# Did Earnings Lose their "Relevance"?

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## ABSTRACT

The literature documents that the cross-sectional earnings-returns relation has weakened over time. Yet, in contrast, we find that the time-series firm-level earnings-returns relation has remained stable. Our results show that while the relation between idiosyncratic earnings and returns has weakened, the relation between firm-level stock returns and aggregate earnings has strengthened. The two time-series trends cancel each other, resulting in a stable overall time-series firm-level earnings-returns relation. Furthermore, the serial correlation of firm-level earnings has declined, but its correlation with prior aggregate earnings has intensified, suggesting the increased importance of aggregate earnings in predicting firm-level earnings and assessing firm values.



**Keywords:** aggregate earnings, firm-level stock returns, earnings response coefficient, firm-level time-series regression

**JEL Classification:** G14, M41

## *1. Introduction*

This paper examines how the relation between earnings and returns (Ball and Brown, 1968) has changed over time. Prior studies found that the cross-sectional association between earnings and returns (or Earnings Response Coefficient, henceforth, ERC) has declined over time. The declining trend is robust to various specifications and periods (e.g., Collins, Maydew, and Weiss, 1997; Francis and Schipper, 1999; Brown, Lo, and Lys, 1999; Lev and Zarowin, 1999; Srivastava, 2014; Barth, Li, and McClure, 2019). This decline has generated a debate in accounting about whether earnings have lost the information content or "value relevance."[1] However, these studies fail to present a complete view of the earnings-returns relation because they mostly examine the relation in the cross-section. By construction, the cross-sectional analysis ignores the potential impact of common earnings or the systematic component of earnings on firm-level stock returns. Thus, the impact of aggregate earnings is excluded from most studies of the earnings-returns relation. Furthermore, firm-level time-series analyses are often not included in existing studies, even though firm-level time-series analyses could provide different insights from firm-level cross-sectional analyses. A cross-sectional analysis compares a firm to other firms during a given period, while a time-series analysis examines the temporal earnings-returns relation within a given firm over time.

In this paper, we fill the literature gap by conducting a more complete analysis of the earnings-returns relation over time including both time-series as well as cross-sectional analyses and taking into account the impact of systematic earnings changes. Specifically, we examine three different earnings-returns associations, which encompass all the different components listed

[1] Not all studies assume a decline in ERCs or the $R^2$ from earnings-returns regressions as an undesirable feature that motivates changes to accounting standards (e.g., Holthausen and Watts, 2001).

above, over time. First, following the studies listed above, we examine the cross-sectional association between firm-level earnings and returns while extending the sample period to 2019. Second, we examine the time-series association between firm-level earnings and returns (Teets and Wasley, 1996). The firm-level time-series regression further allows us to examine the association between firm-level returns and the systematic component of earnings (proxied by aggregate earnings). This component of the earnings-returns relation is excluded, by construction, from the cross-sectional analysis. Finally, we examine the time-series association between aggregate earnings and returns. By examining all three different earnings-returns associations over time, we provide a comprehensive view of the temporal variations in the earnings-returns relation.

We define earnings as a firm's change in annual earnings before extraordinary items deflated by beginning market capitalization and accumulate a firm's twelve-month return from the fourth month after the previous fiscal year-end.[2] Aggregate earnings are based on the sum of all sample firms, and aggregate return is CRSP value-weighted stock return, including dividends.[3] Prior studies document an increase in cross-sectional dispersion of earnings (e.g., Jorgensen, Li, and Sadka, 2012; Kalay, Nallareddy, and Sadka, 2018) and time-varying idiosyncratic volatilities (e.g., Campbell, Lettau, Malkiel, and Xu, 2001; Brandt, Brav, Graham, and Kumar, 2010). The increase in earnings dispersion reduces ERCs, therefore we focus our analysis on $R^2$. However, we do not take a stance on the debate of whether or not an increase (or decrease) in $R^2$ is desirable.

Overall, our findings suggest that the relation between earnings and returns has not declined over time, but rather the nature of the relation has changed. Consistent with existing studies, we find that the positive cross-sectional association between earnings and returns has

[2] We examine long-window associations, instead of a short-window event study around earnings announcements, because relevant earnings information may not always be released via earnings announcements (e.g., Ball and Shivakumar, 2008). We find similar results when using excess return after subtracting risk free rate.
[3] We find similar results when using CRSP equal-weighted stock return, including dividends, as aggregate return.

declined over time. Over the last few years, from 2011-2019, the $R^2$ reduces further to only 0.03 (over three times less than at the beginning of the sample). In contrast, the time-series association between firm-level earnings and returns has remained stable over time, with an average $R^2$ of 0.07. One potential explanation for the discrepancy between the cross-sectional and the time-series associations is the increasing importance of systematic earnings and the decreasing association between idiosyncratic earnings and returns. We define idiosyncratic earnings as earnings that are specific to an individual firm and use aggregate earnings to capture systematic earnings that are common to all firms.

To explore the increased role of systematic earnings, we examine the time-series association between earnings and returns at both the aggregate and firm levels. Consistent with Kim, Schoenberger, Wasley, and Land (2020), we find that the aggregate association between earnings and returns has changed from negative (e.g., Kothari, Lewellen, and Warner, 2006; Sadka, 2007; Sadka and Sadka, 2009) to positive. The change in the aggregate earnings-returns relations is accompanied by an increasing $R^2$ over time. In time-series regressions of firm-level returns on both firm-level and aggregate earnings, we further document a rising incremental $R^2$ for aggregate earnings and a declining incremental $R^2$ for firm-level idiosyncratic earnings. These results suggest that the relation between earnings and returns has changed rather than simply declined over time. Specifically, systematic earnings became more important, while idiosyncratic earnings became less important in explaining variations in firm-level stock returns.[4]

It is worth noting that the increasing association between aggregate earnings and returns (Kim, Schoenberger, Wasley, and Land, 2020) does not imply an increase in the time-series

[4] Consistent with prior evidence (Ball and Brown, 1968; Hayn, 1995; Basu, 1997), we find that negative idiosyncratic earnings have become more relevant than positive idiosyncratic earnings. However, negative systematic earnings are, on average, less relevant than positive systematic earnings, and such difference does not change over time. Taken together, the greater relevance of negative earnings relative to positive earnings seems only a firm-level phenomenon.

relation between firm-level returns and aggregate earnings. For example, before the 2000s, the aggregate earnings-returns relation was negative, while the firm-level associations in both the cross-section and the time-series were positive. This suggests that the strengthened aggregate earnings-returns relation and the weakened firm-level earnings-returns relation could co-exist. Therefore, an increased relation between firm-level returns and aggregate earnings is not obvious.

One underlying reason for the declining importance of idiosyncratic earnings is lack of persistence. Specifically, transitory earnings components, such as special items, are likely to reverse in the next period and less relevant to investors for assessing firm values (Miller and Rock, 1985; Kormendi and Lipe, 1987; Collins and Kothari, 1989). Consistent with existing evidence (e.g., Freeman, Ohlson, and Penman 1982; Fama and French, 2000), we document a negative serial correlation of firm-level earnings change. Furthermore, the serial correlation has become more negative over time, suggesting that firm-level earnings changes tend to reverse. The increasing negative serial correlation implies that abnormally high earnings do not slowly disappear, but rather reverse immediately in the following period. In other words, a firm that outperformed in the current period is likely to underperform in the next period. This result is consistent with the declining importance of idiosyncratic earnings due to lack of persistence.

In contrast to the declining serial correlation of firm-level earnings, the association between firm-level earnings and the previous year's aggregate earnings is positive and strengthens over time. This finding suggests that the overall market performance has become more persistent than firm-level performances. The rising association between firm-level earnings and lagged aggregate earnings is consistent with the earlier documented increasing importance of aggregate earnings in explaining the firm-level earnings-returns association. These results together highlight the increasing valuation of systematic earnings.

We also examine an alternative hypothesis that the declining (rising) importance of idiosyncratic (systematic) earnings is due to change in earnings predictability over time (Beaver, Lambert, and Morse, 1980; Collins, Kothari, and Rayburn, 1987; Collins and Kothari, 1989; Kothari and Sloan, 1992). Sadka and Sadka (2009) and Choi, Kalay, and Sadka (2016) show that earnings predictability affects the earnings-returns relation but have not examined whether predictability explains the time trend in the earnings-returns relation. Although a slight increase in the return predictability of firm-level earnings during recent years may explain the declining relevance of firm-level earnings, we also find a moderate increase in the predictability of aggregate earnings, which is inconsistent with the rising importance of aggregate earnings.

We perform a battery of tests to assess the robustness of the results. Using quarterly data to reduce the survivor bias in the firm-level time-series analysis (Fama and French 2000), we find consistent evidence of an increasing association between firm-level returns and systematic earnings and a declining association between firm-level returns and idiosyncratic earnings. When replacing beginning market capitalization with beginning total assets as an alternate earnings deflator, we continue to find consistent time trends, suggesting the results are unlikely to be influenced by a scaler effect (Brown, Lo, and Lys, 1999). Moreover, excluding financial firms from the sample yields almost identical results. Unlike the aggregate time-series evidence in Kim, Schoenberger, Wasley, and Land (2020), our firm-level time-series findings are not significantly affected by financial institutions.

We further examine different earnings components because items toward the bottom of an income statement tend to be transitory and reduce the earnings-returns relation (Lipe, 1986; Elliott and Hanna, 1996; Donelson, Jennings, and McInnis, 2011). After replacing income before extraordinary items with operating income that excludes interest expense, income taxes, and special items, we continue to document increasing importance of systematic earnings and decreasing importance of idiosyncratic earnings. However, the increase and the decrease magnitudes are smaller compared to those using earnings that include transitory items. Consistently, the serial correlation of firm-level earnings change is less negative, and the association between firm-level returns and the previous year's aggregate earnings is weaker when using operating income instead of the "bottom-line" net income. These findings suggest that transitory earnings components exacerbate the divergent importance between idiosyncratic and systematic earnings. Similarly, we replace firm-level earnings change with analyst forecast error as an alternate earnings news proxy (Easton and Zmijewski, 1989; Bradshaw and Sloan, 2002).[5] Overall, results using forecast errors show increased importance of aggregate earnings, but no significant trends in firm-level forecast errors.

The nature of our sample does not allow for well-identified tests to examine why systematic earnings have become more "relevant" in the overall relation between earnings and returns. Nevertheless, we conjecture that the increased importance of aggregate earnings relates to the superstar firm phenomenon, especially in the post-Sarbanes Oxley (SOX) era. Autor, Doron, Katz, Patterson, and Reenen (2017, 2020) argue that most industries' market shares are dominated by only a few large superstar firms, who are more profitable, productive, and innovative than their smaller-sized competitors. Such a trend is potentially related to globalization and frequent technological disruptions that have led to transient competitive advantages over time (Schumpeter, 1912, 1942; Chun, Kim, Morck, and Yeung, 2008; D'Aveni, Dagnino, and Smith, 2010).[6] For

[5] Analyst forecast error is based on realized pro-forma earnings that exclude transitory earnings components and provides an opportunity to examine whether analysts understand the rising importance of aggregate earnings, measured as the sum of all IBES firms' forecast errors. However, the analysis is restricted to a shorter period from 2002-2019 due to the available data from IBES.

[6] Recent studies show increased industry concentration and weakened competition (e.g., Grullon, Larkin, and Michaely 2019; De Loecker, Eeckhout, and Unger, 2020), distinct from the increased competition argument by Irvine

example, the percentage of sales conducted online has increased from 11 percent in 1999 to 42 percent in 2018, and the percentage of households with internet access has increased from 18 percent in 1999 to 90 percent in 2018.[7]

We conduct several cross-sectional analyses to examine our conjecture. When partitioning the sample by firm size or the market-to-book ratio, we find that the declining relation between firm-level returns and idiosyncratic earnings is driven by large and growth firms. Large firms have become larger during recent years. As a result, their firm-level earnings are not as relevant as aggregate earnings when their business is more subject to macroeconomic conditions. The superstar firm hypothesis suggests that growth firms are more likely to be superstar firms, consistent with 56 (13) percent of superstar firms (identified as the largest 100 firms) are growth (value) firms.

To directly examine the superstar hypothesis, we replace overall aggregate earnings with superstar firm aggregate earnings and identify superstar firms as the largest 100 firms based on beginning market capitalization each year. We find that the incremental $R^2$ of superstar earnings presents almost similar trends as the incremental $R^2$ of aggregate earnings, increasing from -0.11 during the period 1982-2000 to 0.05 over the past few years 2001-2019. The finding is robust to using only the largest 50 or 25 non-financial firms as superstar firms and excluding the financial crisis years. The result suggests that superstar firms' earnings have increasing relevance for non-superstar firms' valuation, consistent with their dominant influence in the product market (Autor et al., 2020; De Loecker et al., 2020). Moreover, the correlation between aggregate earnings and

and Pontiff (2009). Specifically, De Loecker et al. (2020) analyze listed firms' profitability based on the Compustat data and attribute the rise of market power to Schumpeter's (1912) technological disruption.

[7] The percentage of sales conducted online comes from Census E-Commerce Statistics for manufacturers (NAICS 31-33), wholesalers (NAICS 42), and retailers (NAICS 44-45). The percentage of households with internet access comes from the Census 1997 survey and the Pew Research Center post-2000 annual survey.

superstar earnings decreases from 0.91 during 1963-2000 to 0.63 during 2001-2019. The declining relation between aggregate and superstar earnings suggests an increasing disparity between superstar and non-superstar firms and is consistent with the "winner take most" argument in Autor et al. (2020).

We caution that our results are based on listed firms only and may not be generalized to privately held firms because studies have shown that listed firms are drastically different from privately held firms due to the endogenous listing decision (e.g., Davis, Haltiwanger, Jarmin, and Miranda, 2006; Brown and Kapadia, 2007).

The remainder of the paper proceeds as follows. In Section 2, we describe our sample and provide the results of three different associations and robustness tests. Section 3 presents additional cross-sectional analyses, and Section 4 concludes the paper.

## *2. Sample and Results*

### 2.1 SAMPLE AND SUMMARY STATISTICS OF VARIABLES

Our sample comprises U.S. firms with listed common equity securities (CRSP share code: 10 or 11), excluding ADRs (American Depository Receipts), REITs (Real Estate Investment Trusts), and closed-end funds. The sample period starts in 1963 to avoid selection bias in the pre-1963 Compustat annual data (Ball and Watts, 1977; Fama and French, 1992). We require non-missing income before extraordinary items from Compustat and beginning market capitalization from CRSP. The sample period ends in 2019. The final sample includes 210,740 firm-years with 21,204 distinct firms.

Change in earnings for firm i of fiscal year t ($\Delta X_{i,t}$) is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization (CRSP:

PRC×SHROUT). Following prior studies (Kormendi and Lipe, 1987; Collins and Kothari, 1989; Hayn, 1995; Elliott and Hanna, 1996; Lev and Zarowin, 1999), we use beginning market capitalization as the earnings deflator to be consistent with the stock return's denominator. However, we do not use earnings per share or stock price per share to avoid the scale effect discussed in Brown, Lo, and Lys (1999).

Contemporaneous annual stock return for firm i of fiscal year t ($RET_{i,t}$) is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. For example, a firm's fiscal year ends in December. Its annual return for the year 2000 is the twelve-month cumulative return from April 2000 to March 2001 because most firms announce earnings within three months after the fiscal year end (Collins and Kothari, 1989). Firm stock returns are adjusted for delisted returns based on the estimates from Shumway (1997). Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors.

Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. Aggregate return for year t ($RET_t$) is CRSP value-weighted stock return, including dividends (CRSP: VWRETD).

Table 1, Panel A presents the variable distributions based on 210,740 firm-years from 1963-2019. Consistent with existing studies, the distribution of firm-level earnings change is left-skewed, and the distribution of firm-level stock return is right-skewed. Aggregate earnings change and stock return have a smaller standard deviation than firm-level earnings change and stock return, consistent with aggregation reducing firm-specific noises (Collins, Kothari, Shanken, and Sloan, 1994). Moreover, the distributions of aggregate variables are not as skewed as the firm-level variable distributions. Table 1, Panel B presents the variable distributions based on 130,924 firm-years from 1963-2019 when requiring at least 15 years of data used in the firm-level time-series regression analysis. The variable distributions based on the reduced sample are similar to those based on the full sample.

## 2.2 CROSS-SECTIONAL EARNINGS-RETURNS RELATION

We first replicate existing studies by examining the cross-sectional association between firm-level earnings change and the contemporaneous firm-level stock return using the following empirical model:

$$RET_{i.t} = \beta_{0,t} + \beta_{1,t}\Delta X_{i.t} + \varepsilon_{i,t} \qquad (1)$$

$\Delta X_{i,t}$ is firm i's year t's earnings (Compustat: IB) minus year t-1's earnings, deflated by beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/-1% in each year to address potential data input errors. We estimate Equation (1) in a cross-sectional regression for each year t. Table 2 reports the number of observations, $R^2$, and the coefficient estimate on $\Delta X_{i.t}$ by year. Figure A plots the annual $R^2$ statistics based on the full sample.

Consistent with existing studies (Collins, Maydew, and Weiss, 1997; Francis and Schipper, 1999; Brown, Lo, and Lys, 1999; Lev and Zarowin, 1999; Srivastava, 2014; Barth, Li, and McClure, 2019), we document a decline in the cross-sectional earnings-returns relation. Specifically, the annual $R^2$ is significantly decreasing, with a p-value of less than 0.01. Based on the full sample of 210,740 firm-years, the average $R^2$ of 0.08 during the period from 1963-1980 declines to 0.05 during 1981-1990, further declines to 0.04 during 1991-2010, and then to 0.03 over the past few years from 2011-2019. Because the firm-level time-series analysis in Tables 4-

6 requires at least 15 years of data, we further confirm that the reduced sample of 130,924 firm-years presents a similar declining trend in the cross-sectional earnings-returns relation.

## 2.3 AGGREGATE TIME-SERIES EARNINGS-RETURNS RELATION

Next, we replicate existing studies by examining the time-series relation between aggregate earnings change and the contemporaneous aggregate stock return using the following empirical model:

$$RET_t = \gamma_{0,r} + \gamma_{1,r}\Delta X_t + \varepsilon_t \ldots\ldots(2)$$

Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's earnings minus the sum of all sample firms' year t-1's earnings, divided by the sum of all sample firms' beginning market capitalization. $RET_t$ is CRSP value-weighted stock return, including dividends. We estimate Equation (2) for each 20-year rolling window r and rolls over the window every year. Table 3 reports the signed $R^2$ and the coefficient on $\Delta X_t$ by the end year of each rolling window. Signed $R^2$ is the product of $R^2$ and the sign of the coefficient on $\Delta X_t$. Figure B plots the signed $R^2$ statistics based on the full sample.

Consistent with existing studies (Kothari, Lewellen, and Warner, 2006; Hirshleifer, Hou, and Teoh, 2009; Sadka and Sadka, 2009; Gallo, Hann, and Li, 2016; Choi, Kalay, and Sadka, 2016; Kim, Schonberger, Wasley, and Land, 2020), the relation between aggregate returns and earnings is negative during earlier years but has recently changed to positive. The increasing trend is statistically significant with a p-value of less than 0.01. Based on the full sample of 210,740 firm-years, the average signed $R^2$ of -0.14 during the period from 1982-1990 increases to -0.11 during 1991-2010, further climbs up to 0.11 during 2001-2010, and then rises to 0.47 over the past few years from 2011-2019. Because the firm-level time-series analysis in Tables 4-6 requires at least 15 years of data, we further confirm that the reduced sample of 130,924 firm-years presents a similarly increasing trend in the aggregate earnings-returns relation. The dotted line in Figure B suggests that financial crisis exacerbates the increased relation between aggregate returns and earnings.

## 2.4 FIRM-LEVEL TIME-SERIES EARNINGS-RETURNS RELATION

The diverging patterns between the firm-level cross-sectional association and the aggregate time-series association potentially suggest differential implications that emerged between firm-level earnings and aggregate earnings. As an attempt to disentangle the two sources of earnings, we examine Equation (5) below for each firm in a time-series regression (Teets and Wasley, 1996).

Table 4 reports the 50th (median), 25th, and 75th percentile values of $R^2$ and coefficients estimated from the firm-level time-series regression with a 20-year window that rolls over every year. Figure C presents the median value of $R^2$. Year indicates the last year of a rolling window. The median $R^2$ increases from 0.06 during the period from1982-1990 to stay at 0.07 from 1991-2019. The 25th percentile of $R^2$ remains at 0.02, while the 75th percentile of $R^2$ increases from 0.14 to 0.19. Overall, the firm-level time-series earnings-returns relation remains stable over time.

A firm-level time-series regression allows us to further estimate the relation of firm-level return with idiosyncratic and systematic earnings using the following empirical model:

$$RET_{i,t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i,t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t} \quad (3)$$

$$RET_{i,t} = \alpha_{4,i,r} + \alpha_{5,i,r}\Delta X_t + \varepsilon_{i,t} \quad (4)$$

$$RET_{i,t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i,t} + \varepsilon_{i,t} \quad (5)$$

We estimate Equations (3)-(5) for each firm i that has at least 15 years of data during a 20-year rolling window r and roll over the window every year. Then we estimate the incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ as the $R^2$ from Equation (3) minus the $R^2$ from Equation (4) and estimate the incremental $R^2$ of aggregate earnings $\Delta X_t$ as the $R^2$ from Equation (3) minus the $R^2$ from

Equation (5).[8] Table 5 reports the 50th (median), 25th, and 75th percentile values of the signed incremental $R^2$ statistics for firm-level earnings $\Delta X_{i,t}$, and aggregate earnings $\Delta X_t$, based on firm-level time-series regressions with a 20-year window that rolls over every year and requires at least 15 years of data in each rolling window. Signed $R^2$ is the product of incremental $R^2$ and the sign of the corresponding coefficient in Model (3). Figure D presents the median value of firm-level earnings $\Delta X_{i,t}$ incremental $R^2$, and Figure E presents the median value of aggregate earnings $\Delta X_{i,t}$ incremental $R^2$.

The median incremental $R^2$ of firm-level earnings decreases from 0.13 during the period from 1982-2000 to 0.11 from 2001-2019, and such decline is statistically significant with a p-value of less than 0.01. In contrast, the median incremental $R^2$ of aggregate earnings increases from -0.13 during the period from 1982-2000 to 0.06 over the past few years from 2001-2019. Such an increase is significant with a p-value of less than 0.01. The 25th percentile and the 75th percentile of incremental $R^2$ statistics also present divergent patterns for firm-level earnings and aggregate earnings. In sum, results from the firm-level time-series analysis suggest that firm-level idiosyncratic earnings have slightly lost their importance in the earnings-returns relation, but aggregate earnings have constantly gained importance over the past 57 years.

The increasing importance of systematic earnings, along with the decline in the idiosyncratic earnings-returns relation, suggests that firms are gradually more exposed to systematic risk than to firm-specific idiosyncratic risk. Distinct from our firm time-series analysis, Collins and Kothari (1989) develop a similar conjecture to explain the cross-sectional earnings-returns relation. They argue and find supporting evidence that firms with a high systematic risk (i.e., high market beta) have a lower earnings-returns relation than low market beta firms. Why

[8] Collins, Maydew, and Weiss (1997) and Brown, Lo, and Lys (1999) use a similar approach to calculate the incremental $R^2$ of earnings versus book equity in the cross-sectional analysis.

firms are more vulnerable to systematic risk than idiosyncratic risk is beyond the scope of our study, but the documented result is potentially explained by globalization and frequent technological disruptions that have caused transient competitive advantages over time (Schumpeter, 1912, 1942; Chun, Kim, Morck, and Yeung, 2008; D'Aveni, Dagnino, and Smith, 2010). Overall, we find that earnings have not lost their "relevance." Although firm-level earnings became less important, aggregate earnings have become more relevant to investors over the last five decades.

## 2.5 EARNINGS PERSISTENCE AND ITS RELATIONSHIP WITH AGGREGATE EARNINGS

We further examine firm-level earnings persistence and its relationship with lagged aggregate earnings as a potential explanation for the divergent tends. Miller and Rock (1985) argue that the earnings-returns relation is increasing in earnings persistence because persistent earnings allow investors to use current earnings to infer future earnings. Kormendi and Lipe (1987) and Collins and Kothari (1989) document consistent evidence in the cross-section.

Applying this conjecture to the firm-level time-series analysis, we examine firm-level earnings persistence and the relationship between firm-level earnings and the previous year's aggregate earnings using the following model:

$$\Delta X_{i,t} = \delta_{0,i,r} + \delta_{1,i,r}\Delta X_{i,t-1} + \delta_{2,i,r}\Delta X_{t-1} + \varepsilon_{i,t} \quad (6)$$

$\Delta X_{i,t}$ ($\Delta X_{i,t-1}$) is firm i's year t's (t-1's) earnings minus year t-1's (t-2's) earnings, deflated by year t's (t-1's) beginning market capitalization. Aggregate earnings change for year t-1 ($\Delta X_{t-1}$) is the sum of all sample firms' year t-1's earnings minus the sum of all sample firms' year t-2's earnings, divided by the sum of all sample firms' beginning market capitalization. We estimate Equation (6) for each firm i that has at least 15 years of data during a 20-year rolling window r.

The coefficient $\delta_1$ captures firm-level earnings first-order autocorrelation incremental to the relation between firm-level earnings and lagged aggregate earnings. The coefficient $\delta_2$ captures the relationship between firm-level earnings and lagged aggregate earnings. Table 6 reports the 50$^{th}$ (median), 25$^{th}$, and 75$^{th}$ percentile values of $\delta_1$ and $\delta_2$ in Equation (6). Figure F presents the median value of $\delta_1$, and Figure G presents the median value of $\delta_2$.

The median $\delta_1$ decreases from -0.19 during 1982-2000 to -0.28 during 2001-2019, while the median $\delta_2$ increases from 0.15 during 1982-2000 to 0.24 during 2001-2019. Both trends are statistically significant. The 25$^{th}$ and 75$^{th}$ percentiles of coefficients also present consistent patterns---a declining $\delta_1$ and an increasing $\delta_2$. The negative sign of $\delta_1$ is consistent with prior evidence (Freeman, Ohlson, and Penman 1982; Fama and French, 2000; Dichev and Tang, 2008) and suggests that firm-level earnings change reverses in the next period. However, the rising relation between firm-level earnings and the previous year's aggregate earnings suggests that when the overall market performs well, individual firms ride with it and outperform in the future. As the systematic component of earnings becomes more influential in explaining firm earnings, the relation between firm-level return and aggregate earnings strengthens over time.

## 2.6 EARNINGS PREDICTABILITY

We also examine an alternative hypothesis that the declining (rising) importance of idiosyncratic (systematic) earnings is because of the changing earnings predictability over time (Beaver, Lambert, and Morse, 1980; Collins, Kothari, and Rayburn, 1987; Collins and Kothari, 1989; Kothari and Sloan, 1992). Assume that firm-level returns incorporate timely information. The ability of returns to predict firm-level earnings suggests a lack of timely information in earnings. Sadka and Sadka (2009) and Choi, Kalay, and Sadka (2016) show that earnings predictability affects the earnings-returns relation but have not examined whether predictability explains the time trend of the earnings-returns relation. Specifically, we examine the following models in a firm-level time-series regression:

$$RET_{i,t-1} = \varphi_{1,i,r} + \varphi_{2,i,r}\Delta X_{i,t} + \varphi_{3,i,r}\Delta X_t + \varepsilon_{i,t-1} \quad (7)$$

$$RET_{i,t-1} = \varphi_{4,i,r} + \varphi_{5,i,r}\Delta X_{i,t} + \varepsilon_{i,t-1} \quad (8)$$

$$RET_{i,t-1} = \varphi_{6,i,r} + \varphi_{7,i,r}\Delta X_t + \varepsilon_{i,t-1} \quad (9)$$

$\Delta X_{i,t}$ is firm i's year t's earnings minus year t-1's earnings, deflated by year t's (t-1's) beginning market capitalization. Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's earnings minus the sum of all sample firms' year t-1's earnings, divided by the sum of all sample firms' beginning market capitalization. $RET_{i,t-1}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-2's end. We estimate Equations (7)-(9) for each firm i that has at least 15 years of data during a 20-year rolling window r and roll over the window every year.

Using firm-level time-series regressions, we estimate the incremental $R^2$ for the predictability of firm-level earnings $\Delta X_{i,t}$ as the $R^2$ from Equation (7) minus the $R^2$ from Equation (8) and estimate the incremental $R^2$ for the predictability of aggregate earnings $\Delta X_t$ as the $R^2$ from Equation (7) minus the $R^2$ from Equation (9). Figure H presents the incremental $R^2$ for the predictability of firm-level earnings and Figure I presents the incremental $R^2$ for the predictability of aggregate earnings. The incremental $R^2$ for the predictability of firm-level earnings remains at 0.07 throughout the sample period. After excluding the years from 2007-2009, there is a light increase in the predictability of firm-level earnings (see Figure H), which may explain the recent decline in the cross-sectional earnings-returns relation in Table 2 and Figure A. The incremental $R^2$ for the predictability of aggregate earnings also slightly increases from 0.07 during 1982-2000 to 0.08 during 2001-2019. Such trend is inconsistent with the increasing importance of aggregate earnings.

We separately estimate Equation (8) in cross-sectional regressions by each year. Figure J presents a stable trend in the $R^2$, ranging from zero to 0.05. Overall, earnings predictability fails to explain why idiosyncratic and systematic earnings have differential importance over time.

2.7 QUARTERLY ANALYSIS

Our primary analysis examines the annual earnings-returns relation and requires at last 15 years of data in the firm-level time-series analysis. Such a requirement potentially creates a survivor bias (Fama and French, 2000). In this additional analysis, we examine the quarterly data and require at least 15 quarters (i.e., less than four years) of data in the firm-level time-series analysis. We use the seasonally differentiated earnings to capture quarterly earnings change (e.g., Easton and Zmijewski, 1989; Kothari, Lewellen, and Warner, 2006). Quarterly earnings $\Delta X_{i,q}$ is firm i's quarter q's earnings before extraordinary items minus the same quarter of the prior year's quarterly earnings, deflated by beginning market capitalization. $Return_{i.q}$ is firm i quarter q's three-month cumulative return from the month after its prior quarter's earnings announcement. For example, a firm announced Q3 earnings in Nov. 2000. Its Q4 return is the three-month cumulative return from Dec. 2000 to Feb. 2001. We use Compustat quarterly data from 1972Q2 to 2019Q4. Both individual firms' return and change in earnings are winsorized at +/- 1% in each calendar quarter to address potential data input errors.

We estimate the cross-sectional regression by each calendar quarter based on the modified Equation (1) where the subscript t is replaced with the subscript q. Consistent with our annual analysis, we document a declining earnings-returns relation over time. The average $R^2$ of 0.04

during the period from 1972-1980 declines to 0.03 during 1981-1990, further declines to 0.02 during 1991-2010, and then to 0.01 over the past few years from 2011-2019.

When examining the quarterly time-series relation between aggregate earnings and returns by substituting the subscript q for the subscript t in Equation (2), we restrict the sample to firms whose fiscal years end in March, June, September, or December, so that aggregate return is aligned with aggregate earnings (Kothari, Lewellen, and Warner, 2006). Aggregate return $RET_q$ is CRSP value-weighted stock return, including dividends. Aggregate earnings $\Delta X_q$ is the sum of all sample firms' quarter q's income before extraordinary items minus the sum of all firms' quarter q-4's income before extraordinary items, divided by the sum of all firms' beginning market capitalization. The aggregate time-series regression with a 20-year window that rolls over every year. Consistent with the evidence in Kim, Schonberger, Wasley, and Land (2020), we document a rising earnings-returns relation over time. The average signed $R^2$ increases from -0.06 during 1977-2000 to 0.21 during 2001-2019.

More importantly, we find consistent results in the firm-level time-series analysis with a 20-year window that rolls over every year and requires at least 15 quarters of data in each rolling window. When estimating the modified Equations (3)-(5) by substituting the subscript q for the subscript t, we find that the median incremental $R^2$ of firm-level quarterly earnings $\Delta X_{i,q}$ decreases from 0.08 during 1980-2000 to 0.07 during 2001-2019, while the median incremental $R^2$ of aggregate quarterly earnings $\Delta X_q$ increases from -0.07 during 1980-2000 to 0.06 during 2001-2019. Without the decomposition, the median $R^2$ from regressing firm-level quarterly return on firm-level quarterly earnings remains at 0.04 throughout the sample period, suggesting that the rising importance of aggregate earnings is canceled out by the declining importance of firm-level earnings.

When estimating Equation (6) by the quarterly data, we find that the median $\delta_1$ decreases from 0.22 during 1980-2000 to 0.13 during 2001-2019, while the median $\delta_2$ increases from 0.08 during 1980-2000 to 0.13 during 2001-2019. Although quarterly earnings first-order autocorrelation is not negative as those for annual earnings, the positive quarterly autocorrelation reducing towards zero suggests the declining importance of firm-level earnings. Overall, we find consistent results that firm-level earnings have become less relevant, while aggregate earnings have gained its importance when using quarterly data to examine the earnings-returns relation.

## 2.8 ALTERNATE EARNINGS DEFLATOR

The earnings-returns relation is sometimes sensitive to the scale effect (Brown, Lo, and Lys, 1999). Our primary analysis uses beginning market capitalization as the earnings deflator to be consistent with the stock return's denominator. In this additional analysis, we use beginning total asset value as an alternate earnings deflator to assess the robustness of the reported results. Specifically, change in earnings for firm i of fiscal year t ($\Delta X_{i,t}$) is firm i's year t's annual change in earnings, deflated by the year t's beginning total asset (Compustat: AT). Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual earnings minus the sum of all sample firms' year t-1's earnings, divided by the sum of all sample firms' beginning total asset.

The cross-sectional regression based on Equation (1) presents that the average $R^2$ of 0.14 during 1963-1980 declines to 0.06 during 1981-1990, further declines to 0.05 during 1991-2010, and then to 0.02 over the past few years from 2011-2019. The aggregate time-series regression based on Equation (2) shows that the average signed $R^2$ increases from -0.09 during 1982-2000 to 0.25 during 2001-2019. In the firm-level time-series analysis based on Equations (3)-(5), the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.15 during 1982-2000 to 0.13 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -

0.14 during 1982-2000 to 0.05 during 2001-2019. Consistently, the first-order autocorrelation of firm-level earnings declines from -0.15 during 1982-2000 to -0.23 during 2001-2019, while the relation between firm-level earnings and the previous year's aggregate earnings increases from 0.10 during 1982-2000 to 0.29 during 2001-2019. Overall, using an alternate earnings deflator yields consistent results as those obtained by using beginning market capitalization.

### 2.9 EXCLUDING FINANCIAL FIRMS

Kim, Schonberger, Wasley, and Land (2020) attribute the increasing relation between aggregate returns and earnings to the rising number and the economic importance of financial firms and the use of fair value accounting by these firms. To address the concern of whether our results are predominantly driven by financial firms, we exclude them from the sample to re-examine the earnings-returns relation over time. After excluding firms belonged to the SIC four-digit codes from 6000-6999, our sample includes 178,559 firm-years from 1963-2019.

The cross-sectional analysis based on Equation (1) presents that the average $R^2$ of 0.08 during 1963-1980 declines to 0.05 during 1981-1990, further declines to 0.04 during 1991-2010, and then to 0.03 during 2011-2019. The aggregate time-series analysis based on Equation (2) shows that the average signed $R^2$ increases from -0.12 during 1982-2000 to 0.14 during 2001-2019. In the firm-level time-series analysis, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.13 during 1982-2000 to 0.11 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.13 during 1982-2000 to 0.06 during 2001-2019. Consistently, the first-order autocorrelation of firm-level earnings declines from -0.19 during 1982-2000 to -0.29 during 2001-2019, while the relation between firm-level earnings and lagged aggregate earnings increases from 0.15 during 1982-2000 to 0.27 during 2001-2019.

Excluding financial firms from the sample yields almost identical results in the cross-sectional and the firm-level time-series analyses. The only difference is that the average $R^2$ from regressing aggregate returns on aggregate earnings during the period from 2001-2019 becomes 0.14, compared to 0.28 when including financial firms. Therefore, our evidence of the rising importance of systematic earnings and the declining role of idiosyncratic earnings is not significantly affected by financial firms.

2.10 OPERATING INCOME

Several studies show that items toward the bottom of an income statement, such as income taxes and special items, lead to a lower earnings-returns relation due to the transitory nature of these income components (Lipe, 1986; Elliott and Hanna, 1996; Donelson, Jennings, and McInnis, 2011). Motivated by these findings, we replace income before extraordinary item (Compustat: IB) with operating income after depreciation (Compustat: OIADP) that excludes interest expense, income taxes, and special items. Specifically, change in earnings for firm i of fiscal year t ($\Delta X_{i,t}$) is firm i's year t's annual operating income after depreciation minus the year t-1's annual operating income after depreciation, deflated by the year t's beginning market capitalization. Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual operating income after depreciation minus the sum of all sample firms' year t-1's annual operating income after depreciation, divided by the sum of all sample firms' year t's beginning market capitalization.

In the cross-sectional analysis based on Equation (1), the average $R^2$ of 0.09 during 1963-1980 declines to 0.05 during 1981-2000, and further declines to 0.04 during 2001-2019. The aggregate time-series analysis based on Equation (2) presents that the average signed $R^2$ increases from -0.12 during 1982-2000 to 0.19 during 2001-2019. In the firm-level time-series analysis, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.12 during 1982-2000 to 0.11

from 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.11 during 1982-2000 to 0.03 during 2001-2019. Consistently, the first-order autocorrelation of firm-level earnings declines from -0.08 during 1982-2000 to -0.15 during 2001-2019, while the relation between firm-level earnings and the previous year's aggregate earnings increases from 0.09 during 1982-2000 to 0.20 during 2001-2019.

Excluding transitory items from earnings yields similar results to those obtained by including transitory items. The smaller magnitudes of $R^2$ and coefficient statistics from the aggregate and firm-level time-series analyses suggest that transitory items, such as income taxes and special items, potentially lead to extreme values of "bottom-line" earnings. Nevertheless, we continue to document the rising importance of aggregate earnings and the fading relevance of firm-level earnings when using operating income as an alternate earnings measure.

2.11 ANALYST FORECAST ERROR

Researchers have used IBES analysts realized pro-forma earnings as another way to exclude transitory earnings components because analysts often exclude transitory items that are less relevant to investors (Easton and Zmijewski, 1989; Bradshaw and Sloan, 2002). We follow this stream of studies and replace firm-level change in earnings $\Delta X_{i.t}$ with analyst earnings forecast error $FE_{i.t}$, measured as firm i's year t's annual IBES realized pro-forma earnings minus the most recent analyst median forecast consensus prior to an earnings announcement, deflated by the year t's beginning market capitalization. Aggregate earnings forecast error $FE_t$ is the sum of all sample firms' year t's annual IBES realized pro-forma earnings minus the sum of all sample firms' most recent analyst median forecast consensus, divided by the sum of all sample firms' year t's beginning market capitalization. Firm-level analyst forecast errors are winsorized at +/- 1% in each year to address potential data input errors. The sample includes 84,819 firm-years that have available IBIES data from 1983-2019. Note that analyst forecast error captures earnings news with respect to analyst expectations, which are distinct from the change in realized earnings by assuming that earnings follow a random walk (Ball and Watts, 1972).

The cross-sectional regression based on the modified Equation (1) presents that the average $R^2$ of 0.06 during 1983-1990 declines to 0.03 during 1991-2000, further declines to 0.02 during 2001-2010, and then to 0.01 during 2011-2019. The time-series regression of aggregate returns on aggregate forecast errors shows that the average $R^2$ increases from 0.05 during 2002-2010 to 0.13 during 2011-2019. In the firm-level time-series analysis, the median incremental $R^2$ of firm-level forecast error $FE_{i,t}$ increases from 0.09 during 2002-2010 to 0.11 from 2011-2019, and the median incremental $R^2$ of aggregate earnings $FE_t$ increases from 0.06 during 2002-2010 to 0.09 from 2011-2019. Lastly, the first-order autocorrelation of firm-level forecast error declines from 0.02 during to 0.01 during 2011-2019, while the relation between firm-level forecast error and the previous year's aggregate forecast error increases from zero during 2002-2010 to 0.001 during 2011-2019.

We continue to document a declining cross-sectional earnings-returns relation and an increasing aggregate earnings-returns relation. However, due to the limited time-series data available from IBES, the firm-level time-series analysis focuses only on recent years from 2002-2019. The median incremental $R^2$ of firm-level forecast error $FE_{i,t}$ no longer presents a declining trend during 2002-2019, consistent with the stable trend reported in Figure D and Table 5 when examining firm-level realized earnings change. Moreover, the relation between firm-level forecast error and the previous year's aggregate forecast error remains stable, suggesting that analysts incorporate the implications of lagged aggregate earnings into their forecasts. Overall, the rising importance of aggregate earnings seems to be recognized by analysts.

## 2.12 POSITIVE VERSUS NEGATIVE EARNINGS

Studies often argue that negative earnings have a higher association with stock returns than positive earnings (Ball and Brown, 1968; Hayn, 1995; Basu, 1997). To examine whether negative earnings presents differential results from positive earnings, we augment Equations (1)-(5) to the following:

$RET_{i.t} = \beta_{0,t} + \beta_{1,t}\Delta X_{i.t} + \beta_{2,t}I[\Delta X_{i.t} < 0] + \beta_{3,t}I[\Delta X_{i.t} < 0] \times \Delta X_{i.t} + \varepsilon_{i,t}$………(1R)

$RET_{t} = \gamma_{0,r} + \gamma_{1,r}\Delta X_{t} + \gamma_{2,r}I[\Delta X_{t} < 0] + \gamma_{3,r}I[\Delta X_{t} < 0] \times \Delta X_{t} + \varepsilon_{t}$…..…………(2R)

$RET_{i,t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i,t} + \alpha_{3,i,r}\Delta X_{t} + \alpha_{4,i,r}I[\Delta X_{i.t} < 0] + \alpha_{5,i,r}I[\Delta X_{t} < 0] +$

$\alpha_{6,i,r}I[\Delta X_{i.t} < 0] \times \Delta X_{i.t} + \alpha_{7,i,r}I[\Delta X_{t} < 0] \times \Delta X_{t} + \varepsilon_{i,t}$……..…………..……………..….(3R)

$RET_{i,t} = \alpha_{8,i,r} + \alpha_{9,i,r}\Delta X_{t} + \alpha_{10,i,r}I[\Delta X_{t} < 0] + \alpha_{11,i,r}I[\Delta X_{t} < 0] \times \Delta X_{t} + \varepsilon_{i,t}$……(4R)

$RET_{i,t} = \alpha_{12,i,r} + \alpha_{13,i,r}\Delta X_{i,t} + \alpha_{14,i,r}I[\Delta X_{i.t} < 0] + \alpha_{15,i,r}I[\Delta X_{i.t} < 0] \times \Delta X_{i.t} + \varepsilon_{i,t}$.

(5R)

$I[\cdot]$ represents an indicator for negative values. In the cross-sectional analysis based on Equation (1R), the coefficient on $\beta_3$ increases from -0.42 during 1963-1990 to 0.68 during 1991-2010, and further climbs up to 0.89 during 2011-2019. The incremental $R^2$ of Equation (1R) compared to Equation (1) also increases from 0.06 during 1963-2010 to 0.08 during 2011-2019. These findings suggest that negative firm-level earnings have a stronger association with stock returns than positive firm-level earnings over time.

In the aggregate time-series analysis based on Equation (2R), the coefficient on $\gamma_3$ increases from -1.36 during 1982-2000 to 9.05 during 2001-2010, and the incremental $R^2$ of Equation (2R) compared to Equation (2) also increases from 0.01 during 1982-2000 to 0.05 during 2001-2019. The results imply that negative aggregate earnings have a higher association with aggregate returns than positive aggregate earnings over time.

In the firm-level time-series analysis based on Equations (3R)-(5R), the median coefficient on $\alpha_5$ increases from 0.04 during 1982-2000 to 0.59 during 2001-2010, while the median coefficient on $\alpha_6$ increases only slightly from -3.6 during 1982-2000 to -3.0 during 2001-2010. The negative sign of $\alpha_6$ suggests that negative aggregate earnings are less relevant to firm values than positive aggregate earnings. The positive and increasing $\alpha_5$ suggests that negative firm-level earnings have become more important compared to positive firm-level earnings. However, negative aggregate earnings are, on average, less correlated with returns than positive aggregate earnings, and such a difference does not change over time. Taken together, the higher association between returns and negative earnings compared to positive earnings seems to be only a firm-level phenomenon.

### *3. Superstar Firms and Other Potential Explanations*

The nature of our sample does not allow for well-identified tests to examine why systematic earnings have become more "relevant" in the overall relation between earnings and returns. Nevertheless, we conjecture that the increased importance of aggregate earnings relates to the superstar firm phenomenon, especially in the post-Sarbanes Oxley (SOX) era. Autor, Doron, Katz, Patterson, and Reenen (2017, 2020) argue that most industries' market shares are dominated by only a few large superstar firms. They present evidence of within-industry reallocation, instead of a cross-industry shift, such that winning firms are more profitable, productive, and innovative than their smaller-sized competitors. They conjecture that the "winner take most" phenomenon is potentially explained by easier price/quantity comparisons on the internet, software platforms and online services that involve high fixed un-front costs but low subsequent variable costs, strengthened network effects that favor firms adopting the latest technologies, and increasing competition due to globalization.

Their evidence is consistent with growing profitability by U.S. corporations (Barkai, 2020), and such growth in profitability is mostly enjoyed by the largest listed firms in each industry (De Loecker, Eeckhout, and Unger, 2020). Such a trend relates to globalization and frequent technological disruptions that have led to transient competitive advantages over time (Schumpeter, 1912, 1942; Chun, Kim, Morck, and Yeung, 2008; D'Aveni, Dagnino, and Smith, 2010). For example, the percentage of sales conducted online has increased from 11 percent in 1999 to 42 percent in 2018, and the percentage of households with internet access has increased from 18 percent in 1999 to 90 percent in 2018 (see Figure K). In the following sections, we conduct several tests to investigate whether the superstar phenomenon explains the rising (declining) relevance of aggregate (firm-level) earnings.

3.1 FIRM SIZE

We partition our sample by firm size to examine the superstar firm hypothesis. Studies have observed that large firms have a lower earnings-returns relation than small firms in the cross-sectional analysis and attribute the discrepancy to the richer information environment by large firms (Burgstahler, 1981; Freeman, 1987; Collins, Kothari, and Rayburn, 1987; Collins and Kothari, 1989). To assess whether our results differ in firm size, we partition the sample into three terciles based on beginning market capitalization and compare large firms in the top tercile to small firms in the bottom tercile.

In the cross-sectional analysis based on Equation (1), the large firms' average $R^2$ decreases from 0.07 during 1963-1980 to 0.03 during 1981-2019, while the small firms' average $R^2$ presents a greater decline from 0.11 during 1963-1980 to 0.05 during 1981-2010, and further to 0.04 during 2011-2019. The discrepancy between large and small firms becomes narrower over time, but both sizes of firms experience a decline in the cross-sectional earnings-returns relation.

We augment the aggregate time-series analysis in Equation (2) by replacing aggregate earnings with a tercile group's earnings, measured as the sum of all tercile firms' year t's earnings change, divided by the sum of all tercile firms' beginning market capitalization. Based on the time-series regression with a 20-year window that rolls over every year, the large firms' average signed $R^2$ increases from -0.09 during 1982-2000 to 0.26 during 2001-2019, while the small firms' average signed $R^2$ increases from -0.08 during 1982-2000 to 0.23 during 2001-2019. Both sizes of firms experience an increase in the aggregate earnings-returns relation.

We estimate the firm-level time-series regressions based on Equations (3)-(5) for the large firm tercile and the small firm tercile separately. For large firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.11 during 1982-2000 to 0.09 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.16 during 1982-2000 to 0.07 during 2001-2019 (see Figures L and M). For small firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ increases from 0.12 during 1982-2000 to 0.13 during 2001-2019, and the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.08 during 1982-2000 to 0.09 during 2001-2019 (see Figures L and M). These findings suggest that the decline in the firm-level earnings returns relation is more pronounced for large firms. The result is consistent with the superstar firm hypothesis. Large firms have become larger during recent years. As a result, their firm-level earnings are not as relevant as aggregate earnings when their business is more subject to macroeconomic conditions.

### 3.2 SUPERSTAR FIRMS

To directly examine the superstar hypothesis, we replace aggregate earnings with superstar firm earnings. $\Delta SSX_t$ is superstar firms' earnings change, measured as the sum of all superstar firms' year t's annual earnings before extraordinary items minus the sum of all superstar firms' year t-1's annual earnings before extraordinary items, divided by the sum of all superstar firms' year t's beginning market capitalization. We examine the following models in a firm-level time-series regression:

$$RET_{i,t} = \theta_{1,i,r} + \theta_{2,i,r}\Delta X_{i,t} + \theta_{3,i,r}\Delta SSX_t + \varepsilon_{i,t-1} \quad (10)$$

$$RET_{i,t} = \theta_{4,i,r} + \theta_{5,i,r}\Delta X_{i,t} + \varepsilon_{i,t-1} \quad (11)$$

We estimate Equations (10)-(11) for each firm i that has at least 15 years of data during a 20-year rolling window r and roll over the window every year. Then we estimate the incremental $R^2$ of superstar earnings $\Delta SSX_t$ as the $R^2$ from Equation (10) minus the $R^2$ from Equation (11). We exclude superstar firms from the sample, so Figure N presents the relation between non-superstar firms' returns and superstar firms' earnings. In the excluding financial crisis years (from 2007-2009) analysis, we further exclude financial institutions (SIC 6000-6999).

Surprisingly, the incremental $R^2$ of superstar earnings $\Delta SSX_t$ in Figure N presents almost similar trends as the incremental $R^2$ of aggregate earnings $\Delta X_t$ in Figure E. The incremental $R^2$ of superstar earnings increases from -0.11 during the period from 1982-2000 to 0.05 over the past few years from 2001-2019. When excluding financial crisis years and financial institutions, the incremental $R^2$ of superstar earnings still increases from -0.12 during the period from 1982-2000 to 0.03 over the past few years from 2001-2019, suggesting that the increasing trend is not only driven by the financial sector. Figure O presents alternative identifications of superstar firms. When using only the largest 50 or 25 non-financial firms as superstar firms, we still observe the median incremental $R^2$ of superstar earnings increases from -0.11 during the period from 1982-2000 to 0.06 over the past few years from 2001-2019. These findings suggest that superstar firms' earnings have increasing relevance for non-superstar firms' valuation, consistent with their dominant influence in the product market (Autor et al., 2020; Barkai, 2020; De Loecker et al., 2020.)

Consistent with the within-industry reallocation and cross-firm heterogeneity evidence in Autor et al. (2020), the Pearson correlation between aggregate earnings and superstar earnings decreases from 0.91 during the period from 1963-2000 to 0.63 during the recent few years from 2001-2019. The declining relation between aggregate earnings and superstar earnings suggests an increasing disparity between superstar firms and non-superstar firms and is consistent with the "winner take most" argument in Autor et al. (2020).

### 3.3 MARKET-TO-BOOK RATIO

The superstar firm hypothesis suggests that growth firms are more likely to be superstar firms. When partitioning the final sample of 210,740 firm-years from 1963-2019 into three terciles based on beginning market-to-book and comparing growth firms in the top tercile to value firms in the bottom tercile,[9] we find that non-super star firms are equally distributed across three terciles, while 56 percent of superstar firms are in the top tercile (i.e., growth firms), and only 13 percent of superstar firms are in the bottom tercile (i.e., value firms.)

Studies also acknowledge that growth firms, proxied by a high market-to-book ratio, present a lower earnings-returns relation because future growth opportunities are not entirely captured by the current year of earnings, especially after the requirement of expensing R&D activities (Collins and Kothari, 1989; Easton and Zmijewski, 1989; Lev, 1989; Lev and Zarowin, 1999).

[9] Beginning market-to-book is the market value of equity at the end of the prior fiscal year divided by the book value of equity from the prior fiscal year. Following Fama and French (1992), book equity is total assets (Compustat: AT) minus liabilities (LT), plus balance sheet deferred taxes and investment tax credit (TXDITC), minus preferred stock liquidating value (PSTKL), redemption value (PSTKRV), or carrying value (PSTK).

In the cross-sectional analysis based on Equation (1), the growth firms' average $R^2$ decreases monotonically from 0.06 during 1963-1980 to 0.01 during 2011-2019, and the value firms' average $R^2$ also declines from 0.11 during 1963-1980 to 0.05 during 1991-2019. The discrepancy between growth and value firms persists, and both groups of firms experience a decline in the cross-sectional earnings-returns relation. The $R^2$ of growth firms approaching zero is consistent with the superstar firm hypothesis and the lack of incorporating innovative activities in earnings (Lev, 1989; Lev and Zarowin, 1999).

We augment the aggregate time-series analysis in Equation (2) by replacing aggregate earnings with a tercile group's earnings. The growth firms' average signed $R^2$ increases from -0.04 during 1982-2000 to 0.02 during 2001-2019, and the value firms' average signed $R^2$ increases from -0.07 during 1982-2000 to 0.48 during 2001-2019. Consistent with prior evidence, value firms are more vulnerable to systematic risk than growth firms (Fama and French, 1995; Campbell and Vuolteenaho, 2004; Ball, Sadka, and Sadka, 2009; Campbell, Polk, and Vuolteenaho, 2010; Ellahie, Katz, and Richardson, 2020; Ball, Gerakos, Linnainmaa, and Nikolaev, 2020; Ball, Sadka, and Tseng, 2020). Moreover, we show that value firms' aggregate earnings have become more important than growth firms' aggregate earnings, presumably due to firm-specific innovative activities by growth firms.

We estimate the firm-level time-series regressions based on Equations (3)-(5) for the growth firm tercile and the value firm tercile separately. For growth firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.14 during 1982-2000 to 0.09 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.19 during 1982-2000 to 0.05 during 2001-2019 (see Figures P and Q). For value firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ increases from 0.20 during 1982-2000 to 0.21 during 2001-2019, and the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.11 during 1982-2000 to 0.08 during 2001-2019 (see Figures P and Q). These findings suggest that the decline in the firm-level earnings returns relation is more pronounced for growth firms. However, aggregate earnings have gained importance over time for both growth and value firms.

### 3.4 NEWLY LISTED FIRMS

Srivastava (2014) argues and presents evidence that newly listed firms present a lower earnings-returns relation than seasoned firms, in part due to the expensing of innovative activities. To investigate whether our results differ in listing cohorts, we partition the sample into two cohorts based on whether a firm is listed before or after 1980.

In the cross-sectional analysis based on Equation (1), the seasoned firms' average $R^2$ decreases from 0.08 during 1963-1980 to 0.05 during 1981-2019, and the newly listed firms' average $R^2$ declines from 0.04 during 1991-2010 to 0.03 during 2011-2019. Both cohorts of firms experience a decline in the cross-sectional earnings-returns relation.

We augment the aggregate time-series analysis in Equation (2) by replacing aggregate earnings with a listing cohort's earnings, measured as the sum of all cohort firms' year t's change, divided by the sum of all cohort firms' beginning market capitalization. The seasoned firms' average signed $R^2$ increases from -0.08 during 1982-2000 to 0.25 during 2001-2019, and the newly listed firms' average signed $R^2$ increases from 0.08 during 2000-2010 to 0.42 during 2011-2019. Both cohorts of firms experience an increase in the aggregate earnings-returns relation.

We estimate the firm-level time-series regressions based on Equations (3)-(5) for the seasoned firms and the newly listed firms separately. For seasoned firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.13 during 1982-2000 to 0.11 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.13 during 1982-2000 to 0.08 during 2001-2019. For newly listed firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ remains at 0.11 during the sample period from 2000-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.01 during 2000-2010 to 0.12 during 2011-2019. Due to the limited time-series data available for newly listed firms, the time-series analysis for newly listed firms includes only recent years from 2000-2019. The median incremental $R^2$ of newly listed firms' earnings does not decline over the past few years from 2002-2019, consistent with the stable trend reported in Figure D and Table 5, when examining the full sample.

Overall, the declining importance of firm-level earnings is more pronounced for seasoned firms because newly listed firms have only limited time-series data from recent years. Nevertheless, aggregate earnings have become more important for both cohorts of firms.

### 3.5 NEW ECONOMY INDUSTRIES

Dichev and Tang (2008) and Barth, Li, and McClure (2019) argue that new economy industries attribute to the changing earnings-returns relation. To assess whether our results differ between declining and rising industries, we partition 187 MSCI's Global Industry Classification Standard ten-digit industries into three terciles based on the change in the ratio of an industry's member firms to the total number of listed firms during the sample period from 1963-2019 and compare the rising industry firms in the top tercile to the declining industry firms in the bottom tercile. The top three declining industries are electronic utilities (GICS: 55101010), packaged foods and meats (GICS: 30202030), and aerospace and defense (GICS: 20101010). The top three rising industries are regional banks (GICS: 40101015), biotechnology (GICS: 35201010), and application software (GICS: 45103010).

In the cross-sectional analysis based on Equation (1), the declining industry firms' average $R^2$ decreases from 0.10 during 1963-1980 to 0.05 during 1981-2019, and the rising industry firms' average $R^2$ declines from 0.08 during 1963-1980 to 0.04 during 1981-2000, and further declines to 0.03 during 2001-2019. Firms in both types of industries experience a decline in the cross-sectional earnings-returns relation, although declining industry firms have a higher earnings-returns relation than rising industry firms, in part due to differential growth opportunities.

We augment the aggregate time-series analysis in Equation (2) by replacing aggregate earnings with a tercile's earnings, measured as the sum of all tercile firms' year t's earnings change, divided by the sum of all tercile firms' beginning market capitalization. The declining industry firms' average signed $R^2$ increases from -0.08 during 1982-2000 to 0.29 during 2001-2019, and the rising industry firms' average signed $R^2$ increases from -0.03 during 1982-2000 to 0.21 during 2001-2019. Firms in both industries experience an increase in the aggregate earnings-returns relation, and firms in the declining industries seem to be more vulnerable to systematic risk.

We estimate the firm-level time-series regressions based on Equations (3)-(5) for firms in the declining industries and firms in the rising industries separately. For declining industry firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.13 during 1982-2000 to 0.12 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.14 during 1982-2000 to 0.06 during 2001-2019. For rising industry firms, the median incremental $R^2$ of firm-level earnings $\Delta X_{i,t}$ decreases from 0.12 during 1982-2000 to 0.10 during 2001-2019, while the median incremental $R^2$ of aggregate earnings $\Delta X_t$ increases from -0.12 during 1982-2000 to 0.07 during 2001-2019. Firms in both industries experience a similar trend.

Overall, we obtain very similar results between firms in the declining industries and firms in the rising industries, suggesting that our results are less influenced by the changing composition of industries over time. This finding is consistent with the within-industry reallocation, rather than a cross-industry shift, documented in Autor et al. (2020).

## *4. Conclusion and Implications for Future Research*

This paper documents that the overall relation between earnings and returns has remained stable over time. However, the nature of the relation has changed. Specifically, we find that while the cross-sectional relation between firm-level returns and firm-level earnings has declined, the time-series relation between firm-level returns and aggregate earnings has increased over time. Consistently, the serial correlation of firm-level earnings has declined over time, while the relation between firm-level earnings and the previous year's aggregate earnings has strengthened. These findings suggest the increased importance of aggregate earnings in assessing firm values.

Our paper highlights the importance of understanding the systematic component of earnings (e.g., Brown and Ball, 1967; Ball, Sadka, and Sadka. 2009; Ellahie, 2020; Ball, Sadka, and Tseng, 2020). Given the importance of aggregate earnings in firm valuation, a better understanding of the macroeconomic forces driving aggregate shocks warrants future research. Our study also sheds light on the importance of examining earnings properties in both the time-series and the cross-section. One example is the reversal of accruals. Over the life of a firm, the sum of cash flows and the sum of earnings are the same and the sum of accruals is zero, suggesting that accruals reverse over time. This reversal characteristic of accruals is a firm-level time-series property. Yet, most studies on the topic employ cross-sectional regressions to examine accrual reversals. Our study highlights the importance of distinguishing between time-series and cross-sectional properties and the importance of evaluating both firm-level and aggregate earnings properties.

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## FIGURE A

## Cross-Sectional Earnings-Returns Relation

This figure presents the $R^2$ estimated from the annual cross-sectional regression: $RET_{i.t} = \beta_{0,t} + \beta_{1,t}\Delta X_{i.t} + \varepsilon_{i,t}$. We run a cross-sectional regression for each year t. $\Delta X_{i,t}$ is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization (CRSP: PRC×SHROUT). $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. For example, a firm's fiscal year ends in December. Its annual return for the year 2000 is the twelve-month cumulative return from April 2000 to March 2001 because most firms announce earnings within three months after the fiscal year end. Firm stock returns are adjusted for delisted returns based on the estimates from Shumway (1997). Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 210,740 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) from 1963-2019.

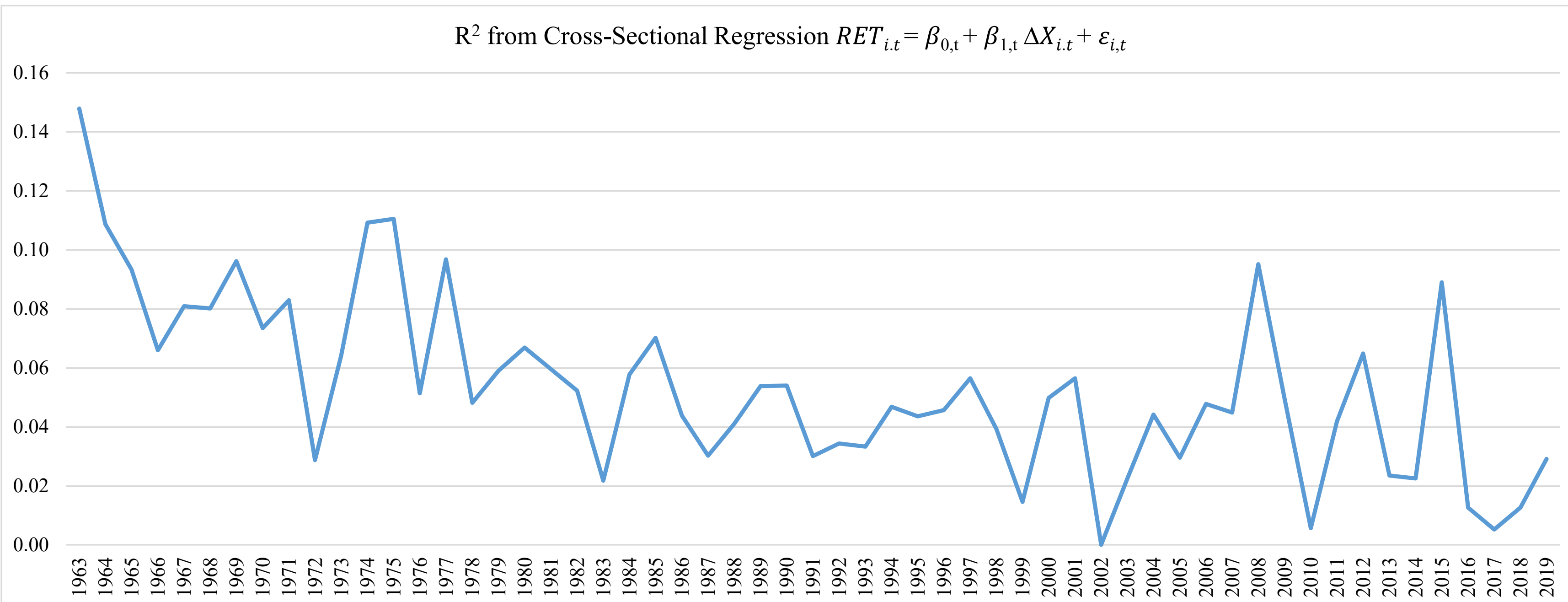
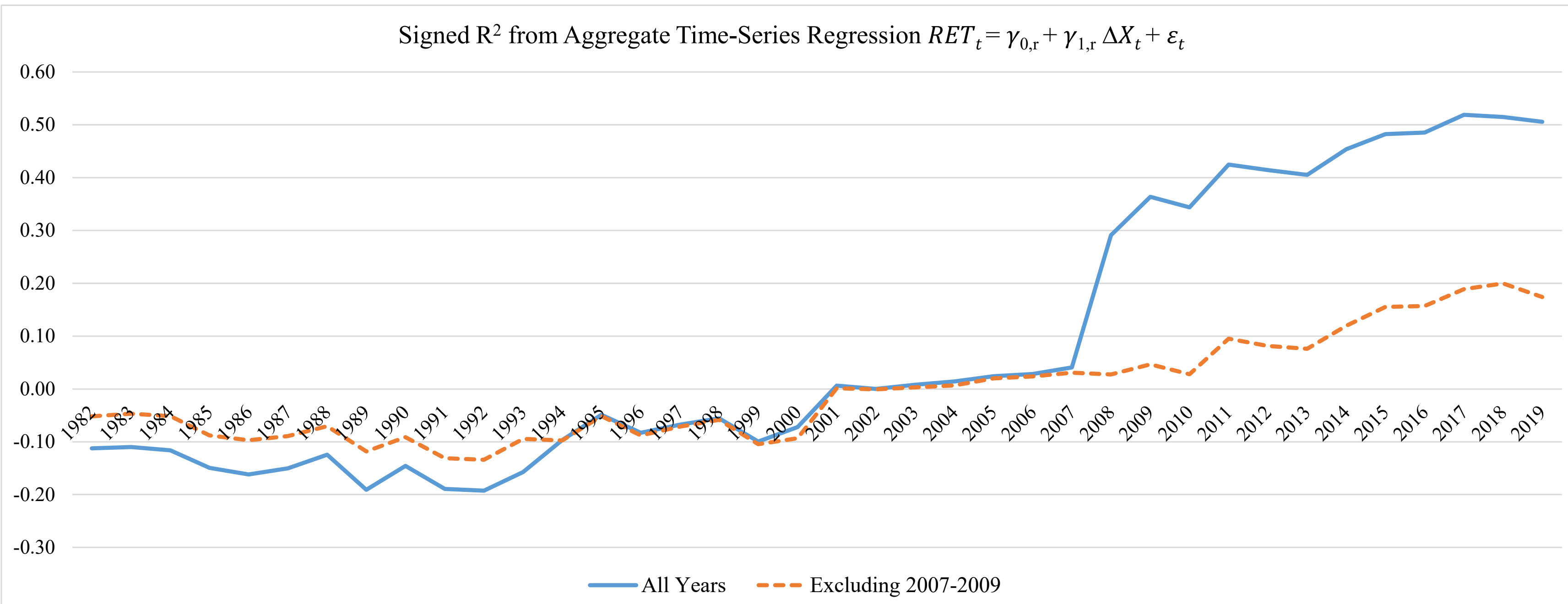


**FIGURE B**

**Aggregate Earnings-Returns Relation**

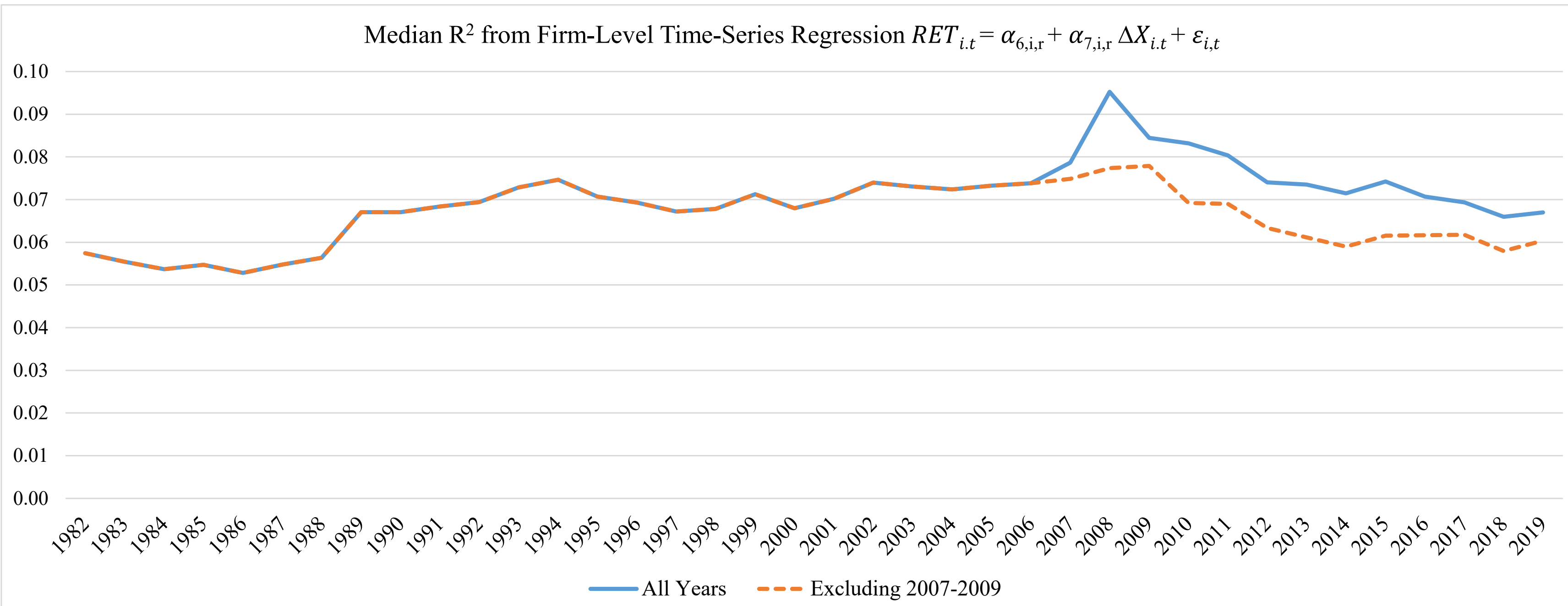
This figure presents the signed $R^2$ estimated from the aggregate time-series regression: $RET_t = \gamma_{0,r} + \gamma_{1,r}\Delta X_t + \varepsilon_{i,t}$. We run a time-series regression for each 20-year rolling window r and rolls over the window every year. Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. Aggregate return for year t ($RET_t$) is CRSP value-weighted stock return, including dividends. The sample comprises 210,740 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) from 1963-2019. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. Signed $R^2$ is the product of $R^2$ and the sign of the coefficient on $\Delta X_t$. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).



## FIGURE C

### Firm-Level Time-Series Earnings-Returns Relation

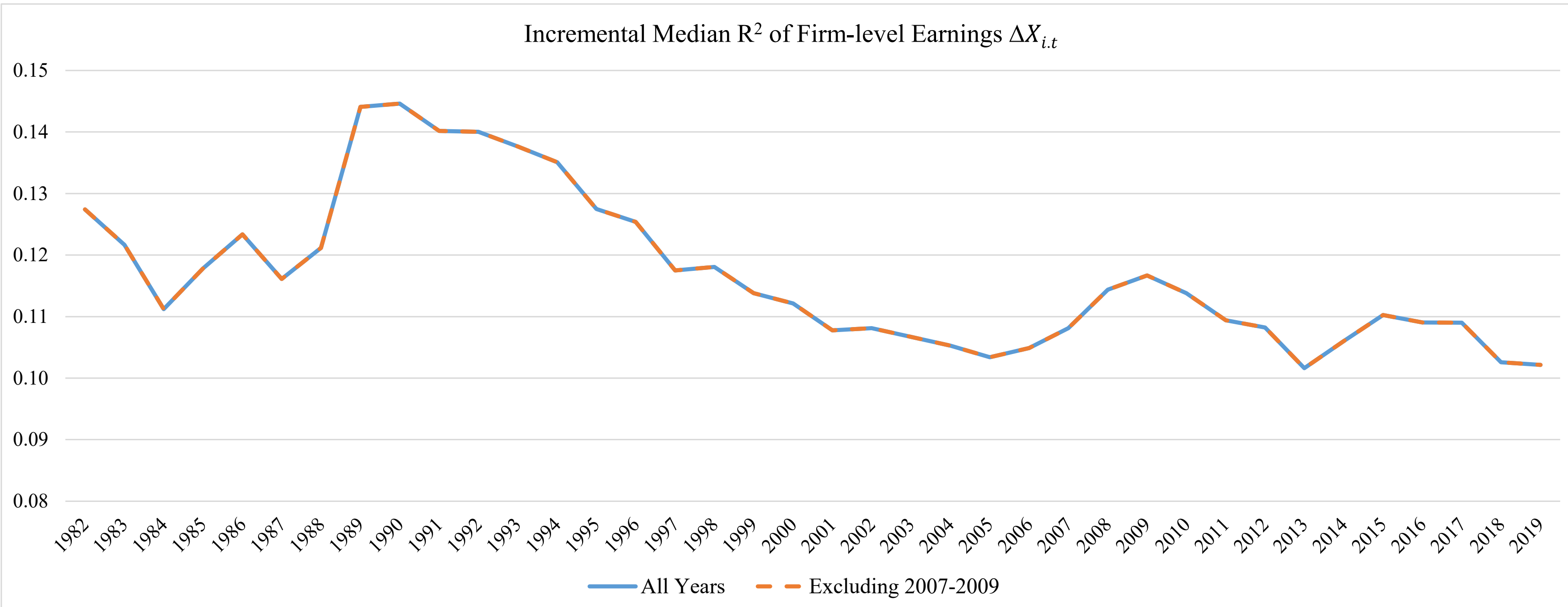
This figure presents the median value of $R^2$ estimated from the firm-level time-series regression with a 20-year window that rolls over every year: $RET_{i.t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i.t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization (CRSP: PRC×SHROUT). $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. For example, a firm's fiscal year ends in December. Its annual return for the year 2000 is the twelve-month cumulative return from April 2000 to March 2001 because most firms announce earnings within three months after the fiscal year end. Firm stock returns are adjusted for delisted returns based on the estimates from Shumway (1997). Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each 20-year rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).



## FIGURE D

### Incremental $R^2$ of Firm-Level Earnings $\Delta X_{i.t}$

This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year. Incremental $R^2$ of firm-level earnings $\Delta X_{i.t}$ is Model (1) $R^2$ minus Model (2) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_{i.t}$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (2): $RET_{i.t} = \alpha_{4,i,r} + \alpha_{5,i,r}\Delta X_t + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).



## FIGURE E

### Incremental $R^2$ of Aggregate Earnings $\Delta X_t$

This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year. Incremental $R^2$ of aggregate earnings $\Delta X_t$ is Model (1) $R^2$ minus Model (3) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_t$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (3): $RET_{i.t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i.t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).

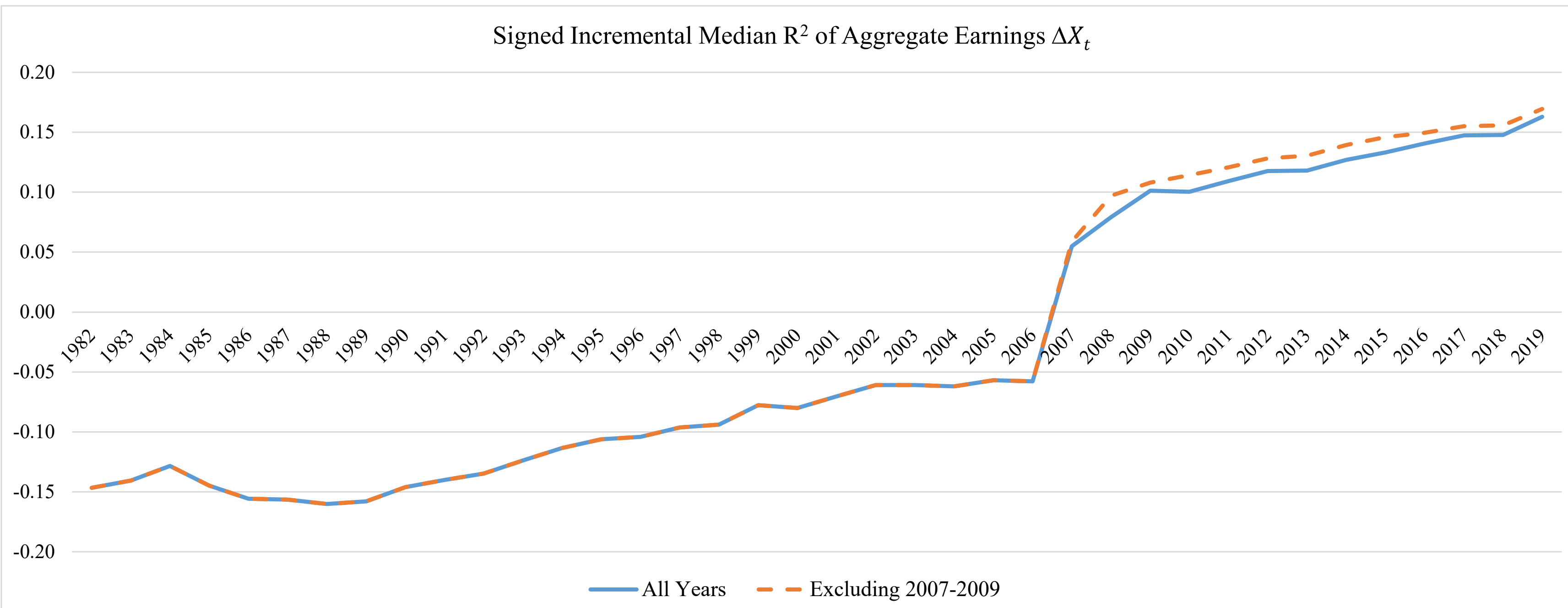


**FIGURE F**

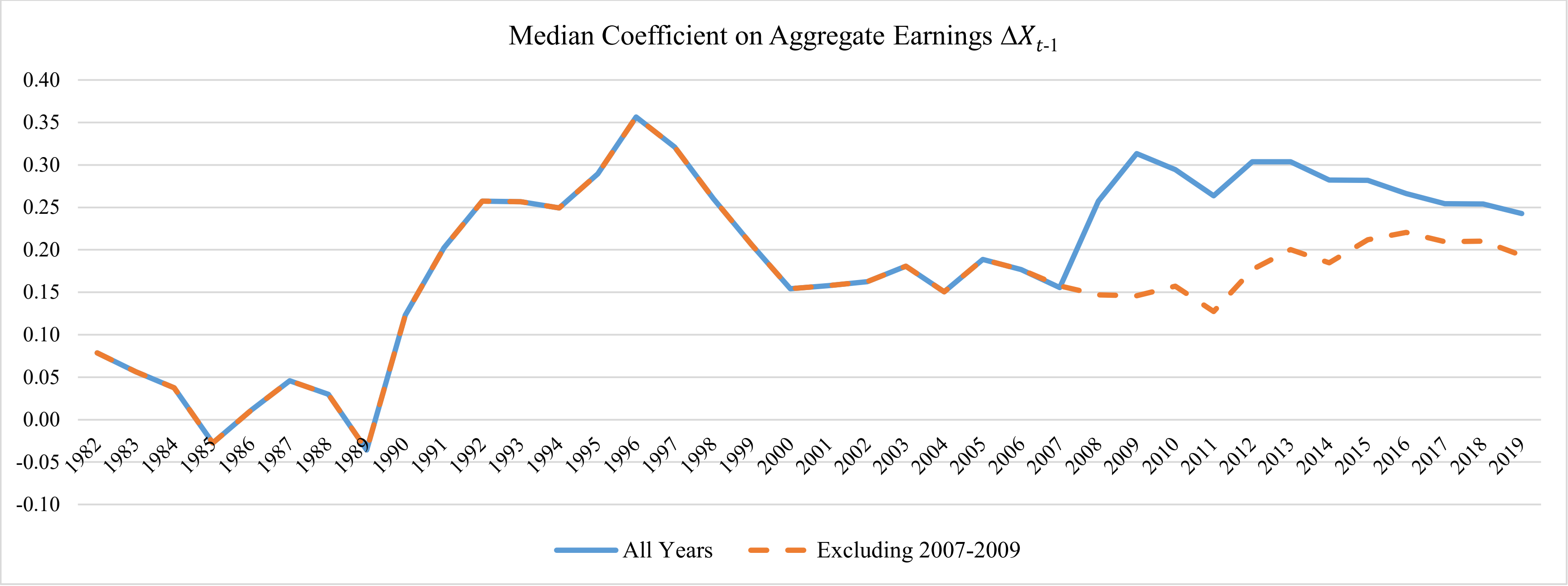
**Firm-Level Earnings Persistence**

This figure presents the median value of the coefficient on $\Delta X_{i,t-1}$ estimated from firm-level time-series regressions with a 20-year window that rolls over every year: $\Delta X_{i,t} = \delta_{0,i,r} + \delta_{1,i,r}\Delta X_{i,t-1} + \delta_{2,i,r}\Delta X_{t-1} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ ($\Delta X_{i,t-1}$) is firm i's year t's (t-1's) annual earnings change, deflated by beginning market capitalization. Aggregate earnings change for year t-1 ($\Delta X_{t-1}$) is the sum of all sample firms' year t-1's annual earnings before extraordinary items minus the sum of all sample firms' year t-2's annual earnings before extraordinary items, divided by the sum of all sample firms' year t-1's beginning market capitalization. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).

## FIGURE G

### Firm-Level Earnings and the Previous Year's Aggregate Earnings

This figure presents the median value of the coefficient on $\Delta X_{t-1}$ estimated from firm-level time-series regressions with a 20-year window that rolls over every year: $\Delta X_{i,t} = \delta_{0,i,r} + \delta_{1,i,r}\Delta X_{i,t-1} + \delta_{2,i,r}\Delta X_{t-1} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ ($\Delta X_{i,t-1}$) is firm i's year t's (t-1's) annual earnings change, deflated by beginning market capitalization. Aggregate earnings change for year t-1 ($\Delta X_{t-1}$) is the sum of all sample firms' year t-1's annual earnings before extraordinary items minus the sum of all sample firms' year t-2's annual earnings before extraordinary items, divided by the sum of all sample firms' year t-1's beginning market capitalization. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).



## FIGURE H

**Predictability of Firm-Level Earnings**

This figure presents the median value of the incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year. Incremental $R^2$ of firm-level earnings $\Delta X_{i.t}$ is Model (1) $R^2$ minus Model (2) $R^2$. Model (1): $RET_{i,t-1} = \varphi_{1,i,r} + \varphi_{2,i,r}\Delta X_{i,t} + \varphi_{3,i,r}\Delta X_t + \varepsilon_{i,t-1}$. Model (2): $RET_{i.t-1} = \varphi_{4,i,r} + \varphi_{5,i,r}\Delta X_t + \varepsilon_{i,t-1}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t-1}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-2's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,356 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).

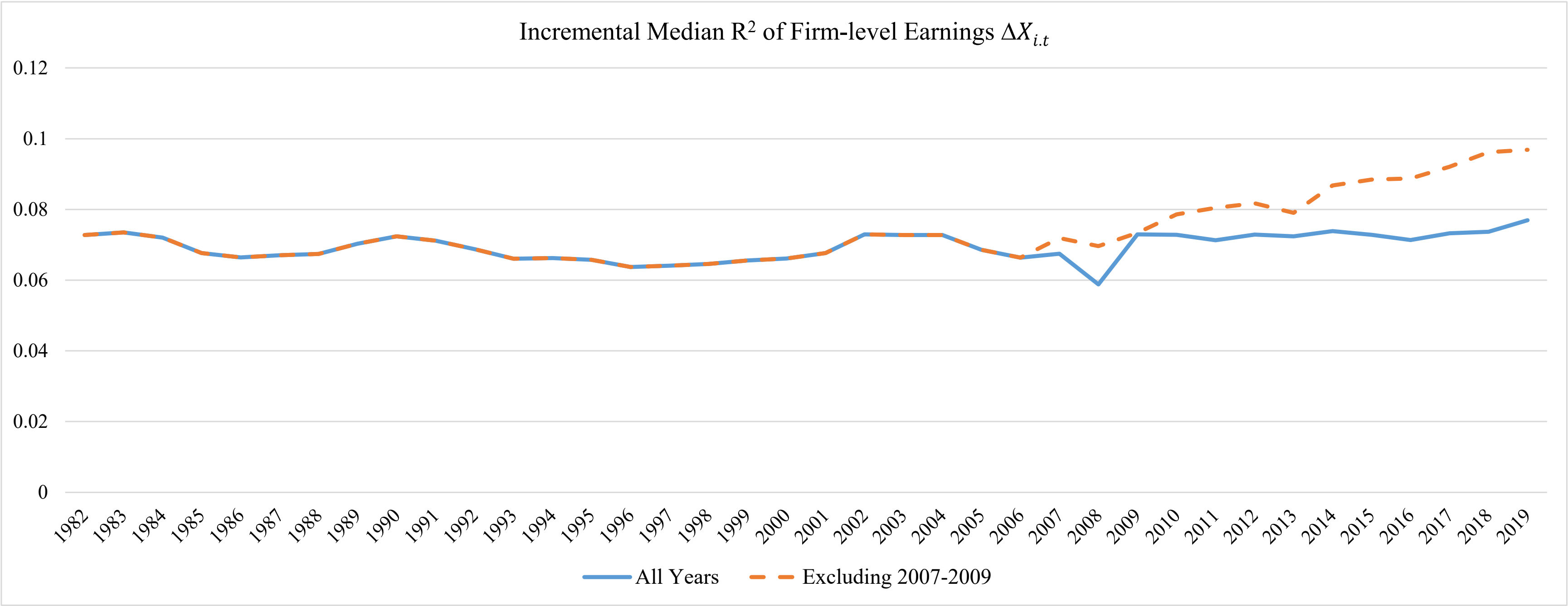


**FIGURE I**

**Predictability of Aggregate Earnings**

This figure presents the median value of the incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year. Incremental $R^2$ of aggregate earnings $\Delta X_t$ is Model (1) $R^2$ minus Model (3) $R^2$. Model (1): $RET_{i,t-1} = \varphi_{1,i,r} + \varphi_{2,i,r}\Delta X_{i,t} + \varphi_{3,i,r}\Delta X_t + \varepsilon_{i,t-1}$Model (3): $RET_{i,t-1} = \varphi_{4,i,r} + \varphi_{5,i,r}\Delta X_{i,t} + \varepsilon_{i,t-1}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t-1}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-2's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,356 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982. The solid line represents results based on all years of the data. The dotted line represents results based on a sample that excludes the years from 2007-2009 (financial crisis).

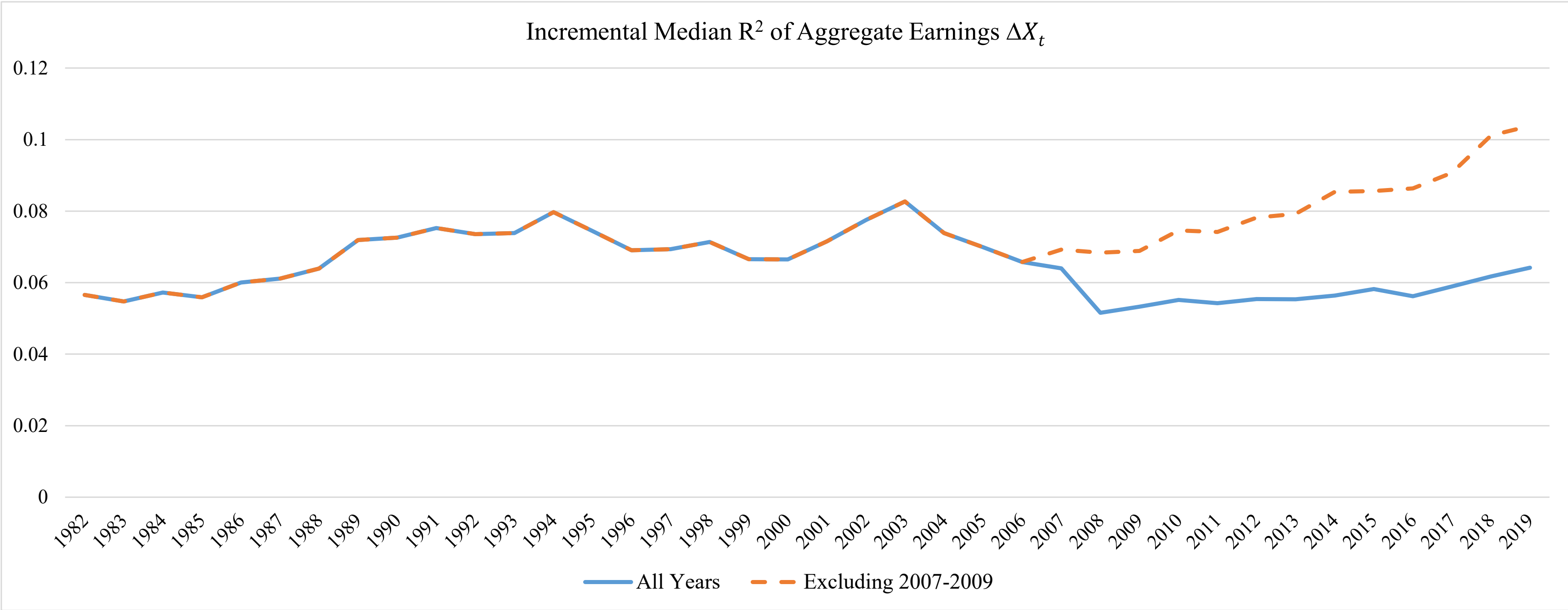
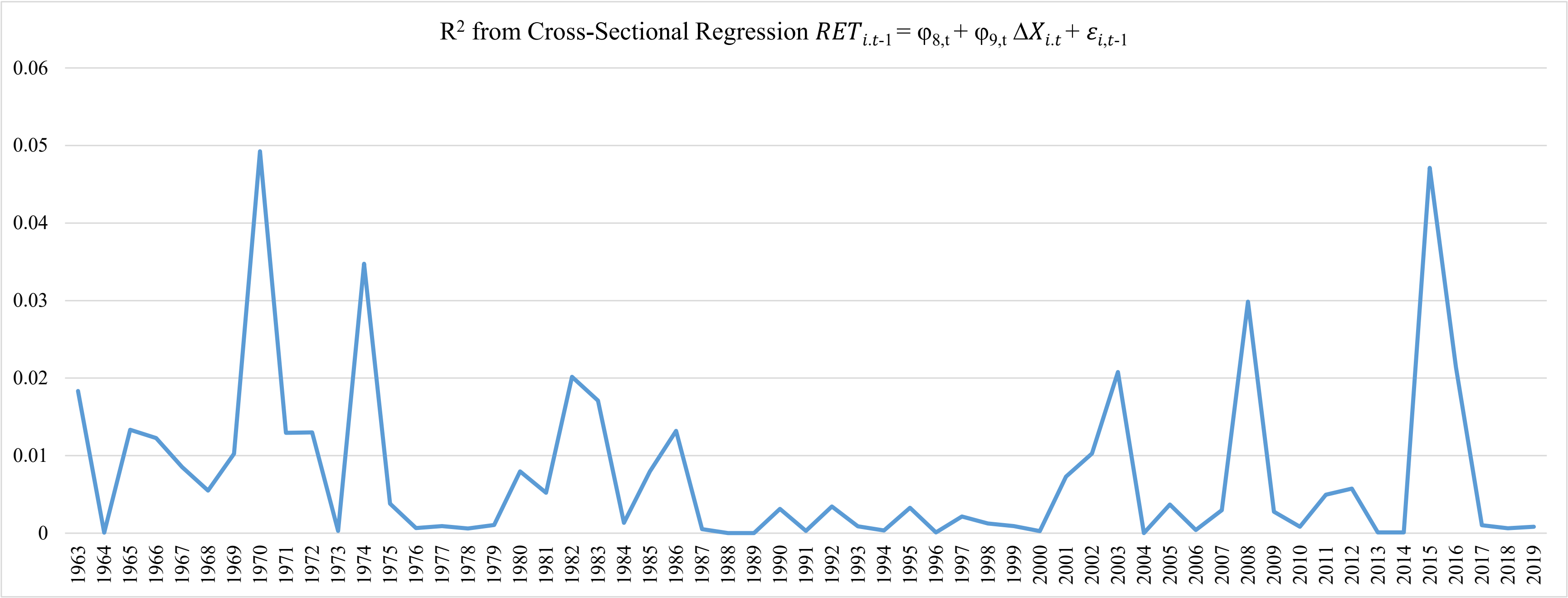


**FIGURE J**

**Cross-Sectional Earnings-Returns Relation**

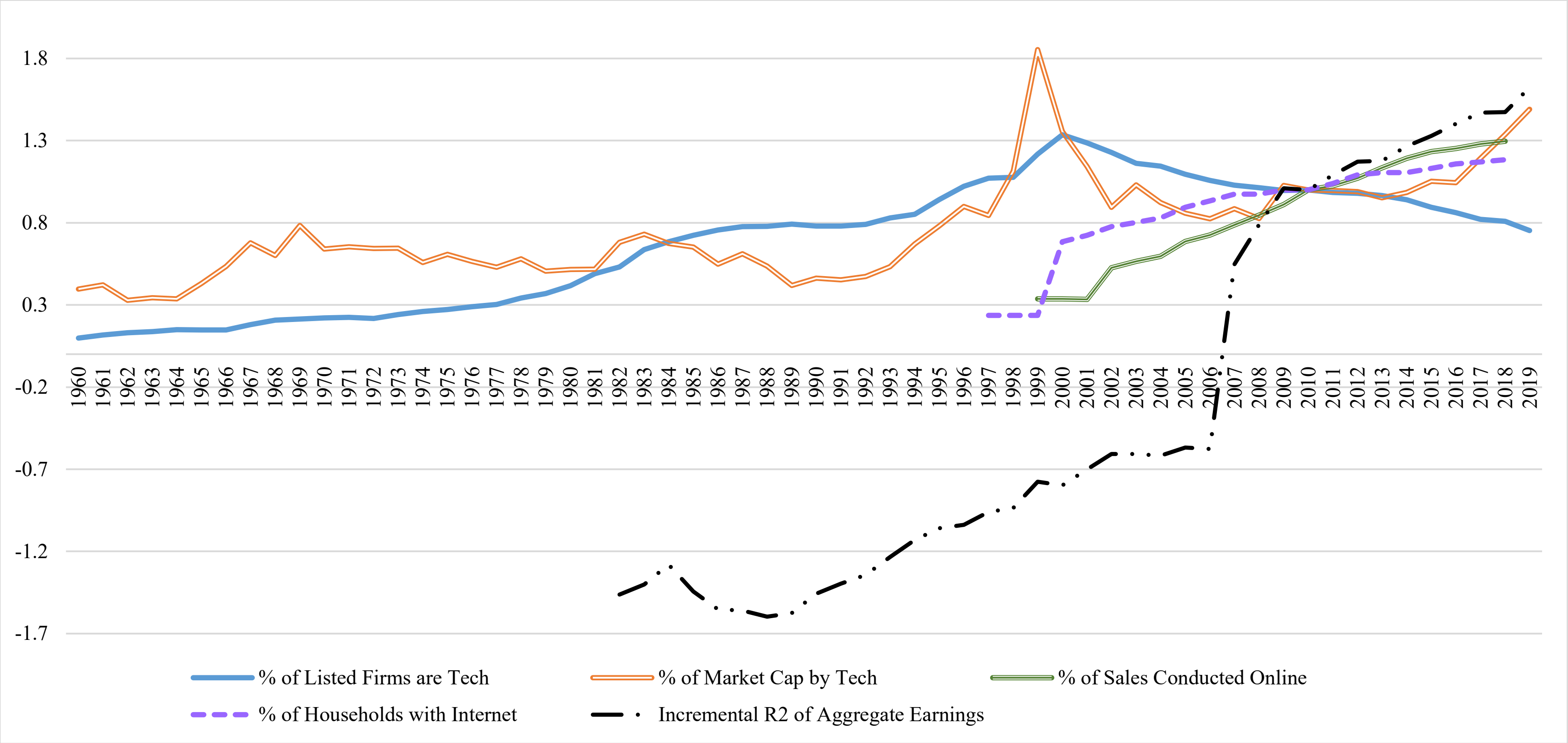
This figure presents the $R^2$ estimated from the annual cross-sectional regression: $RET_{i,t-1} = \varphi_{8,t} + \varphi_{9,t}\Delta X_{i,t} + \varepsilon_{i,t-1}$. We run a cross-sectional aregression for each year t. $\Delta X_{i,t}$ is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization (CRSP: PRC×SHROUT). $RET_{i,t-1}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-2's end. For example, a firm's fiscal year ends in December. Its annual return for the year 2000 is the twelve-month cumulative return from April 2000 to March 2001 because most firms announce earnings within three months after the fiscal year end. Firm stock returns are adjusted for delisted returns based on the estimates from Shumway (1997). Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 210,740 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) from 1963-2019.



# FIGURE K

## The Rising Importance of Internet and Aggregate Earnings

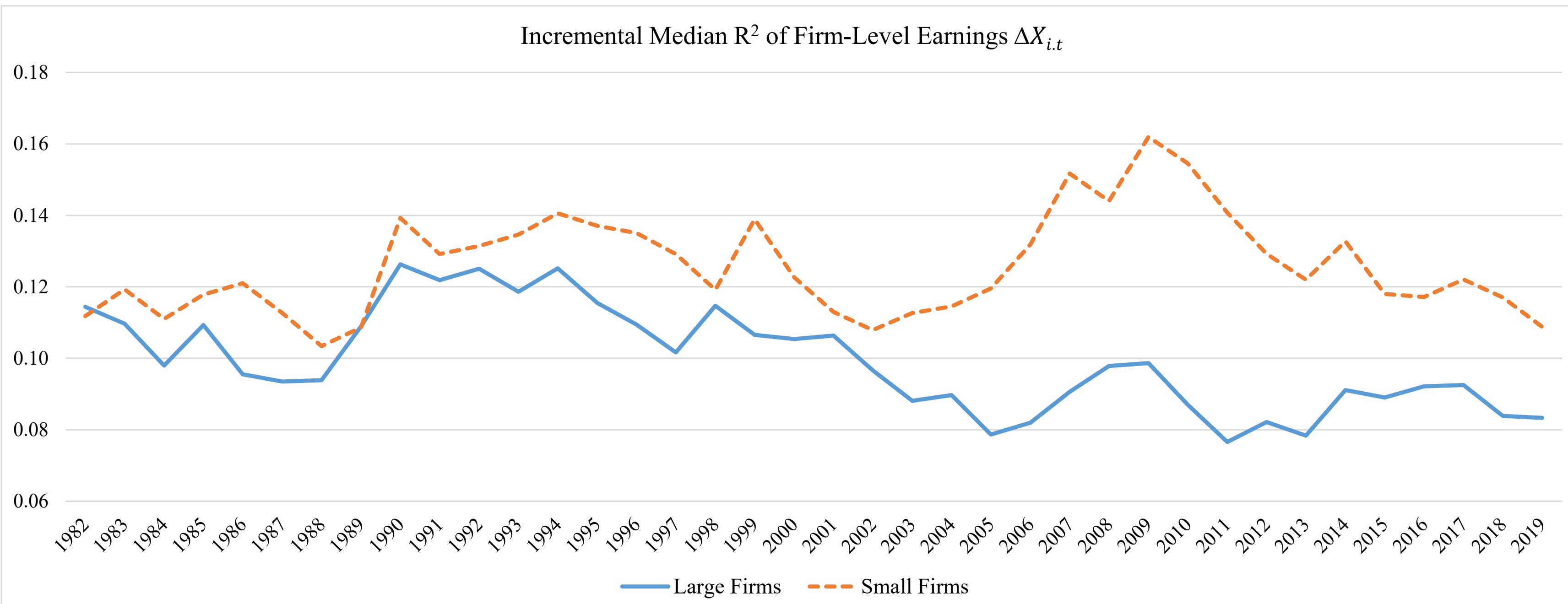
This figure presents the rising influence of technology. We use S&P MSCI's Global Industry Classification Standard 45 Information Technology and 502030 Interactive Media & Services (i.e., social media) to identify technology firms. The number of AMEX, NYSE, and NASDAQ listed firms and their market capitalization are from CRSP. The percentage of sales conducted online comes from Census E-Commerce Statistics for manufacturers (NAICS 31-33), wholesalers (NAICS 42), and retailers (NAICS 44-45). The percentage of households with internet access comes from the Census 1997 survey and the Pew Research Center post-2000 annual survey. Incremental $R^2$ of aggregate earnings is the median value of the signed incremental $R^2$ from firm-level time-series regressions that roll over every 20 years and the year in the y-axis indicates the end of a rolling window (see Figure E). We use 2010 as the benchmark year to create indices for all time-series.



## FIGURE L

### Large and Small Firms' Incremental $R^2$ of Firm-Level Earnings $\Delta X_{i.t}$

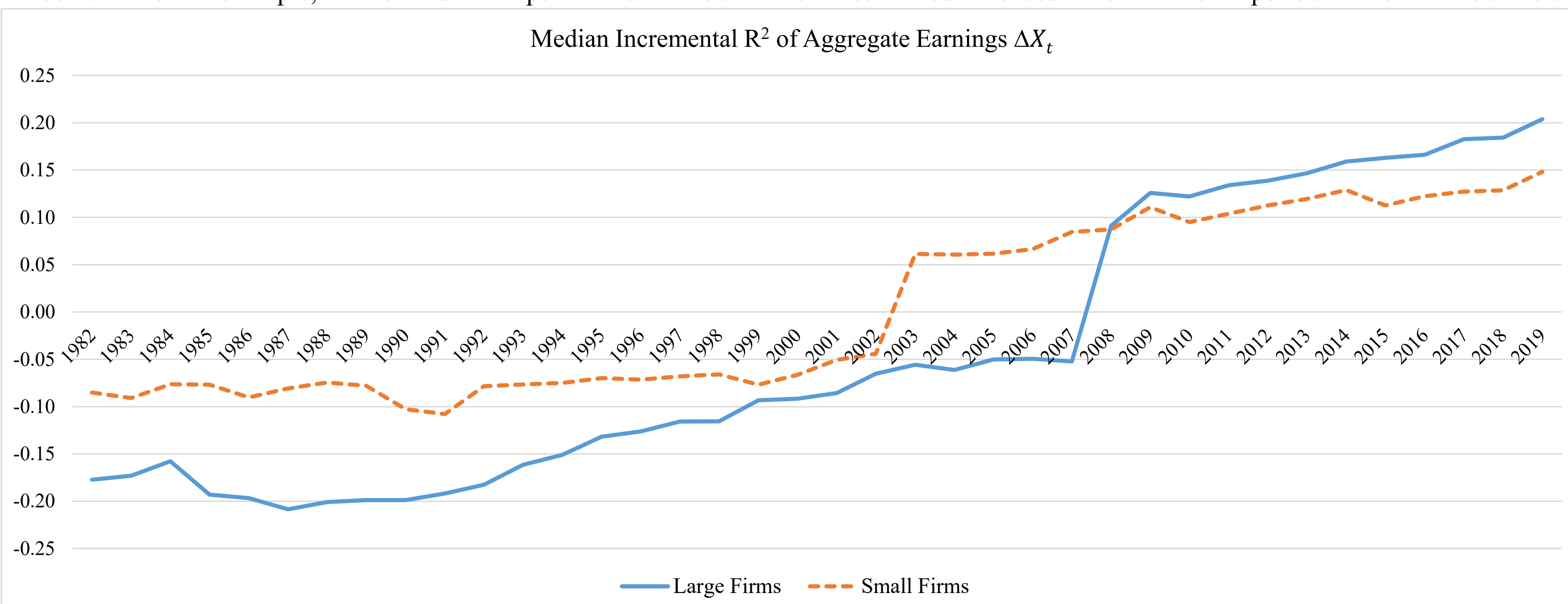
This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for large and small firms. We partition the sample into three terciles based on beginning market capitalization and compare large firms in the top tercile to small firms in the bottom tercile. Incremental $R^2$ of firm-level earnings $\Delta X_{i.t}$ is Model (1) $R^2$ minus Model (2) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_{i.t}$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (2): $RET_{i.t} = \alpha_{4,i,r} + \alpha_{5,i,r}\Delta X_t + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982.



## FIGURE M

### Large and Small Firms' Incremental $R^2$ of Aggregate Earnings $\Delta X_t$

This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for large and small firms. We partition the sample into three terciles based on beginning market capitalization and compare large firms in the top tercile to small firms in the bottom tercile. Incremental $R^2$ of aggregate earnings $\Delta X_t$ is Model (1) $R^2$ minus Model (3) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_t$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (3): $RET_{i.t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i.t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982.



## FIGURE N

## Incremental $R^2$ of Superstar Earnings $\Delta SSX_{i.t}$

This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for non-superstar firms. Superstar firms are the largest 100 firms based on beginning market capitalization in each year. We exclude superstar firms from the sample and further exclude financial institutions in the excluding 2007-2009 analysis. Incremental $R^2$ of superstar earnings $\Delta SSX_t$ is Model (1) $R^2$ minus Model (2) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_t$ coefficient in Model (1). Model (1): $RET_{i,t} = \theta_{1,i,r} + \theta_{2,i,r}\Delta X_{i,t} + \theta_{3,i,r}\Delta SSX_t + \varepsilon_{i,t-1}$. Model (2): $RET_{i,t} = \theta_{4,i,r} + \theta_{5,i,r}\Delta X_{i,t} + \varepsilon_{i,t-1}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta SSX_t$ is superstar firms' earnings change, measured as the sum of all superstar firms' year t's annual earnings before extraordinary items minus the sum of all superstar firms' year t-1's annual earnings before extraordinary items, divided by the sum of all superstar firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window.

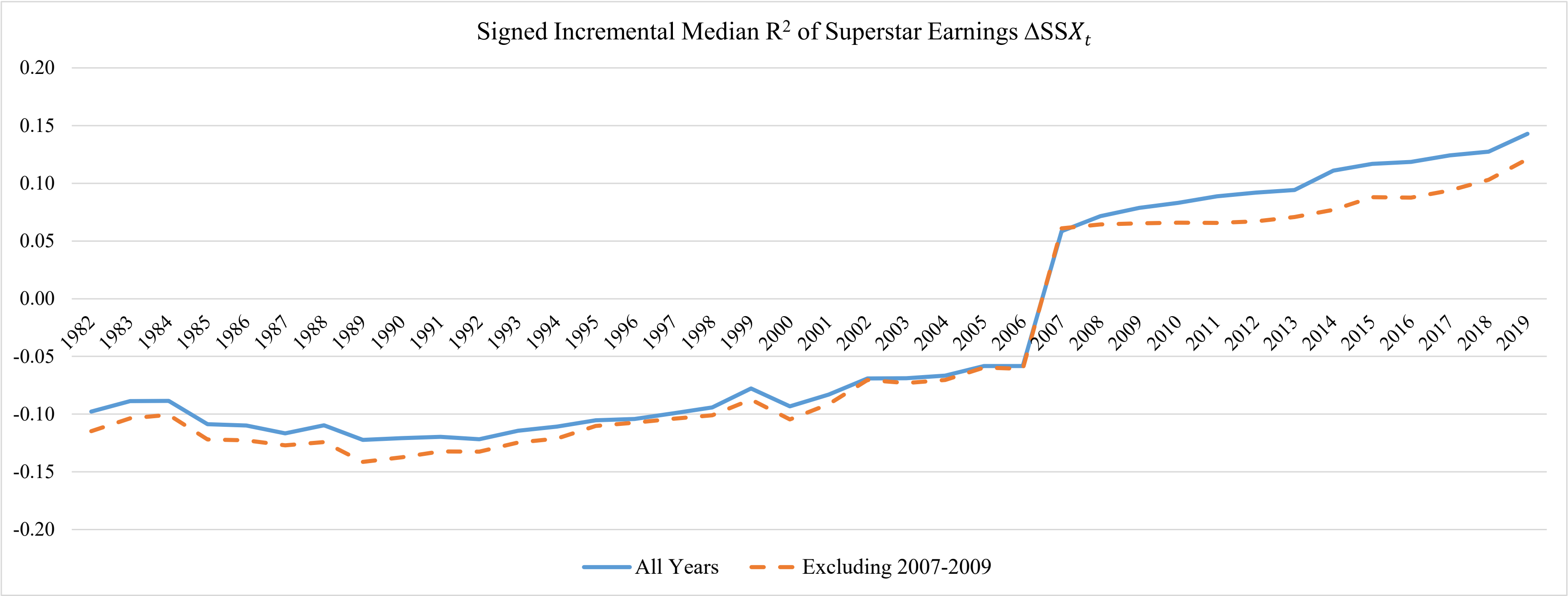
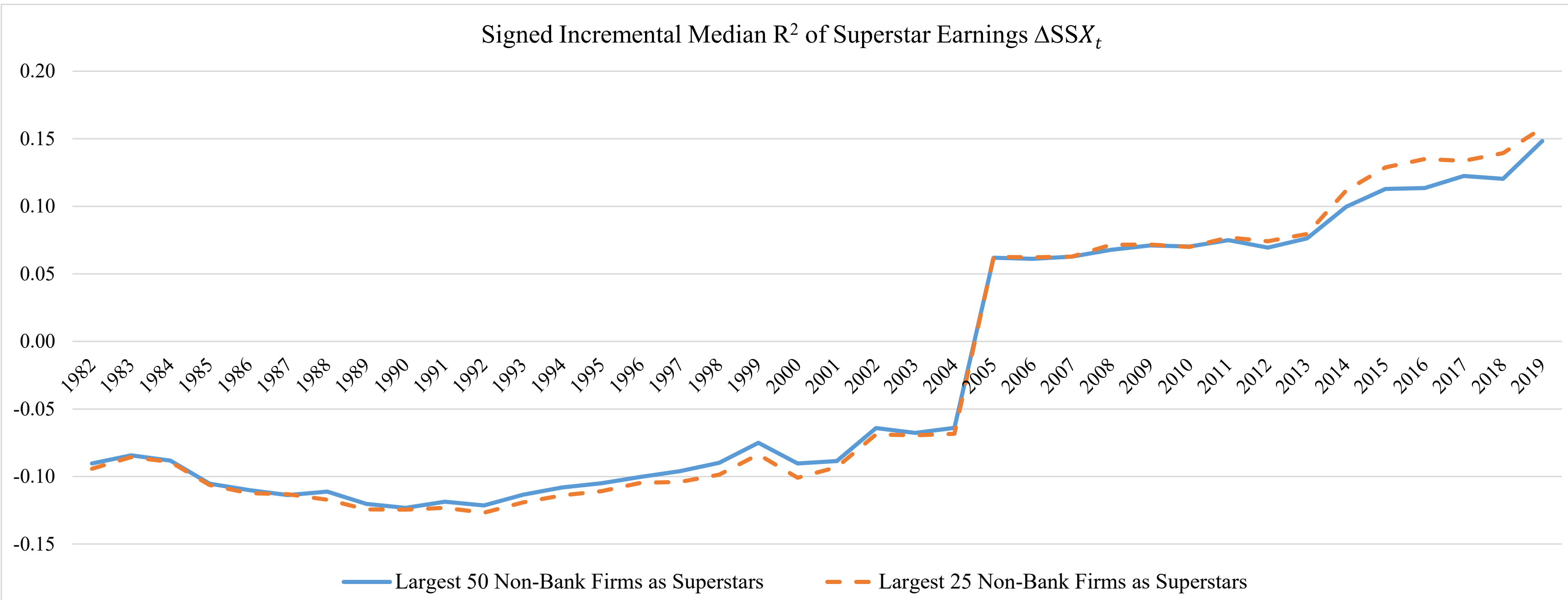


**FIGURE O**

**Incremental $R^2$ of Superstar Earnings $\Delta SSX_{i,t}$ – Alternative Scopes of Superstar Firms**

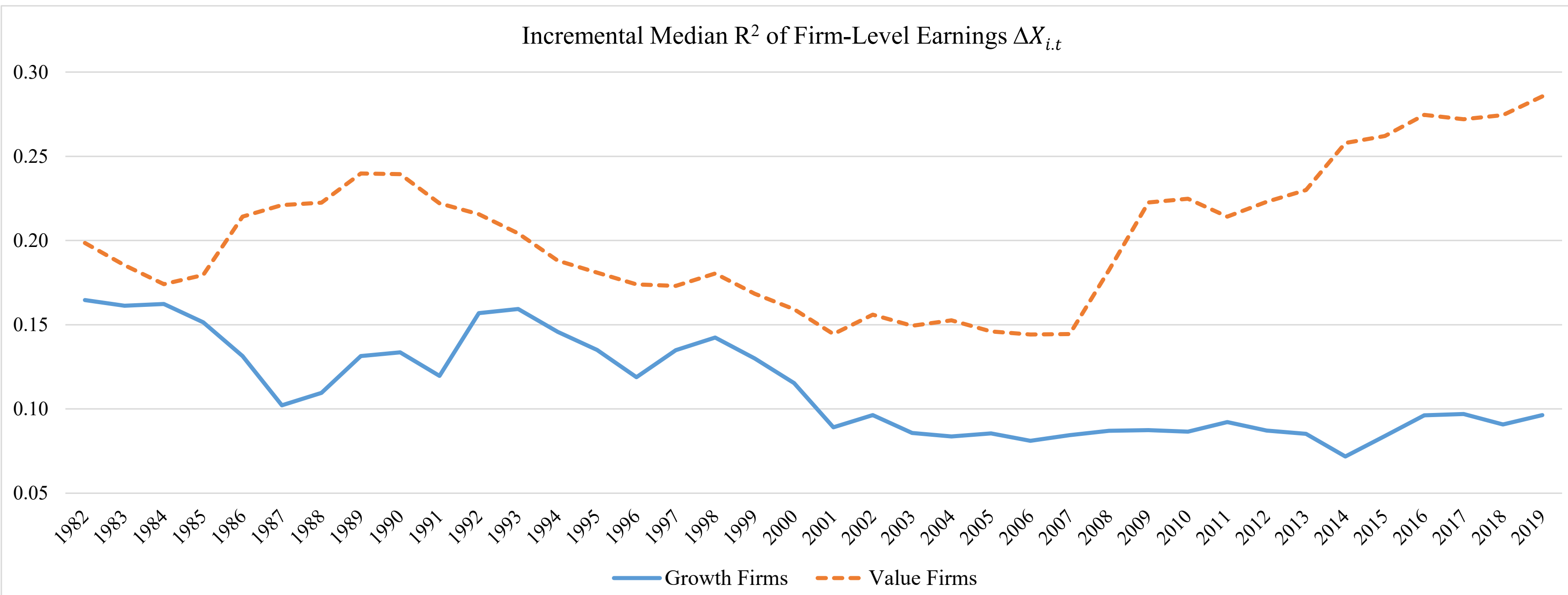
This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for non-superstar firms. Superstar firms are the largest 50 or 25 firms based on beginning market capitalization in each year. We exclude superstar firms from the sample and further exclude financial institutions in the excluding 2007-2009 analysis. Incremental $R^2$ of superstar earnings $\Delta SSX_t$ is Model (1) $R^2$ minus Model (2) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_t$ coefficient in Model (1). Model (1): $RET_{i,t} = \theta_{1,i,r} + \theta_{2,i,r}\Delta X_{i,t} + \theta_{3,i,r}\Delta SSX_t + \varepsilon_{i,t-1}$. Model (2): $RET_{i,t} = \theta_{4,i,r} + \theta_{5,i,r}\Delta X_{i,t} + \varepsilon_{i,t-1}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta SSX_t$ is superstar firms' earnings change, measured as the sum of all superstar firms' year t's annual earnings before extraordinary items minus the sum of all superstar firms' year t-1's annual earnings before extraordinary items, divided by the sum of all superstar firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window.



## FIGURE P

### Growth and Value Firms' Incremental $R^2$ of Firm-Level Earnings $\Delta X_{i.t}$

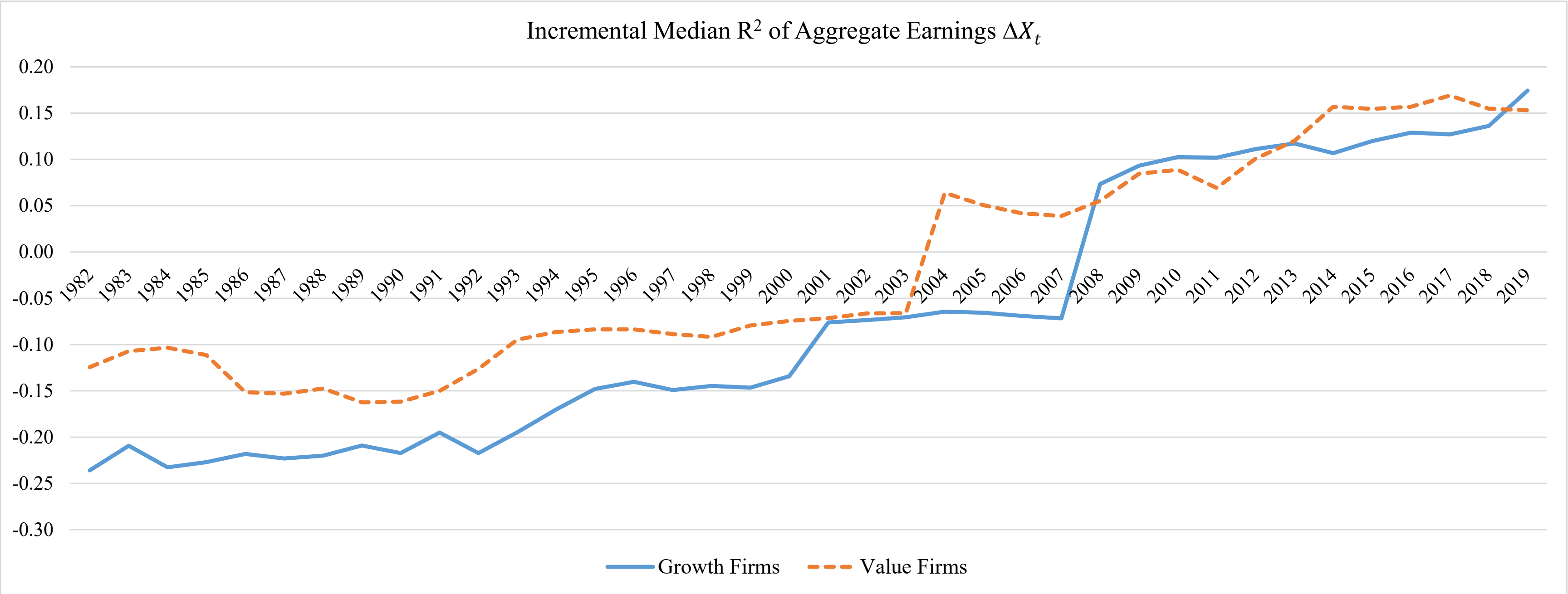
This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for growth and value firms. We partition the sample into three terciles based on beginning market-to-book and compare growth firms in the top tercile to value firms in the bottom tercile. Incremental $R^2$ of firm-level earnings $\Delta X_{i.t}$ is Model (1) $R^2$ minus Model (2) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_{i.t}$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (2): $RET_{i.t} = \alpha_{4,i,r} + \alpha_{5,i,r}\Delta X_t + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each of rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982.



## FIGURE Q

### Growth and Value Firms' Incremental R² of Aggregate Earnings $\Delta X_t$

This figure presents the median value of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year for growth and value firms. We partition the sample into three terciles based on beginning market-to-book and compare growth firms in the top tercile to value firms in the bottom tercile. Incremental $R^2$ of aggregate earnings $\Delta X_t$ is Model (1) $R^2$ minus Model (3) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the $\Delta X_t$ coefficient in Model (1). Model (1): $RET_{i.t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i.t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (3): $RET_{i.t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i.t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change, measured as the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. The sample comprises 130,924 U.S. firms with listed common equity securities (CRSP share code: 10 or 11) and at least 15 years of data in each rolling window. Year in the y-axis indicates the ending year of a rolling window. For example, the data point of 1982 is estimated based on the period from 1963-1982.



## TABLE 1

## Summary Statistics of Variable Distributions

This table presents descriptive statistics of the variables used in the analysis. $\Delta X_{i,t}$ is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization (CRSP: PRC×SHROUT). $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. For example, a firm's fiscal year ends in December. Its annual return for the year 2000 is the twelve-month cumulative return from April 2000 to March 2001 because most firms announce earnings within three months after the fiscal year end. Firm stock returns are adjusted for delisted returns based on the estimates from Shumway (1997). Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. Aggregate return for year t ($RET_t$) is CRSP value-weighted stock return, including dividends (CRSP: VWRETD). The sample of Panel A comprises U.S. firms with listed common equity securities (CRSP share code: 10 or 11) from 1963-2019. The sample of Panel B further requires at least 15 years of earnings change and return data used in the firm-level time-series regression analysis.

**Panel A Full sample of 210,740 firm-years from 1963-2019**

| | Mean | $25^{th}$ | Median | $75^{th}$ | Std Dev |
|---|---|---|---|---|---|
| $\Delta X_{i,t}$ | -0.02 | -0.03 | 0.01 | 0.03 | 0.44 |
| $RET_{i,t}$ | 0.16 | -0.21 | 0.06 | 0.37 | 0.69 |
| $\Delta X_t$ | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 |
| $RET_t$ | 0.12 | 0.02 | 0.13 | 0.22 | 0.18 |

**Panel B Reduced sample of 130,924 firm-years from 1963-2019**

| | Mean | $25^{th}$ | Median | $75^{th}$ | Std Dev |
|---|---|---|---|---|---|
| $\Delta X_{i,t}$ | -0.01 | -0.02 | 0.01 | 0.03 | 0.33 |
| $RET_{i,t}$ | 0.18 | -0.14 | 0.09 | 0.36 | 0.62 |
| $\Delta X_t$ | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 |
| $RET_t$ | 0.12 | 0.02 | 0.13 | 0.21 | 0.18 |

# TABLE 2
## Cross-Sectional Earnings-Returns Relation

This table presents results from the annual cross-sectional regression: $RET_{i.t} = \beta_{0,t} + \beta_{1,t}\Delta X_{i.t} + \varepsilon_{i,t}$.

| | Full sample of 210,740 firm-years | | | Reduced sample of 130,924 firm-years | | |
|---|---|---|---|---|---|---|
| Year | N | $R^2$ | Coefficient | N | $R^2$ | Coefficient |
| 1963 | 723 | 0.15 | 3.92 | | | |
| 1964 | 941 | 0.11 | 2.43 | 784 | 0.12 | 2.89 |
| 1965 | 1106 | 0.09 | 3.97 | 907 | 0.12 | 5.06 |
| 1966 | 1226 | 0.07 | 1.88 | 977 | 0.08 | 2.46 |
| 1967 | 1481 | 0.08 | 5.07 | 1110 | 0.08 | 5.20 |
| 1968 | 1561 | 0.08 | 5.79 | 1161 | 0.10 | 6.40 |
| 1969 | 1658 | 0.10 | 1.79 | 1230 | 0.09 | 1.86 |
| 1970 | 1742 | 0.07 | 1.02 | 1301 | 0.07 | 1.07 |
| 1971 | 1868 | 0.08 | 1.17 | 1385 | 0.07 | 1.22 |
| 1972 | 1982 | 0.03 | 0.73 | 1452 | 0.03 | 0.78 |
| 1973 | 2076 | 0.06 | 0.54 | 1524 | 0.05 | 0.57 |
| 1974 | 2172 | 0.11 | 0.29 | 1573 | 0.13 | 0.34 |
| 1975 | 3746 | 0.11 | 0.65 | 2194 | 0.10 | 0.64 |
| 1976 | 3758 | 0.05 | 0.50 | 2231 | 0.07 | 0.61 |
| 1977 | 3702 | 0.10 | 0.68 | 2259 | 0.10 | 0.79 |
| 1978 | 3624 | 0.05 | 0.82 | 2295 | 0.03 | 0.69 |
| 1979 | 3592 | 0.06 | 0.76 | 2320 | 0.07 | 0.93 |
| 1980 | 3631 | 0.07 | 0.96 | 2350 | 0.06 | 0.98 |
| 1981 | 3583 | 0.06 | 0.60 | 2365 | 0.05 | 0.65 |
| 1982 | 3634 | 0.05 | 0.57 | 2382 | 0.04 | 0.54 |
| 1983 | 3883 | 0.02 | 0.65 | 2462 | 0.01 | 0.53 |
| 1984 | 3933 | 0.06 | 0.39 | 2494 | 0.04 | 0.37 |
| 1985 | 4031 | 0.07 | 0.49 | 2532 | 0.06 | 0.52 |
| 1986 | 4217 | 0.04 | 0.30 | 2602 | 0.04 | 0.32 |
| 1987 | 4180 | 0.03 | 0.23 | 2607 | 0.03 | 0.24 |
| 1988 | 4291 | 0.04 | 0.25 | 2650 | 0.03 | 0.25 |
| 1989 | 4464 | 0.05 | 0.29 | 2729 | 0.05 | 0.32 |
| 1990 | 4490 | 0.05 | 0.16 | 2748 | 0.05 | 0.18 |
| 1991 | 4463 | 0.03 | 0.26 | 2743 | 0.03 | 0.28 |
| 1992 | 4410 | 0.03 | 0.33 | 2763 | 0.04 | 0.36 |
| 1993 | 4493 | 0.03 | 0.50 | 2789 | 0.04 | 0.56 |
| 1994 | 5098 | 0.05 | 0.42 | 2947 | 0.05 | 0.49 |
| 1995 | 5398 | 0.04 | 0.67 | 3038 | 0.03 | 0.64 |
| 1996 | 5749 | 0.05 | 0.52 | 3117 | 0.03 | 0.52 |
| 1997 | 5802 | 0.06 | 0.59 | 3126 | 0.05 | 0.74 |
| 1998 | 5906 | 0.04 | 0.28 | 3150 | 0.03 | 0.32 |
| 1999 | 5652 | 0.01 | 0.66 | 3139 | 0.01 | 0.65 |
| 2000 | 5465 | 0.05 | 0.24 | 3097 | 0.03 | 0.28 |
| 2001 | 5185 | 0.06 | 0.21 | 3085 | 0.04 | 0.25 |
| 2002 | 5136 | 0.00 | 0.00 | 3120 | 0.00 | 0.04 |
| 2003 | 4826 | 0.02 | 0.77 | 3094 | 0.03 | 0.94 |
| 2004 | 4628 | 0.04 | 0.86 | 3079 | 0.03 | 0.88 |
| 2005 | 4435 | 0.03 | 0.73 | 3037 | 0.04 | 0.92 |
| 2006 | 4349 | 0.05 | 0.66 | 2953 | 0.06 | 0.75 |
| 2007 | 4239 | 0.04 | 0.45 | 2857 | 0.05 | 0.55 |
| 2008 | 4158 | 0.10 | 0.08 | 2760 | 0.09 | 0.09 |
| 2009 | 4108 | 0.05 | 0.44 | 2670 | 0.07 | 0.53 |
| 2010 | 3947 | 0.01 | 0.15 | 2584 | 0.00 | 0.13 |
| 2011 | 3759 | 0.04 | 0.25 | 2494 | 0.04 | 0.28 |
| 2012 | 3666 | 0.06 | 0.39 | 2411 | 0.07 | 0.46 |
| 2013 | 3615 | 0.02 | 0.46 | 2330 | 0.02 | 0.43 |
| 2014 | 3570 | 0.02 | 0.34 | 2243 | 0.02 | 0.38 |
| 2015 | 3571 | 0.09 | 0.16 | 2152 | 0.09 | 0.19 |
| 2016 | 3617 | 0.01 | 0.17 | 2054 | 0.01 | 0.15 |
| 2017 | 3570 | 0.01 | 0.14 | 1953 | 0.02 | 0.25 |
| 2018 | 3525 | 0.01 | 0.13 | 1859 | 0.02 | 0.17 |
| 2019 | 3105 | 0.03 | 0.31 | 1656 | 0.06 | 0.41 |

## TABLE 3
## Aggregate Earnings-Returns Relation

This table presents statistics estimated from the aggregate time-series regression with a 20-year window that rolls over every year: $RET_t = \gamma_{0,r} + \gamma_{1,r}\Delta X_t + \varepsilon_t$. Aggregate earnings change for year t ($\Delta X_t$) is the sum of all sample firms' year t's annual earnings before extraordinary items minus the sum of all sample firms' year t-1's annual earnings before extraordinary items, divided by the sum of all sample firms' year t's beginning market capitalization. Aggregate return for year t ($RET_t$) is CRSP value-weighted stock return, including dividends (CRSP: VWRETD). Year indicates the ending year of a rolling window. Signed $R^2$ is the product of $R^2$ and the sign of the coefficient on $\Delta X_t$.

| | Full sample of 210,740 firm-years | | Reduced sample of 130,924 firm-years | |
|---|---|---|---|---|
| Year | Signed $R^2$ | Coefficient | Signed $R^2$ | Coefficient |
| 1982 | -0.11 | -5.70 | | |
| 1983 | -0.11 | -5.65 | -0.08 | -4.98 |
| 1984 | -0.12 | -5.76 | -0.09 | -5.10 |
| 1985 | -0.15 | -6.53 | -0.13 | -5.98 |
| 1986 | -0.16 | -6.40 | -0.14 | -5.96 |
| 1987 | -0.15 | -6.11 | -0.13 | -5.69 |
| 1988 | -0.12 | -5.44 | -0.10 | -4.91 |
| 1989 | -0.19 | -6.38 | -0.16 | -5.88 |
| 1990 | -0.15 | -5.54 | -0.13 | -5.27 |
| 1991 | -0.19 | -6.16 | -0.17 | -5.93 |
| 1992 | -0.19 | -6.21 | -0.17 | -5.96 |
| 1993 | -0.16 | -5.25 | -0.14 | -4.96 |
| 1994 | -0.10 | -3.55 | -0.10 | -3.60 |
| 1995 | -0.05 | -2.58 | -0.05 | -2.66 |
| 1996 | -0.08 | -3.45 | -0.09 | -3.48 |
| 1997 | -0.07 | -3.07 | -0.07 | -3.13 |
| 1998 | -0.06 | -2.87 | -0.06 | -2.94 |
| 1999 | -0.10 | -4.30 | -0.10 | -4.33 |
| 2000 | -0.07 | -3.91 | -0.09 | -4.37 |
| 2001 | 0.01 | 0.96 | 0.00 | -0.17 |
| 2002 | 0.00 | 0.08 | 0.00 | -0.28 |
| 2003 | 0.01 | 1.22 | 0.00 | 0.84 |
| 2004 | 0.01 | 1.65 | 0.01 | 1.38 |
| 2005 | 0.02 | 2.12 | 0.02 | 2.31 |
| 2006 | 0.03 | 2.31 | 0.02 | 2.55 |
| 2007 | 0.04 | 2.72 | 0.04 | 3.09 |
| 2008 | 0.29 | 5.90 | 0.30 | 6.66 |
| 2009 | 0.36 | 6.27 | 0.37 | 7.06 |
| 2010 | 0.34 | 5.73 | 0.35 | 6.41 |
| 2011 | 0.42 | 6.29 | 0.44 | 7.15 |
| 2012 | 0.41 | 6.22 | 0.43 | 6.99 |
| 2013 | 0.40 | 6.31 | 0.41 | 7.07 |
| 2014 | 0.45 | 6.70 | 0.47 | 7.56 |
| 2015 | 0.48 | 6.63 | 0.49 | 7.41 |
| 2016 | 0.49 | 6.59 | 0.49 | 7.36 |
| 2017 | 0.52 | 6.63 | 0.52 | 7.35 |
| 2018 | 0.51 | 6.61 | 0.52 | 7.33 |
| 2019 | 0.51 | 6.63 | 0.50 | 7.28 |

## TABLE 4
## Firm-Level Time-Series Earnings-Returns Relation

This table presents the median, 25th, and 75th percentile values of $R^2$ and coefficients estimated from the firm-level time-series regression with a 20-year window that rolls over every year and requires at least 15 years of data: $RET_{i,t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i,t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings before extraordinary items (Compustat: IB) minus the year t-1's annual earnings before extraordinary items, deflated by the year t's beginning market capitalization. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end. Both firm return and change in earnings are winsorized at +/- 1% in each year to address potential data input errors. Year indicates the ending year of a rolling window.

| Year | **Median** | | **25th** | | **75th** | |
|---|---|---|---|---|---|---|
| | $R^2$ | Coefficient | $R^2$ | Coefficient | $R^2$ | Coefficient |
| 1982 | 0.06 | 1.11 | 0.02 | 0.15 | 0.15 | 3.07 |
| 1983 | 0.06 | 1.02 | 0.02 | 0.12 | 0.14 | 2.75 |
| 1984 | 0.05 | 0.94 | 0.02 | 0.08 | 0.14 | 2.64 |
| 1985 | 0.05 | 0.81 | -0.01 | -0.01 | 0.14 | 2.32 |
| 1986 | 0.05 | 0.73 | -0.01 | -0.04 | 0.14 | 2.13 |
| 1987 | 0.05 | 0.70 | -0.01 | -0.04 | 0.13 | 1.99 |
| 1988 | 0.06 | 0.70 | -0.01 | 0.00 | 0.14 | 1.95 |
| 1989 | 0.07 | 0.87 | 0.02 | 0.11 | 0.16 | 2.26 |
| 1990 | 0.07 | 0.84 | 0.02 | 0.14 | 0.17 | 2.21 |
| 1991 | 0.07 | 0.82 | 0.02 | 0.13 | 0.17 | 2.13 |
| 1992 | 0.07 | 0.81 | 0.02 | 0.17 | 0.17 | 2.18 |
| 1993 | 0.07 | 0.92 | 0.02 | 0.22 | 0.17 | 2.36 |
| 1994 | 0.07 | 0.96 | 0.02 | 0.24 | 0.18 | 2.38 |
| 1995 | 0.07 | 0.93 | 0.02 | 0.23 | 0.17 | 2.46 |
| 1996 | 0.07 | 0.93 | 0.02 | 0.23 | 0.16 | 2.46 |
| 1997 | 0.07 | 0.93 | 0.02 | 0.23 | 0.16 | 2.39 |
| 1998 | 0.07 | 0.96 | 0.02 | 0.24 | 0.16 | 2.47 |
| 1999 | 0.07 | 1.00 | 0.02 | 0.25 | 0.16 | 2.58 |
| 2000 | 0.07 | 0.96 | 0.02 | 0.23 | 0.16 | 2.46 |
| 2001 | 0.07 | 0.92 | 0.02 | 0.22 | 0.16 | 2.51 |
| 2002 | 0.07 | 0.90 | 0.02 | 0.21 | 0.17 | 2.53 |
| 2003 | 0.07 | 0.93 | 0.02 | 0.18 | 0.17 | 2.66 |
| 2004 | 0.07 | 0.94 | 0.02 | 0.18 | 0.17 | 2.72 |
| 2005 | 0.07 | 1.00 | 0.02 | 0.23 | 0.17 | 2.73 |
| 2006 | 0.07 | 1.09 | 0.02 | 0.24 | 0.17 | 2.90 |
| 2007 | 0.08 | 1.16 | 0.02 | 0.30 | 0.18 | 3.06 |
| 2008 | 0.10 | 1.25 | 0.02 | 0.34 | 0.20 | 3.29 |
| 2009 | 0.08 | 1.06 | 0.02 | 0.24 | 0.19 | 2.89 |
| 2010 | 0.08 | 1.07 | 0.02 | 0.22 | 0.19 | 3.00 |
| 2011 | 0.08 | 1.02 | 0.02 | 0.21 | 0.19 | 2.82 |
| 2012 | 0.07 | 0.98 | 0.02 | 0.20 | 0.19 | 2.79 |
| 2013 | 0.07 | 0.95 | 0.02 | 0.17 | 0.18 | 2.71 |
| 2014 | 0.07 | 0.99 | 0.02 | 0.18 | 0.19 | 2.79 |
| 2015 | 0.07 | 0.97 | 0.02 | 0.18 | 0.19 | 2.75 |
| 2016 | 0.07 | 0.93 | 0.02 | 0.19 | 0.19 | 2.77 |
| 2017 | 0.07 | 0.89 | 0.02 | 0.17 | 0.19 | 2.74 |
| 2018 | 0.07 | 0.86 | 0.02 | 0.15 | 0.18 | 2.58 |
| 2019 | 0.07 | 0.85 | 0.02 | 0.15 | 0.19 | 2.54 |

## TABLE 5
## Incremental $R^2$ of Firm-Level Earnings $\Delta X_{i.t}$ and Aggregate Earnings $\Delta X_t$

This table presents the median, 25th, and 75th percentile values of the signed incremental $R^2$ statistics estimated from firm-level time-series regressions with a 20-year window that rolls over every year and require at least 15 years of data. Incremental $R^2$ of firm-level earnings $\Delta X_{i.t}$ is Model (1) $R^2$ minus Model (2) $R^2$. Incremental $R^2$ of aggregate earnings $\Delta X_t$ is Model (1) $R^2$ minus Model (3) $R^2$. Signed $R^2$ is the product of incremental $R^2$ and the sign of the corresponding coefficient in Model (1). Model (1): $RET_{i,t} = \alpha_{1,i,r} + \alpha_{2,i,r}\Delta X_{i,t} + \alpha_{3,i,r}\Delta X_t + \varepsilon_{i,t}$ . Model (2): $RET_{i,t} = \alpha_{4,i,r} + \alpha_{5,i,r}\Delta X_t + \varepsilon_{i,t}$. Model (3): $RET_{i,t} = \alpha_{6,i,r} + \alpha_{7,i,r}\Delta X_{i,t} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ is firm i's year t's annual earnings change, deflated by beginning market capitalization. $\Delta X_t$ is aggregate earnings change. $RET_{i,t}$ is firm i's twelve-month cumulative return from the fourth month after the fiscal year t-1's end.

| Year | Median Incremental $R^2$ | | 25th Incremental $R^2$ | | 75th Incremental $R^2$ | |
|---|---|---|---|---|---|---|
| | $\Delta X_{i,t}$ | $\Delta X_t$ | $\Delta X_{i,t}$ | $\Delta X_t$ | $\Delta X_{i,t}$ | $\Delta X_t$ |
| 1982 | 0.13 | -0.15 | 0.09 | -0.09 | 0.14 | -0.19 |
| 1983 | 0.12 | -0.14 | 0.08 | -0.08 | 0.13 | -0.18 |
| 1984 | 0.11 | -0.13 | 0.08 | -0.08 | 0.14 | -0.17 |
| 1985 | 0.12 | -0.14 | 0.08 | -0.08 | 0.13 | -0.19 |
| 1986 | 0.12 | -0.16 | 0.08 | -0.08 | 0.12 | -0.19 |
| 1987 | 0.12 | -0.16 | 0.08 | -0.08 | 0.12 | -0.20 |
| 1988 | 0.12 | -0.16 | 0.08 | -0.08 | 0.13 | -0.20 |
| 1989 | 0.14 | -0.16 | 0.09 | -0.09 | 0.15 | -0.22 |
| 1990 | 0.14 | -0.15 | 0.08 | -0.08 | 0.16 | -0.20 |
| 1991 | 0.14 | -0.14 | 0.09 | -0.08 | 0.16 | -0.19 |
| 1992 | 0.14 | -0.13 | 0.09 | -0.08 | 0.16 | -0.18 |
| 1993 | 0.14 | -0.12 | 0.08 | -0.08 | 0.16 | 0.17 |
| 1994 | 0.14 | -0.11 | 0.08 | -0.08 | 0.16 | 0.16 |
| 1995 | 0.13 | -0.11 | 0.07 | -0.07 | 0.16 | 0.14 |
| 1996 | 0.13 | -0.10 | 0.07 | -0.07 | 0.16 | 0.14 |
| 1997 | 0.12 | -0.10 | 0.07 | -0.06 | 0.15 | 0.13 |
| 1998 | 0.12 | -0.09 | 0.07 | -0.06 | 0.15 | 0.12 |
| 1999 | 0.11 | -0.08 | 0.06 | -0.05 | 0.16 | 0.11 |
| 2000 | 0.11 | -0.08 | 0.06 | -0.05 | 0.16 | 0.12 |
| 2001 | 0.11 | -0.07 | 0.06 | -0.05 | 0.17 | 0.11 |
| 2002 | 0.11 | -0.06 | 0.05 | -0.04 | 0.17 | 0.10 |
| 2003 | 0.11 | -0.06 | 0.05 | -0.04 | 0.18 | 0.10 |
| 2004 | 0.11 | -0.06 | 0.05 | -0.04 | 0.17 | 0.10 |
| 2005 | 0.10 | -0.06 | 0.05 | -0.04 | 0.16 | 0.09 |
| 2006 | 0.10 | -0.06 | 0.05 | -0.04 | 0.17 | 0.09 |
| 2007 | 0.11 | 0.05 | 0.05 | -0.04 | 0.17 | 0.10 |
| 2008 | 0.11 | 0.08 | 0.08 | -0.08 | 0.14 | 0.13 |
| 2009 | 0.12 | 0.10 | 0.08 | 0.08 | 0.14 | 0.15 |
| 2010 | 0.11 | 0.10 | 0.08 | 0.08 | 0.14 | 0.15 |
| 2011 | 0.11 | 0.11 | 0.08 | 0.08 | 0.14 | 0.16 |
| 2012 | 0.11 | 0.12 | 0.08 | 0.08 | 0.14 | 0.16 |
| 2013 | 0.10 | 0.12 | 0.07 | 0.08 | 0.13 | 0.16 |
| 2014 | 0.11 | 0.13 | 0.07 | 0.08 | 0.13 | 0.17 |
| 2015 | 0.11 | 0.13 | 0.08 | 0.09 | 0.12 | 0.18 |
| 2016 | 0.11 | 0.14 | 0.08 | 0.09 | 0.12 | 0.18 |
| 2017 | 0.11 | 0.15 | 0.08 | 0.09 | 0.13 | 0.19 |
| 2018 | 0.10 | 0.15 | 0.08 | 0.09 | 0.13 | 0.19 |
| 2019 | 0.10 | 0.16 | 0.09 | 0.11 | 0.12 | 0.20 |

## TABLE 6
## Firm-Level Earnings Persistence and its Relationship with Lagged Aggregate Earnings

This table presents the median, 25th, and 75th percentile values of coefficients estimated from firm-level time-series regressions that roll over every 20 years and require at least 15 years of data: $\Delta X_{i,t} = \delta_{0,i,r} + \delta_{1,i,r}\Delta X_{i,t-1} + \delta_{2,i,r}\Delta X_{t-1} + \varepsilon_{i,t}$. $\Delta X_{i,t}$ ($\Delta X_{i,t-1}$) is firm i's year t's (t-1's) annual earnings change, deflated by beginning market capitalization. Aggregate earnings change for year t-1 ($\Delta X_{t-1}$) is the sum of all sample firms' year t-1's annual earnings before extraordinary items minus the sum of all sample firms' year t-2's annual earnings before extraordinary items, divided by the sum of all sample firms' year t-1's beginning market capitalization. Year indicates the ending year of a rolling window.

| Year | Median Coefficient | | 25th Coefficient | | 75th Coefficient | |
|---|---|---|---|---|---|---|
| | $\Delta X_{i,t-1}$ | $\Delta X_{t-1}$ | $\Delta X_{i,t-1}$ | $\Delta X_{t-1}$ | $\Delta X_{i,t-1}$ | $\Delta X_{t-1}$ |
| 1982 | -0.07 | 0.08 | -0.32 | -1.13 | 0.21 | 0.96 |
| 1983 | -0.08 | 0.06 | -0.31 | -0.96 | 0.16 | 1.00 |
| 1984 | -0.12 | 0.04 | -0.34 | -1.01 | 0.12 | 1.03 |
| 1985 | -0.12 | -0.03 | -0.35 | -1.12 | 0.12 | 1.06 |
| 1986 | -0.13 | 0.01 | -0.36 | -1.05 | 0.11 | 1.07 |
| 1987 | -0.15 | 0.05 | -0.38 | -1.11 | 0.09 | 1.13 |
| 1988 | -0.16 | 0.03 | -0.39 | -1.12 | 0.06 | 1.11 |
| 1989 | -0.17 | -0.04 | -0.39 | -1.18 | 0.05 | 1.02 |
| 1990 | -0.18 | 0.12 | -0.40 | -0.90 | 0.05 | 1.24 |
| 1991 | -0.18 | 0.20 | -0.41 | -0.72 | 0.05 | 1.42 |
| 1992 | -0.21 | 0.26 | -0.42 | -0.67 | 0.02 | 1.36 |
| 1993 | -0.22 | 0.26 | -0.42 | -0.64 | 0.02 | 1.37 |
| 1994 | -0.22 | 0.25 | -0.42 | -0.56 | 0.01 | 1.39 |
| 1995 | -0.24 | 0.29 | -0.43 | -0.48 | -0.01 | 1.51 |
| 1996 | -0.25 | 0.36 | -0.43 | -0.41 | -0.02 | 1.64 |
| 1997 | -0.25 | 0.32 | -0.44 | -0.47 | -0.04 | 1.56 |
| 1998 | -0.26 | 0.26 | -0.45 | -0.57 | -0.05 | 1.53 |
| 1999 | -0.28 | 0.21 | -0.45 | -0.71 | -0.06 | 1.54 |
| 2000 | -0.29 | 0.15 | -0.46 | -0.78 | -0.06 | 1.67 |
| 2001 | -0.28 | 0.16 | -0.47 | -0.77 | -0.06 | 1.72 |
| 2002 | -0.30 | 0.16 | -0.47 | -0.73 | -0.09 | 1.67 |
| 2003 | -0.30 | 0.18 | -0.46 | -0.67 | -0.08 | 1.61 |
| 2004 | -0.30 | 0.15 | -0.46 | -0.58 | -0.09 | 1.64 |
| 2005 | -0.29 | 0.19 | -0.45 | -0.56 | -0.07 | 1.61 |
| 2006 | -0.28 | 0.18 | -0.45 | -0.53 | -0.07 | 1.50 |
| 2007 | -0.27 | 0.16 | -0.44 | -0.58 | -0.04 | 1.43 |
| 2008 | -0.27 | 0.26 | -0.46 | -0.48 | -0.04 | 1.71 |
| 2009 | -0.30 | 0.31 | -0.49 | -0.26 | -0.05 | 1.84 |
| 2010 | -0.27 | 0.29 | -0.45 | -0.23 | -0.04 | 1.88 |
| 2011 | -0.27 | 0.26 | -0.46 | -0.24 | -0.04 | 1.79 |
| 2012 | -0.27 | 0.30 | -0.46 | -0.21 | -0.05 | 1.89 |
| 2013 | -0.27 | 0.30 | -0.45 | -0.19 | -0.05 | 1.84 |
| 2014 | -0.27 | 0.28 | -0.45 | -0.20 | -0.05 | 1.74 |
| 2015 | -0.28 | 0.28 | -0.45 | -0.21 | -0.05 | 1.77 |
| 2016 | -0.27 | 0.27 | -0.46 | -0.22 | -0.06 | 1.71 |
| 2017 | -0.27 | 0.25 | -0.45 | -0.22 | -0.06 | 1.60 |
| 2018 | -0.27 | 0.25 | -0.45 | -0.23 | -0.06 | 1.59 |
| 2019 | -0.27 | 0.24 | -0.45 | -0.25 | -0.06 | 1.52 |