation residuals have higher profitability, face lower product market threats, exhibit lower labor shares, and smaller investment sensitivities to Tobin's Q, even after adjusting for capitalized intangible assets. Further, firms with better competitive advantages experienced significant increases in valuation residuals using China's admission to the WTO as an exogenous shock. We find that except for smaller firms that are less profitable and have higher valuation residuals, other firms are on average fairly priced, consistent with our assumption that mispricing is a smaller component of valuation residuals.

[38] Our methodology estimates intangible capitalization parameters using the full-sample period, which we then apply to measure valuation residuals and capitalized intangible assets. While this approach incorporates forward-looking information in portfolio formation, our primary objective is to test whether VR contains mispricing components, rather than identify implementable arbitrage strategies or generate investable alpha signals.

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Appendix A.

Definition of Variables.

Measures of valuation residual

Valuation residual (VR) is the proxy for economic rents, measured based on our model formulated in Section 2:

$$\widehat{VR}_{i,j,t} = MV_{i,j,t} - TA_{i,j,t} - BIA_{i,j,t}$$
$$-\left(\left((1-\tau_{i,j,1})R\&D_{i,j,1}/\left(\hat{\delta}_{KC,j} + g_{\text{R\&D-growth},j}\right)\right)\left(1-\hat{\delta}_{KC,j}\right)^t + \sum_{s=0}^{t-1}\left(1-\hat{\delta}_{KC,j}\right)^s (1-\tau_{i,j,t-s})R\&D_{i,j,t-s}\right)$$
$$-\left(\left(\hat{\lambda}_j \times (1-\tau_{i,j,1})SG\&A_{i,j,1}/\left(\hat{\delta}_{OC,j} + g_{\text{SG\&A-growth},j}\right)\right)\left(1-\hat{\delta}_{OC,j}\right)^t + \sum_{s=0}^{t-1}\left(1-\hat{\delta}_{OC,j}\right)^s \hat{\lambda}_j \times (1-\tau_{i,j,t-s})SG\&A_{i,j,t-s}\right)$$

Scaled VR is the scaled valuation residual variable with a range between 0 to 1. The variable is measured as follows:

$$Scaled\ VR_{i,j,d,t} = \left(Rank\ VR_{i,j,d,t}\right)/N_{j,d,t},$$

where $Rank\ VR_{i,j,d,t}$ stands for an ordinal rank based on a firm *i*'s *VR* within each industry *j* (Fama and French five industry classification, *j*=1, 2…,5) within each size-decile group *d* (*d*=1, 2…,10) in year *t*. The size-decile group *d* is classified based on the decile firm market value within industry *j* in year *t*. $N_{j,d,t}$ is the number of firms in industry *j* in size-decile group *d* in year *t*. For parsimony, we drop subscripts *j*, *d* and use $Scaled\ VR_{i,t}$ as the baseline measure of *VR* for the firm *i* in year *t*.

Measures of capitalized intangible assets

Knowledge capital (KC) is the knowledge capital based on our model formulated in Section 2.

Organization capital (OC) is the organization capital based on our model formulated in Section 2.

Capitalized intangible assets (CIA) is the sum of knowledge capital (*KC*) and organization capital (*OC*).

Scaled CIA is the scaled capitalized intangible assets variable with a range between 0 to 1. The variable is measured following a similar construction described in *Scaled VR* variable.

Variables of estimating valuation residual model

Market value of assets (MV) is the sum of the market value of equity (Compustat *prcc_f* (fiscal year-end price) times *csho* (number of shares outstanding)) and total liabilities (Compustat *lt*).

Tangible assets (TA) is the book value of assets (Compustat *at*) minus the book intangible assets—the sum of identifiable intangible assets (Compustat *intano*) and goodwill (Compustat *gdwl*).

Book intangible assets (BIA) is the sum of identifiable intangible assets (Compustat *intano*) and goodwill (Compustat *gdwl*).

R&D is the reported R&D (Compustat *xrd*) on the balance-sheet minus in-process R&D expenses (Compustat *rdip*).

SG&A is the selling, general, and administrative expense expenditure. Measuring SG&A from our Compustat data is not trivial. Companies typically report SG&A and R&D separately. Compustat, however, adds them together in a variable misleadingly labeled "Selling, General, and Administrative Expense" (Compustat *xsga*). We therefore subtract *xrd (*after deducting *rdip*) from *xsga* to obtain the SG&A reported by companies.

Effective tax rate is the ratio of income taxes (Compustat *txt*) divided by pre-tax income (Compustat *pi* minus *spi*).

Other firm-level variables

Lerner index is the ratio of operating income (Compustat *oibdp*) minus depreciation (Compustat *dp*) divided by sales (Compustat *sale*). The index is set to be 0 if the ratio is negative.

Gross profitability is the ratio of gross profitability (Compustat *gp*) divided by total assets (Compustat *at*).

Intangible-adjusted profitability is the ratio of earnings before interests and taxes (Compustat *ebit*) plus intangible investment expenditures ($R\&D + \lambda \times SG\&A$) divided by the sum of total capital employed (Compustat *dlc* plus *dltt* plus *ceq* plus *pstk*) and capitalized intangible assets. The λ is the portion of SG&A expenditures that build organization capital (see Table 2).

BE/ME is the ratio of book value of equity (BE) to market value of equity (ME). BE refers to the Fama-French defined BE, and ME is measured as the stock price at fiscal year-end (Compustat *prcc_f*) times the number of outstanding shares (Compustat *csho*).

Log market cap is the natural logarithm of market capitalization, measured as the stock price at fiscal year-end (Compustat *prcc_f*) times the number of outstanding shares (Compustat *csho*).

Neg accrual/BE is the ratio of accruals per share for firms with negative accruals (Compustat *act* minus *che* minus *lct* plus *dlc*) divided by book value of equity, and zero otherwise.

Pos accrual/BE is the ratio of accruals per share for firms with positive accruals divided by book value of equity, and zero otherwise.

dA/A is the asset growth (Compustat *at* minus lagged *at* divided by lagged *at*).

No dividend is the dummy variable that equals one for firms that pay no dividend (Compustat *dvpsx*).

Dividend/BE is the ratio of dividends (Compustat *dvpsx* times *csho*) divided by book value of equity.

Neg profitability is the dummy variable that equals one for firms with negative profitability and zero otherwise.

Markup is the production-based approach of markups following De Loecker et al. (2020).

Product market threat is the product market threat measure based on changes in key product words in firms' 10-Ks following Hoberg et al. (2014).

NTR gap is the difference between the non-NTR (normal trade relationship) tariff rate and the NTR tariff rate. We follow Pierce and Schott (2016) and measure the NTR gap at the 4-digit SIC industry level in 1999.

Labor share is the payrolls-to-value-added, measured as the ratio of wage bills (Compustat *xlr*) to the sum of wage bills (Compustat *xlr*) and EBITDA (earnings before interest, tax, depreciation, and amortization) (Compustat *ebitda*). See Autor et al. (2020) for further details.

Log firm age is the natural logarithm of a firm's age in years since its initial public offering.

Total Q is the intangible adjusted Tobin's Q, measured as a firm's market value divided by lagged sum of total capital employed (Compustat *dlc* plus *dltt* plus *ceq* plus *pstk*) and capitalized intangible assets. We follow Crouzet and Eberly (2023) and measure the market value as market value of outstanding equity (Compustat *prcc_f* times *csho*) plus book value of debt (Compustat *dltt* plus *dlc*) minus cash and cash equivalents (Compustat *che*).

Standard Q is the standard Tobin's Q, measured as a firm's market value divided by lagged physical assets (Compustat *ppegt*).

$\boldsymbol{I_{t+1}/K_{t+1}}$ is the ratio of total investment in year *t*+1 divided by total capital at the beginning of year *t*+1. The total investment is the sum of physical investment (Compustat *capx*) and intangible investment $(R\&D + \lambda \times SG\&A)$. The λ is the portion of SG&A expenditures that build organization capital (see Table 2). The total capital is measured as the sum of total capital employed (Compustat *dlc* plus *dltt* plus *ceq* plus *pstk*) and capitalized intangible assets.

$\boldsymbol{I^{phy}_{t+1}/K^{phy}_{t+1}}$ is the ratio of physical investment (Compustat *capx*) in year *t*+1 divided by physical capital (Compustat *ppegt*) at the beginning of year *t*+1.

Appendix B.

List of Top Firms by Valuation Residual in 1985, 2000, 2015, and 2020.

This table lists the top five firms with the highest average valuation residual in a five-year horizon. We rank firms within an industry across different five-year periods: 1981-1985, 1996-2000, 2011-2015, and 2016-2020. The numbers shown in italics are CPI-adjusted valuation residual (CPI index with 1982-1984 =100) and expressed in billion dollars.

	Consumer		Manufacturing		High-tech		Healthcare		Other	
Rank					**Period 1981-1985**					
1st	Coca-Cola	*3.7*	3M	*3.1*	IBM	*28.5*	Abbott Laboratories	*2.5*	Dun & Bradstreet	*3.0*
2nd	Altria Group	*3.6*	Texas Oil & Gas	*2.7*	HP	*3.1*	Merck & Co	*2.2*	Waste Management	*1.5*
3rd	Walmart	*2.6*	Standard Oil	*2.0*	BellSouth	*2.6*	Wyeth	*2.2*	S&P Global	*1.0*
4th	McDonald's	*2.4*	Amoco	*1.0*	Eastman Kodak	*2.3*	HCA Hospital Corp of America	*1.6*	Time Warner	*1.0*
5th	RS Legacy	*2.2*	Procter & Gamble	*0.9*	TEGNA	*2.1*	Smithkline Beckman	*1.2*	FedEx	*1.0*
					Period 1996-2000					
1st	Coca-Cola	*84.2*	Exxon Mobil	*83.1*	Microsoft	*148.3*	Merck & Co	*74.6*	United Parcel Service	*37.9*
2nd	Walmart	*58.4*	Procter & Gamble	*41.5*	Cisco Systems	*93.3*	Pfizer	*71.1*	Avis Budget Group	*7.2*
3rd	Altria Group	*42.8*	Gillette	*23.8*	Intel	*87.5*	Bristol-Myers Squibb	*50.4*	Waste Management	*5.9*
4th	Home Depot	*32.0*	E. I. du Pont de Nemours and Co	*21.5*	AT&T	*51.2*	Johnson & Johnson	*41.5*	Omnicom Group	*5.7*
5th	PepsiCo	*25.4*	Chevron	*18.9*	IBM	*45.1*	Eli Lilly and Co	*37.9*	AES	*5.6*
					Period 2011-2015					
1st	Amazon.com	*59.5*	Exxon Mobil	*83.8*	Apple	*169.1*	Johnson & Johnson	*34.3*	United Parcel Service	*34.4*
2nd	Philip Morris International	*58.0*	Procter & Gamble	*39.2*	Alphabet	*96.3*	Gilead Sciences	*32.2*	Union Pacific	*22.0*
3rd	Coca-Cola	*56.3*	Chevron	*24.3*	Microsoft	*67.9*	AbbVie	*30.8*	Las Vegas Sands	*13.8*
4th	Walmart	*40.9*	3M	*22.7*	Facebook	*63.5*	Celgene	*20.2*	Southern Copper	*8.5*
5th	PepsiCo	*36.8*	Boeing	*21.8*	IBM	*47.9*	Biogen	*16.5*	Hilton Worldwide Holdings	*7.5*
					Period 2016-2020					
1st	Amazon.com	*278.9*	Procter & Gamble	*60.5*	Apple	*366.9*	Johnson & Johnson	*78.8*	Netflix	*45.8*
2nd	Home Depot	*75.4*	Boeing	*53.3*	Microsoft	*269.5*	AbbVie	*39.9*	United Parcel Service	*41.7*
3rd	Coca-Cola	*70.1*	Nike	*36.6*	Alphabet	*225.4*	Merck & Co	*36.2*	Union Pacific	*36.1*
4th	Tesla	*63.9*	Exxon Mobil	*36.3*	Facebook	*157.7*	Amgen	*30.6*	Airbnb	*29.7*
5th	McDonald's	*55.6*	3M	*34.0*	Verizon Communications	*52.0*	Abbott Laboratories	*23.3*	S&P Global	*18.3*

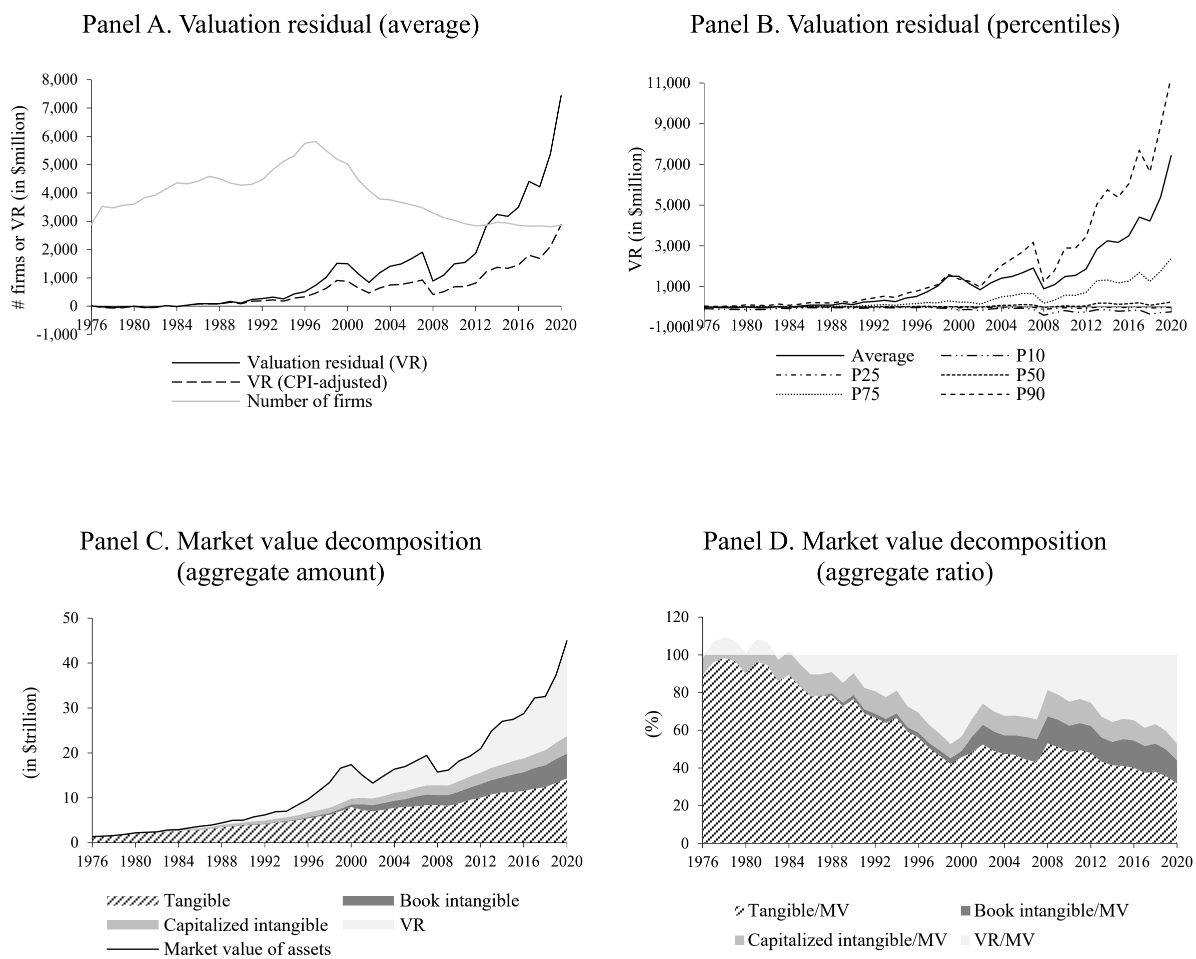
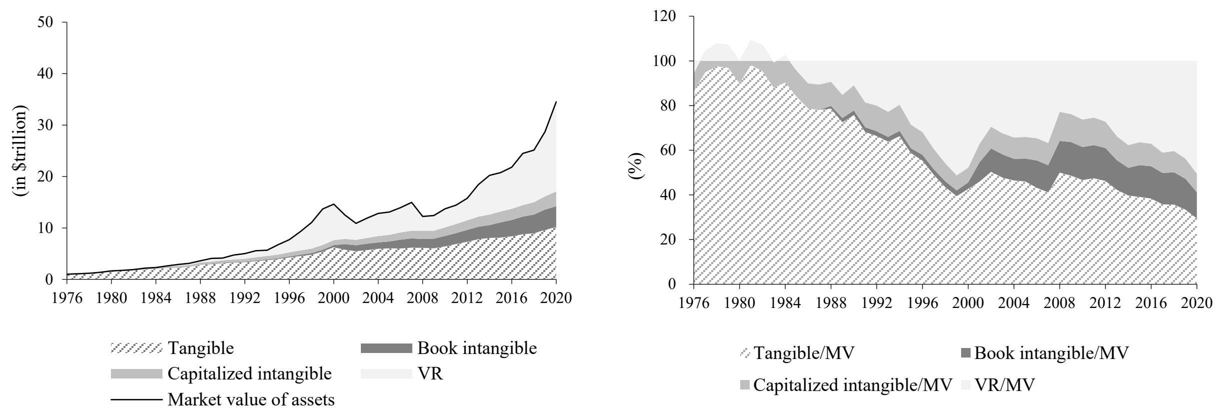


Figure 1. Valuation Residual Distribution and Market Value Decomposition.

This figure presents the valuation residual distribution and the aggregate market value decomposition. The valuation residual (VR) estimated from our VR model. Methodology and data sources are described in Section 2 and Section 3. The sample contains U.S. public firms from 1976 to 2020 with 176,005 firm-year observations and 16,532 unique firms. In Panel A, the solid-black represents the average nominal VR among firms in a year; the dash-black line represents the VR (CPI-adjusted)—the average VR deflated by the CPI index with 1982-1984=100 among firms in a year; the gray line represents the number of publicly traded firms in a year. Panel B presents the percentiles of VR. We decompose a firm's market value into four components: tangible assets, book intangible assets, capitalized intangible assets, and VR. Panel C presents the aggregate amount of each component across all firms in a year. Panel D presents the aggregate ratio, measured by the aggregate of each component to the aggregate market value across all firms in a year.

Panel A. Large firms (top 10% size)



Panel B. Other firms (bottom 90% size)

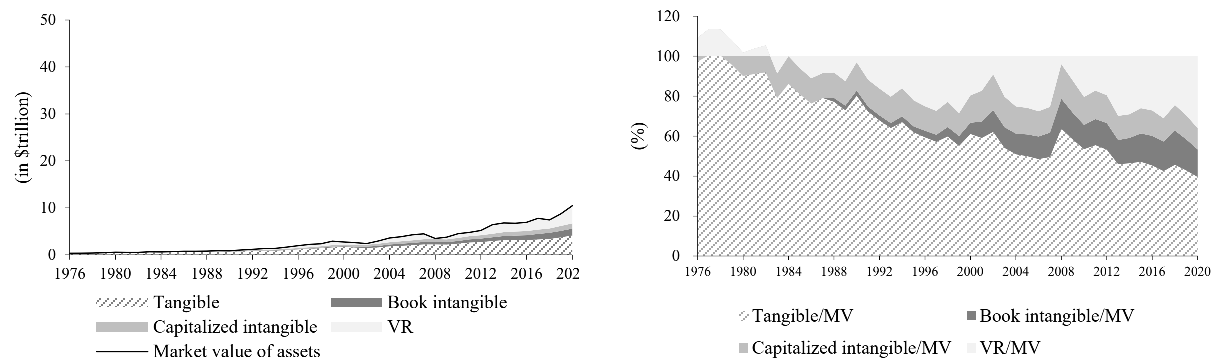
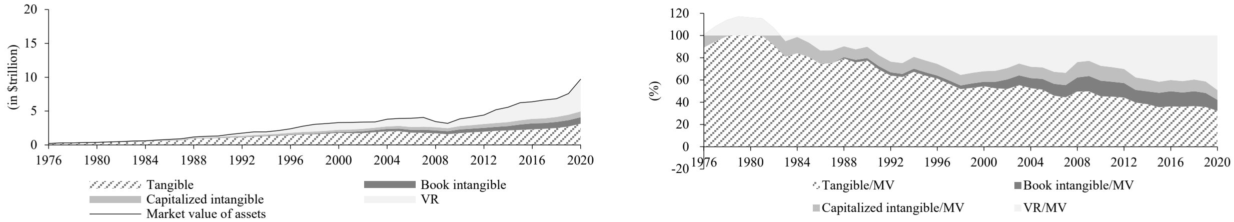


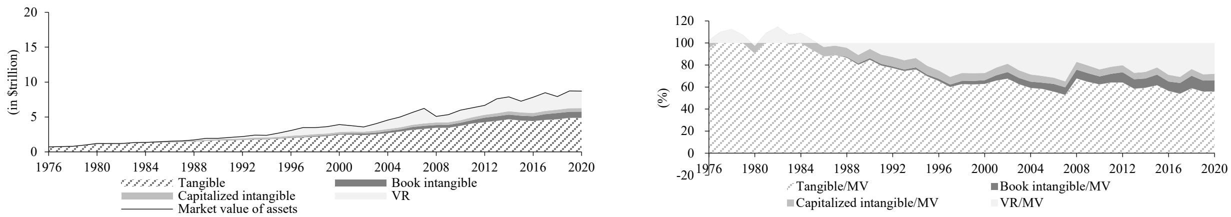
Figure 2. Market Value Decomposition: Large Firms versus Other Firms.

The figure presents the market value decomposition of large firms versus other firms. Firm size is classified based on a firm's market value within an industry (Fama-French five industry classification) in a year. *Large* refers to the group of firms with top 10% size (Panel A) and *Other* refers to the group of firms with bottom 90% size (Panel B). We decompose a firm's market value into four components: tangible assets, book intangible assets, capitalized intangible assets, and valuation residual (VR). The left graphs present the aggregate amount of each component across all firms in a year. The right graphs present the aggregate ratio, measured by the aggregate of each component to the aggregate market value across all firms in a year.

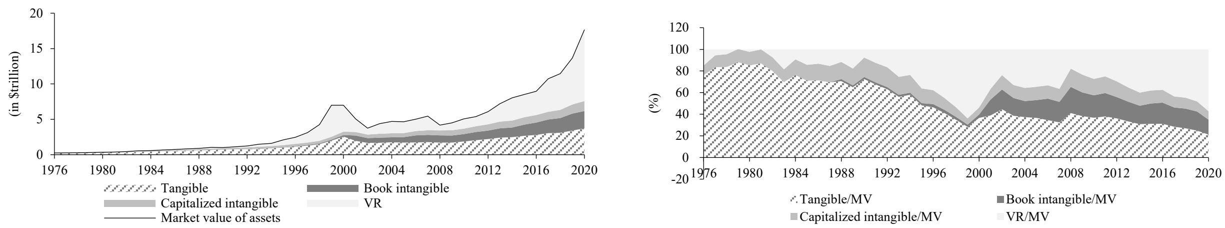
Panel A. Consumer



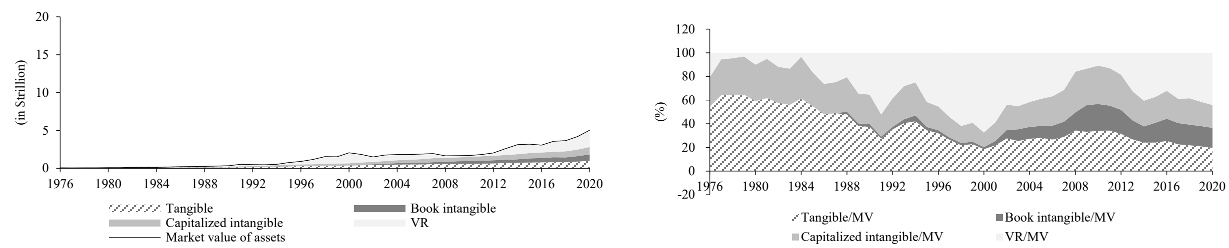
Panel B. Manufacturing



Panel C. High-tech



Panel D. Healthcare



Panel E. Other

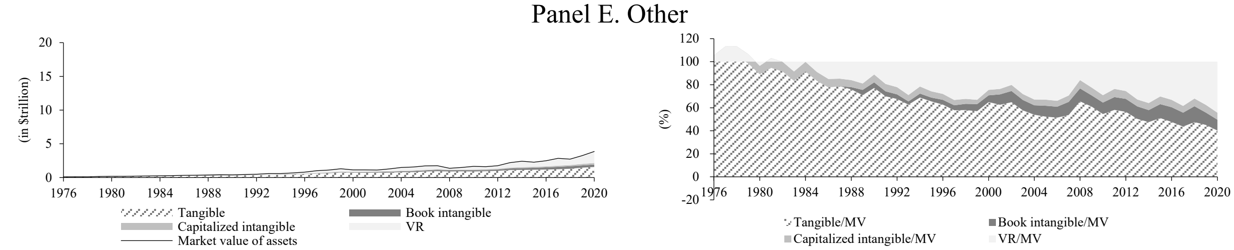


Figure 3. Market Value Decomposition by Industry.

This figure presents the aggregate market value decomposition across industries. We decompose a firm's market value into four components: tangible assets, book intangible assets, capitalized intangible assets, and valuation residual (VR). We use Fama-French five industry classification. The left graphs present the aggregate amount of each component across all firms in each industry in a year. The right graphs present the aggregate ratio, measured by the aggregate of each component to the aggregate market value across all firms in each industry in a year.

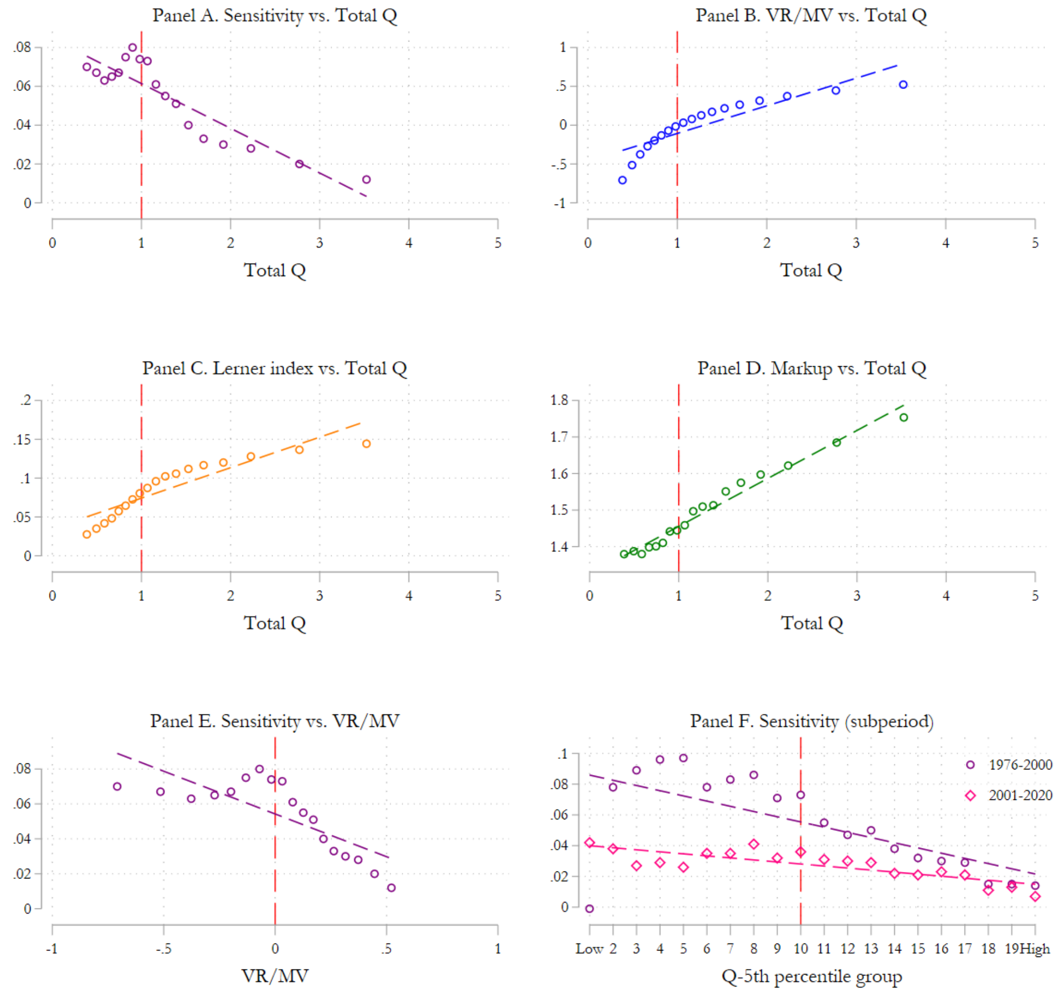


Figure 4. Market Power, Valuation Residual, and Sensitivity of Investment-Q.

This figure presents scatter plots for the relationship among valuation residual (VR), intangible-adjusted Tobin's Q (Total Q), sensitivity of total investment to Total Q (Sensitivity), and market power measures (Lerner index or Markup). We estimate Sensitivity based on the threshold regression that regresses the total investment on Total Q interacted with indicator variables differentiating groups based on Q-5th percentile of Total Q in an industry-year. Section 4.3.3 provides the details of the regression construction. We compute the mean value of VR/MV, Lerner index and De Loecker (2020)'s markup at the group level (twenty Q-5th percentile groups). At the group level, Panel A presents the scatter plot of Sensitivity against the mean value of Total Q. Panel B-D present the scatter plots of VR/MV, Lerner index, or Markup against the mean value of Total Q. Panel E presents the scatter plot of Sensitivity against VR/MV. In Panels A-E, we exclude the minimum and maximum Total Q (or VR/MV) observations when creating scatter plots. Panel F presents the scatter plot of Sensitivity against Q-5th percentile groups separately using the subsamples of early period 1976-2000 or late period 2001-2020.

Table 1. Summary Statistics.

The table presents the summary statistics. The sample contains U.S. public firms from 1976 to 2020 with 176,005 firm-year observations and 16,532 unique firms. Panel A reports the statistics for the variables in the estimation of our valuation residual (VR) model in Section 2. Panel B reports the statistics of the estimated VR and capitalized intangible assets (the sum of knowledge capital and organization capital) from our VR model. Panel C reports the descriptive statistics for the variables used in the regressions. The units of each observation are in million dollars (except for ratios). Appendix A provides variable definitions and details of their construction.

	Mean	SD	P25	P50	P75
Panel A. Variables of the estimation					
Market value of assets (MV)	2,545.34	8,477.98	41.9	192.3	1,091.96
Tangible assets (TA)	1,266.26	4,087.14	26.32	113.42	567.33
Book intangible assets (BIA)	211.10	988.58	0	0	14.13
R&D	23.80	116.37	0	0	5.10
SG&A	174.15	564.64	3.37	17.48	86.57
Effective tax rate	26%	23%	0%	30%	40%
Panel B. Estimated valuation residual and capitalized intangible assets					
Valuation residual (VR)	671.44	2,935.22	-18.14	5.27	156.76
Scaled VR	0.51	0.29	0.26	0.51	0.76
VR/MV	-0.04	0.65	-0.26	0.07	0.36
Knowledge capital (KC)	72.85	354.23	0	0.12	14.97
Organization capital (OC)	172.28	594.82	3.56	17.24	79.48
Capitalized intangible assets (CIA)	255.14	935.97	5.36	26.01	117.65
Scaled CIA	0.511	0.289	0.26	0.51	0.76
CIA/Total capital	0.24	0.19	0.09	0.20	0.35
KC/CIA	0.21	0.28	0	0.05	0.38
OC/CIA	0.79	0.28	0.62	0.95	1
Panel C. Variables of regressions					
Lerner index	0.08	0.09	0	0.06	0.12
Gross profitability	0.35	0.31	0.17	0.33	0.51
Intangible-adjusted profitability	0.14	0.15	0.07	0.15	0.24
Log BE/ME	-0.64	0.93	-1.18	-0.55	0
Log market cap	4.86	2.30	3.14	4.73	6.47
Neg accrual/BE	-0.07	0.22	-0.05	0	0
Pos accrual/BE	0.08	0.16	0	0.01	0.09
dA/A	0.14	0.43	-0.04	0.06	0.20
No dividend	0.66	0.47	0	1	1
Dividend/BE	0.02	0.03	0	0	0.02
Markup	1.53	0.76	1.10	1.29	1.64
Product market threat	6.93	3.55	4.32	6.25	8.80
Labor share	0.55	0.52	0.40	0.64	0.78
Log firm age	2.50	0.85	1.95	2.49	3.18
Total Q	1.48	1.40	0.68	1.08	1.75
Standard Q	5.47	10.29	0.99	2.04	4.93
I_{t+1}/K_{t+1}	0.19	0.13	0.11	0.16	0.24
$I_{t+1}^{phy}/K_{t+1}^{phy}$	0.16	0.18	0.06	0.11	0.19

Table 2. Capitalization Parameter Estimates.

This table presents the estimated parameters in the model for valuation residual below:

$$
\begin{aligned}
MV_{i,j,t} = {} & TA_{i,j,t} + BIA_{i,j,t} \\
& + \left(\left((1-\tau_{i,j,1})R\&D_{i,j,1} / \left(\delta_{KC,j} + g_{\text{R\&D-growth},j}\right)\right)\left(1-\delta_{KC,j}\right)^{t} \right. \\
& \left. + \sum_{s=0}^{t-1} \left(1-\delta_{KC,j}\right)^{s} (1-\tau_{i,j,t-s}) R\&D_{i,j,t-s} \right) \\
& + \left(\left(\lambda_j \times (1-\tau_{i,j,1}) SG\&A_{i,j,1} / \left(\delta_{OC,j} + g_{\text{SG\&A-growth},j}\right)\right)\left(1-\delta_{OC,j}\right)^{t} \right. \\
& \left. + \sum_{s=0}^{t-1} \left(1-\delta_{OC,j}\right)^{s} \lambda_j \times (1-\tau_{i,j,t-s}) SG\&A_{i,j,t-s} \right) + VR_{i,j,t}
\end{aligned}
$$

where $MV_{i,j,t}$ is the market value of assets for firm *i* in industry *j* at the end of year *t*, measured as the sum of the market value of equity and the book value of total liabilities reported in the balance sheet. $TA_{i,j,t}$ is the firm's tangible assets, $BIA_{i,j,t}$ is the firm's book intangible assets, $VR_{i,j,t}$ is the firm's valuation residual, and τ is the effective tax rate. Our estimation parameters are: $\delta_{KC,j}$, the depreciation rate for knowledge capital for industry *j*; $\delta_{OC,j}$, the depreciation rate for organization capital for industry *j*; λ_j, the portion of SG&A expenditures that build organization capital for industry *j*. The sample contains U.S. public firms from 1976 to 2020. The estimates are industry-specific in Fama-French five industries. The model fit (Pseudo-R^2) is computed as the percentage improvement in the exponentiated root mean squared error generated by the full model relative to a model that includes only a constant. Standard errors are bootstrapped with 1,000 replications at the firm-level and reported in parentheses. For column All, we aggregate the estimated parameters across five industries by a weighted-average weighted by the number of observations in each industry.

	Consumer	Manufacturing	High-tech	Healthcare	Other	All
δ_{KC}	0.14	0.15	0.20	0.17	0.33	0.19
(s.e.)	*(0.07)*	*(0.04)*	*(0.03)*	*(0.01)*	*(0.09)*	
δ_{OC}	0.18	0.16	0.25	0.13	0.11	0.17
(s.e.)	*(0.17)*	*(0.11)*	*(0.11)*	*(0.11)*	*(0.04)*	
λ	0.22	0.31	0.49	0.57	0.31	0.37
(s.e.)	*(0.16)*	*(0.16)*	*(0.21)*	*(0.26)*	*(0.05)*	
Pseudo-R^2	81%	85%	79%	72%	80%	
No. of observations	40,551	46,209	42,573	22,048	24,624	176,005

Table 3. Comparison of Capitalization and Depreciation Parameters in the Literature.

This table compares the capitalization parameters of R&D and SG&A based on our valuation residual model with the parameters in the literature. The capitalization parameters are: (1) δ_{KC}, the depreciation rate for knowledge capital; (2) δ_{OC}, the depreciation rate for organization capital; and (3) λ, the portion of SG&A expenditures that build organization capital. The estimates are industry-specific in Fama-French five industries. Panel A presents the baseline estimates based on our valuation residual model (see Table 2) and summarizes the parameters in the literature. Panel B presents the capitalization parameters in Li and Hall (2020) that use the BEA-NSF data from 1987 to 2007 for R&D intensive industries. To compare with the Li and Hall's (2020) parameters, Panel B reports the estimated parameters when we re-estimate our valuation residual model based on the sample that follows their sample construction except that we use Compustat data.

Panel A. Literature comparison

		Consumer	Manufacturing	High-tech	Healthcare	Other
Our paper (Compustat, 1976-2020)	δ_{KC}	0.14	0.15	0.20	0.17	0.33
	δ_{OC}	0.18	0.16	0.25	0.13	0.11
	λ	0.22	0.31	0.49	0.57	0.31
Lev and Sougiannis (1996) (Compustat, 1975-1991)	δ_{KC}	0.13-0.14	0.13-0.14	0.20	0.11	0.13-0.14
Hall (2007) (Compustat, 1974-2003)	δ_{KC}	0.19-0.36	0.19-0.36	0.31	0.15	0.19-0.36
Ewens et al. (2024) (Thomson's SDC, 1996-2017)	δ_{KC}	0.43	0.50	0.42	0.33	0.35
Chan et al. (2001) and others[a]	δ_{KC}			0.15 or 0.20		
Eisfeldt and Papanikolaou (2013) and others[b]	δ_{OC}			0.15 or 0.20		
Hulten and Hao (2008) and others[c]	λ			0.30		
Ewens et al. (2024) (Thomson's SDC, 1996-2017)	λ	0.20	0.21	0.37	0.51	0.21

[a] Chan et al. (2001), Hall et al. (2005), Bloom et al. (2013), and Tseng (2022) use 15%. Hirshleifer et al. (2013, 2018) use 20%.
[b] Eisfeldt and Papanikolaou (2013) use 15%. Hulten and Hao (2008), Eisfeldt and Papanikolaou (2014), Peters and Taylor (2017), Ewens et al. (2024) use 20%.
[c] Eisfeldt and Papanikolaou (2014); Peters and Taylor (2017).

Panel B. R&D depreciation rate in R&D intensive industries

		Pharmaceuticals	Computers and Peripheral Equipment	Semiconductor	Software
	SIC Code (4-digit)	(2830, 2831, 2833-2836)	(3570-3579, 3680-3689, 3695)	(3661-3666, 3669-3679)	(7372)
Li and Hall (2020) (BEA-NSF, 1987-2007)	δ_{KC}	0.11	0.36	0.23	0.31
Our paper (Compustat, 1987-2007)	δ_{KC}	0.11	0.35	0.20	0.27
	δ_{OC}	0.10	0.12	0.15	0.15
	λ	0.57	0.29	0.31	0.37

Table 4. Economic Rents and Profitability.

This table presents the regression coefficients on the effect of valuation residual on future profitability. For the corresponding OLS regression models, see Equation (13) in Section 4.1. The measures of profitability include Lerner index (Columns 1-2), Gross profitability (Columns 3-4), and Intangible-adjusted profitability (Columns 5-6). The Lerner index is the ratio of operating income minus depreciation divided by sales and the ratio is set to be 0 for a negative value. Gross profitability is the ratio of gross profits divided by total assets following Novy-Marx (2013). Intangible-adjusted profitability is the ratio of earnings before interests and taxes plus intangible investment expenditures divided by the sum of total capital employed and capitalized intangible assets. The Scaled VR is the scaled valuation residual variable with a range between 0 to 1 after accounting for firm size, industry, and time effects. All regressions are estimated using OLS and include controls of firm characteristics following Fama and French (2006) and year fixed effects. Appendix A provides the detailed variable definitions. All continuous variables are winsorized at 1% and 99%. Standard errors are clustered at firm and year shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent variable: Profitability$_{t+1}$					
	Lerner index$_{t+1}$		Gross profitability$_{t+1}$		Intangible-adjusted profitability$_{t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Scaled VR$_t$	0.102***	0.015***	0.058***	0.040***	0.094***	0.018***
	0.004	*0.002*	*0.011*	*0.004*	*0.006*	*0.003*
Log BE/ME$_t$		-0.004***		-0.020***		-0.010***
		0.001		*0.002*		*0.001*
Log market cap$_t$		0.002***		0.000		0.002***
		0.001		*0.001*		*0.001*
Neg accrual/BE$_t$		-0.003**		0.006		-0.019***
		0.001		*0.004*		*0.002*
Pos accrual/BE$_t$		-0.014***		-0.001		-0.007**
		0.002		*0.006*		*0.003*
dA/A$_t$		0.008***		0.027***		0.000
		0.002		*0.004*		*0.002*
No dividend$_t$		0.004***		0.000		0.001
		0.001		*0.002*		*0.001*
Dividend/BE$_t$		-0.003		-0.258***		-0.079***
		0.016		*0.022*		*0.018*
Neg profitability$_t$		n.a.		0.073***		0.020***
		n.a.		*0.009*		*0.003*
Profitability$_t$		0.922***		1.045***		0.970***
		0.016		*0.007*		*0.013*
Year FE?	yes	yes	yes	yes	yes	yes
Adjusted R-squared	7.8%	59.4%	2.8%	79.8%	6.3%	66.3%
No. of observations	155,726	131,067	158,667	132,816	156,922	131,087

Table 5. Markup, Product Market Threat, and Labor Share.

The table presents the regression coefficients of the effects of valuation residual on markup, product market threat, and labor share. For the corresponding OLS regression models, see Equations (14)-(16) in Section 4.2. In Column 1, we use the production-based approach of the markup from De Loecker et al. (2020). In Column 2, we use the product market threat measure based on changes in key product words in firms' 10-Ks from Hoberg et al. (2014). In Column 3, we compute the labor share as the payrolls-to-value-added, measured as the ratio of wage bills to the sum of wage bills and EBITDA, following Autor et al. (2020). The Scaled VR is the scaled valuation residual variable with a range between 0 to 1 after accounting for firm size, industry, and time effects. All specifications are estimated using OLS and include controls: log of market cap, log of firm age, and scaled CIA, and fixed effects for year and firm. Appendix A provides the detailed variable definitions. All continuous variables are winsorized at 1% and 99%. Heteroskedasticity-consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Markup	Product market threat	Labor share
	(1)	(2)	(3)
Scaled VR	0.089***	-0.422***	-0.090***
	0.012	*0.060*	*0.020*
Log market cap	0.062***	0.207***	-0.034***
	0.004	*0.018*	*0.008*
Log firm age	-0.031***	-0.336***	0.028
	0.010	*0.062*	*0.022*
Scaled CIA	0.067***	-0.054	-0.026
	0.020	*0.090*	*0.033*
Year FE?	yes	yes	yes
Firm FE?	yes	yes	yes
Adjusted R-squared	78.2%	70.0%	49.2%
No. of observations	128,854	115,646	15,631

Table 6. Sensitivity of Investment to Q: A Threshold Regression.

This table presents the coefficient estimates of a threshold regression that regresses total investment rate on lagged Total Q interacted with different Q-level indicators. For the corresponding OLS regression models, see Equations (17)-(18) in Section 4.3. I_{t+1}/K_{t+1} is total investment rate in year t+1, where I_{t+1} is measured as the sum of physical investment (CAPX) plus intangible investment (R&D plus a portion of SG&A) and K_{t+1} is total capital at the beginning of year t+1, measured as the sum of total capital employed and capitalized intangible assets. Total Q is measured as a firm's market value of assets divided by lagged total capital. LTQ (HTQ) is an indicator variable that equals one when a firm's Total Q is below (above) the median (90th) of Total Q among all firms in an industry-year, otherwise zero. MTQ equals one when observations of LTQ or HTO are zeros. Columns 1-2 present the results using the full sample. Columns 3-6 presents the results by industry. All specifications are estimated using OLS and include controls: log of market cap, log of firm age, and fixed effects for year and firm. Appendix A provides the detailed variable definitions. All continuous variables are winsorized at 1% and 99%. Heteroskedasticity-consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent variable: I_{t+1}/K_{t+1}					
	All industry	All industry	Consumer	Manufacturing	High-tech	Healthcare
	(1)	(2)	(3)	(4)	(5)	(6)
Total Q_t	0.023***					
	0.001					
Total Q_t × LTQ_t		0.060***	0.046***	0.046***	0.074***	0.067***
		0.002	*0.005*	*0.005*	*0.004*	*0.007*
Total Q_t × MTQ_t		0.031***	0.030***	0.044***	0.025***	0.021***
		0.001	*0.002*	*0.003*	*0.002*	*0.003*
Total Q_t × HTQ_t		0.015***	0.016***	0.019***	0.015***	0.010***
		0.001	*0.002*	*0.002*	*0.002*	*0.002*
MTQ_t		0.039***	0.022***	0.011**	0.062***	0.062***
		0.002	*0.004*	*0.005*	*0.004*	*0.008*
HTQ_t		0.090***	0.070***	0.069***	0.103***	0.105***
		0.004	*0.008*	*0.008*	*0.008*	*0.014*
Log market cap_t	-0.003***	-0.012***	-0.010***	-0.004**	-0.021***	-0.014***
	0.001	*0.001*	*0.002*	*0.002*	*0.002*	*0.003*
Log firm age_t	-0.031***	-0.023***	-0.015***	-0.011***	-0.025***	-0.022***
	0.002	*0.002*	*0.004*	*0.004*	*0.005*	*0.007*
Constant	0.248***	0.238***	0.207***	0.162***	0.319***	0.251***
	0.008	*0.007*	*0.012*	*0.015*	*0.016*	*0.020*
Year FE?	yes	yes	yes	yes	yes	yes
Firm FE?	yes	yes	yes	yes	yes	yes
Adjusted R-squared	53.90%	54.80%	57.80%	51.60%	59.50%	45.00%
No. of observations	112,343	112,343	27,528	34,079	25,091	10,325

Table 7. China and Economic Rents: A Quasi-natural Experiment.

This table presents the difference-in-differences estimates of the effects of China being granted PNTR status on the valuation residual. For the corresponding OLS regression models, see Equation (19) in Section 4.1. The dependent variable is Scaled VR is the scaled valuation residual variable with a range between 0 to 1 after accounting for firm size, industry, and time effects. The sample contains U.S. public firms from 1990 to 2007. NTR Gap is defined as the difference between non-NTR (normal trade relationship) tariff rates and NTR tariff rates. We follow Pierce and Schott (2016) to measure the NTR gap at the 4-digit SIC industry level in 1999. We proxy the competitive advantage based on a firm's product market fluidity measure (Hoberg et al., 2014) in 1999. Post is an indicator variable that equals one for observations on or after 2001. Controls include log of market cap, log of firm age, Scaled CIA, and fixed effects for year and industry (4-digit SIC). Appendix A provides the detailed variable definitions. All continuous variables are winsorized at 1% and 99%. Heteroskedasticity-consistent standard errors clustered at the industry level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent variable: Scaled VR					
	Full sample		High competitive advantage		Low competitive advantage	
	(1)	(2)	(3)	(4)	(5)	(6)
NTR gap × Post	0.130**	0.079**	0.162*	0.137**	0.025	-0.098
	0.056	*0.039*	*0.086*	*0.055*	*0.094*	*0.078*
Log market cap		0.041***		0.050***		0.041***
		0.004		*0.006*		*0.006*
Log firm age		-0.029***		-0.035***		-0.017
		0.006		*0.009*		*0.013*
Scaled CIA		-0.679***		-0.637***		-0.693***
		0.022		*0.038*		*0.028*
Year FE?	yes	yes	yes	yes	yes	yes
Industry FE?	yes	yes	yes	yes	yes	yes
Adjusted R-squared	4.5%	43.0%	10.6%	41.3%	6.8%	44.0%
No. of observations	24,721	24,653	7,499	7,473	10,282	10,259

Table 8. Stock Returns: Sorting on Firm Size, Profitability, and Valuation Residual.

This table reports the monthly average returns and asset pricing test alphas for the 18 value-weighted portfolios formed on firm size, profitability, and valuation residual. The sample contains U.S. public firms from 1976 to 2020. We first sort firms into five industries, using Fama and French classification system. To avoid size bias, within each industry, we group stocks into small and big firms based on the median NYSE market capitalization within each industry at the end of June each year. Then, within each size group, we further independently double sort firms based on intangible-adjusted profitability and NVR (normalized VR, calculated as VR/Total Capital) separately into three categories: low, medium, and high. Total Capital is the sum of total capital employed (TCE) and capitalized intangible assets (CIA). The intangible-adjusted profitability is the ratio of earnings before interests and taxes plus intangible investment divided by Total Capital. All the portfolios are re-balanced for every June. The value-weighted monthly returns on the resulting 18 portfolios are then calculated from July of year *t* to June of year *t*+1. In Panel A, we report the descriptive statistics in each portfolio in a month. In Panel B, we report excess returns (the monthly return on portfolios in excess of the Treasury bill rate in month *t*), and the estimated intercepts (alphas) by running time series regressions of portfolio excess returns on CAPM model or Fama-French-five-factor model (FF-5-factor model). The item H–L refers to the portfolio that has a long position in the portfolio with H and a short position in the portfolio with L. Standard errors are computed using the Newey-West estimator to adjust for serial correlation in returns with lag 12. The *t*-statistics are shown below the coefficient estimates in parentheses.

Panel A. Portfolio characteristics

	Small-cap stocks			Big-cap stocks		
		NVR			NVR	
	L	M	H	L	M	H
Intangible-adjusted profitability						
			Average number of firms			
L	356	279	291	131	76	33
M	366	364	224	84	100	55
H	211	306	441	26	63	151
			Average firm size (in $billion)			
L	0.09	0.21	0.22	5.93	6.84	5.47
M	0.13	0.33	0.40	8.25	8.91	9.63
H	0.15	0.34	0.47	7.48	11.84	12.65
			Intangible-adjusted profitability (value-weighted average)			
L	0.03	0.03	-0.02	0.12	0.12	0.11
M	0.14	0.14	0.14	0.21	0.21	0.22
H	0.24	0.25	0.31	0.28	0.31	0.36
			NVR (value-weighted average)			
L	-0.38	0.07	1.98	0.01	0.50	2.03
M	-0.35	0.06	1.14	0.08	0.60	1.68
H	-0.34	0.10	1.54	0.11	0.78	2.54

Table 8. Continued.

Panel B. Excess stock returns and alphas

	Small-cap stocks NVR				Big-cap stocks NVR			
Intangible-adjusted profitability	L	M	H	H–L	L	M	H	H–L
	Excess stock returns							
L	0.69%	0.41%	-0.28%	-0.97%	0.67%	0.44%	0.48%	-0.19%
	(2.01)	(1.32)	(-0.79)	(-5.29)	(3.31)	(2.36)	(1.60)	(-0.93)
M	1.08%	0.93%	0.53%	-0.55%	0.78%	0.68%	0.65%	-0.13%
	(3.56)	(3.48)	(1.79)	(-3.91)	(3.58)	(3.52)	(3.13)	(-0.95)
H	1.23%	1.07%	0.87%	-0.36%	0.83%	0.78%	0.80%	-0.03%
	(4.43)	(4.09)	(3.23)	(-2.98)	(3.52)	(3.93)	(3.77)	(-0.21)
H–L	0.54%	0.66%	1.15%		0.17%	0.34%	0.32%	
	(3.34)	(5.02)	(7.05)		(1.05)	(2.83)	(1.82)	
	Alphas (CAPM model)							
L	-0.27%	-0.51%	-1.29%	-0.83%	0.02%	-0.16%	-0.40%	-0.24%
	(-1.11)	(-2.78)	(-5.81)	(-4.64)	(0.17)	(-1.84)	(-1.76)	(-1.22)
M	0.20%	0.11%	-0.36%	-0.40%	0.08%	0.04%	-0.01%	-0.03%
	(0.98)	(0.75)	(-2.06)	(-2.92)	(1.01)	(0.69)	(-0.08)	(-0.24)
H	0.42%	0.26%	0.03%	-0.26%	0.15%	0.14%	0.10%	0.03%
	(2.15)	(1.75)	(0.22)	(-2.30)	(0.90)	(1.95)	(1.07)	(0.16)
H–L	0.69%	0.76%	1.27%		0.22%	0.33%	0.49%	
	(4.47)	(4.80)	(7.84)		(1.23)	(2.53)	(2.20)	
	Alphas (FF-5-factor model)							
L	-0.22%	-0.35%	-0.89%	-0.67%	-0.07%	-0.19%	-0.11%	-0.03%
	(-1.58)	(-3.25)	(-6.61)	(-3.58)	(-1.11)	(-2.15)	(-0.57)	(-0.18)
M	0.16%	0.01%	-0.14%	-0.30%	0.08%	-0.05%	0.01%	-0.06%
	(1.48)	(0.16)	(-1.51)	(-2.23)	(0.93)	(-0.79)	(0.14)	(-0.50)
H	0.23%	0.15%	0.03%	-0.20%	0.21%	0.07%	0.14%	-0.07%
	(2.22)	(2.30)	(0.58)	(-1.83)	(1.10)	(1.04)	(2.47)	(-0.38)
H–L	0.45%	0.50%	0.92%		0.28%	0.26%	0.24%	
	(3.55)	(3.78)	(6.25)		(1.30)	(2.05)	(1.13)	
	Alphas (FF-5-factor model): Early period 1976-2000							
L	-0.01%	-0.33%	-1.02%	-1.02%	-0.14%	-0.31%	-0.20%	-0.07%
	(-0.03)	(-2.33)	(-4.64)	(-3.88)	(-1.43)	(-2.61)	(-0.81)	(-0.27)
M	0.29%	-0.09%	-0.20%	-0.49%	0.05%	-0.11%	-0.17%	-0.22%
	(1.94)	(-1.28)	(-1.36)	(-2.73)	(0.49)	(-1.57)	(-1.45)	(-1.45)
H	0.46%	0.18%	-0.02%	-0.48%	0.35%	0.22%	0.20%	-0.15%
	(4.64)	(2.09)	(-0.32)	(-4.86)	(1.24)	(2.22)	(2.24)	(-0.55)
H–L	0.47%	0.51%	1.00%		0.49%	0.53%	0.40%	
	(2.82)	(2.63)	(4.01)		(1.45)	(3.00)	(1.32)	
	Alphas (FF-5-factor model): Late period 2001-2020							
L	-0.42%	-0.35%	-0.78%	-0.35%	-0.04%	-0.11%	-0.07%	-0.03%
	(-1.83)	(-2.36)	(-5.74)	(-1.58)	(-0.45)	(-0.80)	(-0.24)	(-0.09)
M	0.08%	0.14%	-0.08%	-0.16%	0.12%	0.01%	0.22%	0.11%
	(0.63)	(1.53)	(-0.74)	(-0.89)	(0.87)	(0.15)	(2.09)	(0.65)
H	-0.03%	0.11%	0.13%	0.16%	0.06%	-0.07%	0.07%	0.01%
	(-0.19)	(1.36)	(2.38)	(0.93)	(0.29)	(-0.83)	(1.21)	(0.07)
H–L	0.39%	0.46%	0.91%		0.10%	0.05%	0.14%	
	(1.94)	(3.22)	(6.64)		(0.53)	(0.29)	(0.45)	

Online Appendix

for

A Simple Approach to Valuing Intangibles and Rents

This Online Appendix provides additional proofs, tables and figures supporting the main text.

OA.1 Comparing Valuation Residual with Rents in Crouzet and Eberly (2023)

We decompose the gap between a firm's market value and its book value into two components: capitalized intangible capital and valuation residual (VR). The VR consists of economic rents, capacity adjustment costs, and potential mispricing. In this section, we compare our measured valuation residual (VR) with Crouzet and Eberly (2023)'s model implied economic rents (hereafter referred to as CE). Using the CE's Equation (19):

$$Q_1 - q_1 = \frac{\mu-1}{r-g} R_1 + q_2 S + \frac{\mu-1}{r-g} R_2 S \quad (1)$$

where Q_1 is the average Q for physical capital (K_1); q_1 is the marginal q of K_1 and q_2 is the marginal q of capitalized intangible capital (K_2); μ captures the rents parameter; r is the discount rate; g is the net growth rate of total capital $K_1 + K_2$; R_1 and R_2 is the user cost of K_1 and K_2; S=K_2/K_1. We rewrite Equation (1) and obtain the equivalent expression for a firm's market value (MV):

$$\frac{MV}{K_1} = q_1 + \frac{\mu-1}{r-g} R_1 + q_2 \left(\frac{K_2}{K_1}\right) + \frac{\mu-1}{r-g} R_2 \left(\frac{K_2}{K_1}\right)$$

$$\Leftrightarrow = q_1 K_1 + q_2 K_2 + \frac{\mu-1}{r-g} R_1 K_1 + \frac{\mu-1}{r-g} R_2 K_2$$

$$\Leftrightarrow MV = K_1 + K_2 + (q_1 - 1)K_1 + (q_2 - 1)K_2 + \frac{\mu-1}{r-g} R_1 K_1 + \frac{\mu-1}{r-g} R_2 K_2. \quad (2)$$

Following CE's definitions, CE's adjustment costs and CE's rents are formulated as follows:

$$CE's\ adjustment\ costs \equiv (q_1 - 1)K_1 + (q_2 - 1)K_2$$

$$CE's\ rents \equiv \frac{\mu-1}{r-g} R_1 K_1 + \frac{\mu-1}{r-g} R_2 K_2 \quad (3)$$

Recall that our defined VR is the difference between MV and total capital $K_1 + K_2$. Hence Equations (2) and (3) imply that our defined VR is the sum of CE's adjustment costs and CE's rents. Empirically, we measure CE's rents and CE's adjustment costs using their STATA code and data.[1] Note that even though CE uses the data at firm-level, CE aggregates firm-level data into sector-level data, and CE's focus is on sector-level investment gaps. Differently, our focus is on how firms differ at firm-level *within* sectors regarding economic rents and investment-Q

[1] See https://onlinelibrary.wiley.com/doi/full/10.1111/jofi.13231

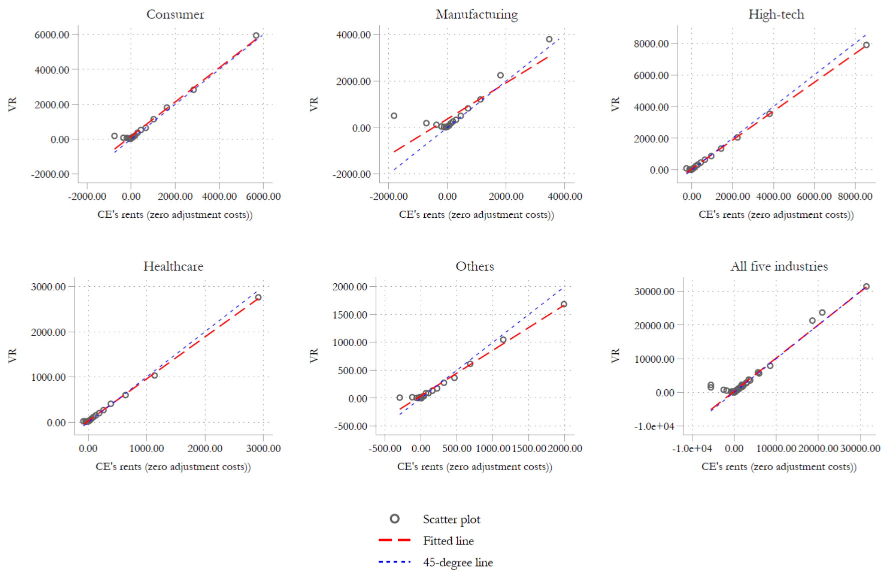
relationships. To fit into our context, we modify CE's STATA code and measure *firm-level* CE's rents and *firm-level* CE's adjustment costs.

To mitigate concerns of measurement errors at firm-level analysis, we design the portfolio analysis as follows. First, we adopt CE's setting of zero (or positive) adjustment costs to quantify firm-level CE's rents and adjustment costs.[2] Second, we sort all firms into 20 portfolios based on the 5th percentiles of CE's rents among all firms in an industry-year using Fama-French five industry classification. Third, we sum up CE's rents (and our VR) in each portfolio across all years. To this end we have 20 observations with paired CE's rents and our VR at portfolio level in each industry. We remove two outliers in the sample in each industry and scatter plot VR against CE's rents at portfolio level.

Figure OA1 Panel A presents the plot in the case of zero adjustment costs. We find that VR lines up closely with CE's rents across industries. One exception occurs in Manufacturing industry, in which some discrepancy appears when CE's rents are small. When we set adjustment costs to be positive (Panel B), the relation between VR and CE's rents exhibits greater discrepancy, as expected. However, we find that considering adjustment costs tends be less sensitive in High-tech and Healthcare industries. Overall, the results suggest that our measured valuation residual likely measures to the same object as CE's rents, and especially when adjustment costs are small, supporting our model estimation assumption.

[2] CE's model requires the marginal q when measuring the adjustment costs and rents. In CE's study, $q_1 = 1 + \gamma_1 g$ and $q_2 = 1 + \gamma_2 g$, where adjustment costs parameters (γ_1, γ_2) are set to be zero (0,0) or positive (3,12).

Panel A. Zero adjustment costs



Panel B. Positive adjustment costs

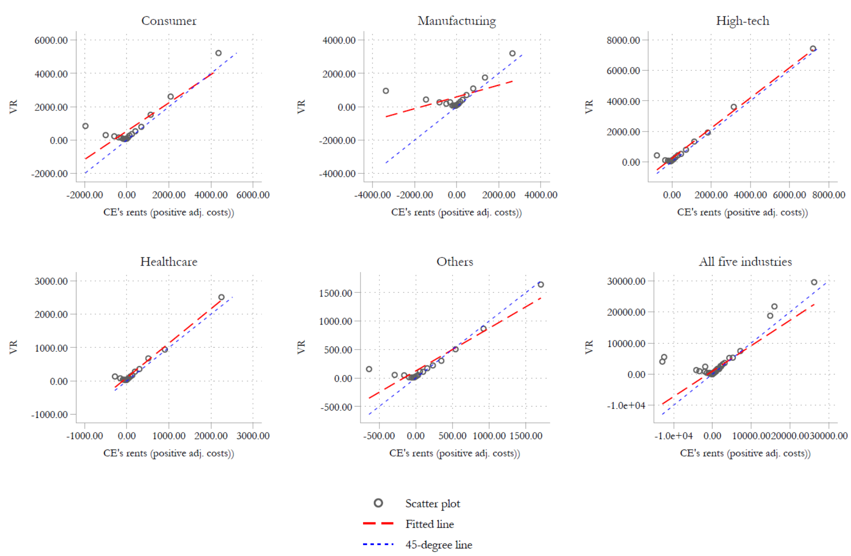


Figure OA1. Valuation Residual versus Rents in Crouzet and Eberly (2023).

This figure presents scatter plots for comparing our measured valuation residual (VR) (a proxy for economic rents) with economic rents derived from Crouzet and Eberly (2023)'s model. We sort firms into 20 portfolios based on the 5th percentiles of CE's rents (Equation OA3) in an industry-year to mitigate concerns of measurement errors at firm-level. We sum up CE's rents and our VR for each portfolio across all years, resulting in 20 observations with paired CE's rents and our VR in each industry. We remove two outliers in the sample in each industry and scatter plot our VR against CE's rents. Panel A (Panel B) presents the plots with zero (positive) adjustment costs.

OA.2 Proofs

OA.2.1 Proofs for Section 4.1

Proof of Proposition 1.

Consider the balanced growth model from Crouzet and Eberly (2023, Section I.C) (henceforth CE), a firm's profit, investment costs, marginal q of capital, user costs of capital, and capital generating process, follow the expressions: $\Pi_t = A_t^{1-1/\mu} K_t^{1/\mu}$, $q_{n,t} = \Phi_n' \left(\frac{K_{n,t+1}}{K_{n,t}}\right)$, $R_n = \frac{\partial \Pi_{t+1}}{\partial K_{n,t+1}}$, and $\frac{K_{n,t+1}}{K_{n,t}} = 1 + g$ for $n = 1,2$. The n denotes physical capital and intangible capital with 1 and 2 respectively. These expressions indicate that a firm's marginal q of capital n $(q_{n,t})$ and capital n $(K_{n,t+1})$ are unaffected by the change in μ, where μ captures economic rents parameters with $\mu \geq 1$.

We define a firm's profitability as the ratio of earnings to total capital ($K_t = K_{1,t} + K_{2,t}$):

$$Profitability_t \equiv \frac{\Pi_t}{K_{t+1}} \tag{4}$$

Substituting CE's profit function (Π_t):

$$Profitability_t = \frac{\Pi_t}{K_{t+1}} = \frac{\Pi_t}{K_t}\frac{K_t}{K_{t+1}} = \frac{1}{1+g}\frac{\Pi_t}{K_t} = \frac{\mu}{1+g}\frac{\partial \Pi_t}{\partial K_t} \tag{5}$$

The marginal profit to capital n is: $\frac{\partial \Pi_t}{\partial K_{n,t}} = \frac{\partial \Pi_t}{\partial K_t}\frac{\partial K_t}{\partial K_{n,t}} = \frac{\partial \Pi_t}{\partial K_t}$. Using CE's expression that $R_n = (r-g)\Phi_n'(1+g) + \Phi_n(1+g)$ and the assumption that $\Phi_n(1+g)$ is strictly increasing and convex, we see that μ does not affect R_n. Hence, taking the first derivative of $R_n = \frac{\partial \Pi_{t+1}}{\partial K_{n,t+1}}$ with respect to μ, gives $\frac{\partial R_n}{\partial \mu} = \frac{\partial \left[\frac{\partial \Pi_{t+1}}{\partial K_{n,t+1}}\right]}{\partial \mu} = 0$, for all t. Taking the first derivative of profitability with respect to μ, gives:

$$\frac{\partial Profitability_t}{\partial \mu} = \frac{\mu}{1+g}\frac{\partial \left[\frac{\partial \Pi_t}{\partial K_t}\right]}{\partial \mu} + \frac{1}{1+g}\frac{\partial \Pi_t}{\partial K_t} = \frac{1}{1+g}\frac{\partial \Pi_t}{\partial K_t} = \frac{1}{1+g}\left(\frac{1}{\mu}\frac{\Pi_t}{K_t}\right) \tag{6}$$

Assuming $\Pi_t \geq 0$ and $K_t > 0$, we have $\frac{\partial Profitability_t}{\partial \mu} \geq 0$, implying that the firm's profitability increases with μ (rents parameters in CE).

As shown in Online Appendix Section OA1, within CE's model, our defined VR_t will be:

$$VR_t = \left(q_{1,t} - 1\right)K_{1,t+1} + \left(q_{2,t} - 1\right)K_{2,t+1} + \frac{\mu-1}{r-g}R_1 K_{1,t+1} + \frac{\mu-1}{r-g}R_2 K_{2,t+1} \quad (7)$$

Substituting CE's R_n shown above, gives:

$$\begin{aligned} VR_t = {} & \left(q_{1,t} - 1\right)K_{1,t+1} + \left(q_{2,t} - 1\right)K_{2,t+1} \\ & + \frac{\mu-1}{r-g}\left[(r-g)\Phi_1'(1+g) + \Phi_1(1+g)\right]K_{1,t+1} \\ & + \frac{\mu-1}{r-g}\left[(r-g)\Phi_2'(1+g) + \Phi_2(1+g)\right]K_{2,t+1} \end{aligned} \quad (8)$$

Taking the first derivative of VR_t with respect to μ, gives:

$$\begin{aligned} \frac{\partial VR_t}{\partial \mu} = {} & \Phi_1'(1+g)K_{1,t+1} + \Phi_2'(1+g)K_{2,t+1} \\ & + \frac{1}{r-g}\Phi_1(1+g)K_{1,t+1} + \frac{1}{r-g}\Phi_2(1+g)K_{2,t+1} \end{aligned} \quad (9)$$

With CE's assumptions that $\Phi_n(1+g)$ and $\Phi_n'(1+g)$ being positive for $n = 1{,}2$, we have $\frac{\partial VR_t}{\partial \mu} \geq 0$; that is, the firm's valuation residual increases with μ.

When we scale VR_t by dividing MV_t:

$$\frac{VR_t}{MV_t} = \frac{VR_t}{K_{1,t+1} + K_{2,t+1} + VR_t} \quad (10)$$

Given that $\frac{VR_t}{MV_t}$ increases when VR_t increases conditional on $K_{1,t+1} + K_{2,t+1}$ held constant, and $\frac{\partial VR_t}{\partial \mu} \geq 0$, we have $\frac{\partial \frac{VR_t}{MV_t}}{\partial \mu} \geq 0$.

Taken together, we show that $\frac{\partial Profitability_t}{\partial \mu} \geq 0$ and $\frac{\partial \frac{VR_t}{MV_t}}{\partial \mu} \geq 0$, and therefore conclude that a firm's profitability as well as its valuation residual scaled by market value increase with μ, resulting in a positive relation between a firm's valuation residual and its profitability.

OA.2.2 Proofs for Section 4.3

Proof of Proposition 2.

Define Total Q as a firm's market value to its total capital:

$$Total\ Q_t \equiv \frac{MV_t}{K_{t+1}} \tag{11}$$

Using the expressions in Proposition 1 and CE's derivations on investment costs function:

$\Phi_n'(x) = 1 + \gamma_n(x-1)$, $\Phi_n''(x) = \gamma_n$, gives $q_{n,t} = 1 + \gamma_n g$ and $R_n = (r-g)\left(1 + \gamma_n g + \frac{\delta_n + g + \frac{\gamma_n}{2} g^2}{r-g}\right)$ for $n = 1,2$. Substituting the above expressions into the definition $Total\ Q_t$:

$$\begin{aligned} Total\ Q_t = &\left[1 + \gamma_1 g + (\mu - 1)\left(1 + \gamma_1 g + \frac{\delta_1 + g + \frac{\gamma_1}{2} g^2}{r-g}\right)\right]\frac{K_{1,t}}{K_t} \\ &+ \left[1 + \gamma_2 g + (\mu - 1)\left(1 + \gamma_2 g + \frac{\delta_2 + g + \frac{\gamma_2}{2} g^2}{r-g}\right)\right]\frac{K_{2,t}}{K_t} \end{aligned} \tag{12}$$

Define $I_{n,t} = K_{n,t+1} - K_{n,t}(1-\delta_n)$, with $\frac{K_{n,t+1}}{K_{n,t}} = 1 + g$ in Proposition 1, gives

$$I_{n,t} = K_{n,t+1} - K_{n,t}(1-\delta_n) = K_{n,t}(g + \delta_n) \tag{13}$$

Define total investment rate as the total investment of all types of capital to total capital, gives:

$$\frac{I_t}{K_t} = \frac{I_{1,t} + I_{2,t}}{K_t} = g + \delta_1 \frac{K_{1,t}}{K_t} + \delta_2 \frac{K_{2,t}}{K_t} \tag{14}$$

Take the first derivative of $Total\ Q_t$ with respect to the total investment rate, gives:

$$\begin{aligned} \frac{\partial Total\ Q_t}{\partial\left[\frac{I_t}{K_t}\right]} &= \frac{\partial Total\ Q_t}{\partial g} \times \frac{\partial g}{\partial\left[\frac{I_t}{K_t}\right]} = \frac{\partial Total\ Q_t}{\partial g} \\ &= \left[\gamma_1 + (\mu - 1)\left(\gamma_1 + \frac{1+\gamma_1 g}{r-g} + \frac{\delta_1 + g + \frac{\gamma_1}{2} g^2}{(r-g)^2}\right)\right]\frac{K_{1,t}}{K_t} \\ &\quad + \left[\gamma_2 + (\mu - 1)\left(\gamma_2 + \frac{1+\gamma_2 g}{r-g} + \frac{\delta_2 + g + \frac{\gamma_2}{2} g^2}{(r-g)^2}\right)\right]\frac{K_{2,t}}{K_t} \end{aligned} \tag{15}$$

Given that $\mu \geq 1$, $\gamma_n > 0$, $(r-g) > 0$, $(1 + \gamma_n g) = \Phi_n'(1+g) \geq 0$, $K_{n,t} > 0$, and $\left(\delta_n + g + \frac{\gamma_n}{2} g^2\right) \geq (\delta_n + g) = \frac{I_{n,t}}{K_{n,t}} \geq 0$, we have $\frac{\partial Total\ Q_t}{\partial\left[\frac{I_t}{K_t}\right]} > 0$, hence $\frac{\partial\left[\frac{I_t}{K_t}\right]}{\partial Total\ Q_t} > 0$.

In essence, the $\frac{\partial\left[\frac{I_t}{K_t}\right]}{\partial Total\ Q_t}$ represents the sensitivity of total investment-Total Q.

In the following, we define $\frac{\partial\left[\frac{I_t}{K_t}\right]}{\partial Total\ Q_t} \equiv Sensitivity_t$ and derive how $Sensitivity_t$ various with $Total\ Q_t$. Take the first derivative of $Sensitivity_t$ with respect to $Total\ Q_t$, gives:

$$\frac{\partial Sensitivity_t}{\partial Total\ Q_t} = \frac{\partial Sensitivity_t}{\partial g} \times \frac{\partial g}{\partial Total\ Q_t}$$

(16)

Using the reciprocal of Equation (15), we derive:

$$\frac{\partial Sensitivity_t}{\partial g} = -\left\{\left[\gamma_1 + (\mu-1)\left(\gamma_1 + \frac{1+\gamma_1 g}{r-g} + \frac{\delta_1+g+\frac{\gamma_1}{2}g^2}{(r-g)^2}\right)\right]\frac{K_{1,t}}{K_t} + \left[\gamma_2 + (\mu-1)\left(\gamma_2 + \frac{1+\gamma_2 g}{r-g} + \frac{\delta_2+g+\frac{\gamma_2}{2}g^2}{(r-g)^2}\right)\right]\frac{K_{2,t}}{K_t}\right\}^{-2} \times \left\{\left[(\mu-1)\left(\frac{\gamma_1}{r-g} + \frac{1+\gamma_1 g}{(r-g)^2} + \frac{1+\gamma_1 g}{(r-g)^2} + \frac{2(r-g)\left(\delta+g+\frac{\gamma_1}{2}g^2\right)}{(r-g)^4}\right)\right]\frac{K_{1,t}}{K_t} + \left[(\mu-1)\left(\frac{\gamma_2}{r-g} + \frac{1+\gamma_2 g}{(r-g)^2} + \frac{1+\gamma_2 g}{(r-g)^2} + \frac{2(r-g)\left(\delta+g+\frac{\gamma_2}{2}g^2\right)}{(r-g)^4}\right)\right]\frac{K_{2,t}}{K_t}\right\} \leq 0 \quad (17)$$

In addition, we derive:

$$\frac{\partial g}{\partial Total\ Q_t} = \frac{\partial g}{\partial\left[\frac{I_t}{K_t}\right]} \times \frac{\partial\left[\frac{I_t}{K_t}\right]}{\partial Total\ Q_t} = \frac{\partial\left[\frac{I_t}{K_t}\right]}{\partial Total\ Q_t} > 0 \quad (18)$$

Results in Equations (17) and (18) indicate that $\frac{\partial Sensitivity_t}{\partial Total\ Q_t} \leq 0$; that is, $Sensitivity_t$ weakly decreases with Total Q_t, or equivalently I_t/K_t is an increasing concave function of $Total\ Q_t$.

Finally, we explore the role of the economic rents parameter μ defined in Proposition 1 gives:

(i) When $\mu = 1$ (no rents), Equation (18) equals zero, and thus $\frac{\partial Sensitivity_t}{\partial Total\ Q_t} = 0$; that is, I_t/K_t will be increasing and linear function of $Total\ Q_t$.

(ii) When $\mu > 1$ (positive rents), Equation (17) becomes negative, and thus $\frac{\partial Sensitivity_t}{\partial Total\ Q_t} < 0$; that is, I_t/K_t will be a strictly increasing and concave function of $Total\ Q_t$.

OA.2.3 Proposition 3 and Proof

Proposition 3. Assume a firm' market value process follows Proposition 2. In the framework of Belo et al. (2022),[3] the adjustment cost parameters γ_1 and γ_2 under a large sample of N firms evolving in T years, are estimated as:

$$(\hat{\gamma}_1, \hat{\gamma}_2) \equiv arg \min_{\gamma_1,\gamma_2} \frac{1}{NT} \sum_{i=1}^{N} \sum_{t=1}^{T} \left(\frac{MV_{i,t}}{K_{i,t+1}} - q_{i,1,t} \frac{K_{i,1,t+1}}{K_{i,t+1}} - q_{i,2,t} \frac{K_{i,2,t+1}}{K_{i,t+1}} \right)^2$$

$$s.t.\ q_{i,n,t} = 1 + \gamma_n \left(\frac{K_{i,n,t+1}}{K_{i,n,t}} - 1 \right) \tag{19}$$

When there is no absence assumed in Belo et al. (2022) and a positive capital growth rate, by the law of large number, $\hat{\gamma}_n$ will weakly converges to γ_n^* that is greater than the true value of γ_n.

Proof of Proposition 3.

Using the expressions in Equation (19), gives:

$$(\hat{\gamma}_1, \hat{\gamma}_2) = arg \min_{\gamma_1,\gamma_2} \frac{1}{NT} \sum_{i=1}^{N} \sum_{t=1}^{T} \begin{bmatrix} \frac{MV_{i,t}}{K_{i,t+1}} - \left(1 + \gamma_1 \left(\frac{K_{i,1,t+1}}{K_{i,1,t}} - 1 \right)\right) \frac{K_{i,1,t+1}}{K_{i,t+1}} \\ - \left(1 + \gamma_2 \left(\frac{K_{i,2,t+1}}{K_{i,2,t}} - 1 \right)\right) \frac{K_{i,2,t+1}}{K_{i,t+1}} \end{bmatrix}^2 \tag{20}$$

Solving $(\hat{\gamma}_1, \hat{\gamma}_2)$ with the first order condition (F.O.C.):

$$\frac{1}{NT} \sum_{i=1}^{N} \sum_{t=1}^{T} 2 \begin{bmatrix} \frac{MV_{i,t}}{K_{i,t+1}} - \left(1 + \hat{\gamma}_1 \left(\frac{K_{i,1,t+1}}{K_{i,1,t}} - 1 \right)\right) \frac{K_{i,1,t+1}}{K_{i,t+1}} \\ - \left(1 + \hat{\gamma}_2 \left(\frac{K_{i,2,t+1}}{K_{i,2,t}} - 1 \right)\right) \frac{K_{i,2,t+1}}{K_{i,t+1}} \end{bmatrix} \left(- \left(\frac{K_{i,n,t+1}}{K_{i,n,t}} - 1 \right) \frac{K_{i,n,t+1}}{K_{i,t+1}} \right) = 0 \tag{21}$$

Based on the law of large number property:

$$\mathbb{E}\left[\left[\frac{MV_t}{K_{t+1}} - \left(1 + \gamma_1^* \left(\frac{K_{1,t+1}}{K_{1,t}} - 1 \right)\right) \frac{K_{1,t+1}}{K_{t+1}} - \left(1 + \gamma_2^* \left(\frac{K_{2,t+1}}{K_{2,t}} - 1 \right)\right) \frac{K_{2,t+1}}{K_{t+1}} \right] \left(\frac{K_{n,t+1}}{K_{n,t}} - 1 \right) \frac{K_{n,t+1}}{K_{t+1}} \right] = 0 \tag{22}$$

[3] The quadratic adjustment cost function is specified slightly differently in Proposition 2 comparing to Belo et al. (2022). Thus, here we adjust the marginal q formula so that the marginal q is correctly specified as in Proposition 2. Specifying $q_{n,t} = 1 + \gamma_n g$ is consistent with the empirical analysis specification in Crouzet and Eberly (2023).

Substituting $K_{t+1} = K_{1,t+1} + K_{2,t+1}$ using the non-random property of $\frac{K_{n,t+1}}{K_{n,t}} = 1 + g,\ K_{n,t} > 0$ and $g > 0$, Equation (22) results in:

$$\frac{MV_t}{K_{t+1}} = 1 + \gamma_1^* g \frac{K_{1,t}}{K_t} + \gamma_2^* g \frac{K_{2,t}}{K_t} \tag{23}$$

Substituting MV_t shown in Proposition 2 and denote the true value of γ_n as γ_n^0, gives:

$$\begin{aligned}\frac{MV_t}{K_{t+1}} = &\left[1 + \gamma_1^0 g + (\mu - 1)\left(1 + \gamma_1^0 g + \frac{\delta_1 + g + \frac{\gamma_1^0}{2} g^2}{r - g}\right)\right]\frac{K_{1,t}}{K_t} \\ &+ \left[1 + \gamma_2^0 g + (\mu - 1)\left(1 + \gamma_2^0 g + \frac{\delta_2 + g + \frac{\gamma_2^0}{2} g^2}{r - g}\right)\right]\frac{K_{2,t}}{K_t}\end{aligned} \tag{24}$$

Equations (23) and (24) give:

$$\begin{aligned}\gamma_1^* g \frac{K_{1,t}}{K_t} + \gamma_2^* g \frac{K_{2,t}}{K_t} = &\left[\gamma_1^0 g + (\mu - 1)\left(1 + \gamma_1^0 g + \frac{\delta_1 + g + \frac{\gamma_1^0}{2} g^2}{r - g}\right)\right]\frac{K_{1,t}}{K_t} \\ &+ \left[\gamma_2^0 g + (\mu - 1)\left(1 + \gamma_2^0 g + \frac{\delta_2 + g + \frac{\gamma_2^0}{2} g^2}{r - g}\right)\right]\frac{K_{2,t}}{K_t}\end{aligned} \tag{25}$$

Equalizing the multiplying terms of $\frac{K_{n,t}}{K_t}$ on both sides of Equation (25), gives:

$$\gamma_n^* g = \gamma_n^0 g + (\mu - 1)\left(1 + \gamma_n^0 g + \frac{\delta_n + g + \frac{\gamma_n^0}{2} g^2}{r - g}\right), \text{ for } n = 1,2 \tag{26}$$

When there exist rents (i.e., $\mu > 1$) with other terms are all positive shown in Proposition 2:

$$\gamma_n^* = \gamma_n^0 + \frac{1}{g} \times (\mu - 1)\left(1 + \gamma_n^0 g + \frac{\delta_n + g + \frac{\gamma_n^0}{2} g^2}{r - g}\right) > \gamma_n^0, \text{ for } n = 1,2 \tag{27}$$

OA.3 Online Appendix Figures

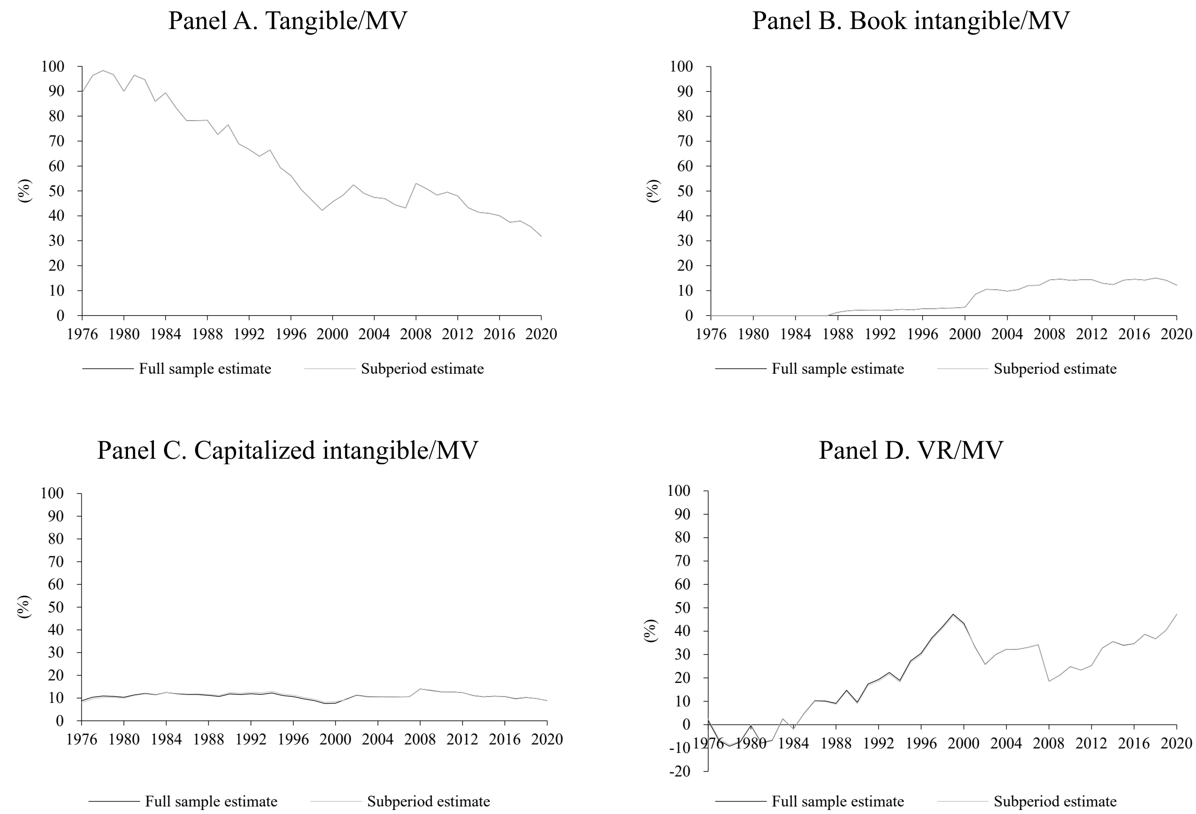


Figure OA2. Market Value Decomposition with Subperiod Estimated Parameters.

This figure presents the market value decomposition based on the subperiod estimated parameters. The full sample period is divided into two subperiods of 1976-2000 and 2001-2020. Within each subperiod sample, we re-estimate our model and obtain the subperiod estimates (see Table OA2). We use the subperiod estimates to measure capitalized intangible assets and valuation residual (VR). The market value decomposition contains four components: tangible assets, book intangible assets, capitalized intangible assets, and VR. The aggregate ratios are measured by the aggregate of each component to the aggregate market value across all firms in each year. The gray (black) line plots the market value decomposition based on the subperiod (full) sample estimates.

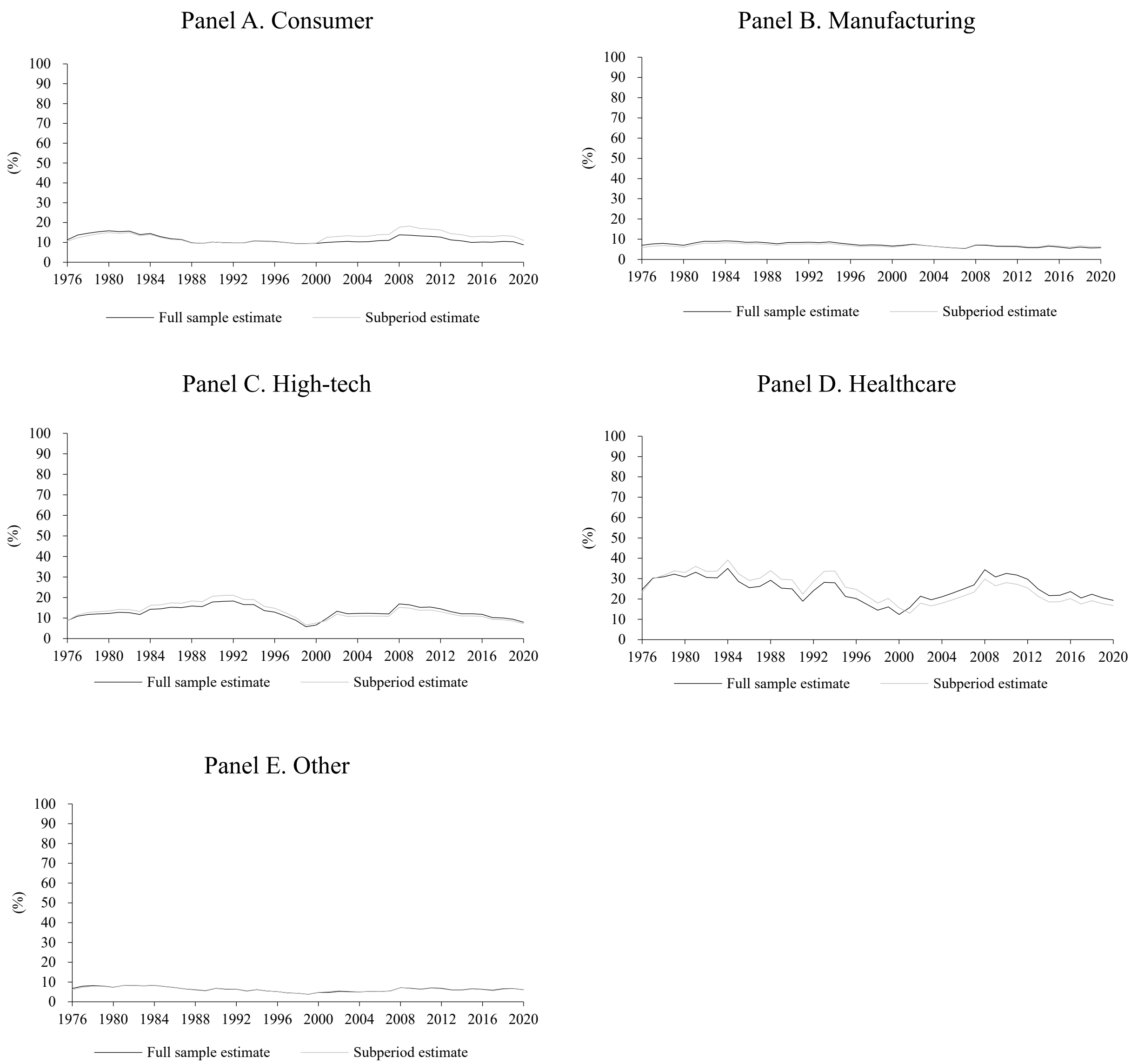


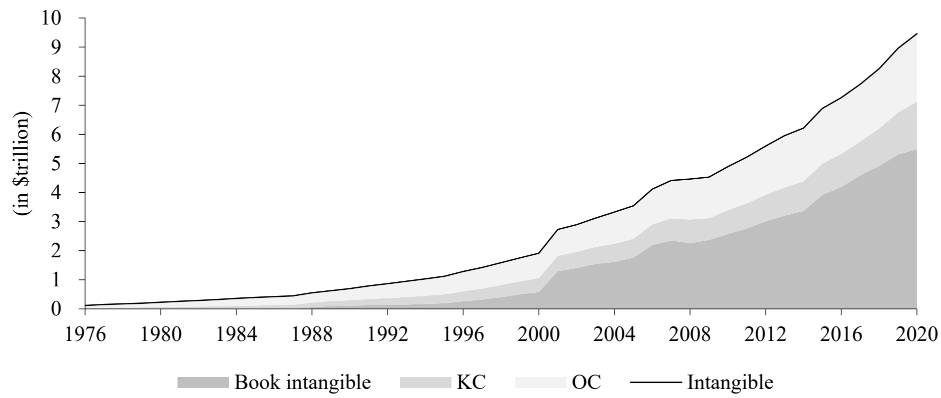
Figure OA3. Capitalized Intangible Assets with Subperiod Estimated Parameters by Industry.

This figure presents by industry the aggregate ratio of the capitalized intangible assets based on the subperiod estimated parameters. The full sample period is divided into two subperiods of 1976-2000 and 2001-2020. Within each subperiod sample, we re-estimate our model and obtain the subperiod estimates (see Table OA2). We use the subperiod estimates to measure capitalized intangible assets. The aggregate ratio is the aggregate capitalized intangible assets to the aggregate market value across all firms in each year. The gray (black) line plots the aggregate capitalized intangible ratio based on the subperiod (full) sample estimates.

Figure OA4. Valuation Residual with Subperiod Estimated Parameters by Industry.

This figure presents by industry the aggregate ratio of the valuation residual based on the subperiod estimated parameters. The full sample period is divided into two subperiods of 1976-2000 and 2001-2020. Within each subperiod sample, we re-estimate our model and obtain the subperiod estimates (see Table OA2). We use the subperiod estimates to measure valuation residuals. The aggregate ratio is the aggregate valuation residual to the aggregate market value across all firms in each year. The gray (black) line plots the aggregate valuation residual ratio based on the subperiod (full) sample estimates.

Panel A. Intangible assets decomposition (aggregate amount)



Panel B. Intangible assets decomposition (aggregate ratio)

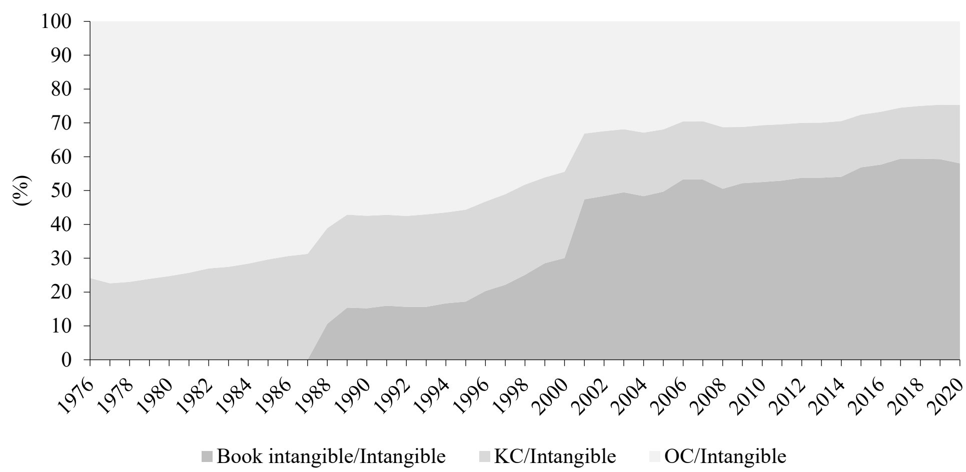
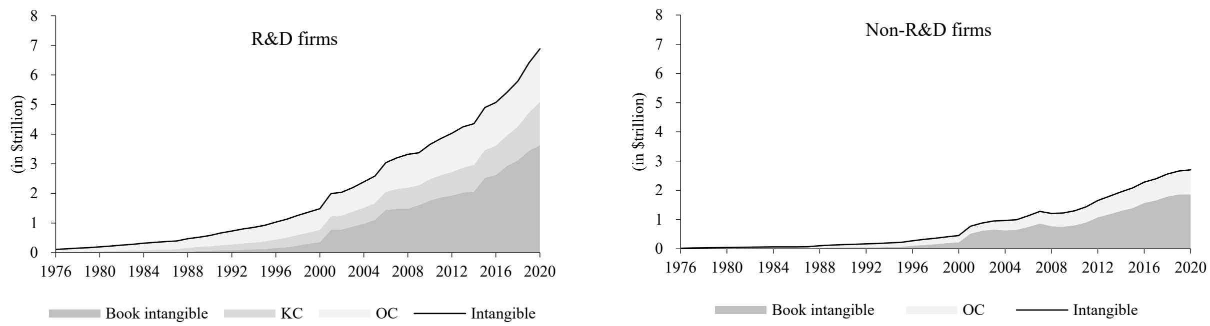


Figure OA5. Intangible Assets Decomposition.

This figure presents the intangible assets decomposition. The decomposition consists of three components: book intangible assets, knowledge capital (KC), and organization capital (OC). The aggregate ratios refer to the ratios of the aggregate book intangible assets, KC, and OC to the aggregate all types of intangible assets across all firms in each year. They are denoted as Book intangible/Intangible, KC/Intangible, and OC/Intangible, respectively. Panel A (Panel B) plots the aggregate amount (ratio) of the decomposition.

Panel A. Intangible assets decomposition (aggregate amount)



Panel B. Intangible assets decomposition (aggregate ratio)

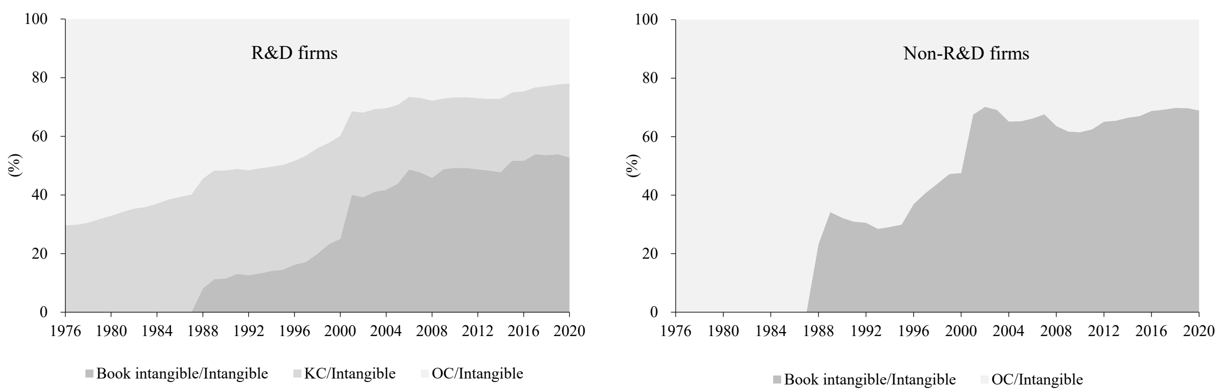


Figure OA6. Intangible Assets Decomposition: Non-R&D Firms versus R&D Firms.

This figure presents the intangible assets decomposition for R&D firms (firms with positive R&D expenditures) and Non-R&D firms (firms with missing or zero R&D expenditures) respectively. We estimate the capitalization parameter separately for firms reporting R&D and firms without, and re-compute knowledge capital (KC), and organization capital (OC). The decomposition consists of three components: book intangible assets, KC, and OC. The aggregate ratios refer to the ratios of the aggregate book intangible assets, KC, and OC to the aggregate all types of intangible assets across all firms in each year. They are denoted as Book intangible/Intangible, KC/Intangible, and OC/Intangible, respectively. Panel A (Panel B) plots the aggregate amount (ratio) of the decomposition for R&D firms (left graph) and Non-R&D firms (right graph).

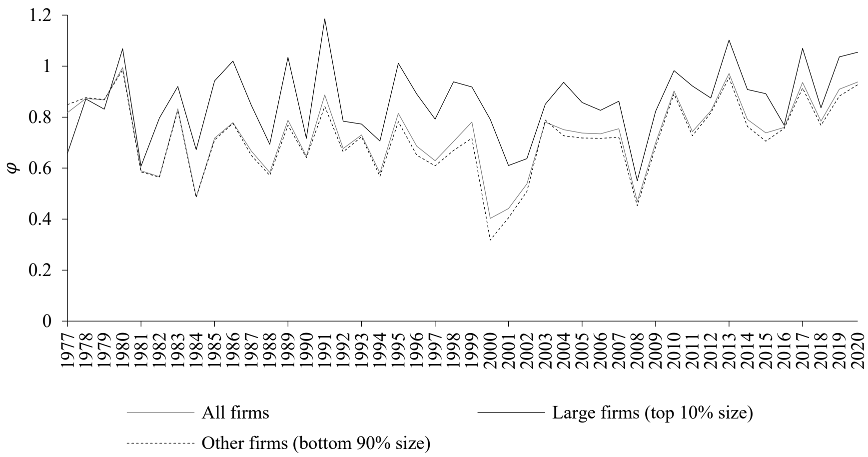


Figure OA7. Autocorrelation of Valuation Residual.

This figure presents the coefficients of valuation residual (VR) in the autoregressive model. We estimate the coefficient on lagged VR (relative to total capital) in the autoregressive model with the order of one (AR(1) model):

$$(VR/Total\ capital)_{i,t} = \alpha + \varphi(VR/Total\ capital)_{i,t-1} + \xi_{i,t}.$$

The total capital is the sum of tangible assets, book intangible assets, and capitalized intangible assets. The AR(1) model is estimated repeatedly every year from 1977 to 2020. The gray line plots the estimated φ using the full sample. The black solid (dash) line plots the estimated φ for Large (Other) firms. Large firms are the firms with top 10% size and Other firms are the firms with bottom 90% size.

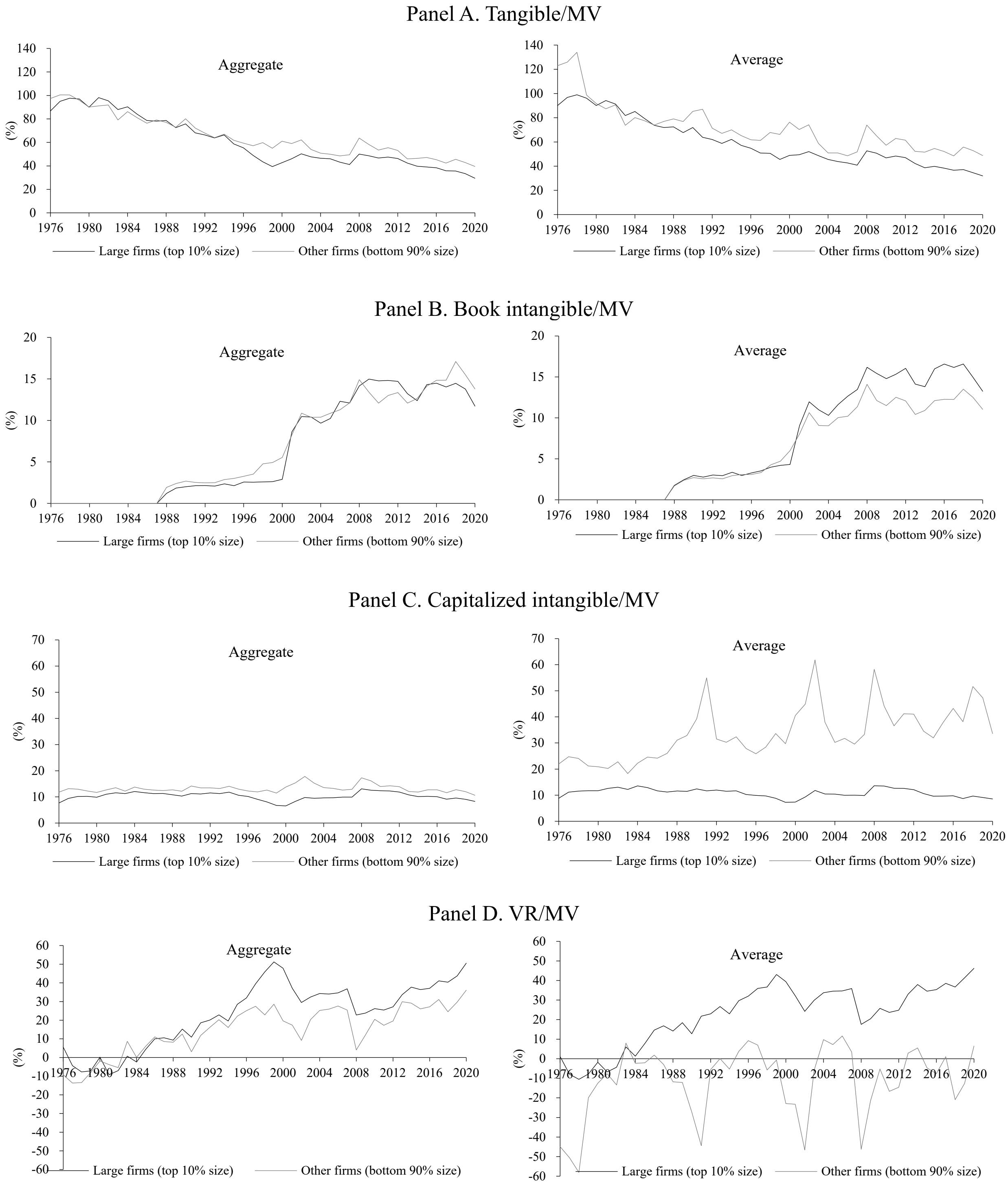


Figure OA8. Market Value Decomposition: Aggregate Ratio versus Average Ratio.

This figure presents the *aggregate* and *average* market value decomposition in the subsamples split by firm size. Firm size is classified based on firm market value in an industry-year. Large firms are top 10% size firms and Other firms are bottom 90% size firms. The *aggregate* refers to the ratios measured by the aggregate tangible assets, book intangible assets, capitalized intangible assets, and valuation residual (VR) to the aggregate market value across all firms in each year (left-side plots). The *average* refers to the ratios measured by the average of a firm's tangible assets (or other market decomposition components) to its market value among firms in each year (right-side plots).

Panel A. Consumer

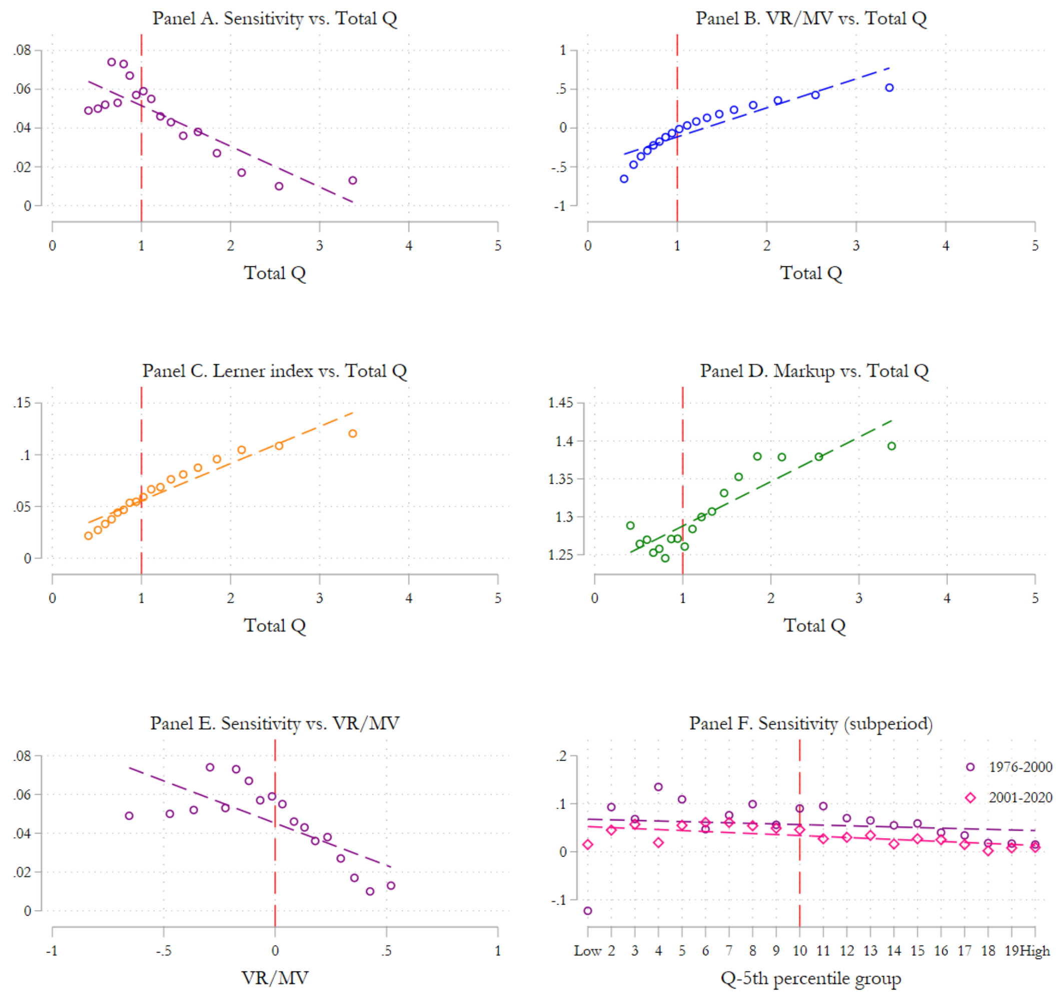


Figure OA9. Market Power, VR, and Sensitivity of Investment-Q by Industry.
This figure presents scatter plots by repeating Figure 4 for each industry: Consumer (Panel A), Manufacturing (Panel B), High-tech (Panel C), and Healthcare (Panel D). We use the Fama-French five industry classification.

Panel B. Manufacturing

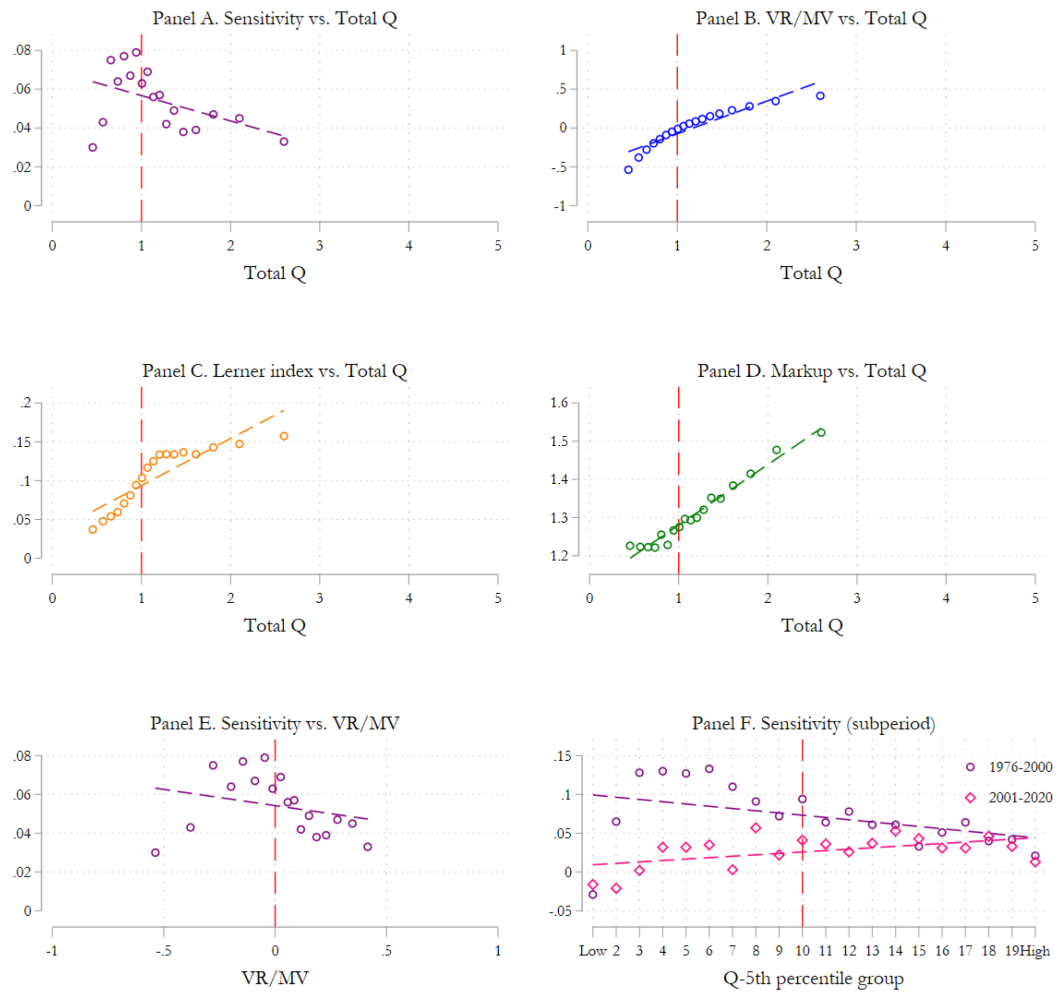


Figure OA9. Continued (Manufacturing).

Panel C. High-tech

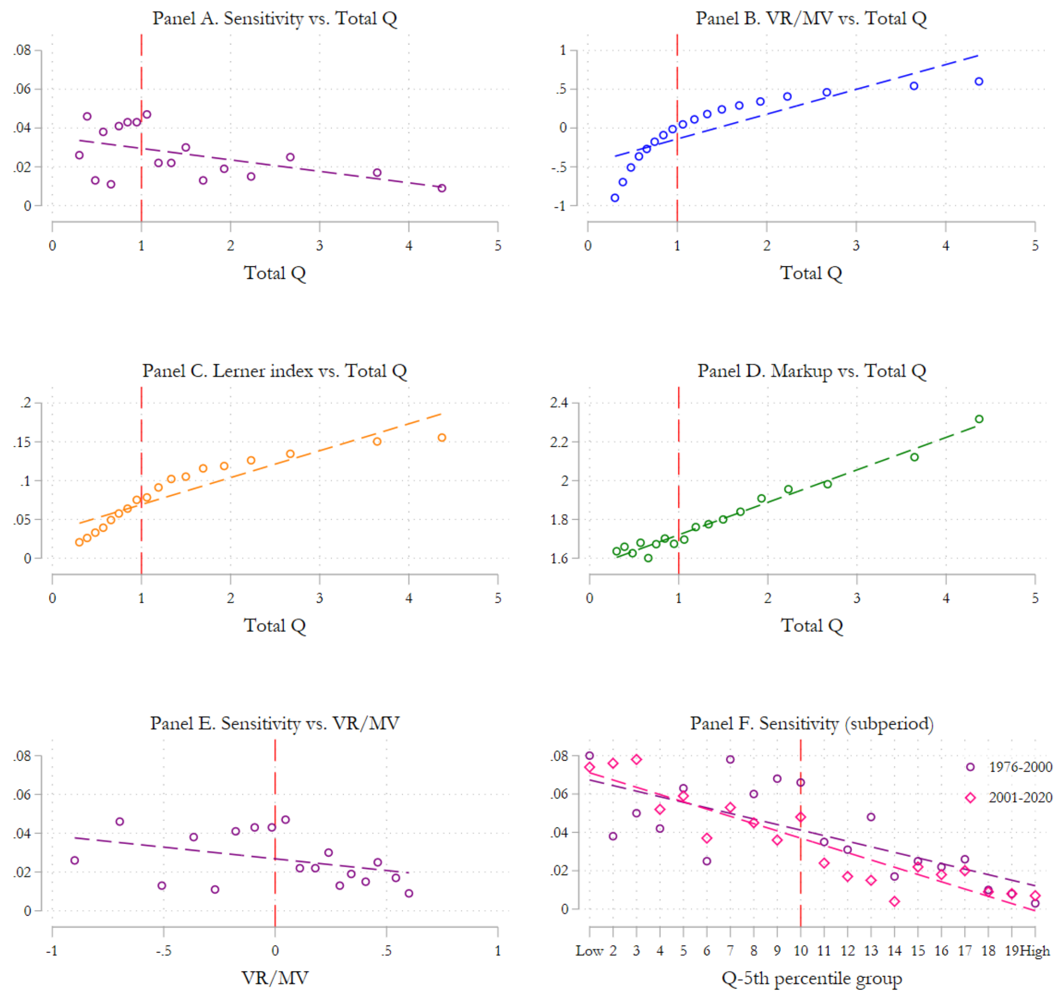


Figure OA9. Continued (High-tech).

Panel D. Healthcare

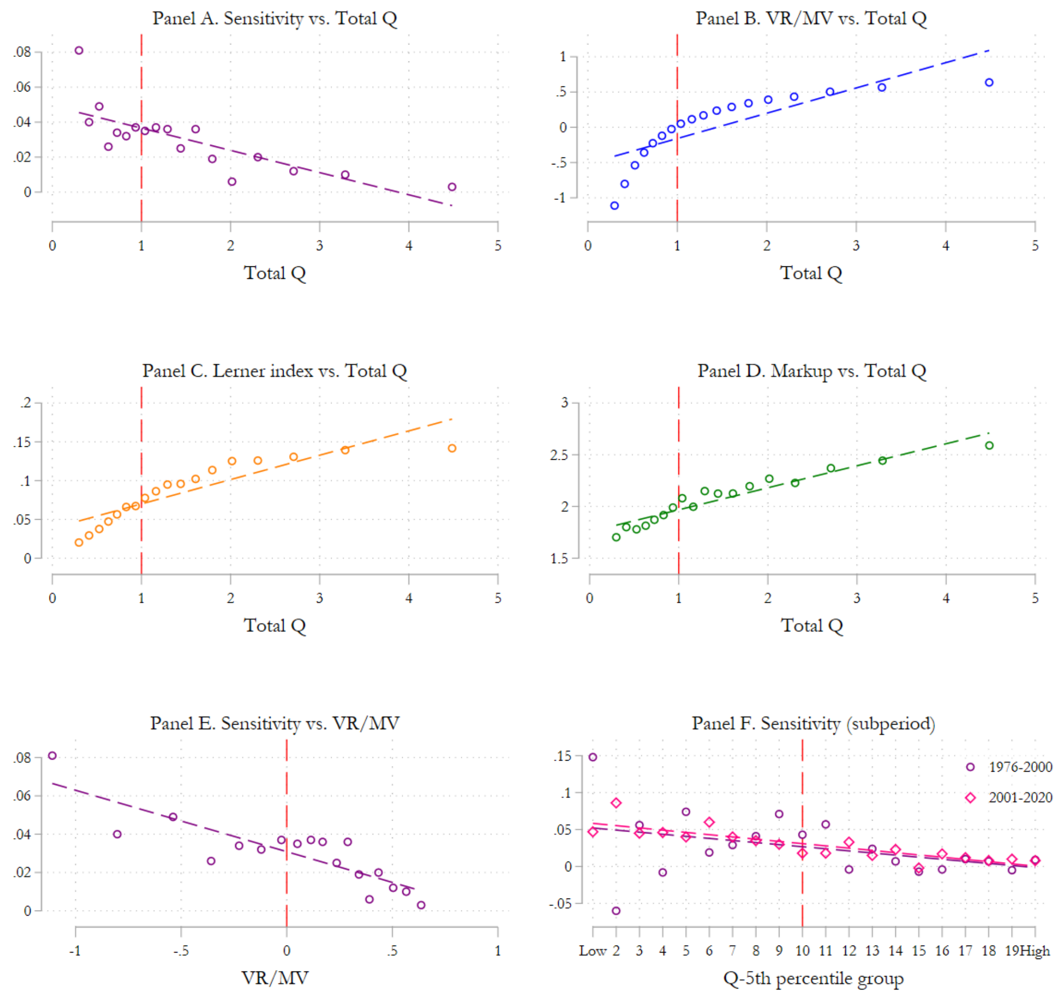


Figure OA9. Continued (Healthcare).

OA.4 Online Appendix Tables

Table OA1. Missing R&D Observations.

This table presents the proportion of missing observations based on firms' R&D records. These numbers indicate the proportion of firms that have no records R&D expenditures (i.e., Missing R&D), zero R&D expenditures (i.e., Zero R&D), or positive R&D expenditures (i.e., Positive R&D) for the full sample and the subsample of each industry using Fama-French five industry classification.

	Full Sample	By Industry				
		Consumer	Manufacturing	High-tech	Healthcare	Other
Missing-R&D	43%	47%	53%	22%	13%	79%
Zero-R&D	10%	31%	3%	2%	6%	9%
Positive-R&D	47%	22%	45%	76%	81%	12%

Table OA2. Capitalization Parameter Estimates by Subperiod.

This table presents the subperiod estimated parameters. The full sample period is divided into two subperiods of 1976-2000 and 2001-2020. Within each subperiod sample, we re-estimate our valuation residual model and report the estimates in Panel A and B respectively.

Panel A. Subsample period 1976-2000

	Consumer	Manufacturing	High-tech	Healthcare	Other	All
δ_{KC}	0.06	0.13	0.13	0.03	0.27	0.12
(s.e.)	*(0.04)*	*(0.04)*	*(0.02)*	*(0.02)*	*(0.10)*	
δ_{OC}	0.25	0.17	0.32	0.17	0.12	0.22
(s.e.)	*(0.04)*	*(0.02)*	*(0.15)*	*(0.07)*	*(0.02)*	
λ	0.22	0.27	0.66	0.68	0.32	0.39
(s.e.)	*(0.02)*	*(0.01)*	*(0.26)*	*(0.13)*	*(0.02)*	
Pseudo-R^2	75%	82%	73%	68%	74%	
No. of observations	27,825	31,864	24,862	10,475	16,034	111,060

Panel B. Subsample period 2001-2020

	Consumer	Manufacturing	High-tech	Healthcare	Other	All
δ_{KC}	0.25	0.48	0.27	0.22	0.41	0.32
(s.e.)	*(0.05)*	*(0.04)*	*(0.04)*	*(0.02)*	*(0.11)*	
δ_{OC}	0.13	0.10	0.21	0.13	0.11	0.14
(s.e.)	*(0.01)*	*(0.00)*	*(0.02)*	*(0.01)*	*(0.01)*	
λ	0.26	0.32	0.43	0.51	0.30	0.37
(s.e.)	*(0.01)*	*(0.01)*	*(0.02)*	*(0.03)*	*(0.01)*	
Pseudo-R^2	77%	80%	78%	69%	75%	
No. of observations	12,726	14,345	17,711	11,573	8,590	64,945

Table OA3. Capitalization Parameter Estimates of Two Parameter Model.

This table presents the parameters estimated from our valuation residual model that sets the depreciation rate of knowledge capital and the depreciation rate of organization capital to be identical (δ_{KC}=δ_{OC}).

	Consumer	Manufacturing	High-tech	Healthcare	Other	All
δ_{KC}=δ_{OC}	0.21	0.16	0.26	0.15	0.18	0.20
(s.e.)	*(0.09)*	*(0.05)*	*(0.07)*	*(0.03)*	*(0.04)*	
λ	0.24	0.31	0.59	0.61	0.38	0.41
(s.e.)	*(0.10)*	*(0.09)*	*(0.20)*	*(0.11)*	*(0.06)*	
Pseudo-R^2	81%	85%	79%	72%	80%	
No. of observations	40,551	46,209	42,573	22,048	24,624	176,005

Table OA4. Criterion Function Value.

This table presents the criterion function value using our model's capitalization parameter estimates and compare the criterion function value alternatively using the capitalization parameters provided in Peters and Taylor (2017) (PT) and Ewens, Peters, and Wang (2024) (EPW). We conduct the out-of-sample test. We estimate capitalization parameters using a randomly selected half the firms in an industry-year within each firm size group (classified based on deciles of firm market value in an industry-year). Within each industry-year-size cell we pick firms 1, 3, 5 etc. (2, 4, 6 etc.) to construct the estimation sample (validation sample). Panel A confirms that estimation sample and validation sample are balanced in key firm characteristics. Recall Section 2 for the estimation and the criterion function value in each industry *j* (Fama-French five industry classification):

$$\min_{\delta_{KC,j},\delta_{OC,j},\lambda_j} Average\left[\ln\left(MV_{i,j,t}\right) - \ln\left(K_{i,j,t}\right)\right]^2$$

$$Criterion\ function\ value\ = \frac{1}{(N_j)}\sum_{i}^{I}\sum_{t}^{T}\left[ln\left(MV_{i,j,t}\right) - ln\left(K_{i,j,t}\right)\right]^2$$

where i, j, and t denotes firm i in industry j in year t; N_j is the number of observations in industry j, and $K_{i,j,t} = TA_{i,j,t} + BIA_{i,j,t} + KC_{i,j,t} + OC_{i,j,t}$. The $KC_{i,j,t}$ and $OC_{i,j,t}$ are measured based on capitalization parameters ($\delta_{KC,j}$, $\delta_{OC,j}$, and λ_j) from three cases: (1) our estimates using the estimation sample; (2) PT parameters (they adopt the estimated δ_{KC} from Li and Hall (2020) and assume $\delta_{OC} = 0.2$, $\lambda = 0.3$; (3) EPW parameters (they estimate δ_{KC} and λ and assume $\delta_{OC} = 0.2$). Panel B presents the estimated parameters, and Panels C and D presents the criterion function value for the estimation and validation samples respectively.

Panel A. Estimation sample and validation sample are balanced in key firm characteristics (in million dollars)

	Estimation sample		Validation sample			
	Mean	SD	Mean	SD	Diff. in means	*t*-stat of Diff.
Market value of assets	3,474.19	22,142.25	3,423.08	21,604.49	51.11	0.49
R&D	41.99	429.75	40.16	417.90	1.83	0.91
SG&A	225.60	1315.88	228.15	1,483.83	-2.55	-0.38

Panel B. Capitalization parameters

	Our model estimates (using estimation sample)			PT parameters			EPW parameters		
	δ_{KC}	δ_{OC}	λ	δ_{KC}	δ_{OC}	λ	δ_{KC}	δ_{OC}	λ
Consumer	0.10	0.18	0.25	0.31	0.20	0.30	0.43	0.20	0.20
Manufacturing	0.19	0.14	0.33	0.25	0.20	0.30	0.50	0.20	0.21
High-tech	0.16	0.26	0.59	0.31	0.20	0.30	0.42	0.20	0.37
Healthcare	0.13	0.12	0.63	0.18	0.20	0.30	0.33	0.20	0.51
Other	0.34	0.10	0.33	0.28	0.20	0.30	0.35	0.20	0.21

Panel C. Criterion function value (estimation sample)

	Our model estimates	PT parameters	EPW parameters	Criterion function value improved by	
				[(b) - (a)]/(b)	[(c) - (a)]/(c)
	(a)	(b)	(c)	(d)	(e)
Consumer	0.308	0.308	0.322	0.04%	4.59%
Manufacturing	0.244	0.247	0.264	1.13%	7.31%
High-tech	0.539	0.555	0.554	2.94%	2.83%
Healthcare	0.634	0.694	0.678	8.65%	6.42%
Other	0.339	0.345	0.367	1.68%	7.54%

Panel D. Criterion function value (validation sample)

	Our model estimates	PT parameters	EPW parameters	Criterion function value improved by	
				[(b) - (a)]/(b)	[(c) - (a)]/(c)
	(a)	(b)	(c)	(d)	(e)
Consumer	0.310	0.311	0.322	0.16%	3.61%
Manufacturing	0.254	0.258	0.276	1.40%	7.83%
High-tech	0.553	0.569	0.567	2.86%	2.37%
Healthcare	0.630	0.678	0.664	7.17%	5.13%
Other	0.358	0.363	0.385	1.39%	6.88%

Table OA5. Descriptive Statistics by Industry.

The table repeats Table 1 and presents the descriptive statistics in each industry based on the Fama-French five industry classification.

Panel A. Consumer					
	Mean	SD	P25	P50	P75
Valuation residual (VR)	610.56	2633.79	-22.17	0.74	114.36
Scaled VR	0.51	0.29	0.26	0.51	0.76
VR/MV	-0.03	0.50	-0.30	0.01	0.32
Knowledge capital (KC)	21.47	110.03	0.00	0.00	0.24
Organization capital (OC)	201.98	595.83	5.22	21.61	110.12
Capitalized intangible assets (CIA)	241.02	733.22	5.84	24.16	120.96
Scaled CIA	0.51	0.29	0.26	0.51	0.76
CIA/Total capital	0.18	0.12	0.10	0.16	0.24
KC/CIA	0.08	0.18	0.00	0.00	0.02
OC/CIA	0.92	0.18	0.98	1.00	1.00
Panel B. Manufacturing					
Valuation residual (VR)	580.63	2350.32	-19.41	4.35	179.28
Scaled VR	0.51	0.29	0.26	0.51	0.76
VR/MV	-0.02	0.46	-0.21	0.05	0.26
Knowledge capital (KC)	56.89	218.64	0.00	0.01	11.45
Organization capital (OC)	131.98	375.21	1.90	13.00	72.73
Capitalized intangible assets (CIA)	193.97	581.34	2.28	15.89	93.49
Scaled CIA	0.51	0.29	0.26	0.51	0.76
CIA/Total capital	0.16	0.14	0.04	0.13	0.23
KC/CIA	0.17	0.21	0.00	0.07	0.28
OC/CIA	0.83	0.21	0.72	0.93	1.00
Panel C. High-tech					
Valuation residual (VR)	934.58	3930.05	-16.01	7.92	193.88
Scaled VR	0.51	0.29	0.26	0.51	0.76
VR/MV	-0.05	0.75	-0.31	0.12	0.45
Knowledge capital (KC)	133.03	480.96	0.55	8.19	47.65
Organization capital (OC)	195.92	660.42	5.72	21.59	83.17
Capitalized intangible assets (CIA)	342.91	1143.51	9.43	36.90	148.33
Scaled CIA	0.51	0.29	0.26	0.51	0.76
CIA/Total capital	0.32	0.19	0.18	0.30	0.44
KC/CIA	0.36	0.26	0.13	0.37	0.53
OC/CIA	0.64	0.26	0.47	0.63	0.87
Panel D. Healthcare					
Valuation residual (VR)	717.28	3339.30	-16.41	14.54	155.43
Scaled VR	0.52	0.29	0.26	0.51	0.77
VR/MV	-0.11	1.01	-0.31	0.18	0.49
Knowledge capital (KC)	164.71	637.16	1.36	16.13	79.25
Organization capital (OC)	230.19	966.83	2.07	14.28	59.95
Capitalized intangible assets (CIA)	403.67	1616.93	14.32	51.13	158.77
Scaled CIA	0.52	0.29	0.26	0.51	0.77
CIA/Total capital	0.45	0.22	0.31	0.45	0.61
KC/CIA	0.46	0.37	0.13	0.37	0.82
OC/CIA	0.54	0.37	0.18	0.63	0.87
Panel E. Other					
Valuation residual (VR)	446.15	1706.07	-13.44	6.10	137.00
Scaled VR	0.51	0.29	0.26	0.52	0.76
VR/MV	0.01	0.53	-0.19	0.08	0.35
Knowledge capital (KC)	1.16	6.03	0.00	0.00	0.00
Organization capital (OC)	106.28	276.31	2.57	14.51	66.58
Capitalized intangible assets (CIA)	108.45	280.36	2.74	14.99	68.43
Scaled CIA	0.51	0.29	0.26	0.52	0.76
CIA/Total capital	0.16	0.16	0.04	0.12	0.24
KC/CIA	0.03	0.11	0.00	0.00	0.00
OC/CIA	0.97	0.11	1.00	1.00	1.00

Table OA6. Persistence of Valuation Residual.

This table presents the results of valuation residual (VR) persistency. A firm is sorted into four groups in an industry-year based on the quartile of valuation residual. Quartile 1 (Quartile 4) denotes a group of firms with the lowest (highest) VR. Quartile 1 (t to $t + n$) indicates the probability that a firm with Quartile1 rank consecutively maintain the same rank for n years. Similarly, Quartile 4 (t to $t + n$) indicates the probability that a firm with Quartile 4 rank consecutively maintains the same rank for n years. Panel A presents the results for a year-on-year persistency and Panel B presents the results for a longer horizon persistency.

Panel A. Probability of transition matrix on annual change of valuation residual quartiles

	year $t + 1$			
year t	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Quartile 1	75%	14%	7%	4%
Quartile 2	18%	62%	18%	2%
Quartile 3	9%	23%	55%	13%
Quartile 4	6%	3%	14%	78%

Panel B. Longer horizon persistency

	n-years				
$n \rightarrow$	1	2	3	4	5
Quartile 1 (t to $t + n$)	75%	59%	49%	41%	34%
Quartile 4 (t to $t + n$)	78%	65%	58%	52%	48%

Table OA7. Economic Rents and Profitability: Fama-MacBeth Estimation.

This table repeats Table 4 by replacing OLS estimation with Fama-MacBeth estimation using Newey-West standard errors of lag 3.

	Dependent variable: $Profitability_{t+1}$					
	Lerner $index_{t+1}$		Gross $profitability_{t+1}$		Intangible-adjusted $profitability_{t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Scaled VR_t	0.103***	0.015***	0.062***	0.034***	0.097***	0.016***
	0.005	*0.002*	*0.014*	*0.005*	*0.008*	*0.004*
Log BE/ME_t		-0.004***		-0.022***		-0.012***
		0.001		*0.001*		*0.001*
Log market cap_t		0.002***		0.001*		0.002***
		0.001		*0.001*		*0.001*
Neg $accrual/BE_t$		-0.003*		0.008**		-0.016***
		0.001		*0.004*		*0.003*
Pos $accrual/BE_t$		-0.015***		-0.013**		-0.012***
		0.002		*0.006*		*0.003*
dA/A_t		0.009***		0.029***		0.003
		0.001		*0.006*		*0.003*
No $dividend_t$		0.004***		0.001		0.001
		0.001		*0.002*		*0.002*
$Dividend/BE_t$		0.001		-0.256***		-0.080***
		0.021		*0.024*		*0.019*
Neg $profitability_t$		n.a.		0.074***		0.016***
		n.a.		*0.011*		*0.005*
$Profitability_t$		0.918***		1.041***		0.954***
		0.019		*0.010*		*0.019*
Adjusted R-squared	7.1%	60.1%	0.5%	80.3%	3.4%	66.5%
No. of observations	155,726	131,067	158,667	132,816	156,922	131,087

Table OA8. Economic Rents and Profitability by Industry.

This table repeats Table 4 by industry based on the Fama French five industry classification.

Panel A. Consumer

	Dependent variable: Profitability$_{t+1}$		
	Lerner index$_{t+1}$	Gross profitability$_{t+1}$	Intangible-adjusted profitability$_{t+1}$
	(1)	(2)	(3)
Scaled VR$_t$	0.009***	0.046***	0.017***
	0.002	*0.008*	*0.003*
Log BE/ME$_t$	-0.003***	-0.018***	-0.009***
	0.001	*0.003*	*0.002*
Controls?	yes	yes	yes
Year FE?	yes	yes	yes
Adjusted R-squared	66.8%	83.5%	68.2%
No. of observations	31,139	31,230	31,229

Panel B. Manufacturing

Scaled VR$_t$	0.032***	0.017***	0.014***
	0.005	*0.005*	*0.005*
Log BE/ME$_t$	0.001	-0.018***	-0.013***
	0.002	*0.003*	*0.002*
Controls?	yes	yes	yes
Year FE?	yes	yes	yes
Adjusted R-squared	55.5%	78.8%	62.3%
No. of observations	36,893	37,095	35,375

Panel C. High-tech

Scaled VR$_t$	0.013***	0.053***	0.030***
	0.003	*0.007*	*0.004*
Log BE/ME$_t$	-0.006***	-0.027***	-0.010***
	0.001	*0.003*	*0.002*
Controls?	yes	yes	yes
Year FE?	yes	yes	yes
Adjusted R-squared	60.9%	70.8%	66.6%
No. of observations	31,484	31,702	31,699

Panel D. Healthcare

Scaled VR$_t$	0.020***	0.031***	0.035***
	0.004	*0.009*	*0.005*
Log BE/ME$_t$	-0.003	-0.022***	-0.001
	0.002	*0.004*	*0.002*
Controls?	yes	yes	yes
Year FE?	yes	yes	yes
Adjusted R-squared	60.0%	80.2%	68.6%
No. of observations	15,054	16,064	16,064

Table OA9. Profitability: A Horse Race Test between VR/MV and BE/ME.

This table presents the coefficients of profitability regressions for a horse race test between VR/MV and BE/ME.

	Dependent variable: $Profitability_{t+1}$								
	Lerner $index_{t+1}$			Gross $profitability_{t+1}$			Intangible-adjusted $profitability_{t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VR/MV_t	0.059***		0.002**	0.000		0.015***	0.062***		0.004**
	0.002		*0.001*	*0.007*		*0.003*	*0.003*		*0.002*
Log BE/ME_t		-0.022***	-0.007***		-0.062***	-0.024***		-0.037***	-0.013***
		0.002	*0.001*		*0.004*	*0.001*		*0.003*	*0.001*
Log market cap_t			0.001***			-0.001***			0.001***
			0.001			*0.001*			*0.001*
Neg $accrual/BE_t$			-0.001			0.011**			-0.016***
			0.001			*0.004*			*0.002*
Pos $accrual/BE_t$			-0.017***			-0.005			-0.009***
			0.002			*0.005*			*0.003*
dA/A_t			0.009***			0.027***			0.001
			0.002			*0.004*			*0.002*
No $dividend_t$			0.004***			0.001			0.001
			0.001			*0.002*			*0.001*
$Dividend/BE_t$			0.003			-0.224***			-0.066***
			0.016			*0.021*			*0.017*
Neg $profitability_t$			n.a.			0.072***			0.021***
			n.a.			*0.009*			*0.003*
$Profitability_t$			0.931***			1.045***			0.972***
			0.016			*0.007*			*0.013*
Year FE?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R-squared	10.2%	4.0%	59.3%	2.6%	5.1%	79.8%	8.1%	7.7%	66.3%
No. of observations	155,723	148,699	131,067	158,664	151,386	132,816	156,920	149,666	131,087

Table OA10. Markup, Product Market Threat, and Labor Share by Industry.

The table repeats Table 5 by industry based on the Fama French five industry classification.

Panel A. Consumer	Markup	Product market threat	Labor share
	(1)	(2)	(3)
Scaled VR	0.033**	-0.317***	-0.109**
	0.014	*0.118*	*0.043*
Log market cap	0.042***	0.065*	-0.037**
	0.006	*0.038*	*0.018*
Log firm age	-0.064***	-0.498***	0.054
	0.013	*0.110*	*0.048*
Scaled CIA	0.124***	-0.142	0.054
	0.028	*0.170*	*0.055*
Year FE?	yes	yes	yes
Firm FE?	yes	yes	yes
Adjusted *R*-squared	77.1%	54.7%	40.8%
No. of observations	33,770	24,491	3,196
Panel B. Manufacturing			
Scaled VR	0.029*	-0.159	-0.076***
	0.015	*0.128*	*0.024*
Log market cap	0.066***	0.145***	-0.024
	0.006	*0.045*	*0.021*
Log firm age	-0.063***	0.455***	0.023
	0.013	*0.125*	*0.056*
Scaled CIA	0.017	-0.372*	-0.004
	0.027	*0.223*	*0.047*
Year FE?	yes	yes	yes
Firm FE?	yes	yes	yes
Adjusted *R*-squared	66.8%	68.4%	51.0%
No. of observations	32,436	26,862	5,122
Panel C. High-tech			
Scaled VR	0.182***	-0.517***	-0.312**
	0.028	*0.099*	*0.126*
Log market cap	0.055***	0.237***	0.053*
	0.008	*0.029*	*0.031*
Log firm age	0.029	-0.961***	-0.077
	0.022	*0.108*	*0.077*
Scaled CIA	-0.012	0.269*	-0.072
	0.041	*0.147*	*0.156*
Year FE?	yes	yes	yes
Firm FE?	yes	yes	yes
Adjusted *R*-squared	79.7%	65.0%	45.4%
No. of observations	34,217	30,780	1,424
Panel D. Healthcare			
Scaled VR	0.134**	-0.501***	-0.024
	0.060	*0.146*	*0.089*
Log market cap	0.143***	0.337***	-0.077***
	0.017	*0.043*	*0.026*
Log firm age	-0.094	-1.062***	0.048
	0.059	*0.167*	*0.070*
Scaled CIA	0.223***	0.568***	-0.313**
	0.076	*0.200*	*0.145*
Year FE?	yes	yes	yes
Firm FE?	yes	yes	yes
Adjusted *R*-squared	75.4%	75.3%	50.0%
No. of observations	11,721	17,509	1,681

Table OA11. Investment-Q Relation: Standard Q and Total Q.

This table presents the estimated coefficients of investment rates on lagged Q. $I_{t+1}^{phy}/K_{t+1}^{phy}$ is the physical investment rate in year *t*+1, calculated as physical investment divided by physical capital at the beginning of year *t*+1. I_{t+1}/K_{t+1} is the total investment rate in year *t*+1, where I_{t+1} is measured as the sum of physical investment (CAPX) and intangible investment (R&D plus a portion of SG&A), and K_{t+1} is total capital measured as the sum of total capital employed and capitalized intangible assets at the beginning of year *t*. Standard Q is measured as a firm's market value of assets divided by the lagged physical capital. Total Q is measured as a firm's market value of assets divided by the lagged total capital. Appendix A provides the detailed variable definitions. Columns 1 regresses the physical investment rate on the baseline model that includes firm fixed effects and year fixed effects. Columns 2-3 regress the baseline model with an additional variable of lagged Standard Q or lagged Total Q. Column 4-6 regress the models that replace physical investment rate in Columns 1-3 with total investment rate. All continuous variables are winsorized at 1% and 99%. Heteroskedasticity-consistent standard errors clustered at the firm level are shown in italics underneath the coefficient estimates. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

		$I_{t+1}^{phy}/K_{t+1}^{phy}$				I_{t+1}/K_{t+1}	
	(1)	(2)	(3)		(4)	(5)	(6)
Standard Q_t		0.010***				0.008***	
		0.000				*0.000*	
Total Q_t			0.044***				0.045***
			0.001				*0.001*
Year FE?	yes	yes	yes		yes	yes	yes
Firm FE?	yes	yes	yes		yes	yes	yes
Adjusted *R*-squared	33.6%	42.3%	44.6%		51.3%	56.6%	61.9%
No. of observations	126,352	123,587	123,587	123,587	126,352	123,587	123,587

Table OA12. A Threshold Regression for Standard Q.

This table repeats Table 6 by replacing the dependent variable with physical investment rate and the independent variable with Standard Q. $I_{t+1}^{phy}/K_{t+1}^{phy}$ is the physical investment rate, calculated as physical investment in year *t*+1 divided by physical capital at the beginning of year *t*+1. Standard Q is measured as a firm's market value of assets divided by lagged physical capital. LSQ (HSQ) is an indicator variable that equals one for a firm when its Standard Q is below (above) the median (90th) of Standard Q among firms in an industry-year otherwise zero. MSQ equals one for observations with zero values of LSQ or HSQ.

	$I_{t+1}^{phy}/K_{t+1}^{phy}$					
	All industry	All industry	Consumer	Manufacturing	High-tech	Healthcare
	(1)	(2)	(3)	(4)	(5)	(6)
Standard Q_t	0.006***					
	0.001					
Standard $Q_t \times LSQ_t$		0.019***	0.047***	0.069***	0.025***	0.015***
		0.001	*0.003*	*0.006*	*0.001*	*0.002*
Standard $Q_t \times MSQ_t$		*0.007****	*0.019****	*0.023****	*0.007****	*0.005****
		0.001	*0.001*	*0.002*	*0.001*	*0.001*
Standard $Q_t \times HSQ_t$		0.004***	0.006***	0.006***	0.004***	0.003***
		0.001	*0.001*	*0.001*	*0.001*	*0.001*
MSQ_t		0.064***	0.065***	0.067***	0.090***	0.082***
		0.002	*0.005*	*0.006*	*0.005*	*0.009*
HSQ_t		0.137***	0.184***	0.161***	0.192***	0.173***
		0.005	*0.011*	*0.01*	*0.012*	*0.021*
Log market cap_t	0.017***	0.001	-0.008***	0.002	-0.013***	-0.006
	0.001	*0.001*	*0.002*	*0.002*	*0.002*	*0.004*
Log firm age_t	-0.088***	-0.066***	-0.049***	-0.035***	-0.068***	-0.059***
	0.003	*0.003*	*0.005*	*0.005*	*0.007*	*0.009*
Constant	0.267***	0.245***	0.209***	0.117***	0.295***	0.229***
	0.01	*0.009*	*0.015*	*0.017*	*0.019*	*0.027*
Year FE?	yes	yes	yes	yes	yes	yes
Firm FE?	yes	yes	yes	yes	yes	yes
Adjusted *R*-squared	44.00%	45.90%	46.90%	43.80%	52.50%	37.00%
No. of observations	112,356	112,356	27,528	34,088	25,091	10,325

Table OA13. Stock Returns: Alternative Profitability and VR Measures.

Panel A presents the results when we repeat Table 8 Panel B using alternative profitability measures of Lerner index and gross profitability and report the alphas based on FF-5-factor model. Panel B presents the results when we alternatively scale VR by MV.

Panel A. Sorting on firm size, Lerner index (or gross profitability), and NVR

	Small-cap stocks NVR				Big-cap stocks NVR			
	L	M	H	H–L	L	M	H	H–L
Lerner index								
L	0.11%	0.02%	-0.57%	-0.67%	-0.08%	-0.22%	0.02%	0.11%
	(0.80)	(0.22)	(-4.48)	(-3.42)	(-0.98)	(-2.24)	(0.20)	(0.66)
M	0.00%	-0.10%	-0.25%	-0.26%	0.08%	-0.04%	0.01%	-0.08%
	(0.05)	(-1.33)	(-3.18)	(-2.21)	(0.99)	(-0.73)	(0.06)	(-0.68)
H	0.07%	0.07%	-0.08%	-0.15%	0.13%	0.06%	0.10%	-0.02%
	(0.56)	(0.88)	(-1.42)	(-1.06)	(1.21)	(0.74)	(1.69)	(-0.20)
H–L	-0.04%	0.04%	0.49%		0.21%	0.28%	0.08%	
	(-0.24)	(0.33)	(3.86)		(1.39)	(2.33)	(0.52)	
Gross profitability				H–L				H–L
L	0.01%	0.10%	-0.42%	-0.43%	-0.04%	-0.03%	-0.11%	-0.07%
	(0.07)	(1.29)	(-4.81)	(-2.68)	(-0.53)	(-0.39)	(-0.92)	(-0.58)
M	-0.05%	-0.07%	-0.21%	-0.15%	0.03%	-0.10%	0.00%	-0.02%
	(-0.45)	(-1.00)	(-2.70)	(-1.22)	(0.35)	(-1.55)	(0.03)	(-0.20)
H	0.25%	0.14%	0.09%	-0.16%	0.27%	0.02%	0.13%	-0.14%
	(2.47)	(2.00)	(1.97)	(-1.44)	(2.27)	(0.26)	(2.13)	(-1.11)
H–L	0.24%	0.05%	0.51%		0.31%	0.05%	0.24%	
	(2.00)	(0.43)	(4.93)		(2.03)	(0.43)	(1.58)	

Panel B. Sorting on profitability and VR/MV

	VR/MV				VR/MV			
	L	M	H	H–L	L	M	H	H–L
Intangible-adjusted profitability								
L	-0.24%	-0.33%	-0.89%	-0.65%	-0.07%	-0.20%	-0.07%	0.00%
	(-1.72)	(-3.42)	(-6.56)	(-3.53)	(-1.08)	(-1.89)	(-0.38)	(0.01)
M	0.16%	0.03%	-0.17%	-0.33%	0.08%	-0.04%	-0.02%	-0.11%
	(1.44)	(0.44)	(-1.87)	(-2.39)	(1.05)	(-0.55)	(-0.26)	(-0.84)
H	0.24%	0.15%	0.02%	-0.22%	0.17%	0.11%	0.15%	-0.02%
	(2.26)	(2.21)	(0.54)	(-1.89)	(1.11)	(1.50)	(2.42)	(-0.12)
H–L	0.48%	0.48%	0.91%		0.24%	0.31%	0.22%	
	(3.88)	(3.79)	(6.19)		(1.35)	(2.27)	(1.03)	
Lerner index				H–L				H–L
L	0.11%	0.03%	-0.56%	-0.67%	-0.11%	-0.18%	0.06%	0.18%
	(0.76)	(0.35)	(-4.27)	(-3.28)	(-1.30)	(-1.78)	(0.54)	(1.07)
M	0.04%	-0.10%	-0.27%	-0.31%	0.02%	-0.03%	0.03%	0.01%
	(0.41)	(-1.37)	(-3.37)	(-2.64)	(0.19)	(-0.46)	(0.32)	(0.10)
H	0.09%	0.08%	-0.09%	-0.18%	0.13%	0.09%	0.09%	-0.04%
	(0.68)	(1.08)	(-1.62)	(-1.25)	(1.28)	(0.94)	(1.47)	(-0.33)
H–L	-0.02%	0.05%	0.47%		0.25%	0.27%	0.03%	
	(-0.12)	(0.41)	(3.51)		(1.63)	(2.15)	(0.18)	
Gross profitability				H–L				H–L
L	-0.01%	0.12%	-0.46%	-0.45%	-0.03%	-0.05%	-0.06%	-0.03%
	(-0.06)	(1.71)	(-5.17)	(-2.72)	(-0.44)	(-0.56)	(-0.53)	(-0.25)
M	-0.05%	-0.06%	-0.22%	-0.17%	0.02%	-0.06%	-0.01%	-0.03%
	(-0.39)	(-0.89)	(-2.85)	(-1.37)	(0.20)	(-0.93)	(-0.15)	(-0.24)
H	0.27%	0.13%	0.09%	-0.18%	0.21%	0.06%	0.15%	-0.07%
	(2.77)	(1.69)	(2.04)	(-1.65)	(1.97)	(0.67)	(2.36)	(-0.57)
H–L	0.28%	0.01%	0.55%		0.24%	0.11%	0.21%	
	(2.32)	(0.05)	(5.24)		(1.79)	(0.81)	(1.36)	