The Production Possibilities Frontier and Future Firm Performance

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ABSTRACT

Economies face a trade-off between consumption and investment. An economy that consumes more of its scarce resources has fewer resources to invest (and vice versa). The production possibilities frontier (PPF) represents the possible investment and consumption combinations assuming the economy is operating efficiently. We characterize the estimated covariance of a firm's earnings with the aggregate investment-to-consumption gap as the firm's position on the economy's PPF. Next, we examine the association between firms' frontier positioning and their future performance. We find that a firm's *ex-ante* PPF position contains predictive power for future firm earnings and returns. Furthermore, a dynamic trading strategy based on firms' *ex-ante* PPF positions and macro expectations earns abnormal returns of 3.48 percent per year in our sample. We contribute to the growing literature examining the associations between firm-level accounting outputs and the macroeconomy by demonstrating that firm's frontier position contains information about future firm performance.

Keywords: Production possibilities frontier; consumption; investment; macroeconomy; earnings; returns

JEL Classifications: D24, E21, E22, M41

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1. Introduction

Economies face trade-offs between consumption and investment. At the macro level, economies have scarce resources and short-run technological constraints. An economy that consumes more of its scarce resources diverts resources away from investment (and vice versa). The production possibilities frontier (PPF) represents the possible investment and consumption combinations assuming the economy is operating as efficiently as possible.[1] At the micro level, firms also have scarce resources and short-run technological constraints. Firms face uncertainty about the path that the macroeconomy will take and must make trade-off decisions about which goods to produce (i.e., investment goods and consumer goods). Therefore, firms' future performance will significantly depend on the degree to which the (re)allocation of the economy's resources between investment and consumption matches the types of goods produced by the firm. In this paper, we examine whether firms' positions on the economy's production possibilities frontier help predict future firm performance, in terms of both earnings and returns.[2]

Our study focuses on utilizing individual firms' positioning on the economy's PPF to predict future earnings and returns for three reasons. First, a large literature in accounting and finance is dedicated to the prediction of earnings and returns as a key function of accounting is to provide value relevant information. Yet, this literature lacks an evaluation of how macro-level trade-offs influence individual firm outcomes (Ferreira and Santa-Clara 2011; Neely et al. 2014; Chen et al. 2022). Second, our study aligns aggregate resource (re)allocations with individual firm outcomes, offering managers better insights to make informed decisions about the strategic positioning of their firms. Managers' ability to divine the future profitable possibilities for the firm is at the center of a long line of research looking into managerial choices and the quality of these choices (Goodman et al. 2014; Heitzman and Huang 2019). Third, our study uniquely

[1] This assumption holds for the U.S. economy at the aggregate level (see, for example, Fernald et al. 2024).
[2] As described later in Section 3 and the Appendix, our empirical tests use seasonally adjusted measures of growth in firm-level earnings, aggregate investment, and aggregate consumption to address seasonality and ensure stationarity of the time series variables consistent with the prior literature (e.g., Konchitchiki and Patatoukas 2014; Abdalla and Carabias 2022). For brevity, the remainder of the text simply refers to earnings, aggregate investment, and aggregate consumption.

demonstrates that investors can leverage fundamental economic theory to enhance the accuracy of their predictions for future firm performance.

We use a stylized setting with a large sample of heterogeneous firms across industries to examine whether firm-specific earnings comovements with aggregate investment and consumption are associated with future firm performance. For example, McDonald's produces fast food items and sells those items to the public to consume. McDonald's earnings may be higher when a greater percentage of society's scarce resources are directed towards consumption, and its earnings may be lower when a greater percentage of society's scarce resources are directed towards investment. Conversely, Caterpillar produces heavy construction equipment and sells that equipment primarily to other firms. Caterpillar's earnings may be higher when a greater percentage of society's scarce resources are directed towards investment, and its earnings may be lower when a greater percentage of society's scarce resources are directed towards consumption.[3]

Empirically, we begin by estimating rolling time-series regressions of firm-level earnings on the aggregate investment-to-consumption gap (i.e., the difference between aggregate investment and aggregate consumption). We characterize the estimated covariance, which we label $ePPF^{gap}$, as the firm's position on the economy's production possibilities frontier. Next, we estimate similar rolling time-series regressions using firm-level earnings as the dependent variable, but we include aggregate investment and aggregate consumption as separate independent variables. This disaggregated methodology allows us to characterize a firm's position relative to both ends of the economy's production possibilities frontier. We label the estimated covariance of a firm's earnings with aggregate investment (consumption) as $ePPF^{i}$ ($ePPF^{c}$).

Our results support rejection of the null hypothesis that $ePPF^{i}$ equals $ePPF^{c}$ in the cross-section, and we find that the probability that a firm is closer to one end of the frontier significantly decreases with

[3] The firms used in the example are intentionally quite different, but we do not use a binary classification system. For example, Caterpillar also produces branded apparel. Caterpillar's earnings may also be high during a period of relatively high aggregate consumption if individuals purchase the company's apparel as fashion items. Our empirical tests measure the covariance of a firm's earnings with both aggregate investment and aggregate consumption, thereby allowing a firm's time-varying position on the macroeconomy's production possibilities frontier to exist on a continuum.

the probability that a firm is closer to the other end. These results are consistent with firms making trade-off decisions about the mix of goods to produce and placing themselves along the economy's production possibilities frontier. We also explore a parsimonious set of firm characteristics correlated with firm placement on the economy's production possibilities frontier. Using logistic regressions, we find that greater capital expenditures, increases in asset turnover, lower production costs, and more growth opportunities are associated with a greater likelihood of a firm being positioned towards the investment end of the frontier. On the other hand, higher inventory turnover, increases in asset turnover, lower production costs, and fewer growth opportunities are associated with a greater likelihood of a firm being positioned towards the consumption end of the frontier.

Next, we examine whether a firm's position on the economy's production possibilities frontier contains information about the firm's future earnings. Specifically, we examine whether our *ex-ante* firm-specific measures of sensitivities to the investment-to-consumption gap (or investment and consumption separately) help predict future earnings. We find that the firm's position contains statistically significant and economically meaningful predictive power for future firm earnings, with higher future earnings being associated with the investment component compared to the consumption component of the firm's position. To gain further insights, we examine two conditional effects associated with a position on the frontier. First, we consider real-time forecasts of aggregate investment and consumption published by the Federal Reserve Bank of Philadelphia. Second, we consider shifts in the economy's frontier from investment-specific technological shocks and consumption-specific technological shocks, published by the Federal Reserve bank of San Francisco.[4] Our findings confirm that combining our firm-specific earnings sensitivities with these variables provides additional information about future earnings. Thus, a firm's positioning on the

[4] We use forecasts of aggregate investment and consumption from the survey of professional forecasters (SPF), which is the most highly regarded macro survey in the US and is widely used in the literature (e.g., see Konchitchki and Patatoukas 2014). We use SPF nowcasts (i.e., current-quarter forecasts) of aggregate investment and consumption growth rates. The investment (consumption) nowcast is the forecasted investment (consumption) for the current quarter and is available in real-time. The nowcasts are published after 45 days from the start of the quarter preceding the quarter during which earnings are announced (https://www.philadelphiafed.org/). Investment-specific and consumption-specific technology innovations are the components of total factor productivity for the U.S. business sector (i.e., the Solow residuals) in investment and consumption (https://www.frbsf.org/).

economy's production possibilities frontier highlights a previously undocumented pathway through which the dynamics of the economy's frontier can influence future individual firm performance.

Finally, we examine the financial market implications of a firm's position on the economy's production possibilities frontier. First, we test whether our *ex-ante* firm-specific measures of earnings sensitivities to the investment-to-consumption gap (or investment and consumption separately) explain cross-sectional patterns in stock returns during an event window starting from the release of real-time investment and consumption nowcasts and ending with earnings announcements. Our results show that the earnings sensitivities predict returns; specifically, stocks with high earnings sensitivities earn higher (risk-adjusted) returns.

Second, we develop two trading strategies that exploit signals provided by the real-time nowcasts of investment and consumption from the Federal Reserve Bank of Philadelphia. Our main "with-news" strategy follows macro consensus expectations by investing in stocks consistent with the firms' positions on the frontier. The "against-news" strategy is a contrarian strategy that represents the suboptimal behavior of the typical investor by investing in stocks opposite to the firms' positions on the frontier. Controlling for risk using a six-factor model, a hedge portfolio that goes long the stocks in the with- news portfolio and goes short the stocks in the against-news portfolio yields abnormal returns of 29 basis points per month (3.48 percent per year).[5] In robustness checks, we demonstrate that the earnings and return predictability results hold even after controlling for (1) other macroeconomic variables previously shown to predict returns (e.g., sentiment, volatility, uncertainty, and the consumption-wealth ratio) and (2) multifactor-conditioned betas associated with the macroeconomic variables.

We contribute to the literature examining the associations between firm-level earnings and the macroeconomy in multiple ways. First, our paper is the first to link the economy's production possibilities frontier with firm-level earnings. Businesses and economists use the production possibilities frontier to

[5] The results are robust when using different asset pricing models to explain the hedge portfolio returns, namely the liquidity factor model, the Capital Asset Pricing Model, the Fama-French three-factor model, the Fama-French four-factor model, the Fama-French five-factor model, and a liquidity-augmented Fama-French five-factor model.

analyze resource allocation decisions and efficiency. We document evidence consistent with firms making trade-off decisions about the mix of goods to produce and placing themselves along the economy's production possibilities frontier.

Second, we show that a firm's *ex-ante* position on the economy's production possibilities frontier is associated with future earnings. This result is particularly significant for analysts and other capital market participants attempting to forecast a firm's future earnings. For example, our results suggest that attempting to forecast earnings by focusing exclusively on time-series properties (e.g., earnings persistence) may be insufficient. Instead, the analyst also needs to consult macroeconomists' most recent forecasts of investment and consumption and account for shifts in the frontier caused by specific technological shocks, as these macro factors combined with the individual firm's position on the frontier are associated with future firm performance.

Third, we demonstrate that an implementable trading strategy based on firms' positions on the production possibilities frontier (which can be estimated using publicly available information) can earn abnormal returns. Our results show that the abnormal returns persist in our sample after controlling for other macroeconomic variables and common proxies for systematic risk. Overall, the results are inconsistent with existing rational risk-based explanations and are instead consistent with investors failing to fully incorporate the information content of the firm's position on the economy's production possibilities frontier into prices.

Finally, prior literature finds that accounting earnings are predominantly procyclical (Anilowski et al. 2007; Bonsall et al. 2013). However, we show that earnings for individual firms tend to be positively correlated with one side of the economy's production possibilities frontier (investment or consumption) and negatively correlated with the other side. Further, prior literature finds that stock prices do not fully incorporate within-quarter economic updates (Carabias 2018). We extend this by documenting that stock prices do not fully impound resource allocation tradeoffs implied by the economy's production possibilities frontier and embedded in earnings sensitivities. Our results highlight the need for future research to utilize granularity within macroeconomic measures when mapping associations with firm-level accounting outputs.

The rest of the paper is organized as follows. Section 2 discusses prior literature and develops the hypotheses. Section 3 empirically measures firms' positions on the production possibilities frontier. Section 4 examines determinants of firm proximity to the frontier ends. Section 5 investigates whether a firm's position on the production possibilities frontier predicts future firm earnings. Section 6 examines whether a firm's position on the production possibilities frontier predicts future firm returns. Section 7 presents robustness checks. Section 8 concludes.

2. Prior Literature and Hypothesis Development

2.1 Firm-level Earnings and the Macroeconomy

Accounting research, as early as Brown and Ball (1967), shows that firm-level earnings comove with aggregate economic conditions.[6] Beaver et al. (1970) find that earnings sensitivity to the market reflects underlying events that determine differential riskiness among stocks. Jackson et al. (2018) find that the market component of earnings contributes more to firm performance than the firm-idiosyncratic component. Research estimates that macroeconomic conditions account for a significant portion between 17% to 60% of the variation in firm-level earnings (Brown and Ball 1967, Fama 1990, and Ball et al. 2009).

The literature explores various associations between firm-level earnings and the macroeconomy. First, one stream of literature explores these associations in an attempt to resolve existing puzzles within the asset pricing literature. For example, Chordia and Shivakumar (2005) suggest that post-earnings-announcement drift (a prominent return anomaly) is partly an illusion driven by the correlation between firm-level earnings and inflation. Ellahie (2021) and Ball et al. (2022) show that forming firm-level earnings betas can better explain the cross-section of returns compared to using return betas from the Capital Asset

[6] Macro research in accounting has evolved in two main directions: one focuses on how macroeconomic factors affect individual firms (e.g., Ball et al. 2009; Ellahie 2021; Ball et al. 2022), while the other focuses on how firm-level information contributes to understanding the broader economy (e.g., Konchitchiki and Patatoukas 2014, Crawley 2015, Shivakumar and Urcan 2017; Abdalla and Carabias 2022). Our study is most relevant to the literature on how macroeconomic factors affect individual firms.

Pricing Model. Li et al. (2014) show that combining firm-level geographic exposures with forecasts of country-level performance yields superior predictions for firm fundamentals. Carabias (2018) finds that continuous intra-quarter macroeconomic news is not fully incorporated into investors' earnings expectations and predicts future abnormal returns. Crawford et al. (2021) suggest that the inconsistent relation between oil prices and stock returns found in previous studies is attributable to a failure to link oil price changes to firm-level earnings. They find that the impact of oil prices on earnings differs significantly across firms, and that unique firm characteristics are more critical in explaining the effects of oil price changes than industry membership. Moore and Velikov (2024) provide evidence that investors respond only to lagged quarterly oil price changes when firms announce earnings in the next quarter, consistent with limited attention.

Second, another stream of literature focuses on the effect macroeconomic factors have on firm-level decisions. For example, Jackson et al. (2017) suggest that earnings comovement within an industry reflects similar economic conditions which affects managers decisions to bias earnings reports. Binz et al. (2022) show that revisions in macroeconomic releases affect firm earnings and capital investments. Their results suggest that managers overreact to both the error and true components of macroeconomic signals. Binz (2022) finds that aggregate uncertainty has a positive effect on firm earnings. He argues that this effect is attributable to a larger negative effect of aggregate uncertainty on expenses relative to revenues, presumably because consumers reduce their spending more significantly than managers reduce their investments.

The existing literature lacks an assessment of how collective decisions made by firms and other economic agents, which inherently involve *trade-offs* at the macro level, affect individual firm earnings and returns. Specifically, at the macro level, scarcity of resources and technological constraints necessitate a trade-off between investment and consumption and economic agents' decisions lead to the reallocation of resources between them (e.g., increasing the production of investment goods such as machinery typically reduces the resources available for the production of consumer goods). Thus, a firm's performance depends on the alignment between economy-wide resource allocation and its strategic decisions.

2.2 The Production Possibilities Frontier

Macroeconomies have scarce resources (e.g., labor and capital) and short-run technological constraints. An economy that consumes more of its scarce resources has fewer resources available for investment (and vice versa). Economists, beginning with Haberler (1936), refer to the curve representing an economy's possible investment and consumption combinations as the production possibilities frontier. The PPF is a valuable tool for understanding how economies allocate resources and maximize output. It has several applications in macroeconomics, including analyzing the impact of trade on wages (e.g., Richardson 1995) and examining the factors that determine directed technological change (e.g., Acemoglu 2002). Figure 1 shows a classic production possibilities frontier highlighting the tradeoff between consumption (the horizontal axis) and investment (the vertical axis). Assuming the economy is operating efficiently (i.e., the economy's [investment, consumption] pair is located on the frontier such as points a, $a^{`}$, and $a^{``}$), any increase in the allocation of the economy's scare resources towards consumption must reduce the allocation of the economy's resources towards investment (and vice versa). The concave shape illustrates diminishing marginal returns to moving toward either end. The frontier PPF_0 can shift from its investment end to PPF_1 due to investment-specific technological innovations or from its consumption end to PPF_2 due to consumption-specific technological innovations.

[Insert Figure 1 Here]

At the micro level, firms face uncertainty about the path of the macroeconomy. Specifically, resource allocations within an economy can change frequently, and the macroeconomy's frontier can shift over time (e.g., due to technological innovations or capital accumulation) (Fernald et al. 2024). Moreover, firms cannot precisely predict the location of the macroeconomy's [investment, consumption] realization on the frontier in the future. Nevertheless, heterogeneous firms (i.e., firms that differ with respect to corporate strategy, risk tolerance, firm life cycle position, customer base, production technology, growth opportunities, financial leverage, production costs, etc.) must make decisions about which goods to currently produce. Due to firm-level resource and technology constraints, firms cannot possibly produce an infinite array of goods to maximize their earnings regardless of the macroeconomy's future [investment, consumption] combination realizations. Therefore, we predict that firms make trade-off decisions about product mix and strategically place themselves along the macroeconomy's production possibilities frontier. More formally, we state the following hypothesis:

> ***H1****: The probability that a firm is closer to one end of the economy's production possibilities frontier (consumption) decreases as the probability that it is closer to the other end (investment) increases.*

A mapping of a firm's position on the economy's production possibilities frontier to future firm performance may exist depending on the firm's contracts with suppliers, customers, and employees (Chordia and Shivakumar 2005). Note, however, that a firm can have a consistent strategy yet their placement on the PPF may change due to rapidly changing resource allocations within the economy and the macroeconomy's frontier shifting over time. Consequently, a firm with a stable business model and product line may also take different positions on the economy's PPF over time. Thus, a firm's future earnings and returns significantly depend on the degree to which the allocation of the economy's resources towards investment and consumption matches the types of goods produced by the firm. Therefore, we state the following hypothesis:

> ***H2****: A firm's position on the economy's production possibilities frontier is associated with future firm performance.*

3. Measuring Firm Positioning on the Production Possibilities Frontier and Research Timeline

3.1 Measuring firm positioning

We empirically measure a firm's position on the economy's production possibilities frontier in a quarter by estimating the following rolling time-series regression:

$$e_{j,Q} = \alpha_{j,Q} + \beta_{1j,Q} e_{j,Q-1} + \beta_{2j,Q} invst\_consm_{Q}^{gap} + \varepsilon_{j,Q} \tag{1}$$

$e_{j,Q}$ is earnings growth for firm *i* in quarter *Q* estimated as the year-over-year change in profit margin.[7] We include the lag of the dependent variable to control for possible persistence in earnings growth.

[7] We require a scalar when calculating earnings growth to reduce heteroskedasticity. Following prior literature (e.g., Konchitchki and Patatoukas 2014, Abdalla and Carabias 2022), we use sales as a scalar to avoid negative denominator

$invst\_consm_Q^{gap}$ is the aggregate investment-to-consumption gap, i.e., the difference between the aggregate investment growth and the aggregate consumption growth ($invst_Q - consm_Q$) where $invst_Q$ is real investment in quarter Q estimated as the year-over-year change in real non-residential investment growth and $consm_Q$ is real consumption in quarter Q estimated as the year-over-year change in real consumption growth. All variables are defined in more detail in the Appendix.

We label $\beta_{2j,Q}$, the estimated covariance of firm j's earnings growth with the aggregate investment-to-consumption gap in quarter Q, as $ePPF_{j,Q}^{gap}$ and characterize the slope coefficient as the firm's position on the economy's production possibilities frontier. Next, we estimate similar rolling time-series regressions, but we include aggregate investment growth and aggregate consumption growth as separate independent variables:

$$e_{j,Q} = \alpha_{j,Q} + \delta_{1j,Q} e_{j,Q-1} + \delta_{2j,Q} invst_Q + \delta_{3j,Q} consm_Q + \varepsilon_{j,Q} \quad (2)$$

This disaggregated methodology allows us to estimate a firm's position relative to both ends of the economy's frontier. We label $\delta_{2j,Q}$, the estimated covariance of firm j's earnings growth with aggregate investment growth in quarter Q, as $ePPF_{j,Q}^{i}$. We label $\delta_{3j,Q}$, the estimated covariance of firm j's earnings growth with aggregate consumption growth in quarter Q, as $ePPF_{j,Q}^{c}$. We characterize $ePPF_{j,Q}^{i}$ and $ePPF_{j,Q}^{c}$ as the firm's positioning towards the investment and consumption ends of the economy's production possibilities frontier, respectively.

3.2 Sample and analysis timeline

Our sample includes accounting data, stock prices, and macroeconomic data. We collect quarterly accounting data from COMPUSTAT, daily stock returns from CRSP, and quarterly investment and

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problems. Specifically, we divide a firm's quarterly income before extraordinary items (Compustat item IBQ) by the firm's quarterly sales (Compustat item SALEQ). Next, we take the difference in the ratio for a firm from quarter Q-4 to quarter Q. Therefore, $e_{i,Q}$ is effectively a year-over-year change in profit margin, consistent with the prior literature.

consumption data from both the Real-Time Data Set for Macroeconomists (RTDS) and the Survey of Professional Forecasters (SPF) of the Federal Reserve Bank of Philadelphia.[8]

We restrict our sample to calendar quarter firms (i.e., firms with fiscal quarters ending in March, June, September, and December). To be consistent with tests in later sections, we also restrict the sample to firms with earnings announced before the day preceding the announcement of macro forecasts of investment and consumption in the subsequent quarter (i.e., around 45 days after the end of the current quarter). We require non-missing earnings and sales values for the variables in regressions (1) and (2) as well as non-missing return values for the tests in later sections. We exclude small firms with quarterly sales of less than three million dollars, and we trim observations in the top and bottom 1 percent of the quarterly cross-sectional distributions of earnings and cumulative abnormal returns. Our final sample includes 58,038 firm-quarters from Q2:1994 to Q1:2017 (92 quarters).

For illustrative purposes, Figure 1 provides examples of estimated $ePPF^i$ and $ePPF^c$ for the individual example companies discussed earlier. As Figure 1 illustrates, McDonald's earnings generally exhibit negative (positive) covariance with aggregate investment (consumption) over our sample, consistent with McDonald's producing and selling consumable food directly to individuals.[9] In contrast, Caterpillar's earnings generally exhibit positive (negative) covariance with aggregate investment (consumption) over our sample, consistent with Caterpillar producing and selling heavy production equipment to other businesses.[10] Overall, these examples demonstrate that firms have different and time-varying earnings sensitivities to aggregate investment and consumption.

[Insert Figure 1 Here]

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[8] We also use additional market and macro data from sources identified in the appendix (e.g., risk factors from Kenneth French's webpage, sentiment from Jeffrey Wurgler's webpage, uncertainty from Sydney Ludvigson's webpage, and the consumption-wealth ratio from Martin Lettau's webpage).

[9] The covariance of McDonald's earnings with aggregate investment and consumption exhibited spikes around the Financial Crisis of 2007-2008. These spikes could be a function of 2007-2008 being a unique period for all firms, but McDonald's earnings also exhibited idiosyncratic volatility during the period. Overall, spikes around the Financial Crisis appear less pronounced for other firms in our sample.

[10] The covariance of Caterpillar's earnings with aggregate investment (consumption) exhibited a negative (positive) shock around 2012. These shocks may be related to the company's disposition of its logistics division (Caterpillar Logistics Services) in May 2012, see https://www.reuters.com/article/caterpillar-logistics-idCNL1E8GA29C20120510.

Figure 2 shows the timeline for our variables and research design. We estimate regressions (1) and (2) by firm using a rolling 20-quarter window.[11] $ePPF^i$ and $ePPF^c$ are measured as of quarter *Q-2* when estimating their predictive ability for future earnings and returns in later sections.

[Insert Figure 2 Here]

Table 1 Panel A reports descriptive statistics. $e_{j,Q}$ has a mean (median) of -0.004 (0.001), suggesting within-firm year-over-year earnings growth was generally flat during our sample period. Turning to the time-series macro variables, $invst_Q$ ($consm_Q$) has a mean of -0.005 (-0.001), median of -0.010 (-0.001), and standard deviation of 0.115 (0.023). Overall, seasonally adjusted growth in aggregate investment is more volatile than growth in aggregate consumption, consistent with prior literature (e.g., Hirshleifer et al. 2015; Lettau and Ludvigson 2001). Table 1 Panel B reports univariate correlations. $e_{j,Q}$ is positively and significantly correlated with both aggregate investment and aggregate consumption, consistent with the historical literature showing that accounting earnings tend to comove with macroeconomic conditions (e.g., Brown and Ball 1967).

[Insert Table 1 Here]

Table 2 reports the means of the firm-level regressions (1) and (2). In column (1), the mean $\beta_{1i,Q}$ coefficient is 0.240 and is statistically significant, suggesting that firm-specific earnings are persistent. Importantly, the mean $\beta_{2i,Q}$ coefficient (i.e., $ePPF_{j,Q}^{gap}$) is 0.109 and is statistically significant, suggesting that the average firm's earnings positively covaries with the aggregate investment-to-consumption gap. In column (2), both the mean $\delta_{2i,Q}$ coefficient (i.e., $ePPF_{j,Q}^{i}$) of 0.096 and the mean $\delta_{3i,Q}$ coefficient (i.e., $ePPF_{j,Q}^{c}$) of 0.141 are positive and statistically significant. However, the magnitude of these coefficients is significantly different from one another at the 1 percent level (in an untabulated Wald test). Therefore, the

[11] We use a 20-quarter rolling window because the average duration of a full business cycle in the US is approximately 20 quarters according to the National Bureau of Economic Research (NBER), https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions. Thus, on average, firm-level earnings are exposed to all phases of a business cycle in each rolling regression.

average firm's earnings covariance with aggregate investment is significantly different from the average firm's earnings covariance with aggregate consumption.

In terms of economic significance, a one standard deviation increase in aggregate investment translates to a 1.104 percent increase in earnings for the average firm. On the other hand, a one standard deviation increase in aggregate consumption translates to a 0.324 percent increase in earnings for the average firm.[12] The impacts of aggregate investment and consumption on firm-level earnings are economically significant given that the median earnings growth in our sample is 0.1 percent (see Table 1).

Descriptively, an untabulated analysis analyzing combinations of $ePPF^i$ and $ePPF^c$ for firms in the sample shows that a slightly greater number of firm-quarter observations are concentrated towards the investment end of the economy's production possibilities frontier compared to the consumption end. Specifically, 31% of the sample shows positive covariance between firm earnings and aggregate investment while also exhibiting negative covariance with aggregate consumption. On the opposite side, 25% of the sample shows positive covariance between firm earnings and aggregate consumption while also exhibiting negative covariance with aggregate investment.

Overall, while one might expect that aggregate investment and consumption both affect firm-level earnings similarly, our analysis shows that each component exhibits a unique covariance with firm earnings.

[Insert Table 2 Here]

4. Determinants of proximity to the frontier ends

To analyze firms placed near each end of the economy's production possibilities frontier, we create two binary variables. The first, $FRONTIER^i_{j,Q}$, captures firms placed simultaneously close to (away from) the investment (consumption) end of the production possibilities frontier. $FRONTIER^i_{j,Q}$ equals 1 if firm j's $ePPF^i$ is in the 90th or higher percentile in quarter Q and firm j's $ePPF^c$ is at the 50th percentile or lower

[12] To recalculate the economic significance for aggregate investment, multiply the mean $\delta_{2i,Q}$ coefficient of 0.096 from Table 2 by the standard deviation of *invst* of 0.115 from Table 1, and multiply the result by 100 to convert to a percentage. Similarly, to recalculate the economic significance for aggregate consumption, multiply the mean $\delta_{3i,Q}$ coefficient of 0.141 from Table 2 by the standard deviation of *consm* of 0.023 in Table 1, and multiply the result by 100 to convert to a percentage.

in quarter Q, and 0 otherwise. Conversely, $FRONTIER^{c}_{j,Q}$ captures firms placed simultaneously close to (away from) the consumption (investment) end of the production possibilities frontier. $FRONTIER^{c}_{j,Q}$ equals 1 if firm j's $ePPF^{c}$ is in the 90th or higher percentile in quarter Q and firm j's $ePPF^{i}$ is at the 50th percentile or lower in quarter Q, and 0 otherwise.

We estimate separate logistic regressions of $FRONTIER^{i}_{j,Q}$ and $FRONTIER^{c}_{j,Q}$ on various firm characteristics that are likely associated with the firm's proximity to the frontier's ends as follows:

$$\begin{aligned}\mathbb{I}(\mathrm{FRONTIER}^{n})_{j,Q} = \alpha_0 + \alpha_1 CAPEX_{j,Q} + \alpha_2 INVCH_{j,Q} + \alpha_3 PRDCST_{j,Q} \\ + \alpha_3 TURNCH_{j,Q} + \alpha_4 TBN_{j,Q-1} + \varepsilon_{i,Q}\end{aligned} \tag{3}$$

where $CAPEX_Q$ is capital expenditures (scaled by total assets), $INVCH_Q$ is changes in inventory (scaled by total assets), $PRDCST_Q$ is production costs based on Roychowdhury (2006), $TURNCH_Q$ is change in asset turnover ratio measured as sales divided by total assets, and TBN_{Q-1} is investment opportunities measured as Tobin's Q.

Table 3 presents the results. In Table 3 column 1 with $FRONTIER^{i}_{j,Q}$ as the dependent variable, the coefficients on capital expenditures and investment opportunities are positive and statistically significant. These results suggest that increases in capital expenditures and more growth opportunities are associated with a greater likelihood of a firm being positioned towards the investment end of the economy's production possibilities frontier. In Table 3 column 2 with $FRONTIER^{c}_{j,Q}$ as the dependent variable, the coefficient on change in inventory is positive and statistically significant while the coefficient on growth opportunities is negative and statistically significant. These results suggest that increases in inventory and fewer growth opportunities are associated with a greater likelihood of a firm being positioned towards the consumption end. The coefficients on production costs are negative and statistically significant and the coefficients on change in asset turnover are positive and significant in both specifications. These results suggest that increases in asset turnover and decreases in production costs tend to result in polarized positions (either closer to the investment or consumption end), consistent with firms operating at either side of the frontier with higher operating efficiency and lower production costs.

[Insert Table 3 Here]

To formally test whether the probability of the firm being placed towards one side of the frontier (consumption) decreases as the probability that it is closer to the other end (investment) increases, we estimate a logistic regression of a dummy variable $ePPF^{c+}$ measured as 1 if $ePPF^{c} > 0$ and 0 otherwise on a dummy variable $ePPF^{i+}$ measured as 1 if $ePPF^{i} > 0$ and 0 otherwise. We control for the set of firm characteristics in equation (3). Specifically, we estimate the following logistic regression:

$$\mathbb{I}(ePPF^{c+})_{j,Q} = \kappa_0 + \kappa_1 \mathbb{I}\left(ePPF^{i+}\right)_{j,Q} + \alpha_1 CAPEX_{j,Q} + \alpha_2 INVCH_{j,Q} + \alpha_3 PRDCST_{j,Q} + \alpha_3 TURNCH_{j,Q} + \alpha_4 TBN_{j,Q-1} + \varepsilon_{i,Q} \tag{4}$$

Table 4 presents the results. The coefficient on $\mathbb{I}\left(ePPF^{i+}\right)_{j,Q}$ is -5.546 and is statistically significant at the 1 percent level. The results, consistent with H1, indicate that as the likelihood of a firm being positioned closer to the investment end of the economy's production possibilities frontier increases (decreases), the likelihood of it being positioned closer to the consumption end decreases (increases).

[Insert Table 4 Here]

Taken together, the results reinforce that the average firm’s earnings sensitivity to aggregate investment is significantly different from the average firm’s earnings sensitivity to aggregate consumption. More strikingly, we find that an individual firm whose earnings tends to be positively correlated with aggregate consumption is more likely to have earnings that are negatively correlated with aggregate investment. Overall, the results support H1, suggesting that firms make trade-off decisions about the mix of goods to produce and strategically place themselves along the economy’s production possibilities frontier.

5. Production Possibilities Frontier Positioning and Earnings Predictability

5.1 Main earnings results

In this section, we investigate whether a firm’s *ex-ante* position on the economy’s production possibilities frontier contains information about its future earnings. Specifically, we estimate the following cross-sectional regressions:

$$e_{j,Q} = \alpha + \gamma_1 e_{j,Q-1} + \gamma_2 invst\_surv_Q + \gamma_3 consm\_surv_Q + \gamma_4 ePPF^{gap}_{j,Q-2} + \delta_\tau IND_\tau + \varepsilon_{j,Q} \quad (5a)$$

$$e_{j,Q} = \alpha + \gamma_1 e_{j,Q-1} + \gamma_2 invst\_surv_Q + \gamma_3 consm\_surv_Q + \mu_4 ePPF^{i}_{j,Q-2} + \mu_5 ePPF^{c}_{j,Q-2} + \delta_\tau IND_\tau + \varepsilon_{j,Q} \quad (5b)$$

$ePPF^{gap}_{j,Q-2}$, $ePPF^{i}_{j,Q-2}$, and $ePPF^{c}_{j,Q-2}$ are the estimated covariances of firm *j*'s earnings growth in quarter Q-2.[13] $invst\_surv_Q$ ($consm\_surv_Q$) is the forecasted change in real aggregate investment (consumption) growth in quarter Q. Specifically, $invst\_surv_Q$ is the difference between (1) the real-time nowcast of aggregate real non-residential investment growth for quarter Q from the SPF and (2) the first release of actual aggregate real non-residential investment growth for Q-4 from the RTDS. Similarly, $consm\_surv_Q$ is the difference between (1) the real-time nowcast of aggregate real consumption growth for quarter Q from the SPF and (2) the first release of actual aggregate real consumption growth for Q-4 from the RTDS.[14] IND_τ denotes a vector of industry fixed effects.

Table 5 reports the results of both regression (5a) using the estimated covariance of firm earnings with the aggregate investment-to-consumption gap and regression (5b) using the estimated covariances of firm earnings with aggregate investment and aggregate consumption separately. First, consider the control variables. The coefficients on lagged firm-specific earnings are positive and statistically significant in both specifications suggesting that earnings are persistent (Lipe 1986, Kormendi and Lipe 1987, Collins and Kothari 1989). The coefficients on $invs\_surv_Q$ and $consm\_surv_Q$ are also positive and statistically significant in both specifications. These results suggest that, on average, firm-level earnings are positively associated with expectations of aggregate investment and consumption. Turning to the variables of interest, the coefficient on $ePPF^{gap}_{j,Q-2}$ in column 1 (regression 5a) is positive and statistically significant. This result

[13] As described in Section 3 and shown in Figure 3, we use firm-specific *ePPF*^{i} and *ePPF*^{c} estimates as of quarter *Q-2* to avoid look-ahead bias when estimating their predictive ability for firm earnings in quarter *Q*.
[14] If the *ex-ante* estimates of current-quarter aggregate investment and consumption growth are equal to actual releases of aggregate investment and consumption growth from the same quarter in the previous year (i.e., if the variables follow a seasonal random walk), then the differences between the nowcasts of the current quarter and the actual releases from the same quarter in the previous year capture aggregate investment and consumption news (or forecasted changes in aggregate investment and consumption growth rates).

suggests that firm earnings sensitivity to the investment-to-consumption gap contains information about future earnings. In column 2 (regression 5b), the coefficients on both $ePPF^{i}_{j,Q-2}$ and $ePPF^{c}_{j,Q-2}$ are positive and statistically significant. These results suggest that firm earnings sensitivities to aggregate investment and consumption are positively associated with future earnings (even after controlling for expectations about aggregate investment and consumption).[15]

Consistent with H2, the results suggest that a firm's *ex-ante* position on the economy's production possibilities frontier is associated with future firm performance. Notably, the coefficient on $ePPF^{i}_{j,Q-2}$ is larger than the coefficient on $ePPF^{c}_{j,Q-2}$, and the difference is statistically significant at the 1 percent level (untabulated using a Wald test). In other words, for the same increase in firm earnings sensitivity, an increase in firm earnings sensitivity to aggregate investment would result, on average, in greater future firm earnings compared to an increase in firm earnings sensitivity to aggregate consumption.

5.1 Earnings predictability conditional on the production possibilities frontier dynamics:

To gain further insights on firm performance, we examine whether firms' positionings on the frontier provide additional information about future earnings conditional on the economy frontier's dynamics. First, we consider whether the *ex-ante* firm positions towards investment and consumption have larger effects on future earnings conditional on the expected economy's position *along* the frontier for the current quarter. Specifically, we expand regression (5b) by including additional interaction terms as follows:

$$\begin{aligned} e_{j,Q} = \alpha + \mu_1 e_{j,Q-1} + \mu_2 invst\_surv_Q + \mu_3 consm\_surv_Q + \mu_4 ePPF^{i}_{j,Q-2} + \mu_5 ePPF^{c}_{j,Q-2} \\ + \mu_6 ePPF^{i}_{j,Q-2} \times invst\_surv_Q + \mu_7 ePPF^{c}_{j,Q-2} \times consm\_surv_Q + \delta_\tau IND_\tau + \varepsilon_{j,Q} \end{aligned} \quad (6)$$

A significant μ_6 (μ_7) in regression (6) suggests that the combined effect of the firm's position towards investment (consumption) and expected changes in investment (consumption) provides additional information about the firm's future earnings. That is, when macroeconomists release their expectations for investment and consumption, firms' ex-ante frontier positions matter in forecasting their performance.

[15] In an untabulated robustness check, we use total assets as an alternative scalar for earnings. Results (effectively using a year-over-year change in return on assets) are qualitatively similar.

Second, we consider whether the *ex-ante* firm positions towards investment and consumption have larger effects on future earnings conditional on *shifts* in the economy's production frontier attributable to technological shocks in investment and consumption, as reported by the Federal Reserve Bank of San Francisco. Technological innovations expand the frontier by boosting the productivity of specific factors of production (Acemoglu 2002), which is expected to influence firms' performance based on their relative allocations between investment and consumption. As indicated earlier in Figure 1, technological innovations (i.e., total factor productivity) that are investment-specific or consumption-specific shift the frontier. An investment-specific technology shock primarily influences the frontier's investment side, while a consumption-specific technology shock affects its consumption side. Therefore, we investigate whether firm positions towards investment and consumption have greater effects on future earnings conditional on these specific-technological shocks. Specifically, we estimate the following regressions:

$$\begin{aligned} e_{j,Q} = \alpha + \mu_1 e_{j,Q-1} + \mu_2 dTFP^i_{Q-2} + \mu_3 dTFP^c_{Q-2} + \mu_4 ePPF^i_{j,Q-2} + \mu_5 ePPF^c_{j,Q-2} \\ + \mu_6 ePPF^i_{j,Q-2} \times dTFP^i_{Q-2} + \mu_7 ePPF^c_{j,Q-2} \times cdTFP^c_{Q-2} + \delta_\tau IND_\tau + \varepsilon_{j,Q} \end{aligned} \tag{7}$$

$dTFP^i_{Q-2}$ is an investment-specific technology shock and $dTFP^c_{Q-2}$ is a consumption-specific technology shock. A significant μ_6 (μ_7) in regression (7) suggests that the combined effect of the firm's position towards investment (consumption) and the shift in the production frontier from its investment (consumption) side provides additional information about future firm earnings. That is, when the economy's frontier shifts due to technological changes, a firm's ex-ante positions predict its future earnings performance.

Table 6 reports the results of both regressions (6) and (7). The coefficients on both interaction terms $ePPF^i_{j,Q-2} \times invst\_surv_Q$ and $ePPF^c_{j,Q-2} \times consm\_surv_Q$ in column 1 (regression 6) are positive and statistically significant. These results suggest that the combined effect of expected aggregate investment (consumption) and the firm positioning towards investment (consumption) is significantly larger than their individual effects. In column 2 (regression 7), the coefficients on both $ePPF^i_{j,Q-2}$ and $ePPF^c_{j,Q-2}$ are positive and statistically significant. For the technology shocks, the coefficient on $dTFP^i_{Q-2}$ ($dTFP^c_{Q-2}$) is positive and statistically significant (insignificant), suggesting that, on average, firm-level earnings are more sensitive to shifts in the frontier from its investment end than its consumption end. Both interaction terms $ePPF^{i}_{j,Q-2} \times dTFP^{i}_{Q-2}$ and $ePPF^{c}_{j,Q-2} \times cdTFP^{c}_{Q-2}$ are positive and statistically significant. These results suggest that a firm's position towards the investment end of the frontier has a larger effect on future earnings when the production possibilities frontier shifts from its investment end. Similarly, a firm's position towards the consumption end of the frontier has larger effect on future firm earnings when the frontier shifts from its consumption end, despite the insignificant direct effect of consumption-specific technology shocks alone.

[Insert Table 6 Here]

Overall, these results contribute to the literature and are significant for capital market participants attempting to forecast a firm's future earnings. Our evidence suggests that when attempting to forecast earnings, the forecaster should consider the impact of the firm's frontier position on future earnings. Additionally, consulting macroeconomists' most recent forecasts of aggregate investment and consumption and accounting for shifts in the frontier are value added to the forecaster, as these factors combined with the firm's frontier position are incrementally associated with future firm earnings.

6. Production Possibilities Frontier Positioning and Return Predictability

6.1 Stock level cross-sectional regressions

Next, we test whether investors understand the implications of firm positionings on the economy's production possibilities frontier. Specifically, we estimate the following cross-sectional regressions:

$$\begin{aligned} CAR = \alpha &+ \varphi_1 invst\_surv_Q + \varphi_2 consm\_surv_Q \\ &+ \varphi_3 ePPF^{gap}_{j,Q-2} + \delta_\tau IND_\tau + \varepsilon \end{aligned} \tag{8a}$$

$$\begin{aligned} CAR = \alpha &+ \theta_1 invst\_surv_Q + \theta_2 consm\_surv_Q \\ &+ \theta_3 ePPF^{i}_{j,Q-2} + \theta_4 ePPF^{c}_{j,Q-2} + \delta_\tau IND_\tau + \varepsilon \end{aligned} \tag{8b}$$

CAR is the firm's cumulative abnormal return beginning the second day following the announcement of quarter *Q*'s SPF macro forecasts of aggregate investment and consumption through the day following the firm's announcement of its quarter Q earnings. We estimate abnormal returns relative to the Carhart (1997) four-factor Fama-French model (FF4FM). Details of estimation are in the Appendix.

Table 7 reports the results. The coefficient on $invs\_surv_Q$ ($consm\_surv_Q$) is positive but statistically insignificant (negative and statistically significant). These results suggest that investors may overreact to expected changes in consumption. The results of interest are the coefficient on $ePPF^{gap}_{j,Q-2}$ in column 1 (regression 8a) and the coefficients on $ePPF^{i}_{j,Q-2}$ and $ePPF^{c}_{j,Q-2}$ in column 2 (regression 8b). Each coefficient of interest is positive and statistically significant at the 1 percent level. These results suggest that a firm's *ex-ante* position on the production possibilities frontier (whether using a single measure of position or using positioning measures from both ends) is associated with future (risk-adjusted) returns consistent with a potential underreaction to the firm's frontier positioning.

[Insert Table 7 here]

The results are noteworthy because firms' positioning on the PPF as of quarter Q-2 can be estimated using publicly available information. Yet, the positions as of quarter Q-2 are associated with future abnormal returns. Our findings suggest that there may be a market inefficiency where information about firms' relative positions on the frontier is not fully incorporated, underscoring a new firm's "frontier premium." We examine this further using portfolio-level analysis in the next section.

6.2 Portfolio-level analysis

When publicly available information is associated with future returns, a natural question is whether the returns are the result of investors demanding compensation for systematic risk or failing to fully incorporate information content into prices. As such, we form portfolios to examine whether the association between a firm's positioning on the production possibilities frontier and future returns is rational given the risk of the firm or whether the market does not fully impound information about firms' positioning into prices. Specifically, we form portfolios by linking a firm's $ePPF^{i}$ and $ePPF^{c}$ at quarter Q with stock returns at the end of the second month of quarter Q+1. At that point, we measure the firm's $ePPF^{i}$ scaled by opening stock price for quarter Q. Then, we classify the firm as High (Low) with respect to aggregate investment if its scaled $ePPF^i$ is above (below) the 70th (30th) percentile of scaled $ePPF^i$ of the corresponding industry. Similarly, we measure the firm's $ePPF^c$ scaled by opening stock price for quarter Q, classifying it as High (Low) with respect to aggregate consumption if its scaled $ePPF^c$ is above (below) the 70th (30th) percentile of scaled $ePPF^c$ of the corresponding industry.[16] Finally, we buy or sell the stocks of the classified firms following a trading algorithm that takes into account the anticipated changes in aggregate investment and consumption during quarter Q.[17]

We develop two dynamic trading strategies, which we refer to as "with-news" and "against-news." The with-news strategy invests in the stocks of firms classified as High (Low) when the anticipated change in the respective aggregate is positive (negative). In contrast, the against-news strategy invests in the stocks of firms classified as Low (High) when the anticipated change in the respective aggregate is positive (negative). Accordingly, the strategies result in four possible combinations between economic states based on expected changes in the aggregates and the firm-quarter sensitivities. A zero-cost hedge portfolio buys stocks in the with-news portfolio and sells stocks in the against-news portfolio. We summarize the trading strategies and how we combine them to create the hedge portfolio in the Appendix.

Figure 4 plots the cumulative excess returns for the with-news and against-news strategies as well as a benchmark portfolio based on the S&P500 index. The results reveal that the with-news strategy outperforms the against-news strategy and that both strategies provide higher excess returns relative to the benchmark. For example, investing \$1 in the with-news (against-news) strategy at the beginning of the

[16] Industry membership is known to affect the firm sensitivity to macroeconomic conditions (e.g., O'Brien 1994). Therefore, we control for the firm's industry in our portfolio formation, which is also consistent with controlling for industry-specific effects in our regression analysis. We use two-digit Standard Industrial Classification (SIC) code to assign firm-quarter into industries.

[17] We center the equity portfolio analysis at the end of the second month of the quarter during which quarter Q earnings are announced (i.e., during quarter $Q+1$). At the end of the second month of quarter $Q+1$, the opening $ePPF^i$ and $ePPF^c$ for quarter Q, measured with data as of quarter $Q-1$, along with the macro nowcasts for investment and consumption growth for quarter Q released on the 45th day of quarter Q, are connected with monthly stock returns starting from the third month of quarter $Q+1$ and ending at the second month of quarter $Q+2$. For example, the $ePPF^i$ and $ePPF^c$ for Q2:1994, measured with data as of Q1:1994, along with the macro nowcasts for investment and consumption growth for Q2:1994, released on 15 May 1994 (i.e., the 45th day of Q2:1994) are linked to monthly stock returns starting from September 1994 (i.e., the third month of Q3:1994) to November 1994 (i.e., the second month of Q4:1994). There are 173,036 firm-month stock returns from September 1994 to August 2017 (276 months) available for the portfolio allocation.

trading algorithm in September 1994 yields $1,311 ($529) in August 2017. During the same period, a dollar invested in the benchmark yields only $201.

[Insert Figure 4 Here]

The results in Figure 4 do not indicate whether the performance of the with-news and against-news strategies are the result of compensation for systematic risk or the result of mispricing. Therefore, we next examine if the long-short hedge portfolio produces abnormal returns using standard time-series portfolio regressions from the asset pricing literature. Specifically, we regress the excess returns of the hedge portfolio on the typical factor-mimicking portfolios using six different factor models: the liquidity factor model (LIQM), the CAPM, the Fama-French three factor model (FF3FM), the Carhart (1997) Fama-French four-factor model (FF4FM), the Fama-French five-factor model (FF5FM), and the liquidity-augmented Fama-French five-factor model (LIQM&FF5FM).[18] If the long-short portfolio returns are fully explained by the risk factors, the alphas should be statistically insignificant.

Table 8 reports the results. The top part of the table shows the average monthly excess return on the long-short hedge strategy whereas the bottom part shows the results for the time-series hedge portfolio regressions for each asset pricing model. The results show that the excess return on the long-short hedge portfolio is 31 basis points per month and is statistically significant. The alphas in the asset pricing models are not fully absorbed by the risk factors. More specifically, the long-short portfolio produces statistically significant abnormal returns of 28, 28, 31, 27, 31, and 29 basis points per month under the LIQM, CAPM, FF3FM, FF4FM, FF5FM, and LIQM&FF5FM, respectively. The loadings on the risk factors are mostly insignificant except for the HML factor. The negative and significant coefficient on HML indicates that a zero-cost strategy buying stocks in the with-news portfolio and shorting stocks in the against-news portfolio has a negative exposure to value stocks.

[Insert Table 8 Here]

[18] The *t*-statistics in all time-series portfolio regressions are Newey-West adjusted for up to four lags. The number of lags is set to the integer part of $T^{0.25} \equiv 276^{0.25} \approx 4$.

We further examine the risk loadings of the long and short legs of the hedge portfolio to better understand the source of the abnormal returns. Specifically, we separately regress the excess returns of the with-news and against-news portfolios on the factor-mimicking portfolios. For brevity, we focus on the FF5FM and LIQM&FF5FM models because these models fit the cross-section of stock returns best (i.e., these models generated the highest adjusted R-squared values in the previous table). Table 9 reports the results. The average excess monthly return of the with-news strategy is 111 basis points and is statistically significant. The long-leg portfolio regressions produce statistically significant alphas equal to 26 and 25 basis points per month under the FF5FM and the LIQM&FF5FM, respectively. Turning to the short leg, the average monthly excess return of the against-news strategy is 80 basis points and is statistically significant. However, this premium disappears both in magnitude and significance when the risk factors are included. This indicates that the contrarian strategy that bets against expected changes in the aggregate investment and consumption is risky, and any returns to the strategy are compensation for bearing this risk.

[Insert Table 9 Here]

To summarize, the results suggest that the abnormal returns earned by the hedge portfolio are driven solely by the long positions and are not explained by existing risk factors. Overall, our results are inconsistent with existing rational risk-based explanations and are instead consistent with investors failing to fully incorporate the information content of the firm's position on the economy's production possibilities frontier into prices.

7. Robustness Checks

Our results show that firms' *ex-ante* positions on the economy's production possibilities frontier are associated with future firm earnings and abnormal returns. Even though we control for up to six risk factors in our returns analyses, we caveat that we can never completely rule out the possibility that the abnormal returns to the hedge portfolio are due to an omitted risk factor. First, the firm's position on the frontier may reflect information about risk in economic fundamentals that is not captured by the risk factors. Second, several predictors of stock returns can represent similar economic phenomena (Harvey et al. 2016).

Therefore, in an attempt to demonstrate that the information content of the firm's position on the production possibilities frontier is distinct, we perform multiple robustness checks.

First, we identify a set of relevant macroeconomic variables previously shown to predict stock returns including the Baker and Wurgler (2006) sentiment index, the Chicago Board Options Exchange volatility index, the Jurado et al. (2015) uncertainty measure, and the consumption-to-wealth ratio (Lettau and Ludvigson 2001). Next, we create firm-specific multifactor-conditioned stock betas with respect to each macroeconomic variable listed above following the approach in Bali et al. (2017). For example, for the Baker and Wurgler (2006) sentiment index, we estimate rolling time-series regressions over a 20-quarter window where the dependent variable is an individual firm's excess return (i.e., the firm's raw return less an estimate of the risk-free rate) and the independent variable is the Baker and Wurgler (2006) sentiment index in addition to all of the factors in the liquidity-augmented Fama-French five-factor model. The slope coefficient on the macroeconomic variable of interest (in this case the Baker and Wurgler 2005 sentiment measure) is known as a multifactor-conditioned stock beta.

Finally, we replicate the earnings predictability tests (in Table 5) and the returns predictability tests (in Table 7) augmented with either the additional macroeconomic variables or their associated multifactor-conditioned stock betas. Table 10 presents the results. Columns 1 and 2 of Panels A and B replicate the earnings predictability tests (i.e., regressions 5a and 5b) with the addition of the new macroeconomic control variables or their associated multifactor-conditioned stock betas. The coefficients on $ePPF_{j,Q-2}^{gap}$, $ePPF_{j,Q-2}^{i}$, and $ePPF_{j,Q-2}^{c}$ all remain positive and statistically significant in each specification. In other words, consistent with H2, the results continue to suggest that a firm's *ex-ante* position on the economy's production possibilities frontier help predict future firm earnings.

Similarly, Columns 3 and 4 of Panels A and B replicate the returns predictability tests (i.e., regressions 4a and 4b) after controlling for the macroeconomic variables or their associated multifactor-conditioned stock betas. The coefficients on $ePPF_{j,Q-2}^{gap}$, $ePPF_{j,Q-2}^{i}$, and $ePPF_{j,Q-2}^{c}$ all remain positive and statistically significant in each specification. Therefore, consistent with H2, the results continue to suggest that a firm's *ex-ante* position on the economy's production possibilities frontier predict future firm returns. Overall, the addition of the macro variables or the stock betas does not absorb the predictive power of the firm's frontier position for future earnings and returns.

[Insert Table 10 Here]

8. Conclusion

Economies, constrained by scarce resources and short-run technological limitations, inherently face a trade-off between consumption and investment. An economy that consumes more of its scarce resources has fewer resources available for investment (and vice versa). The production possibilities frontier represents the possible investment and consumption combinations assuming the economy is operating efficiently. At the micro level, firms also have finite resources and technological limitations and face uncertainty about the path that the macroeconomy will take. A firm's future performance will depend on how well the economy's allocation of resources between investment and consumption aligns with the type of goods it produces.

We estimate rolling time-series regressions of firm-level earnings on the aggregate investment-to-consumption gap or aggregate investment and aggregate consumption separately to estimate firms' positionings on the economy's production possibilities frontier. We find that the average firm's earnings sensitivity to aggregate investment is significantly different from the average firm's earnings sensitivity to aggregate consumption. We also find that certain firm characteristics are associated with firm placement on the economy's production possibilities frontier and that the probability that a firm is closer to one end of the frontier significantly decreases with the probability that a firm is closer to the other end. Next, we show that firms' *ex-ante* position on the economy's production possibilities frontier contains predictive power for future firm-level earnings and returns (even after controlling for professional macroeconomic forecasts of aggregate investment and aggregate consumption, among other factors). Finally, we connect firm positioning on the frontier to an investment strategy based on publicly available data and show that it yields abnormal returns. An implementable trading strategy based on firms' frontier positions earns abnormal returns of 3.24 percent per year. The abnormal returns persist after controlling for common proxies for systematic risk, other macroeconomic variables previously shown to be correlated with future returns, and multifactor-conditioned stock betas.

Overall, our results highlight the importance of applying economic theory and utilizing granularity within macroeconomic measures in future research to more accurately map associations with firm-level accounting outputs.

Appendix

Panel A: Main Variables	
$EA^{Q}_{j,d}$	Earnings announcement date for firm j in quarter Q no later than two days before the end of the second month of the next quarter.
MF^{Q}_{d}	Aggregate investment and consumption macro forecasts announcement date in quarter Q on the 45^{th} day after the start of the same quarter.
$e_{j,Q}$	Seasonally adjusted earnings for firm j in quarter Q estimated as the year-over-year change in profit margin (i.e., COMPUSTAT: IBQ / SALEQ).
$invst\_consm^{gap}_{Q}$	Seasonally adjusted investment-consumption growth gap in quarter Q estimated as the year-over-year change in aggregate real non-residential investment growth minus the year-over-year change in aggregate real consumption growth, both from the first releases of the Federal Reserve Bank of Philadelphia.
$invst_{Q}$	Seasonally adjusted investment growth in quarter Q estimated as the year-over-year change in aggregate real non-residential investment growth, from the first release of the Federal Reserve Bank of Philadelphia.
$consm_{Q}$	Seasonally adjusted consumption growth in quarter Q estimated as the year-over-year change in aggregate real consumption growth, from the first release of the Federal Reserve Bank of Philadelphia.
$ePPF^{gap}_{j,Q}$	Covariance of a firm's earnings growth with the aggregate investment-consumption gap. For each firm j in quarter Q, $ePPF^{gap}_{j,Q}$ is the loading on the investment-consumption gap from rolling time-series regressions of earnings growth on the gap between investment and consumption growth over a 20-quarter fixed window while controlling for lagged earnings growth.
$ePPF^{i}_{j,Q}$	Covariances of a firm's earnings growth with the aggregate investment. For each firm j in quarter Q, $ePPF^{i}_{j,Q}$ is the loading on investment from rolling time-series regressions of earnings growth on investment and consumption growth over a 20-quarter fixed window while controlling for lagged earnings growth.
$ePPF^{c}_{j,Q}$	Covariances of a firm's earnings growth with the aggregate consumption. For each firm j in quarter Q, $ePPF^{c}_{j,Q}$ is the loading on consumption from rolling time-series regressions of earnings growth on investment and consumption growth over a 20-quarter fixed window while controlling for lagged earnings growth.
$invst\_surv_{Q}$	Expected change in investment growth in quarter Q estimated as the difference between the macro forecast for aggregate real non-residential investment growth for the current quarter (i.e., the investment nowcast), made available at MF^{Q}_{d}, and the first release of actual aggregate real non-residential investment growth for the same quarter a year ago. The macro forecast data is from the Survey of Professional Forecasters (SPF).
$consm\_surv_{Q}$	Expected change in consumption growth in quarter Q estimated as the difference between the macro forecast for aggregate real consumption growth for the current quarter (i.e., the consumption nowcast), made available at MF^{Q}_{d}, and the first release of actual aggregate real consumption growth for the same quarter a year ago. The macro forecast data is from the Survey of Professional Forecasters (SPF).

$CAR_{j,Q}$	Cumulative abnormal returns for firm j estimated for a daily window starting from the second day following the announcement of quarter Q macro forecasts of investment and consumption, i.e., MF^Q_{d+2}, through the day following the firm's announcement of its quarter Q earnings, i.e., $EA^Q_{j,d+1}$. We estimate abnormal returns relative to the Carhart (1997) four-factor Fama-French model (FF4FM) using daily excess returns (in excess of the risk-free rate; r_j) over a 365-day pre-window which ends a day before MF^Q_{d+2}, provided that at least 60% of the pre-window daily excess returns are non-missing. The window cumulative abnormal returns are the cumulated window daily excess returns minus their predicted returns based on the pre-window intercept (α_j) and factor loadings ($\beta_{j,m}$), and the window daily factor returns (r_m): $$CAR_{j,Q} \Rightarrow CAR^{EA^Q_{j,d+1}}_{MF^Q_{d+2}} = \sum_{t=MF^Q_{d+2}}^{EA^Q_{j,d+1}} r_j - \left(\alpha_i - \sum_{m=1}^{M=4} \beta_{j,m} \times r_m\right)$$ Where $r_{j,t}$ is the log excess return of stock j on window day t; α_i is the intercept and β_j is the m-factor loading, estimated from the M-factor model of expected returns in the pre-window period where M=m=1 to 4 for the FF4FM and; $r_{m,t}$ is the log return on the m-factor of the M-factor model of expected returns on window day t. All daily excess stock returns are defined by subtracting the daily risk-free rate, obtained from WRDS's daily frequency Fama-French library.
Panel B: Control Variables	
$CAPEX_{i,Q}$	Capital expenditure for firm i in quarter Q estimated as capital expenditure over total assets. Capital expenditure, CAPEXY, is a year-to-date value in COMPUSTAT. For the second through fourth quarters, we subtract the previous-quarter CAPEXY from the current-quarter CAPEXY to compute capital expenditures during the quarter. We assign zero, if the difference value is negative. We then scale capital expenditure by total assets, ATQ.
$INVCH_{i,Q}$	Change in inventory for firm i in quarter Q estimated as change in total inventory over total assets (i.e., COMPUSTAT: INVTQ/ATQ).
$PRDCST_{i,Q}$	Production costs for firm i in quarter Q estimated as production costs over total assets. We measure production costs consistent with Roychowdhury (2006) as cost of goods sold plus change in total inventory (i.e., COMPUSTAT: COGSQ + change in INVTQ).
$TURNCH_{i,Q}$	Change in sales' turnover for firm i in quarter Q estimated as the change in sales over total assets (i.e., COMPUSTAT: SALEQ/ATQ).
$TBNQ_{i,Q}$	The opening Tobin's Q for firm i in quarter Q estimated as market value, MKVALTQ, plus total assets, ATQ, less book equity (BEQ) and then scale by total assets, ATQ.
Panel C: Systematic Risk Factors	
LIQ	The Pastor and Stambaugh (2003) traded liquidity factor in monthly frequency, obtained from the Fama-French Portfolios and Factors library on WRDS.
MKT	The monthly excess return on the market, obtained from Professor Kenneth French's webpage.
SMB	The monthly return on the Small-minus-Big Fama and French (1993) risk factor, obtained from Professor Kenneth French's webpage.
HML	The monthly return on the High-minus-Low Fama and French (1993) risk factor, obtained from Professor Kenneth French's webpage.
MOM	The Carhart (1997) momentum factor in monthly frequency, obtained from the Fama-French Portfolios and Factors library on WRDS.
RMW	The monthly return on the Robust-minus-Weak (profitability) Fama and French (2015) risk factor, obtained from Professor Kenneth French's webpage.
CMA	The monthly return on the Conservative-minus-Aggressive (investing) Fama and (2015) risk factor, obtained from Professor Kenneth French's webpage.
Panel D: Additional macro variables	
snt_Q	The sentiment index of Baker and Wurgler (2006) in quarter Q. We obtain the monthly series of investor sentiment, which is orthogonalized to other macroeconomic effects, from Professor Jeffrey Wurgler's webpage. We compute the value for the quarter by aggregating the monthly values using a three-month average.
vxo_Q	The Chicago Board Options Exchange volatility index in quarter Q. We obtain the monthly values from the Federal Reserve Bank of St. Louis. We compute the value for the quarter by aggregating the monthly values using a three-month average.

unc_Q	The economic uncertainty index of Jurado et al. (2015) in quarter Q. We obtain the one-month-ahead economic uncertainty index from Professor Sydney Ludvigson's webpage. We compute the value for the quarter by aggregating the monthly economic uncertainty index values using a three-month average.
cay_Q	The consumption-wealth ratio of Lettau and Ludvigson (2001a) in quarter Q, obtained from Professor Martin Lettau's webpage.

Panel E: Trading Algorithm

This is a summary of the dynamic strategies that use the investment and consumption earnings-covariances – with-news and against-news – and the corresponding long/short hedge portfolio:

	Expected change in investment growth in Q	Expected change in consumption growth in Q	Scaled $ePPF^i$ assigned to Q	Scaled $ePPF^c$ assigned to Q
Buy with-news strategy	Positive	Positive	High covariance	High covariance
Sell against-news strategy			Low covariance	Low covariance
Buy with-news strategy	Positive	Negative	High covariance	Low covariance
Sell against-news strategy			Low covariance	High covariance
Buy with-news strategy	Negative	Positive	Low covariance	High covariance
Sell against-news strategy			High covariance	Low covariance
Buy with-news strategy	Negative	Negative	Low covariance	Low covariance
Sell against-news strategy			High covariance	High covariance

References

Abdalla, A.M., and J.M. Carabias. 2022. From Accounting to Economics: The Role of Aggregate Special Items in Gauging the State of the Economy. *The Accounting Review* 97: 1-27.

Acemoglu, D. 2002. Directed Technical Change. *The Review of Economic Studies* 69: 781-809.

Baker, M., and J. Wurgler. 2006. Sentiment and the Cross-Section of Stock Returns. *The Journal of Finance* 61: 1645-1680.

Ball, R.T., L. Gallo, and E. Ghysels. 2019. Tilting the Evidence: The Role of Firm-Level Earnings Attributes in the Relation Between Aggregated Earnings and Gross Domestic Product. *Review of Accounting Studies* 24: 570-592.

Ball, R., G. Sadka, and A. Tseng. 2022. Using Accounting Earnings and Aggregate Economic Indicators to Estimate Firm-Level Systematic Risk. *Review of Accounting Studies* 27: 607-646.

Binz, O. 2022. Managerial Response to Macroeconomic Uncertainty: Implications for Firm Profitability. *The Accounting Review* 97: 89-117.

Binz, O., W.J. Mayew, and S. Nallareddy. 2022. Firms' Response to Macroeconomic Estimation Errors. *Journal of Accounting and Economics* 73: 1-22.

Bonsall IV, S.B., Z. Bozanic, and P.E. Fischer. 2013. What Do Management Earnings Forecasts Convey About the Macroeconomy? *Journal of Accounting Research* 51: 225-266.

Brown, P., and R. Ball. 1967. Some Preliminary Findings on the Association Between the Earnings of a Firm, Its Industry, and the Economy. *Journal of Accounting Research* 5: 55-77.

Carabias, J.M. 2018. The Real-Time Information Content of Macroeconomic News: Implications for Firm-Level Earnings Expectations. *Review of Accounting Studies* 23: 136-166.

Carhart, M.M. 1997. On Persistence in Mutual Fund Performance *Journal of Accounting Research* 52: 57-82.

Chen, X, Y. H. Cho, Y. Dou, and B. Lev. 2022. Predicting Future Earnings Changes Using Machine Learning and Detailed Financial Data. *Journal of Accounting Research* 60: 467-515.

Chordia, T., and L. Shivakumar. 2005. Inflation Illusion and Post-Earnings Announcement Drift. *Journal of Accounting Research* 43: 521-556.

Collins, D. W., and S. P. Kothari. 1989. An Analysis of Intertemporal And Cross-Sectional Determinants Of Earnings Response Coefficients. *Journal of Accounting and Economics* 11: 143-181.

Crawford, S., G. Markarian., V. Muslu, and R. Price. 2021. Oil prices, Earnings, and Stock returns. *Review of Accounting Studies*, *26*: 218-257.

Crawley, M.J. 2015. Macroeconomic Consequences of Accounting: The Effect of Accounting Conservatism on Macroeconomic Indicators and the Money Supply. *The Accounting Review* 90: 987-1011.

Ellahie, A. 2021. Earnings Beta. *Review of Accounting Studies* 26: 81-122.

Goodman, T. H., M. Neamtiu, N. Shroff, and H. D. White. 2014. Management Forecast Quality and Capital Investment Decisions. *The Accounting Review* 89: 331-365.

Fernald, J., R. Inklaar, and D. Ruzic. 2024. The productivity slowdown in advanced economies: common shocks or common trends?. *Review of Income and Wealth*, forthcoming.

Ferreira, Miguel A., and Pedro Santa-Clara. 2011. Forecasting Stock Market Returns: The Sum of The Parts is More Than the Whole. *Journal of Financial Economics* 100: 514-537.

Haberler, G.V. 1936. *The Theory of International Trade*. William Hodge.

Harvey, C.R., Y. Liu, and H. Zhu. 2016. … and the Cross-Section of Expected Returns. *Review of Financial Studies* 29: 5-68.

Heitzman, S., and M. Huang. 2019. Internal Information Quality and The Sensitivity of Investment to Market Prices and Accounting Profits. *Contemporary Accounting Research* 36: 1699-1723.

Hirshleifer, D., J. Li, and J. Yu. 2015. Asset Pricing in Production Economies with Extrapolative Expectations. *Journal of Monetary Economics* 76: 87-106.

Konchitchki, Y., and P.N. Patatoukas. 2014. Accounting Earnings and Gross Domestic Product. *Journal of Accounting and Economics* 57: 76-88.

Kormendi, R., and R. Lipe. 1987. Earnings Innovations, Earnings Persistence, and Stock Returns. *Journal of Business*: 323-345.

Jackson, A. B., B. R. Rountree and K. Sivaramakrishnan. 2017. Earnings Co-movements and Earnings Manipulation. *Review of Accounting Studies 22*: 1340-1365.

Jackson, A. B., M. A. Plumlee and B. R. Rountree. 2018. Decomposing the Market, Industry, And Firm Components of Profitability: Implications for Forecasts of Profitability. *Review of Accounting Studies 23*: 1071-1095.

Jurado, K., S.C. Ludvigson, and S. Ng. 2015. Measuring Uncertainty. *American Economic Review* 105: 1177-1216.

Lettau, M., and S. Ludvigson. 2001. Consumption, Aggregate Wealth, and Expected Stock Returns. *The Journal of Finance* 56: 815-849.

Li, N., S. Richardson, and I. Tuna. 2014. Macro to Micro: Country Exposures, Firm Fundamentals, and Stock Returns. *Journal of Accounting and Economics* 58: 1-20.

Lipe, R. 1986. The Information Contained in The Components Of Earnings. *Journal of Accounting Research*: 37-64.

Moore, J., and M. Velikov. 2024. Oil Price Exposure and the Cross-Section of Stock Returns. *The Review of Asset Pricing Studies*: 14: 274-309.

Neely, C. J., D. E. Rapach, J. Tu, and G. Zhou. 2014. Forecasting the equity risk premium: the role of technical indicators. *Management science* 60: 1772-1791.

O'Brien, P.C. 1994. Corporate Earnings Forecasts and the Macroeconomy. Working Paper.

Richardson, J. D. Income Inequality and Trade: How to Think, What to Conclude. *Journal of Economic Perspectives* 9: 33-55.

Roychowdhury, S. 2006. Earnings Management Through Real Activities Manipulation. *Journal of Accounting and Economics* 42: 335-370.

Shivakumar, L., and O. Urcan. 2017. Why Does Aggregate Earnings Growth Reflect Information About Future Inflation? *The Accounting Review* 92: 247-276.

Figure 1: Production Possibilities Frontier of investment and consumption.

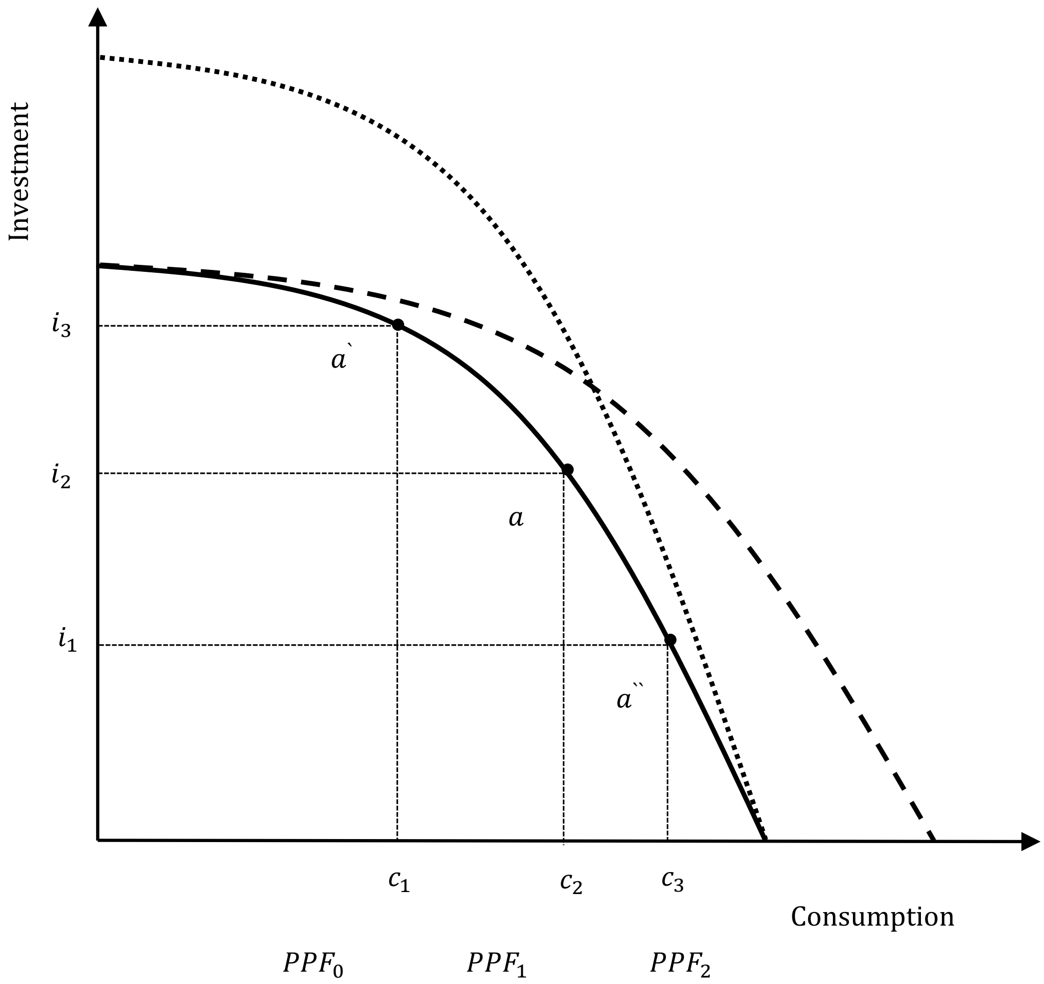
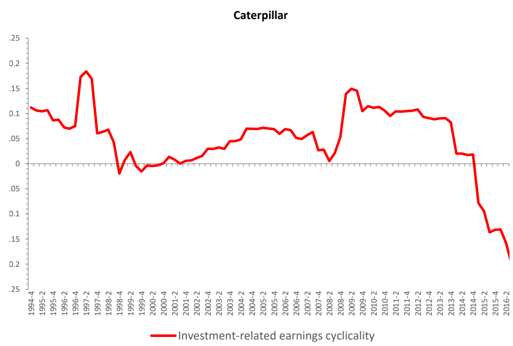
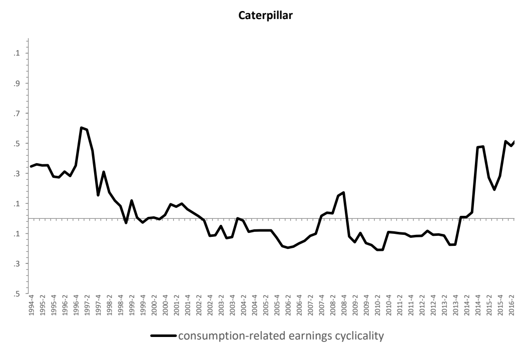


Figure 1 illustrates a classic macroeconomic Production Possibilities Frontier (PPF), highlighting the tradeoff between consumption (the horizontal axis) and investment (the vertical axis).

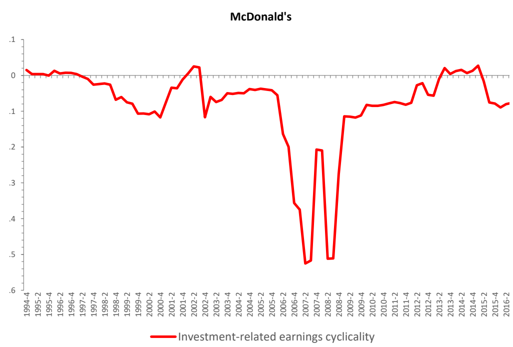
Figure 2: Earnings growth covariances across selected firms.



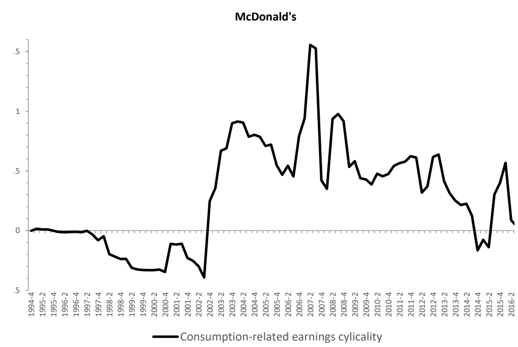
Panel A: Caterpillar's $ePPF^i$.



Panel A': Caterpillar's $ePPF^c$.



Panel B: McDonald's $ePPF^i$.



Panel B': McDonald's $ePPF^c$.

Figure 2 shows the covariance of a firm's earnings growth with growth in aggregate investment ($ePPF^i$; left-hand-side) and aggregate consumption ($ePPF^c$, right-hand-side). Caterpillar manufactures construction and mining equipment and has a line of apparel, and McDonald's franchises and operates McDonald's restaurants.

Figure 3: Timeline for key variable measurement.

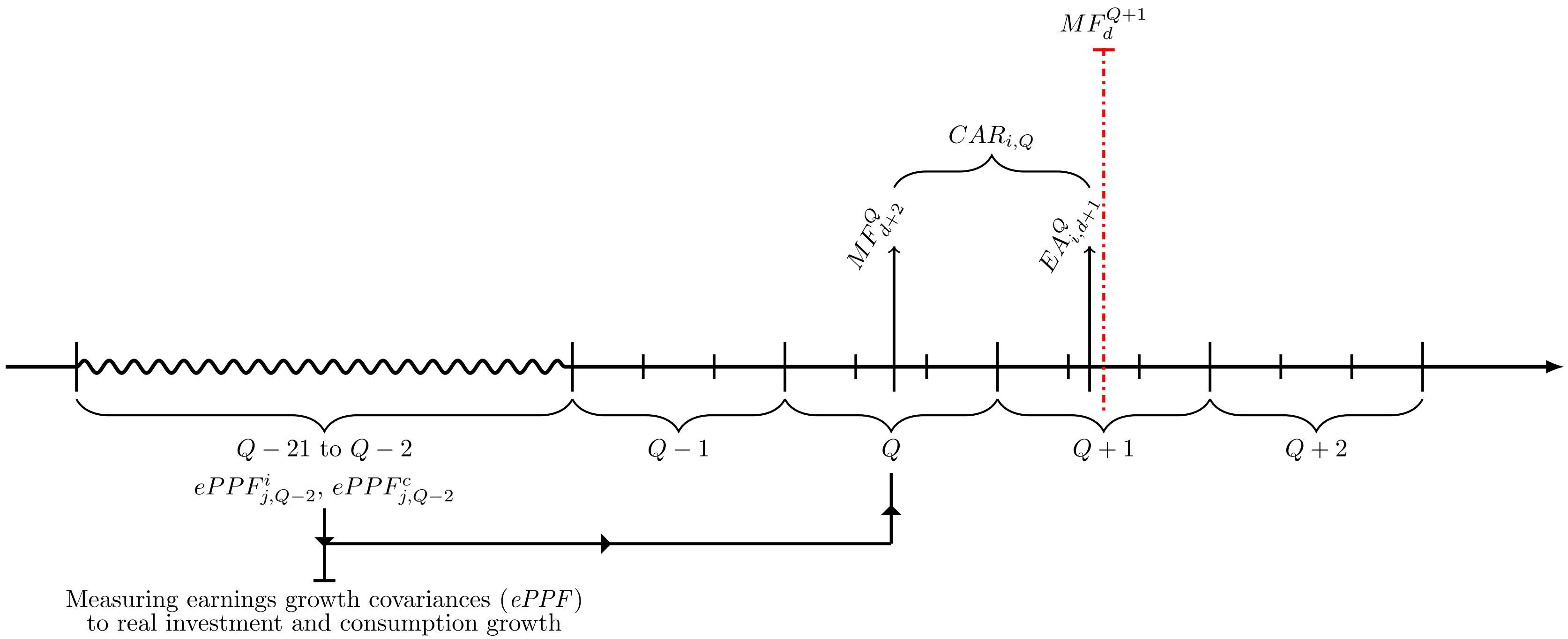


Figure 3 illustrates the research design timeline for our main variables.

Figure 4: Cumulative excess returns of trading strategies based on earnings growth covariances.

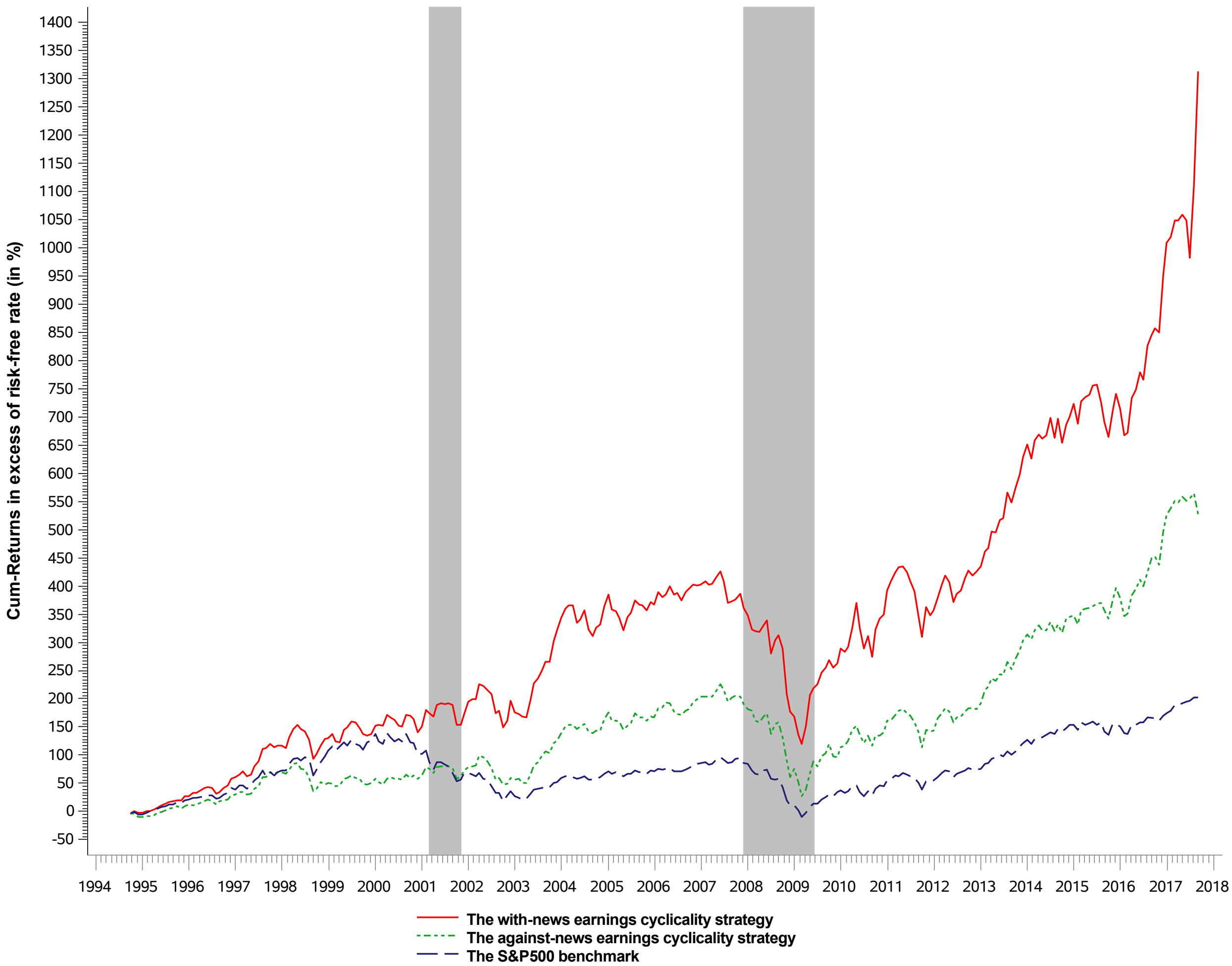


Figure 4 shows the cumulative excess returns of trading strategies that are based on firms' earnings growth covariances with growth in aggregate investment and consumption. The solid line represents the with-news strategy, the short-dashed line represents the against-news strategy, and the long-dashed line represents the S&P500 benchmark. The shaded areas correspond to the National Bureau of Economic Research (NBER) recessions. The sample is from June 1994 to March 2017. The appendix outlines the formation of the trading strategies.

Table 1: Descriptive statistics.

Panel A: Descriptive statistics.

Variable	Firm-Quarters/Quarters	Mean	St. Deviation	Min	1%-pct	25%-pct	Median	75%-pct	99%-pct	Max
$e_{j,Q}$	58,038	−0.004	0.160	−4.592	−0.434	−0.020	0.001	0.020	0.362	4.802
$CAR_{j,Q}$	58,038	0.008	0.149	−0.747	−0.340	−0.071	−0.002	0.072	0.486	1.817
$invst\_consm^{gap}_{Q-2}$	92	−0.005	0.110	−0.365	−0.365	−0.060	−0.013	0.063	0.405	0.405
$invst_{Q-2}$	92	−0.005	0.115	−0.353	−0.353	−0.059	−0.010	0.055	0.419	0.419
$consm_{Q-2}$	92	−0.001	0.023	−0.061	−0.061	−0.016	−0.001	0.014	0.065	0.065
$invst\_surv_{Q}$	92	0.005	0.089	−0.204	−0.204	−0.058	0.006	0.050	0.393	0.393
$consm\_surv_{Q}$	92	−0.005	0.019	−0.062	−0.062	−0.014	−0.005	0.004	0.048	0.048

Panel B: Pearson/Spearman correlations.

	$e_{j,Q}$	$CAR_{j,Q}$	$invst\_consm^{gap}_{Q-2}$	$invst_{Q-2}$	$consm_{Q-2}$	$invst\_surv_{Q}$	$consm\_surv_{Q}$
$e_{j,Q}$	1	0.035***	0.061***	0.077***	0.078***	0.132***	0.100***
$CAR_{j,Q}$	0.028***	1	−0.013***	−0.013***	−0.010**	−0.001	−0.001
$invst\_consm^{gap}_{Q-2}$	0.038***	−0.014***	1	0.962***	0.065***	0.259***	−0.036***
$invst_{Q-2}$	0.047***	−0.019***	0.980***	1	0.279***	0.328***	−0.010**
$consm_{Q-2}$	0.053***	−0.027***	0.111***	0.308***	1	0.313***	0.211***
$invst\_surv_{Q}$	0.117***	0.001	0.266***	0.347***	0.453***	1	0.366***
$consm\_surv_{Q}$	0.102***	−0.016***	−0.059***	−0.016***	0.196***	0.368***	1

Table 1 reports summary statistics for key variables. Panel A shows the descriptive statistics and Panel B shows the Pearson/Spearman correlations. [*], [**], and [***] indicate significance at 10%, 5%, and 1%, respectively. The variables are defined in the appendix.

Table 2: Estimation of firm frontier's positioning.

	[1]	[2]
Dependant: $e_{j,Q}$		
α	0.001	0.001***
	(1.57)	(3.09)
$e_{j,Q-1}$	0.240***	0.249***
	(45.59)	(36.46)
$invst\_consm_Q^{gap}$	0.109***	
	(9.25)	
$invst_Q$		0.096***
		(9.55)
$consm_Q$		0.141***
		(5.76)
$Adj.\,R^2$	14.4%	17.5%
Firm-Quarters (Obs.)	58,038	58,038
Quarters	Q4:1993 to Q3:2016	Q4:1993 to Q3:2016

Table 2 reports the means of time-series regressions of earnings growth, run at the firm level. For each firm, we regress earnings growth ($e_{j,Q}$) on past earnings growth ($e_{j,Q-1}$) and on the aggregate investment-consumption gap ($invst\_consm_Q^{gap}$) and, separately, on investment and consumption growth ($invst_Q$ and $consm_Q$, respectively), over a rolling 20-quarter fixed window. We label the estimated covariance of a firm's earnings growth with the aggregate investment-consumption gap as $ePPF_{j,Q}^{gap}$, and the covariance with aggregate investment (consumption) growth as $ePPF_{j,Q}^{i}$ ($ePPF_{j,Q}^{c}$). t-statistics of two-tailed tests are in parentheses. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. The variables are defined in the appendix.

Table 3: Determinants of proximity to the frontier ends.

	[1]	[2]
Dependant:	$\|(FRONTIER^i)_{j,Q}$	$\|(FRONTIER^c)_{j,Q}$
α_j	-2.690^{***}	-2.472^{***}
	(-87.58)	(-62.55)
$CAPEX_{j,Q}$	8.460^{***}	-0.267
	(7.68)	(-0.16)
$INVCH_{j,Q}$	0.311	2.659^{**}
	(0.32)	(2.40)
$PRDCST_{j,Q}$	-2.061^{***}	-3.166^{***}
	(-12.48)	(-15.25)
$TURNCH_{j,Q}$	1.363^{**}	2.119^{***}
	(2.31)	(2.87)
$TBNQ_{j,Q}$	0.037^{***}	-0.055^{***}
	(2.88)	(-2.67)
Robust std. errors:	YES	YES
χ^2	176.1	294.6
Obs.	56,093	56,093

Table 3 reports the results of a logistic model which examines the corporate positioning closer to one end of the frontier as a function of a set of firm characteristics. The dependent variable in the first (second) column is defined as one if the covariance of a firm's earnings growth to investment (consumption) growth is at or above the 90^{th} percentile of the quarterly distribution of investment (consumption) growth covariances, and the covariance of the firm's earnings growth to consumption (investment) growth is below the 50^{th} percentile of the quarterly distribution of consumption (investment) growth covariances. The firm-specific controls are capital expenditure ($CAPEX_{j,Q}$), change in total inventory ($INVCH_{j,Q}$), production costs ($PRDCST_{j,Q}$), change in revenue turnover ($TURNCH_{j,Q}$), and start-of-period Tobin's Q ($TBNQ_{j,Q}$). t-statistics are in parentheses and based on robust standard errors. [*], [**], and [***] indicate significance at 10%, 5%, and 1%.

Table 4: Firm positioning: consumption versus investment.

Dependant:	$ePPF^{c+}_{j,Q}$
α_j	0.756***
	(36.77)
$ePPF^{i+}_{j,Q}$	−5.546***
	(−30.58)
$CAPEX_{j,Q}$	−6.316***
	(−9.03)
$INVCH_{j,Q}$	0.424
	(0.86)
$PRDCST_{j,Q}$	−0.262***
	(−4.45)
$TURNCH_{j,Q}$	0.261
	(1.12)
$TBNQ_{j,Q}$	−0.052***
	(−6.77)
Robust std. errors:	YES
χ^2	1141.0
Obs.	56,093

Table 4 reports the results of a logistic regression examining the probability of a firm being positioned towards one side of the frontier (consumption) as a function of its positioning towards the other side (investment) and firm characteristics. The dependent variable is defined as one if the covariance of a firm's earnings growth to consumption growth is positive ($ePPF^{c+}_{j,Q}$). This is regressed on another dummy variable that takes the value of one if the covariance of a firm's earnings growth to investment growth is positive ($ePPF^{i+}_{j,Q}$). The firm-specific controls are capital expenditure ($CAPEX_{j,Q}$), change in total inventory ($INVCH_{j,Q}$), production costs ($PRDCST_{j,Q}$), change in revenue turnover ($TURNCH_{j,Q}$), and start-of-period Tobin's Q ($TBNQ_{j,Q}$). t-statistics are in parentheses and based on robust standard errors. [*], [**], and [***] indicate significance at 10%, 5%, and 1%.

Table 5: Firm frontier's positioning and earnings predictability.

	[1]	[2]
Dependant: $e_{j,Q}$		
α_j	-0.003^{***}	-0.003^{***}
	(-6.04)	(-6.96)
$e_{j,Q-1}$	0.180^{***}	0.180^{***}
	(10.63)	(10.57)
$invst\_surv_Q$	0.128^{***}	0.127^{***}
	(11.80)	(11.72)
$consm\_surv_Q$	0.528^{***}	0.523^{***}
	(9.15)	(9.12)
$ePPF^{gap}_{j,Q-2}$	0.015^{***}	
	(7.72)	
$ePPF^{i}_{j,Q-2}$		0.017^{***}
		(7.70)
$ePPF^{c}_{j,Q-2}$		0.002^{***}
		(3.53)
Industry fixed effects:	YES	YES
Firm-clustered st. errors::	YES	YES
Adj. R^2	4.9%	5.0%
Obs.	58,038	58,038

Table 5 reports regressions of earnings forecasts. We regress current earnings growth ($e_{j,Q}$), on lagged earnings growth ($e_{j,Q-1}$), expected changes in investment and consumption growth ($invst\_surv_Q$ and $consm\_surv_Q$, respectively), and the lagged covariance of a firm's earnings growth with the aggregate investment-consumption gap ($ePPF^{gap}_{j,Q-2}$), or the lagged covariances of a firm's earnings growth with the aggregate investment and consumption growths ($ePPF^{i}_{j,Q-2}$ and $ePPF^{c}_{j,Q-2}$, respectively). All regressions control for industry fixed effects. t-statistics are in parentheses and cluster-adjusted at the firm level. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. The variables are defined in the appendix.

Table 6: Firm positioning conditional on frontier's dynamics and earnings predictability.

Dependant: $e_{j,Q}$	[1]	[2]
α_j	-0.003^{***}	-0.005^{***}
	(-6.89)	(-10.01)
$e_{j,Q-1}$	0.149^{***}	0.188^{***}
	(7.51)	(11.14)
$dTFP^i_{Q-2}$		0.373^{**}
		(2.57)
$dTFP^c_{Q-2}$		0.118
		(0.66)
$ePPF^i_{j,Q-2}$	0.008^{***}	0.018^{***}
	(4.10)	(8.26)
$ePPF^c_{j,Q-2}$	0.002^{***}	0.003^{***}
	(3.55)	(3.92)
$ePPF^i_{j,Q-2}\times dTFP^i_{Q-2}$		0.404^{**}
		(2.38)
$ePPF^c_{j,Q-2}\times dTFP^c_{Q-2}$		0.189^{***}
		(2.73)
$invst\_surv_Q$	0.089^{***}	
	(10.62)	
$consm\_surv_Q$	0.527^{***}	
	(8.98)	
$ePPF^i_{j,Q-2}\times invst\_surv_Q$	0.331^{***}	
	(9.94)	
$ePPF^c_{j,Q-2}\times invst\_surv_Q$	0.245^{***}	
	(3.47)	
Industry fixed effects:	YES	YES
Firm-clustered st. errors::	YES	YES
Adj. R^2	6.5%	4.0%
Obs.	58,038	58,038

Table 6 reports regressions of earnings forecasts. The first column tabulates the results of a regression of current earnings growth ($e_{j,Q}$), on lagged earnings growth ($e_{j,Q-1}$), lagged covariances of a firm's earnings growth with the aggregate investment and consumption growth ($ePPF^i_{j,Q-2}$ and $ePPF^c_{j,Q-2}$, respectively), expected changes in investment and consumption growth ($invst\_surv_Q$ and $consm\_surv_Q$, respectively), and the products of covariances and with the aggregate news ($ePPF^i_{j,Q-2}\times invst\_surv_Q$ and $ePPF^c_{j,Q-2}\times invst\_surv_Q$, respectively). The second column tabulates the results of a regression of current earnings growth ($e_{j,Q}$), on lagged earnings growth ($e_{j,Q-1}$), lagged investment-specific and consumption-specific technology shocks ($dTFP^i_{Q-2}$ and $dTFP^c_{Q-2}$, respectively), lagged covariances of a firm's earnings growth with the aggregate investment and consumption growth ($ePPF^i_{j,Q-2}$ and $ePPF^c_{j,Q-2}$, respectively), and the products of covariances with the technology shocks ($ePPF^i_{j,Q-2}\times dTFP^i_{Q-2}$ and $ePPF^c_{j,Q-2}\times dTFP^c_{Q-2}$, respectively). All regressions control for industry fixed effects. t-statistics are in parentheses and cluster-adjusted at the firm level. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. The variables are defined in the appendix.

Table 7: Firm positioning and return predictability.

Dependant: $CAR_{j,Q}$	[1]	[2]
α_j	0.006***	0.006***
	(13.20)	(13.00)
$invst\_surv_Q$	0.011	0.011
	(1.31)	(1.27)
$consm\_surv_Q$	−0.158***	−0.160***
	(−4.19)	(−4.24)
$ePPF^{gap}_{j,Q-2}$	0.006***	
	(4.60)	
$ePPF^{i}_{j,Q-2}$		0.007***
		(4.69)
$ePPF^{c}_{j,Q-2}$		0.001**
		(2.32)
Industry fixed effects:	YES	YES
Firm-clustered st. errors::	YES	YES
$Adj. R^2$	0.1%	0.2%
Obs.	58,038	58,038

Table 7 reports regressions of cumulative abnormal returns. We regress firm-level cumulative abnormal returns ($CAR_{j,Q}$), on expected changes in investment and consumption growth ($invst\_surv_Q$ and $consm\_surv_Q$, respectively), and the lagged covariance of a firm's earnings growth with the aggregate investment-consumption gap ($ePPF^{gap}_{j,Q-2}$), or the lagged covariances of a firm's earnings growth with the aggregate investment and consumption growths ($ePPF^{i}_{j,Q-2}$ and $ePPF^{c}_{j,Q-2}$, respectively). All regressions control for industry fixed effects. t-statistics are in parentheses and cluster-adjusted at the firm level. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. The variables are defined in the appendix.

Table 8: Hedge returns to firm frontier's positioning: Risk or mispricing?

	Hedge Portfolio	**Hedge Portfolio**	**Hedge Portfolio**	**Hedge Portfolio**	**Hedge Portfolio**	**Hedge Portfolio**
Monthly return to be explained:	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.40)	(2.40)	(2.40)	(2.40)	(2.40)	(2.40)
monthly return in %	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%
Pricing model for returns:	LIQM	CAPM	FF3FM	FF4FM	FF5FM	LIQM&FF5FM
Constant (alpha)	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.05)	(2.14)	(2.38)	(2.09)	(2.18)	(2.12)
monthly alpha in %	0.28%	0.28%	0.31%	0.27%	0.31%	0.29%
LIQ	0.065					0.062
	(1.42)					(1.30)
MKT		0.043	0.038	0.059	0.044	0.034
		(1.01)	(1.00)	(1.55)	(1.01)	(0.79)
SMB			−0.053	−0.060	−0.088	−0.097
			(−0.90)	(−1.02)	(−1.30)	(−1.41)
HML			−0.129**	−0.110*	−0.169**	−0.164**
			(−1.98)	(−1.69)	(−2.27)	(−2.30)
MOM				0.052		
				1.31		
RMW					−0.071	−0.080
					(−0.84)	(−0.93)
CMA					0.169	0.174
					(1.43)	(1.47)
Adj. R^2	0.7%	0.4%	2.3%	3.0%	3.5%	4.1%

Table 8 reports regressions of hedge portfolios based on firm-level earnings growth covariances with aggregate investment and consumption growth. We regress the monthly excess returns (i.e., returns in excess of the risk-free rate) of the hedge portfolio on typical monthly factor-mimicking portfolios. The hedge portfolio is created by buying the with-news portfolio and selling the against-news portfolio. The with-news and against-news portfolios take into account the anticipated changes in aggregate investment and consumption during quarter Q. The with-news portfolio (i.e., the long leg) invests in stocks with "High" ("Low") covariances of earnings growth with aggregate investment and consumption growth when the anticipated change is positive (negative). In contrast, the against-news portfolio (i.e., the short leg) invests in stocks with "Low" ("High") covariances of earnings growth with investment and consumption growth when the anticipated change in the aggregate is positive (negative). The asset pricing models to explain the hedge portfolio returns are: the liquidity factor model (LIQM), the CAPM, the Fama-French three-factor model (FF3FM), the Fama-French four-factor model (FF4FM), the Fama-French five-factor model (FF5FM), and the liquidity-augmented Fama-French five-factor model (LIQM&FF5FM). The risk factors include liquidity (LIQ), Small-minus-Big (SMB), High-minus-Low (HML), momentum (MOM), Robust-minus-Weak (RMW), and Conservative-minus-Aggressive (CMA) factors, in addition to the market portfolio (MKT). t-statistics in parentheses are Newey-West adjusted for up to four lags. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. All variables and the trading algorithm are defined in the appendix.

Table 9: Analyzing the firm's frontier premium.

	With-news strategy *(Long)*		**Against-news strategy** *(Short)*		**Hedge Portfolio** *(Long-Short)*	
Monthly return to be explained:	0.011***	0.011***	0.008***	0.008***	0.003**	0.003**
	(12.69)	(12.69)	(8.58)	(8.58)	(2.40)	(2.40)
monthly return in %	1.11%	1.11%	0.80%	0.80%	0.31%	0.31%
Pricing model for returns:	FF5FM	LIQM&FF5FM	FF5FM	LIQM&FF5FM	FF5FM	LIQM&FF5FM
Constant (alpha)	0.003***	0.003**	0.000	0.000	0.003**	0.003**
	(3.38)	(3.77)	(−0.42)	(−0.32)	(2.18)	(2.12)
monthly alpha in %	0.26%	0.25%	−0.05%	−0.04%	0.31%	0.29%
LIQ		0.023		−0.039		0.062
		(0.54)		(−1.20)		(1.30)
MKT	1.047***	1.043***	1.003***	1.009***	0.044	0.034
	(29.15)	(27.10)	(27.34)	(27.19)	(1.01)	(0.79)
SMB	0.318***	0.314***	0.405***	0.411***	−0.088	−0.097
	(4.23)	(4.17)	(7.21)	(7.36)	(−1.30)	(−1.41)
HML	0.387***	0.389***	0.556***	0.553***	−0.169**	−0.164**
	(4.88)	(4.95)	(8.93)	(9.01)	(−2.27)	(−2.30)
RMW	0.021	0.019	0.093	0.098	−0.071	−0.080
	(0.25)	(0.21)	(1.18)	(1.25)	(−0.84)	(−0.93)
CMA	0.081	0.083	−0.088	−0.091	0.169	0.174
	(0.62)	(0.64)	(−0.96)	(−0.85)	(1.43)	(1.47)
Adj. R^2	79.2%	79.2%	85.0%	85.1%	3.5%	4.1%

Table 9 reports regressions of hedge portfolios based on firm-level earnings growth covariances with aggregate investment and consumption growth. We regress the monthly excess returns (i.e., returns in excess of the risk-free rate) of the earnings growth covariance portfolio on typical monthly factor-mimicking portfolios. The with-news and against-news portfolios take into account the anticipated changes in aggregate investment and consumption during quarter Q. The with-news portfolio (i.e., the long leg) invests in stocks with "High" ("Low") covariances of earnings growth with investment or consumption growth when the anticipated change is positive (negative). The against-news portfolio (i.e., the short leg) invests in stocks with "Low" ("High") covariances of earnings growth with investment and consumption growth when the anticipated change is positive (negative). The hedge portfolio goes long on the with-news portfolio and short on the against-news portfolio. The asset pricing models to explain the portfolio returns are the Fama-French five-factor model (FF5FM), and the liquidity-augmented Fama-French five-factor model (LIQM&FF5FM). The risk factors include liquidity (LIQ), Small-minus-Big (SMB), High-minus-Low (HML), momentum (MOM), Robust-minus-Weak (RMW), and Conservative-minus-Aggressive (CMA) factors, in addition to the market portfolio (MKT). t-statistics in parentheses are Newey-West adjusted for up to four lags. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. All variables and the trading algorithm are defined in the appendix.

Table 10: Predicting earnings and returns controlling for other macro variables.

	Panel A: Macro variables.				**Panel B:** Multifactor-conditioned stock betas.			
	[1]	**[2]**	**[3]**	**[4]**	**[1]**	**[2]**	**[3]**	**[4]**
Dependant:	$e_{j,Q}$	$e_{j,Q}$	$CAR_{j,Q}$	$CAR_{j,Q}$	$e_{j,Q}$	$e_{j,Q}$	$CAR_{j,Q}$	$CAR_{j,Q}$
α_j	0.032***	0.032***	−0.035***	−0.035***	−0.003***	−0.003***	0.007***	0.006***
	(5.86)	(5.82)	(−5.82)	(−5.81)	(−6.09)	(−7.05)	(13.37)	(13.17)
$e_{j,Q-1}$	0.178***	0.177***			0.179***	0.179***		
	(10.50)	(10.44)			(10.61)	(10.55)		
$invst\_surv_Q$	0.127***	0.127***	0.019**	0.019**	0.129***	0.128***	0.010	0.010
	(11.01)	(10.97)	(2.11)	(2.08)	(11.82)	(11.74)	(1.22)	(1.19)
$consm\_surv_Q$	0.524***	0.520***	−0.187***	−0.188***	0.524***	0.519***	−0.154***	−0.155***
	(8.64)	(8.62)	(−4.72)	(−4.75)	(9.12)	(9.10)	(−4.08)	(−4.13)
$ePPF^{gap}_{j,Q-2}$	0.016***		0.006***		0.015***		0.006***	
	(7.88)		(4.28)		(7.78)		(4.33)	
$ePPF^{i}_{j,Q-2}$		0.018***		0.006***		0.018***		0.007***
		(7.90)		(4.32)		(7.79)		(4.45)
$ePPF^{c}_{j,Q-2}$		0.002***		0.001**		0.002***		0.001**
		(3.49)		(2.33)		(3.63)		(2.15)
snt_{Q-2}	−0.001	−0.001	−0.001	−0.001				
	(−0.73)	(−0.68)	(−0.69)	(−0.67)				
vxo_{Q-2}	0.001***	0.001***	0.000	0.000				
	(5.48)	(5.36)	(0.90)	(0.87)				
unc_{Q-2}	−0.071***	−0.071***	0.060***	0.060***				
	(−7.30)	(−7.29)	(5.73)	(5.71)				
cay_{Q-2}	0.106**	0.111**	0.050	0.052				
	(2.43)	(2.54)	(1.20)	(1.23)				
$sntSB_{j,Q-2}$					0.028***	0.029***	−0.025***	−0.024***
					(3.83)	(3.99)	(−5.10)	(−5.03)
$vxoSB_{j,Q-2}$					−0.025	−0.031	−0.341***	−0.343***
					(−0.33)	(−0.40)	(−5.79)	(−5.82)
$uncSB_{j,Q-2}$					0.002***	0.002***	−0.003***	−0.003***
					(3.01)	(3.08)	(−5.18)	(−5.17)
$caySB_{j,Q-2}$					0.000	0.000	0.001***	0.001***
					(0.24)	(0.30)	(4.38)	(4.40)
Industry fixed effects:	YES	YES	YES	YES	YES	YES	YES	YES
Firm-clustered st. errors:	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R^2	5.0%	5.1%	0.3%	0.3%	5.0%	5.1%	0.3%	0.3%
Obs.	58,038	58,038	58,038	58,038	58,038	58,038	58,038	58,038

Table 10 reports regressions of earnings forecasts and cumulative abnormal returns that also control for other macro variables (Panel A) and their associated multifactor-conditioned stock betas (Panel B). Our regressors include lagged earnings growth ($e_{j,Q-1}$), expected changes in investment and consumption growth ($invst\_surv_Q$ and $consm\_surv_Q$, respectively), and the lagged covariance of a firm's earnings growth with the aggregate investment-consumption gap ($ePPF^{gap}_{j,Q-2}$) or the lagged covariances of a firm's earnings growth with the aggregate investment and consumption growths ($ePPF^{i}_{j,Q-2}$ and $ePPF^{c}_{j,Q-2}$, respectively), and macro variables or their multifactor-conditioned stock betas. A multifactor-conditioned stock beta is the loading on a macro variable from rolling time-series regressions of excess stock return on the macro variable over a 20-quarter fixed window while controlling for the liquidity, market, Small-minus-Big, High-minus-Low, momentum, Robust-minus-Weak, and Conservative-minus-Aggressive factors of Fama and French (1993, 2015), Carhart (1997) and Pastor and Stambaugh (2003). We estimate betas with respect to the following macro variables: the sentiment index of Baker and Wurgler (2006; snt_{Q-2}), Chicago Board Options Exchange volatility index (vxo_{Q-2}), the economic uncertainty index of Jurado et al (2015; unc_{Q-2}), and the consumption-wealth ratio of Lettau and Ludvigson (2001a; cay_{Q-2}). The corresponding multifactor-conditioned stock betas are: $sntSB_{j,Q-2}$, $vxoSB_{j,Q-2}$, $uncSB_{j,Q-2}$ and $caySB_{j,Q-2}$. t-statistics are in parentheses and cluster-adjusted at the firm level. [*], [**], and [***] indicate significance levels of 10%, 5%, and 1%, respectively. The variables are defined in the appendix.