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Abstract

This study investigates whether economic policy uncertainty magnifies peer effects in corporate investment decisions, and whether this could lead to industry-wide investment inefficiency, using data for Chinese manufacturing firms over the period 1999–2013. First, we show that peer firms have significant causal effects on Chinese manufacturing firms' investment policies. Second, we provide evidence to show that economic policy uncertainty magnifies peer effects in corporate investment decisions, and we identify the channels of such effects. Finally, we show that this effect is more pronounced in the under-investment sample, suggesting that economic policy uncertainty could exacerbate industry-wide under-investment problems through peer effects.

JEL classification: G31, E22, D81, G32

Keywords: corporate investment policy, peer effects, economic policy uncertainty, underinvestment

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1 Introduction

There is growing interest in peer effects in financial decisions, e.g., capital structure (Leary and Roberts, 2014), institutional investment (Choi and Sias, 2009), analysts' behavior (Jegadeesh and Kim, 2010), and stock-split behavior (Kaustia and Rantala, 2015). A peer effect is said to exist if an agent's decision is affected by its peers' decisions. Several rationales behind peer effects can be found in the literature. In a strategic setting, an individual agent's decision and its peers' decisions could be strategic complements or strategic substitutes (Bulow *et al.*, 1985). In such a setting, a game theoretic model predicts that firms' best response reaction to other firms' decisions would naturally take a form similar to typical peer effects. According to the information cascade model, herding behavior can arise due to the belief that peers have made their decisions based on superior information (Bikhchandani *et al.*, 1992). Also, due to agency motives, decision-makers may have incentives to mimic peers (Scharfstein and Stein, 1990). Managers who are concerned about their own reputation, in relation to future employment opportunities, may make similar choices as those of their peer firms in order to 'share the blame' if the decision turns out to be suboptimal. Intuitive as they may seem to be, the existence of, and reasons behind, peer effects in corporate investment policy have been understudied. Due to endogeneity problems, it is a challenge to identify the causal effects of peer firms' investment decisions on a firm's investment decision.[1] In this paper, we try to improve our understanding of the existence, direction and determinants of peer effects in corporate investment policy.

We examine whether peer firms influence corporate investment policies, using accounting and

[1] See Manski (1993), Leary and Roberts (2014) and Angrist (2014) for more details on endogeneity issues.

stock market data of Chinese manufacturing firms over the period 1999–2013. Numerous theories, such as the basic neoclassical theory of investment (Jorgenson, 1963), the Tobin-Hayashi q theory of investment (Hayashi, 1982), or the real option theory of investment under uncertainty (Dixit and Pindyck, 1994) identify various determinants of corporate investment decisions. Given the risky nature of the decision and the cost of acquiring relevant information, however, firms may tend to learn from or even mimic the decisions of other firms that either are in the same industry or share similar attributes. For instance, Foucault and Fresard (2014) have shown that a firm's investment is influenced by peer firms' stock prices. Their model describes the situation in which managers learn information from their own and peers' stock prices and it empirically confirms that firms' investments are positively related to the stock prices of their peer firms. Generally, however, peer firms' stock prices can be affected by common factors that also affect the firm's investment. In order to address this endogeniety issue, we utilize peer-firm-average idiosyncratic return shock, as proposed by Leary and Roberts (2014), as an instrumental variable for peer-firm-average investment.

We further investigate whether economic policy uncertainty (EPU) magnifies peer effects in corporate investment behavior. In most cases, economic policies implemented by regulators alter business environments. Thus, uncertain economic policies bring about business uncertainty for firms. Intuitively, higher business uncertainty would worsen agency problems and make it more costly to make accurate investment decisions due to higher costs of information. Therefore, peer effects are more likely to arise when EPU is greater. Baker *et al.* (2016) develop EPU indices for the world's major economies based on a textual analysis of economic policy news. We utilize the EPU index for the Chinese economy as China has had frequent and significant economic policy changes

over the last several decades.[2] A brief inspection of the index, as shown in Figure 1, reveals that there are three spikes during our sample period: China's entry into the World Trade Organization (WTO) in 2001; declining exports and a US$580 billion rescue package obtained due to the global financial crisis in 2008; and the Euro debt crisis and trade protectionism, economic growth slowdown expectations, an anti-corruption campaign, and political elections in 2011–2012.

[Insert Figure 1 Here]

There are three possible channels through which EPU influences peer effects in corporate investment decisions. One possible mechanism stems from the information cascade theory. Bikhchandani *et al.* (1992) and Zhang (1997) show that rational agents engage in herding behavior when they make sequential decisions while receiving only incomplete private signals regarding the true state of the world. The problem of firms' investment decision-making fits well with the model, as firms can observe others' decisions and uncertainty always exists in investment outcomes. When EPU increases, the noise of private signals would increase as well, and the peer effects in investment decisions will eventually be magnified. Another possible channel through which EPU influences peer effects in corporate investment decisions is due to the asymmetric impact of higher EPU on firms with different capacities to acquire information. Firms with longer histories and superior connections have better access to information than others. With higher EPU, these firms are more likely to keep their information advantages. Consequently, other firms with inferior information capacities would increase their tendency to follow the better firms. Finally, peer effects could be intensified

[2]The Chinese EPU index is calculated using a text-based analysis and is in accordance with the frequency with which EPU is discussed in the pages of *South China Morning Post*, a leading English-language newspaper in Hong Kong. See the website for detailed information: http://www.policyuncertainty.com/china_monthly.html.

by higher EPU relatively more for firms with managers who are concerned about their careers. In Scharfstein and Stein's (1990) and Trueman's (1994) models, managers, due to their own career concerns, may choose to mimic other firms' decisions to avoid making unusual decisions. When the evaluation scheme of the firm does not reward an extraordinary success as much as how it would punish a rare failure, managers will be reluctant to make a unique decision. Higher EPU would increase the risk of such cases, so the higher the degree of EPU the more severe peer effects there will be. We test whether there is any support for these three mechanisms of peer effects.

We find evidence supporting the information cascade channel. More specifically, firms are faced with more noise in regard to predicting the outcome of investments when EPU increases. However, we do not find support for the other channels. There is no evidence that firms with inferior information capacities are subject to a more significant impact from higher EPU. Higher EPU may not necessarily impact inferior firms more severely. Indeed, if higher EPU has a rather uniform impact on most firms, the peer effects of firms with different capacities for acquiring information may be affected in a similar way. We also do not find evidence that firms with worse corporate governance suffer more from peer effects driven by EPU. It is possible that the corporate governance measures we use do not capture the different evaluation schemes or organizational structures with which we are concerned. Alternatively, our results may imply that managers' career concerns are a universal issue. Overall, these results suggest that higher EPU would affect overall peer effects in the industry rather than those for specific types of firms.

In addition, we explore more closely whether EPU affects the peer effects asymmetrically between firms that over-invest relative to optimal investment levels and firms that under-invest. Al-

though both over-investment and under-investment would generate undesirable investment results, our findings further suggest that the consequences from a change in EPU would have an asymmetric impact. Bernanke (1983), Julio and Yook (2012), Wang *et al.* (2014), Kang *et al.* (2014), Gulen and Ion (2015), and An *et al.* (2016) document the finding that economic and policy uncertainty affects corporate investment negatively. However, there are few studies about the asymmetric impact economic and policy uncertainty may have on peer effects in corporate investment. We do find that the effects of EPU on investment peer effects are stronger for under-investment firms. Our analysis of peer effects fills the gap in the literature and provides evidence that the impact of EPU has more severe consequences for under-investment firms.

This study contributes to the literature in several ways. First, it contributes to the literature on uncertainty and corporate investment. Although there are a number of studies that provide evidence that higher uncertainty leads to lower corporate investment, there are few studies that specify the role of peer effects in this process. We fill the gap in the literature by providing evidence that peer effects exacerbate the impact on investments, especially for under-investment cases. Second, our paper identifies the mechanisms through which increased uncertainty affects peer effects. Most theoretical works on peer effects (Bikhchandani *et al.*, 1992, Zhang, 1997, Scharfstein and Stein, 1990, and Trueman, 1994) indicate that uncertainty is the major source of peer effects. By empirically testing the effectiveness of different channels we improve the understanding of peer effects driven by EPU, which to the best of our knowledge has not yet attracted much attention.

The remainder of the paper is organized as follows. In Section 2, we first review the literature on EPU, peer effects in corporate investment decisions, and various determinants of corporate invest-

ment in China, and then we derive testable predictions regarding the effects of EPU on peer effects in corporate investment policy. Section 3 describes the sample, the construction of variables, and descriptive statistics, and presents our methodology. In Section 4 we present and discuss our main empirical results. Section 5 concludes.

2 Development of hypotheses

There is abundant evidence of peer effects and herding behavior in various financial decisions.[3] Foucault and Fresard (2014) provide a theoretical model in which peer firms' stock prices increase a firm's investment because the firm learns from its peers' stock prices. Although they show some evidence of peer effects in corporate investment decisions using data for US public firms, they do not attempt to further identify the details of such peer effects. Meanwhile, Leary and Roberts (2014) find evidence that a firm's capital structure is influenced by its peers' capital structure decisions, using a method designed to address endogeneity issues that arise when we study peer effects. We use a similar approach to identify peer effects in corporate investment decisions. Specifically, we use peer-firm-average idiosyncratic return shock as an instrumental variable for peer-firm-average investment.

Chinese manufacturing industry data is an appropriate data source for studying whether peer effects exist in corporate investment decision-making, and whether EPU affects peer effects in corporate investment, for two reasons. First, China's manufacturing industry is the most dynamic in the world, and China has had a significant share in the global manufacturing product market for

[3] See Spyrou (2013) for a review of recent developments in this field.

several decades. Virtually everything is now "made in China". Unlike manufacturing firms in most advanced economies, such as the United States and Europe, Chinese manufacturing firms had a considerable amount of investment opportunities during our sample period, and thus, on average, they might have made more important investment decisions more frequently during the sample period. Second, the Chinese economy is a (at least partly) centrally planned and fast developing economy, and thus economic policies, including industrial policies, might have had a more significant influence on corporate investment decision-making in China than in most developed economies. In addition, an inspection of the EPU index for the Chinese economy reveals that China's economic policy has been more uncertain at certain times than at others.

Before we investigate whether EPU magnifies peer effects in corporate investment policy, we first investigate whether peer effects exist in Chinese manufacturing firms' investment decision-making. Thus, our first hypotheses is stated as follows:

Hypothesis 1. *There exist peer effects in Chinese manufacturing firms' investment policies.*

Economic policy, especially industrial policy, often alters the business environment, and thus uncertain economic policies bring about business uncertainty for firms. Baker *et al.* (2016) summarize two main consequences from EPU: economic uncertainty and policy uncertainty. It is well documented that both types of uncertainty lead to lower levels of investment.[4] Decreased investments can come about two components: collective individual decisions to lower investments due to optimal adjustments and peer effects that magnify the aforementioned changes. Most of the existing literature reports the overall tendency of decreased investments, but it does not focus on identifying

[4]See Bernanke (1983), Julio and Yook (2012), Wang *et al.* (2014), Kang *et al.* (2014), Gulen and Ion (2015), and An *et al.* (2016).

them. Controlling for common factors and idiosyncratic adjustments, we attempt to verify whether such peer effects become more severe as EPU increases. In other words, we test if peer effects exacerbate the reduced investments following increased EPU. We use the EPU index constructed by Baker *et al.* (2016) as a proxy for the degree of EPU prevalent in the economy. They construct the EPU indices for major economies in the world based on a textual analysis of economic policy news. Thus, our second hypothesis is stated as follows:

Hypothesis 2. *Higher EPU magnifies peer effects in corporate investment policy.*

We further our analysis by testing possible channels through which increased EPU causes more severe peer effects. Consider that there are multiple firms competing in an industry. Each firm has a manager who is in charge of making investment decisions. In each period, the manager exerts an effort to acquire information about various items (e.g., financial and product markets, cash flows of the company, and various investment projects) to make optimal investment decisions and then makes investment decisions. The manager makes investment decisions based on her own judgment, based on the acquired information. Alternatively, the manager may also try to observe the decisions made by the company's competitors before making its own decisions. Since we are interested in peer effects among firms within the same industry, we assume that their investment opportunities are positively correlated. Thus, their optimal investment choices are likely to be positively correlated as well. In other words, when a firm's optimal investment decision is to increase investments, it is likely that the competitors are also better off increasing investments, and and *vice versa*.

The first possible channel that we propose is based on the '*information cascade*'. Since the seminal work by Bikhchandani *et al.* (1992), information cascade theory has been used to explain

economic agents' herding behavior in various tasks. According to the model, when there are multiple decision makers who are making decisions sequentially, and each of them only receives incomplete personal signals regarding the true state of the world, herding behavior will arise as a result of rational choices. The idea is that an agent who makes decisions later on can observe those decisions already made by others. Although the agent cannot observe other agents' personal signals, she can make inferences regarding their private information. Once the degree of the precision of information revealed in the choices of others is sufficiently high and the information outweighs the agent's own private information, a rational agent would mimic others' choices while ignoring her own private information. Thus, when an accumulation of certain choices is observed in the market, agents will start to follow these choices regardless of their private information. Zhang (1997) further develops this idea and verifies that the herding behavior that the information cascade model predicts will arise when agents can choose at what point in time they make an investment decision.

When the degree of accuracy of the private signal is high, it is less likely that information cascading will arise because agents acting later on need to be able to observe more opposing choices accumulating in order to start mimicking them. When EPU increases, the accuracy of the signal would decrease. Consequently, peer effects would become more severe. We test whether increased EPU actually increases the noise in investment opportunities (and in turn optimal investment choices) using Tobin's q. We measure the inaccuracy of private information using the residuals from the AR(1) or AR(2) model of Tobin's q. The higher the absolute value of the residual, the lower the accuracy regarding future investment opportunities. We are interested in whether higher EPU would, indeed, decrease the accuracy of the signal.

Hypothesis 3. *(*INFORMATION CASCADE*) Higher EPU makes it more difficult for firms to predict future investment opportunities measured by Tobin's q.*

Another possible channel through which higher EPU could exacerbate peer effects in investment decisions is based on the '*asymmetric capacity of information acquisition*'. Different firms have different capacities for acquiring the relevant information required to make optimal investment decisions. Firms with a longer history are likely to have more experience of making better investment decisions. Firms that have better connections would have better access to valuable information. Furthermore, in China, state-owned enterprises (SOEs) commonly have better access to important information regarding economic policies. Zhang (1997) confirmed that those with better information would lead the decision-making, while others with inferior information would follow by mimicking the leaders' decisions.[5]

Higher EPU would also affect the ability to acquire information differently across firms. We suspect that higher EPU would widen the asymmetry of the capacity to acquire information. That is, firms with information advantages would still be able to obtain some valuable information under higher EPU than those with a lower capacity for information acquisition. Consequently, firms with inferior capacity would have to rely more on mimicking the leading firms.

Hypothesis 4. *(*ASYMMETRIC CAPACITY OF INFORMATION ACQUISITION*) Higher EPU magnifies the peer effects of (i) small and young firms, and (ii) non-SOEs.*

[5]Bikhchandani *et al.* (1992) also write as follows: "While the order of moves is exogenous in [their] model, it is plausible that the highest-precision individual decides first. Consider a more general setting in which all individuals have the choice to decide or to delay, but there is a cost of delaying decision. All individuals have an incentive to wait in the hope of free-riding on the first to decide. However, other things equal, the cost of deciding early is the lowest for the individual with the highest precision" (p. 1002).

The third possible channel that can explain the relation between EPU and peer effects relates to the '*career concerns of managers*'. In modern organizations, managers are consistently evaluated. In many cases, their evaluation depends not only on their own company's absolute performance but also on their performance relative to peer firms. Scharfstein and Stein (1990) and Trueman (1994) document that managers who have concerns regarding their own careers may engage in herding behavior in investment decisions. Consider a manager who has received a signal that indicates a certain decision is the optimal one for the firm. If this manager also observes that many of her competitors have made opposing decisions, it would be a challenge to follow her own signal. Following her own signal would give her the opportunity to achieve a rare success, but it would also mean there will be the chance of an unusual failure. Following the majority would make her outcome rather a common one (again either a success or a failure). When the evaluation of her firm's relative performance is linked to her job security, she might make a suboptimal decision and mimic others in spite of her own private signal. Kahneman and Lovallo (1997) describe such organizational motivation as being derived by an behavioral bias called 'narrow framing'. Although an organization's investment objective is supposed to focus on the overall performance of all investment decisions, the evaluations carried out by managers are commonly conducted with respect to individual projects. Thus, managers might make a safer decision—following others rather than acting according to their own signals—even though they are aware that this is not the best decision for the whole organization.[6] In such circumstances, managers may prefer the option of 'moderate success or failure' rather than

[6]Describing the finding of Kahneman and Lovallo (1993), Thaler (2015) writes as follows: "Each manager is loss-averse regarding any outcomes that will be attributed to him. In an organizational setting, the natural feeling of loss aversion can be exacerbated by the system of rewards and punishment. In many companies, creating a large gain will lead to modest rewards, while creating an equal-sized loss will get you fired. Under those terms, even a manager who starts out risk neutral, willing to take any bet that will make money on average, will become highly risk averse. Rather than solving the problem, the organizational structure is making things worse." (p. 187)

'extreme success or failure'.

Higher EPU would naturally increase the volatility of investment returns and this would increase the risk of extreme losses in investments, which would increase the career concerns for managers. Thus, we expect that peer effects would become more severe due to higher EPU. We use commonly-used corporate governance measures as proxies for how well the firms' incentive schemes and organizational structures are designed and implemented. Firms with better corporate governance would suffer relatively less from peer effects due to managers' career concerns. Consequently, we test the following hypothesis regarding corporate governance and peer effects derived by higher EPU.

Hypothesis 5. *(*CAREER CONCERNS*) Higher EPU magnifies the peer effects of firms with bad corporate governance.*

Firms change their investment behavior and adjust their investment strategies in response to their expectations about economic policies. Gulen and Ion (2015) further verify that the cross-sectional relation between EPU and corporate investment is not uniform. Specifically, as real option theories suggest, they find, using a few different proxies for investment irreversibility, that EPU increases the benefits that a firm might receive from delaying its investment spending. Moreover, they find that firms that are more dependent on government are more negatively affected by policy uncertainty.

To the best of our knowledge, however, there are few studies regarding whether the impacts that EPU has on peer effects in corporate investment decisions are asymmetric in regard to over-investment and under-investment firms. Real-option-based investment theories suggest that higher EPU is likely to magnify peer effects more strongly for under-investment firms than for over-investment firms, because these firms would delay their investment spending together. This view

is also consistent with the observations of Gulen and Ion (2015), Wang *et al*. (2014), and Kang *et al* (2014), who all report that higher EPU hampers corporate investment.

Over-investment and under-investment will both generate suboptimal outcomes but the underlying mechanism connecting EPU and peer effects allows us to further verify whether asymmetric consequences would exist. On the one hand, if higher EPU results in lower investments and higher peer effects, the overall effect would generate more severe under-investment. That is, when under-investment is prevalent, stronger peer effects would further drive the investment down to an even lower level. On the other hand, when lower EPU results in higher investments and lower peer effects, the over-investment issue would be less severe because there would be weaker peer effects that can further increase the investments.

We test this hypothesis by analyzing the over- and under-investment subsamples separately. In this way, we can study whether EPU has heterogenous effects on investment peer effects between over-investment and under-investment firms. Thus, our final hypotheses is stated as follows:

Hypothesis 6. *The magnifying effects of EPU on investment peer effects are stronger for under-investment firms than for over-investment firms.*

3 Data and methodology

Our primary source of data is the China Stock Market and Accounting Research (CSMAR) database, which contains financial statements and stock market information for Chinese listed companies. This

study covers the sample period 1999–2013 for all listed manufacturing firms.[7] We carry out a series of data cleaning procedures, including the following procedures. First, we drop observations without the key variables described below, including lagged investment. Second, we drop information on B-share stocks as B-share stocks are restricted to foreign investors. Third, we drop information on firms listed on ChiNext, widely known as the Growth Enterprises Market Board (GEM), for the reason that GEM is a second-board market and its listing rules are qualitatively different from a main-board market: for instance, there is no cash flow requirement for GEM firms, while firms on a main board are expected to have more than $8 million in total for the last three accounting periods.[8] Fourth, we require firms to have monthly returns, with at least 24 observations during the previous five-year period. Fifth, we drop special treatment (ST) firms as these firms have suffered losses for two or more consecutive years and are not comparable with non-ST firms due to their high default and delisting risks (Jiang *et al.*, 2009). All continuous variables are winsorized at the 1st and 99th percentiles. Our final sample consists of 7,366 firm-year observations, corresponding to 994 firms. The total number of three-digit industries (i.e., peer groups) is 39 and we have on average some 29 firms per industry-year subsample. Panel A of Table 1 provides a definition of each variable.

[Insert Table 1 Here]

To examine if peer firms affect corporate investment policy we extend the empirical model used by Hubbard (1998) and Richardson (2006) by adding an *ex post* peer-firm-average investment mea-

[7]The stock return data starts in 1990 as the Chinese stock market opened in that year, but cash flow data starts in 1998 as firms were required to report cash flow statements from 1997 onwards. For more details, see the State Administration of Taxation website: http://www.chinatax.gov.cn/jypx/jckj/jxnr/1/kjfg03.htm.

[8]For more details, see the Shenzhen Stock Exchange website: http://www.szse.cn/main/en/.

sure to capture peer effects. Our baseline model is specified as follows:

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + \beta_2 INV_{i,t}^{peer} + \beta_{CONTROLS} CONTROLS \\ &\quad + Firm\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where $INV_{i,t}$ is defined as firm i's net capital expenditure plus net acquisitions, less sales of fixed assets at the end of year t, scaled by total assets at the beginning of year t (Richardson, 2006; Bloom *et al.*, 2007). $INV_{i,t}^{peer}$ is calculated as the average of the investment rates of all the firms in firm i's peer group, excluding itself. Peer groups are defined based on three-digit industry classification codes developed by the China Securities Regulatory Commission (CSRC).

We expect β_2 or the coefficient of $INV_{i,t}^{peer}$ to be significantly positive. $CONTROLS$ includes the natural logarithm of total assets ($LNTA_{i,t-1}$), Tobin's q ($TQ_{i,t-1}$), leverage ($LEV_{i,t-1}$), cash holdings to total assets ($CASH_{i,t-1}$), the natural logarithm of the time elapsed since stock listing ($LNAGE_{i,t-1}$), and earnings before interest and taxes to total assets ($EBIT_{i,t-1}$). The control variables are similar to those in Richardson (2006). To examine whether a firm reacts to peer firms' characteristics in addition to peer firms' investment decisions, we also include peer-firm-average characteristics, such as $LNTA_{i,t-1}^{peer}$ and $TQ_{i,t-1}^{peer}$, in some regression models. In addition, we include year dummies to control for year fixed effects. Panel B in Table 1 presents summary statistics with respect to firm-specific and peer-firm-average variables.

However, the inclusion of a peer-firm-average investment measure ($INV_{i,t}^{peer}$) on the right-hand side of Equation (1) is subject to some endogeneity problems in that (*i*) there could be confounding

effects, as firms within the same peer group are exposed to the same or a similar investment environment; and (*ii*) there may be a reverse causality running from $INV_{i,t}^{peer}$ to $INV_{i,t}$. To address these endogeneity concerns, we adopt peer-firm-average idiosyncratic return shocks as an instrumental variable for peer-firm-average investment ratios $INV_{i,t}^{peer}$ similarly to Leary and Roberts (2014). The estimation model is shown below in Equation (2):

$$r_{ijt} = \alpha_{ijt} + \beta_{ijt}^{MKT}(r_{mt} - r_{ft}) + \beta_{ijt}^{IND}(\bar{r}_{-ijt} - r_{ft}) + \eta_{ijt}, \tag{2}$$

where i, j and t denote firm i, peer group j and month t, respectively. r_{ijt} is firm i's monthly return. r_{mt} refers to the monthly market return and r_{ft} refers to the monthly risk free rate. $\bar{r}_{-ijt}$ is the peer-firm-average monthly return for firm i (excluding firm i's own monthly return). Essentially, Equation (2) is a revised capital asset pricing model in which one additional component—excess peer group return $(\bar{r}_{-ijt} - r_{ft})$—is added to capture the common factors within the same peer group. This model is estimated on a rolling annual basis using monthly returns during the previous five-year period (with at least 24 observations). On average, adjusted R^2 is as high as 53.8%. It is interesting to notice that a firm's monthly stock returns are weighted averages of market factors and industry factors, with one-third and two-thirds being weights, respectively, given that the constant is close to zero and the sum of the two factor loadings is almost one. Mean idiosyncratic return is around -10 basis points, which is comparable to that for US firms, as reported in Leary and Roberts (2014). The results of regressions to estimate return shocks are summarized in Table 2.

[Insert Table 2 Here]

For each firm we annualize actual monthly stock returns and expected monthly returns estimated from Equation (2). The difference between the two is equal to firm i's annualized idiosyncratic shocks, $IDIO_{i,t}$. Peer-firm-average idiosyncratic return shocks denoted by $IDIO_{i,t}^{peer}$, our main variable of interest, are then obtained by taking the average of peer firms' annualized idiosyncratic shocks (excluding firm i's). The correlation coefficients between the main variables are reported in Table 1, Panel C. It is noteworthy that we use a contemporaneous peer return shock measure ($IDIO_{i,t}^{peer}$), instead of the lagged measure $IDIO_{i,t-1}^{peer}$, because the contemporaneous peer effect is much stronger than the lagged peer effect based on the correlation analysis.

4 Empirical results

4.1 Do peer firms influence corporate investment policy?

4.1.1 Identification of peer effects using dynamic panel regressions

To investigate whether peer firms play an important role in determining a firm's investment policy, we first examine if peer-firm-average investment has a significant effect on a firm's investment. Table 3 gives empirical results corresponding to the model specified in Equation (1). The first three columns display results based on pooled ordinary least squares (OLS) (which ignores firm fixed effects), fixed effects (FE) and System GMM estimators, respectively.[9] According to Nickell (1981)

[9] Although Difference GMM estimators developed by Arellano and Bond (1991) are consistent provided the instruments are valid, the instruments become weak if the series are highly persistent (Blundell and Bond, 1998). In this case, the system GMM estimator, proposed by Arellano and Bover (1995) and developed by Blundell and Bond (1998), is potentially more efficient than the difference GMM estimator. This estimator augments the system of equations in first-differences by additional equations in levels and uses the lagged first-difference of the dependent variable and explanatory variables as instruments for the equations in levels. We implement System GMM in Stata using the *xtabond2*

and Bond (2002), a pooled OLS estimator is likely to produce $\widehat{\beta}_1$ that is biased upwards, while a fixed effects estimator is likely to generate $\widehat{\beta}_1$ that is biased downwards when the length of time periods is not long enough. As a result, the estimated coefficients on other explanatory variables, such as peer-firm-average investment ($INV_{i,t}^{peer}$), are also likely to be biased when using both an OLS estimator and a fixed effects estimator. Our estimation results seem to be highly consistent with their predictions: $\widehat{\beta}_1^{OLS} = 0.460$; $\widehat{\beta}_1^{FE} = 0.281$. The coefficient estimated by System GMM ($\widehat{\beta}_1^{GMM} = 0.405$), on the other hand, comfortably falls between the pooled OLS estimate and FE estimate. The GMM-style instruments used in Column (3) include the second to sixth lags of *INV* and the second to third lags of INV^{peer} and firm-specific control variables for the equations in first-differences, and the first lag of their first-differences for the equations in levels. The year dummies are used as IV-style instruments for the equations in levels only. The Sargan-Hansen test of over-identifying restrictions does not reject this specification, and there is no significant evidence of second-order serial correlation in the first-differenced residuals. The goodness-of-fit score of the reported System GMM model (0.323) is much higher than that of the FE model (0.118), and similar to that of the OLS model (0.337).

[Insert Table 3 Here]

The coefficient estimates of peer-firm-average investment, $\widehat{\beta}_2$, are significantly positive across all three models, providing strong evidence for peer effects in corporate investment policy. Note also that the magnitude of $\widehat{\beta}_2$ based on System GMM is greater than those based on OLS or FE. Estimated coefficients for control variables suggest that firms with more investment opportunities,

command proposed by Roodman (2009).

more cash holdings, a bigger size and higher profitability tend to invest more, while firms that exist longer and are more likely to be in the later period of their life cycle invest less. In Column (4), we extend the model to examine the role of peer-firm-average characteristics as in Leary and Roberts (2014) and Foucault and Fresard (2014). No significant empirical evidence is found regarding the role of peer-firm-average characteristics in determining firms' investment policies. The additional instruments used in Column (4) are the second and third lags of peer-firm-average characteristics for the equations in first-differences, and the first lag of first-differences of peer-firm-average characteristics for the equations in levels. The Sargan-Hansen test of overidentifying restrictions and Arellano-Bond second-order serial correlation test are comfortably satisfied. The goodness-of-fit score does not increase at all when we add peer-firm-average control variables.

4.1.2 Addressing endogeneity concerns using dynamic panel IV regressions

However, as we discussed earlier, endogeneity problems arise if a peer-firm-average investment measure is included in the right-hand side of the equation, with a firm's investment measure being the dependent variable. Thus, we use an instrumental variable, $IDIO_{i,t}^{peer}$ described in Section 3, to address these problems.[10] We consider the following two model specifications:

[10]We use $IDIO_{i,t}^{peer}$ instead of $IDIO_{i,t-1}^{peer}$ based on the correlation matrix documented in Table 1, Panel C. The coefficient of correlation between $INV_{i,t}^{peer}$ and $IDIO_{i,t}^{peer}$ is 0.106 and statistically significant at the 1% level. However, the coefficient of correlation between $INV_{i,t}^{peer}$ and $IDIO_{i,t-1}^{peer}$ is not statistically significant even at the 10% level. Furthermore, the first-order serial correlation of $IDIO_{i,t}^{peer}$ is negative and statistically significant at the 1% level. Thus, contemporaneous peer-firm-average idiosyncratic return shock is more appropriate as an instrumental variable than the first-lagged peer-firm-average idiosyncratic return shock.

Reduced-form dynamic panel IV specification

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + \beta_2 IDIO^{peer}_{i,t} + \beta_3 IDIO_{i,t} + \beta_{CONTROLS} CONTROLS \\ &\quad + Firm\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_{i,t}; \end{aligned} \tag{3}$$

Structural dynamic panel IV specification

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + \beta_2 \widehat{INV^{peer}_{i,t}} + \beta_3 IDIO_{i,t} + \beta_{CONTROLS} CONTROLS \\ &\quad + Firm\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned} \tag{4}$$

where $\widehat{INV^{peer}_{i,t}}$ is the fitted values from the first-stage regression in which $IDIO^{peer}_{i,t}$ is used as an instrumental variable.

Results for the reduced-form specification are shown in Columns (1) and (2) in Table 4. In Column (2) we include peer-firm-average characteristics. The GMM-style instruments used in these two models are the same as those in Table 3, except that instead of peer-firm-average-investment-related instruments, the current value and all available lags of $IDIO^{peer}$ and $IDIO$ and the first lag of their first-differences are used as instruments for the equations in first-differences and for the equations in levels, respectively. Again, the Sargan-Hansen test and Arellano-Bond test are comfortably satisfied. The goodness-of-fit score increases somewhat when we add peer-firm-average control variables. Significantly positive coefficients of $IDIO^{peer}_{i,t}$ in both columns indicate that there are strong *causal* peer effects in corporate investment decisions.

[Insert Table 4 Here]

In Columns (3) and (4) we report the results for the structural specification based on two-stage System GMM (2SGMM). 2SGMM is a combination of IV estimation and System GMM estimation. To implement this we use a pooled OLS regression at the first stage, with $IDIO_{i,t}^{peer}$ being the instrument. Then, at the second stage we use the fitted values of $INV_{i,t}^{peer}$ to estimate a dynamic panel regression model using System GMM. Coefficients of $IDIO_{i,t}^{peer}$ from the first-stage regression are significantly positive at the 1% level of significance, indicating that $IDIO_{i,t}^{peer}$ is a relevant instrumental variable for $INV_{i,t}^{peer}$. The instruments used to estimate a dynamic panel regression model in Columns (3) and (4) are the same as those used in Columns (1) and (2), respectively. Sargan-Hansen and Arellano-Bond tests are comfortably satisfied again. Consistent with the reduced form specification results, coefficients of $\widehat{INV_{i,t}^{peer}}$ in both Column (3) and Column (4) are significantly positive and their magnitudes are comparable to coefficients for first-lagged investment rate, confirming that there are strong *causal* peer effects in corporate investment decisions. When we compare empirical results with and without peer firms' characteristics, the goodness-of-fit scores are very close. In addition, the coefficients of those peer firms' characteristics variables remain insignificant in Column (4), suggesting that firms react to their peer firms' actual investment policies rather than to the peer firms' characteristics. Overall, our results suggest that peer firms' actual investment decisions, a neglected factor in classical investment theories, play a very important role in determining a firm's investment policy.

4.1.3 Robustness tests

Our major findings are robust to alternative choices with respect to variable definitions, peer group definitions, or estimation methods. Table 5 presents the results for several robustness tests. Note that the models in Column (1) through Column (4) are the reduced-form dynamic panel IV regression models, while the models in Columns (5) and (6) are the structural dynamic panel IV regression models. All the models are estimated using System GMM methods. As the first robustness test we test if our main results are robust when we define peer groups based on the four-digit CSRC industry codes established in 2001 instead of the three-digit CSRC industry codes. The new classification gives us 76 peer groups. The first two columns show that, whether we control for peer-firm-average characteristics or not, peer effects exist in Chinese manufacturing firms' investment policies. Second, instead of a commonly used cash-flow-statement-based investment measure we also consider a balance-sheet-based investment measure, which is defined as the change in fixed assets divided by total assets at the beginning of the year. Columns (3) and (4) suggest that our main results hold. Our finding that there are peer effects in corporate investment policy is not sensitively influenced by the choices of investment measures. However, it is worth noting that if we use this balance-sheet-based investment measure, our goodness-of-fit score is much lower. Finally, to obtain the structural 2SGMM results reported in Columns (3) and (4) of Table 4 we use the OLS estimator at the first-stage regression. As a robustness check, we use the fixed effects estimator instead for the first-stage regression estimation. From the last two columns in Table 5 we can see that our main results do not change with different estimation methods in the first-stage regression.

[Insert Table 5 Here]

4.2 Does EPU magnify peer effects in corporate investment policy?

To examine whether EPU is the main driver for the peer effects we test whether a more uncertain economic policy magnifies peer effects in corporate investment policy. The original EPU index has a large variation across time periods, ranging from 9 to 393, and its mean value is 112. As the EPU index is a monthly measure, we first take its annual average, and then divide the annualized EPU index by 100 and take the logarithm to obtain our proxy for EPU, $LNEPU_t$, as in Kang *et al.* (2014). We first consider the following specification:

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + (\gamma_0 + \gamma_1 LNEPU_t + \gamma_2 LNEPU_t^2) \times IDIO_{i,t}^{peer} + \beta_3 IDIO_{i,t} \\ &\quad + \beta_4 LNEPU_t + \beta_{CONTROLS} CONTROLS + Firm\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned} \tag{5}$$

where we allow the coefficient of $IDIO_{i,t}^{peer}$, β_2, to be a linear or quadratic function of $LNEPU_t$. We expect only the coefficient of $LNEPU_t \times IDIO_{i,t}^{peer}$ to be significantly positive, but we consider a quadratic form just in case there is a non-linear relationship between EPU and the magnitude of peer effects in corporate investment policy. We then consider the following specification:

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + (\gamma_0 + \gamma_1 HighEPU_t) \times IDIO_{i,t}^{peer} + \beta_3 IDIO_{i,t} \\ &\quad + \beta_4 HighEPU_t + \beta_{CONTROLS} CONTROLS + Firm\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned} \tag{6}$$

where we allow the coefficient of $IDIO_{i,t}^{peer}$, β_2, to be different depending on whether EPU is higher than its historical median. $HighEPU_t$ is an indicator variable which has 1 if EPU_t is higher than its historical median and 0 otherwise.

Table 6 summarizes the results. In Columns (1) and (6), we find that $LNEPU_t$ and $HighEPU_t$ have significantly negative signs, confirming the findings of the existing literature on the effect of economic policy on corporate investment. For example, Gulen and Ion (2015), Wang *et al.* (2014), and Kang *et al.* (2014) find a negative relation between EPU and corporate investment. Columns (2), (3), and (7) present empirical results based on the full sample without controlling for peer-firm-average characteristics, while Columns (4), (5), and (8) present corresponding empirical results based on the full sample with appropriate controls for peer-firm average characteristics. All of these columns uniformly show that the coefficients of $LNEPU_t \times IDIO_{i,t}^{peer}$ or $HighEPU_t \times IDIO_{i,t}^{peer}$ are significantly positive, while the coefficients of $LNEPU_t^2 \times IDIO_{i,t}^{peer}$ in Columns (3) and (5) are not significantly different from zero. These results show that the relationship between EPU and the magnitude of peer effects is closer to being linear than it is to being quadratic. The significantly positive coefficients of $LNEPU_t \times IDIO_{i,t}^{peer}$ or $HighEPU_t \times IDIO_{i,t}^{peer}$ suggest that higher EPU amplifies the peer effects in corporate investment policy. In addition to the GMM-style instruments used in Columns (1) and (2) of Table 4, the current value and all available lags of $LNEPU$ or $HighEPU$ are included as GMM-style instruments in Columns (1) and (6), those of $LNEPU$ and $LNEPU \times IDIO^{peer}$ in Columns (2) and (4), those of $LNEPU$, $LNEPU \times IDIO^{peer}$ and $LNEPU^2 \times IDIO^{peer}$ in Columns (3) and (5), and those of $HighEPU$ and $HighEPU \times IDIO^{peer}$ in Columns (7) and (8). Again, the Sargan-Hansen test and Arellano-Bond test are comfortably satisfied in the models with EPU and peer-effect-related variables.[11]

[Insert Table 6 Here]

[11] The models with $LNEPU$ or $HighEPU$ only have slightly low p-values for Sargan-Hansen tests, but the models that are of interest to us have sufficiently high Sargan-Hansen p-values, confirming the validity of the instruments included.

4.3 Mechanisms through which EPU magnifies the peer effects in corporate investment policy

In this section we examine through which mechanisms higher EPU magnifies peer effects in corporate investment policy. We test which works better among the three mechanisms discussed in Section 2: *i)* information cascade; *ii)* asymmetric capacity of information acquisition; and *iii)* career concerns of managers.

First, the information cascade mechanism suggests that higher EPU actually increases the noise in investment opportunities as measured by Tobin's q. Therefore, higher EPU makes it more difficult for firms to predict future investment opportunities. To test this mechanism, we propose to use a two-stage regression framework. In the first stage, we estimate an AR(1) or AR(2) model of Tobin's q to obtain firm-year-specific residuals. In the second stage, we regress the absolute value of the residual on a measure of EPU. Our empirical framework is specified as below:

$$TQ_{i,t} = \alpha_0 + \alpha_1 TQ_{i,t-1} (+\alpha_2 TQ_{i,t-2}) + \alpha_{CONTROLS} CONTROLS + Firm\ Fixed\ Effects + \varepsilon_{i,t}, \quad (7)$$

$$|\widehat{RES_{i,t}}| = \beta_0 + \beta_1 LNEPU_t + Firm\ Fixed\ Effects + \varepsilon_{i,t}, \quad (8)$$

where $CONTROLS$ includes the natural logarithm of total assets ($LNTA_{i,t-1}$), leverage ratios ($LEV_{i,t-1}$), cash holdings to total assets ($CASH_{i,t-1}$), the natural logarithm of the time elapsed since stock listing ($LNAGE_{i,t-1}$), and earnings before interests and taxes to total assets ($EBIT_{i,t-1}$).[12]

[12] In unreported tables, our main results still hold even when we estimate a standard AR(1) or AR(2) model of Tobin's q without those control variables.

Table 7 presents the empirical results. We use System GMM to estimate Equation (7) for the AR(1) model of Tobin's q, TQ. Column (1) reports the first-stage estimation results for the AR (1) model. The goodness-of-fit score for the AR(1) model is 0.451 and the Sargan/Hansen test is also comfortably satisfied. The absolute value of the residual from Equation (7), $|\widehat{RES_{i,t}}|$, is then used as the dependent variable in Equation (8). A positive sign of $LNEPU_t$ would indicate that higher EPU decreases the accuracy of the signal. The results reported in Columns (2) to (5) show that there is a positive relation between EPU and $|\widehat{RES_{i,t}}|$ across different models: *i)* when we use the EPU level, $LNEPU_t$, or instead the dummy variable for high EPU, $highEPU_t$; and *ii)* when we control for firm fixed effects or industry fixed effects. Results based on the AR(2) model in the first stage are similar, as shown in Columns (6) to (10). The goodness-of-fit score for the AR(2) model is 0.46, which is a marginal increase from that for the AR(1) model. Again, the Sargan/Hansen test is comfortably satisfied.

[Insert Table 7 Here]

To sum up, we find evidence that EPU affects the magnitude of peer effects by affecting the accuracy of firms' signals regarding their investment opportunities. This evidence supports Hypothesis 3 or the information cascade mechanism. In other words, higher EPU decreases the accuracy of the signal of investment opportunities, so higher EPU makes it more difficult for firms to predict future investment opportunities, and thus higher EPU makes peer effects in corporate investment policy more severe.

Secondly, asymmetric capacity for information acquisition mechanism predicts that firms with a longer history and SOEs in China will have better access to important information regarding eco-

nomic policies. This implies that when EPU is higher, peer effects in corporate investment are more likely to be stronger for smaller and younger firms and non-SOEs, as they are at a disadvantage in terms of information acquisition and instead they are more likely to rely on peers' behavior to make decisions. In Table 8, we present empirical results to test this channel. $NonSOE_{i,t}$ is an indicator variable which is equal to 1 if a firm is not an SOE in a given year and 0 otherwise.[13] $SmallYoung_{i,t}$ is an indicator variable which is equal to 1 if a firm is both younger (i.e., its listing year is below the median in the same peer group) and smaller (i.e., its size is below the median in the same peer group) and 0 otherwise. All four columns are results for dynamic panel regressions and are estimated using System GMM methods. We control for firm-specific characteristics in all columns, while we also control for peer-firm-average characteristics in the second and fourth columns. The coefficients of $NonSOE_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$ and $SmallYoung_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$, our variables of interest, are not significantly positive, indicating that we do not find evidence supporting the asymmetric capacity for information acquisition mechanism. In other words, Hypothesis 4 is not supported.

The results suggest that higher EPU does not affect either small and young firms or non-SOEs more significantly. It might be the case that higher EPU does affect most firms uniformly. Our hypothesis is based on the conjecture that firms with superior information will be able to keep or even enlarge their edge over other firms. However, it might also be the case that higher EPU would reduce their comparative advantages. If this were the case, higher EPU would not necessarily impact the firms with inferior information capacity more severely.

[13] Note that alongside the privatization process in China, state-ownership has decreased each year in recent decades.

[Insert Table 8 Here]

Finally, the managers' career concerns mechanism suggests that higher EPU increases career concerns for managers, meaning that higher EPU could worsen agency conflicts between managers and shareholders, and lead to stronger peer effects in investment. Agency conflicts could presumably be resolved by better corporate governance through either monitoring (concentrated ownership) or incentive plans (managerial ownership). Zhang and Lu (2012) identify a series of corporate governance measures, including shareholder ownership concentration, a monitoring role of independent directors and managerial ownership of shares etc. However, Jiang and Kim (2015) cast doubt on whether independent directors would be credible monitors for firms, and also on the effectiveness of stock option grants as proper incentives for managers in China, as it is not very common for firms to actually provide stock option grants. Although the effect of concentrated ownership on firm value is controversial due to the tunneling effect brought about by large shareholders, as indicated in Jiang and Kim (2015), its inverse remains a good proxy for the degree of agency conflicts between managers and shareholders. In this study, following Zhang and Lu (2012) and Jiang and Kim (2015), we use three measures: *i)* the ratio of the shareholding percentage of the largest shareholder to that of the second largest shareholder ($CentZ$); *ii)* the sum of squares of the shareholding percentage of the top five shareholders ($HF5$); and *iii)* the number of shares held by executives scaled by total number of shares ($EXECSH$). This mechanism predicts negative signs of $CentZ_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$, $HF5_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$, and $EXECSH_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$, indicating that when EPU is higher, peer effects in corporate investment due to managers' career concerns are stronger for firms with more severe agency conflicts between managers and shareholders.

However, empirical results reported in Table 9 do not support this mechanism. In other words, Hypothesis 5 is not supported. We do not find evidence that higher EPU affects the peer effects more significantly for firms with worse corporate governance measures. One possibility is that our corporate governance measures based on the composition of shareholding may not be a good proxy for career concerns of managers. A more direct measure of managerial career concerns could be directly related to managers' evaluation schemes and organizational culture. Such measures, however, are difficult to obtain. It is also possible that managers' career concerns are universal problems that apply to most firms and that EPU does not affect the severity of managers' career concerns.

[Insert Table 9 Here]

Our analysis of the possible mechanisms through which EPU magnifies peer effects in corporate investment policy suggests that EPU affects the magnitude of peer effects by affecting the accuracy of firms' signals regarding their investment opportunities. We do not find evidence that specific types of firms' peer-mimicking behavior are more significantly affected by EPU, suggesting that EPU uniformly magnifies the peer effects of every type of Chinese manufacturing firm.

4.4 Does EPU magnify peer effects in corporate investment inefficiency?

To further explore the impact that EPU has on peer effects in investment inefficiency, we divide our sample into two parts: over-investment firms and under-investment firms.[14] To determine which

[14]Investment efficiency refers to a situation in which firms undertake all, and only, projects with a positive net present value. Consistent with prior research (Biddle *et al*., 2009; Li and Wang, 2010), we define investment inefficiency as deviation from optimal investment using a model that predicts investment as a function of growth opportunities.

firms over-invest or under-invest, we first cross-sectionally estimate Richardson's (2006) model for each industry-year group, with at least 20 observations, to obtain optimal investment. We then define an over-investment (under-investment) firm as a firm whose actual investment is greater (less) than the optimal investment. Empirical results are shown in Table 10. First of all, we find that peer effects, as measured by the coefficients of $IDIO_{i,t}^{peer}$, are stronger for over-investment firms than for under-investment firms. Interestingly, however, we also find that the coefficient of the interaction term $LNEPU_t \times IDIO_{i,t}^{peer}$ is significantly positive in the under-investment sample but insignificant in the over-investment sample, indicating that the result in the full sample is mainly driven by under-investment firms. This implies that when EPU is higher, under-investment firms react to their peers' under-investment behavior.

This result is consistent with the real-option-based investment theory (Dixit and Pindyck, 1994; Bloom *et al.*, 2007). Higher uncertainty would deter investment due to the irreversible nature of corporate investment. An under-investment firm's peer effect becomes more severe with higher EPU. In other words, when economic policy is more uncertain, firms are more likely to heavily mimic their peers and to give up some of their valuable (i.e., positive net present value (NPV)) investment opportunities.

Our findings are also consistent with findings found in the previous literature, as well as with the evidence supporting Hypothesis 2 in this paper. When EPU increases, we expect a firm's investments to decrease and peer effects to increase. Higher peer effects accompanied by a firm's lower investments implies that the overall level of under-investment could be quite large. In other words, once peer firms tend to lower their investments, peer effects would further decrease a firm's

investments. Therefore, firms in the under-investment subsample are more significantly affected by higher EPU. When EPU decreases, however, peer effects would decrease, while a firm's investment increases. Since the peer effects are not as prevalent as before, the further increase in investments would be limited. Thus, we can expect firms in the over-investment subsample to be less impacted by higher EPU.

[Insert Table 10 Here]

5 Conclusion

We investigated whether there are peer effects in corporate investment policies. We find that a firm tends to reduce its investment when peer firms invest less. Using peer-firm-average idiosyncratic return shock as an instrumental variable for *ex post* peer-firm-average investment, we confirm that positive causal peer effects in corporate investment policies exist. We further document that such peer effects are significantly stronger when EPU is higher. Analyzing several possible channels for such effects, we find evidence supporting the '*information cascade*' channel, in which increased EPU increases the noise of the information firms use to make investment decisions, and eventually increases the peer effects. Analyzing over-investment and under-investment firms separately, we further find that EPU exacerbates peer effects only when firms invest less than their optimal investment levels. This result suggests that higher EPU could cause industry-wide under-investment problems to last longer, slowing down the recovery from a recession. Based on our empirical findings, we argue that economic policy should be planned and executed in a consistent, reliable, predictable and

transparent manner, especially during a recession.

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Table 1: Variable definitions, summary statistics, and correlation matrix

This table shows definitions, summary statistics and a correlation matrix of the variables used in this study. The sample consists of all listed manufacturing firms in the CSMAR database between 1999 and 2013. Panel A provides definitions of and formulas for the main variables used in this study. Panel B presents means, standard deviations (SD), medians, lower quartiles (Q1), and upper quartiles (Q3) for the variables. Panel C reports a correlation matrix containing Pearson correlation coefficients between key variables. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Variable definitions

Abbreviation	Definition	Calculation
Firm-specific variables		
$INV_{i,t}$	Investment rate	Net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t
$LNTA_{i,t-1}$	Firm size	Natural logarithm of total assets
$TQ_{i,t-1}$	Investment opportunities	Tobin's q
$LEV_{i,t-1}$	Leverage	Book leverage ratio
$EBIT_{i,t-1}$	Profitability	Earnings before interest expenses and taxes scaled by total assets at the beginning of the year t
$CASH_{i,t-1}$	Cash holdings	Cash plus tradable financial assets divided by total assets
$LNAGE_{i,t-1}$	Age	Natural logarithm of the time elapsed since stock listing
$IDIO_{i,t}$	Idiosyncratic return shock	Annualized idiosyncratic stock returns constructed as in Leary and Roberts (2014)
Peer-firm-average variables		
$INV_{i,t}^{peer}$	Peer-firm-average investment rate	Peer-firm-average $INV_{i,t}$ (excluding firm i)
$LNTA_{i,t-1}^{peer}$	Peer-firm-average firm size	Peer-firm-average $LNTA_{i,t-1}$ (excluding firm i)
$TQ_{i,t-1}^{peer}$	Peer-firm-average investment opportunities	Peer-firm-average $TQ_{i,t-1}$ (excluding firm i)
$LEV_{i,t-1}^{peer}$	Peer-firm-average leverage	Peer-firm-average $LEV_{i,t-1}$ (excluding firm i)
$EBIT_{i,t-1}^{peer}$	Peer-firm-average profitability	Peer-firm-average $EBIT_{i,t-1}$ (excluding firm i)
$CASH_{i,t-1}^{peer}$	Peer-firm-average cash holdings	Peer-firm-average $CASH_{i,t-1}$ (excluding firm i)
$LNAGE_{i,t-1}^{peer}$	Peer-firm-average age	Peer-firm-average $LNAGE_{i,t-1}$ (excluding firm i)
$IDIO_{i,t}^{peer}$	Peer-firm-average idiosyncratic return shock	Peer-firm-average $IDIO_{i,t}$ (excluding firm i)

Panel B. Summary statistics

VARIABLES	Mean	SD	Q1	Median	Q3
Firm-specific variables					
$INV_{i,t}$	0.067	0.079	0.016	0.045	0.092
$INV_{i,t-1}$	0.071	0.082	0.018	0.047	0.096
$LNTA_{i,t-1}$	21.637	1.160	20.863	21.523	22.267
$TQ_{i,t-1}$	1.797	1.309	1.145	1.406	1.958
$LEV_{i,t-1}$	0.230	0.155	0.108	0.222	0.334
$EBIT_{i,t-1}$	0.064	0.083	0.028	0.056	0.096
$CASH_{i,t-1}$	0.147	0.104	0.073	0.122	0.195
$LNAGE_{i,t-1}$	2.104	0.437	1.792	2.079	2.485
$IDIO_{i,t}$	-0.059	0.538	-0.272	-0.060	0.145
Peer-firm-average variables					
$INV_{i,t}^{peer}$	0.069	0.031	0.046	0.066	0.087
$LNTA_{i,t-1}^{peer}$	21.583	0.612	21.201	21.487	21.863
$TQ_{i,t-1}^{peer}$	1.850	0.848	1.303	1.621	2.193
$LEV_{i,t-1}^{peer}$	0.228	0.073	0.170	0.222	0.272
$EBIT_{i,t-1}^{peer}$	0.062	0.036	0.041	0.059	0.079
$CASH_{i,t-1}^{peer}$	0.147	0.042	0.119	0.146	0.172
$LNAGE_{i,t-1}^{peer}$	2.030	0.282	1.818	2.081	2.229
$IDIO_{i,t}^{peer}$	-0.058	0.138	-0.090	-0.039	-0.005
Industry characteristics					
Number of firms per industry-year	28.86	18.67	13	26	43
Number of industries	39				
Sample characteristics					
Observations	7,366				
Number of firms	994				

Panel C. Correlation matrix

	$IDIO_{i,t-1}$	$IDIO_{i,t}$	$IDIO_{i,t-1}^{peer}$	$IDIO_{i,t}^{peer}$	$INV_{i,t}^{peer}$	$INV_{i,t-1}$
$IDIO_{i,t}$	-0.040***					
$IDIO_{i,t-1}^{peer}$	-0.005	-0.009				
$IDIO_{i,t}^{peer}$	0.000	-0.004	-0.076***			
$INV_{i,t}^{peer}$	0.006	0.021*	0.014	0.106***		
$INV_{i,t-1}$	0.008	-0.058***	0.043***	0.056***	0.217***	
$INV_{i,t}$	0.032**	0.016	0.003	0.047***	0.232***	0.564***

Table 2: Stock return factor regression results

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013. The table presents mean factor loadings and adjusted R^2 from the regression

$$r_{ijt} = \alpha_{ijt} + \beta_{ijt}^{MKT}(r_{mt} - r_{ft}) + \beta_{ijt}^{IND}(\bar{r}_{-ijt} - r_{ft}) + \eta_{ijt},$$

where i, j and t denote firm i, peer group j and month t, respectively. r_{ijt} is firm i's monthly return. r_{mt} refers to monthly market return and r_{ft} refers to monthly risk free rate. $\bar{r}_{-ijt}$ is the peer-firm-average monthly return for firm i (excluding firm i's own monthly return), where peer groups are defined by the 2001 CSRC three-digit industry codes. The regression is estimated for each firm on a rolling annual basis using historical monthly returns during the five-year period. We require at least 24 months of historical data in the estimation. We compute expected returns using the estimated factor loadings and realized factor returns one year hence. We then compute idiosyncratic returns as the difference between realized returns and expected returns. Refer to Leary and Roberts (2014) for more details.

VARIABLES	Mean	SD	Q1	Median	Q3
Regression summary					
α_{ijt}	0.004	0.013	-0.004	0.003	0.010
β_{ijt}^{MKT}	0.327	0.645	-0.066	0.268	0.671
β_{ijt}^{IND}	0.688	0.615	0.344	0.745	1.062
Observations per regression	59.79	1.077	60	60	60
Adjusted R^2	0.528	0.158	0.430	0.544	0.644
Avg. monthly return	0.014	0.052	-0.021	0.003	0.042
Avg. expected monthly return	0.015	0.048	-0.013	0.006	0.038
Avg. idiosyncratic monthly return	-0.001	0.032	-0.019	-0.002	0.016

Table 3: Identification of peer effects in corporate investment decisions—Dynamic panel regression results

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. Column (1) presents OLS estimated coefficients and standard errors that allow for intra-firm correlation. Column (2) presents fixed effects (FE) coefficients and standard errors that allow for intra-firm correlation. Columns (3) and (4) present two-step System GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation, and which use the finite-sample correction proposed by Windmeijer (2005). The dependent variable is firm i's investment rate ($INV_{i,t}$) defined as net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t. All explanatory variables are described in Panel A of Table 1. Year dummies are included in all regression models. The GMM-style instruments used in System GMM models are the second to sixth lags of the investment rate, second to third lags of the peer-firm-average investment rate, and second to third lags of the firm-specific control variables (and peer-firm-average control variables) for the equations in first-differences, and the first lag of the change in investment rate, the first lag of the change in peer-firm-average investment rate, and the first lag of the change in all firm-specific control variables (and peer-firm-average control variables) for level equations. Note that year dummies are treated as instruments for the equations in levels only. We report p-values for the Arellano-Bond test for second-order serial correlation in first-differenced residuals and the Sargan/Hansen test of overidentifying restrictions. Overall goodness-of-fit scores are reported for OLS, FE, and System GMM models. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
ESTIMATION METHOD	OLS	FE	SYS GMM	SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
Constant	-0.055**	0.383***	-0.144***	-0.061
	(0.021)	(0.069)	(0.052)	(0.065)
$INV_{i,t-1}$	0.460***	0.281***	0.405***	0.406***
	(0.015)	(0.018)	(0.021)	(0.020)
Peer-effect-related variable				
$INV_{i,t}^{peer}$	0.267***	0.130***	0.319***	0.510***
	(0.031)	(0.041)	(0.073)	(0.055)
Firm-specific characteristics				
$LNTA_{i,t-1}$	0.003***	-0.018***	0.007***	0.006***
	(0.001)	(0.003)	(0.002)	(0.002)
$TQ_{i,t-1}$	0.003**	0.005***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
$LEV_{i,t-1}$	0.005	-0.035***	-0.002	-0.006
	(0.006)	(0.012)	(0.012)	(0.011)
$EBIT_{i,t-1}$	0.103***	0.090***	0.063***	0.070***
	(0.015)	(0.017)	(0.019)	(0.020)
$CASH_{i,t-1}$	0.021**	0.108***	0.092***	0.083***
	(0.009)	(0.015)	(0.021)	(0.019)
$LNAGE_{i,t-1}$	-0.012***	0.008	-0.010***	-0.010***
	(0.002)	(0.010)	(0.003)	(0.003)
Peer-firm-average characteristics				
$LNTA_{i,t-1}^{peer}$				-0.005
				(0.004)
$TQ_{i,t-1}^{peer}$				-0.001
				(0.004)
$LEV_{i,t-1}^{peer}$				0.035
				(0.026)
$EBIT_{i,t-1}^{peer}$				-0.025
				(0.043)
$CASH_{i,t-1}^{peer}$				-0.045
				(0.037)
$LNAGE_{i,t-1}^{peer}$				0.015
				(0.009)
Firm fixed effects	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	7,366	7,366	7,366	7,366
Number of firms	994	994	994	994
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.337	0.118	0.323	0.323
Second-order serial correlation (p-value)			0.606	0.708
Sargan/Hansen (p-value)			0.211	0.672

Table 4: Identification of peer effects in corporate investment decisions—Dynamic panel IV regression results

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. Columns (1) and (2) present reduced-form IV regression results, while Columns (3) and (4) present structural IV regression results. The reduced-form model and the second-stage model in the structural specification are estimated using the System GMM estimator. The first-stage model in the structural specification is estimated using an OLS regression to obtain a peer-firm-average investment rate estimate ($\widehat{INV_{i,t}^{peer}}$). All four columns present two-step System GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation, and which use the finite-sample correction proposed by Windmeijer (2005). The dependent variable is firm i's investment rate ($INV_{i,t}$) defined as net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t. All explanatory variables are described in Panel A of Table 1. Year dummies are included in all regression models. GMM-style instruments used in System GMM are the contemporaneous and all available lags of firm i's idiosyncratic return shock and peer-firm average idiosyncratic return shock, the second to sixth lags of the investment rate, and second to third lags of the firm-specific control variables (and peer-firm-average variables) for the equations in first-differences, and the first lag of the change in firm i's idiosyncratic return shock and peer-firm average idiosyncratic return shock, first lag of the change in investment rate, and the first lag of the change in all firm-specific control variables (and peer-firm-average control variables) for level equations. Note that year dummies are treated as instruments for the equations in levels only. We report p-values for the Arellano-Bond test for second-order serial correlation in first-differenced residuals and the Sargan/Hansen test of overidentifying restrictions. Overall goodness-of-fit scores are also reported. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

ESTIMATION METHOD	(1) SYS GMM	(2) SYS GMM	(3) 2-STAGE SYS GMM	(4) 2-STAGE SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
Constant	-0.125***	-0.197***	-0.138***	-0.135**
	(0.044)	(0.059)	(0.044)	(0.064)
$INV_{i,t-1}$	0.411***	0.415***	0.410***	0.415***
	(0.020)	(0.019)	(0.020)	(0.019)
Peer-effect-related variable				
$IDIO_{i,t}^{peer}$	0.011**	0.012**		
	(0.005)	(0.005)		
$\widehat{INV_{i,t}^{peer}}$			0.449**	0.531**
			(0.218)	(0.245)
Firm-specific characteristics				
$LNTA_{i,t-1}$	0.007***	0.005**	0.006***	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
$TQ_{i,t-1}$	0.004**	0.005**	0.004**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
$LEV_{i,t-1}$	-0.001	0.002	-0.009	-0.001
	(0.012)	(0.012)	(0.012)	(0.012)
$EBIT_{i,t-1}$	0.086***	0.088***	0.066***	0.079***
	(0.020)	(0.020)	(0.022)	(0.020)
$CASH_{i,t-1}$	0.085***	0.076***	0.099***	0.080***
	(0.020)	(0.019)	(0.021)	(0.019)
$LNAGE_{i,t-1}$	-0.010***	-0.012***	-0.009***	-0.012***
	(0.003)	(0.003)	(0.003)	(0.003)
$IDIO_{i,t}$	0.008***	0.008***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Peer-firm-average characteristics				
$LNTA_{i,t-1}^{peer}$		0.006*		-0.000
		(0.003)		(0.004)
$TQ_{i,t-1}^{peer}$		0.002		-0.001
		(0.003)		(0.003)
$LEV_{i,t-1}^{peer}$		0.055**		0.010
		(0.026)		(0.033)
$EBIT_{i,t-1}^{peer}$		0.160***		-0.022
		(0.041)		(0.093)
$CASH_{i,t-1}^{peer}$		-0.091**		-0.028
		(0.038)		(0.046)
$LNAGE_{i,t-1}^{peer}$		-0.007		0.016
		(0.009)		(0.014)
First-stage instrument				
$IDIO_{i,t}^{peer}$			0.025***	0.022***
			(0.003)	(0.003)
Observations	7,366	7,366	7,366	7,366
Number of firms	994	994	994	994
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.318	0.331	0.318	0.331
Second-order serial correlation (p-value)	0.461	0.476	0.451	0.476
Sargan/Hansen (p-value)	0.526	0.774	0.499	0.774

Table 5: Peer effects in corporate investment decisions—Robustness tests

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. This table presents results for several robustness checks. In the first four columns, we estimate the reduced-form models using the System GMM method. First, we test if our main results are robust when we define peer groups based on the four-digit 2001 CSRC industry codes instead of the three-digit 2001 CSRC industry codes. Second, we test if our main results are robust when we replace our cash-flow-statement-based investment measure with a balance-sheet-based investment measure, which is defined as the change in fixed assets divided by total assets at the beginning of the year. In the last two columns, we report System GMM results for the structural models, in which a peer-firm-average investment rate estimate ($\widehat{INV_{i,t}^{peer}}$) is obtained using a fixed-effects regression instead of an OLS regression. All six columns present two-step System GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation, and which use the finite-sample correction proposed by Windmeijer (2005). The dependent variable is firm i's investment rate ($INV_{i,t}$) defined as net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t. All explanatory variables are described in Panel A of Table 1. Year dummies are included in all regression models. Instrument variables used in System GMM procedures are similar to those used in Table 3 and Table 4. Note that year dummies are treated as instruments for the equations in levels only. We report p-values for the Arellano-Bond test for second-order serial correlation in first-differenced residuals and the Sargan/Hansen test of overidentifying restrictions. Overall goodness-of-fit scores are also reported. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Peer group classification		*Investment measure*		*FE in the first stage*	
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV1_{i,t}$	$INV1_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
Constant	0.000	0.000	0.000	-0.429***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.085)	(0.000)	(0.000)
$INV_{i,t-1}$	0.408***	0.417***			0.410***	0.415***
	(0.019)	(0.019)			(0.020)	(0.019)
$INV1_{i,t-1}$			0.036**	0.036**		
			(0.017)	(0.017)		
Peer-effect-related variable						
$IDIO^{peer}_{i,t}$	0.010*	0.011**	0.018**	0.018**		
	(0.005)	(0.005)	(0.008)	(0.008)		
$\widehat{INV^{peer}_{i,t}}$					0.655**	0.637**
					(0.318)	(0.293)
Firm-specific characteristics						
$LNTA_{i,t-1}$	0.008***	0.006***	0.023***	0.018***	0.006***	0.004*
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
$TQ_{i,t-1}$	0.005**	0.005**	0.009***	0.006***	0.004**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$LEV_{i,t-1}$	-0.005	0.000	0.065***	0.073***	0.003	-0.001
	(0.012)	(0.011)	(0.017)	(0.017)	(0.012)	(0.012)
$EBIT_{i,t-1}$	0.084***	0.089***	0.192***	0.192***	0.066***	0.078***
	(0.021)	(0.021)	(0.026)	(0.025)	(0.022)	(0.020)
$CASH_{i,t-1}$	0.087***	0.076***	-0.055**	-0.039	0.083***	0.073***
	(0.020)	(0.019)	(0.027)	(0.026)	(0.020)	(0.019)
$LNAGE_{i,t-1}$	-0.010***	-0.012***	-0.016***	-0.017***	-0.008***	-0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$IDIO_{i,t}$	0.008***	0.008***	0.007***	0.006**	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Peer-firm-average characteristics						
$LNTA^{peer}_{i,t-1}$		0.006*		0.003		-0.001
		(0.003)		(0.005)		(0.004)
$TQ^{peer}_{i,t-1}$		0.002		0.004		-0.002
		(0.003)		(0.005)		(0.003)
$LEV^{peer}_{i,t-1}$		0.046*		-0.027		0.053**
		(0.026)		(0.034)		(0.026)
$EBIT^{peer}_{i,t-1}$		0.140***		0.142***		0.003
		(0.039)		(0.054)		(0.083)
$CASH^{peer}_{i,t-1}$		-0.121***		-0.131**		-0.150***
		(0.039)		(0.057)		(0.049)
$LNAGE^{peer}_{i,t-1}$		-0.004		-0.005		0.019
		(0.009)		(0.013)		(0.015)
First-stage instrument						
$IDIO^{peer}_{i,t}$					0.017***	0.018***
					(0.003)	(0.003)
Observations	7,228	7,228	7,440	7,440	7,366	7,366
Number of firms	977	977	994	994	994	994
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.315	0.331	0.053	0.059	0.318	0.331
Second-order serial correlation (p-value)	0.323	0.357	0.902	0.900	0.451	0.476
Sargan/Hansen (p-value)	0.634	0.817	0.434	0.971	0.466	0.752

Table 6: Impacts of EPU on peer effects in corporate investment decisions

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. This table presents the results of the regression models designed to investigate the effects of EPU on the magnitude of peer effects in corporate investment decisions. In Columns (1)–(5) we present System GMM results for the following regression specification:

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + (\gamma_0 + \gamma_1 LNEPU_t + \gamma_2 LNEPU_t^2) \times IDIO_{i,t}^{peer} + \beta_3 IDIO_{i,t} \\ &\quad + \beta_4 LNEPU_t + \beta_{CONTROLS} CONTROLS + \textit{Firm Fixed Effects} + \varepsilon_{i,t}, \end{aligned}$$

where we allow the coefficient of $IDIO_{i,t}^{peer}$, β_2, to be a linear or quadratic function of the natural logarithm of the annualized EPU measure divided by 100 ($LNEPU_t$). In Columns (6)–(8), we present the following regression specification:

$$\begin{aligned} INV_{i,t} &= \beta_0 + \beta_1 INV_{i,t-1} + (\gamma_0 + \gamma_1 HighEPU_t) \times IDIO_{i,t}^{peer} + \beta_3 IDIO_{i,t} \\ &\quad + \beta_4 HighEPU_t + \beta_{CONTROLS} CONTROLS + \textit{Firm Fixed Effects} + \varepsilon_{i,t}, \end{aligned}$$

where we allow the coefficient of $IDIO_{i,t}^{peer}$, β_2, to be different depending on whether EPU is higher than its historical median. $HighEPU_t$ is an indicator variable which has 1 if EPU_t is higher than its historical median and 0 otherwise. All eight columns present two-step System GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation, and which use the finite-sample correction proposed by Windmeijer (2005). The dependent variable is firm i's investment rate ($INV_{i,t}$) defined as net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t. All explanatory variables are described in Panel A of Table 1. In addition to the GMM-style instruments used in Columns (1) and (2) of Table 4, the current value and all available lags of $LNEPU$ or $HighEPU$ are included as GMM-style instruments in Columns (1) and (6), those of $LNEPU$ and $LNEPU \times IDIO^{peer}$ in Columns (2) and (4), those of $LNEPU$, $LNEPU \times IDIO^{peer}$ and $LNEPU^2 \times IDIO^{peer}$ in Columns (3) and (5), and those of $HighEPU$ and $HighEPU \times IDIO^{peer}$ in Columns (7) and (8). We report p-values for the Arellano-Bond test for second-order serial correlation in first-differenced residuals and the Sargan/Hansen test of overidentifying restrictions. Overall goodness-of-fit scores are also reported. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

ESTIMATION METHOD	(1) SYS GMM	(2) SYS GMM	(3) SYS GMM	(4) SYS GMM	(5) SYS GMM	(6) SYS GMM	(7) SYS GMM	(8) SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
Constant	-0.113***	-0.099***	-0.099***	-0.143***	-0.143***	-0.122***	-0.104***	-0.164***
	(0.037)	(0.033)	(0.033)	(0.047)	(0.047)	(0.037)	(0.032)	(0.047)
$INV_{i,t-1}$	0.419***	0.412***	0.412***	0.418***	0.418***	0.424***	0.414***	0.419***
	(0.021)	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.019)	(0.019)
EPU and peer-effect-related variables								
$LNEPU_t$	-0.004*	-0.000	0.000	-0.001	-0.000			
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)			
$IDIO_{i,t}^{peer}$		0.009*	0.006	0.008	0.002		-0.007	-0.008
		(0.005)	(0.006)	(0.005)	(0.006)		(0.006)	(0.006)
$LNEPU_t \times IDIO_{i,t}^{peer}$		0.056***	0.049***	0.050***	0.040**			
		(0.017)	(0.017)	(0.018)	(0.017)			
$LNEPU_t^2 \times IDIO_{i,t}^{peer}$			0.032		0.055			
			(0.033)		(0.034)			
$HighEPU_t$						-0.005***	-0.003	-0.002
						(0.002)	(0.002)	(0.002)
$HighEPU_t \times IDIO_{i,t}^{peer}$							0.033***	0.032***
							(0.011)	(0.011)
Firm-specific characteristics								
$LNTA_{i,t-1}$	0.007***	0.006***	0.006***	0.005***	0.005***	0.007***	0.006***	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$TQ_{i,t-1}$	0.007***	0.005***	0.005***	0.005**	0.005**	0.007***	0.006***	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
$LEV_{i,t-1}$	0.007	0.015	0.015	0.003	0.003	0.006	0.008	0.000
	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)
$EBIT_{i,t-1}$	0.076***	0.094***	0.094***	0.083***	0.084***	0.073***	0.087***	0.082***
	(0.017)	(0.018)	(0.018)	(0.020)	(0.020)	(0.018)	(0.018)	(0.021)
$CASH_{i,t-1}$	0.083***	0.078***	0.078***	0.081***	0.081***	0.087***	0.083***	0.082***
	(0.019)	(0.018)	(0.018)	(0.020)	(0.020)	(0.019)	(0.019)	(0.020)
$LNAGE_{i,t-1}$	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***	-0.012***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
$IDIO_{i,t}$		0.008***	0.008***	0.007***	0.007***		0.008***	0.007***
		(0.002)	(0.002)	(0.002)	(0.002)		(0.002)	(0.002)
Peer-firm-average characteristics								
$LNTA_{i,t-1}^{peer}$				0.003	0.003			0.004
				(0.003)	(0.003)			(0.003)
$TQ_{i,t-1}^{peer}$				0.002	0.002			0.002
				(0.002)	(0.002)			(0.002)
$LEV_{i,t-1}^{peer}$				0.082***	0.083***			0.088***
				(0.024)	(0.025)			(0.024)
$EBIT_{i,t-1}^{peer}$				0.169***	0.172***			0.168***
				(0.043)	(0.044)			(0.043)
$CASH_{i,t-1}^{peer}$				-0.065	-0.062			-0.048
				(0.042)	(0.043)			(0.043)
$LNAGE_{i,t-1}^{peer}$				-0.011**	-0.010**			-0.013**
				(0.005)	(0.005)			(0.005)
Observations	7,248	7,248	7,248	7,248	7,248	7,248	7,248	7,248
Number of firms	994	994	994	994	994	994	994	994
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.308	0.316	0.316	0.325	0.325	0.307	0.314	0.324
Second-order serial correlation (p-value)	0.271	0.210	0.212	0.261	0.260	0.316	0.237	0.276
Sargan/Hansen (p-value)	0.083	0.293	0.285	0.298	0.322	0.064	0.232	0.328

Table 7: Testing the information cascade channel

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. This table presents the results of the two-stage regressions designed to test the information cascade channel. At the first stage, we estimate AR(1) or AR(2) model of Tobin's q using System GMM method. The model is specified as in Equation (7). GMM-style instruments used in System GMM estimation are the second to sixth lags of Tobin's q, and second to all available lags of firm-specific control variables for the equations in first-differences, and the first lag of the change in Tobin's q and first lag of the change in all firm-specific variables for level equations. Column (1) and Column (6) give estimation results for AR (1) and AR (2) models of Tobin's q respectively. At the second stage, we use the absolute value of the residual ($|\widehat{RES_{i,t}}|$) of AR (1) and AR (2) models as the dependent variable. Column (2) to Column (5) present the second-stage results corresponding to the first-stage AR (1) model, while Column (7) to Column (10) are the second-stage results corresponding to the first-stage AR (2) model. We include in the regressions either an EPU level measure, *LNEPU*, or a dummy variable indicating higher EPU period, *highEPU*, and we control for either firm fixed effects or industry fixed effects. In the first stage, we report two-step GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation and which use the finite-sample correction proposed by Windmeijer (2005). In the second stage, we report OLS/FE coefficients and standard errors that allow for intra-firm correlation. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	AR(1) Model for Tobin's q					AR(2) Model for Tobin's q				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	$TQ_{i,t}$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$	$TQ_{i,t}$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$	$\lvert\widehat{RES_{i,t}}\rvert$
$LNEPU_t$		0.182***		0.184***			0.153***		0.154***	
		(0.029)		(0.039)			(0.030)		(0.039)	
$HighEPU_t$			0.102***		0.102***			0.050***		0.046**
			(0.018)		(0.023)			(0.018)		(0.023)
$TQ_{i,t-1}$	0.664***					0.511***				
	(0.119)					(0.075)				
$TQ_{i,t-2}$						0.150*				
						(0.077)				
$LNTA_{i,t-1}$	-0.293***					-0.271***				
	(0.046)					(0.055)				
$LEV_{i,t-1}$	-0.598**					-0.441				
	(0.276)					(0.397)				
$EBIT_{i,t-1}$	0.418					0.729				
	(0.474)					(0.900)				
$CASH_{i,t-1}$	0.819*					0.118				
	(0.436)					(0.333)				
$LNAGE_{i,t-1}$	0.314***					0.375***				
	(0.039)					(0.051)				
Constant	6.298***	0.474***	0.442***	1.084***	1.025***	5.737***	0.451***	0.445***	1.058***	1.025***
	(0.741)	(0.030)	(0.032)	(0.003)	(0.010)	(0.877)	(0.032)	(0.033)	(0.004)	(0.010)
Firm fixed effects	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Industry fixed effects	No	Yes	Yes	No	No	No	Yes	Yes	No	No
Observations	7,440	7,440	7,440	7,440	7,440	7,433	7,433	7,433	7,433	7,433
Sargan/Hansen (p-value)	0.724	N/A	N/A	N/A	N/A	0.219	N/A	N/A	N/A	N/A
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.451	0.042	0.039	0.234	0.232	0.460	0.044	0.041	0.242	0.239

Table 8: Testing the asymmetric capacity for information acquisition channel

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. This table presents the results of the regressions designed to test the asymmetric capacity for information acquisition channel. $NonSOE_{i,t}$ is an indicator variable which has 1 if a firm is not an SOE in a given year, and 0 otherwise. $SmallYoung_{i,t}$ is an indicator variable which has 1 if a firm is both younger (i.e., its listing year is below the median in the same peer group) and smaller (i.e., its size is below the median in the same peer group), and 0 otherwise. We control for firm-specific characteristics in all columns, while we also control for peer-firm-average characteristics in the second and fourth columns. In all four columns, the reduced-form dynamic panel IV models are estimated using the System GMM method. GMM-style instruments are similar to those used in Table 4, except that $NonSOE_{i,t}$, $SmallYoung_{i,t}$, and their interactions are treated similarly to firm i's idiosyncratic return shock and peer-firm average idiosyncratic return shock. We report two-step GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation and which use the finite-sample correction proposed by Windmeijer (2005). Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
ESTIMATION METHOD	SYS GMM	SYS GMM	SYS GMM	SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
$HighEPU_t$	-0.001	-0.001	-0.003	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
$IDIO_{i,t}^{peer}$	-0.012	-0.014*	-0.004	-0.006
	(0.008)	(0.008)	(0.007)	(0.007)
$HighEPU_t \times IDIO_{i,t}^{peer}$	0.041***	0.035**	0.031**	0.026**
	(0.016)	(0.015)	(0.012)	(0.012)
$NonSOE_{i,t}$	-0.004	-0.003		
	(0.004)	(0.004)		
$NonSOE_{i,t} \times HighEPU_t$	-0.003	-0.002		
	(0.004)	(0.004)		
$NonSOE_{i,t} \times IDIO_{i,t}^{peer}$	0.018	0.020		
	(0.013)	(0.013)		
$NonSOE_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$	-0.026	-0.021		
	(0.025)	(0.024)		
$SmallYoung_{i,t}$			-0.005	-0.007**
			(0.003)	(0.003)
$SmallYoung_{i,t} \times HighEPU_t$			0.006	0.006
			(0.004)	(0.004)
$SmallYoung_{i,t} \times IDIO_{i,t}^{peer}$			0.012	0.013
			(0.013)	(0.014)
$SmallYoung_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$			0.008	0.004
			(0.026)	(0.026)
$Constant$	-0.100***	-0.130***	0.016***	-0.106**
	(0.036)	(0.049)	(0.005)	(0.050)
Lagged dependent variable	Yes	Yes	Yes	Yes
Firm-specific characteristics	Yes	Yes	Yes	Yes
Peer-firm-average characteristics	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	6,491	6,491	7,366	7,366
Number of firms	988	988	994	994
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.322	0.330	0.316	0.324

Table 9: Testing the career concerns channel

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with non-missing data for all analysis variables. This table presents the results of the regressions designed to test the career concerns channel. *CentZ* is the ratio of the shareholding percentage of the largest shareholder to that of the second largest shareholder, $HF5$ is the sum of squares of the shareholding percentage of the top five shareholders, and $EXECSH$ is the number of shares held by executives scaled by the total number of shares. We control for firm-specific characteristics for all columns, while we also control for peer-firm-average characteristics in the second, fourth, and sixth columns. All six columns are results for reduced-form dynamic panel IV regressions, and are estimated using System GMM methods. GMM-style instruments are similar to those used in Table 4, except that *CentZ*, $HF5$, and $EXECSH$ and their interactions are treated similarly to firm i's idiosyncratic return shock and peer-firm average idiosyncratic return shock. We report two-step GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation and which use the finite-sample correction proposed by Windmeijer (2005). Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ESTIMATION METHOD	SYS GMM	SYS GMM	SYS GMM	SYS GMM	SYS GMM	SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
$HighEPU_t$	-0.002	-0.002	-0.004	-0.003	-0.001	0.001
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
$IDIO_{i,t}^{peer}$	-0.009	-0.010	-0.013	-0.011	-0.011	-0.012*
	(0.007)	(0.007)	(0.011)	(0.011)	(0.007)	(0.007)
$HighEPU_t \times IDIO_{i,t}^{peer}$	0.039***	0.034***	0.032*	0.031*	0.037***	0.032***
	(0.013)	(0.013)	(0.018)	(0.017)	(0.013)	(0.012)
$CentZ_{i,t}$	-0.000	-0.000				
	(0.000)	(0.000)				
$CentZ_{i,t} \times HighEPU_t$	0.000	0.000				
	(0.000)	(0.000)				
$CentZ_{i,t} \times IDIO_{i,t}^{peer}$	0.000	0.000				
	(0.000)	(0.000)				
$CentZ_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$	-0.000	-0.000				
	(0.000)	(0.000)				
$HF5_{i,t}$			0.013	0.008		
			(0.014)	(0.014)		
$HF5_{i,t} \times HighEPU_t$			0.009	0.009		
			(0.017)	(0.017)		
$HF5_{i,t} \times IDIO_{i,t}^{peer}$			0.031	0.017		
			(0.056)	(0.054)		
$HF5_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$			0.015	-0.015		
			(0.112)	(0.104)		
$EXECSH_{i,t}$					0.004	0.040
					(0.086)	(0.086)
$EXECSH_{i,t} \times HighEPU_t$					-0.024	-0.034
					(0.084)	(0.084)
$EXECSH_{i,t} \times IDIO_{i,t}^{peer}$					0.784*	0.568
					(0.456)	(0.447)
$EXECSH_{i,t} \times HighEPU_t \times IDIO_{i,t}^{peer}$					-0.255	-0.137
					(0.678)	(0.668)
Constant	-0.110***	-0.141***	-0.090***	-0.108**	-0.111***	-0.138***
	(0.034)	(0.047)	(0.034)	(0.049)	(0.037)	(0.049)
Lagged dependent variable	Yes	Yes	Yes	Yes	Yes	Yes
Firm-specific characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Peer-firm-average characteristics	No	Yes	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,523	6,523	6,524	6,524	6,088	6,088
Number of firms	990	990	990	990	987	987
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.321	0.330	0.323	0.332	0.325	0.335

Table 10: Impacts of EPU on peer effects in corporate investment decisions: over-investment firms vs. under-investment firms

The sample consists of monthly returns for all manufacturing firms in the CSMAR database between 1999 and 2013 with nonmissing data for all analysis variables. To further explore the impact that EPU has on the peer effects in investment inefficiency we divide our sample into two parts: over-investment firms and under-investment firms. This table presents System GMM results based on the two subsamples for the following regression model:

$$\begin{aligned} INV_{i,t} \quad = \quad & \beta_0 + \beta_1 INV_{i,t-1} + (\gamma_0 + \gamma_1 HighEPU_t) \times IDIO_{i,t}^{peer} + \beta_3 IDIO_{i,t} \\ & + \beta_4 HighEPU_t + \beta_{CONTROLS} CONTROLS + Firm\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned}$$

where $HighEPU_t$ is an indicator variable which has 1 if EPU_t is higher than its historical median and 0 otherwise. The first two columns use the sample of over-investment firms while the last two columns use the sample of under-investment firms. All four columns present two-step System GMM coefficients and standard errors that are asymptotically robust to both heteroskedasticity and serial correlation, and which use the finite-sample correction proposed by Windmeijer (2005). The dependent variable is firm i's investment rate ($INV_{i,t}$) defined as net capital expenditures plus net acquisitions less sale of fixed assets scaled by total assets at the beginning of the year t. All explanatory variables are described in Panel A of Table 1. GMM-style instruments are similar to those used in Table 6. We report p-values for the Sargan/Hansen test of overidentifying restrictions. Overall goodness-of-fit scores are also reported. Note that ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Over-investment firms		Under-investment firms	
	(1)	(2)	(3)	(4)
ESTIMATION METHOD	SYS GMM	SYS GMM	SYS GMM	SYS GMM
VARIABLES	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
Constant	-0.135*	-0.026	-0.138***	-0.168***
	(0.079)	(0.081)	(0.040)	(0.056)
$INV_{i,t-1}$	0.501***	0.540***	0.284***	0.303***
	(0.038)	(0.036)	(0.029)	(0.031)
EPU and peer-effect-related variables				
$HighEPU_t$	-0.006	-0.006	-0.004*	-0.003
	(0.004)	(0.004)	(0.002)	(0.002)
$IDIO_{i,t}^{peer}$	-0.010	0.000	-0.016*	-0.017
	(0.016)	(0.018)	(0.010)	(0.010)
$HighEPU_t \times IDIO_{i,t}^{peer}$	0.076	0.032	0.079***	0.047*
	(0.054)	(0.055)	(0.027)	(0.027)
Firm-specific characteristics				
$LNTA_{i,t-1}$	0.008**	0.005	0.008***	0.012***
	(0.004)	(0.004)	(0.002)	(0.003)
$TQ_{i,t-1}$	0.011***	0.012***	0.005***	0.006**
	(0.003)	(0.004)	(0.002)	(0.003)
$LEV_{i,t-1}$	0.024	-0.039*	0.014	-0.033**
	(0.027)	(0.021)	(0.016)	(0.015)
$EBIT_{i,t-1}$	0.111***	0.077**	0.095***	0.038
	(0.038)	(0.035)	(0.024)	(0.026)
$CASH_{i,t-1}$	0.109***	0.132***	0.053**	0.094***
	(0.041)	(0.038)	(0.021)	(0.024)
$LNAGE_{i,t-1}$	-0.015***	-0.012**	-0.015***	-0.010***
	(0.005)	(0.005)	(0.003)	(0.003)
$IDIO_{i,t}$	0.012***	0.013***	0.007***	0.007***
	(0.003)	(0.004)	(0.002)	(0.002)
Peer-firm-average characteristics				
$LNTA_{i,t-1}^{peer}$		-0.003		-0.001
		(0.006)		(0.004)
$TQ_{i,t-1}^{peer}$		0.000		0.001
		(0.005)		(0.003)
$LEV_{i,t-1}^{peer}$		0.150***		0.109***
		(0.048)		(0.034)
$EBIT_{i,t-1}^{peer}$		0.176**		0.175***
		(0.076)		(0.050)
$CASH_{i,t-1}^{peer}$		-0.232**		-0.101
		(0.093)		(0.067)
$LNAGE_{i,t-1}^{peer}$		0.010		-0.028***
		(0.012)		(0.008)
Observations	2,042	2,042	2,543	2,543
Number of firms	651	651	680	680
Goodness-of-fit—$Corr(INV_{i,t}, \widehat{INV}_{i,t})^2$	0.402	0.413	0.475	0.460
Sargan/Hansen (p-value)	0.478	0.988	0.304	0.968

Figure 1: Economic policy uncertainty index: monthly vs. yearly

This figure depicts the Baker, Bloom, and Davis (2016) index of economic policy uncertainty (EPU) for Chinese market during the period from December 1995 to December 2015, both in monthly frequency (bar chart) and yearly frequency (solid line), where yearly EPU is the mean of monthly EPU in each year.