Journal of Accounting and Economics xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Accounting and Economics

journal homepage: www.journals.elsevier.com/journal-of-accounting-and-economics

Investment, inflation, and the role of internal information systems as a transmission channel[☆]

Oliver Binz [a], Elia Ferracuti [b, *], Peter Joos [a]

[a] INSEAD Singapore Campus, 1 Ayer Rajah Avenue, 138676, Singapore
[b] Fuqua School of Business, Duke University, 100 Fuqua Drive, Durham, NC, 27708, USA

A R T I C L E I N F O

Article history:
Received 24 April 2022
Received in revised form 6 March 2023
Accepted 24 July 2023
Available online xxx

JEL Classification:
E22
E52
M41

Keywords:
Accounting quality
Inflation
Internal information systems
Investment

A B S T R A C T

We examine whether the quality of firms' internal information systems influences the relation between inflation shocks and corporate investment, as posited by imperfect information models. Inconsistent with RBC models' prediction that nominal variables (e.g., inflation) do not affect real variables (e.g., corporate investment) but consistent with the presence of information frictions, we first document a positive relation between inflation shocks and firm-level investment. Next, we show that higher internal information system quality, measured through responses to the World Management Survey, mitigates the positive relation between inflation shocks and firm-level investment. This result suggests that internal information quality serves as a channel through which aggregate-level nominal variables affect firm-level real variables. We then document that firms with higher internal information system quality make relatively more efficient investment decisions following inflation shocks. Our inferences are robust to using the 8th EU Company Law Directive as a shock to internal information system quality and to several additional tests.

1. Introduction

In June 2022, US consumer price inflation hit a 40-year high of 9.1% and became the most pressing economic concern for Americans (Gallup Polls 2022). The current threat of rising inflation has revived the academic and non-academic debate on how inflation affects economic agents' decision-making. This paper contributes to the debate by studying how inflation shocks affect corporate investment and whether the quality of firms' internal information systems influences this relation.

☆ We gratefully acknowledge financial support from INSEAD and Duke University. We appreciate helpful comments and suggestions from Hami Amiraslani, Andrea Bafundi, Phil Berger, Michaël Bikard, Matthias Breuer (discussant), Stefano Cascino (discussant), Gavin Cassar, Jung Ho Choi, Anna Cieslak, Nuno Clara, Praj Desai, Lily Fang, Lindsey Gallo (*JAE* discussant and referee), Beatriz García Osma, Wayne Guay (editor), Naveen Gondhi, John Hand, Cam Harvey, Kelly Huang (discussant), Xu Jiang, Nadav Klein, Yaniv Konchitchki, Eva Labro, Alina Lerman, Gary Lind, Francesco Lippi, Paulo Maduro, Steven Monahan, Suresh Nallareddy, Jim Omartian, Stephen Penman, Joel Peress, Peter Pope, Joshua Ronen, Loïc Sadoulet, Katherine Schipper, Shiwon Song, Andrew Sutherland, Stefan Thau, Ayung Tseng, Rodrigo Verdi, Xiaoxi Wu, Wanli Zhao. We also thank workshop participants at Bocconi University, Goethe University, Nazerbayev University, University of Bremen, University of Houston, the Fuqua Summer Seminar Series, the INSEAD School-Wide Research Seminar Series, the Accounting Design Project, the 2021 Bolzano-Padova Accounting Summer Camp Emerging Researcher Consortium, the 2021 International Accounting Research Symposium, the 2022 Hawaii Accounting Research Conference, the 2022 FARS Midyear Meeting, the 2022 EAA Annual Congress, the 2022 JLFA Conference, and the 2022 *JAE* Conference. We thank the World Management Survey team for sharing their data with us.

* Corresponding author.
E-mail addresses: oliver.binz@insead.edu (O. Binz), elia.ferracuti@duke.edu (E. Ferracuti), peter.joos@insead.edu (P. Joos).

https://doi.org/10.1016/j.jacceco.2023.101632

Real Business Cycle (RBC) models predict that nominal variables cannot affect real variables because, in the absence of frictions, prices immediately and perfectly adjust to changes in real and nominal quantities. As a consequence, agents rely solely on relative (i.e., relative to other goods and services) rather than absolute prices when making decisions. Yet, analytical work links inflation to real decisions through the quality of firms' internal information systems, a mechanism that arises naturally in models featuring imperfect information (Lucas 1972, 1975). In these models, firms are subject to firm-level real (such as changes in customer preferences) and aggregate-level nominal (such as inflation) shocks. Managers seek to adjust their investment only in response to firm-level real shocks but cannot perfectly disentangle them from aggregate-level nominal shocks because each type of shock is observed with noise.

For example, a manager who observes an increase in demand for her firm's product cannot be sure about whether the increase in demand derives from consumers enjoying the product more (in which case she should invest to produce more of her product) or from inflation reducing the product's real price (in which case she should not invest but instead increase the price of her product to keep up with the general price level). As a result, in a world of imperfect information, firms' investment decisions partially respond to firm-level real as well as to aggregate-level nominal shocks, which induces a positive relation between inflation and investment.

We combine this framework with prior evidence that higher internal information quality raises the precision of the signal about firm-level real shocks available to managers (Feng et al., 2009), and predict that an internal information system of higher quality allows managers to more effectively filter information about firm-level real shocks from the garbled signals they receive. This filtering mutes managers' investment response to inflation shocks and thereby mitigates the positive relation between firm-level real (investment) decisions and aggregate-level nominal (inflation) shocks. To continue the previous example, we predict that higher-quality internal information systems help the manager to better understand changes in customer preferences and, as a result, reduce the probability that the manager misinterprets an increase in demand for her product deriving from inflation as deriving from changes in customer preferences.

To test our predictions empirically, we assemble a sample of firms that participated in the World Management Survey (hereafter WMS) during the 2004 to 2015 period and have financial information available through the Bureau van Dijk's Orbis database. The WMS surveys a set of randomly selected medium-sized international firms and provides us with a composite proxy for the quality of firms' internal information systems. This proxy arises from five individual proxies for different dimensions associated with superior internal information system quality (documentation, tracking, review, dialogue, and consequences) and has been extensively validated for both internal and external validity by its creators (Van Reenen et al., 2014). Thus, the WMS allows us to overcome one of the main difficulties when studying the consequences of internal information system design, i.e., its unobservability to outsiders.

Using this sample, we first evaluate our baseline prediction that firms adjust their investment decisions in response to inflation shocks. We find support for this prediction: a one-standard-deviation inflation shock (0.78 percentage points) is associated with a 0.092-standard-deviation (1.01 percentage points) increase in investment as a share of total assets. We then evaluate our prediction that superior internal information system quality attenuates the relation between inflation shocks and investment by allowing managers to better disentangle real shocks from nominal shocks. In support of this prediction, we document that the positive association between inflation shocks and investment weakens for firms with higher internal information system quality. The magnitude of the effect is economically meaningful: a one-standard-deviation increase in internal information system quality offsets more than a third of the positive association between inflation and investment. This finding suggests that internal information system quality is an important channel for the transmission of aggregate-level nominal shocks into real decisions at the firm level.

We investigate next whether the mitigating effect of internal information system quality on the inflation-investment relation also translates into higher investment efficiency. Imperfect information models posit that investment in response to nominal shocks constitutes an inefficiency, absent in the first-best case of perfect information. To continue the previous example: if the manager could observe that the increase in demand for her products derives from inflation rather than changes in customer preferences, she would not invest because the increase in demand will not persist after she adjusts the price of her product to keep up with the general price level. Hence, if internal information systems help managers to behave in a way more consistent with the frictionless case of perfect information, higher internal information system quality should translate into higher investment efficiency. To test this prediction, we examine the effect of internal information system quality on investment efficiency measured as the relation between inflation shocks and future profitability (Chen et al. 2007; Jayaraman and Wu 2019). Consistent with inflation shocks leading managers to make inefficient investment decisions, we document a negative relation between inflation shocks and year-ahead profitability. Importantly, we also find that this effect decreases in the quality of internal information systems, consistent with higher-quality information systems reducing the distorting effect of nominal shocks on managers' investment decisions.

While inflation shocks are likely exogenous to an individual firm, the degree of investment in internal information systems is a choice by the firm that partially derives from its exposure to macroeconomic fluctuations (Hugon et al. 2015). Consequently, our results could be confounded by firms' exposure to macroeconomic fluctuations and the actions firms take to mitigate this exposure. To address this concern and to enhance the internal validity of our inferences, we rely on a difference-in-differences analysis based on the 8th EU Company Law Directive ("the Directive"). Enacted on May 17, 2006, the Directive requires *public* firms to provide assurance to the board of directors and the audit committee that adequate and effective controls to monitor and manage critical risks exist, and that a process to adequately report on this monitoring is in place. We expect that, like SOX (Cheng et al. 2013; Schroeder and Shepardson 2016), the Directive induced at least a subset of affected firms to improve their internal information systems, providing managers with more accurate information about their operations (Charoenwong et al. 2022). We find that the Directive led public firms headquartered in adopting European countries to increase the quality of their internal information systems more than both private firms in those same countries, which are not subject to the Directive, and public firms in European countries that did not adopt the Directive. Consistent with imperfect information models and with our baseline analysis, we also find that this exogenous increase in the quality of internal information systems mitigates the positive relation between inflation and investment for treated firms relative to control firms.

We perform several additional analyses to assess the sensitivity of our inferences. First, we test whether our results vary in the cross-section as predicted by theory. We document that our results concentrate 1) in competitive industries, consistent with the assumption in incomplete information models that firms are price takers and operate in competitive product markets; 2) in firms that find it more difficult to distinguish between firm-level real and aggregate-level nominal shocks; and 3) in firms that experience moderate levels of inflation. Second, we show that our results are robust to alternative measures of investment and inflation shocks. Third, we provide evidence that our findings derive from higher internal information system quality rather than higher general management quality.

Finally, we examine whether our firm-level results extend to the country level. Consistent with our previous findings, we find that country-level investment increases in inflation shocks and that this relation is muted in countries where firms, on average, have higher-quality internal information systems. This evidence suggests that information frictions play an important role in explaining aggregate investment fluctuations (Romer 2012).

Our paper makes several contributions. First, we contribute to the literature that studies the effects of inflation on accounting numbers.[1] While this literature generally focuses on whether external users of accounting information (such as investors) understand the confounding effect of inflation on historical cost accounting numbers (Chordia and Shivakumar 2005; Basu et al. 2010; Konchitchki 2011), we take a different approach and document that internal information systems can influence managers' ability to disentangle firm-level real shocks from aggregate-level nominal shocks, thereby affecting investment decision-making. Our findings inform regulators about a source of firm-level heterogeneity that explains firms' responses to macroeconomic outcomes, thus emphasizing one important mechanism driving the transmission of nominal shocks into the real economy (Yellen 2016).

Second, we add to research on the implications of the internal information environment for managerial decision-making. Decision theory and empirical work suggest that higher-quality internal information facilitates various managerial decisions such as tax planning, hiring, and investment (Gallemore and Labro 2015; Heitzman and Huang 2019; Ferracuti 2022). We show that higher internal information quality leads to better managerial decisions by facilitating the separation of firm-level real and aggregate-level nominal shocks. Our findings that 1) firms' internal information systems influence the transmission of inflation shocks into corporate investment decisions and 2) that these firm-level results hold at the aggregate level provide a way to assess the economic importance of information frictions in explaining aggregate fluctuations (Romer 2012, p. 255) and to explain differences in total factor productivity across countries, industries, or firms (e.g., Van Reenen et al., 2014).

Third, we contribute to the literature that relates information quality to investment decisions. A large number of studies document that information quality influences firms' investment decisions by reducing the information uncertainty managers face and/or the information asymmetry between managers and capital providers (for a review see Roychowdhury et al. 2019). In the latter group of studies, Armstrong et al. (2019) and Gallo and Kothari (2019) document that low *external* information quality and unexpected decreases (but not increases) in the federal funds rate during Federal Open Market Committee meetings jointly increase firms' stock returns and investments. On the one hand, our finding that *internal* information system quality deters managers from inefficiently investing in response to inflation complements these papers and provides further evidence on how information quality can help to alleviate firm-level effects of aggregate-level shocks. On the other hand, by introducing managers' inability to perfectly distinguish between firm-level real and aggregate-level nominal shocks as a source of uncertainty, our study differs from these papers in its focus on information frictions within the firm (as opposed to between the firm and capital providers), on accounting information's role in resolving information uncertainty (as opposed to information asymmetry), and on internal (as opposed to external) information quality.

Lastly and more broadly, we contribute to the macroeconomics literature by providing micro-foundational evidence that helps distinguish among leading theories. Specifically, as predicted by imperfect information models but not by Real Business Cycle and New Keynesian models, we find 1) that the positive association between inflation shocks and investment leads to inefficient investment, 2) that this association is muted for firms with higher internal information system quality, and 3) that this association concentrates in firms operating in a competitive environment. While we cannot rule out that the forces described in other models exist, our evidence is largely consistent with the assumptions and implications of imperfect information models.

[1] These papers are part of a growing literature that examines how aggregate-level variables affect firm-level decisions. Research in this literature shows that macroeconomic conditions explain significant variation in firm-level outcomes (Ball et al. 2009; Bonsall et al. 2013); that incorporating aggregate growth expectations improves firm-level profitability forecasting models (Bonsall et al., 2013; Jackson et al. 2018); that macroeconomic uncertainty drives firms' management guidance, revenues, expenses, earnings, and media coverage (Rogers et al. 2009; Kim et al. 2016; Bonsall et al. 2020; Binz 2022); that monetary policy affects firms' accruals and cash flows (Binz et al. 2022a); that firms increase their disclosure about macroeconomic conditions over time (Holstead et al. 2022); and that macroeconomic estimation errors drive firms' investment and production (Binz et al. 2022b).

2. Hypotheses development

Standard business cycle models, such as the Real Business Cycle (RBC) model proposed by Kydland and Prescott (1982), predict that under conditions of perfect competition, full price flexibility, and perfect information, nominal variables do not affect real variables because money merely serves as a unit of account and does not influence agents' decision-making: in the absence of frictions, producers make investment decisions based on relative (to the prices of other goods or services) rather than absolute prices, so aggregate price levels are irrelevant. However, the empirical literature consistently shows that aggregate-level nominal variables (such as inflation) influence aggregate-level real variables (such as aggregate investment) (for a survey see Taylor 1999). For this reason, starting in the 1970s, researchers have introduced various types of frictions into the standard RBC model to analyze the relation between real and nominal variables (Galí 2018).

Among these alternatives, Lucas (1972, 1975) proposes a model that preserves RBC models' assumptions of perfect competition and full price flexibility but relaxes the assumption of perfect information.[2,3] In his model, firms are subject to both firm-level real and aggregate-level nominal shocks. Managers seek to forecast and invest in response to firm-level real shocks only but are unable to do so because the two types of shocks are noisy and garbled with each other, which prevents managers from perfectly disentangling the drivers behind the signals their firms receive. As a result, managers face a signal extraction problem and invest in response to both firm-level real and aggregate-level nominal shocks. Higher quality internal information systems help managers to forecast firm-level real shocks more accurately, and thereby reduce their investment response to the aggregate-level nominal component of the garbled signal.

For example, a manager who observes an increase in demand for her firm's product cannot be sure about whether the increase in demand derives from consumers enjoying the product more or from inflation reducing the product's real price. On the one hand, if a positive signal reflects a real shock and the manager does not invest, the manager misses an opportunity and risks losing market share to competitors. On the other hand, if the signal reflects a nominal shock and the manager invests, the manager risks misallocating capital. If the manager would know that an observed increase in demand for her product derives from inflation rather than changes in customer preferences, she would prefer not to invest but instead to increase her product's price to keep up with the general price level.

On average, to mitigate the negative consequences of investment mistakes, managers invest less in response to positive signals in a world of imperfect information than in a world of perfect information. This overall reduction in investment derives entirely from a reduction in investment in response to real shocks that is partly offset by an inefficient increase in investment in response to nominal shocks (to which managers would not respond if information were perfect), which results in a positive relation between investment and inflation.[4] This discussion leads to our first hypothesis.

Hypothesis 1. Corporate investment is positively associated with inflation shocks.

The assumption that managers cannot perfectly disentangle firm-level real from aggregate-level nominal shocks introduces the possibility that the quality of firms' internal information systems moderates the association between corporate investment and nominal shocks. Corporate internal information systems acquire, process, and communicate data to produce knowledge that supports managerial decision-making (Radner 1993). Models of internal information design suggest that higher-quality internal information systems, while costlier, increase the quality of managerial decisions (Feltham and Demski 1970). More recent empirical evidence supports this conjecture and shows that higher internal information quality facilitates information acquisition and integration (Hodge et al. 2004; Brazel and Dang 2008), which increases the precision of performance signals available to managers (Feng et al., 2009) and ultimately leads to superior managerial decisions (Gallemore and Labro 2015; Labro et al. 2022; Ferracuti 2022).[5]

Thus, to the extent that higher-quality internal information provides managers with less-noisy signals about firm-level real shocks, managers with access to higher-quality internal information systems should be able to measure firm-level

[2] A different class of models preserves the assumption of perfect information but relaxes the assumptions of perfect competition and full price flexibility (Rotemberg 1982; Calvo 1983). In these models, usually referred to as New Keynesian models, imperfect competition allows firms to increase the prices of their goods and services without experiencing an immediate decline in demand; at the same time, the presence of price-adjustment frictions induces firms to update prices infrequently, which creates nominal rigidity or price "stickiness." Jointly, these conditions yield the Phillips curve, which relates corporate investment decisions to inflation shocks. Shocks to the money supply, inflation expectations ("animal spirits"), or input costs deriving from divergences between the efficient and natural levels of output ("cost-push inflation") directly drive inflation. When these shocks are paired with nominal rigidity, firms' nominal cost of capital adjusts slowly to changes in inflation. Hence, if the nominal cost of capital equals the real cost of capital plus inflation (i.e., the Fisher equation), fluctuations in inflation paired with a slow-moving nominal cost of capital induce fluctuation in the real cost of capital, which influences managers' investment decisions (Roberts 1995; Clarida et al. 1999).

[3] To illustrate our hypotheses development, we provide a simplified version of the Lucas model in Appendix B.

[4] In contrast, New Keynesian models predict that, in the presence of nominal rigidity, aggregate demand determines managers' investment decisions. As a result, managers react efficiently to aggregate demand signals, such as inflation.

[5] Superior internal information systems can aid firms in gathering less-noisy performance signals. Managers can adopt technological solutions such as enterprise resource planning and corporate performance management that allow them to track transaction-level price and quantity data, aggregate transaction-level data at multiple levels (customer, division, geographic area, etc.), or collect data about competitors. Anecdotal evidence supports these mechanisms. For example, Delta Air Lines monitors daily changes in the fares charged by its competitors (Breath and Ives 1986), while Phillips 66 Company integrates information on competitors' prices, petroleum market spot prices, and internal cost and supply levels on a daily basis to aid managerial decisions (Creps and O'Leary 1994).

real shocks more precisely and, as a result, should be less likely to confuse firm-level real shocks and aggregate-level nominal shocks (Reis 2006; Paciello and Wiederholt 2014).[6] In consequence, managers with access to higher-quality internal information systems will be less likely to adjust their investment decisions in response to aggregate-level nominal shocks and therefore will behave in a way more consistent with the frictionless case of perfect information. To continue our example, higher-quality internal information systems should help the manager to understand changes in customer preferences better and, as a result, reduce the probability that the manager misinterprets an increase in demand for her product deriving from inflation as deriving from changes in customer preferences. It follows that the presence of higher-quality internal information systems mitigates the positive relation between corporate investment and inflation, leading to our second hypothesis.

Hypothesis 2. The positive association between corporate investment and inflation shocks decreases in the quality of a firm's internal information system.

The imperfect information channel posits that nominal variables affect real decisions because nominal and real variables are measured with noise. For the following three reasons, inflation is likely one of the noisiest nominal variables, which makes it especially well suited to test the predictions of imperfect information models. First, managers observe inflation only indirectly through demand for their firms' products or through price increases by other firms. Hence, from their perspective, it is unclear whether a rise in demand or input costs derives from a general increase in price levels or from changes in customer preferences, competitive dynamics, or supply chains.[7] Second, there is no "right" measure of inflation. Commonly used measures such as CPI and PPI are based on the constellation of a representative basket of goods chosen by the Bureau of Economic Analysis. However, this representative basket may differ from the specific basket that is relevant to a manager's decision-making. Third, survey evidence indicates that managers are largely uninformed about recent aggregate inflation dynamics (Kumar et al. 2015; Candia et al. 2021), and that, even when they pay attention to inflation, the dispersion of their beliefs is substantially wider for inflation than for other aggregate-level variables (such as GDP or the unemployment rate) (Coibion et al. 2018).[8]

3. Empirical approach

3.1. Research design

We test our two hypotheses by estimating the following regression model:

$$\begin{aligned} Investment_{i,t} = {} & \beta_1 Inflation\ Shock_t + \beta_2 Internal\ Info\ Quality_{i,t} + \beta_3 Inflation\ Shock_t \times Internal\ Info\ Quality_{i,t} \\ & + \sum \gamma_j\ Control_{j,i,t} + \Gamma_{ind} + \Theta_{c-t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Hypothesis 1 predicts a positive β_1 coefficient, and Hypothesis 2 predicts a negative β_3 coefficient. $Investment_{i,t}$ denotes the change in fixed assets scaled by average total assets for firm *i* in year *t*. *Inflation Shock* denotes the difference between realized CPI inflation at the end of year *t* minus forecasted CPI inflation at the beginning of year *t* in the firm's home country.[9] We focus on inflation shocks instead of inflation levels to identify the unpredictable portion of inflation because, in imperfect

[6] The model in Appendix B shows that, under the assumption that internal information systems decrease the measurement error with which managers observe firm-level shocks more than the measurement error with which managers observe aggregate-level shocks, internal information system quality can mitigate the effect of inflation shocks on firms' investment decisions. Prior analytical and empirical work supports this assumption. Maćkowiak and Wiederholt (2009) show analytically that managers optimally choose to learn more about firm-level than about aggregate-level shocks because firm-level shocks generate more volatility in the optimal price for the firm's product. Specifically, in a calibrated version of their model, Maćkowiak and Wiederholt (2009) find that firms allocate 94% (6%) of their attention to firm-level (aggregate-level) shocks. Bloom et al. (2021) document empirically that, on average, management quality decreases firm-level (aggregate-level) uncertainty by 6.2% (4.9%). In Online Appendix OA1, we directly test the assumption in our sample by regressing managers' firm-level and aggregate-level inflation forecast errors on internal information system quality, control variables, and firm and year fixed effects for 110 of our sample firm-year observations for which we could obtain managers' firm-level and aggregate-level inflation forecasts from the Confederation of British Industry's Industrial Trends Survey. We find that an increase in internal information quality decreases managers' firm-level forecast errors more than their aggregate-level forecast errors.

[7] A quotation from a recent Wall Street Journal article illustrates that it is often unclear whether movements in firm-level variables arise from firm-level real or aggregate-level nominal signals: "US retail sales, in data to be unveiled Tuesday, are expected to increase in October, pushed higher by strong household demand, a partial rebound in auto sales and accelerating inflation."

[8] Other aggregate-level nominal variables such as federal funds rate changes are observed with little or no noise and have only indirect effects insofar as they reflect some of the variation in noisy aggregate-level nominal variables.

[9] Alternative measures of inflation are changes in the GDP deflator inflation, Producer Price Index inflation, and core inflation (which excludes food and energy consumption). We focus on CPI inflation because it is the only measure for which the OECD provides data on realizations as well as forecasts. However, different measures of inflation are highly correlated with each other. In the US, for example, the correlations between annual CPI inflation and GDP deflator inflation, Producer Price Index inflation, and core inflation from 1960 to 2020 are 0.96, 0.73, and 0.93, respectively.

information models, that portion is the one that managers cannot perfectly disentangle from real shocks (Lucas 1972).[10] An ideal measure of inflation shocks would compare realized inflation with managers' expectations about inflation at the time they make their investment decision. Since we observe investments annually, our measure of inflation shocks is intended to capture the differences between expectations at the beginning of the year and realizations at the end of the year. *Internal Info Quality* denotes the quality of firms' internal information systems, as measured by the WMS described in more detail below. *Control* denotes a vector of aggregate-level and firm-level control variables proposed in prior literature. First, we control for the first and second moment of aggregate performance by including forecasted GDP growth (*Growth Expectations*) and the average level of the global Economic Policy Uncertainty Index (*Macroeconomic Uncertainty*) (Baker et al. 2015; Bloom et al. 2018). Second, we control for firms' broader management quality by including scores for other management practices from the WMS: people management (*People Management*), operating quality (*Operating Quality*), and target focus (*Target Focus*) (Bloom and Van Reenen 2007).[11] Third, we include firm-level determinants of investment decisions documented in prior literature: cash flow scaled by average total assets (*Cash Flow*), change in cash flow scaled by average total assets (Δ*Cash Flow*), long-term debt scaled by total assets (*Leverage*), and the natural logarithm of total assets (*Size*) to control for the availability of internal and external financing (Fazzari et al. 1988; Hadlock and Pierce 2010); the change in operating revenue scaled by average total assets (*ΔSales*) to control for differences in growth opportunities (Badertscher et al. 2013); and the absolute value of discretionary accruals (*External Reporting Quality*) to control for differences in the quality of external reporting (Jones 1991; Dechow et al. 2010). Fourth, we include industry fixed effects (Γ) based on the NACE Revision 2 one-digit industry code to control for time-invariant differences among industries, and/or country-by-year fixed effects (Θ) to control for potentially confounding macroeconomic movements beyond those captured by *Growth Expectations* and *Macroeconomic Uncertainty*.

3.2. Measurement: internal information quality

To test our hypotheses, we need a proxy for the quality of firms' internal information systems, a difficult task given the unobservable nature of firms' internal information systems. Previous research has measured internal information quality using surveys (Ittner et al. 2002; Maiga et al. 2014); experiments (Cardinaels et al. 2008; Cardinaels and Labro 2008); simulations (Labro and Vanhoucke 2007; Balakrishnan et al. 2011); and indirect empirical archival proxies such as discretionary accruals, reporting speed, management forecast accuracy, SOX Section 404 material weaknesses, and unintentional restatements caused by unintentional errors (Gallemore and Labro 2015; Cheng et al. 2018).[12] However, each of these measurement approaches has its drawbacks: surveys and experiments suffer from non-response bias and small sample sizes, simulations depend on the quality of the underlying model, and indirect empirical archival proxies are noisy, prone to measurement error, and likely reflect differences in both underlying fundamentals and accounting measurement (Owens et al. 2017). We address these challenges by relying on the WMS to identify proxies that offer several advantages over those employed in the literature.

The WMS is a project developed to measure a number of management practices, thereby allowing researchers to identify the impact of those practices on corporate outcomes. The project scores firms' managerial practices on a scale ranging from 1 ("worst practice") to 5 ("best practice") for a set of randomly sampled medium-sized firms from multiple countries around the world.[13] Interviewers conduct 45-min double-blind phone interviews (i.e., the managers do not know that their firm is being scored, and the interviewers do not have any information about the firm's financial performance) with plant managers "senior enough in their establishment to have decision powers, but not too senior so as to be detached from the day-to-day running of the establishment" (Scur et al., 2021, p. 2). After the interview, the interviewers score the firms employing these

[10] Imperfect information models are not the first to make it clear that unexpected but not expected inflation rate changes induce agents to change their real decisions. Fisher (1933) and Bernanke (1983) argue that unexpected deflation results in unexpectedly high real interest rates and thereby transfers real wealth from debtors to creditors, causing financial distress and bankruptcies. Friedman (1968) notes that the trade-off between unemployment and inflation "comes not from inflation per se, but from unanticipated inflation." Consistent with this discussion, in Online Appendix Section OA2, we find that neither inflation levels nor forecasts explain firms' investment, and that inflation shocks continue to explain firms' investment after controlling for either inflation levels or forecasts.

[11] Prior literature identifies five broad classes of determinants of managerial practices: product market competition, trade and foreign direct investment, general education, labor regulation, and governance (Scur et al. 2021). Since most of these determinants are measured at the country-year level, their effect on management quality will be subsumed by our country-by-year fixed effects. However, in Online Appendix OA6, we directly control for these determinants and find that our inferences remain unchanged.

[12] We correlate (whenever both measures are available) the WMS monitoring score discussed below with discretionary accruals ($\rho = -0.09$, $p < 0.01$, $N = 4870$), reporting speed ($\rho = 0.12$, $p < 0.10$, $N = 20$), and management forecast accuracy ($\rho = 0.005$, $p > 0.10$, $N = 47$). These findings suggest that our direct internal information system quality measure varies with indirect measures used in prior literature as expected. We also tried to correlate the monitoring score with the incidence of SOX Section 404 material weaknesses and unintentional restatements. Unfortunately, none of our sample observations features SOX Section 404 material weaknesses or unintentional restatements, which prevents us from computing these correlations. Online Appendix Section OA3 discusses these results in more detail.

[13] While random sampling addresses external validity concerns, it cannot entirely extinguish non-response bias as firms contacted by the WMS might still choose not to respond. However, endorsements by local governments and industry associations allow the WMS to achieve response rates between 40 and 50%, which is high relative to those of other surveys (Scur et al., 2021).

managers based on a grid that comprises 18 questions, classified into four broad categories: monitoring, people management, operating quality, and target focus.[14]

Importantly, one of the four categories, monitoring, aims to measure how organizations monitor what goes on inside the firm, and how managers use this information in their decision-making. We use the monitoring score as a proxy for firms' internal information quality because firms with superior internal information systems track external and internal influences on the firm's operations and transactions more closely and with greater precision. We believe that the monitoring score has several advantages over measures employed in previous research discussed above. First, the monitoring score directly measures the quality of firms' internal information systems and thus avoids using the quality of *external* financial reporting as an indirect proxy. Although analytical (Hemmer and Labro 2008, 2019) and empirical (Gong et al. 2009) research suggests a link between internal information systems and external information quality, using a direct measure reduces noise and bias induced by other determinants of external reporting quality, such as discretion in the application of accounting standards and fluctuations in fundamentals underlying external reporting figures.

Second, as illustrated in Equation (A18) of our model in Appendix B, imperfect information models predict that better internal information systems help managers to form more precise expectations about firm-level real shocks, which reduces the risk of investing in response to nominal shocks.[15] The WMS's focus on plant-level managers captures this emphasis on increasing the precision of firm-level real relative to the precision of aggregate-level nominal shocks. Plant managers are more likely to pick up fluctuations affecting day-to-day operations (such as variation in raw materials prices or plant worker wages) while firm-level managers (i.e., the C-suite) are more to likely pick up fluctuations not specific to the firm (such as competition within the firm's industry or aggregate demand) (Savignac et al. 2021).[16]

Third, rather than simply asking managers to score their own firms, the WMS interviewers score firms based on answers to a set of open-ended (as opposed to closed-ended) survey questions. This is important because people could be unwilling or unable to truthfully and objectively respond to closed-ended questions due to career concerns or behavioral biases (Schwarz 1999; Bertrand and Mullainathan 2001). Fourth, as of 2022, the survey has been conducted for a large number of firms for over 19 years. The resulting dataset addresses small sample concerns and ensures that the validity of inferences is not limited to the economic climate present in a specific country and/or at a specific time. Fifth, the availability of information about medium-sized firms from multiple countries reduces external validity concerns that apply to smaller hand-collected proxies of internal information quality. Sixth and last, the survey methodology and the resulting scores have been validated extensively by the original authors (Van Reenen et al., 2014) and used in published research in the fields of economics and management (e.g., Bloom et al. 2012).

3.3. Sample construction and description

We test our hypotheses using a sample of firms from 21 countries that participated in the WMS during the 2004 to 2015 period. This sample, which includes 4,870 firm-year observations distributed over 3,597 firms, represents the intersection of three different databases: the WMS database described in the previous section for firm-year level survey data about internal information systems, the Bureau van Dijk's Orbis database for annual financial statement information for a broad set of public and private international firms, and the Organization for Economic Co-operation and Development's (OECD) Economic Outlook database for annual country-year level variables, including inflation forecasts and realizations. Of the 3,597 firms, 2,596 are surveyed once, 741 twice, 248 three times, and 12 four times. Repeatedly sampled firms come from 16 of our 21 countries, while firms sampled at least three times come from eight countries (China, Germany, Greece, India, Italy, Portugal,

[14] To address concerns about the idiosyncratic biases of the interviewer or the manager, the survey organizers resurveyed 5% of the sample firms using another interviewer and another manager. The scores of this second survey are highly positively correlated with those of the first survey. See Van Reenen et al. (2014) for additional details on the data collection process. To further address concerns that differences in interviewers' assessment drive our results, in untabulated analyses, we estimate Equation (1) after adding interviewer fixed effects. Our slope coefficients of interest remain approximately unchanged. Because interviewer indicators are not available for many of our sample observations, we omit interviewer fixed effects from our main tests to mitigate sample attrition.

[15] To illustrate, combine Equation (A18) with the coefficient obtained by regressing output on inflation to obtain $\frac{\gamma}{(1-\gamma)} = \frac{\sigma_\theta^2}{(1+\alpha)\sigma_x^2+\alpha\sigma_\theta^2}$. Because $0 < \alpha < 1$, $\frac{\partial}{\partial\sigma_\theta^2} > 0$ and $\frac{\partial}{\partial\sigma_x^2} < 0$. Thus, an increase in the precision of the firm-level real shock θ decreases its variance σ_θ^2 and thereby decreases the inflation-investment relation, while the opposite applies to the precision of aggregate-level nominal shocks. These results highlight that imperfect information models predict that internal information systems cause managers to make better investment decisions not because they help managers to understand inflation shocks better, but because they help managers to understand the real shocks that affect their firms better.

[16] Within-firm differences among plant managers introduce measurement error in our firm-level measure of internal information system quality because the WMS surveys individual plant managers who might not be representative of the typical plant manager at the firm. While we cannot entirely eliminate this concern, the structure of our analyses addresses it in several ways. First, management scores across plants of the same firm tend to be positively correlated, which suggests the scores are measuring a common (latent) variable. Hence, by the law of large numbers, examining a large sample of firms (as we do) should smooth out measurement error and thereby recover the true effect of firm-wide management quality on the inflation-investment relation. Second, the WMS focuses on medium-sized manufacturing firms with 100 to 5000 employees. These firms have fewer plants than larger firms and, as a result, measuring management practices at the plant level is more likely to be representative of the firm as a whole (because an individual plant comprises a larger share of the firm). Third, we do not rely only on the WMS for our internal information quality measure but also triangulate our results across another internal information quality measure, the 8th EU Company Law Directive, discussed later.

the UK, and the USA). Of those countries, the UK has the largest representation with 75 firms, followed by Portugal with 53 and Italy with 49.[17]

Table 1 presents information about how our sample is distributed across countries and years and provides descriptive statistics about our inflation and inflation shock measures by country and year. With respect to countries (years), the UK (23.04%), Italy (11.66%), Greece (9.88%), and China (8.91%) (2006 (32.85%), 2014 (20.41%), and 2010 (17.41%)) provide the largest contributions to the sample. Table 2 presents descriptive statistics for the variables used in the study. Investment comprises on average 1% of total assets and exhibits substantial heterogeneity, with a standard deviation of 11 percentage points and an interquartile range of 9 percentage points of total assets. Inflation varies considerably both across countries and over time, with an average inflation of 2.2% and a standard deviation of 2 percentage points. At the same time, inflation shocks have a zero mean and median, indicating that the OECD's inflation forecasts are unbiased and approximately symmetrically distributed. Fig. 1 presents a histogram of the inflation shock distribution. While most shocks are close to zero, there are three notable clusters of outliers: Chile's inflation was forecasted to be 8.72% but only reached 0.35% at the advent of the financial crisis; Australia experienced lower-than-expected inflation in 2010 with forecasted inflation of 4.35% and realized inflation of 1.77%; China experienced higher-than-expected inflation in 2010 with forecasted deflation of 0.73% and realized inflation of 4.03% (in untabulated analysis we find that our results are robust to excluding of these outliers).

Table 1
Sample composition.

Panel A. Distribution of Observations by Country

Country	Observations	Percent of Total (%)	*Inflation* (mean)	*Inflation* (Std)	*Inflation Shock* (mean)	*Inflation Shock* (Std)
Australia	56	1.15	0.020	0.003	−0.015	0.011
Brazil	60	1.23	0.059	0.004	0.014	0.009
Canada	3	0.06	0.019	.	−0.009	.
Chile	34	0.70	0.011	0.010	−0.048	0.051
China	434	8.91	0.028	0.016	0.016	0.024
France	107	2.20	0.013	0.012	−0.003	0.003
Germany	356	7.31	0.014	0.003	0.000	0.007
Greece	481	9.88	0.022	0.031	0.009	0.022
India	105	2.16	0.093	0.028	0.019	0.005
Ireland	54	1.11	0.041	.	0.012	.
Italy	568	11.66	0.015	0.008	−0.002	0.007
Japan	108	2.22	−0.002	0.007	0.007	0.001
Mexico	10	0.21	0.040	0.002	−0.007	0.006
New Zealand	2	0.04	0.021	.	−0.018	.
Poland	264	5.42	0.018	0.011	−0.012	0.000
Portugal	341	7.00	0.014	0.017	0.009	0.015
Spain	192	3.94	0.014	.	−0.010	.
Sweden	301	6.18	0.013	0.001	0.013	0.005
Turkey	153	3.14	0.075	.	−0.014	.
United Kingdom	1,122	23.04	0.022	0.009	0.003	0.008
USA	119	2.44	0.023	0.008	0.006	0.009
Total	4,870	100	0.027	0.026	0.001	0.018

Panel B. Distribution of Observations by Year

Year	Observations	Percent of Total (%)	*Inflation* (mean)	*Inflation* (Std)	*Inflation Shock* (mean)	*Inflation Shock* (Std)
2004	289	5.93	0.020	0.005	−0.001	0.005
2005	21	0.43	0.019	0.003	0.001	0.006
2006	1,600	32.85	0.023	0.015	0.003	0.009
2007	363	7.45	0.048	.	0.032	.
2008	216	4.44	0.054	0.022	0.017	0.006
2009	83	1.70	0.038	0.048	−0.028	0.042
2010	848	17.41	0.029	0.032	0.012	0.016
2012	8	0.16	0.018	.	−0.016	.
2013	417	8.56	0.041	0.027	−0.006	0.009
2014	994	20.41	0.005	0.010	−0.006	0.004
2015	31	0.64	0.014	.	−0.007	.
Total	4,870	100	0.027	0.025	0.001	0.018

Table 1 Panel A (Panel B) presents our sample composition and descriptive statistics for *Inflation* and *Inflation Shock* by country (year). All variables are defined in Appendix A.

[17] The fact that the WMS samples some firms multiple times raises the possibility that being surveyed on management effectiveness could induce improvements in management practices. To address this possibility, in Online Appendix Section OA4, we repeat our main regression after dropping resampled firm-years or all observations from resampled firms. Our inferences remain unchanged.

Table 2
Descriptive statistics.

Variable	Observations	Mean	Std	P1	P25	P50	P75	P99
Firm-level Variables								
Investment	4,870	0.01	0.11	−0.36	−0.04	0.00	0.05	0.42
Future Profitability	4,385	0.06	0.36	−1.97	0.01	0.08	0.18	1.32
Inflation	4,870	0.02	0.02	−0.01	0.01	0.02	0.03	0.08
Inflation Shock	4,870	0.00	0.01	−0.03	−0.01	0.00	0.01	0.03
Internal Info Quality	4,870	3.26	0.78	1.40	2.80	3.20	3.80	4.80
Documentation	4,870	3.18	1.01	1.00	2.00	3.00	4.00	5.00
Tracking	4,870	3.35	0.97	1.00	2.00	3.00	4.00	5.00
Review	4,870	3.41	0.96	1.00	3.00	3.00	4.00	5.00
Dialogue	4,870	3.21	0.98	1.00	3.00	3.50	4.00	5.00
Consequences	4,870	3.15	0.96	1.00	3.00	3.00	4.00	5.00
Growth Expectations	4,870	0.04	0.06	−0.05	−0.01	0.04	0.06	0.17
Macroeconomic Uncertainty	4,870	0.94	0.26	0.64	0.64	1.09	1.21	1.27
People Management	4,870	2.77	0.63	1.33	2.33	2.83	3.17	4.33
Operating Quality	4,870	2.93	0.98	1.00	2.50	3.00	3.50	5.00
Target Focus	4,870	2.91	0.74	1.20	2.40	3.00	3.40	4.60
Cash Flow	4,870	0.06	0.11	−0.28	0.01	0.05	0.11	0.42
ΔCash Flow	4,870	0.01	0.08	−0.28	−0.02	0.01	0.04	0.34
External Reporting Quality	4,870	0.07	0.08	0.00	0.02	0.05	0.10	0.47
Leverage	4,870	0.10	0.15	0.00	0.00	0.03	0.16	0.73
ΔSales	4,870	0.08	0.33	−1.01	−0.08	0.06	0.23	1.37
Size	4,870	17.77	1.41	14.62	16.79	17.63	18.65	21.56
Aggregate-level Variables								
Aggregate Investment	240	2.83	8.99	−20.56	−1.10	2.96	6.85	23.98
Inflation	240	0.03	0.03	−0.01	0.01	0.02	0.04	0.11
Inflation Shock	240	0.00	0.02	−0.04	−0.01	0.00	0.01	0.03
Expected Domestic Demand	203	1.80	3.83	−8.03	0.16	2.08	4.01	11.42
GDP Growth	203	3.62	4.40	−6.05	1.57	3.77	5.24	12.56
Long-Term Interest Rate	203	4.36	2.49	0.52	2.89	4.17	5.44	10.55
Unemployment	203	8.59	4.78	3.59	5.38	7.59	9.68	26.12

Table 2 presents our descriptive statistics. All continuous firm-level variables are winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A.

Our proxies for internal information quality, i.e., *Internal Info Quality* and its components *Documentation*, *Tracking*, *Review*, *Dialogue*, and *Consequences*, have mean values of 3.18, 3.35, 3.41, 3.21, and 3.15, respectively, which suggests that the WMS interviewers consider the internal information systems of our sample firms to be better than the median firm in the WMS (corresponding to a value of 3.00). These variables exhibit considerable variation, with some firms at the bottom and some at the top of the distribution for each score.

Table 3 presents the Pearson and Spearman correlation matrix. Consistent with Hypothesis 1, investment exhibits a significantly positive univariate correlation with inflation shocks. We also observe that *Documentation*, *Tracking*, *Review*, *Dialogue*, and *Consequences* are highly positively correlated, which suggests that different aspects of internal information quality go hand in hand and supports the decision to combine them into a single internal information quality score (*Internal Info Quality*).

4. Empirical results

4.1. Baseline analysis

Table 4 presents coefficient estimates for Equation (1), in which we regress investment on the interaction between inflation shocks and internal information system quality, their main effects, and different combinations of controls, industry fixed effects, and country-by-year fixed effects. We cluster standard errors by industry and standardize all continuous variables for ease of interpretation.[18] We observe that, consistent with Hypothesis 1, investment is positively associated with inflation shocks before and after the inclusion of controls and fixed effects. The association is also economically meaningful: the full model in Column (6) suggests that a one-standard-deviation inflation shock (0.78 percentage points) is associated with a 0.092-standard-deviation (1.01-percentage-point (= 0.11 × 0.092)) increase in investment as a share of total assets. This magnitude is large relative to the effect of a one-standard-deviation increase in other investment determinants documented in prior literature such as *Growth Expectations*, *Cash Flow*, and *External Reporting Quality*. Consistent with prior

[18] We follow Van Reenen et al. (2014) and include industry rather than firm fixed effects and cluster by industry rather than by firm because most firms appear only once in our sample. The results are qualitatively similar when we rely on bootstrapped standard errors.

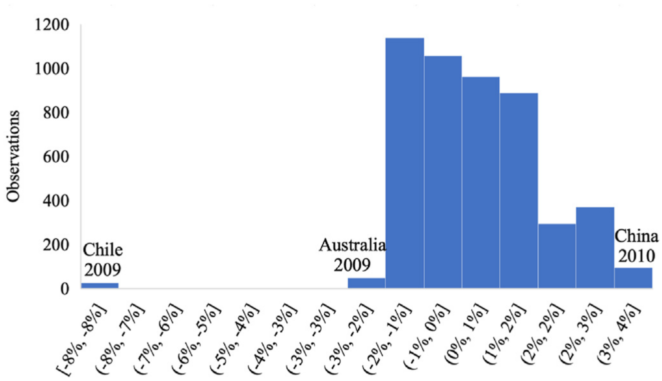

Fig. 1. Inflation Shock Regimes.
Figure 1 presents a histogram of our inflation shock measure.

Table 3
Correlation matrix.

Variable		1	2	3	4	5	6	7	8	9
Investment	1	1.00	0.08*	0.06*	0.02	0.00	0.02	0.00	0.03	0.01
Future Profitability	2	0.12*	1.00	0.00	0.04*	0.04	0.05*	0.04	0.02	0.03
Inflation Shock	3	0.09*	−0.01	1.00	−0.05*	−0.09*	0.00	−0.02	−0.05*	−0.05*
Internal Info Quality	4	0.01	0.10*	0.00	1.00	0.79*	0.79*	0.83*	0.89*	0.76*
Documentation	5	−0.01	0.10*	−0.05*	0.79*	1.00	0.55*	0.54*	0.54*	0.49*
Tracking	6	0.03	0.10*	0.04*	0.78*	0.54*	1.00	0.61*	0.55*	0.46*
Review	7	0.00	0.08*	0.01	0.82*	0.54*	0.58*	1.00	0.66*	0.53*
Dialogue	8	0.02	0.07*	−0.01	0.82*	0.54*	0.53*	0.63*	1.00	0.56*
Consequences	9	0.01	0.05*	0.01	0.74*	0.48*	0.45*	0.51*	0.56*	1.00

Table 3 presents our correlation matrix. Pearson (Spearman) correlations are above (below) the diagonal. All continuous firm-level variables are winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. * indicates significance at the 1% level.

empirical findings and inconsistent with the classical dichotomy, this is evidence that firms adjust their investment decisions in response to inflation shocks.

As predicted by Hypothesis 2, we also observe that the coefficient on the interaction between *Inflation Shock* and *Internal Info Quality* is significantly negative in all columns. This effect is economically meaningful as well: the estimates in Column (6) suggest that a one-unit increase in internal information quality offsets approximately 36.96% (= 0.034/0.092) of the positive association between investment and inflation shocks. This result supports our hypothesis that higher internal information quality allows managers to filter firm-level real from nominal inflation shocks more effectively and thereby mitigates the positive association between investment and inflation shocks.

Together, the findings in Table 4 are consistent with two observations. First, as predicted by the information quality channel posited in imperfect information models, managers adjust their investment decisions to inflation. Second, higher internal information quality helps managers differentiate between firm-level real and aggregate-level nominal shocks; as a result, it decreases the sensitivity of managers' investment decisions to inflation shocks.

4.2. Investment efficiency

Our baseline results show that the investment decisions of firms with higher internal information system quality respond less strongly to inflation shocks. Since inflation shocks are nominal and will not be sustained by real future demand, imperfect information models predict that investment in response to inflation shocks is inefficient and should result in misallocated capital and lower investment efficiency. At the same time, the negative effect of inflation shocks on investment efficiency should be attenuated for firms with higher internal information quality because, as documented in Table 4, these firms adjust their investments less in response to inflation shocks.

To test this prediction, we follow prior literature (Chen et al., 2007; Jayaraman and Wu 2019) and estimate Equation (1) after replacing *Investment* with *Future Profitability* (next year's return on equity) as the dependent variable. Table 5 shows that return on equity decreases following inflation shocks, consistent with a decline in the quality of firms' investment decisions. We also observe that this decrease is muted for firms with higher internal information quality, consistent with higher internal information quality supporting firms' investment efficiency by helping managers to filter real from nominal shocks. The two effects are economically significant as well: a one-standard-deviation inflation shock is associated with a 0.204-standard-deviation, or a 7.34-percentage-point (= 0.36 × 0.204), decline in return on equity; a one-unit increase in internal information

Table 4
Inflation, investment, and internal information systems as a transmission channel.

Dependent Variable	*Investment*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation Shock	**0.278*****	**0.276*****			**0.093*****	**0.092*****		
	(10.13)	**(10.43)**			**(3.40)**	**(3.49)**		
Internal Info Quality	0.021***	0.020***	0.028***	0.025***	−0.024	−0.024	−0.025	−0.027
	(3.80)	(3.60)	(4.01)	(3.83)	(-0.56)	(-0.56)	(-0.59)	(-0.64)
Inflation Shock × ***Internal Info Quality***	**−0.068*****	**−0.068*****	**−0.023****	**−0.023****	**−0.034*****	**−0.034*****	**−0.024*****	**−0.024*****
	(-5.62)	**(-5.69)**	**(-2.55)**	**(-2.54)**	**(-4.11)**	**(-4.28)**	**(-3.25)**	**(-3.26)**
Growth Expectations					0.033***	0.032***		
					(4.67)	(4.51)		
Macroeconomic Uncertainty					−0.144***	−0.146***		
					(-6.11)	(-6.11)		
People Management					0.006	0.007	−0.008	−0.008
					(0.60)	(0.84)	(-0.56)	(-0.53)
Operating Quality					−0.040**	−0.040**	−0.031**	−0.031**
					(-2.36)	(-2.35)	(-2.61)	(-2.57)
Target Focus					0.043	0.045	0.044	0.046
					(1.49)	(1.50)	(1.400)	(1.42)
Cash Flow					0.132***	0.132***	0.139***	0.138***
					(9.31)	(9.38)	(13.14)	(12.76)
ΔCash Flow					−0.067**	−0.065**	−0.064**	−0.063**
					(-2.74)	(-2.58)	(-3.13)	(-2.95)
External Reporting Quality					0.045***	0.046***	0.039***	0.041***
					(3.83)	(4.11)	(3.39)	(3.73)
Leverage					0.045***	0.044***	0.034***	0.034***
					(4.08)	(3.83)	(4.16)	(3.98)
ΔSales					0.225***	0.224***	0.172***	0.170***
					(12.09)	(12.05)	(8.37)	(8.29)
Size					0.115***	0.116***	0.141***	0.142***
					(8.69)	(8.56)	(9.34)	(8.98)
Observations	4,870	4,870	4,870	4,870	4,870	4,870	4,870	4,870
Adjusted R-squared	0.006	0.006	0.120	0.121	0.138	0.138	0.183	0.183
Industry FE	No	Yes	No	Yes	No	Yes	No	Yes
Country-by-Year FE	No	No	Yes	Yes	No	No	Yes	Yes

Table 4 regresses investment (*Investment*) on the interaction between inflation shocks (*Inflation Shock*) and the composite internal information system score (*Internal Info Quality*), controls, and industry and country-by-year fixed effects. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

system quality offsets approximately 25.98% (= 0.053/0.204) of this association. Finally, consistent with prior research, we find that *Internal Info Quality* (as measured by the sum of its individual effect and its interactive effect with *Inflation Shock*) has a positive impact on investment efficiency.

Overall, as predicted by imperfect information models, the evidence in this section suggests that firms' investment efficiency declines following inflation shocks, and that this effect is mitigated by the quality of firms' internal information systems. While we cannot directly attribute the negative association between investment efficiency and inflation in Table 5 to the positive association between investment and inflation in Table 4, the combined evidence is difficult to reconcile with alternative explanations. It appears unlikely that internal information systems would contemporaneously mitigate both associations if the two were not connected.

4.3. The 8th EU Company Law Directive

Firms' differential exposure to macroeconomic fluctuations can influence managers' choice of how much to invest in internal information systems (Hugon et al., 2015). If this is the case, then the documented moderating effect of internal information quality on the inflation-investment relation could result from firms' exposure to macroeconomic fluctuations and not from the filtering mechanism posited by imperfect information models. We address this concern using the (revised) 8th EU Company Law Directive of May 17th, 2006 as a plausibly exogenous shock to internal information quality within a difference-in-differences analysis.

Similar to the Sarbanes-Oxley Act in the US, the Directive extends the existing EU Company Law's scope of the requirements for external quality assurance by clarifying the duties of statutory auditors and harmonizing principles of audit independence and ethics across countries (Tiron-Tudor and Boţa-Avram 2013). While the Directive was adopted to reinforce and to harmonize the statutory audit function throughout Europe, its requirements indirectly push firms to improve their internal information systems. Specifically, the Directive requires firms to provide assurance to the board of directors and the audit committee that adequate and effective controls to monitor and manage critical risks exist, and that a process to

Table 5
Investment efficiency.

Dependent Variable	*Future Profitability*			
	(1)	(2)	(3)	(4)
Inflation Shock	**−0.198****	**−0.204*****		
	(-3.19)	**(-3.26)**		
Internal Info Quality	0.018**	0.013	0.000	−0.006
	(2.30)	(1.61)	(0.03)	(-0.55)
Inflation Shock × ***Internal Info Quality***	**0.052****	**0.053****	**0.045****	**0.047****
	(2.71)	**(2.78)**	**(2.41)**	**(2.50)**
Internal Info Quality + *Inflation Shock* × *Internal Info Quality*	0.070	0.066	0.045	0.041
p-value	0.009	0.008	0.040	0.041
Observations	4,385	4,385	4,385	4,385
Adjusted R-squared	0.178	0.180	0.178	0.181
Controls	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Country-by-Year FE	No	No	Yes	Yes

Table 5 regresses year-ahead profitability (*Future Profitability*) on the interaction between inflation shocks (*Inflation Shock*) and the composite internal information system score (*Internal Info Quality*), controls, and industry and country-by-year fixed effects. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

adequately report on this monitoring is in place. As a result, after the enactment of the Directive, professional associations like the Federation of European Risk Management Associations (FERMA) and the European Confederation of Institutes of Internal Auditing (ECIIA) issued several guidance documents to aid senior management teams in establishing effective risk management and control processes for their firms (e.g., FERMA/ECIIA 2010, 2011).[19] Therefore, similar to corporate responses following adverse audit opinions (Cheng et al., 2013), the adoption of new accounting standards (Shroff 2017), and the 2014 amendment to Rule 17a-5 (Charoenwong et al., 2022), the Directive likely incentivizes firms to improve their internal information systems to provide sufficient assurance to the board and the audit committee.

In addition to potentially influencing firms' internal information systems, two features of the Directive make it well suited to address endogeneity concerns. First, the Directive was designed to improve information quality, not management quality more generally, so there is no a priori reason to expect that it would improve management practices beyond internal information quality. Second, the Directive applies only to public firms located in countries that adopt it.[20] Our data include both public and private firms from adopting and non-adopting countries, which provides cross-sectional variation in firms' exposure to the Directive and thereby allows us to employ a difference-in-differences analysis.

Table 6 Panel A and Fig. 2 illustrate the composition of our sample, which includes firms from the following countries: Germany, Ireland, Italy, Poland, Portugal, Spain, Sweden, and the United Kingdom.[21] While all countries must ultimately adopt the Directive, national governments have discretion over the timing of the adoption. Because of these adoption timing differences and limitations in WMS coverage, Germany, Ireland, and Spain do not feature any post-adoption observations; Poland, Portugal, Sweden, and the United Kingdom feature post-adoption observations starting in 2010; and Italy features post-adoption observations starting in 2014. Therefore, we use the Directive in a staggered difference-in-differences design. We identify treated firms with an indicator set to one for public firms and zero for private firms (*Public*). We identify the post-period as an indicator set to one for years 2010 and onward for firms located in Poland, Portugal, Sweden, and the United Kingdom and for years 2014 and onward for firms located in Italy, zero otherwise (*Post*).

We use the Directive in two stages. In the first stage, we verify that the Directive induced treated firms to increase the quality of their internal information systems relative to control firms. To do so, we estimate the following regression specification:

$$Internal\ Info\ Quality_{i,t} = \beta_1 Public_i + \beta_2 Public_i \times Post_t + \sum \gamma_j\ Control_{j,i,t} + \Gamma_{\mathrm{ind}} + \Theta_{\mathrm{c-t}} + \varepsilon_{\mathrm{i,t}} \qquad (2)$$

[19] To illustrate, FERMA/ECIIA (2011) presents recommendations to implement Article 41 of the Directive that stipulates that the audit committee shall "monitor the effectiveness of the internal control, internal audit, and risk management systems." The document contains a detailed questionnaire for executive committees on various aspects of the risk management and control processes in place at the firm.
[20] The regulation applies to public-interest entities, defined as all entities that are both governed by the law of a member state and listed on an EU regulated market.
[21] We exclude France and Greece from the EU Directive analyses because they only partially implemented the Directive during the sample period.

Table 6
8th EU company law directive.

Panel A. Sample Composition

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Total												
Public = 1	46	.	62	.	9	.	38	.	.	2	21	178
Public = 0	176	21	1,207	.	198	.	625	.	.	190	603	3,020
Germany												
Public = 1	32	.	25	.	.	.	11	.	.	.	2	70
Public = 0	79	4	123	.	.	.	52	.	.	.	28	286
Post	0	0	0	0	0	0	0	0	0	0	0	
Ireland												
Public = 1	.	.	.	.	2	.	.	.	.	.	.	2
Public = 0	.	.	.	.	52	.	.	.	.	.	.	52
Post	0	0	0	0	0	0	0	1	1	1	1	
Italy												
Public = 1	.	.	4	.	.	.	4	.	.	.	5	13
Public = 0	.	3	167	.	.	.	93	.	.	.	292	555
Post	0	0	0	0	0	0	0	1	1	1	1	
Poland												
Public = 1	.	.	5	.	.	.	3	.	.	.	.	8
Public = 0	.	.	163	.	.	.	93	.	.	.	.	256
Post	0	0	0	0	0	0	1	1	1	1	1	
Portugal												
Public = 1	.	.	5	.	.	.	5	.	.	.	3	13
Public = 0	.	.	129	.	.	.	115	.	.	.	84	328
Post	0	0	0	0	0	1	1	1	1	1	1	
Spain												
Public = 1	.	.	.	.	.	.	.	.	.	2	.	2
Public = 0	.	.	.	.	.	.	.	.	.	190	.	190
Post	0	0	0	0	0	0	0	0	0	0	0	
Sweden												
Public = 1	.	.	4	.	.	.	3	.	.	.	.	7
Public = 0	.	.	201	.	.	.	93	.	.	.	.	294
Post	0	0	0	0	1	1	1	1	1	1	1	
UK												
Public = 1	14	.	19	.	7	.	12	.	.	.	11	63
Public = 0	97	14	424	.	146	.	179	.	.	.	199	1,059
Post	0	0	0	0	0	1	1	1	1	1	1	

Panel B. 8th EU Company Law Directive and Internal Information System Quality

Dependent Variable	*Internal Info Quality*					
	(1)	(2)	(3)	(4)	(5)	(6)
Public	−0.053*	−0.051*	−0.057**	−0.047*	−0.058**	−0.042
	(-1.87)	(-2.04)	(-2.39)	(-2.04)	(-2.45)	(-1.21)
Public* × *Post	**0.095****	**0.099****	**0.124****	**0.105****	**0.142****	**0.095****
	(2.62)	**(2.78)**	**(2.69)**	**(3.04)**	**(2.35)**	**(2.85)**
Observations	3,198	3,198	2,630	2,809	2,474	4,071
Adjusted R-squared	0.608	0.610	0.616	0.606	0.611	0.605
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-by-Year FE	Yes	Yes	Yes	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	Yes	No
Country-by-Year-by-Cohort FE	No	No	No	No	No	Yes
Industry-by-Cohort FE	No	No	No	No	No	Yes

Panel C. Inflation, Investment, and the 8th EU Company Law Directive

Dependent Variable	*Investment*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public	0.045	0.053	0.035	0.042	0.027	0.029	0.153***	
	(0.39)	(0.46)	(0.31)	(0.36)	(0.25)	(0.29)	(5.30)	
Public × *Post*	−0.149	−0.157	−0.130	−0.145	−0.108	−0.164	0.054	0.054
	(-0.97)	(-1.04)	(-0.87)	(-0.91)	(-0.66)	(-1.26)	(0.76)	(0.63)
Public × *Inflation Shock*	0.292***	0.261***	0.281***	0.276***	0.291***	0.282**	0.152***	0.126***
	(6.37)	(5.88)	(7.08)	(5.75)	(6.72)	(2.55)	(7.36)	(3.88)
Public* × *Post* × *Inflation Shock	**−0.501****	**−0.484****	**−0.518****	**−0.584****	**−0.616***	**−0.496****	**−0.112*****	**−0.076***
	(-2.63)	**(-2.63)**	**(-2.30)**	**(-2.52)**	**(-2.21)**	**(-2.91)**	**(-3.55)**	**(-2.07)**
Observations	3,198	3,198	2,630	2,809	2,474	4,071	1,281	1,281
Adjusted R-squared	0.177	0.176	0.164	0.171	0.166	0.172	0.217	0.206
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(*continued on next page*)

Table 6 (*continued*)

Panel C. Inflation, Investment, and the 8th EU Company Law Directive								
Dependent Variable	*Investment*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Country-by-Year FE	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Industry FE	No	Yes	Yes	Yes	Yes	No	Yes	No
Firm FE	No	No	No	No	No	No	No	Yes
Country-by-Year-by-Cohort FE	No	No	No	No	No	Yes	No	No
Industry-by-Cohort FE	No	No	No	No	No	Yes	No	No

Table 6 Panel A presents the composition of our Directive sample by year, country, and an indicator that the firm is publicly traded (*Public*).
Table 6 Panel B regresses the composite internal information system score (*Internal Info Quality*) on an indicator that firm is publicly traded (*Public*) interacted with an indicator set to one during the years following the firm's home country's adoption of the Directive, zero otherwise (*Post*). Columns (1) and (2) present the estimation results for the full sample before and after industry fixed effects; Column (3) presents the results after excluding Italian firms; Column (4) presents the results after excluding always-treated firms; Column (5) presents the results after excluding Italian and always-treated firms; Column (6) presents the results using the stacking approach proposed by Cengiz et al. (2019). Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.
Table 6 Panel C estimates the effect of the 8th EU Company Law Directive on the relation between investment and inflation by regressing *Investment* on an indicator set to one if the firm is publicly traded, zero otherwise (*Public*) interacted with an indicator set to one during the years following the firm's home country's adoption of the Directive, zero otherwise (*Post*). Columns (1) to (6) presents results restricted to firms with available data for *Internal Info Quality*. More specifically, Columns (1) and (2) present the estimation results for the full sample before and after industry fixed effects; Column (3) presents the results after excluding Italian firms; Column (4) presents the results after excluding always-treated firms; Column (5) presents the results after excluding Italian and always-treated firms; Column (6) presents the results using the stacking approach proposed by Cengiz et al. (2019). Columns (7) and (8) repeat the analysis without restricting the sample to firms with available data for *Internal Info Quality*. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

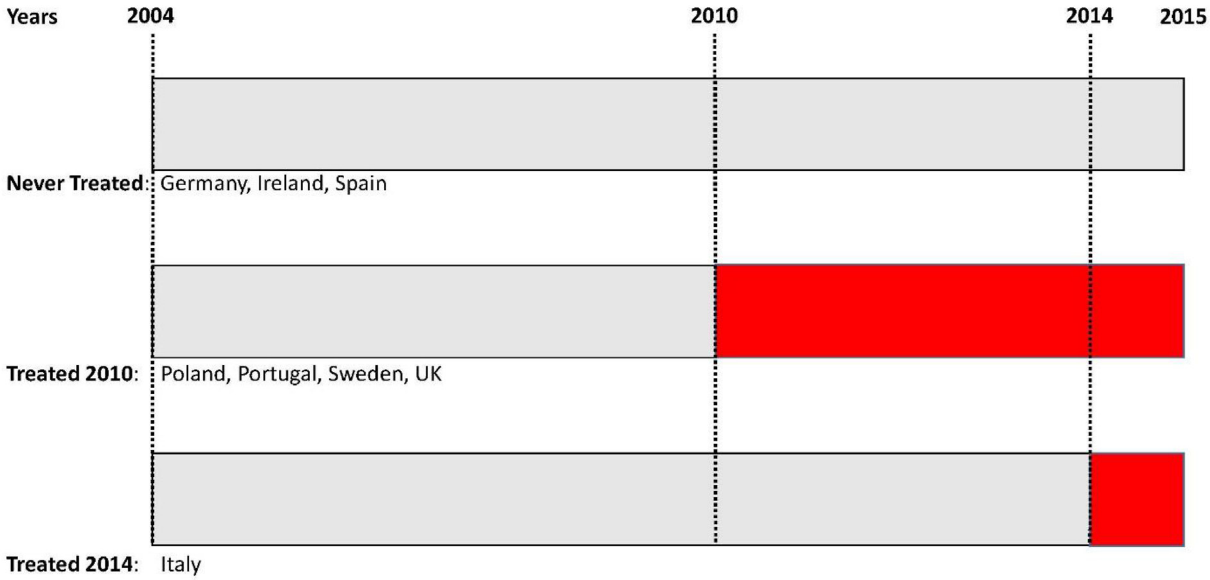

Fig. 2. 8th EU Company Law Directive Adoption Timeline.
Figure 2 illustrates the adoption timeline of the 8th EU Company Law Directive for the countries included in our sample.

We expect the difference-in-differences coefficient β_2 to be positive if the Directive leads to an increase in the quality of firms' internal information systems.[22] Coefficient estimates, presented in Table 6 Panel B, Columns (1) and (2), support this conjecture: the interaction term's slope coefficient is positive and statistically different from zero at the 5% level irrespective

[22] The reader may be concerned that the Directive induced improvements in other management practices. In Online Appendix Section OA5, we examine this possibility by estimating Equation (2) with *People Management*, *Operating Quality*, *Target Focus*, and *External Reporting Quality* as dependent variables (including *Internal Info Quality* as a control replacing the respective dependent variable). The estimates show that the Directive did not consistently improve other management practices.

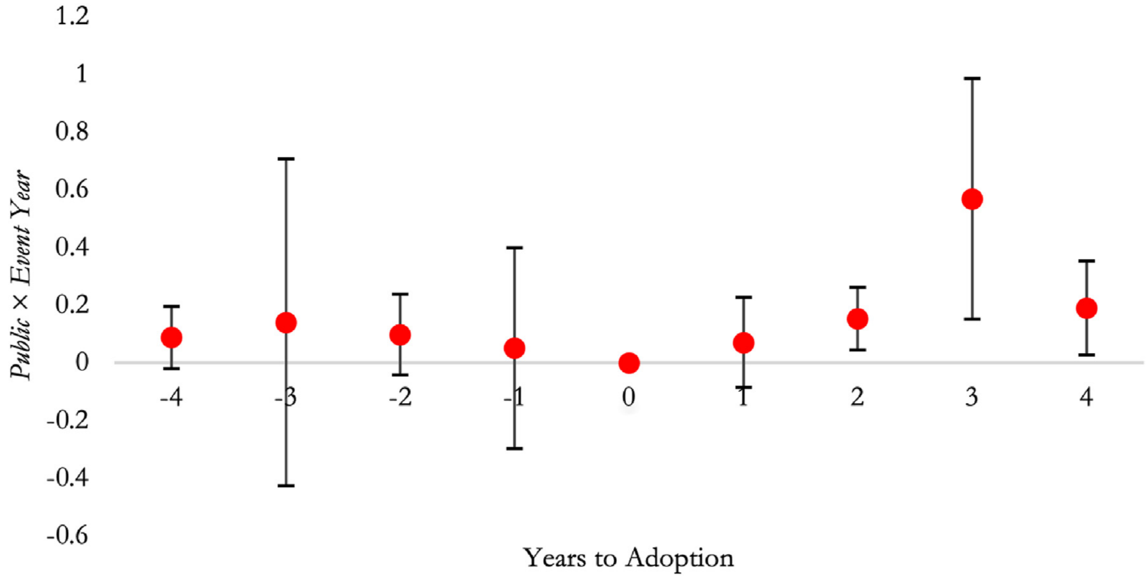

Fig. 3. 8th EU Company Law Directive as an Instrument for Internal Information System Quality: Parallel Trends Test.
Figure 3 tests the parallel trends assumption of our 8th EU Company Law Directive difference-in-differences design by regressing *Internal Info Quality* on an indicator that the firm is publicly traded (*Public*) interacted with event-time indicators for the difference between the year in which the firm's home country adopted the Directive minus the year of the observation (*Event Year*), controls, and industry and country-by-year fixed effects. The year in which the firm's home country adopted the Directive constitutes the base year. The figure displays the slope coefficients and 95% confidence intervals for the interaction term between *Public* and each of the event-time indicators. Standard errors are clustered by industry. All continuous firm-level variables are winsorized at the 1st and 99th percentiles. Variables are as in Appendix A.

of the fixed effect structure, and it amounts to a 0.2-standard-deviation increase in internal information quality. Fig. 3 tests the parallel trends assumption underlying our design by re-estimating Equation (2) after replacing *Post* with fiscal year indicators (Christensen et al. 2016). The base year for this analysis is the year in which the Directive takes effect in a given country. Consistent with our parallel trends assumption, the difference in the quality of internal information systems between treatment and control firms is insignificant in the pre-period and turns increasingly positive in the post-period. While the economic magnitude of the effect of the Directive on treated firms' internal information system quality is larger three years after adoption, the figure shows that the Directive induced statistically and economically meaningful increases in treated firms' internal information system quality in each period starting two years after its adoption.

Our identification strategy relies on a staggered difference-in-differences design. Recent research shows that in the presence of heterogenous or trending treatment effects, this approach can yield invalid estimates of treatment effects even when the parallel trends assumption is not violated, since it includes previously treated units in the control group (Goodman-Bacon 2021; Baker et al. 2022). We take numerous steps to mitigate this concern, and report the results in Table 6 Panel B. In addition to the standard staggered difference-in-differences design with (Column (2)) and without (Column (1)) fixed effects, we 1) exclude Italy from the sample, which aligns the adoption period of the remaining observations and thereby yields a standard difference-in-differences design (Column (3)); 2) exclude all firms that enter the sample as always treated (Column (4)); 3) exclude Italy and all firms that enter the sample as always treated (Column (5)); and 4) use a stacked regression approach, in which we re-estimate Equation (2) on a stacked dataset of event-specific two-by-two datasets for the treated cohort and untreated controls within the treatment window (Column (6)) (Cengiz et al. 2019).[23] In all cases, the coefficient β_2 is significantly positive. Furthermore, the different estimations produce coefficients of similar economic magnitude. This is comforting since evidence of coefficient stability mitigates endogeneity concerns (Oster 2019).

In the second stage of our analysis, we test whether the investment of treated firms becomes relatively less responsive to nominal shocks following their home country's adoption of the Directive by estimating the following regression model (all variables are defined as before):[24]

[23] We create the stacked dataset in three steps. First, we create a dataset that contains firms from never-treated countries, countries treated in 2010, and firms from Italy before they are treated (i.e., before 2014). Second, we create a dataset that contains firms from countries that are never treated or are from Italy. Third, we stack the two datasets together.

[24] The model includes the full set of interactions between *Public*, *Post*, and *Inflation Shock*. However, the variables *Post*, *Inflation Shock*, and *Post* × *Inflation Shock* drop out of the model because they are perfectly collinear with our fixed effects.

$$Investment_{i,t} = \beta_1 Public_i + \beta_2 Public_i \times Post_t + \beta_3 Public_i \times Inflation\ Shock_t + \beta_4 Public_i \times Post_t \times Inflation\ Shock_t + \sum \gamma_j\ Control_{j,i,t} + \Gamma_{ind} + \Theta_{c-t} + \varepsilon_{i,t} \tag{3}$$

We expect the coefficient β_4 to be negative if treated firms, which sustain an increase in the quality of their internal information system, make investment decisions that are less responsive to nominal shocks after the Directive takes effect in their home country. Coefficient estimates, presented in Table 6 Panel C, Columns (1) and (2), support this prediction: β_4 is significantly negative before and after fixed effects. The effect is economically meaningful as well. While treated firms' investment decisions are more responsive to inflation shocks than control firms' in the pre-period ($\beta_3 = 0.261$, $t = 5.88$), this difference turns insignificant in the post-period ($\beta_3 + \beta_4 = 0$, $F = 1.29$). Columns (3) to (6) of Table 6 Panel C report the results of the same robustness tests as in Panel B. β_4 remains significantly negative across all columns.

While providing supporting evidence, the Directive analysis suffers from limitations: only 5% of the observations are treated; treatment is concentrated in UK firms; public and private firms could differ along observable and unobservable characteristics; and we measure the effects of the Directive years after its implementation, which increases the risk that confounding events affect our results. To address these limitations, we re-estimate Equation (3) without limiting our sample to firms covered by the WMS. More specifically, we start with the broad cross-section of all public and private firms affected by the Directive in the six-year window around the adoption of the Directive for each EU country, which includes 98 public firms and 1932 private firms. We then mitigate the differences in characteristics between public and private firms by using propensity score matching. That is, for each public firm, we identify a paired private firm using nearest neighbor matching based on all firm-level control variables within the same country and industry the year before the firm's home country adopts the Directive. We then re-estimate Equation (3) on the resulting sample, which includes 1,281 observations distributed over 98 public and 98 private firms. Table 6 Panel C Columns (7) and (8) show that our results are robust to this approach even after including firm fixed effects.

Together, these findings lend additional support to our predictions that treated firms improve their internal information systems following the adoption of the Directive and, as a result, their investment decisions become less sensitive to inflation shocks.

5. Additional tests

5.1. *Cross-sectional analysis*

To shed further light on the mechanism underlying our main results, we examine whether the documented effects vary in the cross-section as predicted by theory.

5.1.1. *Competition*

We first assess whether the mitigating effect of internal information system quality on the inflation-investment relation is concentrated in competitive product markets, i.e., markets in which firms act as price takers, a key assumption in imperfect information models. We test this conjecture by estimating Equation (1) separately on firms operating in industries and countries whose Herfindahl—Hirschman index is above and below the sample median. Coefficient estimates, reported in Table 7 Panel A, support our conjecture: β_1 and β_3 are only significant in the subsample of firms exposed to high product market competition. Furthermore, the difference in the β_3 coefficient across subsamples is statistically significant at the 5% level for industry-level product market competition ($p = 0.014$) and at the 1% level for country-level product market competition ($p < 0.001$).

Prior research documents a positive effect of competition on management practices and thereby performance (Syverson 2004, 2011; Van Reenen 2011; Bloom and Van Reenen 2007; Bloom et al. 2015). Our evidence points to an additional channel through which the interaction between competition and management quality influences performance: higher *Internal Info Quality* allows firms to better interpret the nature of shocks they face when they operate in a competitive product market.

5.1.2. *Relative volatility of real and nominal shocks*

Imperfect information models also predict that the effect of inflation shocks on investment increases in the ratio of the volatility of the firm-level real to the aggregate-level nominal shocks (e.g., Appendix B, Equation (A18)). That is, the higher the difficulty of measuring firm-level real shocks relative to aggregate-level nominal shocks, the higher the likelihood that managers inefficiently invest in response to aggregate-level nominal shocks.

We test this prediction by estimating Equation (1) separately for firms with above and below the sample median ratio of firm-level real volatility (measured as firm-level revenue volatility) relative to aggregate-level nominal volatility (measured as country-level inflation volatility in firms' home countries). Table 7 Panel B shows that β_1 and β_3 are only significant in the subsample of firms facing high firm-level real relative to aggregate-level nominal volatility, consistent with the comparative static in imperfect information models.

Table 7
Cross-sectional analyses.

Panel A. Product Market Competition

Dependent Variable	*Investment*			
	Product Market Competition (Industry)		Product Market Competition (Country)	
Subsample	Low	High	Low	High
	(1)	(2)	(4)	(5)
Inflation Shock	**0.020**	**0.140*****	**−0.060**	**0.387*****
	(0.42)	**(6.54)**	**(-1.05)**	**(6.31)**
Internal Info Quality	−0.014	−0.040	−0.007	−0.06
	(-0.32)	(-0.99)	(-0.32)	(-0.99)
Inflation Shock* × *Internal Info Quality	**0.000**	**−0.051*****	**0.009**	**−0.099*****
	(0.00)	**(-8.15)**	**(0.54)**	**(-8.98)**
Difference in *Inflation Shock* × *Internal Info Quality*	0.051		0.108	
p-value	0.014		<0.001	
Observations	2,435	2,433	2,431	2,438
Adjusted R-squared	0.165	0.170	0.149	0.175
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Panel B. Relative Volatility of Real and Nominal Shocks

Dependent Variable	*Investment*	
Revenue Volatility/Inflation Volatility	Low	High
	(1)	(2)
Inflation Shock	**0.014**	**0.212*****
	(0.25)	**(4.51)**
Internal Info Quality	0.020	−0.072
	(0.79)	(-0.82)
Inflation Shock* × *Internal Info Quality	**−0.010**	**−0.063*****
	(-0.94)	**(-4.83)**
Difference in *Inflation Shock* × *Internal Info Quality*	0.053	
p-value	0.006	
Observations	2,433	2,435
Adjusted R-squared	0.142	0.175
Controls	Yes	Yes
Country FE	Yes	Yes
Industry FE	Yes	Yes

Panel C. Inflation Regime

Dependent Variable	*Investment*		
Inflation Regime	Deflation	Moderate Inflation	High Inflation
	(1)	(2)	(3)
Inflation Shock		**0.243****	**−0.261*****
		(2.33)	**(-3.94)**
Internal Info Quality	−0.100	−0.054	−0.026
	(-1.66)	(-0.69)	(-0.73)
Inflation Shock* × *Internal Info Quality	**−0.147**	**−0.074****	**−0.006**
	(-0.59)	**(-2.68)**	**(-0.31)**
Differences of *Inflation Shock* × *Internal Info Quality* between:			
Columns (1) and (2)		−0.073	
p-value		0.172	
Columns (1) and (3)		−0.141	
p-value		0.062	
Columns (2) and (3)		−0.068	
p-value		<0.001	
Observations	383	2,361	2,126
Adjusted R-squared	0.061	0.191	0.164
Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Table 7 Panel A repeats our main regressions in subsamples with above and below the sample median product market competition (measured as Herfindahl–Hirschman index) defined at the industry (Columns (1) and (2)) or country (Columns (3) and (4)) level. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.
Table 7 Panel B repeats our main regressions in subsamples with above and below the sample median for the ratio of the volatility of firm-level real shocks (measured as firms' revenue volatility) over the volatility of aggregate-level nominal shocks (measured as firms' home country's inflation volatility). Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the

1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.
Table 7 Panel C repeats our main regressions in three inflation regimes: deflation (*Inflation* < 0), moderate inflation (positive inflation below the sample median of positive inflation), and high inflation (positive inflation above the sample median of positive inflation). Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

5.1.3. Inflation regime

While imperfect information models do not predict that the inflation-investment relation and the mitigating effect of internal information quality depend on the inflation regime, these models necessarily abstract away from reality and, as a result, could miss important features of these relations. To examine the possibility that the inflation-investment relation and the mitigating effect of internal information quality depend on the inflation regime, in Table 7 Panel C, we split our sample in three inflation regimes: deflation (inflation < 0), moderate inflation (positive inflation below the sample median of positive inflation), and high inflation (positive inflation above the sample median of positive inflation) and re-estimate our main analyses for each subsample.

Table 7 Panel C shows that our main findings concentrate in the moderate inflation subsample. Coefficients estimated on the deflation subsample are as expected but indistinguishable from zero. This result, however, should be interpreted with caution because we observe deflation only for Japan in 2010 (37 observations), Greece in 2014 (259 observations), and Portugal in 2014 (87 observations), raising concerns regarding the power of the test. Finally, we document a negative relation between inflation shocks and corporate investment and no mitigating effect of internal information systems in the high inflation subsample.

5.2. Measurement

5.2.1. Alternative investment definitions

One concern with our empirical approach is that investment mechanically increases in inflation when measured in nominal terms. Scaling investment by total assets addresses this concern because both investment in the numerator and total assets in the denominator are affected by inflation. As a result, inflation effects should cancel out. However, inflation could affect investment and total assets differently because the former is a flow while the latter is a stock.

We address this concern by examining the robustness of our results to three alternative measurement approaches. First, we repeat the analysis with sales (a flow) as an alternative deflator. Second, we deflate nominal investment by realized inflation and scale by undeflated beginning-of-period total assets instead of average total assets (so that the denominator is unaffected by inflation over the period) (Konchitchki 2011). Third, we explore whether our results extend to investment in the form of the number of employees, which is unaffected by changes in the value of money. We re-estimate Equation (1) with these alternative investment measures and report the coefficients in Table 8 Panel A. The table shows that our main inference remains unchanged: investment continues to be significantly positively associated with inflation shocks, and this association continues to decline in the quality of firms' internal information systems.

5.2.2. Alternative inflation shock definitions

In our main tests, we rely on an inflation shock measure derived from inflation expectations both because deviations from managers' expectations determine their decision-making and because prior research documents that survey-based inflation forecasts are more accurate than those derived from more complicated econometric models (Ang et al. 2007). Nonetheless, in Table 8 Panel B, we explore three alternative measures of inflation shocks to assess the sensitivity of our results to different measurement approaches.

Table 8
Alternative Measurement Choices.

Panel A. Alternative Investment Definitions						
Dependent Variable	*Investment*					
Investment Definition	Scaled by sales		Konchitchki		Number of employees	
	(1)	(2)	(3)	(4)	(5)	(6)
Inflation Shock	**0.156****	**0.158****	**0.099***	**0.100***	**0.090****	**0.088****
	(3.09)	**(3.17)**	**(2.06)**	**(2.16)**	**(2.68)**	**(2.71)**
Internal Info Quality	−0.007	−0.009	−0.071	−0.068	−0.037*	−0.039*
	(-0.31)	(-0.39)	(-1.24)	(-1.19)	(-2.02)	(-2.24)
Inflation Shock × Internal Info Quality	**−0.045*****	**−0.045*****	**−0.042***	**−0.041***	**−0.028****	**−0.028****
	(-3.33)	**(-3.37)**	**(-2.08)**	**(-2.14)**	**(-2.76)**	**(-2.77)**
Observations	4,869	4,869	4,869	4,870	4,870	4,870
Adjusted R-squared	0.072	0.073	0.123	0.050	0.054	0.187
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes

Panel B. Alternative Inflation Shock Definitions

Dependent Variable	Investment					
Inflation Shock Definition	Inflation Shock (Citi)		Change in Inflation		Inflation Shock (Model)	
	(1)	(2)	(3)	(4)	(5)	(6)
Inflation Shock	**0.225***** **(8.34)**		**0.271***** **(9.05)**		**0.159***** **(3.48)**	
Internal Info Quality	−0.004 (-0.53)	−0.072 (-1.27)	0.021*** (3.57)	−0.027 (-0.64)	0.026* (1.69)	−0.046** (-2.07)
Inflation Shock × Internal Info Quality	**−0.043***** **(-4.20)**	**−0.027*** **(-2.03)**	**−0.067***** **(-5.09)**	**−0.026**** **(-2.95)**	**−0.027**** **(-2.25)**	**−0.016***** **(-4.56)**
Observations	2,250	2,250	4,870	4,870	4,497	4,497
Adjusted R-squared	0.010	0.187	0.005	0.183	0.014	0.184
Controls	No	Yes	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Country-by-Year FE	No	Yes	No	Yes	No	Yes

Table 8 Panel A repeats our main regressions using three alternative measures of investment. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.
Table 8 Panel B repeats our main regressions using three alternative measures of inflation shock. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

We test the robustness of our results to using 1) Citigroup's Inflation Surprise Index, an index estimated by Citigroup using CPI but also PPI and wage shocks, thereby incorporating multiple dimensions of inflation potentially relevant to firms, but available only for nine of our sample countries (Australia, Canada, China, India, Japan, New Zealand, Sweden, UK, US) (Columns (1) and (2)); 2) changes in inflation based on the assumption that expected inflation follows a random walk (Fama and Gibbons 1984) (Columns (3) and (4)); and 3) residuals obtained from a determinant model built following previous research (Fisher 1930; Sargent 1973; Fama and Schwert 1977) (Columns (5) and (6)).[25] Across all models, we continue to document a positive relation between corporate investment and inflation shocks that declines in the quality of firms' internal information systems.

5.3. Internal information quality versus management quality

Prior research shows that better management practices lead to better decisions. Therefore, our results could reflect superior management practices rather than the information channel we posit. For example, in Tables 4 and 5, when we interact inflation shocks with our proxy for internal information quality but not with other control variables, we implicitly assume that any differential response to inflation shocks runs exclusively through the internal information channel. In Table 9, we relax this assumption and replicate the analyses in Table 4 (Panel A) and Table 5 (Panel B) after interacting all control variables with inflation shocks. The table generates two insights. First, inconsistent with better management rather than internal information quality driving our results, *People Management, Operating Quality*, and *Target Focus* do not reliably relate to investment and investment efficiency. For example, Table 9 Panel A shows that *People Management* and *Operating Quality* interact positively, and *Target Focus* does not interact significantly, with inflation shocks. Second and importantly, adding these interactions does not significantly affect our main inference, suggesting that our results reflect the information mechanism posited.

We follow a second strategy to isolate the information channel from better management practices in general. Prior literature identifies five broad classes of determinants of “good” management: product market competition, trade and foreign direct investment, general education, labor regulation, and governance (Scur et al., 2021).[26] In our main analysis, our fixed effect structure subsumes these determinants, which are mostly measured at the country-year level. Nevertheless, in Online

[25] The estimated determinant model is $Inflation_{c,t} = 0.138^{*} \times Inflation_{c,t\text{-}1} + 0.011 \times GDP\ Growth_{c,t\text{-}1} - 0.002^{***} \times Unemployment_{c,t\text{-}1} + 0.001^{**} \times Long\text{-}Term\ Interest\ Rate_{c,t\text{-}1} + 0.001 \times Expected\ Domestic\ Demand_{c,t\text{-}1} + \Theta_{c,t} + \varepsilon_t$. We define all variables in Appendix A and cluster standard errors by country.

[26] Scur et al. (2021) also argue that better management quality more generally is associated with higher intangible investment, which raises the possibility that our results do not extend to intangible investments. While this possibility is outside the scope of our paper, in Online Appendix Section OA7 we repeat our main test using intangible instead of tangible investment as the dependent variable. We find neither that inflation is positively associated with intangible investment, nor that internal information system quality reliably mitigates the inflation-intangible investment relation. Therefore, our results seem to concentrate in tangible investments, consistent with the idea that these investments are made to support current production and not innovation, which is not featured in imperfect information models. Further, conceptually our results should hold for long-term (i.e., fixed) as well as short-term (i.e., inventory) tangible investment. However, inventory data is available for only 5% of our observations with 57% of these observations coming from three countries (Greece, India, and the United Kingdom). Given these data limitations, we are unable to examine whether our results hold for short-term tangible investment.

Table 9
Internal information quality versus operating quality.

Panel A. Investment

Dependent Variable	*Investment*			
	(1)	(2)	(3)	(4)
Inflation Shock	**0.047**	**0.050**		
	(0.78)	**(0.81)**		
Internal Info Quality	−0.018	−0.017	−0.022	−0.024
	(-0.39)	(-0.39)	(-0.50)	(-0.54)
Inflation Shock × Internal Info Quality	**−0.087*****	**−0.087*****	**−0.088*****	**−0.088*****
	(-4.69)	**(-4.70)**	**(-5.05)**	**(-5.10)**
People Management × Inflation Shock	−0.049	−0.050*	−0.036	−0.036
	(-1.80)	(-1.85)	(-1.56)	(-1.59)
Operating Quality × Inflation Shock	0.051***	0.052***	0.043***	0.044***
	(13.79)	(14.08)	(10.83)	(10.81)
Target Focus × Inflation Shock	0.057**	0.056**	0.053***	0.054***
	(2.61)	(2.61)	(3.36)	(3.45)
Growth Expectations × Inflation Shock	0.054***	0.054***		
	(3.33)	(3.31)		
Macroeconomic Uncertainty × Inflation Shock	0.042***	0.043***		
	(3.75)	(3.80)		
Cash Flow × Inflation Shock	−0.025**	−0.025**	−0.012	−0.012
	(-2.48)	(-2.44)	(-0.88)	(-0.87)
ΔCash Flow × Inflation Shock	0.005	0.005	0.000	0.001
	(0.42)	(0.41)	(0.02)	(0.05)
External Reporting Quality × Inflation Shock	0.016	0.016	0.012	0.012
	(0.70)	(0.70)	(0.46)	(0.46)
Leverage × Inflation Shock	0.009	0.009	0.013	0.014
	(0.39)	(0.42)	(0.67)	(0.70)
ΔSales × Inflation Shock	−0.050***	−0.051***	−0.051***	−0.051***
	(-3.43)	(-3.47)	(-4.56)	(-4.55)
Size × Inflation Shock	0.013	0.014	0.028*	0.028*
	(0.55)	(0.56)	(2.17)	(2.01)
Observations	4,870	4,870	4,870	4,870
Adjusted R-squared	0.144	0.145	0.187	0.187
Controls	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Country-by-Year FE	No	No	No	Yes

Panel B. Future Profitability

Dependent Variable	*Future Profitability*			
	(1)	(2)	(3)	(4)
Inflation Shock	**−0.210***	**−0.220***		
	(-2.04)	**(-2.17)**		
Internal Info Quality	0.015	0.009	−0.001	−0.008
	(1.34)	(0.83)	(-0.09)	(-0.56)
Inflation Shock × Internal Info Quality	**0.107****	**0.109****	**0.100****	**0.103****
	(2.56)	**(2.60)**	**(2.74)**	**(2.78)**
People Management × Inflation Shock	0.041	0.042	0.044	0.045
	(1.05)	(1.03)	(1.21)	(1.19)
Operating Quality × Inflation Shock	−0.059***	−0.060***	−0.059***	−0.060***
	(-3.77)	(-4.01)	(-5.42)	(-5.68)
Target Focus × Inflation Shock	−0.034	−0.034	−0.037	−0.036
	(-1.40)	(-1.35)	(-1.24)	(-1.22)
Growth Expectations × Inflation Shock	−0.005	−0.006		
	(-0.37)	(-0.44)		
Macroeconomic Uncertainty × Inflation Shock	−0.021	−0.019		
	(-0.92)	(-0.82)		
Cash Flow × Inflation Shock	−0.013	−0.012	−0.016	−0.015
	(-0.40)	(-0.37)	(-0.46)	(-0.42)
ΔCash Flow × Inflation Shock	−0.005	−0.006	−0.006	−0.006
	(-0.28)	(-0.31)	(-0.25)	(-0.25)
External Reporting Quality × Inflation Shock	−0.019**	−0.019**	−0.016**	−0.016**
	(-2.58)	(-2.67)	(-2.29)	(-2.38)
Leverage × Inflation Shock	0.032	0.032	0.037	0.038
	(1.41)	(1.38)	(1.24)	(1.28)
ΔSales × Inflation Shock	0.038**	0.038**	0.042***	0.042***
	(2.99)	(3.01)	(3.30)	(3.31)
Size × Inflation Shock	−0.002	−0.005	−0.000	−0.003
	(-0.32)	(-0.73)	(-0.01)	(-0.40)
Observations	4,385	4,385	4,385	4,385

Table 9 (*continued*)

Panel B. Future Profitability				
Dependent Variable	*Future Profitability*			
	(1)	(2)	(3)	(4)
Adjusted R-squared	0.180	0.183	0.181	0.184
Controls	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Country-by-Year FE	No	No	No	Yes

Table 9 Panel A (Panel B) repeats our main regressions for *Investment (Future Profitability)* interacting *Inflation Shock* with each control. Robust t-statistics are reported in parentheses. Standard errors are clustered by industry. All continuous firm-level variables are standardized and winsorized at the 1st and 99th percentiles. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

Appendix Section OA6, we explore an alternative research design where we directly control for the five determinants. Our inferences remain unchanged.

6. Aggregate effects

Our theoretical framework centers on the idea that information frictions induce a positive association between inflation and investment. So far, we have documented that this relation exists at the firm level. In Table 10 Panel A (Panel B), we examine whether the firm-level relation aggregates to the economy level as well by regressing aggregate country-level investment on inflation shocks interacted with an annual equal-weighted (total assets-weighted) country-level average of *Internal Info Quality*, controls, and country and year fixed effects:[27]

$$\begin{aligned} \textit{Aggregate Investment}_{c,t} = {} & \beta_1\, \textit{Inflation Shock}_{c,t} + \beta_2 \textit{Internal Info Quality}_c + \beta_3 \textit{Inflation Shock}_{c,t} \times \textit{Internal Info Quality}_c \\ & + \sum \gamma_j\, \textit{Controls}_{j,i,t} + \kappa_c + \nu_t + \varepsilon_{i,t} \end{aligned} \tag{4}$$

We define all variables in Appendix A and cluster standard errors by country. Consistent with our firm-level findings, Table 10 documents a consistently positive relation between *Aggregate Investment* and *Inflation Shock* that is mitigated by country-level internal information system quality. These results indicate that information frictions play an important role in the transmission of nominal shocks to the real economy, and therefore in explaining aggregate investment fluctuations.[28]

7. Conclusion

Different types of macroeconomic models make distinct predictions about the relation between inflation and corporate investment. While RBC models predict that nominal variables, such as inflation, do not affect real variables, such as investment, imperfect information models predict that managers adjust their investment decisions to inflation shocks because they cannot perfectly distinguish between aggregate-level nominal and firm-level real shocks. This information-based channel highlights the role played by the quality of information available to managers by predicting that the higher the quality of firm-level information available to managers at the time of the investment decision, the less managers will react to aggregate-level inflation shocks. We build on this prediction to study whether the quality of firms' internal information systems acts as a channel through which inflation affects corporate investment.

Our empirical analysis provides evidence consistent with the prediction of imperfect information models in three ways. First, we document a positive association between corporate investment and inflation shocks. Second, we show that this association weakens in the quality of firms' internal information systems. Third, we document that this difference in

[27] In Online Appendix Section OA8, we also estimate our firm-level results by country. For most countries, the results are either not estimable or not significant, which is not surprising given the small numbers of observations (see Table 1 Panel A). Further, while we find evidence consistent with our main results for Italy, we observe the opposite in Japan and Poland. These findings should be interpreted with caution. During the two years we observe for Japan and Poland (2006 and 2010), inflation shocks are very similar in magnitude: 0.008 and 0.006 for Japan and −0.012 in both years for Poland. Since the models are estimated by country and include year fixed effects, the resulting inflation shocks are very close to zero and exhibit little variation, making it difficult to draw reliable inferences.

[28] In Online Appendix Section OA9, we investigate whether our results vary as a function of the central banks' monetary policy transparency. Consistent with Equation (A18), we find that the country-level investment response to inflation shocks, as well as the mitigating effect of country-level internal information system quality, is more pronounced for countries with higher monetary policy transparency. Intuitively, the more precise the information managers have about their countries' inflation environments, the lower the likelihood that the garbled signals managers receive represent nominal rather than real shocks. As a result, managers increase their investment response to shocks broadly and thereby (unintentionally) to inflation shocks more specifically, which raises the benefit of having higher-quality internal information systems.

Table 10
Country-level analysis.

Panel A. Equally Weighted			
Dependent Variable	*Aggregate Investment*		
	(1)	(2)	(3)
Inflation Shock	**2.186****	**0.898***	**0.761****
	(2.57)	**(2.07)**	**(2.23)**
Internal Info Quality	−0.057	0.009	
	(-0.11)	(0.06)	
Inflation Shock* × *Internal Info Quality	**−0.626****	**−0.291****	**−0.262****
	(-2.52)	**(-2.31)**	**(-2.62)**
Δ GDP (%)		3.579*	3.607*
		(2.12)	(1.84)
Unemployment Rate		0.011	0.025**
		(1.24)	(2.81)
LT Interest Rates		−0.026	−0.014
		(-1.55)	(-0.87)
Expected Domestic Demand		0.199***	0.223***
		(29.53)	(15.29)
Observations	240	203	203
Adjusted R-squared	0.015	0.862	0.880
Country FE	No	No	Yes
Year FE	No	No	Yes
Panel B. Weighted by Total Assets			
Dependent Variable	*Aggregate Investment*		
	(1)	(2)	(3)
Inflation Shock	**2.177****	**0.922***	**0.784****
	(2.45)	**(2.09)**	**(2.26)**
Internal Info Quality	−0.081	−0.002	
	(-0.15)	(-0.01)	
Inflation Shock* × *Internal Info Quality	**−0.621****	**−0.297****	**−0.268****
	(-2.41)	**(-2.33)**	**(-2.64)**
Δ GDP (%)		3.575*	3.608*
		(2.12)	(1.84)
Unemployment Rate		0.010	0.025**
		(1.23)	(2.81)
LT Interest Rates		−0.027	−0.014
		(-1.58)	(-0.87)
Expected Domestic Demand		0.199***	0.223***
		(29.56)	(15.30)
Observations	240	203	203
Adjusted R-squared	0.014	0.862	0.880
Country FE	No	No	Yes
Year FE	No	No	Yes

Table 10 Panel A (Panel B) repeats our main regressions at the country-year level measuring *Internal Info Quality* as an equally weighted (total assets-weighted) average by country of firm-level internal information system quality. Robust t-statistics are reported in parentheses. Standard errors are clustered by country. All continuous variables are standardized. All variables are defined in Appendix A. ***, **, and * denote statistical significance at the 1, 5, and 10% levels.

investment behavior translates into differences in investment efficiency. Our results 1) are robust to using the 8th EU Company Law Directive as an instrument for internal information quality within a difference-in-differences design; 2) vary in the cross-section in ways consistent with imperfect information theory; 3) are robust to using alternative variable measurement approaches; 4) are unlikely to be explained by management quality more generally rather than internal information system quality more specifically; and 5) generalize to the country level. Overall, we contribute to the literature by presenting evidence that internal information systems function as a mechanism through which aggregate-level nominal shocks drive firm-level real decisions.

We acknowledge that these results are subject to several limitations. First, while the WMS monitoring score measures internal information quality more directly than alternative approaches used in prior literature, it is impossible to capture all dimensions of the quality of firms' internal information systems in a single score. We leave it to future research to examine how different dimensions of internal information quality affect the transmission of aggregate-level nominal shocks into firm-level real decisions. Second, while our difference-in-differences test provides some assurance that internal information quality deriving from the 8th EU Company Law Directive helps firms to disentangle aggregate-level nominal from firm-level real shocks, our inferences based on these measures are potentially not generalizable. Future research can examine different instruments for internal information quality to verify that our inferences carry over to alternative settings. Third, while our results suggest that the imperfect information channel explains the relation between inflation and investment, they do not imply that alternative channels identified by other models, such as RBC or New Keynesian models, are absent. Indeed, theory suggests that real rigidities, such as those arising in imperfect information models, enhance and interact with the effects of the nominal rigidities described in New Keynesian models (Ball and Romer 1990; Jeanne 1998).

Appendix A. Variable Definitions

Variable	Source	Definition
Firm-level Variables		
Documentation	WMS[1]	Score from 1 to 5 based on the question: Are process improvements made only when problems arise, or are they actively sought out for continuous improvement as part of normal business processes?
Tracking	WMS[1]	Score from 1 to 5 based on the question: Is tracking ad hoc and incomplete, or is performance continually tracked and communicated to all staff?
Review	WMS[1]	Score from 1 to 5 based on the question: Is performance reviewed infrequently and only on a success/failure scale, or is performance reviewed continually with an expectation of continuous improvement?
Dialogue	WMS[1]	Score from 1 to 5 based on the question: In review/performance conversations, to what extent are the purpose, data, agenda, and follow-up steps (like coaching) clear to all parties?
Consequences	WMS[1]	Score from 1 to 5 based on the question: To what extent does failure to achieve agreed objectives carry consequences, which can include retraining or reassignment to other jobs?
Internal Info Quality	WMS[1]	Average of *Documentation*, *Tracking*, *Review*, *Dialogue*, *and Consequences*.
Operating Quality	WMS[1]	Average of WMS questions pertaining to operating quality (questions 1 and 2).
Target Focus	WMS[1]	Average of WMS questions pertaining to target focus (questions 8 to 12).
People Management	WMS[1]	Average of WMS questions pertaining to people management (questions 13 to 18).
Investment	BvD[2] Orbis	Change in fixed assets scaled by average total assets.
Future Profitability	BvD[2] Orbis	Year-ahead operating income scaled by total equity.
Cash Flow	BvD[2] Orbis	Earnings before interest and taxes (EBIT) scaled by average total assets.
ΔCash Flow	BvD[2] Orbis	Change in earnings before interest and taxes (EBIT) scaled by average total assets.
Size	BvD[2] Orbis	Natural logarithm of total assets.
Leverage	BvD[2] Orbis	Long-term debt scaled by total assets.
ΔSales	BvD[2] Orbis	Change in operating revenue scaled by average total assets.
External Reporting Quality	BvD[2] Orbis	Absolute value of the residual obtained by regressing total accruals on changes in sales and fixed assets (all scaled by average total assets).
Public	BvD[2] Orbis	Indicator that the firm's common stock trades on a public exchange.
Aggregate-**level Variables**		
Inflation	OECD	Country-level realized inflation.
Inflation Shock	OECD	Country-level realized inflation minus consensus inflation forecast made in the previous year.
Growth Expectations	OECD	Country-level GDP forecast made in the previous year.
Macroeconomic Uncertainty	Baker et al. (2016)	Global Economic Policy Uncertainty score averaged over the year.
Aggregate Investment	OECD	Country-level realized investment growth.
GDP Growth	OECD	Country-level realized GDP growth.
Expected Domestic Demand	OECD	Country-level expected demand growth.
Long-Term Interest Rate	OECD	Country-level interest rates on government bonds maturing in ten years
Unemployment	OECD	Country-level realized unemployment rate

1 World Management Survey.
2 Bureau van Dijk.

Appendix B. Analytical Model

This appendix provides a simplified version of the Lucas (1972, 1975) model based on Bénassy (1999, 2011) to illustrate our hypothesis development. The signal extraction methodology used here is common in the finance and accounting literature (e.g., Grossman and Stiglitz 1980; Kanodia and Sapra 2016).

Model Setup

Competitive intermediary good producers invest an amount I_{jt} to produce intermediary output Y_{jt} via the production function:[29]

$$Y_{jt} = I_{jt}. \tag{A1}$$

29 While inferences remain similar when one employs more realistic objective functions and budget constraints, closed-form solutions do not exist in these settings.

Households consume an aggregate consumption good Y_t produced by competitive final goods producers via the production function:

$$Log(Y_t) = y_{jt} = E\left[\Theta_{jt}Log(Y_{jt})\right] = E\left[\Theta_{jt}Log(y_{jt})\right] \tag{A2}$$

where Θ_{jt} is an i.i.d. intermediary-goods-producer-specific real shock following $E[\Theta_{jt}] = 1$ and $Log(\Theta_{jt}) = \theta_{jt} \sim N(\mu_\theta, \sigma_\theta^2)$. Lower-case letters denominate logarithms.

Intermediary goods producer j is financed by a continuum of households normalized to 1. The households' demography follows an overlapping generation structure: households work for intermediary goods producer j and earn a return R_{jt} for investing their labor $L_{jt} = I_{jt}$ in intermediary goods producer j when they are young and generate utility by consuming C_{jt+1} units of the aggregate consumption good when they are old via the utility function:[30]

$$U_{jt} = C_{jt+1} - \frac{L_{jt}^{1+\alpha}}{1+\alpha} \tag{A3}$$

where $0 < \alpha < 1$. Households consume one period after they receive their investment returns, which they store by accumulating money.

Changes in the aggregate quantity of money M_t are determined by exogenous i.i.d. money supply shocks $Log(X_t) = x_t \sim N(0, \sigma_x^2)$ deriving from monetary policy shocks, aggregate demand shocks, or aggregate supply shocks, such that:

$$M_t = X_t M_{t-1} \tag{A4}$$

Hence, the budget constraint for the old households is:

$$P_{t+1}C_{jt+1} = X_{t+1}M_t = X_{t+1}R_{jt}I_{jt} \tag{A5}$$

where P_t is the aggregate price level. Intermediary goods producer j and its employees observe all variables specific to their firm in the current period but learn about all aggregate variables in the following period.

Model Solution

Because intermediary goods producers are competitive, their marginal revenue equals their marginal costs. Thus,

$$P_{jt} = R_{jt} \tag{A6}$$

Old households spend their entire money holdings and are the only ones consuming. Thus,

$$Y_t = \frac{M_t}{P_t} \tag{A7}$$

Households solve:

$$\max_{I_{it}} E_{it}[C_{it+1}] - \frac{I_{it}^{1+\alpha}}{1+\alpha} \tag{A8}$$

subject to (A5). Taking the first order condition of maximization with respect to I_{jt} and setting the derivative equal to zero yields:

$$I_{jt}^{\alpha} = R_{jt}E_{jt}[X_{t+1} / P_{t+1}] \tag{A9}$$

Employing the method of undetermined coefficients to evaluate $E_{jt}[X_{t+1} / P_{t+1}]$, we assume that the household conjectures that:

$$P_t = \frac{M_{t-1}X_t^{1-\gamma}}{\Lambda} \tag{A10}$$

where the parameters γ and Λ are unknown. Hence,

[30] A more satisfying and dynamic approach would be to let capital enter the production function and link current to past capital via investment and depreciation. Using this approach, the predicted effect of inflation on investment becomes stronger (Lucas 1975). However, closed-form solutions do not exist when one follows this approach.

$$E_{jt}\left[\frac{X_{t+1}}{P_{t+1}}\right]=\frac{\Lambda}{M_{t-1}}E_{jt}\left[\frac{1}{X_t}\right]E_{jt}\left[X_{t+1}^{\gamma}\right] \tag{A11}$$

Given the information structure described previously, households can infer the product of the firm-level real and the aggregate-nominal shock $\Theta_{jt}X_t$, but they cannot infer Θ_{jt} and X_t individually. We employ two signal extraction formulas to evaluate $E_{jt}[1/X_t]$: 1) $E_{jt}[x_t|x_t+\theta_{jt}]=\rho(x_t+\theta_{jt}-\mu_\theta)$ and 2) $Var_{jt}[x_t|x_t+\theta_{it}]=\rho\sigma_\theta^2$, where $\rho=\sigma_x^2/(\sigma_x^2+\sigma_\theta^2)$. Given the properties of the log-normal distribution ($\mu_\theta+\sigma_\theta^2/2=0$):

$$E_{jt}\left[\frac{1}{X_t}\right]=\left(\frac{1}{\Theta_{jt}X_t}\right)^{\rho}\exp\left(\rho\mu_\theta+\frac{\rho\sigma_\theta^2}{2}\right)=\left(\frac{1}{\Theta_{jt}X_t}\right)^{\rho} \tag{A12}$$

Because X_{t+1} is log-normally distributed with a mean of 0 and a variance of σ_x^2:

$$E_{jt}\left[X_{t+1}^{\gamma}\right]=\exp\left(\frac{\gamma^2\sigma_x^2}{2}\right)=\xi \tag{A13}$$

Combining (A11), (A12), and (A13) yields:

$$E_{jt}\left[\frac{X_{t+1}}{P_{t+1}}\right]=\frac{\Lambda\xi}{M_{t-1}}\left(\frac{1}{\Theta_{jt}X_t}\right)^{\rho} \tag{A14}$$

Combining (A9) and (A14) yields:

$$I_{jt}=\left[\Lambda\xi\left(\Theta_{jt}X_t\right)^{1-\rho}\right]^{1/(1+\alpha)} \tag{A15}$$

Combining (A1), (A2), and (A15) yields the aggregate level of output:

$$Log(Y_t)=\frac{Log(\Lambda\xi)+(1-\rho)Log(X_t)+(1-\rho)\left(\Theta_{jt}\,Log\left(\Theta_{jt}\right)\right)}{1+\alpha} \tag{A16}$$

Combining $P_tY_t=M_t=X_tM_{t-1}$ and (A11) and taking logarithms yields:

$$Log(Y_t)=Log\left(\Lambda X_t^{\gamma}\right) \tag{A17}$$

Under rational expectations, (A16) and (A17) are the same. Solving yields the two undetermined coefficients:

$$\gamma=\frac{1-\rho}{1-\alpha}=\frac{\sigma_\theta^2}{(1+\alpha)\left(\sigma_x^2+\sigma_\theta^2\right)} \tag{A18}$$

and

$$Log(\Lambda)=\frac{1}{\alpha}\left(\frac{\gamma^2\sigma_x^2}{2}+\frac{(1-\rho)\sigma_\theta^2}{2}\right) \tag{A19}$$

Ignoring constants, we get $y_t=\gamma x_t$ and $p_t=m_t-\gamma x_t$. Defining inflation as $\pi_t=p_t-p_{t-1}$, we get $\pi_t=(1-\gamma)x_t-\gamma x_{t-1}$. Thus, the coefficient obtained by regressing output on inflation equals $\gamma/(1-\gamma)>0$. Consistent with Hypothesis 1, firms increase their output by increasing their investment in response to inflation shocks. Further, (A18) shows that the relation between investment and inflation increases in the variance of the firm-level real shock but decreases in the variance of the aggregate-level nominal shock. These variances have two components: 1) the true volatility underlying the shocks and 2) the measurement error with which firms observe the shocks. If firms' internal information systems help to reduce the measurement error with which the firms observe the firm-level real (aggregate-level nominal) shocks, the relation between investment and inflation decreases (increases) in the quality of firms' internal information systems. Internal information systems are typically designed to track firm-level rather than aggregate-level developments. Hence, we expect that internal information systems decrease measurement error more for firm-level than for aggregate-level signals, and, consistent with Hypothesis 2, we expect the positive inflation-investment relation to decrease in the quality of firms' internal information systems.

References

Ang, A., Bekaert, G., Wei, M., 2007. Do macro variables, asset markets, or surveys forecast inflation better? J. Monetary Econ. 54 (4), 1163–1212.
Armstrong, C., Glaeser, S., Kepler, J., 2019. Accounting quality and the transmission of monetary policy. J. Account. Econ. 68 (2), 1–30.
Badertscher, B., Shroff, N., White, H.D., 2013. Externalities of public firm presence: evidence from private firms' investment decisions. J. Financ. Econ. 109 (3), 682–706.
Baker, A.C., Larcker, D.F., Wang, C.C., 2022. How much should we trust staggered difference-in-differences estimates? J. Financ. Econ. 144 (2), 370–395.
Baker, S.R., Bloom, N., Davis, S.J., 2015. Measuring economic policy uncertainty. The Quarterly J. Econ. 131 (4), 1593–1636.
Balakrishnan, R., Hansen, S., Labro, E., 2011. Evaluating heuristics used when designing product costing systems. Management Sci. 57 (3), 520–541.
Ball, L., Romer, D., 1990. Real rigidities and the non-neutrality of money. The Rev. Econ. Studies 57 (2), 183–203.
Ball, R., Sadka, G., Sadka, R., 2009. Aggregate earnings and asset prices. J. Acc. Res. 47 (5), 1097–1133.
Basu, S., Markov, S., Shivakumar, L., 2010. Inflation, earnings forecasts, and post-earnings announcement drift. Rev. Acc. Studies 15 (2), 403–440.
Bénassy, J.-P., 1999. Analytical solutions to a structural signal extraction model: Lucas 1972 revisited. J. Monetary Econ. 44 (3), 509–521.
Bénassy, J.-P., 2011. Macroeconomic Theory. Oxford University Press.
Bernanke, B.S., 1983. Irreversibility, uncertainty, and cyclical investment. The Quarterly J. Econ. 98 (1), 85–106.
Bertrand, M., Mullainathan, S., 2001. Do people mean what they say? Implications for subjective survey data. Am. Econ. Rev. 91 (2), 67–72.
Binz, O., 2022. Managerial response to macroeconomic uncertainty: implications for firm profitability. Acc. Rev. 97 (5), 89–117.
Binz, O., Joos, P., Kubic, M., 2022a. The Income Statement Channel of Monetary Policy. Working Paper. Available at. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3835653.
Binz, O., Mayew, W.J., Nallareddy, S., 2022b. Firms' response to macroeconomic estimation errors. J. Acc. Econ. 73 (2–3).
Bloom, N., Floetotto, M., Jaimovich, N., Saporta-Eksten, I., Terry, S.J., 2018. Really uncertain business cycles. Econometrica 86 (3), 1031–1065.
Bloom, N., Kawakubo, T., Meng, C., Mizen, P., Riley, R., Senga, T., Van Reenen, J., 2021. Do Well Managed Firms Make Better Forecasts? Working paper. Available at. https://www.nber.org/papers/w29591.
Bloom, N., Propper, C., Seiler, S., Van Reenen, J., 2015. The impact of competition on management quality: evidence from public hospitals. Rev. Econ. Studies 82 (2), 457–489.
Bloom, N., Sadun, R., Van Reenen, J., 2012. The organization of firms across countries. Quarterly J. Econ. 127 (4), 1663–1705.
Bloom, N., Van Reenen, J., 2007. Measuring and explaining management practices across firms and countries. Quarterly J. Econ. 122 (4), 1351–1408.
Bonsall, S.B., Bozanic, Z., Fischer, P.E., 2013. What do management earnings forecasts convey about the macroeconomy? J. Acc. Res. 51 (2), 225–266.
Bonsall, S.B., Green, J., Muller, K.A., 2020. Market uncertainty and the importance of media coverage at earnings announcements. J. Acc. Econ. 69 (1), 1–23.
Brazel, J.F., Dang, L., 2008. The effect of erp system implementations on the management of earnings and earnings release dates. J. Info. Systems 22 (2), 1–21.
Breath, C.M., Ives, B., 1986. Competitive information systems in support of pricing. Mis Quarterly 85–96.
Calvo, G.A., 1983. Staggered prices in a utility-maximizing framework. J. Monetary Econ. 12 (3), 383–398.
Candia, B., Coibion, O., Gorodnichenko, Y., 2021. The Inflation Expectations of US Firms: Evidence from a New Survey. Working paper. Available at. https://www.nber.org/papers/w28836.
Cardinaels, E., Labro, E., 2008. On the determinants of measurement error in time-driven costing. Acc. Rev. 83 (3), 735–756.
Cardinaels, E., Roodhooft, F., Warlop, L., Van Herck, G., 2008. Competitive pricing in markets with different overhead costs: concealment or leakage of cost information? J. Acc. Res. 46 (4), 761–784.
Cengiz, D., Dube, A., Lindner, A., Zipperer, B., 2019. The effect of minimum wages on low-wage jobs. Quarterly J. Econ. 134 (3), 1405–1454.
Charoenwong, B., Kowaleski, Z.T., Kwan, A., Sutherland, A., 2022. Regtech. in. Working paper. Available at. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4000016.
Chen, Q., Goldstein, I., Jiang, W., 2007. Price informativeness and investment sensitivity to stock price. Rev. Financial Studies 20 (3), 619–650.
Cheng, M., Dhaliwal, D., Zhang, Y., 2013. Does investment efficiency improve after the disclosure of material weaknesses in internal control over financial reporting? J. Acc. Econ. 56 (1), 1–18.
Cheng, Q., Cho, Y.J., Yang, H., 2018. Financial reporting changes and the internal information environment: evidence from sfas 142. Rev. Acc. Studies 23 (1), 347–383.
Chordia, T., Shivakumar, L., 2005. Inflation illusion and post-earnings-announcement drift. J. Acc. Res. 43 (4), 521–556.
Christensen, H.B., Hail, L., Leuz, C., 2016. Capital-market effects of securities regulation: prior conditions, implementation, and enforcement. Rev. Financial Studies 29 (11), 2885–2924.
Clarida, R., Galí, J., Gertler, M., 1999. The science of monetary policy: a new keynesian perspective. J. Econ. Literature 37 (4), 1661–1707.
Coibion, O., Gorodnichenko, Y., Kumar, S., 2018. How do firms form their expectations? New survey evidence. Am. Econ. Rev. 108 (9), 2671–2713.
Creps, W.B., O'Leary, D.E., 1994. Executive Information Systems. In: AICPA IT Division Report, pp. 1–17.
Dechow, P., Ge, W., Schrand, C., 2010. Understanding earnings quality: a review of the proxies, their determinants and their consequences. J. Acc. Econ. 50 (2–3), 344–401.
Fama, E.F., Gibbons, M.R., 1984. A comparison of inflation forecasts. J. Monetary Econ. 13 (3), 327–348.
Fama, E.F., Schwert, G.W., 1977. Asset returns and inflation. J. Financial Econ. 5 (2), 115–146.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 1988. Financing constraints and corporate investment. Brookings Papers on Econ. Activity 1988 (1), 141–206.
Feltham, G.A., Demski, J.S., 1970. The use of models in information evaluation. Acc. Rev. 45 (4), 623–640.
Feng, M., Li, C., McVay, S., 2009. Internal control and management guidance. J. Acc. Econ. 48 (2–3), 190–209.
FERMA/ECIIA, 2010. Guidance on the 8th Eu Company Law Directive, 41. Part 1.
FERMA/ECIIA, 2011. Guidance on the 8th Eu Company Law Directive, 41. Part 2.
Ferracuti, E., 2022. Information uncertainty and organizational design. J. Acc. Econ. 74 (1), 101493.
Fisher, I., 1930. Theory of Interest. Augustus M. Kelly Publishers, New York (Clifton).
Fisher, I., 1933. The debt deflation theory of great depressions. Econometrica 1 (4), 337–357.
Friedman, M., 1968. The role of monetary policy. Am. Econ. Rev. 58, 1–17.
Galí, J., 2018. The state of new keynesian economics: a partial assessment. J. Econ. Perspectives 32 (3), 87–112.
Gallemore, J., Labro, E., 2015. The importance of the internal information environment for tax avoidance. J. Acc. Econ. 60 (1), 149–167.
Gallo, L.A., Kothari, S., 2019. Discussion of "accounting quality and the transmission of monetary policy". J. Acc. Econ. 68 (2), 1–6.
Gallup Polls, 2022. Inflation Dominates Americans' Economic Concerns in March.
Gong, G., Li, L.Y., Xie, H., 2009. The association between management earnings forecast errors and accruals. Acc. Rev. 84 (2), 497–530.
Goodman-Bacon, A., 2021. Difference-in-Differences with variation in treatment timing. J. Econ. 225 (2), 254–277.
Grossman, S.J., Stiglitz, J.E., 1980. On the impossibility of informationally efficient markets. Am. Econ. Rev. 70 (3), 393–408.
Hadlock, C.J., Pierce, J.R., 2010. New evidence on measuring financial constraints: moving beyond the kz index. Rev. Financial Studies 23 (5), 1909–1940.
Heitzman, S., Huang, M., 2019. Internal information quality and the sensitivity of investment to market prices and accounting profits. Contemporary Acc. Res. 36 (3), 1699–1723.
Hemmer, T., Labro, E., 2008. On the optimal relation between the properties of managerial and financial reporting systems. J. Acc. Res. 46 (5), 1209–1240.
Hemmer, T., Labro, E., 2019. Management by the numbers: a formal approach to deriving informational and distributional properties of "unmanaged" earnings. J. Acc. Res. 57 (1), 5–51.
Hodge, F.D., Kennedy, J.J., Maines, L.A., 2004. Does search-facilitating technology improve the transparency of financial reporting? Acc. Rev. 79 (3), 687–703.

Holstead, C., Kalay, A., Sadka, G., 2022. When Micro Firms Speak Macro: Evidence on Firms' Macroeconomic Disclosures. Working paper. Available at. https://www8.gsb.columbia.edu/ceasa/sites/ceasa/files/03%20Holstead%20Kalay%20Sadka%202022_01_10.pdf.
Hugon, A., Kumar, A., Lin, A.-P., 2015. Analysts, macroeconomic news, and the benefit of active in-house economists. Acc. Rev. 91 (2), 513–534.
Ittner, C.D., Lanen, W.N., Larcker, D.F., 2002. The association between activity-based costing and manufacturing performance. J. Acc. Res. 40 (3), 711–726.
Jackson, A.B., Plumlee, M.A., Rountree, B.R., 2018. Decomposing the market, industry, and firm components of profitability: implications for forecasts of profitability. Rev. Acc. Studies 23 (3), 1071–1095.
Jayaraman, S., Wu, J.S., 2019. Is silence golden? Real effects of mandatory disclosure. Rev. Financial Studies 32 (6), 2225–2259.
Jeanne, O., 1998. Generating real persistent effects of monetary shocks: how much nominal rigidity do we really need? Euro. Econ. Rev. 42 (6), 1009–1032.
Jones, J.J., 1991. Earnings management during import relief investigations. J. Acc. Res. 29 (2), 193–228.
Kanodia, C., Sapra, H., 2016. A real effects perspective to accounting measurement and disclosure: implications and insights for future research. J. Acc. Res. 54 (2), 623–676.
Kim, K., Pandit, S., Wasley, C.E., 2016. Macroeconomic uncertainty and management earnings forecasts. Acc. Horizons 30 (1), 157–172.
Konchitchki, Y., 2011. Inflation and nominal financial reporting: implications for performance and stock prices. Acc. Rev. 86 (3), 1045–1085.
Kumar, S., Afrouzi, H., Coibion, O., Gorodnichenko, Y., 2015. Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand. National Bureau of Economic Research. Working paper. Available at. https://www.nber.org/system/files/working_papers/w21814/w21814.pdf.
Kydland, F.E., Prescott, E.C., 1982. Time to build and aggregate fluctuations. Econometrica: J. Econ. Society 50 (6), 1345–1370.
Labro, E., Lang, M.H., Omartian, J.D., 2022. Predictive analytics and the changing manufacturing employment relationship: plant level evidence from census data. J. Acc. Econ., 101526
Labro, E., Vanhoucke, M., 2007. A simulation analysis of interactions among errors in costing systems. Acc. Rev. 82 (4), 939–962.
Lucas, R.E., 1972. Expectations and the neutrality of money. J. Econ. Theory 4 (2), 103–124.
Lucas, R.E., 1975. An equilibrium model of the business cycle. J. Political Economy 83 (6), 1113–1144.
Maćkowiak, B., Wiederholt, M., 2009. Optimal sticky prices under rational inattention. Am. Econ. Rev. 99 (3), 769–803.
Maiga, A.S., Nilsson, A., Jacobs, F.A., 2014. Assessing the interaction effect of cost control systems and information technology integration on manufacturing plant financial performance. Br. Acc. Rev. 46 (1), 77–90.
Oster, E., 2019. Unobservable selection and coefficient stability: theory and evidence. J. Business & Econ. Statistics 37 (2), 187–204.
Owens, E.L., Wu, J.S., Zimmerman, J., 2017. Idiosyncratic shocks to firm underlying economics and abnormal accruals. Acc. Rev. 92 (2), 183–219.
Paciello, L., Wiederholt, M., 2014. Exogenous information, endogenous information, and optimal monetary policy. Rev. Econ. Studies 81 (1), 356–388.
Radner, R., 1993. The organization of decentralized information processing. Econometrica: J. Econ. Society 1109–1146.
Reis, R., 2006. Inattentive producers. Rev. Econ. Studies 73 (3), 793–821.
Roberts, J.M., 1995. New keynesian economics and the Phillips curve. J. Coney, Credit and Banking 27 (4), 975–984.
Rogers, J.L., Skinner, D.J., Van Buskirk, A., 2009. Earnings guidance and market uncertainty. J. Acc. Econ. 48 (1), 90–109.
Romer, D., 2012. In: Advanced Macroeconomics, vol. 4. McGraw-Hill Irwin.
Rotemberg, J.J., 1982. Monopolistic price adjustment and aggregate output. Rev. Econ. Studies 49 (4), 517–531.
Roychowdhury, S., Shroff, N., Verdi, R.S., 2019. The effects of financial reporting and disclosure on corporate investment: a review. J. Acc. Econ. 68 (2–3), 101246.
Sargent, T.J., 1973. Interest rates and prices in the long run: a study of the gibson paradox. J. Money, Credit and Banking 5 (1), 385–449.
Savignac, F., Gautier, E., Gorodnichenko, Y., Coibion, O., 2021. Firms' Inflation Expectations: New Evidence from France. Working paper. Available at. https://www.nber.org/papers/w29376.
Schroeder, J.H., Shepardson, M.L., 2016. Do SOX 404 control audits and management assessments improve overall internal control system quality? Acc. Rev. 91 (5), 1513–1541.
Schwarz, N., 1999. Self-reports: how the questions shape the answers. Am. psychologist 54 (2), 93.
Scur, D., Sadun, R., Van Reenen, J., Lemos, R., Bloom, N., 2021. The world management survey at 18: lessons and the way forward. Oxford Rev. Econ. Policy 37 (2), 231–258.
Shroff, N., 2017. Corporate investment and changes in GAAP. Rev. Acc. Studies 22 (1), 1–63.
Syverson, C., 2004. Market structure and productivity: a concrete example. J. Political Economy 112 (6), 1181–1222.
Syverson, C., 2011. What determines productivity? J. Economic Literature 49 (2), 326–365.
Taylor, J.B., 1999. Staggered price and wage setting in macroeconomics. Handbook of Macroecon. 1, 1009–1050.
Tiron-Tudor, A., Boţa-Avram, C., 2013. European Union Directive: the 8th Company Law Directive on Disclosure and Transparency. Springer, Berlin.
Van Reenen, J., 2011. Does competition raise productivity through improving management quality? Int. J. Industrial Organization 29 (3), 306–316.
Van Reenen, J., Bloom, N., Sadun, R., Lemos, R., Scur, D., 2014. The New Empirical Economics of Management. Working paper. Available at. https://www.nber.org/papers/w20102.
Yellen, J.L., 2016. Macroeconomic research after the crisis. In: Paper Read at Speech at the 60th Annual Economic Conference Sponsored by the Federal Reserve Bank of Boston.