UTS UNIVERSITY OF TECHNOLOGY SYDNEY

# Essays on The Impact of Economic Policy Uncertainty in Australia

**by Cao Hoang Anh Le**

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**Doctor of Philosophy**

under the supervision of Distinguished Professor Stephen Taylor and Professor Yaowen Shan

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Faculty of Business

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# Certificate of Original Authorship

I, Cao Hoang Anh Le, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the UTS Business School at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

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# List of Abbreviations

| | |
|---|---|
| APEC | Asia-Pacific Economic Region |
| ASX | Australian Securities Exchange |
| CBOE | Chicago Board Options Exchange |
| CPI | Consumer price index |
| DFAT | Australian Department of Foreign Affairs and Trade |
| EPU | Economic policy uncertainty |
| FEVD | Forecast error variance decomposition |
| FRED | Federal Reserve Economic Data |
| FRR | Federal funds rate |
| GDP | Gross domestic product |
| GFCF | Gross fixed capital formation |
| GICS | Global Industry Classification Standard |
| GNP | Gross national product |
| GPDI | Gross private domestic investment |
| I/B/E/S | Institutional Brokers' Estimate System |
| IMF | International Monetary Fund |
| IRF | Impulse response function |
| LTCM | Long-term capital management |
| M&A | Mergers and acquisitions |
| OECD | Organization for Economic Co-operation and Development |
| OLS | Ordinary least squares |
| PBOC | The People's Bank of China |
| PPE | Property, plant, and equipment |
| PPP | Purchasing power parity |
| R&D | Research and development |
| RBA | Reserve Bank of Australia |
| S&P | Standard and Poor |
| SCMP | South China Morning Post |
| SOE | State-owned enterprise |
| SPPR | Share Price and Price Relative Database |
| SVAR | Structural vector autoregression model |
| SZSE | Shenzhen Stock Exchange |
| UK | United Kingdom |
| US | United States |
| VAR | Vector autoregression model |
| VIX | Volatility Index |
| WDI | World Development Indicator - World Bank Database |
| WRDS | Wharton Research Data Services |
| ZLB | Zero lower bound |

# Abstract

This thesis consists of three stand-alone yet interconnected essays investigating the consequences of uncertainty surrounding government economic policies in Australia at the aggregate and firm level. Using Australian data, the thesis first examines the link between economic policy uncertainty (EPU) and capital investment and then considers the potential spillover effect of external, foreign shocks on the Australian economy. The results indicate that domestic EPU has a persistent and negative effect (up to four years) on investment decisions made by Australian Securities Exchange (ASX) listed firms. In addition, there is robust evidence that foreign EPU sources exert a strong incremental effect on Australian capital investment and economic growth. Finally, the thesis considers the extent to which EPU affects sell-side financial analysts' earnings forecasts for ASX listed firms. The results suggest that forecast errors and forecast dispersion significantly increase in the presence of heightened policy uncertainty.

Overall, the thesis goes beyond the traditional focus on autarkic economies like the United States to consider the dynamics of the EPU effect in Australia, as a relatively small and open economy. By doing so, it contributes to the emerging literature on policy uncertainty, corporate investment policies and agents' economic behaviors. The findings have important practical implications and provide insights for financial analysts, investors, corporate managers and policy makers into the joint effect of local and foreign EPU on firm-level decisions and the mitigation of possible adverse impacts.

# Chapter 1:

# Introduction

## 1.1 Introduction and main findings

An emerging literature demonstrates that policy-related uncertainty adversely affects the global economy and agents' economic behaviors (Pastor and Veronesi, 2012, 2013; Julio and Yook, 2012, 2016; Baker, Bloom and Davis, 2016). The impact of economic policy uncertainty (hereafter EPU) on corporate decisions has been investigated extensively, focusing primarily on the United States (US) setting (Gulen and Ion, 2016; Jens, 2017; Nguyen and Phan, 2017; Bonaime, Gulen and Ion, 2018). However, little attention has been paid to small and open economies, which are more likely to be susceptible to various foreign sources of uncertainty and economic shocks (Cardia, 1991; Fernandez-Villaverde, Guerron-Quintana, Rubio-Ramirez and Uribe, 2011). This thesis attempts to fill this gap by investigating the consequences of policy-inducing uncertainty shocks for the Australian economy.

The thesis consists of the three essays on economic policy uncertainty in Australia. The thesis begins by examining the impact of EPU on Australian firms' capital investment decisions and then considers more carefully the underlying economic channels of by which any impact occurs. For the first two essays, the central research question is: *Do multiple sources of economic policy uncertainty affect corporate investment decisions by Australian-listed firms*? Moving from the real decision channel into the information channel, the third essay investigates the relationship between EPU and properties of sell-side analysts' earnings forecasts. The final research question is: *Does Australian policy uncertainty influence sell-side financial analysts' earnings forecast characteristics*, inclusive of analyst coverage, analyst earnings forecast error and degree of forecast dispersion?

Following replication of widely-cited United States evidence (Gulen and Ion, 2016), the first study shows that EPU has a persistent and negative effect (up to four years) on capital investment by Australian Securities Exchange (ASX) listed firms, in contrast to the more short-lived effect of EPU in the US. The different results are consistent with the high proportion of ASX-listed firms in the resources and mining industries, where investment projects frequently proceed in stages and have time-to-build considerations. In accordance with real options theory, the findings reinforce the notion that EPU can dampen investment opportunities due to investment irreversibility.

Motivated by the initial findings, the second study examines the link between uncertainty about the future policy and Australian corporate investment by considering the possible spillover effect of foreign policy shocks. Australia is an export-oriented and resource-intensive country, so it is likely that corporate investment will be affected by external demand shocks. In particular, the study examines the negative association between local versus foreign EPU and capital investment in Australia, at both the macro-level and firm-level. At the aggregate (i.e., macro) level, structural vector autoregression (SVAR) analysis shows that Chinese EPU is relatively more important than local and US EPU in driving Australian investment. At the micro-level, ordinary least squares (OLS) regression results confirm the incremental effect of Chinese EPU on Australian firms' investment decisions, after controlling for other confounding factors.

The second study also finds that the effects of EPU are heterogenous cross-sectionally, being significantly stronger for firms operating in mining industries and firms with a higher degree of investment irreversibility, in conformity with the real options theory. Further analysis indicates that the negative impacts of local and foreign news-based EPU are more profound for firms that are relatively smaller, have lower cash-flows, and that report losses. These results lend empirical support to the notion that the real effects of EPU on investment are sensitive to the context of information uncertainty, and firms operating in Australia, as a relatively small open economy, are likely to face higher levels of external uncertainty shocks than those in large economies.

Finally, the third study investigates whether uncertainty around government economic policy exerts a significant impact on the characteristics of analysts' earnings forecasts. Over a twenty-year period, there is robust evidence that forecast errors increase in the presence of heightened policy uncertainty, as does the degree of forecast dispersion. Further, foreign economic policy uncertainty sources also have a strong incremental effect on analysts' earnings forecast accuracy for Australian listed firms. Additional analysis finds evidence that the association between EPU and earnings forecast errors is not cross-sectionally uniform. The implied magnitudes are sizeable for firms in the resources and mining industries and for longer horizon forecasts. Overall, pronounced EPU leads to a decline in the quality of information environment for firms and thus increases the complexity of the forecasting task for sell-side analysts. Given the elevated levels of policy-inducing uncertainty in recent years and the vital intermediation role played by financial analysts, these findings have implications for academics, investors, corporate managers and policy makers.

## 1.2 Literature review

The relationship between politics, policy and economic outcomes has featured in recent academic research and public debate (Julio and Yook, 2012; Bloom, 2014, 2017; Brogaard and Detzel, 2015). Politicians and government agencies regularly make decisions that directly change the environment in which numerous economic agents engage. Firms may be highly sensitive to policy-based uncertainty in many forms, for example, uncertainty[1] about future

[1] Knight (1921) defines that uncertainty is people's inability to forecast the likelihood of events happening in the future. Meanwhile, risk is defined as "a known probability distribution over a set of events". Even though being conceptually different, the two terms are hard to distinguish in reality (Castelnuovo et al., 2017).

corporate tax policy, interest rates, or future import prices and input costs. Overall, different economic theories emphasize different channels, some suggesting a negative relationship and others pointing to a positive relationship.

### *1.2.1 Real options theory*

The 'real options' theory is the cornerstone of the theoretical literature about the effects of uncertainty (Arrow, 1968; Bernanke, 1983; McDonald and Siegel, 1986; Pindyck, 1988). The intuition is that firms can view a typical investment project as a series of operating options. These multiple options may include, but are not limited to, the optimal time to invest in a project, the option to pause and restart production in response to changes in input prices, the option to abandon a project if results are unsatisfactory, and the option to expand production if there is a rightward shift in the demand curve.

The theory suggests that policy-related uncertainty discourages investment behaviors due to the real options value of 'wait and see' generated by the presence of adjustment costs or investment irreversibility. It is worth noting that the rationality of delay depends on the arrival of 'new information' relevant to assessing long-run projects over time. By waiting for incremental information, potential investors can enhance their opportunity of making an optimal decision. In other words, they may avoid early commitment until the longer-run states of both the economic environment and the investors' own fortunes are better known (but never, of course, with complete certainty).

Using dynamic general stochastic equilibrium models, Fernandez-Villaverde et al. (2011) investigate the effects of monetary policy uncertainty, proxied by the volatility of real interest rate in small open economies (i.e., Argentina, Brazil, Ecuador, and Venezuela). They find that an increase in real interest rate volatility triggers a significant reduction in output, consumption, investment and hiring. Turning from a setting of emerging countries to the experience of the United States after World War II, Fernandez-Villaverde et al. (2015) model uncertainty as stochastic volatility shocks to the variance of fiscal policy. The key finding is that unexpected changes in taxes and government spending can have a sizeable adverse impact on economic activity. The negative effect is more pronounced when the economy is at the zero lower bound (ZLB) of nominal interest rates, that is, aggregate outputs decrease by 1.5 percent (the effect is 15 times larger than when the ZLB is inactive).

One form of uncertainty is that economic agents are likely to react to changes in economic policy targets. Eusepi and Preston (2018) find that imperfect knowledge makes agents uncertain about future policy regimes, and they thus attempt to estimate the long-term equilibrium levels of inflation and taxes by using their own econometric tools. Croce, Nguyen and Schmid (2012) study the long-run implication of uncertainty about the future trajectory of fiscal policies. Their analytical model illustrates that when agents become more risk-adverse, they behave as if the worst-case scenario of fiscal shocks has materialized, which is consistent with the real options theory of investment decision making (Bernanke, 1983; Brennan and Schwartz, 1985). The authors find that countercyclical deficit policies promote short-run consumption at the expense of significantly increasing the volume of long-run uncertainty. Hence, policy-based uncertainty depresses innovation and long-term growth and, ultimately, generates welfare losses.

Using firm-level analysis, Chetty (2007) present a theoretical model to study the effect of interest rate shocks, as a proxy for monetary policy uncertainty, on investment in an environment where firms make irreversible investment with uncertain pay-offs. When making an investment decision, a firm faces an inherent tradeoff between the real options value of delay and the present value of the expected future profits that would otherwise be realized during the period of delay. The benefits of delay become larger when the ‘learning’ effect that occurs during this period is stronger.

While the theoretical literature on policy uncertainty is growing rapidly, the empirical literature examining the relationship between policy uncertainty and real economic outcomes has also blossomed in recent years. In the early attempts, empirical studies mostly focus on certain types of policy, i.e., monetary policy, fiscal policy, social security, rather than the overall level, partly because it is a daunting task to measure the aggregate variation of policy-inducing uncertainty faced by firms and other agents over time. In their seminal paper, Baker, Bloom and Davis (2016) construct a new index of economic policy uncertainty based on newspaper coverage frequency. They validate that their US policy uncertainty index is positively correlated with several political events in the period from 1985 onwards, such as multiple presidential elections, Russian Crisis/LTCM, the first and second Gulf War, and the 9/11 attacks. Their findings suggest that policy-based uncertainty is negatively associated with aggregate investment, output, and employment throughout major economies worldwide, not only in the United States. These measures of EPU have subsequently facilitated empirical analysis for the causal effects of policy uncertainty through various macro- and micro-channels.

Following Bloom (2009), there is also growing attention on the effects of policy-based uncertainty on total (i.e., aggregate) outcomes. A number of vector autoregression (VAR) studies have been conducted to quantify the impact of uncertainty shocks at a national level. Consistent with the real options theory, many investigations confirm that a series of geopolitical and economic shocks have raised economic policy uncertainty, with serious repercussions on private domestic outcomes in the United States (Alexopoulos and Cohen, 2009; Caggiano, Castelnuovo and Groshenny, 2014; Leduc and Liu, 2016). However, beyond single country analysis, a natural question is the extent to which policy-based shocks originating from one country affect fluctuations in uncertainty and the business cycles in other countries. For example, Kim (2001) demonstrates that US monetary policy shocks trigger business cycles in the non-US G-6 countries.

Using the Baker et al. (2016) index as a proxy for policy uncertainty in the US and Europe, Colombo (2013) finds that a one standard deviation shock to US EPU foreshadows a statistically significant decrease in European industrial production and consumer prices. Further, she concludes that the contribution of exogenous variation in US EPU is larger than its local area counterpart. Turning to small and open economies, Cheng (2017) and Luk, Cheng, Ng and Wong (2018) use the Baker et al. (2016) index to show that both foreign and domestic policy uncertainty shocks, have a negative and significant impact on South Korea and Hong Kong, respectively. Their results also indicate that the magnitude of international EPU spillovers is larger in smaller, open economies, and that foreign EPU plays a relatively more important role in explaining domestic business fluctuations and disruption in those economies.

From a microeconomic perspective, Gulen and Ion (2016) use the Baker et al. (2016) index as a proxy for the continuously varying amounts of aggregate policy uncertainty in the US economy to study the dynamic relationship between uncertainty and firm-level capital investment. They document that a doubling of EPU is associated with an 8.7% fall in average capital investment in the following quarter, with the negative impact lasting up to eight quarters into the future. More importantly, they find evidence that this relationship varies cross-sectionally, being significantly stronger for firms with higher degree of investment irreversibility and for firms with greater reliance on government purchases. Similarly, Julio and Yook (2012) and Jens (2017) suggest a negative relationship between political uncertainty proxied by election cycles and corporate investment, especially for more politically sensitive firms and in close (marginal-win) elections.

Although the real options theory of corporate investment decision making continues to grow, there are some key observations. First, the negative impact of policy uncertainty appears stronger on investment than on other components of aggregate demand (i.e., consumption and government expenditure). This is not surprising, given that corporate investment decisions are forward-looking and an aggregate data-driven process (Bloom, 2017). Second, real options effects are not homogeneous. Their occurrence depends on the timing and extent to which investment decisions can be reversed. Firms with more capital intensity and greater degrees of sunk costs would gain more from waiting for new information, thereby reducing uncertainty. Third, real options theory also suggests that economic agents become less sensitive to changes in business conditions during prolonged periods of uncertainty, dampening the effect of any countercyclical policy and depressing long-run growth (Croce et al., 2012; Bloom, 2014).

Finally, real options theory assumes that investments have decreasing-returns-to-scale (Bloom, 2014). In contrast, when firms are in industries with an increasing-returns-to-scale technology, the opportunity costs of delaying research and development investments implies that managers do not have the flexibility to wait. Grossman and Shapiro (1986) and Pindyck (1993) argue that R&D investment could respond differently to varying levels of uncertainty because of technical risk and time-to-build considerations. If a delay is costly, then the option value of delaying is no longer economically rational.

### *1.2.2 Growth options theory*

The 'growth options' theory of investment decision making is based on the intuition that uncertainty can encourage investment if it increases the size of the potential benefit. Oi (1961), Hartman (1972) and Abel (1983) suggest that the impact of uncertainty on investment is conditional on the firm's capital adjustment costs. In these models, the costs of adjusting capital exceed those of labor. This assumption, together with a constant-returns-to-scale technology, make the marginal revenue product of capital a convex function of output price. By Jensen's inequality, increased output price uncertainty leads to a higher marginal product of capital and thus increases the levels of investment. However, since investment either occurs periodically

(Hartman, 1972) or continuously (Abel, 1983), concerns about the timing or delay of investment do not arise in their analytical models.

Multiple stages of investment, such as those in mining exploration and R&D activities, can also lead to a positive relationship between uncertainty and the incentive to invest. For example, Paddock, Siegel and Smith (1988) show how oil price uncertainty increases the call option value of possible future extraction. Most notably, Bar-Ilan and Strange (1996) and Weeds (2002) show that if firms have investment lags in completing projects due to time-to-build or time-to-develop, the value on options for future growth and flexibility increases with uncertainty and hence leads to positive association between uncertainty and investment.

Without lags, the decision to delay investment is based on the 'bad news principle' in the real options theory (Bernanke, 1983) in which the value of avoiding bad outcomes (by increased information) is traded off against the opportunity cost of returns from early commitment. However, with investment lags, the opportunity cost of waiting is also a function of uncertainty. Hence, a state of higher uncertainty can lead firms to invest sooner, suggesting a 'good news principle' (Bar-Ilan and Strange, 1996). Effectively, only good news matters since bad news is capped by abandoning and closing down the project. In a related paper, Bar-Ilan and Strange (1998) find that when investments are completed in stages, firms have an incentive to carry out exploratory investment in the presence of high uncertainty in order to create an option to complete the project.

Empirical studies offer some support for the growth options theory of investment decision making. Kraft, Schwartz and Weiss (2017) find that for R&D-intensive firms, higher uncertainty can significantly raise their market value. These findings suggest that growth options are relatively more important for firms that are R&D intensive firms. Using US gubernatorial elections as exogenous shocks, Atanassov, Julio and Leng (2018) examine the relationship between political uncertainty and R&D investment. Their findings suggest uncertainty about government policy stimulates firm-level R&D investment, consistent with the growth options theory. In terms of economic magnitude, firms increase R&D investment by an average of 4.6% in election years compared to non-election years. The positive impact is stronger in marginal-win elections and for firms operating in politically sensitive industries and facing greater product market competition. More recently, Ni (2020) studies the association between political uncertainty, proxied by the turnovers of city heads in China, and firm innovation. She finds that local policy uncertainty can significantly encourage firm innovation, but the positive relationship is exclusively concentrated on state-owned enterprises (SOEs). The positive effect of local policy uncertainty is not only attributed to the political connection channel, but also to the growth options channel, as SOEs face higher competition and have more growth opportunities.

Overall, it is still a question whether, in the presence of economic policy uncertainty, corporate investment decisions are primarily influenced by the classic 'bad news principles' (Bernanke, 1983) or the 'good news principles' (Bar-Ilan and Strange, 1996). Indeed, Segal, Shaliastovich and Yaron (2015) find evidence consistent with both effects of uncertainty on aggregate output, consumption, and investment. Good news uncertainty predicts an increase in future economic activity, and is positively related to valuation ratios, while bad news uncertainty forecasts a decline in economic growth and depresses asset prices. Segal et al. (2015) conclude that multiple sources of uncertainty with different characteristics can differentially trigger economic actors' perceptions and behaviors.

## 1.3 Thesis contribution

The thesis contributes to the emerging literature on policy uncertainty, agents' economic behaviors and corporate investment policies. The first study contributes to the EPU literature in two important ways. First, it responds to a call for replication of widely cited findings beyond the traditional United States setting (Faff, 2019). Second, it yields evidence on the extent to which a robust effect in one national setting extends to other national settings. Specifically, this thesis shows that EPU has a longer lasting negative impact on capital investment in Australia than the US.

The second study adds to the literature on uncertainty and investment by presenting novel evidence on the spillover effects of policy-related uncertainty on firm-level economic outcomes such as corporate investment in a small and open economy. Extant literature focuses on how EPU from one single country, (i.e., the US) affects economic outputs in numerous other countries. In contrast, this thesis explicitly considers how multiple sources of EPU (local versus foreign) may affect agents' behaviors in one country (i.e., Australia). The findings in this study provide insights for policy makers into the joint effect of local and foreign policy uncertainty on investments and ways of limiting possible adverse effects. This study also contributes to the very limited evidence on the determinants of Australian corporate investment.

The third study contributes to the literature by identifying EPU as a significant determinant of analysts' forecast accuracy, in addition to many recognized firm-level factors. Further, the study adds to the literature on the capital market consequences of policy uncertainty, documenting that EPU negatively impacts firms' information environment and the predictability of earnings. Finally, there is evidence of cross-country spillover effects of EPU on analyst-level performance in Australia.

### 1.4 Thesis structure

The remainder of the thesis is organised as follows. Chapter 2 presents a replication of widely cited evidence that EPU has a negative impact on capital investment in the United States (Gulen and Ion, 2016), and then applies the same empirical analysis to investment decisions by Australian listed firms. Chapter 3 further investigates the negative association between local versus foreign EPU and capital investment in Australia at both the aggregate level and firm-level. Chapter 4 examines whether uncertainty around government economic policy exerts a significant impact on the characteristics of analysts' earnings forecasts for Australian firms. Finally, Chapter 5 concludes and discusses the thesis's limitations and avenues for future research.

# Chapter 2:

# Australian Economic Policy Uncertainty and Firm-Level Investment

## 2.1 Introduction

Since the global financial crisis, the global economy has experienced a range of policy-related shocks such as the Greek debt crisis in 2011, the United States debt ceiling dispute in 2011, the Brexit vote and more recently the China–United States trade war. An emerging literature has shown that uncertainty about economic policy has a negative effect on corporate investment decisions (Julio and Yook, 2012; Gulen and Ion, 2016). This effect is not surprising, given that corporate investment decisions are forward-looking and an aggregate data-driven process (Bloom, 2017). Moreover, real option theory suggests that EPU discourages corporate investments due to the real option value of a 'wait and see' approach generated by the presence of adjustment costs or irreversibility (Bernanke, 1983; Bloom, 2009).

Widely cited evidence consistent with EPU having a negative effect on corporate investment decisions is provided by Gulen and Ion (2016). This study provides a replication of their evidence, and then considers the extent to which similar results occur in Australia. Most of the existing EPU literature focuses on large economies, such as the US, China, and Japan (Julio and Yook, 2012; Wang, Chen and Huang, 2014; Morikawa, 2016). In contrast, Australia is a relatively small, open economy, indicating that Australian firms tend to face higher uncertainty in investment decisions than those in large economies (Bloom, 2017; Nimark, 2009).

Economic theories of investment under uncertainty suggest that the effect of EPU depends on the properties of corporate investment (Bernanke, 1983; Dixit and Pindyck, 1994). In contrast to the US, a much higher percentage of firms listed on the Australian Stock Exchange are in the resources and mining industries, with these two activities accounting for

40 per cent of all ASX-listed firms (Chen et al., 2020). Investment projects in mining and resources firms are highly irreversible with significant sunk costs (Jotzo, Jordan and Fabian, 2012), suggesting that higher EPU is likely to discourage corporate investment. However, the growth options theory of investment suggests that, when firms have investment lags and these investments are developed in several stages due to time-to-build or time-to-develop, the value of options for future growth and flexibility increases with uncertainty, leading to a positive effect of EPU on investment (Bar-Ilan and Strange, 1996; Weeds, 2002). Thus, in the presence of a significant portion of mining and resources firms, the relation between EPU and investment in Australia can be jointly driven by the real option (negative) and growth option (positive) effects; thus, EPU is expected to have a significant but smaller impact on capital investment among Australian firms than their US peers.

An initial analysis confirms the replicability of the findings reported by Gulen and Ion (2016). Using the same empirical proxy for EPU (Baker et al., 2016), empirical results using both quarterly and annual financial data for US firms confirm the main findings of Gulen and Ion (2016), namely that shocks originating from economic policies and regulatory outcomes have a negative impact on US firms' capital investment decisions. The impact is economically significant. When current period EPU doubles, capital investment reduces on average by 17% to 21.4% in each of the next four quarters and by 24.4% in the next year. Further analysis shows that EPU, and especially uncertainty related to media news, has a significant and negative impact on corporate investment in the next four quarters, but does not persist beyond one year.

The same empirical analysis is then applied to investment decisions by ASX-listed firms. This replication faces two challenges. First, Australian firms are not required to disclose quarterly financial statements. Second, although the EPU index for Australia is constructed in the same manner as the newspaper-based EPU index for the US, an overall EPU index for Australia incorporating measures of uncertainty from taxation, CPI and trade data is unavailable. These two issues are tackled by replicating the US quarterly results on an annual basis, using only the newspaper-based EPU index, and then comparing these with Australian results that are also based on annual financial data and utilize the same newspaper-based EPU measure. The US analysis confirms the validity of using annual data for comparison. The main finding is a significant and negative impact of newspaper-based EPU on corporate investment in the following year among US firms, comparable to evidence based on quarterly financial data. In addition, the newspaper-based EPU index accounts for 50% of the overall EPU index in the US and is highly correlated with the overall index (Baker et al., 2016).[2]

In contrast to the short-lived effect on US firms' investment decisions, the study finds that newspaper-based EPU has a significant and persistent effect on Australian firms' capital investment for up to four years. When newspaper-based policy uncertainty in the current period doubles, corporate investment declines by 15.1% in the next year, and by 13.1% in the fourth year. This sustained but smaller effect of EPU on investment decision making in Australia, relative to US firms, can be attributed to the joint effects of the irreversible nature and time-to-build of investment projects, such as those in the mining and resources industries.

The findings have several implications. First, the study confirms well-documented evidence that the effect of EPU on investment in the US is short-lived. The short-lasting EPU effect in the US is consistent with the notion that while uncertainty may cause delays in investment, once EPU is partly resolved, investment levels rise to satisfy pent up demand in the US market (Bloom, 2014; Gulen and Ion, 2016). Second, it further provides interesting evidence that EPU could have a significant and persistent effect on corporate fixed investment in Australia up to four years ahead. The results are consistent with the idea that firms operating

[2] As shown in Table 1, the correlation coefficient between the newspaper-based EPU and the overall EPU index is 0.897. It is acknowledged that the overall EPU index can be more informative than the newspaper-based EPU, but the comparisons in Baker et al. (2016) and in Table 2 show that the effect of the newspaper-based EPU on investment is similar, though in smaller magnitude, to that for the overall EPU index.

in smaller economy are more likely to be exposed to higher levels of uncertainty when making corporate decisions compared to those in autarkic economies (Bloom, 2017).

The remainder of this chapter proceeds as follows. Section 2.2 explains the measurement of EPU. Section 2.3 describes data sources and provides summary statistics of key variables. Section 2.4 discusses the empirical results, while section 2.5 concludes and identifies future research opportunities.

## 2.2 Measuring economic policy uncertainty

The study follows Gulen and Ion (2016) and proxies EPU using the Baker et al. (2016) index for US and Australian firms respectively.[3] For the US, the EPU index is constructed based on the monthly value-weighted average of three uncertainty components starting from January 1985, namely newspaper-based uncertainty, tax-related uncertainty, and forecaster disagreement regarding government spending and the consumer price index.[4] The Australian EPU index is measured by using text archives from eight Australian newspapers from January 1998 onwards to construct a policy uncertainty index similar to the newspaper-based EPU index provided for the US.

Figure 1 shows that the Australian newspaper-based index clearly escalates around events that are ex ante anticipated to increase EPU such as economic crises and wars, consistent with a large portion of Australian EPU shocks originating from abroad (Moore, 2017). While many of the events are foreign shocks, local factors such as federal elections, the mining and

[3] The EPU index (Baker et al., 2016) is available at: https://www.policyuncertainty.com/.

[4] In the US, the first component of the EPU index, news-based uncertainty, encapsulates the intensity of public concerns regarding future government policy and regulatory outcomes. The second component, the level of uncertainty related to future changes in the tax code, is measured by the discounted value of the revenue effects of every tax provisions set to expire over the next ten years. The third component, the forecast disagreement of government spending and consumer price index (CPI), is measured as the average of the interquartile ranges of CPI and federal, state and local governments spending forecasts. The weighting for the news-based, tax code and forecaster disagreement components are one half, one sixth, and one third, respectively.

tax policy debates, and changes in prime ministers also appear to contribute to spikes in uncertainty.

[Figure 1 about here]

Figure 2 compares the newspaper-based EPU index for Australia and the US. The aggregate global index is shown as a log-level deviation from trend, using the Hodrick and Prescott (1997) filter.[5] We find that the Australian EPU index is more volatile than its US counterpart, or the global index.[6] This is consistent with the notion that Australia is a relatively small and open economy, which is therefore susceptible to foreign sources of EPU (Bloom, 2017; Kirchner, 2019).

[Figure 2 about here]

### 2.3 The sample

To replicate the main results in Gulen and Ion (2016), *quarterly* and *annual* financial data are extracted from Compustat North America over 1987-2013. Since quarterly financial statement information is not readily available in Australia, the analysis of Australian corporate investment is conducted based on *annual* data, and annual financial data are then used to compare the results for Australian and US firms.[7] Australian financial data are obtained from the Morningstar Huntley Aspect for the years 1998-2017. The sample period is selected to match the availability of the EPU index in Australia.

Following Gulen and Ion (2016), the baseline regression model is as follows:

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[5] The Hodrick and Prescott (1997) filter is a widely used method for removing trend movements in the business cycle, which can be applied to non-stationary time series.

[6] Untabulated tests show that the standard deviation for the Australian news-based index is 58, while that for the US and the global index is around 45. The correlation coefficient between the Australian index and the US one is 0.71, while the correlation coefficient between Australia and the global economy is 0.65.

[7] Companies listed on the Australian Securities Exchange (ASX) are required to prepare and lodge financial reports with ASX each half year. These are filed in Appendix 4D (half-year report), and Appendix 4B (preliminary final report).

$$\frac{CAPX_{i,t+l}}{TA_{i,t+l-1}} = \alpha_i + \beta_1 EPU_{i,t} + \beta_2 TQ_{i,t} + \beta_3 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_4 SG_{i,t} + \delta M_t + QRT_t + \varepsilon_{i,t+l}$$

where capital expenditure (*CAPX*) is in the next $l$ quarters or years ($l \in \{1,2,3,4\}$). Policy uncertainty (*EPU*) is measured as the natural logarithm of the average of monthly Baker et al. (2016) index values in a fiscal quarter (*quarterly* data) or in a given year (*annual* data). Since the time-series of the text-based index may capture not only policy-induced uncertainty but also fundamental economic volatility, macroeconomic controls (*M*) are included such as GDP growth and election indicators to alleviate endogeneity concerns. Following the prior literature, Tobin's *q* (*TQ*), cash flows (*CF*), and sales growth (*SG*) are further controlled. *QRT* represents calendar quarter dummies in the quarterly analysis. Standard errors are adjusted for heteroscedasticity with the White (1980) correction and clustered by firm and by calendar quarter or year.[8] Variable measurement is summarized in the Appendix.

Table 1 presents summary statistics for all the variables in each setting. Panels A1 and A2 show that the replication sample is close to the original sample in Gulen and Ion (2016).[9] In addition to the equivalent sample size, values for scaled variables (*CAPX, TQ, CF, SG*) in the quarterly sample are similar to those reported in Gulen and Ion (2016). For example, the mean and median values of scaled *CAPX* are 0.014 and 0.007 respectively, compared to 0.014 and 0.008 respectively in the original study.[10]

[Table 1 about here]

[8] Capital expenditure (*CAPX*) and cash flows are deflated by the beginning-of-period total assets (*TA*). *i* indexes firms, *t* stands for calendar quarter or year, and $\alpha_i$ is firm-fixed effects.

[9] To be included in the replicated sample for the US, firms must have non-missing accounting variables for at least three consecutive years. This results in a sample of 10,442 unique firms with 441,046 firm-quarter observations and 108,330 firm-year observations.

[10] One exception is the level of capital expenditure (*CAPX*). The mean (median) value of *CAPX* is 20.126 (1.072) for the replicated quarterly sample and 20.511 (0.891) for the quarterly Compustat universe respectively. In contrast, Gulen and Ion (2016) report a mean (median) value of 26.5 (1.5) for the quarterly sample, and 24 (1.1) for the Compustat universe.

Since there is an interest in assessing the applicability of the Gulen and Ion (2016) results in Australia, annual samples are constructed for both economies.[11] This helps to ensure that differences between the Australian results and the replicated Gulen and Ion (2016) results are not attributable to the use of annual data in tests for Australian firms. The descriptive statistics shown in Panels B1 and C1 of Table 1 indicate significant differences in firm-specific variables between the two economies. Australia has higher mean values of deflated *CAPX*, Tobin's *q* and sales growth, but average negative *cash flows*,[12] consistent with La Cava, Richards, Shuetrim and Vickery (2005) and Tran (2014).

Additionally, a benchmark investment model is tested by regressing corporate investment on Tobin's *q* and *cash flows*. The results are also reported in Table 1. For US firms, both Tobin's *q* and cash flows are statistically significant and positive in all specifications for both quarterly (Panel A3) and annual (Panel B2) samples. However, consistent with a significant portion of listed firms having negative operating cash flows, the results in Panel C2 show that investment is positively correlated with Tobin's *q*, but negatively correlated with *cash flows* (La Cava et al., 2005; Tran, 2014). The negative coefficient on *cash flows* is largely driven by the influence of negative cash flows observations (Allayannis and Mozumdar, 2004).[13]

## 2.4 Results

### *2.4.1 The US results*

This study first replicates the effect of EPU on firm-level investment reported by Gulen and Ion (2016). Quarterly capital investment is regressed on EPU and other accounting and

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[11] For Australia, firms with a listing history of less than three consecutive years and missing main variables are excluded. Similar to Tran (2014), firms with a clear sign of financial distress, proxied by cash flows (deflated by the beginning-of-period total assets) less than -100 per cent, are also excluded. Those requirements result in a sample of 2,037 unique firms with 20,261 firm-year observations.

[12] More than 50% of firm-year observations in the Australian sample have negative cash flows, consistent with a significant portion of listed firms originating from the mining and resources industries. In contrast, less than 25% of US firm-year observations experience negative cash flows.

[13] Untabulated tests show that in the Australian sample, the coefficient on cash flows becomes positive when observations with negative cash flows are excluded.

macroeconomic variables over 1987-2013. All variables are normalised by their sample standard deviation. Table 2 shows that the replication yields results that are close to those reported in Gulen and Ion (2016). Panel A presents the results using the overall policy uncertainty index, while Panels B, C, and D present the results for each of the three index components respectively. Column (1) in Panel A indicates that when EPU increases by 100%, corporate investment in the next quarter decreases by 0.150 standard deviations.[14] This equates to a 30 basis points decrease, being equivalent to around 21.4% of the average investment level in the sample. The effect of policy uncertainty also persists beyond the current quarter. When EPU doubles, it leads to a decrease in investment of 20% in the second quarter, 19.3% in the third quarter, and 17% in the fourth quarter respectively. When the newspaper-based and tax-code index components double, investment in the next quarter decreases by 16.3% and 9.0% respectively (Panel B and Panel C). However, Panel D shows no significant effect on corporate investment of uncertainty sourced from forecaster disagreement on government spending.

[Table 2 about here]

In Panel E, the regression model is re-estimated using annual data for US firms and the newspaper-based component of EPU. The use of annual data and newspaper-based EPU allows for a comparison of the US results directly with those for Australian firms, and for understanding whether any differences are a reflection of real effects, or simply attributable to the use of a longer financial period for Australian firms. The results based on the annual sample in Panel E indicate that the effect of EPU on investment is significant for the following year, but the coefficient on EPU is found to be insignificant and close to zero in subsequent years. In terms of economic significance, when newspaper-based EPU doubles, corporate investment in the next year decreases by 0.178 standard deviations, representing an average investment

[14] The coefficient on the logged policy uncertainty variable can be interpreted as the number of standard deviation change of the independent variable for each 100% increase in policy uncertainty.

decrease of 24.4%. However, a joint test of the sum of the coefficients over Years 2 to Year 4 shows that the overall effect of EPU on investment over the three years is positive and significantly different from zero (coefficient = 0.065, Wald-test statistic = 66.27, $p$-value = 0.000). This confirms that any negative effect of EPU on US firms' investment decisions is not long-lasting.

Overall, the results in Table 2 confirm the negative association between policy uncertainty and corporate investment identified by Gulen and Ion (2016), as well as demonstrating that the newspaper-based index accounts for the majority of the explanatory power of the overall Baker et al. (2016) index. Further analysis shows that policy uncertainty, especially EPU related to media news and tax code, has an impact on corporate investment in the next four quarters, but does not persist beyond the following year.

### *2.4.2 The Australian results*

Table 3 presents the empirical results from the regression of corporate investment on the newspaper-based EPU index and control variables using Australian firm-years from 1998 to 2017. The basic result demonstrating a negative association between EPU and corporate investment occurs in a broadly similar manner to the US results. In particular, when EPU doubles, corporate investment declines by 0.090 standard deviations, which is equivalent to a 15.1% decrease in average investment.

However, there are also some notable differences between the Australian results reported in Table 3 and the annual-period US results in Table 2. In contrast to the short-lived effect of EPU on investment in the US, the results in Table 3 indicate that EPU can have a significant and persistent effect on capital investment by Australian firms for up to four years ahead. The effect of EPU remains economically and statistically significant beyond one year ahead, with an average decrease of 13.1% in the fourth year. While the coefficients on newspaper-based

EPU for the second and third years are marginally significant, a joint test suggests that the overall effect of EPU on investment is significant and negative in years beyond the next period.[15] Given the proportion of mining and resource firms in Australia, the results can be attributed at least in part to the high degree of irreversibility and time-to-build considerations associated with investment projects in these industries.

[Table 3 about here]

**2.5 Conclusions**

This chapter provides further evidence on the association between the aggregate level of EPU and corporate investment in the US, as well as extending this analysis to a relatively small, open economy (i.e., Australia). In doing so it is confirmed that extant US findings (Gulen and Ion, 2016) can be replicated, and that similar conclusions are reached when annual data is used instead of quarterly data. The similarity of annual and quarterly results is important in facilitating comparison of the results between US and Australian settings, as Australian EPU effects can only be measured using annual data. Compared to the US evidence, it appears that the effect of EPU on Australian firms' investment is more long-lasting, with an identifiable negative effect on investment for up to four years. The Australian evidence Chapter 2 reports is consistent with real option theory regarding delayed investment, and also demonstrates that, for Australian firms at least, EPU has a negative and prolonged effect on capital investment decision making.

The study contributes to the EPU literature in two important ways. First, it responds to the call for replication of widely cited findings (Faff, 2019). Second, it yields evidence on the extent to which a robust effect in one national setting extends to other national settings. Indeed, in this case it would appear that EPU has a longer lasting negative effect on corporate

[15] The sum of the coefficients on policy uncertainty in Year 2 and Year 3 is -0.113, significantly different from zero at the 1% significance level (Wald-test statistic = 10.88). The sum of the coefficients on policy uncertainty in Year 2 to Year 4 is -0.191, significantly different from zero at the 1% significance level (Wald-test statistic = 15.89).

investment by Australian firms than their US counterparts. Such evidence has important implications for government, especially in light of concerns that have been expressed about an alleged lack of investment activity by Australian firms.[16]

While the findings support the role of EPU in negatively impacting corporate investment, they also identify many further opportunities. The Australian economy is, by international standards, not only small but very open. This suggests that domestic EPU may not be as important relative to EPU of major trading partners, especially when compared to EPU within the countries with whom the Australian economy is most closely linked. It is also noted that there is a high proportion of Australian firms engaged in the resources and mining industries, and so the effect of domestic EPU (as well as the effect of EPU in major trading partner countries) may be industry-specific.[17] There is also the question of whether managers respond to EPU in ways beyond deferring (or even cancelling) planned investment activity (Nagar, Schoenfeld and Wellman, 2019). The robust nature of highly cited US evidence, along with initial evidence of a stronger, more persistent EPU effect in Australia, suggests there is still much research to be done.

[16] Australian Treasurer Josh Frydenberg reiterated that because of a drop-off in firm investment, Australian productivity growth has slowed down in recent years and the whole economy cannot simply depend on high commodity prices to boost national income (Coorey, 2019).
[17] Heterogeneity of the EPU effect on capital investment for Australian firms will be discussed to a greater extent in Chapter 3 (Section 3.6).

# Tables

## Table 1. Summary statistics for the US and Australian samples

### Panel A: The US Quarterly Sample

Panel A1: Correlation matrix between the US policy uncertainty index, its components and GDP growth

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. EPU | 1.000 | | | | | |
| 2. EPU news-based component | 0.897*** | 1.000 | | | | |
| 3. EPU tax-related component | 0.655*** | 0.410*** | 1.000 | | | |
| 4. EPU CPI-related component | 0.456*** | 0.151*** | 0.246*** | 1.000 | | |
| 5. EPU Gov Purch component | 0.439*** | 0.174*** | 0.176*** | 0.416*** | 1.000 | |
| 6. Real GDP growth | -0.407*** | -0.382*** | -0.205*** | -0.298*** | -0.078 | 1.000 |

Panel A2: Descriptive statistics for the US quarterly sample

| | *Quarterly* sample used in this replication | | | | *Quarterly* Compustat universe 1987-2013 | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | Median | SD | N | Mean | Median | SD |
| CAPX | 441,010 | 20.123 | 1.072 | 69.757 | 572,701 | 20.508 | 0.891 | 71.448 |
| PPE | 425,266 | 498.310 | 23.721 | 1,796.472 | 637,582 | 532.013 | 19.337 | 1,837.675 |
| Total assets | 441,010 | 2,229.328 | 197.411 | 7,261.181 | 658,248 | 2,339.754 | 196.567 | 7,505.821 |
| Operating cash flows | 441,010 | 40.167 | 1.925 | 147.051 | 553,325 | 38.970 | 1.433 | 142.999 |
| Sales | 441,010 | 344.696 | 35.919 | 1,029.728 | 676,793 | 287.961 | 28.000 | 843.627 |
| CAPX/Lag total assets | 441,010 | 0.014 | 0.007 | 0.020 | 569,257 | 0.014 | 0.007 | 0.022 |
| Tobin's *q* | 441,010 | 1.877 | 1.335 | 1.558 | 590,361 | 1.929 | 1.271 | 1.892 |
| Cash flows /Lag TA | 441,010 | 0.011 | 0.014 | 0.058 | 552,153 | 0.005 | 0.012 | 0.067 |
| Sales growth | 441,010 | 0.207 | 0.083 | 0.664 | 608,296 | 0.223 | 0.078 | 0.785 |
| PPE/Lag total assets | 425,266 | 0.254 | 0.174 | 0.242 | 618,834 | 0.262 | 0.167 | 0.263 |

Panel A3: Classic investment regressions using the US quarterly sample

| | CAPX/TA | CAPX/TA | CAPX/TA |
|---|---|---|---|
| Tobin's *q* | 0.158*** | | 0.158*** |
| | (26.69) | | (26.77) |
| Cash flows | | 0.042*** | 0.043*** |
| | | (11.73) | (12.28) |
| N | 441,010 | 441,010 | 441,010 |
| Adjusted $R^2$ | 0.021 | 0.002 | 0.023 |

The table presents summary statistics for main variables used in empirical analysis. In Panel A, the US data extend from January 1987 to December 2013. Panel A1 illustrates correlation between the EPU index of Baker et al. (2016), the index's subcomponents, and the quarterly growth rate in real GDP. All variables in Panel A1 are measured at the monthly frequency, except for the GDP growth rate which is measured quarterly. Panel A2 presents descriptive statistics for the *quarterly* US sample used in the replication as well as for the whole Compustat universe. The quarterly sample consists of 10,443 unique firms with 441,010 firm-quarter observations. To reduce the impact of extreme outliers, all variables have been winsorized at the 1% and 99% level. In Panel A3, the classic investment regression is run by regressing *quarterly* capital investments (CAPX/TA) on Tobin's *q* and operating cash flows.

**Panel B: The US Annual Sample**

Panel B1: Descriptive statistics for the US annual sample

| | N | Mean | Median | SD |
|---|---|---|---|---|
| CAPX | 108,330 | 85.755 | 5.078 | 283.477 |
| PPE | 106,874 | 564.883 | 23.460 | 1,971.252 |
| Total assets | 108,330 | 1,529.856 | 141.930 | 4,644.513 |
| Operating cash flows | 108,330 | 138.347 | 7.253 | 458.467 |
| Sales | 108,330 | 1,262.938 | 126.894 | 3,690.902 |
| CAPX/Lag total assets | 108,330 | 0.073 | 0.041 | 0.100 |
| Tobin's *q* | 108,330 | 1.974 | 1.377 | 1.750 |
| Cash flows/Lag total assets | 108,330 | 0.037 | 0.073 | 0.221 |
| Sales growth | 108,330 | 0.242 | 0.092 | 0.757 |
| PPE/Lag total assets | 106,874 | 0.319 | 0.224 | 0.298 |

Panel B2: Classic investment regressions using the US annual sample

| | CAPX/TA | CAPX/TA | CAPX/TA |
|---|---|---|---|
| Tobin's *q* | 0.220*** | | 0.223*** |
| | (18.53) | | (18.59) |
| Cash flows | | 0.064*** | 0.073*** |
| | | (9.86) | (12.89) |
| N | 108,330 | 108,330 | 108,330 |
| Adjusted $R^2$ | 0.049 | 0.004 | 0.054 |

Panel B presents summary statistics using US *annual* data, which extend from 1987 to 2013. Panel B1 presents descriptive statistics for the *annual* US sample used in empirical analysis. The annual sample consists of 108,330 firm-quarter observations over 1987-2013. All accounting variables have been winsorized at the 1% and 99% level. In Panel B2, *annual* capital investment (CAPX/TA) is regressed on Tobin's *q* and operating cash flows. All specifications include firm- and year-fixed effects, while standard errors are clustered by firm and by year. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Panel C: The Australian Annual Sample**

Panel C1: Descriptive statistics for the Australian annual sample

| | N | Mean | Median | SD |
|---|---|---|---|---|
| CAPX | 20,261 | 36.308 | 1.696 | 137.034 |
| PPE | 20,259 | 218.206 | 2.789 | 926.031 |
| Total assets | 20,261 | 648.743 | 34.260 | 2411.717 |
| Operating cash flows | 20,261 | 49.032 | -0.049 | 196.934 |
| Sales | 20,261 | 435.589 | 15.724 | 1539.986 |
| CAPX/Lag total assets | 20,261 | 0.109 | 0.042 | 0.183 |
| Tobin's *q* | 20,261 | 2.046 | 1.287 | 2.447 |
| Cash flow/Lag total assets | 20,261 | -0.031 | -0.003 | 0.236 |
| Sales growth | 20,261 | 5.611 | 0.078 | 31.493 |
| PPE/Lag total assets | 20,259 | 0.232 | 0.093 | 0.301 |

Panel C2: Classic investment regressions using the Australian annual sample

| | CAPX/TA | CAPX/TA | CAPX/TA |
|---|---|---|---|
| Tobin's *q* | 0.183*** | | 0.183*** |
| | (7.99) | | (8.19) |
| Cash flows | | -0.030* | -0.002 |
| | | (-2.05) | (-0.16) |
| N | 19,404 | 19,404 | 19,404 |
| Adjusted $R^2$ | 0.0328 | 0.0006 | 0.0327 |

Panel C presents summary statistics for Australian annual sample. Data are obtained from Morningstar Aspect for the years 1998-2017. The sample consists of 2,037 unique firms with 20,261 firm-year observations. Panel C1 presents descriptive statistics for all the accounting variables used in empirical analysis. To reduce the impact of extreme outliers, all variables have been winsorized at the 1% and 99% level. In Panel C2, *annual* capital investment (CAPX/TA) is regressed on Tobin's *q* and operating cash flows. All specifications include firm- and year-fixed effects, while standard errors are clustered by firm and by year. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Table 2. EPU and capital investment for US firms**

**EPU and capital investment – *Quarterly* US sample**

| Dependent variable: CAPX/Total assets | Panel A: Overall EPU index (Quarterly sample) | | | | Panel B: Newspaper-based component of EPU index (Quarterly sample) | | | |
|---|---|---|---|---|---|---|---|---|
| | $Q_{t+1}$ | $Q_{t+2}$ | $Q_{t+3}$ | $Q_{t+4}$ | $Q_{t+1}$ | $Q_{t+2}$ | $Q_{t+3}$ | $Q_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| EPU | -0.150*** | -0.140*** | -0.135*** | -0.119*** | -0.114*** | -0.116*** | -0.123*** | -0.113*** |
| | (-4.86) | (-4.64) | (-4.59) | (-3.86) | (-4.06) | (-4.27) | (-4.41) | (-3.82) |
| Tobin's *q* | 0.180*** | 0.169*** | 0.153*** | 0.139*** | 0.181*** | 0.169*** | 0.153*** | 0.139*** |
| | (24.81) | (24.39) | (23.35) | (20.04) | (25.23) | (24.71) | (23.42) | (20.04) |
| Cash flow | 0.022*** | 0.032*** | 0.037*** | 0.033*** | 0.022*** | 0.032*** | 0.037*** | 0.032*** |
| | (8.84) | (12.22) | (15.66) | (13.80) | (8.81) | (12.17) | (15.61) | (13.78) |
| Sales growth | 0.048*** | 0.050*** | 0.044*** | 0.035*** | 0.048*** | 0.050*** | 0.044*** | 0.035*** |
| | (16.50) | (16.42) | (14.26) | (11.72) | (16.27) | (16.43) | (14.41) | (11.90) |
| GDP growth | 0.003 | 0.007** | 0.010*** | 0.012*** | 0.004 | 0.007** | 0.009*** | 0.011*** |
| | (0.90) | (2.16) | (2.85) | (3.39) | (1.09) | (2.21) | (2.78) | (3.22) |
| Election indicator | 0.005 | -0.001 | -0.011 | -0.023 | 0.003 | -0.002 | -0.013 | -0.024 |
| | (0.31) | (-0.05) | (-0.70) | (-1.25) | (0.17) | (-0.15) | (-0.77) | (-1.30) |
| N | 441,010 | 430,967 | 420,774 | 411,118 | 441,010 | 430,967 | 420,774 | 411,118 |
| Adjusted $R^2$ | 0.045 | 0.044 | 0.040 | 0.033 | 0.045 | 0.044 | 0.040 | 0.033 |
| | | | | | | | | |
| Firm fixed effects | yes | yes | yes | yes | yes | yes | yes | yes |
| Quarter dummies | yes | yes | yes | yes | yes | yes | yes | yes |
| | | | | | | | | |
| Cluster by firm | yes | yes | yes | yes | yes | yes | yes | yes |
| Cluster by quarter | yes | yes | yes | yes | yes | yes | yes | yes |

*(continued)*

**Table 2. EPU and capital investment for US firms (continued)**

| Dependent variable: CAPX/Total assets | Panel C: EPU related to tax code (Quarterly sample) | | | | Panel D: EPU related to government spending and inflation (Quarterly sample) | | | |
|---|---|---|---|---|---|---|---|---|
| | $Q_{t+1}$ | $Q_{t+2}$ | $Q_{t+3}$ | $Q_{t+4}$ | $Q_{t+1}$ | $Q_{t+2}$ | $Q_{t+3}$ | $Q_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| EPU | -0.063*** | -0.058*** | -0.055*** | -0.052*** | 0.010 | 0.017 | 0.013 | 0.009 |
| | (-14.60) | (-13.44) | (-12.20) | (-10.92) | (0.20) | (0.39) | (0.29) | (0.21) |
| Tobin's *q* | 0.173*** | 0.162*** | 0.148*** | 0.133*** | 0.186*** | 0.174*** | 0.159*** | 0.144*** |
| | (24.42) | (24.08) | (23.48) | (20.12) | (25.46) | (25.05) | (24.20) | (20.86) |
| Cash flow | 0.023*** | 0.033*** | 0.038*** | 0.034*** | 0.022*** | 0.032*** | 0.037*** | 0.032*** |
| | (9.49) | (12.90) | (16.45) | (14.40) | (8.82) | (12.19) | (15.52) | (13.69) |
| Sales growth | 0.043*** | 0.046*** | 0.040*** | 0.031*** | 0.049*** | 0.052*** | 0.046*** | 0.036*** |
| | (15.38) | (15.35) | (13.41) | (10.56) | (16.77) | (16.70) | (14.69) | (11.93) |
| GDP growth | 0.005* | 0.009*** | 0.012*** | 0.013*** | 0.010*** | 0.014*** | 0.016*** | 0.018*** |
| | (1.87) | (3.26) | (3.85) | (4.30) | (2.75) | (3.91) | (4.29) | (4.77) |
| Election indicator | 0.014 | 0.009 | -0.002 | -0.015 | 0.000 | -0.006 | -0.016 | -0.028 |
| | (1.03) | (0.62) | (-0.15) | (-0.80) | (0.00) | (-0.33) | (-0.91) | (-1.42) |
| N | 441,010 | 430,967 | 420,774 | 411,118 | 441,010 | 430,967 | 420,774 | 411,118 |
| Adjusted $R^2$ | 0.055 | 0.053 | 0.047 | 0.040 | 0.043 | 0.042 | 0.038 | 0.032 |
| Firm fixed effects | yes | yes | yes | yes | yes | yes | yes | yes |
| Quarter dummies | yes | yes | yes | yes | yes | yes | yes | yes |
| Cluster by firm | yes | yes | yes | yes | yes | yes | yes | yes |
| Cluster by quarter | yes | yes | yes | yes | yes | yes | yes | yes |

In Table 2, the main results in Gulen and Ion (2016) are replicated by regressing firm-level quarterly investment (capital expenditure scaled by lagged total assets) on Tobin's *q*, operating cash flows, sales growth, and the EPU index from Baker et al. (2016) (Panel A). In Panels B through D, the overall EPU index is replaced with each of its three components. The quarterly data covers from January 1987 to December 2013. In specifications marked (1), the dependent variable has a lead of one period (calendar quarter) with respect to the independent variables. In specifications marked (2) it leads two periods, and so forth until (4). All specifications include calendar and fiscal quarter dummies, as well as firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-quarter and by firm. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Table 2. EPU and capital investment for US firms (continued)**

**EPU and capital investment - *Annual* US sample**

| Dependent variable: CAPX/Total assets | Panel E: US Newspaper-based EPU index (Annual sample) | | | |
|---|---|---|---|---|
| | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ |
| | (1) | (2) | (3) | (4) |
| EPU | -0.178** | -0.067 | 0.035 | 0.097 |
| | (-2.27) | (-0.59) | (0.26) | (0.73) |
| Tobin's *q* | 0.225*** | 0.104*** | 0.044*** | 0.017 |
| | (16.70) | (6.75) | (3.82) | (1.63) |
| Cash flow | 0.070*** | 0.047*** | 0.017*** | -0.004 |
| | (13.19) | (7.74) | (3.25) | (-0.60) |
| Sales growth | 0.041*** | 0.019*** | 0.011* | 0.018*** |
| | (9.56) | (4.46) | (1.83) | (4.10) |
| GDP growth | 0.031*** | 0.025 | 0.010 | -0.002 |
| | (2.96) | (1.56) | (0.61) | (-0.11) |
| Election indicator | -0.027 | -0.005 | 0.003 | 0.045 |
| | (-0.70) | (-0.10) | (0.05) | (0.80) |
| N | 108,330 | 97,700 | 87,791 | 78,780 |
| Adjusted $R^2$ | 0.080 | 0.021 | 0.003 | 0.003 |
| | | | | |
| Firm fixed effects | yes | yes | yes | yes |
| Cluster by firm | yes | yes | yes | yes |
| Cluster by year | yes | yes | yes | yes |

In Panel E, annual capital investment is regressed on Tobin's *q*, operating cash flows, sales growth, macroeconomic factors, and the newspaper-based EPU index from Baker et al. (2016). The annual data covers from 1987 to 2013. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables. In specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the firm level and year level. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

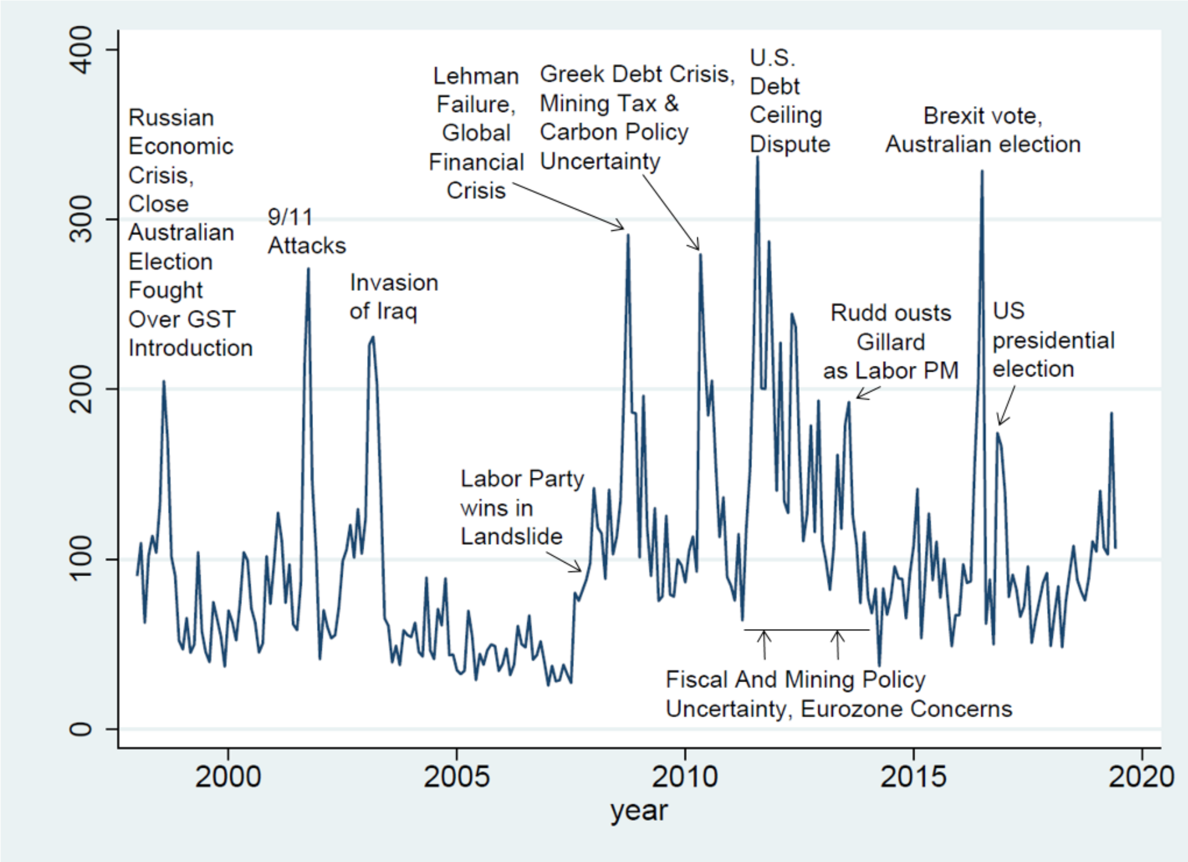
**Table 3. EPU and capital investment for Australian firms**

| Dependent variable: CAPX/Total assets | Australian Newspaper-based EPU index (Annual sample) | | | |
|---|---|---|---|---|
| | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ |
| | (1) | (2) | (3) | (4) |
| EPU | -0.090* | -0.058 | -0.055 | -0.078* |
| | (-2.05) | (-1.32) | (-1.31) | (-2.11) |
| Tobin's *q* | 0.183*** | 0.083*** | 0.045*** | 0.032* |
| | (8.25) | (5.84) | (3.17) | (2.00) |
| Cash flow | -0.002 | -0.022* | -0.055*** | -0.042*** |
| | (-0.16) | (-1.92) | (-4.23) | (-3.07) |
| Sales growth | 0.025** | 0.011 | 0.004 | 0.018 |
| | (2.68) | (1.12) | (0.38) | (1.48) |
| GDP growth | -0.005 | -0.013 | -0.004 | -0.006 |
| | (-0.26) | (-0.63) | (-0.27) | (-0.32) |
| Election indicator | -0.016 | -0.030 | -0.028 | -0.007 |
| | (-0.39) | (-0.81) | (-0.74) | (-0.23) |
| N | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.037 | 0.009 | 0.005 | 0.004 |
| | | | | |
| Firm fixed effects | yes | yes | yes | yes |
| Cluster by firm | yes | yes | yes | yes |
| Cluster by year | yes | yes | yes | yes |

This table presents results using the Australian newspaper-based index which is constructed in the same manner as the newspaper-based EPU index for the US. Specifically, major findings from Gulen and Ion (2016) are replicated by regressing Australian firm-level annual investment (capital expenditure scaled by lagged total assets) on the Australian EPU index, Tobin's *q*, operating cash flows, sales growth, and macroeconomic variables (i.e., GDP growth and election indicator). The annual data covers from 1998 to 2017. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables. In specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the firm level and year level. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Figures

### Figure 1. EPU index in Australia




The figure plots the newspaper-based Baker et al. (2016) index of EPU for Australia over the period from January 1998 to June 2019. A number of major events and shocks have been identified in accordance with sizeable spikes in uncertainty. Index reflects scaled monthly counts of articles in eight Australian newspapers containing the key terms, such as uncertain or uncertainty, economic or economy, and one or more policy-relevant terms: regulation, Reserve Bank of Australia, RBA, deficit, tax, taxation, taxes, parliament, senate, cash rate, legislation, tariff, war. The eight newspapers are Daily Telegraph, Courier Mail, The Australian, The Age, The Advertiser, Mercury, Sydney Morning Herald, and The Herald Sun. To control for the changing volume of news over time, for each of the eight newspaper, the raw economic policy uncertainty counts are scaled by the number of all articles in the same newspaper and month. The eight series are then normalised to unit standard deviation and summed within each month. The final index is scaled to have an average value of 100 at a given time. Data are available at www.policyuncertainty.com.

**Figure 2. Newspaper-based EPU: Log-level deviation from trend**

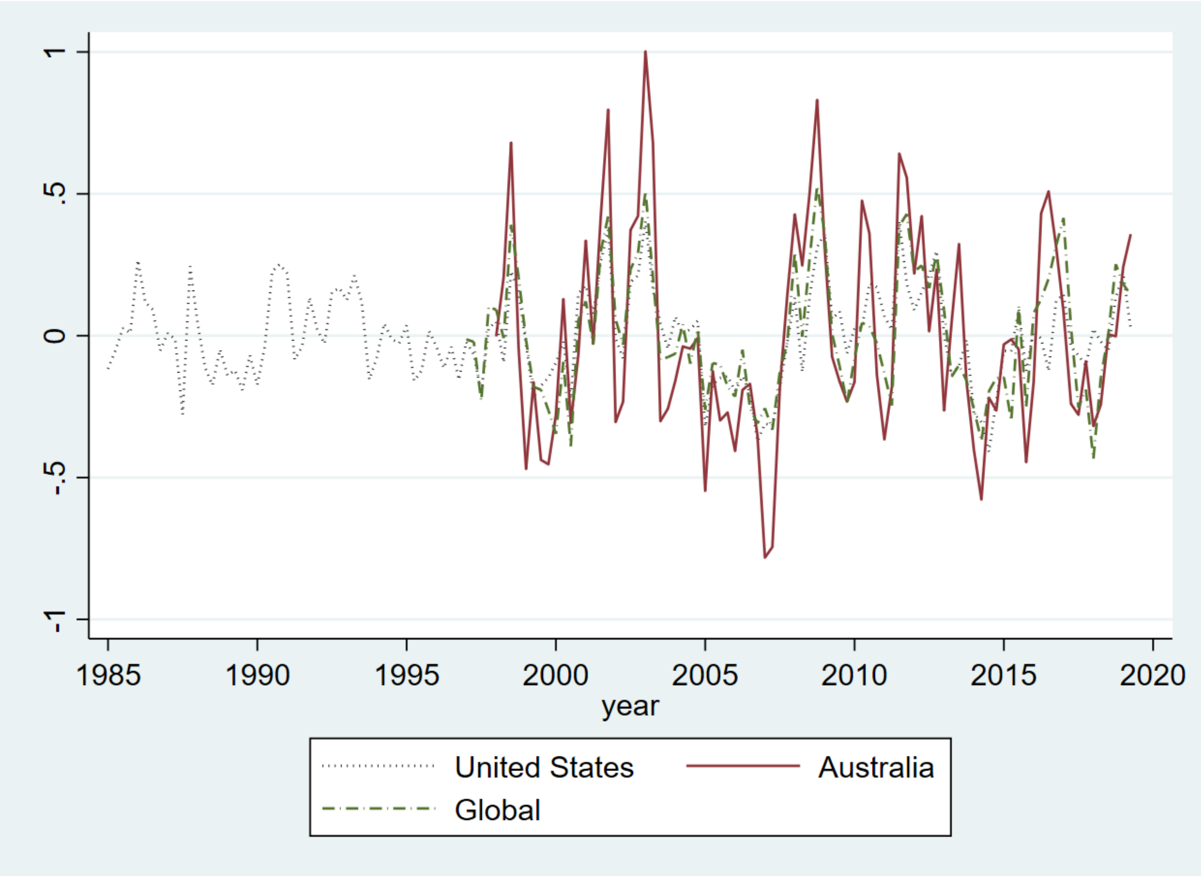



Figure 2 shows the newspaper-based EPU index for United States, Australia and the global aggregate index as a log-level deviation from a filter trend, using the Hodrick–Prescott high-pass filter. The US EPU index is available from 1985 onwards, while the global and the Australian index are only available from 1997 and 1998, respectively. Data are available at www.policyuncertainty.com.

## Appendix

### Variable measurement

| Variable | Definition | Source |
|---|---|---|
| ***Dependent variable*** | | |
| *CAPX/TA* | Capital expenditure (*CAPX*) normalized by total assets (*TA*) at the beginning of the period. The dependent variable is constructed to have a lead of one to four periods (calendar quarter or year) with respect to the independent variables. | Compustat (US)<br>Morningstar (Australia) |
| ***Experimental variables*** | | |
| *US policy uncertainty* (*EPU*) | Natural logarithm of the weighted average of the Baker et al. (2016) monthly index for the US over a fiscal quarter or a calendar year.<br>US EPU could be an overall Baker et al. (2016) index and/or its components, namely, newspaper-based EPU, as well as EPU related to tax code, government spending and inflation respectively. | Policyuncertainty.com |
| *Australian policy uncertainty* (*EPU*) | Natural logarithm of the weighted average of the Baker et al. (2016) newspaper-based monthly index for Australia over a fiscal year. | |
| ***Firm-level accounting variables**** | | |
| *Tobin's q (TQ)* | The market value of equity plus the book value of assets minus the sum of book value of equity plus deferred taxes, all divided by book values of assets. | Compustat (US)<br>Morningstar (Australia) |
| *Cash flows (CF)* | Operating cash flow from the statement of cash flows divided by the beginning of the period total assets. | Compustat (US)<br>Morningstar (Australia) |
| *Sales growth (SG)* | Sales growth is calculated as the year-on-year growth in quarterly sales (in quarterly analysis); or<br>Sales growth is calculated as the year-on-year growth in yearly sales (in annual analysis). | Compustat (US)<br><br>Compustat (US)<br>Morningstar (Australia) |

| | | |
|---|---|---|
| ***Macroeconomic variables*** | | |
| *GDP growth* | Quarterly and/or annual growth rate of the US gross domestic product;<br>Annual growth rate of Australian gross domestic product. | World Bank Database - World Development Indicator (WDI) |
| *Election indicator* | Dummy variable takes a value of one in the year of the US presidential elections;<br>Dummy variable takes a value of one in the year of Australian federal elections. | MIT Election Data and Science Lab<br>UWA Australian Politics and Elections Database |

* Firm-level accounting variables are measured on a quarterly or annual basis for the US, while all variables for the Australian sample are measured on an annual basis.

# Chapter 3:

# Local and Foreign Economic Policy Uncertainty and Capital Investment

## 3.1 Introduction

Government policy uncertainty regarding fiscal, regulatory, and monetary policy can have a detrimental impact on the overall economy. Many studies have examined the impact of uncertainty surrounding government policy on financial performance, business cycles and firm-level real activities (Bonaime, Gulen and Ion, 2018; Brogaard and Detzel, 2015; Li, Luo and Chan, 2018; Nguyen and Phan, 2017). However, most of the empirical literature on uncertainty has focused on autarkic economies like the United States, in which domestic shocks are main drivers of the business cycles rather than foreign shocks (Bloom, 2009; Castelnuovo, Lim and Pellegrino, 2017). Little is known about small and open economies which are largely affected by external shocks coming from adjacent countries and the rest of the world (Cardia, 1991; Fernandez-Villaverde et al., 2011). This study attempts to address this gap by investigating the impact of EPU on firms' capital investment decisions in Australia, as a typical small and open economy, and the underlying channels of the EPU effects. The central research questions are: Do the sources of *local* and *foreign* policy uncertainty shocks affect levels of capital investment in Australia at both the aggregate- and firm-level? Is *foreign* EPU relatively more important than *local* EPU in affecting capital investment in Australian at the aggregate- and firm-level?

More recently, there is a growing attention on the international spillovers of uncertainty. A number of macroeconomic studies have been conducted to quantify the impact of uncertainty shocks at an international level (Handley, 2014; Jones and Olson, 2015; Gabauer and Gupta, 2018, Nguyen, Su, Wongchoti and Schinckus, 2020). As a matter of fact, private capital investments in small open economies like Australia can be affected by both local and foreign policy uncertainty originating in closely-linked economies (Fernandez-Villaverde et al., 2011). Empirical evidence shows that external uncertainty shocks originating from the US transmit to other economies and trigger business cycles at an international level (Kim, 2001; Colombo, 2013). While the existing literature on the spillover effect of EPU employs the aggregate data at the macro-level exclusively, the study is among the first to further consider the possible spillover effect of EPU on firm-level investment.

Other studies focus on how EPU from a single country (i.e., the United States), impedes economic outputs in various other countries. For example, Colombo (2013) examines the spillover effect of the US shocks on the European area, while Jones and Olson (2015) study the US shocks on Japanese and British economies. In contrast, this chapter focuses on how multiple sources of EPU (*local* versus *foreign*) may affect agents' behaviours in one country, (i.e., Australia). This approach is premised on the assumption that Australia, as an export-oriented and relatively open economy, may be more affected by external uncertainty shocks.

This study focuses on a trio of countries: Australia, China, and the United States. Australia has strong bilateral relationships with China and the United States regarding economic and trade complementarities (Hill, 2012; OECD, 2020). China is the biggest two-way trading partner of Australia (28.8% share of the total two-way trading), followed by the United States (9.3% share of the total) (DFAT, 2020). While China is the largest trading partner of Australia, the United States and Chinese economies are mutually linked, leading to spillover effects from US EPU to Chinese EPU and vice versa (Zhang, Lei, Li and Kutan, 2019). Finally, China has become more influential as the second-largest global economy.

The study investigates the relation between economic policy uncertainty and capital investment in Australia from 1998 onwards using Baker et al. (2016). Their EPU index is built based on newspaper coverage frequency for a wide variety of countries. Particularly, the Australian text-based EPU index significantly correlates with events that are ex ante anticipated to generate policy-related shocks such as federal elections, economic crises and wars, with around 90% of the uncertainty shocks originated from abroad over time (Bloom, 2017; Moore, 2017).

However, a significant empirical challenge is that domestic and foreign EPU indices are correlated and interdependent. As a consequence, appropriate econometric techniques are required to identify and isolate local and foreign EPU shocks from both macro- and micro-perspectives. First, the empirical analysis begins at the aggregate level by deploying structural vector autoregression model (SVAR) which accounts for the intercorrelation among macroeconomic variables in multiple periods (Cheng, 2017; Jurado, Ludvigson and Ng, 2015; Caggiano, Castelnuovo and Pellegrino, 2017). More specifically, impulse response functions (IRFs) in SVAR are used to explain the response of aggregate fixed investment to different EPU shocks, whereas forecast error variance decomposition (FEVD) is used to assess the relative importance of local and foreign EPU in affecting fixed investment.

Using quarterly time-series data, the SVAR results show that both domestic and foreign EPU shocks have a negative and significant impact on the Australian economy and trigger a reduction in private capital investment in Australia. While the negative local EPU effect is statistically significant in the longer run (up to 16 quarters ahead), foreign EPU originating from China is relatively more important in depressing Australian investment growth. A one-standard-deviation Chinese EPU shock immediately reduces aggregate fixed investment by around 1.5 per cent, with this effect being statistically significant up to eight quarters ahead. Finally, the FEVD results also indicate that the Chinese EPU effect is five times more important than the Australian and US EPU counterparts. Chinese EPU shocks contribute significantly to variation in Australian investment, accounting for around 14 percent of forecast error variance at the sixteen-quarter horizon.

Next, with regard to firm-level analysis, standardized investment-cash flow sensitivity OLS regression is used by adding the EPU factor so as to examine the average effect of uncertainty cross-sectionally after controlling for other confounding factors related to firm characteristics, investment opportunities and macroeconomic uncertainty (Gulen and Ion, 2016; Chen, Le, Shan and Taylor, 2020). To further investigate the magnitude of foreign shocks, the residuals of Chinese and US EPU unexplained by the variation of Australian EPU are included in the baseline regression model. The rationale is that Australian economic policies are unlikely to directly affect economic policies in the US or China; rather the US or Chinese policies would substantially impact Australian policies. Thus, by taking out the US and Chinese EPU component that can be explained by Australian EPU, the US and Chinese EPU residuals capture the unique *foreign* EPU that has not been incorporated in the Australian policy-related uncertainty. Intuitively, the residual EPU measures would potentially underestimate the effect of the US and Chinese EPU on corporate investment especially when using annual financial data.[18] However, if the coefficients on the EPU residuals are significant, it further highlights the incremental effect of *foreign* sources of policy-induced uncertainty.

Using firm-year panel data, the regression results show that when Australian EPU doubles, corporate investment in the next year declines by 0.147 standard deviations, which is equivalent to a 24.6% decrease in average investment. The effect of *local* EPU remains economically and statistically significant beyond one year ahead, with an average decrease of 19.6% in investment the fourth year. Furthermore, a doubling of the Chinese EPU residual is associated with a decline in investment of around 0.045 standard deviation in the second year and the third year. This equates to an 88 basis point decrease, being equivalent to around 8.05% of the sample average investment. It highlights the incremental effect of Chinese EPU on

[18] Since quarterly financial statement information is not readily available in Australia, the analysis of Australian corporate investment is conducted based on annual data.

Australian corporate investment, beyond that captured in Australian EPU. However, testing the US effect shows that the US EPU residual is statistically insignificant. It suggests that the impact of US EPU has been mostly absorbed by Australian EPU; thus, the US EPU has only a very marginal incremental effect.

The main findings are robust to several additional tests. First, estimation of separate regressions shows there are some notable differences between the EPU effects for mining-firms and non-mining firms. Both *local* and *foreign* EPU exert a persistent negative impact on firms in mining and exploration industries, in contrast to the short-lasting effect on non-mining listed firms. Second, the interactions between local and foreign EPU with proxies for investment irreversibility are added into the baseline firm-level regression, and the test indicates that firms with higher capital intensity and greater levels of sunk costs are strongly impacted by policy uncertainty originating from China. Third, further tests indicate that the negative impact of local and foreign policy-based uncertainty is more profound for relatively smaller firms, firms with lower cash-flows, and loss-making firms.

This study makes several contributions. First, it adds to the emerging literature on policy-related uncertainty and corporate policies such as investment, innovation, mergers and acquisitions and tax policies. Second, it contributes to the literature on uncertainty and investment by presenting novel evidence on the spillover effect of policy-related uncertainty on firm-level economic outcomes such as corporate investments. There is little prior research examining the link between news-based policy-related uncertainty transmitting from other economies and firm-level corporate investment. Third, the findings in this study provide insights for policy makers into the joint effect of local and foreign policy uncertainty on investments and ways of limiting possible adverse effects. Finally, this study also contributes to the very limited research on investments in Australia.

The remainder of Chapter 3 proceeds as follows. Section 3.2 briefly reviews the literature and develops the hypotheses and empirical predictions. Section 3.3 describes the EPU measures and explains the research methodology. Section 3.4 describes data sources and provides summary statistics of key variables. Section 3.5 discusses the empirical SVAR results and the dynamic responses of aggregate investment to local and foreign policy uncertainty shocks. Section 3.6 examines how firm-level capital investment is associated with local and foreign policy-inducing uncertainty. Section 3.7 concludes and discusses the implications of this study.

## 3.2 Literature review and hypothesis development

### *3.2.1 Measuring economic policy uncertainty*

Finding an appropriate measure of EPU is a significant empirical challenge. Despite their imperfections, text-based measures of EPU have facilitated empirical analysis of the causal effects of policy uncertainty through various macro- and micro-channels. The most prominent index in the extant literature is outlined by Baker et al. (2016). With more than 6,000 citations on Google Scholar, their index has provided a solid foundation for the recent growth in interest in the effects of EPU. Their index is based on the frequency in major newspapers of terminology related to policy uncertainty. In their framework, media articles are counted as discussing EPU exclusively when language for each of the three specified economic, policy, uncertainty categories are present. To control for the changing volume of a newspaper's overall content, the number of policy uncertainty articles is scaled by the total number of articles in a given newspaper, and is then normalized to unit standard deviation, so as to facilitate averaging across standardized values. The procedure avoids many issues that would otherwise arise from using raw frequency of the coverage of EPU articles in news media outlets.

As the main component of the Baker et al. (2016) index is constructed using newspaper textual analysis and not by directly estimating any relevant economic indicators, their approach raises concerns about whether media coverage frequency could encapsulate a reliable, accurate, and consistent measure of EPU. In order to address this concern, the authors first conduct an extensive audit of ten thousand randomly selected articles from major US news outlets. They conclude their human- and computer-constructed indices are highly correlated (0.86), and false negatives and false positives (i.e., the discrepancy between those generated by human and computers), are not correlated with the aggregate level of EPU or real GDP growth. Second, they find the EPU indices based on right-leaning and left-leaning newspapers co-move with extremely high correlation (0.92), indicating that political slant does not pose an issue for their methodology.

Similar to the methodology to construct the text-based EPU index for the US, the Australian EPU index is measured using textual archives from eight leading Australian newspapers from January 1998 onwards. Table B1 presents a correlation matrix between the measure of Australian EPU and other indicators of economic uncertainty, such as the VIX index of 30-day implied volatility on the S&P/ASX 200 stock market index and survey-based business confidence and consumer sentiments provided by OECD Statistics. This Australian VIX implied volatility index is the market's expectation of volatility over the next 30-days from security option prices, depicting uncertainty about future equity returns and investor sentiments for Australian listed firms. Meanwhile, the OECD monthly survey of business confidence measures firms' expectation of business conditions for the upcoming months.

[Table B1 about here]

The Australian EPU index is positively correlated with the Australian VIX (0.463) and significantly negatively associated with survey-based business confidence (-0.407). This provides an insight into an endogeneity issue partly triggered by omitted variable bias. Policy uncertainty is highly likely to comove with other measures of general economic uncertainty as well as firms' investment opportunities. In other words, much of variation in economic outcomes, such as domestic consumption and corporate investment, attributed to the volatility of EPU indeed derives from fluctuations in the overall economic environment.

[Figure B1 about here]

Figure B1 plots the volatility of the Australian EPU index and the Australian VIX index, measured by their standard deviations from the series mean for each index. The figure clearly demonstrates that although the two series appear to covary to a certain extent, the association exhibits several periods of marked divergence, for instance during the global financial crisis (2008-2009) and the period of 2015-2017. It also indicates that there is an upward drift in policy uncertainty observed between 2008 and 2020. Overall, this suggests that despite some information overlap between the index for EPU and that for general economic uncertainty, they each contain unique information. The relatively high correlation between the Australian EPU index and the Australian VIX index (0.463) seemingly provides an opportunity to observe whether EPU could be driven by levels of near-term market volatility.

[Figure B2 about here]

Figure B2 illustrates the spread between the z-scores of the Australian EPU and the Australian VIX index from January 2008 to December 2020. The area chart shows two remarkable points. First, the spread was negative from the beginning of 2008 till the middle of 2010, suggesting that the variation in other confounding market forces outweighed that of policy-based uncertainty in the given period. The negative magnitude was more pronounced during the deep financial crisis of late 2008 – 2009. After 2010, the spread became positive, suggesting higher policy-inducing uncertainty compared to general economic factors, and it reached a peak in the middle of 2016 when Australian federal election and Brexit vote occurred almost at the same time. This indicates unpredictability about future economic policy is a dominant source of uncertainty post-financial-crisis. Hassett and Sullivan (2016) argue that the upward trend for EPU can be partially attributed to the heightened political polarization in recent years, while Baker et al. (2014) suggest that this is evidence of the increasing role of the federal government in modern economy. Although this has interesting implications, the question is left for future research to answer.[19]

Although there is also a voluminous literature studying the link between political elections and real economic activities and financial markets, the focus of this study is on the effects of EPU. The use of political elections as a measure of uncertainty has several limitations that are less present in measures of EPU such as that developed by Baker et al. (2016). For example, to the extent that the timing of elections is known in advance, rational market participants should expect that election cycles may have predictable consequences on real economic effects. In other words, the occurrence of election itself would not be expected to have significant impact on real economic activity, because the market has already reflected or impounded the predictable election outcomes (Cornell, 1999).

A further drawback of using an election indicator to capture uncertainty is that it assumes policy uncertainty does not alter during non-election years. Even though election cycles provide a potentially exogenous setting for fluctuation in uncertainty, they fail to capture temporal fluctuations in policy-based uncertainty. A large portion of uncertainty-inducing events are likely to happen between federal elections in Australia. Three such examples are the global financial crisis (2008-2009), the US debt ceiling disputes (2011), and the US-China trade war (2018).

[19] In extant literature, these studies are overwhelmingly US-based, and use federal as well as state elections as proxy for political uncertainty. Examples include Li and Born (2006), Gao and Qi (2012), Chen, Cihan, Jens and Page (2018), Cao, Li and Liu (2019).

### *3.2.2 The Australian setting*

The majority of the extant EPU literature focuses on the US setting (Nagar, Schoenfeld and Wellman, 2019; Bonaime, Gulen and Ion, 2018; Nguyen and Phan, 2017; Jens, 2017). The Australian setting differs from the US in that (1) a significant proportion of listed firms are from the resources and mining industries with investment projects being proceeded in stages; and (2) the Australian economy, especially its exports and imports, is heavily dependent on countries from the Asia-Pacific economic region. Exploring the unique setting of the Australian market, the thesis aims to examine the impact of policy uncertainty on capital investment from both macro- and micro-economic perspectives.

The real options theory suggests that firms weigh the profit difference between current and future investments due to the irreversibility nature of investment projects. Policy-related uncertainty increases the value of the option associated with waiting and the return on waiting for future investment, thereby discouraging corporate current investment spending (Julio and Yook, 2012; Gulen and Ion, 2016). However, policy uncertainty can also encourage firm-level investment. The growth options theory suggests that, when firms have investment lags in completing projects with several stages due to time-to-build or time-to-develop, the value associated with future growth options increases with uncertainty. Hence, there can be a positive association between policy uncertainty and investment (Bar-Ilan and Strange 1996; Weeds 2002). Consistent with this view, Atanassov et al. (2018) find that political uncertainty due to US gubernatorial elections stimulates firm-level R&D investment. Therefore, economic theories of investment under uncertainty in general suggest that the real effects of policy uncertainty depend on the properties of corporate investment.

Australia is an export-oriented economy and a resource-intensive country. Unlike US listed firms, the Australian market has a strong bias towards the resources and mining industries, and they account for around 40% of all listed firms (Lu et al., 2018). Investment projects in mining and resources firms are highly irreversible with significant sunk costs, but are often developed in several stages and have investment lags due to time-to-build considerations (Jotzo, Jordan and Fabian, 2012).

Thus, the nature of corporate investment among Australian firms leads to two competing effects of policy uncertainty on firm-level investment. It is an empirical question as to whether policy-related uncertainty is positively or negatively associated with corporate investment in Australia. It is also possible that policy uncertainty has a non-linear relation with firm-level investment. Bloom, Bond and Van Reenen (2007) show that demand uncertainty has convex effects on corporate investment, especially in the short term when firms undertake investment at the plant level. In other words, the association between EPU and capital investment in Australia can be jointly driven by both the real options theory (bad news principles) and the growth options (good news principles).

The prevalence of Australian listed firms from the resources and mining industries also indicates that policy uncertainty can have a prolonged effect on corporate investment in Australia, compared to the US setting, due to the irreversible nature and time-to-build of investment projects. Thus, it is conjectured that economic policy uncertainty could be associated with corporate investment in Australia over a longer period than has been shown for US listed firms (Gulen and Ion, 2016; Chen et al., 2020). Overall, it is expected that domestic economic policy uncertainty may impact corporate investment in Australia in either direction (i.e., positive or negative). Therefore, the first hypothesis is stated in an alternative form as follows:

*Hypothesis 1: Local economic policy uncertainty is associated with capital investment in Australia.*

### *3.2.3 The spillover effects of foreign economic policy uncertainty*

If two economies are closely linked via international trade and/or financial markets, there will be a higher likelihood of EPU spillovers (Arellano, Bai and Kehoe, 2019; Marfatia, Zhao and Ji, 2020). Private capital investment in small open economies like Australia can be affected by both local and foreign policy uncertainty originating in closely-linked economies. The Australian economy has strong economic bonds with countries in the Asia-Pacific Economic Region (APEC).[20] Statistics show that (as at 2020) approximately 75% of Australia's total goods and services exports are to APEC countries, with exports to China accounting for 35%. China is also the Australia's biggest two-way trading partner (28.8% share of total two-way trading), followed by the United States (9.3% share). In addition, Australia's export mix is dominated by minerals and energy, with their 2020 share of total exports being almost 50% (Australian Trade and Investment Commission, 2020).

From a theoretical perspective, Fernandez-Villaverde et al. (2011) model uncertainty as stochastic volatility shocks and show that external uncertainty shocks are a key driver of business cycle uncertainty in small open economies (e.g., Australia). Empirical studies support this view and find that uncertainty shocks originating in the US transmit to other economies (Mumtaz and Theodoridis, 2015) and trigger business cycles at an international level (Kim, 2001; Colombo, 2013). Mumtaz and Theodoridis (2015) find that a one-standard-deviation increase in the volatility of US shocks leads to a decline in UK gross domestic products (GDP) and a rise in the UK consumer price index (CPI). Colombo (2013) shows that policy uncertainty shocks originating in the US exert greater impacts on European output fluctuations.

Australia has a strong bilateral relationship with the United States and China in terms of economic bonds and trade complementarities over years. Hence, the impacts of policy

[20] Asia-Pacific Economic Region is an inter-governmental forum for 21 member economies in the Pacific Rim that promotes free trade throughout the Asia-Pacific region. APEC is recognized as one of the highest-level multilateral blocs and oldest forums in the Asia-Pacific region and exerts a significant global influence.

uncertainty originating from China and the US are considered separately, given the importance of China and the US as Australia's two biggest trading partners. Thus, the second hypothesis is stated as follows:

*Hypothesis 2a: Chinese economic policy uncertainty is associated with capital investment in Australia.*

*Hypothesis 2b: United States economic policy uncertainty is associated with capital investment in Australia.*

#### *3.2.4 The relative importance of local versus foreign EPU on capital investment decisions*

Several studies have examined international spillovers of uncertainty (Carrière-Swallow and Céspedes, 2013; Handley, 2014; Jones and Olson, 2015; Gabauer and Gupta, 2018). Carrière-Swallow and Céspedes (2013) investigate the effects of an uncertainty shock originating from the US on different developed and developing countries. They present evidence that developed economies experience a rapid drop and rebound in investment with private consumption nearly unaffected. In contrast, they find that emerging economies suffer a much more sizeable and persistent fall in investment. Jones and Olson (2015) investigate the effects of US uncertainty shocks on the Japanese and British economies with VAR models. Their results confirm that uncertainty shocks originating from the US have international effects.[21]

This study extends prior analysis to carefully consider the relative importance of local and foreign policy uncertainty in affecting corporate investment in Australia. Investment theories suggest that foreign policy uncertainty, alike local policy-related uncertainty, can have a positive, negative or even non-linear relationship with firm-level investment. While most of

[21] The US uncertainty shocks reduce domestic investment and domestic demand under the real options theory, which in turn lower interest rate in equilibrium and depreciate USD. Lower domestic output and a weaker domestic currency foreshadow a drop in foreign exports (i.e., from Japan and the UK), causing foreign outputs to decline due to a drop in aggregate demand.

the extant literature relies on aggregate data to examine how US EPU impacts economic output in other countries, this study focuses on how multiple sources of EPU (i.e., *local* versus *foreign*) impacts investment activity in Australia. Hence, the third hypothesis is stated as follows:

*Hypothesis 3: Foreign policy uncertainty is relatively more important in affecting corporate investment by Australian firms than local policy uncertainty.*

### 3.3 Research design

At the aggregate level, structural vector autoregressive models are used to identify local and foreign uncertainty shocks. Their relative importance in explaining variations in Australian gross fixed investment are identified via impulse response functions and decomposition of forecast error variance. At the firm-level, standard investment-cash flow sensitivity regressions are extended by including measures of *local* and *foreign* EPU.

#### *3.3.1 Implementation of structural vector autoregression*

The use of vector autoregressive models (VAR) has evolved as a standard approach in econometrics (Sims, 1980). Generalized VAR models explain the endogenous variables solely by their own history, apart from deterministic regressors. In contrast, structural vector autoregressive models (SVAR) allow the explicit modeling of contemporaneous interdependence between the left-hand side variables.

In its basic form, a VAR consists of a set of K endogenous variables $y_t = (y_{1t}, \dots, y_{kt})$. The VAR(p)-process is then defined as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + u_t \quad (1)$$

in that $A_i$ are $(K\ x\ K)$ *coefficient matrices* for $i = 1, \dots, p$ and $u_t$ is a $K-$dimensional process with $E(u_t) = 0$ and *covariance matrix of error terms* $E(u_t u_t') = \sum$ (white noise).

A SVAR model is in a structural form and defined as:

$$Ay_t = C_1 y_{t-1} + C_2 y_{t-2} + \cdots + C_P y_{t-p} + B\,\varepsilon_t \quad (2)$$

It is assumed that the structural errors, $\varepsilon_t$, are white noise and the coefficient matrices $A_i^*$ for $i = 1, \dots, p$, are structural coefficients that differ in general from VAR.

In order to see the key difference, both sides of Equation (2) are multiplied by the inverse of A:

$$y_t = A^{-1}C_1 y_{t-1} + A^{-1}C_2 y_{t-2} + \cdots + A^{-1}C_P y_{t-p} + A^{-1}B\,\varepsilon_t \quad (3)$$

which implies the following set of relationships,

$$A^{-1}C_i = A_i \quad (4)$$

$$u_t = B\,\varepsilon_t \quad (5)$$

for $i = 1, \dots, p$,

$$A^{-1}BB'A^{-1'} = \sum \quad (6)$$

A SVAR model can be used to identify and trace shocks by employing impulse response functions (IRF) or forecast error variance decomposition (FEVD) through imposing restrictions on the matrices $A$ and/or $B$. The most common identification is that $A$ is set to be $I_K$ and $B$ to be a lower-triangular matrix, placing zeros all entries above the diagonal. This identification turns Equation (6) to a reduced form as follows:

$$BB' = \sum \quad (7)$$

There is a unique lower-triangular matrix $B$ that satisfies conditions, and thus the structure can be uniquely recovered from the reduced form. This identification scheme is usually called 'Cholesky identification' because the matrix can be recovered by taking a Cholesky decomposition of $\sum$.

FEVD is a common econometric tool used to assess the relative importance of different structural shocks in business cycle fluctuations. The SVAR literature allows a multitude of possibilities for identifying general economic volatility, monetary policy, and demand shocks, and the dynamic response of macroeconomic variables to each of them. In short, FEVD is advantageous for determining the contribution of structural shocks to macroeconomic outcomes.

Jurado, Ludvigson, and Ng (2015) use FEVD to study the quantitative importance of economic uncertainty shocks for fluctuations in production and employment. They develop a comprehensive measure of aggregate uncertainty and show that such uncertainty shocks are associated with around four times the change in production and employment in comparison with CBOE Volatility Index VXO shocks, which are another common proxy for general economic volatility. Kim (2001) also employs FEVD to examine the role of US monetary policy shocks in explaining variation in trade balances, industrial production and GDP. Colombo (2013) and Cheng (2017) investigate the spillover of US EPU to Europe and South Korea, respectively. Using a FEVD analysis, both studies conclude that the contributions of US policy uncertainty shocks on local aggregate variables exceed those of local uncertainty shocks.

### *3.3.2 Baseline SVAR regression*

As a small open economy, the Australian economy is expected to be relatively susceptible to foreign shocks. In this regard, it is possible that foreign uncertainty shocks affect Australian economic outcomes differently than local shocks. As mentioned in Section 3.2, this study exclusively focuses on economic policy uncertainty originating from the United States and China because Australia has a long-term bilateral relationship with both of them based on strong economic and trade complementarities.

To test this conjecture, the study uses the EPU index developed by Baker et al. (2016) for the US, China, and Australia, respectively, to separate foreign and domestic uncertainty shocks. For consistency, only the news-based component of the US policy uncertainty index, available from 1985 onwards, is used in the main analysis. For China, the South China Morning

Post (SCMP) news-based EPU index runs from 1995 to the present. For additional analysis, the global EPU index is also employed as a composite proxy for foreign EPU factors.

$$y_t = A^{-1}C_1 y_{t-1} + A^{-1}C_2 y_{t-2} + \cdots + A^{-1}C_P y_{t-p} + A^{-1}B\,\varepsilon_t$$

As a baseline model, the six-variable SVAR is estimated for measuring the spillover of the US or Chinese EPU on Australian macroeconomic factors. From the above equation, the vector $y_t$ has the following order:

$$y_t = [Foreign\_EPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$$

where *Foreign_EPU* is the proxy for foreign news-based EPU, and *AUEPU* is the measure of Australian EPU. *ASX500* is the natural logarithm of ASX500 index as a measure of capital market volatility. *RBAR* is the cash rate as a monetary policy instrument. *AUGPDI* is natural logarithm of gross domestic fixed investment in the private sectors, and *AUGDP* is natural logarithm of gross domestic product as a proxy for aggregate demand conditions.

As a Choleski decomposition is imposed, *B* is set to be a lower-triangular matrix. Given Equation (5), the regression residuals $u_{it}$ are composed of six shocks, such that:

$$\begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \\ u_{4t} \\ u_{5t} \\ u_{6t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 \end{bmatrix} \text{x} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix}$$

In this model, *foreign* EPU (i.e., EPU for either the US or China) is ordered ahead of all the Australian macroeconomic factors. This assumes that domestic shocks affecting the Australian economy have no contemporaneous effects on EPU originating from foreign countries. Given Australia's economic status, there is very little likelihood that Australian EPU will influence the US or China. Meanwhile, the matrix of coefficient *A* is predetermined to be $I_K$. The small open economy assumption is achieved by shrinking the parameters on Australian variables in the foreign EPU equation (i.e., first-order in SVAR) to zero.

Thus, this identification scheme not only allows for *foreign* uncertainty shocks to contemporaneously affect the Australian economy but also restricts the response of the US or Chinese EPU such that it does not react to any of the Australian macro-level variables. Identification is based on two lags because both the Akaike information criterion and Hannan–Quinn information criterion test suggest that a lag length of two has a significant and relatively low coefficient for the baseline regression (Beveridge and Nelson, 1981; Lutkepohl, 2005; Seymen, 2008).

For extended models, the foreign block (i.e., the US and China) is ordered prior to the Australian block. This assumes that foreign macroeconomic variables are externally driven and do not respond to contemporaneous shocks in Australian domestic variables. Furthermore, the effect of EPU shocks is identified by ordering the policy-related uncertainty indexes first within each foreign and domestic block. This approach is similar to the identification scheme used in Caggiano et al. (2014) and Cheng (2017). Identification is based on two lags and a Cholesky decomposition with the following ordering.

- The set of the US macroeconomic variables as a foreign block:

$$y_t = [USEPU_t, SP500_t,\ FRR_t, USGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$$

- The set of Chinese macroeconomic variables as foreign block:

$$y_t = [CNEPU_t, SZSE_t,\ PBOCR_t, CNGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$$

All variables, except EPU and cash rates, are expressed in natural logarithms. Variable definitions can be found in Appendix A.

### *3.3.3 Baseline OLS regression*

The baseline regression model is as follows:

$$\frac{CAPX_{i,t+l}}{TA_{i,t+l-1}} = \alpha_i + \beta_1 EPU_{i,t} + \beta_2 TobinQ_{i,t} + \beta_3 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_4 Leverage_{i,t} + \beta_5 Sales\_Growth_{i,t} + \beta_6 Cash_{i,t} + \delta M_t + \varepsilon_{i,t+l} \qquad (8)$$

where capital expenditure (*CAPX*) is in the next *l* years ($l \in \{1,2,3,4\}$). Local policy uncertainty (*AUEPU*) is measured as the natural logarithm of the arithmetic average of monthly Baker et al. (2016) index values for Australia within a fiscal year. Because the time-series of this newspaper-based index may capture policy-related uncertainty as well as underlying economic fluctuations, several variables are included to control for confounding sources of uncertainty and expectations about future economic conditions. Annual *GDP growth* is used as a proxy for current demand conditions, while the *VIX* volatility index, provided by CBOE, is proxied for market sentiment related to general economic uncertainty.

Following Bonaime, Gulen and Ion (2018), the study further controls for *investment opportunities* as the first principal component of the following three variables, that is composite leading indicator, survey-based business confidence and survey-based consumer confidence (provided by OECD Statistics for the Australian market). A federal election indicator is included to control for political risks. In accordance with the prior literature, additional independent variables are Tobin's $q$, cash flow scaled by lagged total assets, leverage (total debt divided by total assets), year-on-year sales growth and cash holdings (cash including short-term deposits divided by total assets). Standard errors are adjusted for heteroscedasticity with the White (1980) correction and clustered by firm and by fiscal year. Variable definitions are provided in Appendix A.

The magnitude of *foreign* uncertainty shocks is measured by extracting the variation in each of the foreign policy uncertainty indices (i.e., China and the US) that are unexplained by the Australian text-based EPU index. Specifically, this is identified by estimating the monthly time-series regression as follows:

$$EPU_{Foreign} = \alpha_i + \beta_1 AUEPU_{i,t} + \varepsilon_{i,t}$$

The residual term $\varepsilon_{i,t}$ represents a measure of EPU originating abroad independent of local Australian policy uncertainty. The monthly residuals are then combined to create an annualized measure. $REPU_{i,t}$ is the natural logarithm of the average of the residuals corresponding to firm's *i* in fiscal year *t*, and this measure is added to the baseline regression to assess the relative magnitude of local and foreign EPU on firm-level capital expenditure by Australian firms.

$$\frac{CAPX_{i,t+l}}{TA_{i,t+l-1}} = \alpha_i + \beta_1 AUEPU_{i,t} + \beta_2 REPU_{i,t} + \beta_3 TobinQ_{i,t} + \beta_4 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_5 Leverage_{i,t} + \beta_6 Sales\_Growth_{i,t} + \beta_7 Cash_{i,t} + \delta M_t + \varepsilon_{i,t+l} \qquad (9)$$

### *3.3.4 Cross-sectional heterogeneity*

The real options theory suggests that firms weigh the profit difference between current and future investments due to the irreversibility nature of investment projects. Cross-sectional heterogeneity is examined by adding to the baseline regression variables that capture the interaction between EPU measures and several proxies for firm-level varying degrees of irreversibility, including capital intensity, sunk cost index, and durable index.

$$\frac{CAPX_{i,t+l}}{TA_{i,t+l-1}} = \alpha_i + \gamma_t + \beta_1 AUEPU_{i,t}.\ IR_{i,t} + \beta_2 REPU_{i,t}.\ IR_{i,t} + \beta_3 TobinQ_{i,t} + \beta_4 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_5 Leverage_{i,t} + \beta_6 Sales\_Growth_{i,t} + \beta_7 Cash_{i,t} + \varepsilon_{i,t+l} \qquad (10)$$

For the purpose of identifying cross-sectional effects, there is no interest in the average impact of EPU on investment. Hence, a time fixed effect $\gamma_t$ is used instead of *EPU*, which also has the advantage of controlling for other macroeconomic, firm-invariant factors having a confounding effect with policy-based uncertainty.[22] Hence, there is no vector of macroeconomic controls $M_t$ in Model (10).[23]

[22] However, the time fixed effects do not control for the possibility that these confounding forces may operate through the investment opportunities channel. To mitigate the issue, model (10) is replicated by adding the interaction between three proxies for investment irreversibility and first principal component of leading economic indicators in untabulated tests. The results are very similar to those reported in Table 9.

[23] In untabulated tests, model (10) is estimated but includes both EPU and macro-level controls $M_t$ without time fixed effect. The coefficients on EPU are basically similar to those reported in Table 7.

Moreover, given the vital role of mining industries in the Australian economy (around 50% of total commodity exports), sample observations are split into two groups, namely mining firms and non-mining firms. Cross-sectional variation in the impact of EPU on corporate investment is further investigated by identifying selected firm characteristics (firm size, loss reporter, cash flow, cash holding, and leverage), and then adding equivalent dummy variables capturing above median values and their interactions with the measures of local and foreign EPU.

### *3.3.5 Constructing proxies for investment irreversibility*

Following Gulen and Ion (2016), several different proxies are used to capture the extent to which corporate investments are irreversible (i.e., the cost of adjusting capital downwards). First, an industry-year capital intensity index is constructed. To do this, the ratio of net PPE scaled by total assets is calculated for each firm, and then aggregated at the six-digit GICS code by taking the averages of the firm-level ratio. Finally, a dummy variable is created that takes a value of one for industries with values above the sample median, and zero for the remaining.

Second, a sunk cost index is derived from firms' depreciation expense and past sale of PPE. Two separate measures are calculated, namely depreciation expense and sales of PPE over the last three years, scaled by lagged PPE. Next, the industry-average levels of these measures are aggregated, based on the six-digit GICS codes. A dummy variable is coded zero if both these measures are above the median, and one if at least one of the industry proxies falls below the median. The intuition is that sunk costs are lower for firms operating in industries with rapidly depreciating capital and which have more liquid markets for pre-owned capital equipment.

Third, Shleifer and Vishny (1992) suggest that highly cyclical industries are more affected by negative demand shocks that reflect general economic volatility. Thus, firms operating in such industries tend to have a higher level of investment irreversibility due to the lower recovery of their capital assets. Similar to Sharpe (1994), the correlation between each firm's annual sales and gross national product (GNP) is calculated, and then aggregated at the six-digit GICS codes. A dummy variable is created that takes a value of one for industries with correlation above the sample median, and zero for other industries. This methodology approximates splitting the full sample into durables and non-durables.

## 3.4 Sample selection and descriptive analysis

### *3.4.1 Macro-level data*

In line with the extant literature, this study uses the Baker et al. (2016) newspaper-based index as a proxy for national policy uncertainty in United States, Australia, and China. Each national EPU index reflects the relative frequency of own-country newspaper articles that contain key search terms related to the economy, uncertainty and policy-related matters. National BBD indices have been widely used and accepted in extant literature to compare the degree of EPU fluctuations across countries and regions. For example, Colombo (2013) uses EPU index to investigate the spillover effect of the US uncertainty shocks on the European countries, and Zhang et al. (2019) use EPU index for China and the US to study the impact of the US and China on various aspects of the global market, including stock, credit, energy and commodity markets. Thus, it is clearly shown that despite its imperfection, the standardized EPU measures could be useful in the cross-country studies to document the relative importance of different EPU sources.

For the US, the EPU index is constructed based on the monthly value-weighted average of three uncertainty components running from January 1985 to the present, namely newspaper-based uncertainty, tax-related uncertainty, and forecaster disagreement regarding government spending and the consumer price index. Gulen and Ion (2016) suggest that most of the explanatory power of the overall EPU index for the US comes from its news-based component. For Australian EPU, Baker et al. (2016) use text archives from eight Australian newspapers from January 1998 onwards to construct a policy uncertainty index in the same manner as the newspaper-based EPU index provided for the US. Therefore, empirical analysis mainly uses the newspaper-based uncertainty component for the US due to its overwhelming explanatory power relative to the other two components and for the purpose of comparability among national uncertainty indices. To measure EPU for China, the index is constructed based on a scaled frequency count of articles about policy-related economic uncertainty in the South China Morning Post (SCMP), Hong Kong's leading English-language newspaper.[24] The EPU data for China are available from January 1995.

China is a special case since there are two different EPU indices for China developed by two different research teams. On the one hand, Baker, Bloom, Davis and Wang (2013) argue that media censorship and state control pose a major challenge for measuring real EPU in mainland China. Consequently, they use the SCMP, a news media located in Hong Kong, to originally develop the EPU index for China given that Hong Kong has a free media tradition. On the other hand, Davis, Liu and Sheng (2019) suggest that mainland newspapers can provide a solid measure for estimating policy-related uncertainty in China from an insider's perspective. They develop another index for China using two mainland Chinese-language newspapers, that is, the Renmin Daily and the Guangming Daily, and their overall monthly EPU Index for China starts from October 1949 to the present.

The two China EPU indices tend to move together in response to a number of major shocks and events such as Asian Financial Crisis in 1997-1998; Global Financial Crisis in 2008, but there are some considerable divergences in time series. The index based on SCMP has

[24] The South China Morning Post (SCMP) is the first and largest Hong Kong English-language newspaper founded in 1903. Its contents cover economic news mainly regarding Mainland China, Hong Kong and Macau.

overall been higher than its mainland news-based counterpart since 2011 onwards.[25] The media bias in political views inherently reflects in the widening gap between the two EPU indices for China. Davis, Liu and Sheng (2019) mention that these differences are attributable to the fact that the mainland China newspapers are Chinese government tools to express and reflect policymakers' viewpoints in contrast to the SCMP-based index that shows a more objective perspective of independent editors and reviewers on mainland Chinese economic outlooks. Extant literature mostly uses the SCMP news-based EPU index for China instead of the Renmin Daily and the Guangming Daily news-based EPU index (Zhang et al., 2019; Zhang et al., 2015; Wang, Chen and Huang, 2014). Therefore, the SCMP-based EPU index will be utilized within the scope of this thesis.[26]

[Figure 1 about here]

Figure 1A plots the monthly newspaper-based indices of EPU for Australia, China, United States, while Figure 1B compares the newspaper-based policy uncertainty index for Australia, China and the US as a log-level deviation from trend, using the Hodrick and Prescott (1997) filter. The Hodrick and Prescott (1997) filter is a widely used method for removing trend movements in the business cycle, which can be applied to non-stationary time series. It is interesting to observe both the Australian and Chinese EPU indexes are more volatile than their US counterpart. Figure 1B also confirms that Australian EPU has a unique component that has not been driven by the US or Chinese EPU.

[Table 1 about here]

[25] There have been a series of political events occurring in China since 2011. China, the Communist Party-led nation, was in a set of political transitions in 2011-2012. In 2015, China posted its lowest annual GDP growth in twenty-five years, leading to a growing concern about a multiyear slowdown for the world's second largest economy. Starting from 2018, the China–United States trade war is an ongoing economic conflict between China and the United States.

[26] Additional analysis has been conducted using the hybrid index for China, which is an average of one based on the South China Morning Post and one based on two mainland newspapers. Untabulated test confirms that the key findings are not sensitive to this choice.

Table 1 presents the correlation matrix and descriptive statistics for the monthly national EPU indices. Table 1 (Panel A) shows that the standard deviation for the Australia news-based index is around 57, compared to 47 for the US. The EPU index for China has the highest standard deviation (159). The correlation coefficient between the Australian index and the US counterpart is 0.66, while the correlation coefficient between Australia and China is relatively weak (only 0.29). The high correlation between these uncertainty indices for Australia and the US presents the first empirical challenge about how to disentangle the relative importance of domestic and foreign EPU on capital investment.

The effects of foreign and domestic policy-based uncertainty shocks on the Australian economy are estimated through a structural vector autoregression model. The analysis starts by fitting a SVAR model to quarterly Australian macroeconomic variables (baseline SVAR model), and quarterly the US and Chinese macroeconomic outcomes (extended SVAR model) from 1998Q1 to 2019Q2. Aggregate capital investment data are only available at a quarterly frequency, not monthly. Macroeconomic data are retrieved from the US Bureau of Economic Analysis, Australian Bureau of Statistics, and OECD Statistics.

### *3.4.2 Firm-level data*

Data is collected from the Morningstar DatAnalysis Database combined with the SIRCA Share Price and Price Relative (SPPR) file for stock price data. The sample period starts from 1998 and concludes in 2017. The sample period is selected to match the availability of the Baker et al. (2016) index for Australia. From the initial sample of 35,158 firm-year observations over the given period, firm-years with (i) missing main variables, (ii) negative sales or (iii) negative or zero total assets are removed. This reduces the sample to 22,373 firm-years. Similar to Tran (2014), this study excludes firms with a clear sign of financial distress, as proxied by negative cash flows which exceed the opening value of total assests. Firms with a listing history of less than three consecutive years are also excluded (1,253 observations). These requirements result in a sample of 2,037 unique firms with 20,261 firm-year observations.

[Table 2 about here]

Table 2, Panel A presents summary statistics for all the financial variables. To reduce the impact of extreme outliers, all variables have been winsorized at the 1% and 99% level. It is noticeable that the mean and median of operating cash flows scaled by lagged total assets is negative. More than 50% of firm-year observations in the Australian sample have negative cash flows since a significant proportion of ASX-listed firms operate in the mining and resources industries.

Mining firms are firms operating in GICS Sector: Energy and GICS Sector: Material (GICS industry: Metals and Mining). In total, there are 7,978 firm-year observations for mining firms and 12,283 firm-year observations for non-mining firms. The proportion of mining firms in the sample is similar to the entire Morningstar universe (around 39.4%). The descriptive statistics shown in Panel A2 and A3 of Table 2 indicate significant differences in firm-specific variables between mining and non-mining industries. Firms operating in mining and resources industries have higher average values of deflated CAPX and sales growth, but higher average negative cash flows and much lower profitability.

A benchmark investment model is estimated by regressing corporate investment on Tobin's $q$ and cash flows for the total sample (Panel C1) and two subsamples of mining firms (Panel C2) and non-mining firms (Panel C3). The results reported in Panel C1 of Table 2 indicate that investment is positively correlated with Tobin's $q$, but negatively correlated with cash flows, which is consistent with a significant portion of mining firms having negative operating cash flows. In effect, the negative coefficient on cash flows is largely driven by the influence of negative cash flow observations (La Cava et al., 2005; Tran, 2014). Panel C2 confirms that the coefficient on cash flows becomes positive when firm-year observations for mining firms are excluded.

## 3.5 Macro-level analysis

### *3.5.1 The impacts of United States and Chinese EPU on the Australian economy*

#### *3.5.1.1 EPU originating from the United States*

Figure 2 illustrates the estimated impulse responses to a one standard deviation positive shock to US EPU, along with 68 percent confidence intervals. Sims and Zha (1999) suggest using 68 percent interval bands is better to capture the true estimation of uncertainty. In Figure 2A, a Cholesky decomposition is used with the following ordering: US EPU, Australian EPU, and Australian macroeconomic factors, including stock index volatility, money market rate, gross fixed investment in the private sector, and gross GDP. In Figure 2B, the analysis is repeated, but using the residual EPU values for the US (obtained by regressing US EPU on Australian EPU). In Figure 2C, the SVAR model is extended to consist of both foreign and domestic economic factors for the volatility in capital markets and aggregate demand. In the extended model, the US block is ordered before the Australian block.

[Figure 2A about here]

Figure 2A indicates that there is a significant spillover from US EPU to Australia. Policy uncertainty rises hugely in Australia immediately after a shock in its US counterpart. A one standard deviation shock to US EPU causes the stock index in Australia (ASX 500) to decrease by 3 percent immediately, and real GDP in Australia to maximally drop by 0.4 percent in the following two years. An uncertainty shock in the US also predicts a decrease in Australian interest rates. As a result, fixed investment in Australia tends to decrease initially following a one-standard deviation upward shock to the US EPU. The negative response of Australian aggregate investment gradually declines and becomes statistically insignificant after the fourth quarter. When using the *residual* US EPU in Figure 2B, the responses of all Australian macroeconomic factors become insignificant with extremely wide confidence intervals, consistent with the notion that there is a high level of spillover of economic policy uncertainty between two countries.

[Figure 2B about here]

Figure 2C displays the dynamics among the US macroeconomic factors and their Australian counterparts in response to the US EPU shocks. Overall, the model predicts that GDP and fixed investment in the United States will fall significantly up to four quarters into the future (one year) in response to the one-standard deviation shock in US EPU. The drop and rebound response of the US economic outcomes following an uncertainty shock is consistent with the real options theory of investment, which predicts that EPU discourages economic agents' behavior such as firm investment and consumer consumption due to the increasing value of the 'wait-and-see' option.

[Figure 2C about here]

The IRF models in Figure 2C further confirm the finding in the baseline model (Figure 2A) that a positive US EPU shock is estimated to trigger a considerable reduction in Australian GDP, money market rate and capital investment. However, the negative response of Australian aggregate investment is only in the short run (up to two quarters), as opposed to the long-lasting impact of a US EPU shock on Australian GDP. Relative to the baseline model (Figure 2A), the extended model in Figure 2C has better predictability since it generates much narrower error bands.

***3.5.1.2 EPU originating from China***

Figure 3 illustrates the estimated impulse responses to a one standard deviation positive shock to Chinese EPU, along with 68 percent confidence intervals. Similar to the analysis of US EPU, a Cholesky decomposition is used with the following ordering: Chinese EPU (Figure

3A) or residual EPU values for China (Figure 3B), Australian EPU, and Australian macroeconomic factors. In Figure 3C, a Chinese block for macroeconomic factors is further added to the baseline SVAR regression, and this foreign block is ordered ahead of the domestic one.

[Figure 3 about here]

There is a spillover from Chinese EPU to Australia EPU, but to a significantly lesser extent than that of the US counterpart. While policy uncertainty in Australia increases by more than 20 units in response to the US uncertainty shock, Australian EPU only rises by 10 units following an unexpected increase in Chinese uncertainty. However, it is noticeable that both Australian money market rates (i.e., RBA cash rate) and aggregate fixed investment respond strongly to Chinese uncertainty shocks.

The key result is that Australian capital investment is persistently lower than its steady state value after a one standard deviation Chinese EPU shock (Figure 3A). The negative effect is statistically significant up to 10 quarters ahead and moderate in terms of magnitude, that is Australian investment declines by around 1.5 percent immediately in the first quarter. In comparison with the domestic investment response to US EPU shocks, Chinese uncertainty is relatively more important in impeding Australian investment growth. Even in Figure 3B, when the residual China EPU is used, a positive *residual* China EPU shock is still predicted to trigger a significant decline in Australian capital investment more than one year ahead.

In Figure 3C, when further controlling for Chinese macroeconomic variables, Australian fixed investment and the RBA cash rate still respond negatively to an increase in Chinese EPU in the longer-run, with similar magnitude as Figure 3A but narrower error bands (i.e., better identification). It also suggests that Chinese EPU shocks significantly affect Australian stock volatility in the very short run and marginally impact Australian GDP.

### *3.5.2 The relative importance of the US and Chinese EPU on Australian economy*

#### *3.5.2.1 The contribution of the United States EPU shock*

Table 3 shows the contributions of US EPU shocks (as the foreign factor) and Australian EPU shocks (as the domestic factor) in explaining economic fluctuations in Australia. A forecast error variance decomposition (FEVD) analysis is conducted, and the results are evident over a horizon between one and sixteen quarters into the future.

[Table 3 about here]

In Column (1) for the baseline model, the volatility of US EPU plays a more vital role in predicting Australian investment and GDP than its Australian counterpart. US uncertainty contributes significantly to variations in Australian output, accounting for around 3 percent of FEV for Australian investment and 10 percent for GDP at the 16-quarter horizon. In sharp contrast, the model in Column (2) shows that Australian EPU's contribution to the FEV of Australian investment and GDP is more pronounced than the *residual* US EPU. The combined results from these two models confirm that Australian EPU and US EPU are extremely highly correlated, which suggests an empirical challenge in disentangling their relevant real effects on Australian economic outcomes.

One potential concern is that the newspaper-based EPU index may capture the effect of general economic uncertainty. Since events resulting in increasing US EPU also raise overall macroeconomic volatility on the global scale, it is possible that when businesses encounter policy uncertainty, they may well face other sources of uncertainty about external demand shocks. In other words, the evidence of US EPU in explaining Australian investment and GDP in the baseline model (i.e., specification 1) may be biased upward due to omitted variables. For the purpose of identification, it is essential to control for other possible confounding economic forces.

To address this concern, several aggregate variables for the US economy, such as stock index S&P 500 volatility, money market rate, US investment and GDP growth, are further controlled in specification (3). As a result, in the short run, the Australian variables are estimated to respond more strongly to US uncertainty shocks than to the Australian counterpart. US shocks explain around two percent of the variation in Australian aggregate investment at the two-quarter horizon. However, in the longer run, the change in Australian investment in response to the Australian uncertainty shock (1.8% at the fourth year) is twice as large as the response to US EPU (0.9%).

#### *3.5.2.2 The contribution of Chinese EPU shock*

Table 4 shows the contribution of Chinese EPU shock (as the foreign factor) and Australia EPU shock (as the domestic factor) to forecast error variance of Australian investment and Australian GDP. The results run for horizons between one and sixteen quarters into the future.

[Table 4 about here]

The results reported in Table 4 show that Chinese EPU plays an important role in explaining the volatility of fixed investment in Australia in the longer run. Shocks to Chinese EPU contribute significantly to variation in Australian investment, accounting for around 10 percent and 17 percent of FEV at the two-quarter horizon and the sixteen-quarter horizon in the baseline model (specification 1). However, in Column (1), the contribution of Australian EPU to domestic investment is strikingly small, raising possible identification concerns.

In Column (2), results using the residual Chinese EPU (from regressing Chinese EPU on Australian EPU), are more intuitive. The *residual* Chinese EPU is still dominant in terms of its contribution to variation in Australian investment (12 percent), doubling the contribution of local EPU shock at the 16-quarter horizon. The empirical results in Column (3) are relatively similar to the results in Column (2). More importantly, the three models in Table 4 confirm that

Chinese EPU shocks appear to be more relevant to Australian aggregate investment than its Australian counterpart.

[Table 5 about here]

In Table 5, to mitigate omitted variable bias, both of US and Chinese EPU is controlled in the structural model. The intuition is that if two economies share a close link in international trade, there is a likelihood of EPU spillovers. Investment behavior in Australia can be affected contemporaneously not only by US EPU but also by EPU originating from China. As shown in Table 5, a one standard deviation in US EPU contributes greatly to variation in Australian GDP (around 9 percent), but, to a much lesser extent, to Australian investment (less than 3 percent). In contrast, Chinese EPU accounts for around 14 percent of long-run variation in Australian fixed investment decisions.

[Table 6 about here]

In order to further alleviate omitted variable bias, other countries' EPU indices are added to the baseline model. Table 5 and Table 6 provide empirical evidence to corroborate the more profound impact of Chinese EPU in triggering variation in Australian aggregate investment. US EPU plays a minor role in explaining Australian investment, regardless of the fact that it is ordered first in both multi-country models. Therefore, it is safe to rule out potential bias due to the SVAR ordering.

In summary, the SVAR analysis, using impulse response functions and forecast error variance decomposition, suggests that *foreign* uncertainty appears to be a dominant source of uncertainty for Australia. The results show that foreign policy uncertainty shocks have significant and negative impacts on the Australian economy. External policy uncertainty shocks, especially originating from China, have a much more detrimental long-run impact on local capital investment. In term of magnitude, FEVD tests confirm Chinese EPU is five times more important than Australian EPU in explaining fluctuations in Australian aggregate investment.

### *3.5.3 Robustness tests*

The findings reported so far show that both foreign and local EPU shocks have negative effects on the Australian economy. However, the empirical results are sensitive to different model specifications. In this section, further analysis is conducted by re-examining the EPU effects under alternative model settings.

First, the baseline SVAR model is estimated with two lags based on the selection of the Akaike information criterion. To examine the extent to which this choice may alter the results, the model is re-estimated with one lag and three lags. Overall, the results remain robust to alternative lag length selection up to three lags.

Second, it is noticed that the EPU index for the US consists of three components while its Australian counterpart is exclusively constructed by media coverage frequency. For comparability, only the newspaper-based index for the US is deployed in all specifications. Robustness tests re-estimate the baseline and extended models by using an aggregate EPU index (three components) for the US. Untabulated tests confirm that the responses of Australian macroeconomic variables to the aggregate US EPU shocks are similar to those obtained in the baseline model using only the news-based component. It is unsurprising given that most of the explanatory power of the Baker et al. (2016) index for the US economy comes from its newspaper component (Gulen and Ion, 2016; Chen et al., 2020).

[Figure 4 about here]

Third, the global EPU index is used as a foreign factor to consider international spillovers to real economic activity in Australia. Figure 4 confirms that the global EPU fluctuations have a negative and significant effect on Australian investment, money market rate and stock index.

With regard to magnitude, aggregate fixed investment in Australia exhibits a peak decline of about one percent in response to an upward one-standard-deviation global EPU shock.

### 3.6 Firm-level analysis

#### *3.6.1 The average effect of local and foreign EPU on corporate investment*

Table 7 presents the empirical results from the regression of corporate investment on the newspaper-based EPU index for Australia and control variables using Australian firm-years from 1998 to 2017. The results indicate that when Australian EPU doubles, corporate investment in the next year declines by 0.147 standard deviations, which is equivalent to a 24.6% decrease in average investment.[27]

[Table 7 about here]

The results in Panel A of Table 7 support *Hypothesis 1* and, specifically, indicate that *local* EPU can have a significant and persistent effect on capital investment by Australian firms for up to four years ahead. The effect of *local* EPU remains economically and statistically significant beyond one year ahead, with an average decrease of 19.6% in the fourth year. The Australian evidence is consistent with the real options theory of investment, which suggests that policy-related uncertainty discourages corporate investments due to the real option value of 'wait and see' in the presence of adjustment costs or irreversibility (Bernanke, 1983; Bloom, 2009).

Testing *Hypothesis 2a*, Panel B of Table 7 shows the results from regressing firm-level annual capital expenditure on both *local* uncertainty in Australia and *foreign* uncertainty originating from China, as proxied by the residuals from regressing Chinese EPU on its Australian counterpart. Generally, the tests give empirical support to *Hypothesis 2a* and suggest

[27] The coefficient on the logged policy uncertainty variable can be interpreted as the number of standard deviations change in the independent variable value for each 100% increase in policy uncertainty.

that the negative effect of policy uncertainty from China on capital investment by Australian firms is statistically significant, and the effect could last up to three years.

In terms of magnitude, Panel B shows that a doubling of the *residual* EPU index for China is associated with a decline in Australian firms' investment of around 0.05 standard deviations in the second year and the third year. This equates to an 88 basis point decrease, being equivalent to around 8.05% of the sample average investment. A joint test of the sum of the coefficients over Years 1 to Year 3 confirms that the overall Chinese EPU effect, beyond that captured by Australian EPU, is negative and significant over the three years (coefficient = -0.081, Wald-test statistic = 58.76, *p*-value = 0.000). Put simply, uncertainty about future policy decided by the Beijing government exerts a long-lasting and economically significant influence on Australian firms' investment decisions.

Panel C and Panel D of Table 7 repeat this analysis but using US news-based EPU and the global composite EPU index respectively in the forms of the residuals from regressing each of those indices on its Australian counterpart. To test *Hypothesis 2b*, Panel C of Table 7 shows that policy uncertainty originating from the US, at least as measured by newspaper coverage frequency, does not have the incremental effect on Australian corporate investment. A joint test of the sum of the coefficients over years confirms that the negative US EPU effect is weak in magnitude and statistically insignificant (coefficient = -0.014, Wald-test statistic = 0.86, *p*-value = 0.352). Overall, these OLS results suggests that any US EPU effect is largely absorbed by Australian EPU. Hence, US policy uncertainty exerts only marginally incremental effects on corporate investment in Australia.

Meanwhile, Panel D shows when the composite global EPU (weighted on purchasing power parity adjusted GDP of 21 countries) increases by 100 per cent, it leads to an average decrease in Australian capital expenditure of 8.56% in the third year, and 7.55% in the fourth year. This *global* EPU incremental effect highlights the relevance of external, foreign uncertainty shocks in influencing Australian investment and economic growth.

### *3.6.2 Cross-sectional heterogeneity*

#### *3.6.2.1 Mining versus non-mining firms*

Because of the importance of mining industries in the Australian economy, accounting for around 50% of total commodity exports (DFAT, 2020), Table 8 presents regression results that examine the effects of local and foreign economic policy uncertainty on capital investment decisions made by mining and non-mining firms separately.

[Table 8 about here]

Overall, the basic results demonstrate a negative association between uncertainty about government policies and corporate investment in a broadly similar manner to the total sample results (Table 7). However, there are some notable differences between the results for mining firms reported in the first four columns and those for non-mining firms shown in the last four columns of Table 8. The results confirm that both domestic and foreign EPU have a persistent and negative effect on capital investment decisions made by listed firms in mining and exploration industries, in sharp contrast to the more short-lived effect of EPU for non-mining listed firms. A doubling of *local* EPU is significantly associated with a decline in investment of 30.4% up to four years later with respect to the average investment level among mining firms. The negative *foreign* EPU effects are also strongly evident for mining firm-years, as shown in Table 8.[28]

In term of magnitude, a doubling of the EPU index for China is associated with a decrease in investment of around 0.095 standard deviation in the second year for mining firms, which is

[28] Robustness tests are conducted by running separate regressions on large and small resources and mining firms (based on median market capitalisation). The results confirm that the EPU effects are strong for both larger and smaller resources and mining companies.

equivalent to 12.8% decrease in average investment rate in the mining subsample. This is a relatively large effect given that Chinese EPU is triple during the global financial crisis (2008-2009) and nearly four times higher in the period surrounding China's leadership transition (2012).

The sustained and significant EPU effect originating from China on Australian firms' investment can be attributed to a strong economic bond sharing between the two economies. China is by far the Australia's largest two-way trading partner in goods and services, and nearly 35% of Australia's trade exports have been to China (Australian Trade and Investment Commission, 2020). This is a clear indication why Chinese EPU can have a prolonged spillover effect on Australian corporate decisions, not only in mining industries but also in non-mining industries (up to three years ahead).

#### *3.6.2.2 Interactions with investment irreversibility*

Table 9 reports estimates of local and foreign EPU impact when three investment irreversibility proxies are interacted with the news-based EPU indices for Australia, the US and China, respectively. The results in general provide empirical support that investment irreversibility magnifies the effect of policy uncertainty on investment. As can be seen from Panel A of Table 9, firms operating in high *capital-intensive* industries are more impacted by EPU originating from China in the longer run than their low capital-intensive counterparts. In a similar manner, Panel B shows that a higher level of *sunk cost* is associated with the long-lasting negative effect of Chinese EPU on firm-level investment decisions (up to four years ahead). In contrast to the well-documented evidence of cyclical investment fluctuations (Bernanke, 1983), Panel C of Table 9 yields evidence that Australian firms in *durables* industries may actually increase their investment level following an increase in *local* news-based EPU, consistent with the growth options theory.

[Table 9 about here]

The results in both Panel A and Panel B confirm that while there is a marginally significant difference between investment decisions made by firms operating in high- and low-*capital intensive* and *sunk cost* industries in response to Australian EPU and US EPU, those firms are significantly different in the way they react to Chinese uncertainty. In other words, the more irreversible Australian firms' investment is, the more those investments are negatively affected by Chinese policy-based uncertainty.

### *3.6.3 Additional analysis*

This section examines the impact of EPU on firm investment based on various firm characteristics. Table 10 presents evidence on the effect of firm size in Panel A, profitability in Panel B, cash flows in Panel C, cash holdings in Panel D, and leverage in Panel E. *Small size* takes a value of one if total assets are below the sample median, and zero otherwise. *Loss* is equal to one if firms have negative net profit after tax as reported in Statement of Income. *Cash flow*, *Cash holdings,* and *Leverage* equals one if operating cash flow, cash plus short-term deposits, and total debt, all scaled by total assets are higher than the sample median, and zero otherwise. For ease of exposition, the table only shows the coefficient estimates of the variables of interest, that is, local and foreign news-based EPU and the interaction between EPU and firm indicators, but those OLS regressions do include control variables for macroeconomic volatility and firm-level variables.

[Table 10 about here]

Panel A shows that there is no statistically significant difference between investment decisions made by large firms and small firms in response to *local* EPU. However, small-firm capital investment decisions are more affected by *foreign* EPU originating from both China and the United States. The main reason why China EPU significantly affects the small

Australian firms' investments is due to the fact that these small firms are mostly Australian early-stage mining exploration entities. One common characteristic of those firms is at cash-burn stage with considerably long-run investment projects. In terms of economic magnitude, a doubling of Chinese EPU and US EPU are statistically associated with a decrease in small-firm investment by 0.088 and 0.041 standard deviations, respectively. Similarly, Panel B shows that there is a very marginal difference between loss-making firms and profit-making firms' investment decisions following an increase in *local* EPU, but the former is greatly affected by external shocks from China (with up to two years lag).

Panel C confirms that *cash flow* is a significant predictor for investment even under uncertainty. The results suggest that the long-lived negative relationship between policy uncertainty and corporate investment is significantly stronger for Australian firms with lower operating cash flows. On average, they are impacted not only by domestic EPU in the long run (in the fourth year) but also Chinese EPU in the shorter run (in the second year).

As can been seen from Panel D, the investment level of high *cash-holding* firms is significantly more affected by *local* EPU than that of low cash-holding firms in the longer run. This result seems counter-intuitive since Jacob, Wentland, and Wentland (2014) document that cash holdings can be used as a hedge against uncertainty to finance large investment projects. One potential explanation is that high levels of corporate cash may not indicate higher investment opportunities but imply a weak outlook for corporate investment. Finally, Panel E indicates that *high-leverage* firms are less affected by EPU than low-leverage firms.

Overall, the evidence presented in this section finds empirical support for the idea that not all listed firms in Australia are affected by policy uncertainty in the same way. The negative effect of EPU on capital investment is more profound for firms that are capital intensive, have higher sunk costs, are of smaller size, have lower cash flows, and which report losses.

### 3.7 Conclusions

Using a newspaper-based EPU index, the study documents a negative relationship between capital investment and the aggregate level of uncertainty associated with future policy outcomes in Australia. Also, there is evidence that both local and foreign policy uncertainty adversely impacts capital investment decisions by Australian firms. Policy uncertainty originating from China is relatively more important than corresponding US and local measures in depressing Australian investment growth. In general, Australia, as a small open economy, suffers a sizeable drop in investment following policy-related uncertainty shocks and this drop is considerably more persistent (up to four years) compared to short-lived EPU effect observed in larger economies (i.e., Japan and the United States) (Chen et al., 2020; Wang et al., 2014; Morikawa, 2016).

In order to examine the degree to which the EPU effect reflects the real options theory of investment (Bernanke, 1983; McDonald and Siegel, 1986; Pindyck, 1988), further analysis is undertaken in the presence of adjustment costs and/or investment irreversibility. There is strong evidence in support of this conjecture using multiple proxies for investment irreversibility, such as higher capital intensity and greater levels of sunk costs. Another dimension of cross-sectional heterogeneity is whether firms are operating in mining or non-mining industries. Firms are likely to have much a higher degree of irreversibility and time-to-build considerations associated with investment projects when in the mining and resource industries. By separately estimating EPU effects for mining and non-mining firms, the study confirms that *mining and exploration firms* are more negatively and significantly impacted by local and foreign policy-related uncertainty shocks, in sharp contrast to the short-lasting EPU effect on non-mining listed firms.

Corporate investments in small open economies can be affected by both local and foreign policy uncertainty originating from closely-linked economies. In theory, heightened policy uncertainty may strongly impede economic outcomes. The findings in this study provide a relatively complete picture as to how local and foreign policy-related uncertainty jointly affect capital investment at the aggregate and firm level. Extant research pays close attention to how EPU from the US influences economic outputs in numerous countries. In contrast, this study focuses on how multiple sources of EPU (i.e., local versus foreign) may affect agents' behaviors in Australia, which is an example of a small and open economy. The results thus have important practical implications by providing insights for policy makers and investors at the macroeconomic, industry and firm levels into the joint effect of local and foreign policy uncertainty on corporate investment decisions and how to mitigate the possible adverse impact.

More specifically, the relationship between Australia and China is complex and multifaceted, and any changes in Chinese policy can have significant implications for Australian firms. China is a largest trading partner of Australia, and Chinese policy uncertainty can have a range of impacts on the Australian economy, including decreased capital investment and increased volatility of capital markets (as shown in SVAR results of Figure 3). In terms of public policy debate, China's influence on Australian economy has been a topic of discussion in recent years.[29] As such, policymakers and businesses in Australia must carefully consider their strategies for dealing with China and navigating the challenges and opportunities that come with this relationship.

It is acknowledged that the mining and resources sectors have a wide range of firms with different sizes and operating conditions. In the absence of direct evidence, it is unclear how EPU affects the funding sources and investment decisions of mid-size and small mining

[29] In 2020, China imposed trade restrictions on Australian coal, barley, beef, cotton, wine and lobster imports, which had a significant impact on the Australian mining and agricultural industries. These restrictions led to a drop in demand for Australian goods, and as a result, many Australian companies had to find alternative markets for their products (Mizen, 2021).

exploration entities.[30] Hence, a possible avenue for future research is to assess whether EPU impedes or facilitates equity market capital raisings by these companies, and to explore the extent to which domestic and external, foreign EPU affect the performance of these companies and the strategies they adopt to manage their exposure to policy uncertainty shocks.

[30] A few of examples of Australian mid-size and small mining firms with large overseas projects are Resolute Mining, which raised $196 million to fund its African projects in 2020, and Perseus Mining, which raised $60 million to expand its operations in West Africa in 2021.

# Tables

## Table 1. Summary statistics for the Baker et al. (2016) EPU indices

Panel A: Descriptive statistics for the monthly newspaper-based EPU indices

| | Mean | Std. dev. | P25 | Median | P75 |
|---|---|---|---|---|---|
| Australia | 99.827 | 57.492 | 60.742 | 88.029 | 117.642 |
| United States | 121.076 | 46.505 | 86.658 | 110.699 | 148.450 |
| China | 170.054 | 158.842 | 77.089 | 113.684 | 205.628 |
| Japan | 108.930 | 35.430 | 84.288 | 103.134 | 124.465 |
| South Korea | 125.140 | 61.478 | 81.927 | 114.875 | 152.253 |
| United Kingdom | 120.338 | 68.543 | 70.793 | 111.793 | 149.028 |
| Singapore | 123.837 | 54.884 | 81.695 | 114.571 | 150.701 |
| India | 93.058 | 51.665 | 53.544 | 79.001 | 120.239 |
| Hong Kong SAR | 126.874 | 73.552 | 72.063 | 110.913 | 155.995 |

Panel B: Correlation matrix between each national EPU indices

| | Australia | United States | China | India | South Korea | United Kingdom | Singapore | India | Hong Kong |
|---|---|---|---|---|---|---|---|---|---|
| Australia | 1.000 | | | | | | | | |
| US | 0.662*** | 1.000 | | | | | | | |
| China | 0.285*** | 0.509*** | 1.000 | | | | | | |
| Japan | 0.642*** | 0.477*** | 0.209*** | 1.000 | | | | | |
| South Korea | 0.549*** | 0.724*** | 0.585*** | 0.330*** | 1.000 | | | | |
| UK | 0.553*** | 0.576*** | 0.569*** | 0.528*** | 0.539*** | 1.000 | | | |
| Singapore | 0.553*** | 0.779*** | 0.894*** | 0.618*** | 0.736*** | 0.707*** | 1.000 | | |
| India | 0.669*** | 0.424*** | 0.024 | 0.570*** | 0.360*** | 0.177** | 0.305*** | 1.000 | |
| Hong Kong | 0.420*** | 0.369*** | 0.410*** | 0.431*** | 0.429*** | 0.402*** | 0.514*** | 0.421*** | 1.000 |

The table presents summary statistics for the monthly newspaper-based EPU indices (Baker et al., 2016) used in macro-level analysis for the years 1998-2019, except India and Singapore with their index only available since 2003 onwards. Panel A presents descriptive statistics for EPU indices for each country, while Panel B illustrates the correlation matrix of EPU indices for selected countries. All EPU variables are measured at the monthly frequency. Data is available at www.policyuncertainty.com.

**Table 2. Summary statistics for the Australian firm-level sample over the years 1998 – 2017**

Panel A: Descriptive statistics for the Australian annual sample

| | Panel A1: Total sample | | | | Panel A2: Mining firms | | | | Panel A3: Non-mining firms | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | Std. dev. | Median | N | Mean | Std. dev. | Median | N | Mean | Std. dev. | Median |
| CAPX | 20,261 | 36.308 | 137.034 | 1.696 | 7,978 | 35.881 | 135.981 | 1.942 | 12,283 | 36.585 | 137.719 | 1.536 |
| PPE | 20,261 | 218.184 | 925.988 | 2.787 | 7,978 | 203.461 | 933.440 | 0.833 | 12,283 | 227.747 | 921.028 | 4.673 |
| Total assets | 20,261 | 648.743 | 2,411.717 | 34.260 | 7,978 | 490.716 | 2,270.422 | 20.804 | 12,283 | 751.384 | 2,493.947 | 48.070 |
| Total debt | 20,261 | 596.029 | 5,060.304 | 10.142 | 7,978 | 440.837 | 3,797.098 | 2.777 | 12,283 | 696.829 | 5,731.482 | 19.611 |
| Operating cash flows | 20,261 | 49.032 | 196.934 | -0.049 | 7,978 | 39.777 | 195.537 | -0.617 | 12,283 | 55.043 | 197.612 | 1.592 |
| Sales | 20,261 | 435.589 | 1,539.986 | 15.724 | 7,978 | 283.069 | 1407.039 | 1.289 | 12,283 | 534.654 | 1,612.853 | 39.470 |
| Cash holding | 20,261 | 75.257 | 650.228 | 3.777 | 7,978 | 63.400 | 575.455 | 3.003 | 12,283 | 82.959 | 694.409 | 4.420 |
| CAPX/Lag total assets | 20,261 | 0.109 | 0.183 | 0.042 | 7,978 | 0.171 | 0.232 | 0.088 | 12,283 | 0.068 | 0.126 | 0.031 |
| Tobin's *q* | 20,261 | 2.046 | 2.447 | 1.287 | 7,978 | 2.024 | 2.501 | 1.255 | 12,283 | 2.061 | 2.412 | 1.307 |
| Cash flow/Lag total assets | 20,261 | -0.031 | 0.236 | -0.003 | 7,978 | -0.070 | 0.231 | -0.052 | 12,283 | -0.006 | 0.236 | 0.041 |
| Leverage | 20,261 | 0.428 | 0.484 | 0.358 | 7,978 | 0.333 | 0.541 | 0.174 | 12,283 | 0.490 | 0.432 | 0.447 |
| Sales growth | 20,261 | 5.611 | 31.493 | 0.078 | 7,978 | 10.516 | 43.628 | 0.067 | 12,283 | 2.425 | 19.341 | 0.080 |
| Cash holding/Total assets | 20,261 | 0.197 | 0.229 | 0.103 | 7,978 | 0.226 | 0.239 | 0.138 | 12,283 | 0.178 | 0.220 | 0.084 |
| Dividend dummy | 20,261 | 0.352 | 0.478 | 0.000 | 7,978 | 0.138 | 0.345 | 0.000 | 12,283 | 0.491 | 0.500 | 0.000 |
| ROA | 20,261 | -0.251 | 0.761 | -0.028 | 7,978 | -0.353 | 0.852 | -0.109 | 12,283 | -0.185 | 0.687 | 0.020 |
| PPE/Total assets | 20,261 | 0.201 | 0.234 | 0.090 | 7,978 | 0.210 | 0.259 | 0.055 | 12,283 | 0.194 | 0.215 | 0.104 |

Panel B: Correlation matrix

| | CAPX/TA | Tobin's *q* | CF/TA | Leverage | Sales growth | Cash/TA | Dividend | ROA | PPE/TA |
|---|---|---|---|---|---|---|---|---|---|
| CAPX/TA | 1.000 | | | | | | | | |
| Tobin's *q* | 0.045*** | 1.000 | | | | | | | |
| CF/TA | 0.026*** | -0.222*** | 1.000 | | | | | | |
| Leverage | -0.089*** | 0.392*** | -0.010 | 1.000 | | | | | |
| Sales growth | 0.132*** | 0.007 | -0.041*** | -0.038*** | 1.000 | | | | |
| Cash/TA | 0.009 | 0.303*** | -0.274*** | -0.135*** | 0.063*** | 1.000 | | | |
| Dividend | -0.136*** | -0.110*** | 0.461*** | 0.061*** | -0.108*** | -0.258*** | 1.000 | | |
| ROA | 0.033*** | -0.406*** | 0.381*** | -0.384*** | -0.004 | -0.196*** | 0.290*** | 1.000 | |
| PPE/TA | 0.156*** | -0.117*** | 0.225*** | 0.122*** | -0.027*** | -0.320*** | 0.189*** | 0.113*** | 1.000 |

Panel C: Classic investment regressions using the Australian annual sample

| Dependent variable: CAPX/Total assets | Panel C1: Total sample | | | Panel C2: Mining firms | | | Panel C3: Non-mining firms | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| Tobin's *q* | 0.183*** | | 0.183*** | 0.194*** | | 0.189*** | 0.169*** | | 0.173*** |
| | (7.99) | | (8.19) | (7.50) | | (7.58) | (5.22) | | (5.42) |
| Cash flows | | -0.030* | -0.002 | | -0.074*** | -0.035 | | 0.039** | 0.056*** |
| | | (-2.05) | (-0.16) | | (-3.10) | (-1.53) | | (2.16) | (3.15) |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 19,404 | 19,404 | 7,683 | 7,683 | 7,683 | 11,721 | 11,721 | 11,721 |
| Adj. $R^2$ | 0.0328 | 0.0006 | 0.0327 | 0.0376 | 0.0041 | 0.0384 | 0.0237 | 0.0009 | 0.0257 |

Table 2 presents summary statistics for Australian annual sample. Data are obtained from Morningstar Aspect for the years 1998-2017. The sample consists of 2,037 unique firms with 20,261 firm-year observations. Panel A presents descriptive statistics of all firm-level variables for the whole sample used in this study (Panel A1) as well as the subsamples of mining firms (Panel A2) and non-mining firms (Panel A3), while Panel B shows pairwise correlation matrix among those variables. To reduce the impact of extreme outliers, all variables have been winsorized at the 1% and 99% level. In Panel C, I regress annual capital expenditure (CAPX/TA) on Tobin's *q* and operating cash flows for the whole sample (Panel C1), the subsamples of firms operating in mining (Panel C2) and non-mining industries (Panel C3). All specifications include firm- and year-fixed effects, while standard errors are clustered by firm and by year. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Table 3. Forecast error variance decomposition of Australian variables due to United States and Australian EPU shock**

Relative importance of local uncertainty versus foreign uncertainty in SVAR

*Fraction variation in Australian aggregate investment (percent)*

| Horizon | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| (quarters) | USEPU | AUEPU | RUSEPU | AUEPU | USEPU | AUEPU |
| 2 | 2.8 | 0.2 | 1.8 | 1.2 | 2.1 | 0.1 |
| 4 | 2.0 | 0.1 | 1.1 | 1.0 | 1.2 | 0.4 |
| 6 | 1.8 | 0.1 | 0.9 | 1.0 | 0.9 | 0.6 |
| 8 | 1.9 | 0.2 | 0.8 | 1.3 | 0.9 | 0.7 |
| 10 | 2.2 | 0.3 | 0.7 | 1.7 | 0.9 | 0.9 |
| 12 | 2.5 | 0.5 | 0.7 | 2.3 | 0.9 | 1.1 |
| 14 | 2.8 | 0.6 | 0.7 | 2.7 | 0.9 | 1.4 |
| 16 | 3.1 | 0.7 | 0.7 | 3.1 | 0.9 | 1.8 |

*Fraction variation in Australian GDP (percent)*

| Horizon | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| (quarters) | USEPU | AUEPU | RUSEPU | AUEPU | USEPU | AUEPU |
| 2 | 0.7 | 0.0 | 0.3 | 0.4 | 1.8 | 1.5 |
| 4 | 2.5 | 0.3 | 0.5 | 2.3 | 5.1 | 2.3 |
| 6 | 4.6 | 1.2 | 0.6 | 5.2 | 7.1 | 1.7 |
| 8 | 6.4 | 2.0 | 0.6 | 7.8 | 7.4 | 1.3 |
| 10 | 7.8 | 2.6 | 0.6 | 9.7 | 7.9 | 1.1 |
| 12 | 8.7 | 3.0 | 0.7 | 11.0 | 9.0 | 0.9 |
| 14 | 9.4 | 3.2 | 0.7 | 11.9 | 9.7 | 0.9 |
| 16 | 9.9 | 3.4 | 0.7 | 12.5 | 9.8 | 0.9 |

Table 3 shows the contributions of US EPU shock (as foreign factor) and Australian EPU shock (as domestic factor) to forecast error variance of Australian investment and Australian GDP.

SVAR identification is based on two lags and a Cholesky decomposition with the following ordering for each specification:
Specification 1: $y_t = [USEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$
Specification 2: $y_t = [USEPU\_residual_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$
Specification 3: $y_t = [USEPU_t, SP500_t,\ FRR_t, USGPDI_t, USGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

Employing quarterly SVAR, specification (1) orders US EPU ahead of Australian EPU and restricts the response of US EPU such that it does not respond to any of the Australian variables. Specification (2) replaces US EPU by the residuals from the regression of the US EPU values on the Australian EPU values, which represents the component of US EPU unexplained by Australian EPU. Specification (3) extends the baseline model by including more macroeconomic factors proxied for US economic outputs.

The data are quarterly and run from 1998Q1 to 2019Q2. Macroeconomic data are retrieved from the US Bureau of Economic Analysis, Australian Bureau of Statistics, OECD Statistics, and Internal Financial Statistics, while national EPU values are available at www.policyuncertainty.com.

**Table 4. Forecast error variance decomposition of Australian variables due to Chinese EPU and Australian EPU shock**

Relative importance of local uncertainty versus foreign uncertainty in SVAR

*Fraction variation in Australian aggregate investment (percent)*

| Horizon (quarters) | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| | CNEPU | AUEPU | RCNEPU | AUEPU | CNEPU | AUEPU |
| 2 | 10.0 | 0.5 | 8.5 | 2.1 | 11.4 | 2.4 |
| 4 | 11.6 | 0.3 | 9.5 | 2.4 | 12.1 | 4.2 |
| 6 | 12.8 | 0.2 | 10.2 | 2.8 | 12.6 | 4.4 |
| 8 | 13.7 | 0.3 | 10.5 | 3.5 | 13.2 | 4.4 |
| 10 | 14.6 | 0.4 | 10.9 | 4.2 | 13.6 | 4.4 |
| 12 | 15.5 | 0.5 | 11.2 | 4.8 | 13.7 | 4.4 |
| 14 | 16.3 | 0.6 | 11.6 | 5.2 | 13.6 | 4.4 |
| 16 | 16.9 | 0.6 | 11.9 | 5.5 | 13.4 | 4.4 |

*Fraction variation in Australian GDP (percent)*

| Horizon (quarters) | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| | CNEPU | AUEPU | RCNEPU | AUEPU | CNEPU | AUEPU |
| 2 | 0.0 | 0.3 | 0.1 | 0.2 | 0.0 | 0.1 |
| 4 | 0.0 | 2.0 | 0.6 | 1.4 | 0.0 | 0.1 |
| 6 | 0.0 | 4.6 | 1.1 | 3.5 | 0.1 | 0.3 |
| 8 | 0.0 | 7.0 | 1.5 | 5.5 | 0.2 | 0.8 |
| 10 | 0.0 | 8.9 | 2.1 | 6.8 | 0.7 | 1.4 |
| 12 | 0.1 | 10.3 | 2.8 | 7.6 | 1.8 | 1.9 |
| 14 | 0.4 | 11.3 | 3.6 | 8.0 | 3.2 | 2.2 |
| 16 | 0.7 | 12.1 | 4.6 | 8.1 | 4.9 | 2.4 |

Table 4 shows the contributions of Chinese EPU shock (as foreign factor) and Australian EPU shock (as domestic factor) to forecast error variance of Australian investment and Australian GDP.

SVAR identification is based on two lags and a Cholesky decomposition with the following ordering for each specification:
Specification 1: $y_t = [CNEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$
Specification 2: $y_t = [CNEPU\_residual_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$
Specification 3: $y_t = [CNEPU_t, SZSE_t, PBOCR_t, CNGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

Employing quarterly SVAR, specification (1) orders Chinese EPU, based on media coverage frequency from *South China Morning Post,* ahead of Australian EPU and restricts the response of Chinese EPU such that it does not respond to any of the Australian variables. Specification (2) replaces the Chinese EPU index by the residuals from the regression of its EPU values on Australian EPU values, which represents the component of Chinese EPU unexplained by Australian EPU. Specification (3) extends the baseline model by including more macroeconomic factors proxied for Chinese economic outputs.

The data are quarterly and run from 1998Q1 to 2019Q2. Macroeconomic data are retrieved from Australian Bureau of Statistics, OECD Statistics, and Internal Financial Statistics, while national EPU values are available at www.policyuncertainty.com.

**Table 5. Forecast error variance decomposition of Australian variables due to United States, Chinese, and Australian EPU shock (in percentage)**

| Variable | Horizon (quarters) | Economic policy uncertainty originating from | | |
|---|---|---|---|---|
| | | United States | China | Australia |
| *Australian investment* | 2 | 2.6 | 7.4 | 0.3 |
| | 4 | 1.8 | 9.4 | 0.2 |
| | 6 | 1.6 | 11.1 | 0.2 |
| | 8 | 1.8 | 12.0 | 0.2 |
| | 10 | 2.0 | 12.7 | 0.3 |
| | 12 | 2.3 | 13.3 | 0.4 |
| | 14 | 2.5 | 13.8 | 0.5 |
| | 16 | 2.6 | 14.2 | 0.5 |
| *Australian GDP* | 2 | 0.7 | 0.1 | 0.0 |
| | 4 | 2.5 | 0.6 | 0.3 |
| | 6 | 4.5 | 0.8 | 1.0 |
| | 8 | 6.4 | 1.0 | 1.8 |
| | 10 | 7.9 | 1.4 | 2.3 |
| | 12 | 8.9 | 2.0 | 2.6 |
| | 14 | 9.5 | 2.7 | 2.8 |
| | 16 | 9.9 | 3.6 | 2.9 |

Table 5 shows the contributions of US and Chinese EPU shocks (as foreign shocks) and Australian EPU shock to forecast error variance of Australian investment and Australian GDP.

SVAR identification is based on two lags and a Cholesky decomposition with the following ordering:
$y_t = [USEPU_t, CNEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

The data are quarterly and run from 1998Q1 to 2019Q2. Macroeconomic data are retrieved from Australian Bureau of Statistics, OECD Statistics, and Internal Financial Statistics, while national EPU values are available at www.policyuncertainty.com.

**Table 6. Forecast error variance decomposition of Australian variables due to EPU shocks from Australia's Top 5 major trading partners (in percentage)**

| Variable | Horizon (quarters) | Economic policy uncertainty originating from | | | | | |
|---|---|---|---|---|---|---|---|
| | | US | China | Japan | South Korea | UK | Australia |
| *Australian investment* | 2 | 1.8 | 7.3 | 1.3 | 0.0 | 0.3 | 1.1 |
| | 4 | 1.0 | 9.4 | 1.0 | 0.8 | 0.5 | 2.2 |
| | 6 | 0.8 | 10.9 | 1.1 | 1.9 | 0.7 | 2.2 |
| | 8 | 0.8 | 12.0 | 1.2 | 2.8 | 0.8 | 1.9 |
| | 10 | 0.8 | 13.1 | 1.2 | 3.7 | 1.0 | 1.7 |
| | 12 | 0.8 | 14.2 | 1.2 | 4.3 | 1.2 | 1.5 |
| | 14 | 0.8 | 15.3 | 1.1 | 4.8 | 1.4 | 1.4 |
| | 16 | 0.8 | 16.4 | 1.0 | 5.2 | 1.6 | 1.3 |
| *Australian GDP* | 2 | 0.7 | 0.2 | 0.3 | 2.3 | 3.5 | 0.0 |
| | 4 | 2.0 | 0.5 | 1.0 | 4.0 | 5.4 | 0.3 |
| | 6 | 3.8 | 0.5 | 1.6 | 5.2 | 4.9 | 0.9 |
| | 8 | 5.5 | 0.4 | 1.9 | 5.7 | 5.5 | 1.3 |
| | 10 | 6.9 | 0.3 | 1.9 | 6.1 | 6.4 | 1.5 |
| | 12 | 7.7 | 0.3 | 1.9 | 6.4 | 7.5 | 1.6 |
| | 14 | 8.1 | 0.2 | 1.7 | 6.7 | 8.4 | 1.6 |
| | 16 | 8.3 | 0.2 | 1.6 | 7.0 | 9.1 | 1.5 |

Table 6 shows the contributions of individual countries' EPU shocks to forecast error variance of Australian investment and Australian GDP.

SVAR identification is based on two lags and a Cholesky decomposition with the following ordering:
$y_t = [USEPU_t, CNEPU_t, JPEPU_t,\ KOEPU_t, UKEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

The data are quarterly and run from 1998Q1 to 2019Q2. Macroeconomic data are retrieved from Australian Bureau of Statistics, OECD Statistics, and Internal Financial Statistics, while national EPU values are available at www.policyuncertainty.com.

**Table 7. Local and foreign EPU and capital investment for Australian firms**

| Dependent variable: CAPX/Total assets | Panel A: Local news-based EPU | | | | Panel B: Foreign news-based EPU originating from China | | | | Panel C: Foreign news-based EPU originating from the United States | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | **-0.147*** ** | **-0.140** ** | **-0.124** ** | **-0.117*** ** | -0.151*** | -0.129** | -0.114** | -0.111*** | -0.145** | -0.144** | -0.117** | -0.114*** |
| | **(-2.98)** | **(-2.66)** | **(-2.75)** | **(-4.05)** | (-2.91) | (-2.64) | (-2.69) | (-3.68) | (-2.78) | (-2.66) | (-2.65) | (-4.14) |
| China EPU *Residuals* | | | | | **0.006** | **-0.044** ** | **-0.048** ** | **-0.024** | | | | |
| | | | | | **(0.32)** | **(-2.85)** | **(-2.67)** | **(-0.99)** | | | | |
| US EPU *Residuals* | | | | | | | | | **-0.004** | **0.009** | **-0.018** | **-0.008** |
| | | | | | | | | | **(-0.27)** | **(0.37)** | **(-1.17)** | **(-0.52)** |
| Tobin's *q* | 0.203*** | 0.065*** | 0.029* | 0.009 | 0.203*** | 0.066*** | 0.030* | 0.010 | 0.204*** | 0.065*** | 0.030* | 0.010 |
| | (8.85) | (4.51) | (1.84) | (0.62) | (8.80) | (4.62) | (1.89) | (0.63) | (8.88) | (4.53) | (1.87) | (0.63) |
| Cash flow | 0.006 | -0.016 | -0.053*** | -0.042*** | 0.006 | -0.016 | -0.053*** | -0.042*** | 0.006 | -0.016 | -0.053*** | -0.042*** |
| | (0.44) | (-1.40) | (-4.07) | (-3.16) | (0.44) | (-1.40) | (-3.98) | (-3.09) | (0.44) | (-1.40) | (-4.06) | (-3.17) |
| Leverage | -0.094*** | -0.003 | 0.016 | 0.053* | -0.093*** | -0.003 | 0.015 | 0.052* | -0.094*** | -0.003 | 0.016 | 0.053* |
| | (-4.22) | (-0.13) | (0.84) | (1.91) | (-4.24) | (-0.16) | (0.77) | (1.88) | (-4.23) | (-0.13) | (0.83) | (1.91) |
| Sales growth | 0.022** | 0.008 | 0.002 | 0.018 | 0.022** | 0.008 | 0.002 | 0.018 | 0.022** | 0.008 | 0.003 | 0.018 |
| | (2.38) | (0.84) | (0.24) | (1.49) | (2.40) | (0.81) | (0.24) | (1.48) | (2.39) | (0.84) | (0.26) | (1.49) |
| Cash holding | 0.106*** | 0.098*** | 0.047** | 0.008 | 0.106*** | 0.097*** | 0.046** | 0.008 | 0.106*** | 0.098*** | 0.048** | 0.008 |
| | (5.90) | (5.73) | (2.73) | (0.45) | (5.89) | (5.70) | (2.68) | (0.42) | (5.91) | (5.70) | (2.76) | (0.46) |
| GDP growth | -0.013 | -0.019 | -0.010 | -0.004 | -0.011 | -0.023 | -0.014 | -0.008 | -0.013 | -0.020 | -0.009 | -0.003 |
| | (-0.66) | (-1.24) | (-0.55) | (-0.19) | (-0.57) | (-1.59) | (-0.99) | (-0.43) | (-0.66) | (-1.24) | (-0.48) | (-0.14) |
| Investment opportunities | 0.014 | 0.017 | 0.013 | 0.002 | 0.013 | 0.025** | 0.022* | 0.007 | 0.015 | 0.016 | 0.014 | 0.003 |
| (first principal component) | (0.94) | (1.58) | (0.95) | (0.14) | (0.80) | (2.62) | (1.74) | (0.41) | (0.95) | (1.59) | (1.03) | (0.16) |
| VIX | 0.009** | 0.010*** | 0.008** | 0.003 | 0.009** | 0.010*** | 0.008** | 0.003 | 0.009** | 0.010*** | 0.008** | 0.003 |
| | (2.79) | (3.62) | (2.78) | (1.13) | (2.72) | (4.35) | (2.63) | (1.02) | (2.78) | (3.78) | (2.89) | (1.18) |
| Election indicator | -0.007 | -0.015 | -0.017 | 0.000 | -0.010 | 0.014 | 0.004 | 0.008 | -0.006 | -0.017 | -0.013 | 0.003 |
| | (-0.21) | (-0.45) | (-0.52) | (0.00) | (-0.30) | (0.42) | (0.13) | (0.24) | (-0.18) | (-0.49) | (-0.41) | (0.08) |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.056 | 0.018 | 0.009 | 0.006 | 0.056 | 0.020 | 0.010 | 0.006 | 0.056 | 0.018 | 0.009 | 0.006 |

*(continued)*

**Table 7. Local and foreign EPU and capital investment for Australian firms (continued)**

| Dependent variable: CAPX/Total assets | Panel D: Global news-based EPU | | | |
|---|---|---|---|---|
| | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) |
| Australia EPU | -0.147*** | -0.144** | -0.133*** | -0.124*** |
| | (-2.95) | (-2.79) | (-3.37) | (-4.09) |
| Global EPU *Residuals* | **-0.001** | **-0.033** | **-0.051**** | **-0.045**** |
| | **(-0.06)** | **(-1.66)** | **(-2.57)** | **(-2.73)** |
| Tobin's *q* | 0.203*** | 0.066*** | 0.030* | 0.009 |
| | (8.86) | (4.58) | (1.86) | (0.63) |
| Cash flow | 0.006 | -0.016 | -0.052*** | -0.041*** |
| | (0.44) | (-1.39) | (-3.96) | (-3.05) |
| Leverage | -0.094*** | -0.003 | 0.015 | 0.052* |
| | (-4.23) | (-0.14) | (0.78) | (1.86) |
| Sales growth | 0.022** | 0.008 | 0.003 | 0.018 |
| | (2.39) | (0.83) | (0.26) | (1.49) |
| Cash holding | 0.106*** | 0.097*** | 0.047** | 0.008 |
| | (5.89) | (5.76) | (2.73) | (0.43) |
| GDP growth | -0.013 | -0.023 | -0.015 | -0.010 |
| | (-0.65) | (-1.58) | (-0.97) | (-0.53) |
| Investment opportunities | 0.014 | 0.022** | 0.022 | 0.010 |
| (first principal component) | (0.91) | (2.24) | (1.69) | (0.62) |
| VIX | 0.009** | 0.010*** | 0.007** | 0.002 |
| | (2.62) | (3.19) | (2.48) | (0.77) |
| Election indicator | -0.006 | 0.011 | 0.014 | 0.025 |
| | (-0.18) | (0.28) | (0.41) | (0.86) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.056 | 0.019 | 0.010 | 0.007 |

In the table, I regress firm-level annual capital expenditure (CAPX/Lagged total assets) on the Australia EPU values and the residuals from the regression of foreign news-based EPU index on local news-based EPU index (Baker et al., 2016) and Tobin's *q*, operating cash flows, leverage, annual sales growth, and cash holdings. I also control for various proxies for investment opportunities and general economic uncertainty. Annual GDP growth is used as a proxy for demand conditions, while the VIX index, provided by CBOE, is proxied for market sentiment related to general economic uncertainty. Regarding investment opportunities, I use the first principal component of the following three variables: composite leading indicator, survey-based business confidence and consumer confidence for Australian market, provided by OECD. Federal election indicator is included to control for confounding political risks.

In Panel A, I use only the EPU index for Australia, while in Panel B, I control for the residual from the news-based EPU for China. In Panel C, I use the news-based component of the US EPU. In Panel D, for further analysis, I use the composite global index, that is, an average of national EPU indices for 21 countries, weighting on PPP-adjusted GDP values of each country. The annual data covers from 1998 to 2017. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables. In specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the firm level and year level. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 8. The effect of local and foreign EPU on Australian mining and non-mining firms

| Dependent variable: CAPX/Total assets | Mining firms | | | | Non-mining firms | | | |
|---|---|---|---|---|---|---|---|---|
| | Panel A: Local news-based EPU | | | | | | | |
| | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) |
| Australia EPU | -0.227** | -0.250** | -0.241*** | -0.240*** | -0.059* | -0.017 | 0.018 | 0.011 |
| | (-2.35) | (-2.71) | (-3.23) | (-4.31) | (-1.92) | (-0.42) | (0.60) | (0.33) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 7,683 | 6,958 | 6,215 | 5,534 | 11,721 | 10,552 | 9,424 | 8,423 |
| Adj. R-squared | 0.086 | 0.039 | 0.031 | 0.016 | 0.037 | 0.006 | 0.003 | 0.001 |
| | Panel B: Foreign news-based EPU originating from China | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.224** | -0.228** | -0.227*** | -0.224*** | -0.074** | -0.020 | 0.024 | 0.005 |
| | (-2.30) | (-2.67) | (-3.21) | (-4.13) | (-2.36) | (-0.48) | (0.84) | (0.16) |
| China EPU *Residuals* | -0.004 | -0.095*** | -0.065* | -0.075* | 0.025* | 0.011 | -0.032** | 0.027 |
| | (-0.13) | (-3.10) | (-1.91) | (-1.96) | (1.75) | (0.77) | (-2.42) | (1.19) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 7,683 | 6,958 | 6,215 | 5,534 | 11,721 | 10,552 | 9,424 | 8,423 |
| Adj. R-squared | 0.086 | 0.045 | 0.033 | 0.019 | 0.038 | 0.006 | 0.004 | 0.001 |
| | Panel C: Foreign news-based EPU originating from the United States | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.230** | -0.251** | -0.225*** | -0.239*** | -0.049 | -0.023 | 0.017 | 0.016 |
| | (-2.31) | (-2.65) | (-3.18) | (-4.44) | (-1.56) | (-0.54) | (0.55) | (0.45) |
| US EPU *Residuals* | 0.007 | 0.005 | -0.038 | -0.002 | -0.022* | 0.015 | 0.003 | -0.013 |
| | (0.23) | (0.08) | (-1.43) | (-0.07) | (-2.05) | (1.03) | (0.37) | (-1.25) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 7,683 | 6,958 | 6,215 | 5,534 | 11,721 | 10,552 | 9,424 | 8,423 |
| Adj. R-squared | 0.086 | 0.039 | 0.031 | 0.016 | 0.037 | 0.006 | 0.003 | 0.001 |
| | Panel D: Global news-based EPU | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.224** | -0.258** | -0.251*** | -0.251*** | -0.062* | -0.017 | 0.012 | 0.011 |
| | (-2.33) | (-2.83) | (-3.76) | (-4.42) | (-2.02) | (-0.40) | (0.43) | (0.30) |
| Global EPU *Residuals* | -0.013 | -0.075* | -0.077* | -0.090** | 0.015 | 0.005 | -0.031** | -0.004 |
| | (-0.42) | (-1.81) | (-1.94) | (-2.80) | (0.93) | (0.37) | (-2.11) | (-0.35) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 7,683 | 6,958 | 6,215 | 5,534 | 11,721 | 10,552 | 9,424 | 8,423 |
| Adj. R-squared | 0.086 | 0.042 | 0.033 | 0.020 | 0.037 | 0.006 | 0.004 | 0.001 |

This table presents regression results that examine the effects of local and foreign EPU on capital investment decisions made by mining and non-mining firms in Australia, while controlling for key determinants for firm characteristics, investment opportunities and economic volatility. The sample for mining firms consists of 7,683 firm-year observations, while the sample for non-mining firms consists of 11,721 firm-year observations. For expositional clarity, I show only the coefficient estimates of the variables of interest, that is, local and foreign EPU.

In Panel A, I use only the EPU index for Australia, while in Panel B, I control for the residual from the news-based EPU for China. In Panel C, I use the news-based component of the US EPU. In Panel D, for further analysis, I use the composite global index, that is, an average of national EPU indices for 21 countries, weighting on PPP-adjusted GDP values of each country. The annual data covers from 1998 to 2017. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables. In specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the firm level and year level. The *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 9. The effect of local and foreign EPU with investment irreversibility

| Dependent variable: CAPX/Total assets | Local news-based EPU | | | | Foreign news-based EPU originating from China | | | | Foreign news-based EPU originating from the US | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panel A: Interactions with capital intensity index** | | | | | | | | | | | | |
| | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| AUEPU x Capital intensity | -0.025 | 0.007 | 0.001 | -0.003 | -0.067 | -0.040 | -0.056 | -0.088 | -0.064 | -0.033 | -0.038 | -0.071 |
| | (-0.42) | (0.13) | (0.02) | (-0.09) | (-1.06) | (-0.66) | (-1.00) | (-1.66) | (-0.96) | (-0.45) | (-0.66) | (-1.61) |
| RCNEPU x Capital intensity | | | | | -0.026 | -0.073*** | -0.059*** | -0.049 | | | | |
| | | | | | (-0.93) | (-3.07) | (-3.09) | (-1.72) | | | | |
| RUSEPU x Capital intensity | | | | | | | | | 0.006 | 0.034 | -0.008 | -0.008 |
| | | | | | | | | | (0.18) | (0.72) | (-0.26) | (-0.35) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.049 | 0.014 | 0.005 | 0.004 | 0.053 | 0.017 | 0.008 | 0.005 | 0.053 | 0.015 | 0.007 | 0.004 |
| **Panel B: Interactions with sunk cost index** | | | | | | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| AUEPU x Sunk cost | 0.045 | 0.052 | 0.088 | 0.100 | -0.050 | -0.028 | -0.003 | -0.041* | -0.056 | -0.042 | 0.001 | -0.035* |
| | (0.57) | (0.56) | (1.34) | (1.57) | (-1.08) | (-0.69) | (-0.13) | (-2.06) | (-1.14) | (-0.95) | (0.03) | (-1.86) |
| RCNEPU x Sunk cost | | | | | -0.004 | -0.024** | -0.042*** | -0.041** | | | | |
| | | | | | (-0.35) | (-2.32) | (-3.29) | (-2.53) | | | | |
| RUSEPU x Sunk cost | | | | | | | | | 0.014 | 0.038*** | -0.011 | -0.016 |
| | | | | | | | | | (0.85) | (3.11) | (-1.06) | (-1.07) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.049 | 0.014 | 0.007 | 0.004 | 0.053 | 0.015 | 0.008 | 0.005 | 0.053 | 0.016 | 0.008 | 0.004 |
| **Panel C: Interactions with durable index** | | | | | | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| AUEPU x Durable | 0.169** | 0.128 | 0.130* | 0.171*** | 0.024* | 0.029 | 0.024 | 0.018 | 0.029* | 0.023 | 0.027 | 0.020 |
| | (2.14) | (1.59) | (1.74) | (2.93) | (1.83) | (1.42) | (1.01) | (0.93) | (1.93) | (1.08) | (1.11) | (0.89) |
| RCNEPU x Durable | | | | | 0.013 | 0.002 | -0.017* | 0.022** | | | | |
| | | | | | (1.27) | (0.24) | (-1.98) | (2.32) | | | | |
| RUSEPU x Durable | | | | | | | | | -0.013 | 0.016 | -0.002 | -0.015 |
| | | | | | | | | | (-1.55) | (1.69) | (-0.18) | (-1.66) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.050 | 0.015 | 0.006 | 0.006 | 0.052 | 0.015 | 0.006 | 0.004 | 0.052 | 0.015 | 0.006 | 0.004 |

In this table, I regress firm-level annual investment (CAPX/Lagged Total Assets) on Tobin's *q*, operating cash flows, leverage, annual sales growth, cash holdings, to which I add the investment irreversibility proxies for capital intensity in Panel A, sunk costs in Panel B, and durable index in Panel C, as well as their interaction with the news-based policy uncertainty index for Australia, China and United States from Baker et al. (2016). For expositional clarity, I show only the coefficient estimates of the variables of interest, that is, the interaction between local and foreign EPU and the irreversibility proxies. All variables are defined in Appendix A. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables in specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects as well as fiscal-year fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the year and firm level; *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 10. The effect of local and foreign EPU with various firm characteristics

| Dependent variable: CAPX/Total assets | Local news-based EPU | | | | Foreign news-based EPU originating from China | | | | Foreign news-based EPU originating from the US | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panel A: Small vs large firms** | | | | | | | | | | | | |
| | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) | $Year_{t+1}$ (1) | $Year_{t+2}$ (2) | $Year_{t+3}$ (3) | $Year_{t+4}$ (4) |
| Australia EPU | -0.165*** | -0.139** | -0.099** | -0.070** | -0.168*** | -0.121** | -0.084** | -0.061** | -0.170*** | -0.140** | -0.101*** | -0.066** |
| | (-2.96) | (-2.83) | (-2.89) | (-2.54) | (-2.90) | (-2.61) | (-2.42) | (-2.14) | (-3.05) | (-2.80) | (-2.92) | (-2.70) |
| AUEPU x Small size | 0.061 | 0.052 | 0.003 | -0.040 | 0.061 | 0.039 | -0.004 | -0.043 | 0.077 | 0.048 | 0.022 | -0.042 |
| | (0.99) | (0.89) | (0.05) | (-0.74) | (1.01) | (0.82) | (-0.08) | (-0.77) | (1.23) | (0.79) | (0.37) | (-0.76) |
| China EPU *Residuals* | | | | | 0.007 | -0.000 | -0.028 | -0.021 | | | | |
| | | | | | (0.39) | (-0.01) | (-1.69) | (-1.06) | | | | |
| RCNEPU x Small size | | | | | -0.004 | -0.088** | -0.048 | -0.019 | | | | |
| | | | | | (-0.15) | (-2.84) | (-1.34) | (-0.78) | | | | |
| US EPU *Residuals* | | | | | | | | | 0.015 | 0.004 | 0.007 | -0.012 |
| | | | | | | | | | (0.93) | (0.26) | (0.37) | (-0.79) |
| RUSEPU x Small size | | | | | | | | | -0.040** | 0.009 | -0.048* | 0.007 |
| | | | | | | | | | (-2.10) | (0.37) | (-1.96) | (0.19) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.058 | 0.026 | 0.016 | 0.013 | 0.057 | 0.029 | 0.018 | 0.014 | 0.058 | 0.026 | 0.016 | 0.013 |
| **Panel B: Loss vs profit-making firms** | | | | | | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.131*** | -0.123*** | -0.099** | -0.080*** | -0.134** | -0.108*** | -0.087** | -0.073** | -0.129** | -0.119*** | -0.096** | -0.077*** |
| | (-2.87) | (-3.22) | (-2.86) | (-3.28) | (-2.76) | (-3.08) | (-2.69) | (-2.80) | (-2.74) | (-3.27) | (-2.77) | (-3.57) |
| AUEPU x Loss | -0.032 | -0.034 | -0.051 | -0.074* | -0.031 | -0.043 | -0.055 | -0.077* | -0.031 | -0.050 | -0.042 | -0.075 |
| | (-0.57) | (-0.65) | (-1.25) | (-1.75) | (-0.57) | (-0.93) | (-1.29) | (-1.76) | (-0.53) | (-0.82) | (-0.99) | (-1.74) |
| China EPU *Residuals* | | | | | 0.007 | -0.011 | -0.038** | -0.020 | | | | |
| | | | | | (0.45) | (-0.80) | (-2.31) | (-1.03) | | | | |
| RCNEPU x Loss | | | | | -0.003 | -0.058*** | -0.018 | -0.008 | | | | |
| | | | | | (-0.11) | (-3.05) | (-0.90) | (-0.37) | | | | |
| US EPU *Residuals* | | | | | | | | | -0.004 | -0.014 | -0.005 | -0.008 |
| | | | | | | | | | (-0.27) | (-0.88) | (-0.39) | (-0.64) |
| RUSEPU x Loss | | | | | | | | | -0.001 | 0.042* | -0.022 | 0.002 |
| | | | | | | | | | (-0.06) | (1.92) | (-1.42) | (0.08) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.056 | 0.018 | 0.009 | 0.007 | 0.056 | 0.020 | 0.010 | 0.007 | 0.056 | 0.019 | 0.009 | 0.007 |

*(continued)*

## Table 10. The effect of local and foreign EPU with various firm characteristics (continued)

| Dependent variable: CAPX/Total assets | Local news-based EPU | | | | Foreign news-based EPU originating from China | | | | Foreign news-based EPU originating from the US | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panel C: High vs low cash flows** | | | | | | | | | | | | |
| | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ | Year$_{t+1}$ | Year$_{t+2}$ | Year$_{t+3}$ | Year$_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.156** | -0.148** | -0.147** | -0.157*** | -0.160** | -0.142** | -0.139** | -0.153*** | -0.151** | -0.153** | -0.131* | -0.154*** |
| | (-2.51) | (-2.19) | (-2.32) | (-3.84) | (-2.54) | (-2.28) | (-2.28) | (-3.64) | (-2.27) | (-2.17) | (-2.08) | (-3.86) |
| AUEPU x Cash flows | 0.020 | 0.018 | 0.047 | 0.082** | 0.020 | 0.026 | 0.050 | 0.086** | 0.015 | 0.022 | 0.029 | 0.082** |
| | (0.40) | (0.38) | (1.06) | (2.33) | (0.41) | (0.60) | (1.12) | (2.31) | (0.29) | (0.43) | (0.61) | (2.37) |
| China EPU *Residuals* | | | | | 0.002 | -0.071*** | -0.058* | -0.034 | | | | |
| | | | | | (0.06) | (-3.01) | (-1.91) | (-1.16) | | | | |
| RCNEPU x Cash flows | | | | | 0.010 | 0.056** | 0.021 | 0.018 | | | | |
| | | | | | (0.39) | (2.25) | (0.62) | (1.00) | | | | |
| US EPU *Residuals* | | | | | | | | | -0.011 | 0.015 | -0.042** | -0.008 |
| | | | | | | | | | (-0.47) | (0.47) | (-2.24) | (-0.31) |
| RUSEPU x Cash flows | | | | | | | | | 0.013 | -0.012 | 0.049*** | 0.001 |
| | | | | | | | | | (0.68) | (-0.75) | (2.95) | (0.02) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.056 | 0.019 | 0.009 | 0.006 | 0.056 | 0.021 | 0.010 | 0.007 | 0.056 | 0.018 | 0.009 | 0.006 |
| **Panel D: High vs low cash holdings** | | | | | | | | | | | | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.131*** | -0.142*** | -0.095** | -0.075** | -0.134*** | -0.129*** | -0.087** | -0.070** | -0.129*** | -0.149*** | -0.081* | -0.071** |
| | (-3.17) | (-3.10) | (-2.28) | (-2.63) | (-2.99) | (-3.04) | (-2.16) | (-2.29) | (-3.00) | (-3.10) | (-2.05) | (-2.61) |
| AUEPU x Cash holdings | -0.027 | 0.005 | -0.055 | -0.079* | -0.028 | 0.002 | -0.052 | -0.078* | -0.027 | 0.011 | -0.066 | -0.081* |
| | (-0.58) | (0.12) | (-1.47) | (-2.06) | (-0.66) | (0.07) | (-1.41) | (-2.03) | (-0.54) | (0.28) | (-1.60) | (-2.02) |
| China EPU *Residuals* | | | | | 0.019 | -0.031** | -0.051** | -0.024 | | | | |
| | | | | | (1.26) | (-2.16) | (-2.62) | (-0.94) | | | | |
| RCNEPU x Cash holdings | | | | | -0.025 | -0.027 | 0.007 | -0.002 | | | | |
| | | | | | (-1.34) | (-1.17) | (0.42) | (-0.11) | | | | |
| US EPU *Residuals* | | | | | | | | | -0.003 | 0.017 | -0.033** | -0.011 |
| | | | | | | | | | (-0.22) | (1.10) | (-2.16) | (-0.66) |
| RUSEPU x Cash holdings | | | | | | | | | -0.003 | -0.015 | 0.028 | 0.006 |
| | | | | | | | | | (-0.17) | (-0.46) | (0.85) | (0.35) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.059 | 0.019 | 0.009 | 0.006 | 0.060 | 0.020 | 0.010 | 0.006 | 0.059 | 0.018 | 0.009 | 0.006 |

*(continued)*

## Table 10. The effect of local and foreign EPU with various firm characteristics (continued)

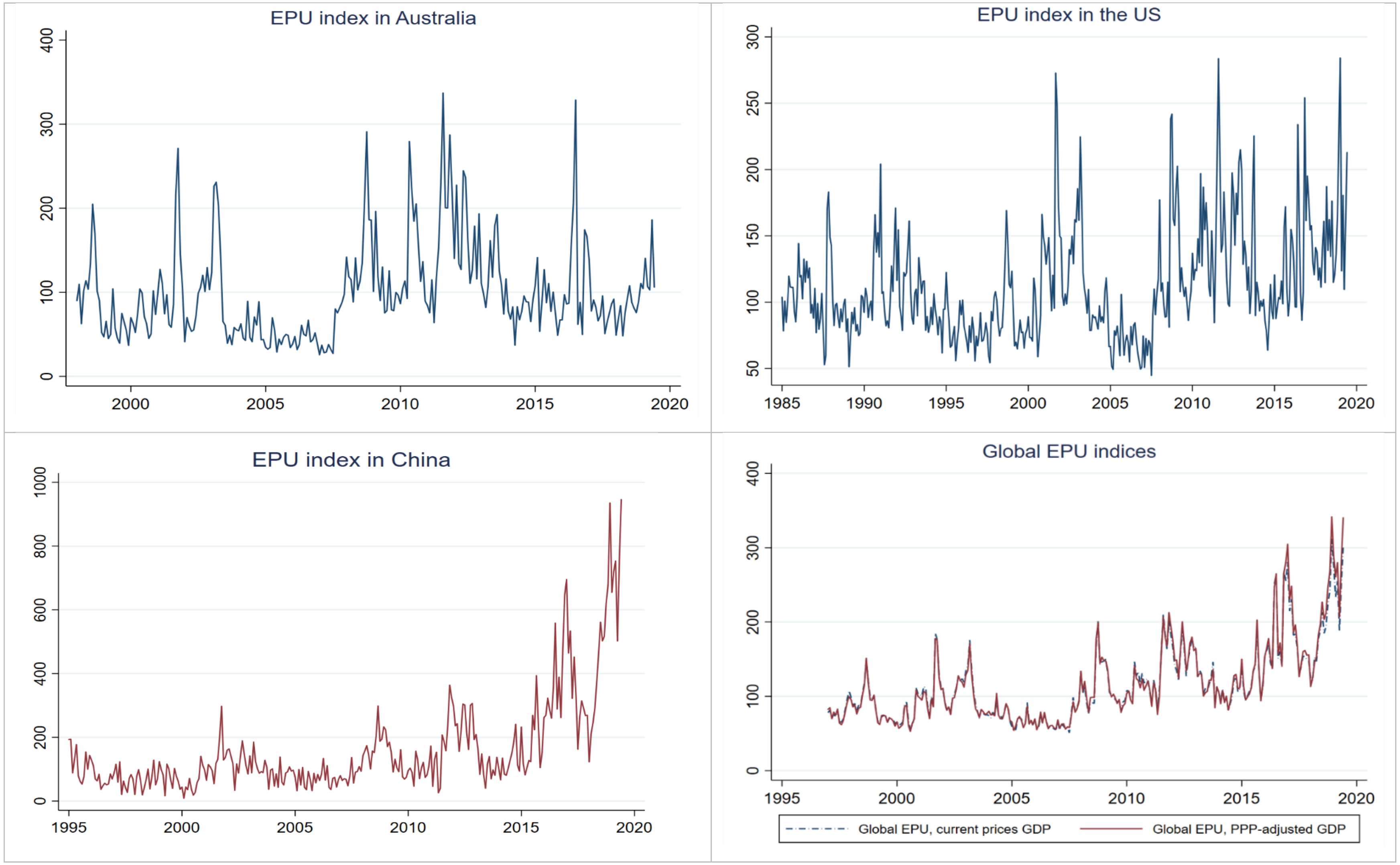
| Dependent variable: CAPX/Total assets | Local news-based EPU | | | | Foreign news-based EPU originating from China | | | | Foreign news-based EPU originating from the US | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Panel E: High vs low leverage** | | | | | | | | | | | | |
| | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ | $Year_{t+1}$ | $Year_{t+2}$ | $Year_{t+3}$ | $Year_{t+4}$ |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Australia EPU | -0.152** | -0.144** | -0.158** | -0.154*** | -0.155** | -0.134** | -0.150** | -0.151*** | -0.150* | -0.146** | -0.151** | -0.150*** |
| | (-2.21) | (-2.23) | (-2.72) | (-3.46) | (-2.22) | (-2.21) | (-2.71) | (-3.28) | (-2.07) | (-2.22) | (-2.57) | (-3.57) |
| AUEPU x Leverage | 0.011 | 0.006 | 0.068 | 0.072* | 0.011 | 0.009 | 0.071 | 0.079* | 0.011 | 0.001 | 0.066 | 0.070* |
| | (0.22) | (0.18) | (1.48) | (1.76) | (0.23) | (0.24) | (1.49) | (1.88) | (0.23) | (0.04) | (1.42) | (1.78) |
| China EPU *Residuals* | | | | | 0.003 | -0.051** | -0.063** | -0.046 | | | | |
| | | | | | (0.12) | (-2.16) | (-2.53) | (-1.34) | | | | |
| RCNEPU x Leverage | | | | | 0.006 | 0.014 | 0.029 | 0.041* | | | | |
| | | | | | (0.37) | (0.68) | (1.27) | (1.97) | | | | |
| US EPU *Residuals* | | | | | | | | | -0.003 | 0.003 | -0.019 | -0.009 |
| | | | | | | | | | (-0.13) | (0.08) | (-1.00) | (-0.42) |
| RUSEPU x Leverage | | | | | | | | | -0.002 | 0.014 | 0.003 | 0.004 |
| | | | | | | | | | (-0.08) | (0.67) | (0.24) | (0.21) |
| Macro and firm controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 | 19,404 | 17,510 | 15,639 | 13,957 |
| Adjusted $R^2$ | 0.056 | 0.018 | 0.009 | 0.007 | 0.056 | 0.020 | 0.011 | 0.007 | 0.056 | 0.018 | 0.009 | 0.006 |

Table 10 presents the impact of local and foreign news-based EPU on firm investment with various firm characteristics, inclusive of firm size, loss, cash flows, cash holdings, and leverage. In this table, I regress firm-level annual investment (CAPX/Lagged Total Assets) on local and foreign EPU, general economic uncertainty and firm-level variables, to which I add dummy variables for small firm size (total assets below median) in Panel A, loss-making firms in Panel B, high and low cash flows in Panel C, high and low cash holdings in Panel D, and high and low leverage in Panel E, as well as their interactions with the EPU index from Baker et al. (2016). For expositional clarity, I show only the coefficient estimates of the variables of interest, that is, local and foreign EPU and the interaction between EPU and key firm characteristics. All variables are defined in Appendix A. In specifications marked (1), the dependent variable has a lead of one period (calendar year) with respect to the independent variables in specifications marked (2) it leads two periods, and so forth until (4). All specifications include firm fixed effects. All variables are normalized by their sample standard deviation. Standard errors are clustered at the year and firm level; *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

# Figures

## Figure 1. Economic policy uncertainty indices (Baker et al., 2016)

### 1A. Newspaper-based economic policy uncertainty indices for Australia, China, United States, and the global economy



**1B. Newspaper-based EPU: Log-level deviation from trend**

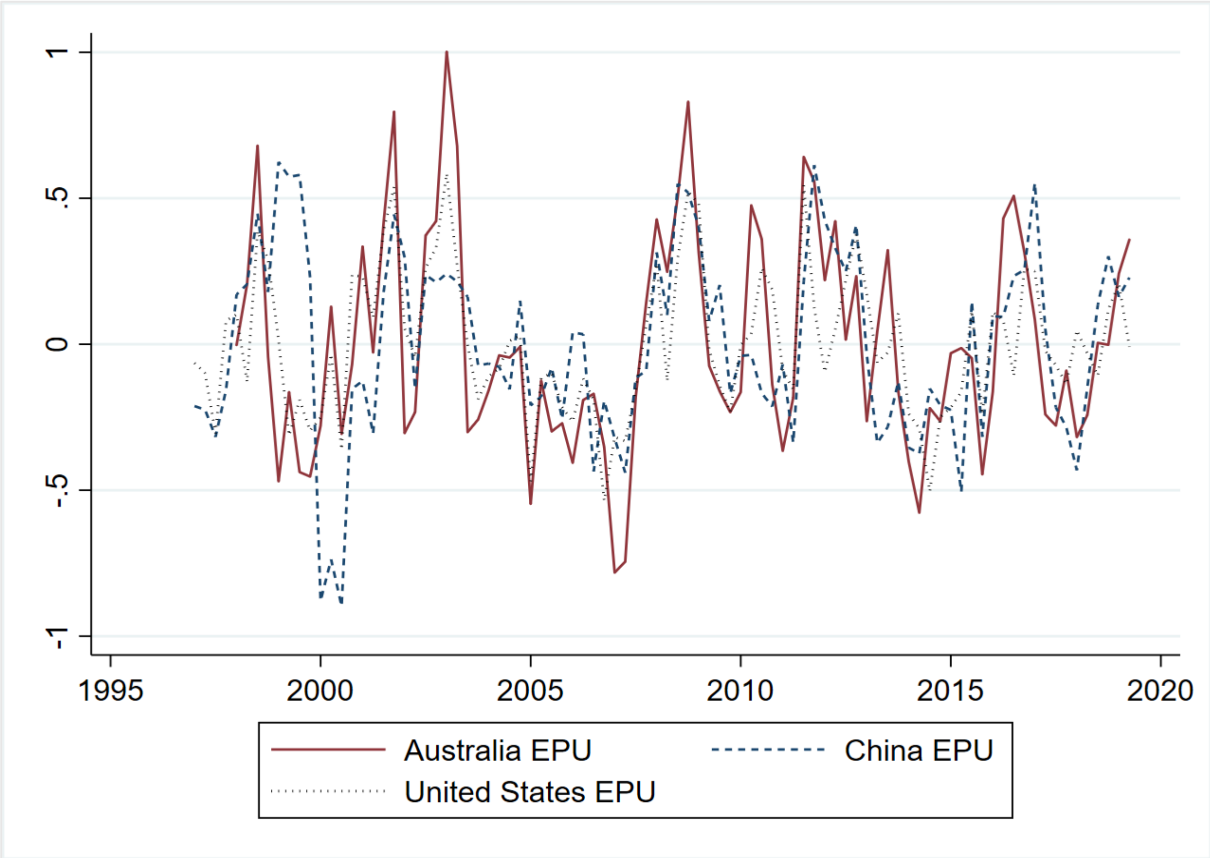
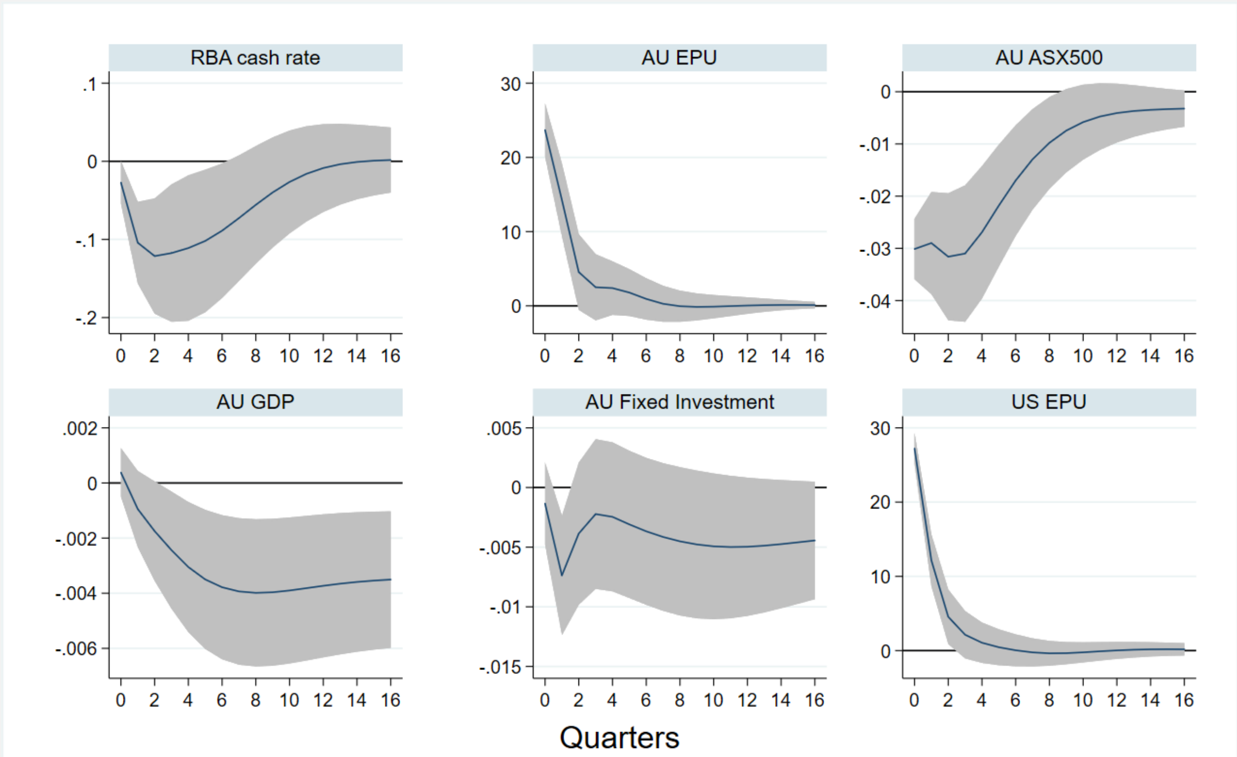



Figure 1A plots the monthly newspaper-based indices of economic policy uncertainty (EPU) developed by Baker et al. (2016) for Australia, China, United States, and the aggregate global index over a given period. The global EPU index is a GDP-weighted average of national EPU indices for 21 countries: Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States. There are also two versions of the global EPU index, that is, one based on national GDP measured at current prices and the other based on GDP adjusted for purchasing power parity.

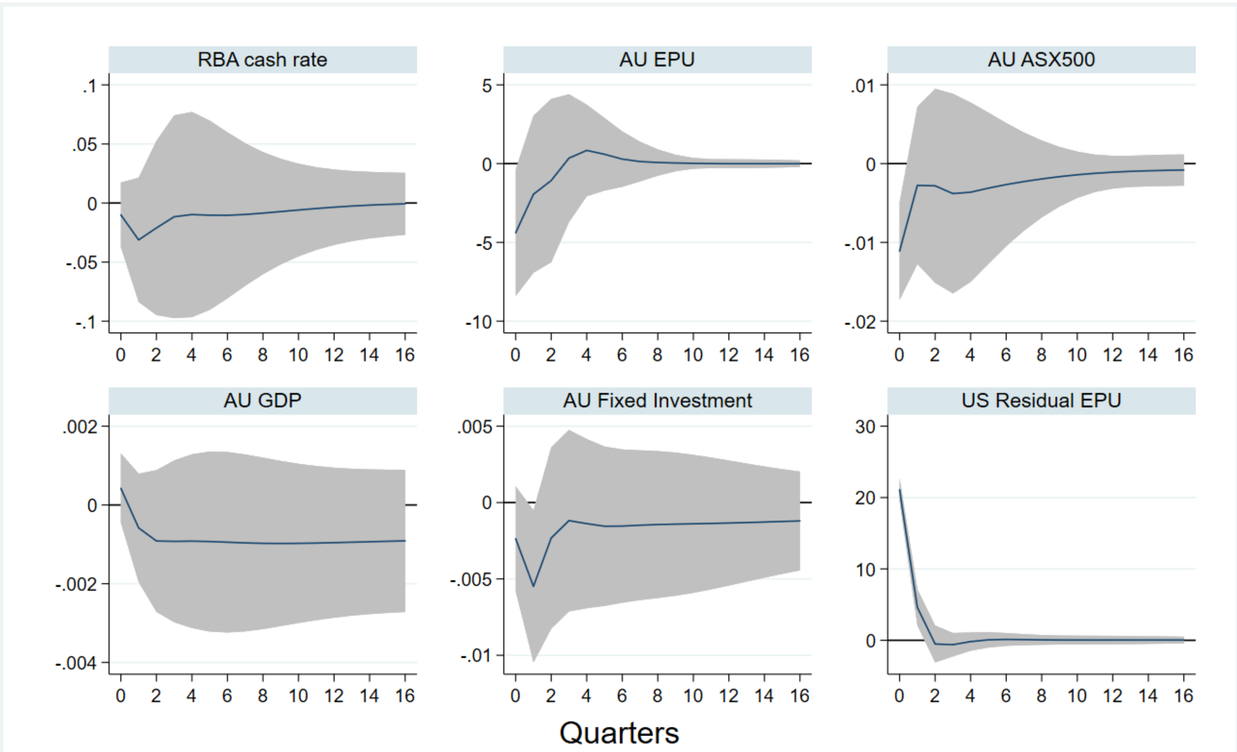
Figure 1B shows the national EPU index (newspaper-based) for Australia, United States, and China as a log-level deviation from a filter trend, using the Hodrick–Prescott high-pass time series filter. The US EPU index is available from 1985 onwards, while the index for Australia and the global economy are only available from 1998 and 1997, respectively. For China, the South China Morning Post (SCMP) news-based EPU index runs from 1995 to the present. EPU index data are available at www.policyuncertainty.com.

**Figure 2. Impulse response to United States economic policy uncertainty shock**

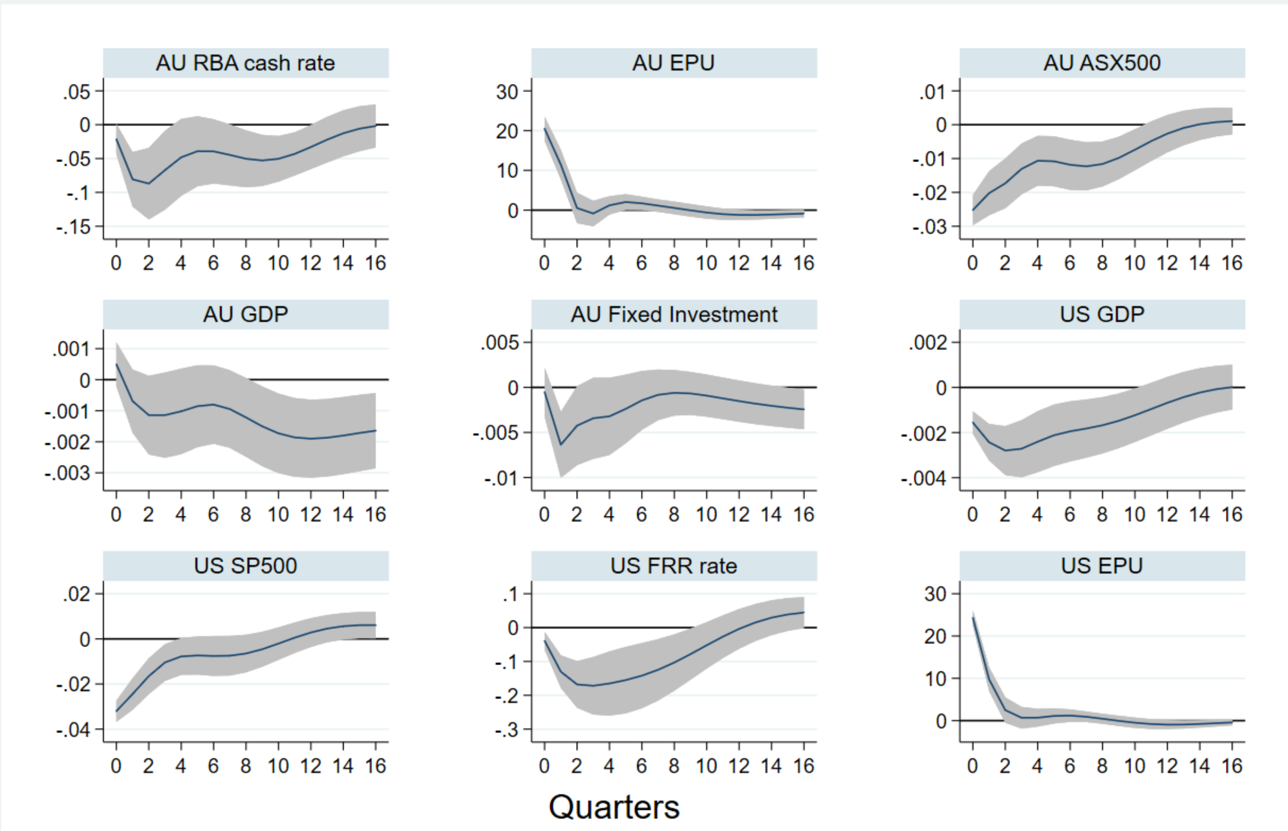
**2A. Baseline SVAR model**




**2B. SVAR model, using residuals of US EPU**



## 2C. Extended SVAR model




Impulse response to a one standard deviation shock to the US economic policy uncertainty. The error bands correspond to 68 percent confidence interval. SVAR identification is based on two lags and a Cholesky decomposition with the following ordering:

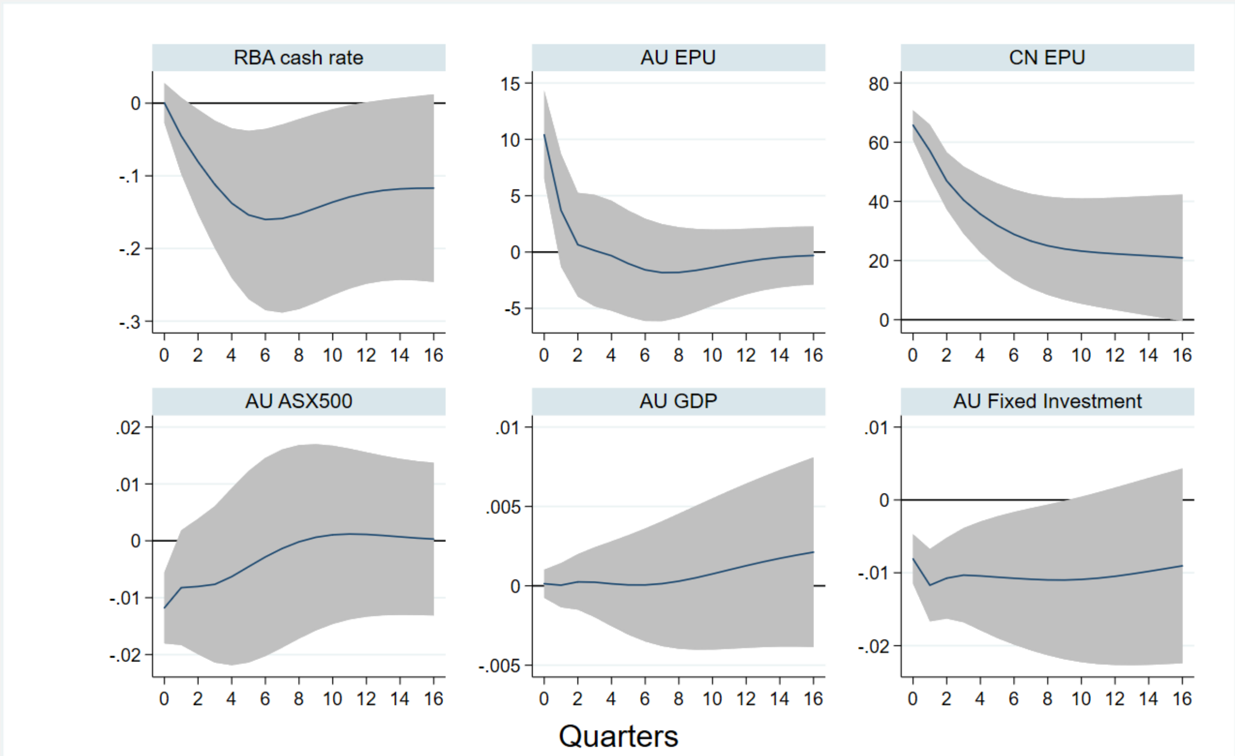
Baseline model: $y_t = [USEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

Extended model: $y_t = [USEPU_t, SP500_t,\ FRR_t,\ USGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

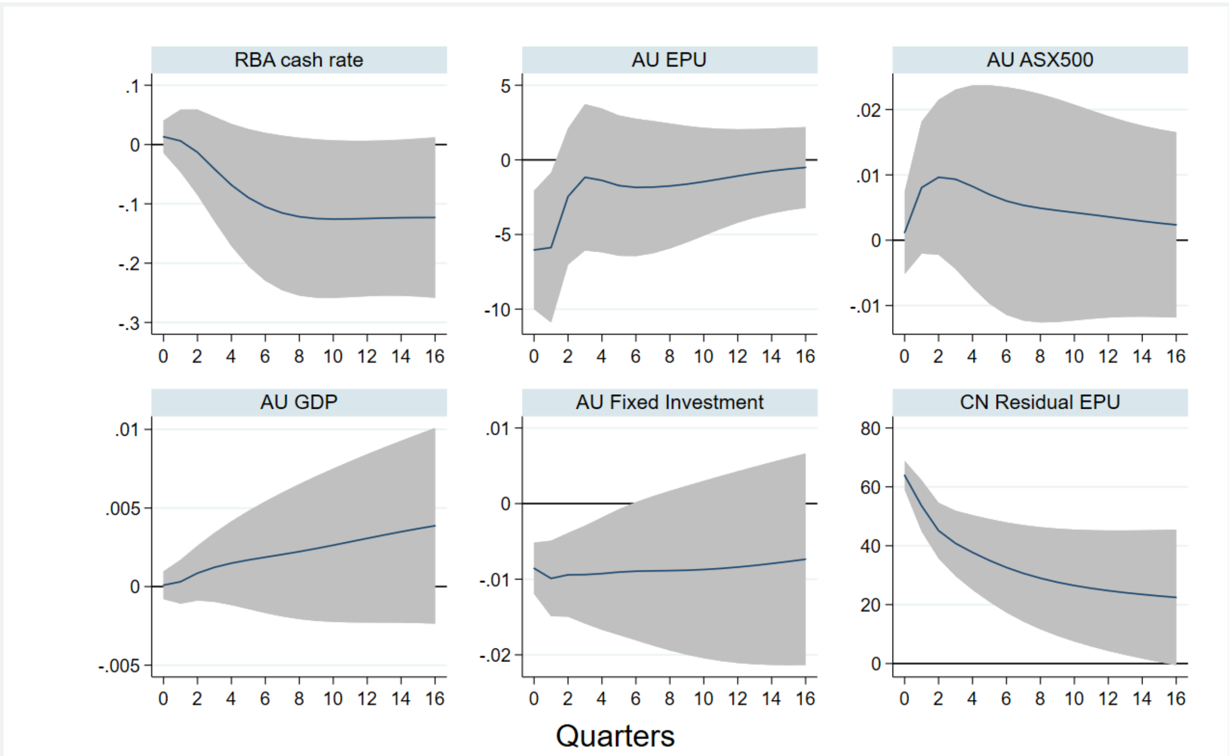
The data are quarterly and run from 1998Q1 to 2019Q2. All variables are defined in Appendix A.

**Figure 3. Impulse response to Chinese economic policy uncertainty shock**

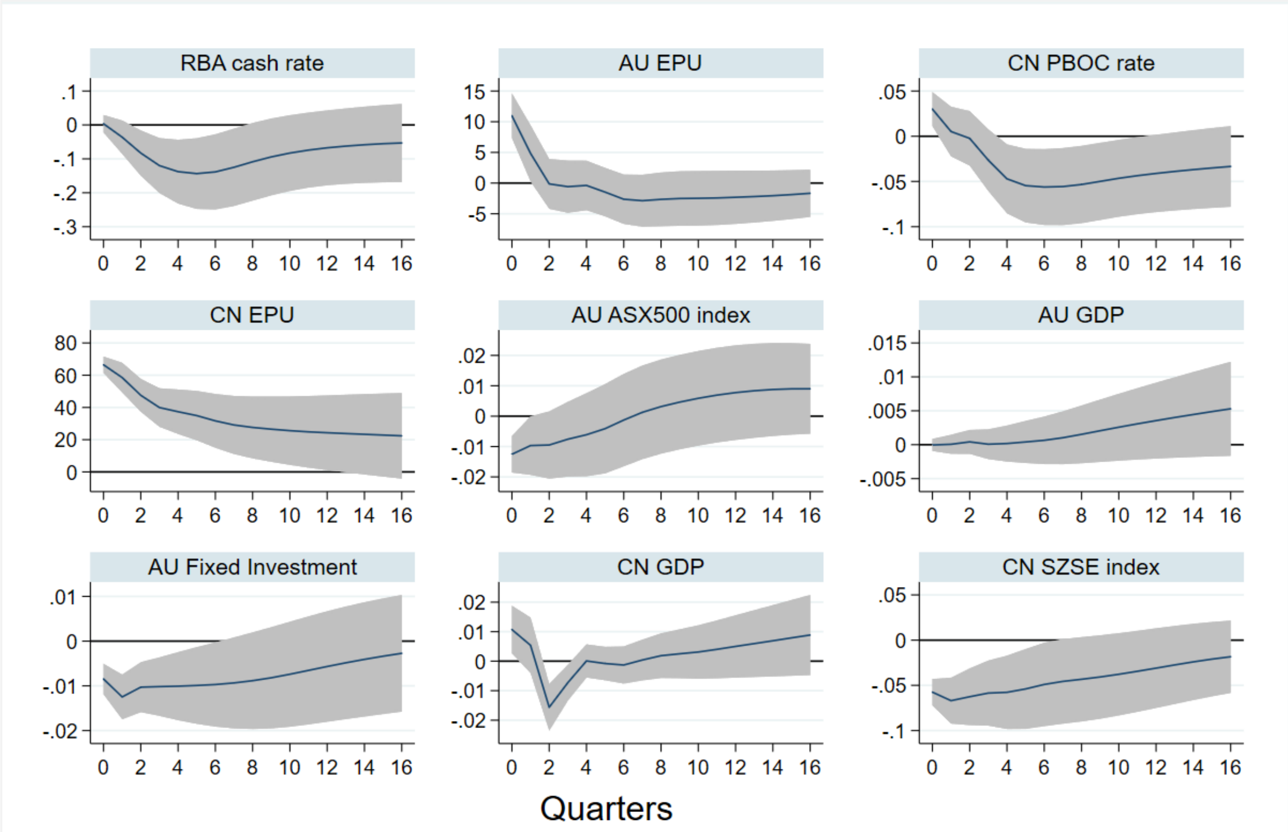
**3A. Baseline SVAR model**




**3B. SVAR model, using residuals of the Chinese EPU**



## 3C. Extended SVAR model




Impulse response to a one standard deviation shock to Chinese economic policy uncertainty. The error bands correspond to 68 percent confidence interval. SVAR identification is based on two lags and a Cholesky decomposition with the following ordering:

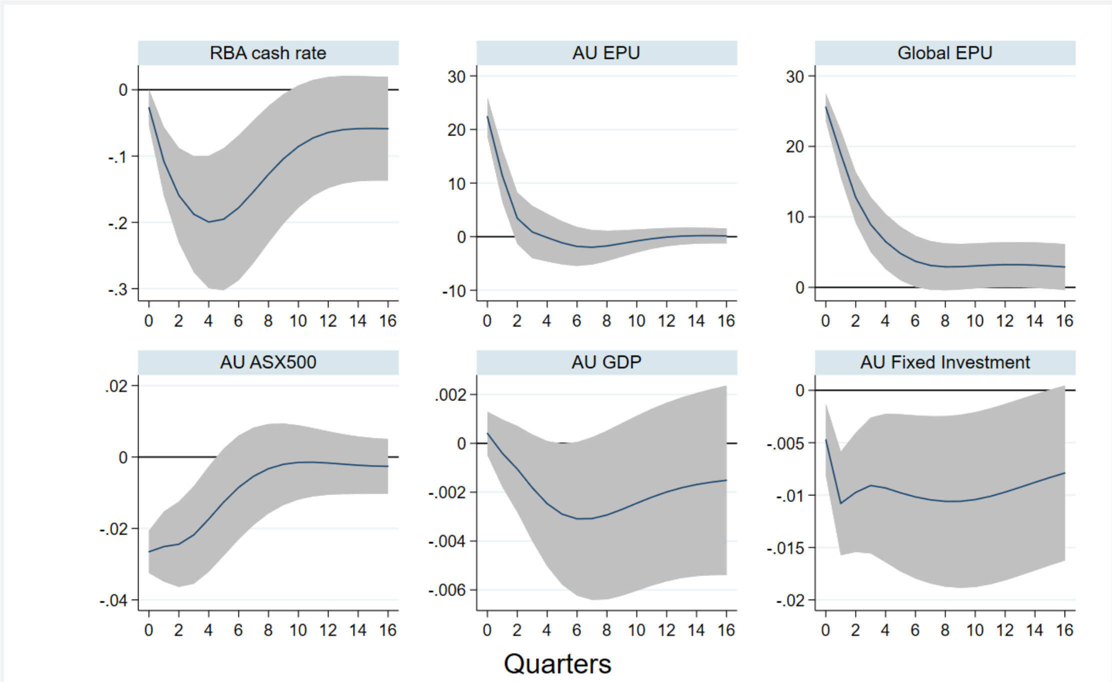
Baseline model: $y_t = [CNEPU_t, AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

Extended model: $y_t = [CNEPU_t, SZSE_t, PBOCR_t, CNGDP_t; AUEPU_t, ASX500_t, RBAR_t, AUGPDI_t, AUGDP_t]'$

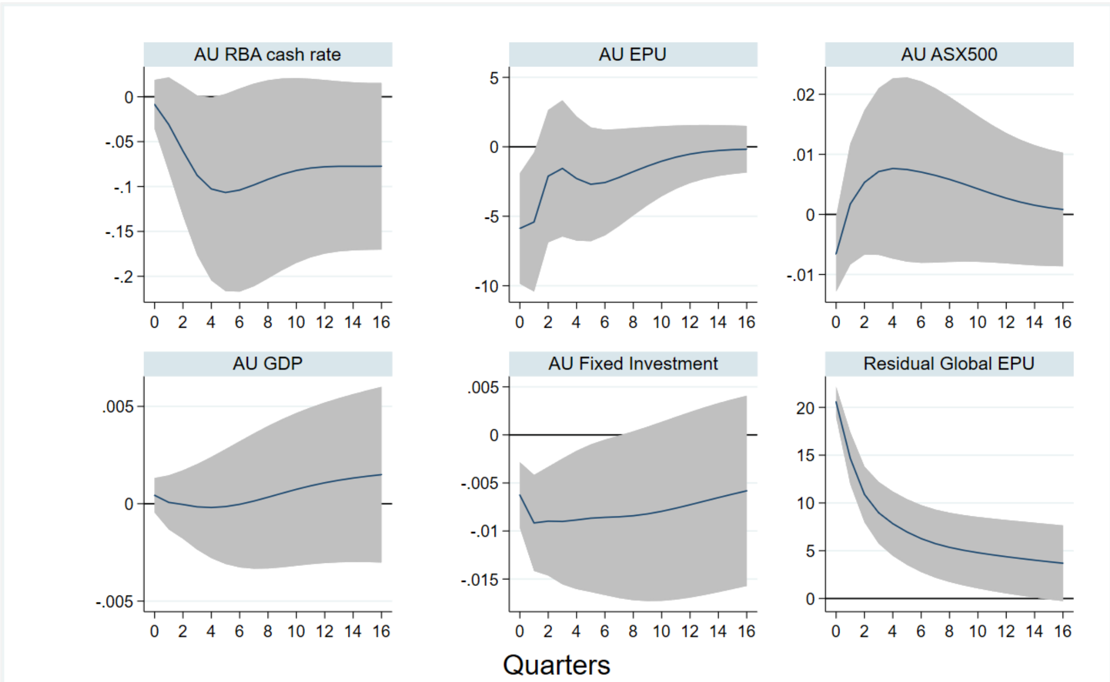
The data are quarterly and run from 1998Q1 to 2019Q2. All variables are defined in Appendix A.

**Figure 4. Impulse response to the global economic policy uncertainty shock**

**4A. Baseline SVAR model**




**4B. SVAR model, using residuals of the global EPU**




Impulse response to a one standard deviation shock to the global economic policy uncertainty. The error bands correspond to 68 percent confidence interval. SVAR identification is based on two lags and a Cholesky decomposition with the following ordering: global and Australian EPU index, natural logarithm of ASX 500 index, Reserve Bank of Australia's cash rate, natural logarithm of Australian aggregate fixed investment in private sectors, and natural logarithm of Australian GDP. The data are quarterly and run from 1998Q1 to 2019Q2. All variables are defined in Appendix A.

# Appendices

## Appendix A: Variable Definitions

| Variables | Description | Data source |
|---|---|---|
| ***A1. Economic policy uncertainty*** | | |
| AUEPU | Natural logarithm of the weighted average of the Baker et al. (2016) newspaper-based monthly index for Australia over a fiscal quarter or year. | Policyuncertainty.com |
| CNEPU | Natural logarithm of the weighted average of the newspaper-based monthly index for China based on key term counts from *South China Morning Post*, an English language newspaper located in Hong Kong, over a fiscal quarter or year. The index is developed by Baker, Bloom, Davis and Wang (2013). | Policyuncertainty.com |
| USEPU | Natural logarithm of the weighted average of the Baker et al. (2016) newspaper-based monthly index for the US over a fiscal quarter or year. | Policyuncertainty.com |
| GEPU | Natural logarithm of the weighted average of the Baker et al. (2016) monthly index for the global economy over a fiscal quarter or year.<br><br>The GEPU Index is a GDP-weighted average of national EPU indices for 21 countries: Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States (PPP-adjusted). | Policyuncertainty.com |
| ***A2. Macroeconomic outcome variables*** | | |
| AU Aggregate capital investment | Australian gross fixed capital formation in the private sector, quarterly, seasonally adjusted. | Australian Bureau of Statistics |
| ASX 500 Index | The All Ordinaries is considered a market benchmark for the Australian stock market, which contains the 500 largest ASX listed companies. | DataStream |
| S&P 500 Index | The S&P 500 is a stock market index that measures the stock performance of 500 large companies listed on stock exchanges in the United States. | DataStream |

| | | |
|---|---|---|
| SZSE Component Index | The SZSE Component Index is an index of 500 stocks that are traded at the Shenzhen Stock Exchange (SZSE) in China. | DataStream |
| AU RBAR | Reserve Bank of Australia (RBA)'s cash rate is proxied for money market rate in Australia, measured in percent (monthly). | Reserve Bank of Australia |
| US FRR | Effective federal funds rate is proxied for money market rate in the US, measured in percent (monthly). | Federal Reserve Economic Data (FRED) |
| CN PBOCR | Loan prime rate set by The People's Bank of China | OECD Statistics |
| Gross domestic product | Gross domestic product for Australia, China and the US, quarterly, seasonally adjusted. | OECD Statistics |
| ***A3. Firm-level financial variables*** | | |
| CAPX | Capital expenditure (*CAPX*) normalized by total assets (*TA*) at the beginning of the period.<br>The dependent variable is constructed to have a lead of one to four periods (calendar year) with respect to the independent variables. | Morningstar |
| Tobin's *q* | The market value of equity plus the book value of assets minus the sum of book value of equity plus deferred taxes, all divided by book values of assets. | Morningstar |
| Cash flow | Operating cash flow from the statement of cash flows divided by the beginning of the period total assets. | Morningstar |
| Leverage | The ratio of the book value of debts, which includes short-term and long-term debt, to the book value of assets. | Morningstar |
| Cash holding | Cash including short term deposits divided by total assets. | Morningstar |
| Sales growth | Sales growth is calculated as the year-on-year growth in annual operating revenues. | Morningstar |
| PPE | Property, plant and equipment divided by total assets. | Morningstar |
| ROA | Net profit after tax, scaled by total assets | Morningstar |

| | | |
|---|---|---|
| Size | Natural logarithm of total asset | Morningstar |
| Dividend | Dummy variable that takes a value of one if a firm pays a common dividend in a given year, and zero otherwise. | Morningstar |
| ***A4. Proxies for investment opportunities and general economic uncertainty*** | | |
| Investment opportunities<br>(First principal component) | The first principal component of the following three variables. I use annual averages of these variables throughout my firm-level analysis. Consequently, this principal component measure is also aggregated at a yearly frequency. | |
| | (1) Composite leading indicator: The composite leading indicator is designed to provide early signals of turning points in business cycles showing fluctuation of the economic activity around its long-term potential level. | OECD Statistics |
| | (2) Business confidence: This business confidence indicator provides information on future developments, based upon opinion surveys on developments in production, orders and stocks of finished goods in the industry sector. It can be used to monitor output growth and to anticipate turning points in economic activity. | OECD Statistics |
| | (3) Consumer confidence: The monthly, survey-based index of consumer confidence in Australia, based upon answers regarding consumer sentiment about the general economic situation, unemployment and capability of savings. | OECD Statistics |
| VIX | Daily index of implied volatility released by the Chicago Board Options Exchange, calculated based on trading of S&P 500 options. I use annual averages of these variables throughout my firm-level analysis. | Wharton Research Data Services (WRDS) |
| GDP growth | Annual growth rate of gross domestic product in Australia. | World Bank Database - World Development Indicator (WDI) |
| Election | Dummy variable takes a value of one in the year of Australian federal elections, proxied for political risks | UWA Australian Politics and Elections Database |

| *A5. Proxies for investment irreversibility* | | |
|---|---|---|
| Capital intensity | Dummy variable equals one if the measure of net PPE divided by total assets is above median at industry-year level (six-digit GICS code). | Morningstar |
| Sunk cost index | Dummy variable equals one if the target industry has high sunk cost. I first create the two measures: depreciation expense and sales of PPE over the last three years, scaled by PPE at the beginning of the current year. Next, I calculate the industry-average level of these measures, based on six-digit GICS code. This variable is equal to zero if all two proxies are above the median, and one if at least one of the industry proxies falls below the median. | Morningstar |
| Durable index | Following Sharpe (1994), I calculate the correlation between each firm's annual sales and GNP and then aggregate these correlations at the six-digit GICS codes. Finally, I create dummy variable that takes a value of one for industries with correlation above the sample median, and zero for the rest of the industries. | Morningstar |
| Mining index | I generate an indicator taking a value of one for GICS Sector: Energy (GICS industry: *Energy Equipment and Services*; *Oil, Gas and Consumables Fuels*) and GICS Sector: Material (GICS industry: *Metals and Mining*), and zero otherwise. | Morningstar |

## Appendix B: Fluctuations in uncertainty in Australia

### Figure B1. The Australian EPU index compared to the 30-day S&P/ASX 200 VIX index

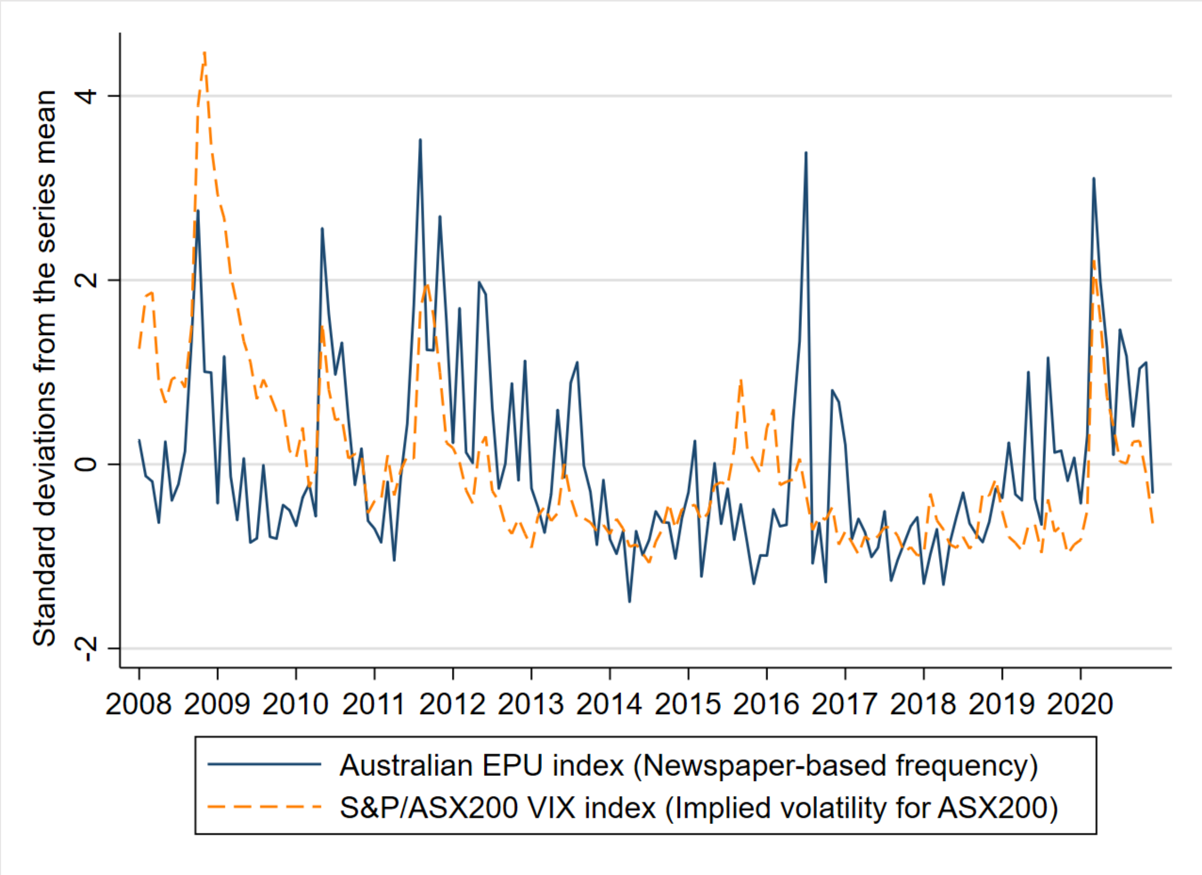



Figure B1 shows the volatility of the Baker et al. (2016) EPU index for Australia and the monthly average of daily values for the 30-day S&P/ASX 200 VIX index during the 2008-2020 period. The EPU index is the monthly newspaper-based index of policy-based uncertainty for Australia, running from January 1998 onwards. Meanwhile, Australian VIX, an index of 30-day option-implied volatility in the S&P/ASX 200 index, is a measure of market sentiment and anticipated levels of general economic volatility, available since 2008. Specifically, the figure plots the standard deviations from the series mean for each index. The data are monthly and span the period from January 2008 to December 2020.

**Figure B2. The spread between the Australian EPU index and S&P/ASX 200 VIX index**

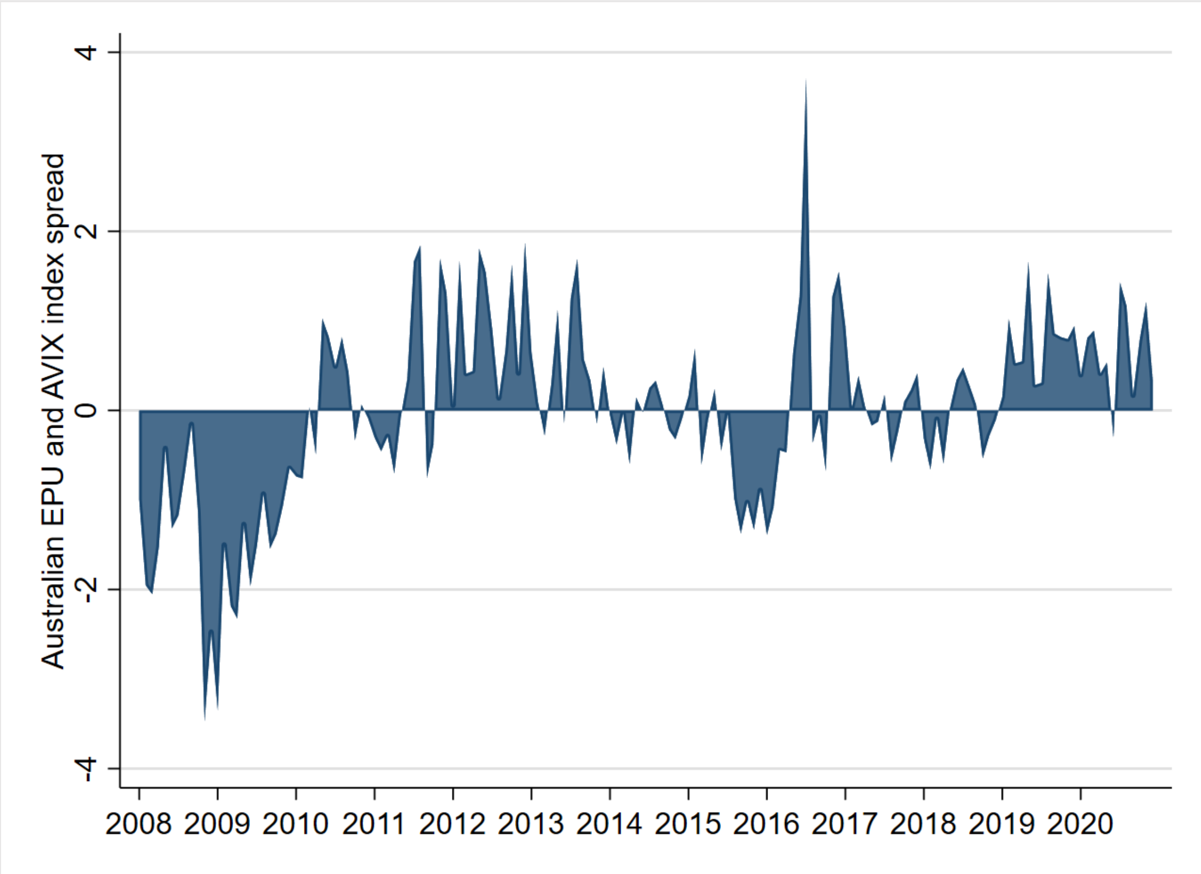



Figure B2 plots the spread between the z-scores of the Baker et al. (2016) EPU index for Australia and the monthly average of daily values for the 30-day S&P/ASX 200 VIX index during the 2008-2020 period. The EPU index is the monthly newspaper-based index of policy-based uncertainty for Australia, running from January 1998 onwards, while the Australian VIX is an index of 30-day option-implied volatility in the S&P/ASX 200 index, available since 2008. The data are monthly and span the period from January 2008 to December 2020.

**Table B1. Pairwise correlation matrix among indicators for economic policy uncertainty and general economic volatility in Australia**

| | Australian EPU | Market volatility (AVIX) | Business Confidence (survey) | Consumer Sentiment (survey) | Composite Leading Indicator |
|---|---|---|---|---|---|
| Australian EPU | 1.000 | | | | |
| Australian VIX | 0.463*** | 1.000 | | | |
| Business Confidence | -0.407*** | -0.747*** | 1.000 | | |
| Consumer Sentiment | -0.215*** | -0.319*** | 0.460*** | 1.000 | |
| Leading Indicator | -0.254*** | -0.485*** | 0.583*** | 0.500*** | 1.000 |

The table presents the correlation matrix among indices for economic policy uncertainty and general economic volatility in Australia for the period from January 2008 to December 2020. The EPU index is the monthly newspaper-based index of policy-based uncertainty developed by Baker et al. (2016) for Australia, running from 1998 to the present. Australian VIX, an index of 30-day option-implied volatility in the S&P/ASX 200 index, is a measure of market sentiments, available since 2008. Furthermore, there are three proxies regarding general economic conditions and investment opportunities in Australia. First, the business confidence indicator, a survey-based measure provided by OECD Statistic, gives information on future developments in production, orders and stocks of finished goods in the industry sector. It can be used to monitor output growth and to anticipate turning points in economic activity. Second, the consumer sentiment indicator, a monthly survey-based measure, is proxied for levels of consumer confidence about the general economic situation, unemployment and capability of savings. Third, the composite leading indicator is designed to provide early signals of turning points in business cycles showing fluctuation of the economic activity around its long-term potential levels.

Pearson (Spearman) correlation coefficients are in the lower (upper) triangle. *, **, *** denotes significant at the 10%, 5%, and 1% level, respectively.

# Chapter 4:

# Australian Economic Policy Uncertainty and Analysts' Forecast Properties

## 4.1 Introduction

The aim of this study is to extend our understanding of the consequences of economic policy uncertainty (EPU) on capital market participants, specifically sell-side financial analysts. Although there is an extensive literature examining the effect of EPU on corporate investment decisions (Gulen and Ion, 2016; Chen et al., 2020), the manner in which EPU impacts on information available to capital market participants (i.e., investors) is not well understood. In general, uncertainty surrounding government policies aggravates the information asymmetries that already exist between investors and firms (Brogaard and Detzel, 2015; Kelly, Pastor and Veronesi, 2016), and corporate managers responds to the heightened policy uncertainty by increasing their voluntary disclosures (Nagar, Schoenfeld and Wellman, 2019). However, we know little about the consequences of EPU for financial intermediaries. For example, there is relatively little evidence of how sell-side analysts react to EPU, yet EPU is likely an important source of uncertainty which is largely independent of actions taken by managers or investors.[31] This is somewhat surprising given the central role sell-side analysts play in reducing information asymmetry between firms and investors. This study attempts to fill the literature gap by examining the effect of variation in EPU on the performance of the most important group of information intermediaries, that is, sell-side financial analysts.

Sell-side financial analysts are important information intermediaries (Baloria and Mamo, 2017; Mikhail, Walther and Willis, 2007). During times of uncertainty, when the cost of information production is high, demand for analysts' services may increase (Lehavey, Li and

[31] Of the small number of papers examining the association between EPU and sell-side analysts' outputs (Biswas, 2019; Chahine et al., 2021; Chen et al., 2022), none consider the effect of EPU on forecasts for Australian firms.

Merkley, 2011; Loh and Stulz, 2018). Yet, other studies demonstrate that many sources of uncertainty have a negative impact on analysts' performance. Examples include the volatility of a firm's underlying fundamentals (Zhang, 2006), accrual quality and operating uncertainty (Lobo, Song and Stanford, 2012), investor sentiment (Hribar and McInnis, 2012) and uncertainty related to intangible assets (Barth, Kasznik and McNichols, 2001; Barron, Byard, Kile and Riedl, 2002). This study adds to such evidence by considering how EPU influences analyst performance.

Intuitively, EPU may adversely impact analysts' forecast performance, possibly due to the greater complexity of earnings forecasting tasks. Bottom-line earnings become less predictable because heightened EPU increases uncertainty about future cash flow of assets that are already in place. For example, uncertainty about regulatory and tax policies can increase the difficulty of predicting operating costs, while uncertainty about policies related to government expenditures and trade policy can increase the difficulty of estimating revenues for firms with greater reliance on government purchases and international trade. Next, EPU may alter corporate real decisions due to the real options value of 'wait and see'. Firms respond to EPU by holding more cash, paying less taxes, reducing investment and hiring, and delaying financing (Julio and Yook, 2012; Li, Luo and Chan, 2018; Jens, 2017; Gulen and Ion, 2016). EPU also has a direct effect on firms' financial reporting choices. As policy uncertainty rises, firms become more conservative in their accounting choices (Dai and Ngo, 2020). Taken together, it is conjectured that policy-based uncertainty is likely to have meaningful economic consequences on analyst performance, of which analyst forecast errors and analyst forecast dispersion increase with EPU.

Using the Baker, Bloom and Davis (2016) newspaper-based index as a proxy for the degree of economic policy uncertainty in Australia, the analysis begins at the analyst-level using a sample comprising 217,959 analyst-firm-month observations, comprising 2,365 unique analysts for Australian firms listed on the Australian Securities Exchange (ASX) over the period from January 1998 to December 2019. Analyst-level analysis is premised on the assumption that EPU could impact individual analysts to a varying extent.[32] Examination is made of the extent to which changes in EPU are associated with the extent of analyst coverage, as well as forecast error and dispersion.

Overall, the study finds that EPU significantly increases analyst coverage. In terms of economic magnitude, when EPU doubles, analyst coverage increases by 2.8 percent. This result is consistent with investors' demand for external information such as analysts' forecasts increasing with EPU. The empirical tests also confirm the conjecture that EPU is positively associated with analysts' forecast errors and forecast dispersion. A doubling of Australian EPU leads to a 22% increase of the average forecast error in the sample and an 18% increase in average forecast dispersion. Given that significant increases in EPU do occur (i.e., EPU is far from stable), these results suggest that the properties of analysts' forecasts will also change over time. In the all baseline regression models, the incremental effect of EPU is measured after controlling for macroeconomic factors, differences in analysts' attributes and firm-level variables.

To address concerns about omitted variables bias and endogeneity, the research uses fixed effects at the firm-level and analyst-level for all specifications, and employs a battery of robustness tests. These tests indicate that the EPU effect is concentrated in earnings forecasts for mining and resources firms, with the EPU effect increasing as the forecast horizon is lengthened. However, there is no significant evidence of heterogeneity in analyst experience. In other words, analysts with better overall, industry- and firm-specific experience do not

[32] When empirical analysis is conducted at the firm-level using consensus analyst forecasts, the results remain quantitatively similar.

provide better forecasts with fewer errors and less degree of dispersion in the periods of elevated policy uncertainty.

Given that Australia is an export-oriented economy, investment decisions are more likely to be affected by foreign EPU compared to say, the United States. Motivated by the emerging literature on the cross-country spillover effect (Colombo, 2013; Chen et al., 2022), this study extends the analysis of local EPU impact to also consider how foreign EPU simultaneously impacts sell-side analysts covering ASX-listed firms. The results indicate that both US and Chinese EPU exert a strong positive and incremental effect on analyst forecast errors for Australian firms, even after controlling for local EPU and other macro- and micro-factors. However, only Chinese EPU has a significant impact on forecast dispersion, beyond that captured in Australian EPU. Overall, this study confirms the spillover effect of foreign EPU on sell-side analysts covering ASX-listed firms.

The study makes several contributions. First, it provides novel evidence of the impact of EPU on analysts' performance for Australian listed firms, while also contributing to the existing EPU literature by identifying EPU as a significant determinant of analysts' forecast accuracy. While extant studies confirm how firm-specific information impedes analysts' accuracy (Zhang, 2006; Lobo, Song and Stanford, 2012; Barth, Kasznik and McNichols, 2001; Barron et al., 2002), little is known about how analysts incorporate economy-wide news into their evaluations despite the important associations between macroeconomic shocks and firm-level earnings. Second, the study contributes to the literature on the capital market consequences of policy uncertainty. Because public policy plays a key role in corporate real decisions and operations, these findings add to the extant literature of EPU effects on firms' information environment. Third, the research provides evidence of cross-country spillover effects of policy-related uncertainty on analyst-level performance in the Australian setting. This evidence supports analysis using the real decision channel (see Chapter 3), that indicates external uncertainty shock is a key driver of macro-uncertainty in small open economies such as Australia.

The remainder of Chapter 4 proceeds as follows. Section 4.2 discusses the literature review and develops the hypotheses and empirical predictions. Section 4.3 explains the measurement of EPU and research methodology. Section 4.4 describes data sources and provides summary statistics of key variables. Section 4.5 presents empirical results and robustness tests. Section 4.6 concludes and discusses possible avenues for future research.

## 4.2 Literature review and hypothesis development

### *4.2.1 Economic policy uncertainty, corporate disclosure and analysts forecast*

An emerging stream of literature examines the effect of economic policy uncertainty on firms' financial reporting policies and financial intermediaries. Nagar et al. (2019) use a large sample of US public firms from 2003 to 2016 and find a positive effect of economic policy uncertainty on voluntary management disclosures related to management forecasts and 8-K filings, which alleviate the increased information asymmetry between investors and managers in higher uncertainty periods. Further, Boone, Kim and White (2018) examine US-based firms and find that firms in states experiencing gubernatorial elections provide more frequent and informative 8-K filings, containing additional information about product development, customers, and key employees. Their cross-sectional analyses show that these increased disclosures are concentrated in firms with more investment, higher information demand, and lower proprietary disclosure costs.

Financial analysts are information intermediaries who facilitate the transfer of information from firms to the market, as well as potentially identifying novel information beyond that sourced from firms and market participants (i.e., analysts' forecasts reflect both public and private information sources). Prior research has examined the impact of various information uncertainties on analyst performance, including the volatility of firms' underlying fundamentals (Zhang, 2006), accrual quality and operating uncertainty (Lobo, Song and Stanford, 2012), investor sentiment (Hribar and McInnis, 2012), and uncertainty related to intangible assets (Barth, Kasznik and McNichols, 2001; Barron et al., 2002). These studies generally find that information uncertainty reduces forecast accuracy. The underreaction to new information is often attributed to analysts' judgement heuristics and biases under uncertainty, such as conservatism (Edwards, 1968) or overconfidence (Daniel, Hirshleifer, and Subrahmanyam, 1998). However, uncertainty in the abovementioned literature usually measures historical or backward-looking variability and is not concerned with the future.

More recent research has been directed at understanding how analysts are impacted by sources of uncertainty that extend beyond corporate-specific (i.e., idiosyncratic) risk (Bird, Karolyi and Ruchti, 2017; Hassan, Hollander, Van Lent and Tahoun, 2017; Baloria and Mamo, 2017). Using conference call scripts, Hassan et al. (2017) document that managers and analysts devote more time to discussing topics directly related to political risks prior to or during presidential and congressional election quarters. Baloria and Mamo (2017) show that the quality of analysts forecast declines during periods of high policy uncertainty, with reduced analyst coverage (i.e., reduced following), larger forecast errors, and greater forecast dispersion.

Sell-side analysts are considered among the most important groups of information intermediaries (Baloria and Mamo, 2017). Their views are generally taken to represent those of investors, and they are typically viewed as sophisticated users of accounting information (Schipper, 1991; Brown, 1993). Furthermore, accounting academics often use their earnings forecasts as a proxy for the market's earnings expectations (Kothari, So and Verdi, 2016). Therefore, investigating factors that impact analysts' earnings forecasts is of interest not only to academia and researchers but also to practitioners, investors and corporate managers. While the extant literature suggests that a wide range of firm-specific factors significantly affect analyst forecast performance, little attention has been paid to how macroeconomic factors are associated with analyst forecast accuracy. This is surprising given the central role of sell-side analysts in reducing information asymmetry between firms and investors, and enhancing the overall efficiency of capital markets. This study attempts to fill this gap by investigating variation in two dimensions of analysts' behaviour – *the number of analysts following a firm* and the properties of analysts' forecast, i.e., *forecast accuracy* and *forecast dispersion*, in the presence of heightened economic policy uncertainty.

Furthermore, there is mixed evidence on the relationship between increases in EPU and analysts' forecast accuracy. On the one hand, periods of high EPU are more likely to lead to increases on forecast errors and forecast dispersion (Biswas, 2019; Baloria and Mamo, 2017). On the other hand, Wu et al. (2022) document evidence that EPU is positively related to forecast accuracy due to reduced forecast optimism bias, and Chen et al. (2022) suggest that EPU decreases dispersion of forecast due to herding behaviors. Therefore, the EPU effect on the properties of analysts' earnings forecasts is ultimately an empirical question to further investigate.

#### *4.2.2 Hypothesis development*

An implicit assumption underlying any expected association between EPU and properties of analysts' forecasts is that individual analysts with heterogeneous characteristics and expertise may understand and predict economic events differently. Political uncertainty has significant impacts for firm profitability (Pastor and Veronesi, 2012, 2013) and, thus, can plausibly complicate individual analysts' earnings forecast tasks. Tests of these hypotheses are also at the analyst level, although some complementary tests are conducted at the firm level. Firms are frequently exposed to greater uncertainty when it comes to the timing, content, and potential impact of economic policy decisions made by politicians and regulatory institutions, and this significantly affects corporate decisions. An increase in policy uncertainty can cause firms to hold more cash, reduce investment, mergers and acquisitions, labour hiring, and delay the raising of finance (Julio and Yook, 2012; Gulen and Ion, 2016; Nguyen and Phan, 2017; Li et al., 2018).

The first hypothesis examines whether EPU leads to greater analyst coverage. Bhushan (1989) and Lang and Lundholm (1996) suggest that the number of analysts following a specific firm is a function of analysts' benefits and costs. Intuitively, when EPU is high, there is less reliable information available for investors to predict firm earnings. This intuition is supported by Chen, Chen, Wang and Zheng (2018), documenting evidence suggesting that firms react to political uncertainty by reducing the amount and the quality of information provided to investors. They also find that financial analysts and media increase the production of information during periods of local government leaders' turnover in China. In contrast, Nagar et al. (2019) find that the US managers respond to EPU by increasing their voluntary disclosures; however, these disclosures only partly alleviate the level of information asymmetry. Therefore, it is arguable that the worse information environment associated with high policy uncertainty will increase investor demand for analyst coverage, which leads to an increase in the benefits gained by sell-side analysts. In other words, investors may demand timelier information, regardless of its accuracy during the period of high EPU. The potential higher benefit of increased investor demand may outweigh the higher cost of assimilating information.

When EPU is high, an increase in analyst coverage may partly reduce information asymmetry between investors and firms and facilitates firms' better access to capital market. Further, Lang and Lundholm (1996) find that analyst following is positively associated with managerial disclosure quality. Nagar et al. (2019) and Chahine et al. (2021) document evidence of the increase in the managerial supply of voluntary and corporate social responsibility disclosures in periods of heightened EPU. Taken together, this could result in higher analyst coverage. The first hypothesis is formalized in the alternative form as follows:

*Hypothesis 1: Australian EPU is positively associated with analysts' coverage for Australian firms.*

The second and third hypotheses examine the association between EPU and the properties of analysts' earnings forecasts. The first property to be examined is earnings forecast accuracy. There are several reasons to expect that increased EPU will result in less accurate earnings forecasts. First, EPU increases volatility about future firm economic outcomes, such as profitability, cash flow or valuation of fixed assets already in place. In periods of prolonged political risks, analysts are required to comprehend the likelihood of future policy outcomes and estimate how these outcomes will differentially influence individual firms. Policy-related uncertainty, stemming from fiscal policy choices, taxation decisions and other regulations, can challenge the prediction of corporate expenditure, and the resulting economic benefits. Furthermore, policy uncertainty regarding trade policies or government spending can increase the difficulty of predicting revenues for firms with greater exposure to international trade and higher reliance on government spending.

Second, EPU also has first order effects on the overall economy, especially corporate real decisions. The unexpected changes in real investment and financing decisions together with the greater fluctuations in firms' operating activities following an increase in EPU (Gulen and Ion, 2016; Chen et al., 2020) may well complicate and dampen forecasting tasks as analysts are required to estimate the earnings implication for the real effect of EPU on firm-level decisions.

Third, EPU has a direct effect on firms' financial reporting choices. Dai and Ngo (2020) investigate the impact of political uncertainty on accounting conservatism using the US sample from 1963 to 2016. They document evidence of an increase in the asymmetric timeliness of bad news recognition in earnings in periods leading up to US gubernatorial elections, and attribute this result to higher political risks leading to an increased contracting demand for accounting conservatism.

Fourth, prior evidence suggests that analysts tend to overweight their private information and underweight readily available public information. Early research finds that analysts systematically underreact to public information, such as the news in stock prices (Abarbanell, 1991) and earnings (Abarbanell and Bernard, 1992). More recently, Zhang (2006) and Hann, Ogneva and Sapriza (2012) show that when analysts face increased uncertainty, they systematically fail to incorporate publicly available information, resulting in higher forecast errors.

Of course, to the extent that analysts have sophisticated macroeconomic knowledge and sources of information related to economic policies which are not publicly available, any effect on forecast accuracy of increasing EPU may be attenuated. Hutton, Lee and Shu (2012) suggest that analysts' information advantage resides at the macroeconomic level since they have access to macroeconomic expertise providing them information advantage over managers in terms of forecast the earnings implication of macroeconomic factors. Moreover, individual analyst characteristics, such as experience or compensation, influence forecast performance (Brown, Call, Clement and Sharp, 2015; Cao, Guan, Li and Yang, 2020; Kumar, 2010) in addition to high degree of political connection well maintained by certain brokerage houses (Christensen, Mikhail, Walther and Wellman, 2017). Hence, it is ultimately an empirical question as to whether variation in EPU is associated with the accuracy of analysts' earnings forecasts for Australian firms. The second hypothesis is stated in an alternative form:

*Hypothesis 2: Australian EPU is positively associated with analysts' earnings forecast errors for Australian firms.*

A second characteristic of analysts' earnings forecasts that may be influenced by EPU is the degree of dispersion surrounding analysts' predictions (i.e., the standard deviation of earnings forecasts all analysts have issued for the same firm in the same period). However, the direction of any association is less clear. On the one hand, there are several possible channels through which dispersion may increase with EPU. First, analysts may assign different probabilities to different policy outcomes even when they are faced with the same information (Harris and Raviv, 1993; Kandel and Pearson, 1995; Varian, 1985). Second, analysts may have different levels of expertise in interpreting or predicting the consequences of government policies. Third, market participants may not share the same information set. Uncertainty may induce some analysts to seek out additional information (Kim and Verrecchia, 1991), or the private information individual analysts have access to may vary significantly (Diamond and Verrecchia, 1981).

Alternately, an increase in uncertainty surrounding government economic policy may lead to less dispersed earnings forecasts, because of herding behaviours. Prior research documents that analysts manifest herding behaviour (Clement and Tse, 2005; Jegadeesh and Kim, 2010). Zhang (2006) finds that analysts' herding tendency becomes exacerbated when firm-level information uncertainty is high. In addition to market risk and firm-level uncertainty, Lin (2018) suggests that analysts' tendency to herd increases with aggregate uncertainty. In an uncertain information environment, the risk-adverse feeling leads analysts to think that others may be better informed. Increased uncertainty can also enhance analysts' career insecurity in times of economic recessions, motivating them to take part in the herd to avoid individual blame. In short, analysts may have a higher tendency to imitate the actions of their peers during periods of fundamental uncertainty in the economy caused by politicians' indecision.

Taken together, the combination of these observations leads to Hypothesis 3, presented in an alternative form:

*Hypothesis 3: Australian EPU is positively (negatively) associated with analysts' earnings forecast dispersions for Australian firms.*

## 4.3 Research design

### *4.3.1 Measuring economic policy uncertainty*

In conformity with the EPU literature, this study employs the Baker et al. (2016) newspaper-based index as a proxy for the degree of economic policy uncertainty in Australia. For Australian EPU, they use text archives from eight Australian newspapers from January 1998 onwards to construct a policy uncertainty index.

[Figure 1A about here]

Figure 1A plots the Australian EPU index from January 1998 to December 2019. It is evident that about 90 percent (nine out of ten spikes) of uncertainty shocks originate from abroad. While many of the events are foreign shocks that are ex ante expected to generate EPU such as economic crises and wars, local factors such as federal elections, debate about mining and tax policies, and changes in prime ministers also appear to contribute to spikes in uncertainty.

[Table 1 about here]

Panel A of Table 1 presents the descriptive statistics for macroeconomic variables for Australia while Panel B reports their correlation. Australian EPU is only moderately correlated with federal elections and recessions (0.10 and 0.18, respectively). Furthermore, Panel C shows *t*-test difference between the EPU values for months in election versus non-election periods and months in recessions versus expansionary periods. Overall, it suggests that on average, Australian EPU in non-election months is not significantly different from its value in election months, even though the latter tends to be higher. In sharp contrast, the average EPU value of

112 during recessionary months is significantly greater than its mean of 91 in expansionary periods.

[Figure 1B and 1C about here]

Figure 1B and 1C confirm that weak economic periods often coincide with peaks in Australian EPU. However, more recent years have observed prolonged high EPU that is not associated with either federal elections or recessions. In short, while it is true that policy uncertainty tends to be countercyclical and could thus be capturing the effect of poor economic prospects, the Australian text-based EPU index covers incremental sources of information beyond uncertainty surrounding election years and general economic conditions.

### *4.3.2 Baseline OLS regression*

The analyst-level regression is:

$$Forecast\_Characteristics_{ijt} = \alpha + \beta_1 AUEPU_t + \gamma Macro\_controls_t + \delta Analysts\_attributes_{ijt} + \theta Firm\_controls_{it} + \varepsilon_{ijt} \quad (11)$$

Dependent variables are *COVERAGE* (analyst coverage), calculated as the natural logarithm of the number of analysts following a firm, and the properties of analysts' earnings forecasts, namely *ABS_FE* (absolute earnings forecast errors) and *DISP* (dispersion of analyst earnings forecasts). Following Hong and Kubik (2003) and Loh and Mian (2006), the absolute forecast errors are measured as follows:

$$ABS\_FE_{ijt} = \left|\frac{Actual_{it} - Forecast_{ijt}}{Actual_{it}}\right|$$

where $ABS\_FE_{ijt}$ (hereafter *ABS_FE* for simplicity) represents analyst *j*'s absolute forecast error for firm *i* at time *t*. *ABS_FE* is formally defined as the absolute value of the difference between the actual earnings per share and the individual analyst earnings forecast for a firm within a calendar month, scaled by the absolute value of actual earnings at the end of the firm's fiscal year.[33]

In addition, *DISP* is defined as the standard deviation of earnings forecasts issued by individual analysts during a calendar month and is deflated by the absolute value of actual earnings at the end of the firm's fiscal year. Both scaled *ABS_FE* and *DISP* are expressed as percentages. To reduce the impact of extreme outliers on the regression results, analyst forecast error and forecast dispersion are winsorized at the 1% and 99% level.

The main variable of interest is Australian policy uncertainty (*AUEPU*), measured as the natural logarithm of the monthly Baker et al. (2016) index values for Australia in a calendar month. In addition to EPU indices, the regression analysis controls for three alternative economy-wide sources of uncertainty that may disrupt analysts' ability to make accurate forecasts. *Quarterly GDP growth* is used as a proxy for the volatility of current demand conditions, while the indicator variable for *federal election* is a proxy for political risks. In identifying election periods, months in election years from January to the month of the occurrence of a specific national election are coded as one, suggesting unresolved election outcomes. The months after an election together with all calendar months in non-election years are coded as zero. *Changes in business cycles* are further controlled by adding the indicator variable for recessionary periods provided by OECD, indicating alternate periods of economic expansions and recessions. A value of one indicates a recessionary period, while a value of zero is an expansionary period.[34]

In determining the properties of analyst forecast accuracy, analyst-specific control variables include the logarithm of *the number of analysts following a firm*, as greater analyst

[33] Alternatively, the methodology of Richardson, Teoh and Wysocki (2004) is to define *ABS_FE* as the absolute value of the difference between actual annual EPS and the forecast EPS for firm *i* in year *t*, deflated by company *i*'s share price 11 months before the fiscal year end month. The study finds unchanged statistical significance when using this alternative measure of forecast error.
[34] As defined by OECD, Australian recessionary periods include December 1998-March 2001, June 2002-April 2003, January 2008-February 2011, May 2012-May 2015, and November-December 2019.

coverage is positively associated with an improved information environment for the firm (Barron et al., 2008), and *brokerage house size*, since analysts from larger brokerage house size may benefit from having access to improved information, especially with regard to factors underlying EPU. Further, from the supply-side perspective, economies of scale mean that the research cost per firm declines with *the number of firms* for which an analyst provides coverage (O'Brien and Bhushan, 1990). Finally, because longer forecast horizons are associated with less forecast accuracy, this study controls for *forecast horizon*, which is defined as the natural logarithm of the number of days between the forecast announcement date and the financial year-end date.

The key firm-level control is *firm size*, defined as the natural logarithm of market capitalisation. *Firm size* has a mixed effect on analyst earnings forecast accuracy (Duru and Reeb, 2002). Larger firms have more complex operations, which may result in higher earnings forecast errors. In contrast, there are more information disclosures by larger firms, which helps analysts make more accurate forecasts. Additionally, this study controls for firm growth proxied by *market-to-book ratio* and financial distress proxied by the *Altman Z-score* because analysts, intuitively, find it more difficult to accurately forecast earnings for firms with high growth and with financial distress.

DeFond and Hung (2003) suggest the subjectivity and uncertainty associated with accruals have a negative impact on earnings quality as perceived by market participants. Therefore, lower earnings quality resulting from the larger magnitude of accruals may reduce the accuracy of analyst earnings forecasts. Taken together, the magnitude of *absolute accruals* is added to the baseline regression, as a proxy for earnings quality. Further, the earnings-related variables to be controlled include an indicator variable for negative earnings (*loss*), the absolute value of the difference between this year's and last year's earnings, scaled by share price (*abs_earnings_surprise*), and earnings volatility, measured as historical standard deviation of accounting return on equity over the last five years (*sd_ROE*).

All accounting variables are winsorized at 1% and 99% level and normalized by their sample standard deviation. All models include firm-fixed effects and analyst-fixed effects to control for unobservable firm and analyst characteristics, while standard errors are clustered by firm and by calendar months. Similar to Gulen and Ion (2016) and Chen et al. (2020), the study does not include time-fixed effects, since doing this absorbs all the explanatory power of the monthly EPU.

**4.4 Sample selection and data description**

Data for analyst forecast properties and the extent of analyst coverage is obtained from the I/B/E/S database. Accounting and other firm-specific data are obtained from the Morningstar DatAnalysis Database, while stock price data is sourced from the SIRCA Share Price and Price Relative (SPPR) file. The sample period starts from January 1998 to December 2019. This sample period is selected to match the availability of the newspaper-based EPU index for Australia.

From the initial sample of 280,863 analyst-firm-month observations over the given period, firm-months with (i) missing variables, (ii) negative sales or (iii) negative or zero total assets are removed. Firms with a listing history of less than three consecutive years and foreign firms listed in Australia are also excluded. Additionally, the sample is restricted to forecasts for annual earnings made no later than the end of the accounting period and no earlier than a full year prior to fiscal year-end. As a result, the maximum forecast horizon is 365 calendar days. Those requirements result in a final sample of 217,959 analyst-firm-month observations with 1,531 unique firms and 2,365 unique analysts (from 190 brokerage houses).

Summary statistics for forecast accuracy and forecast dispersion are reported in Table 2. Panel A1 of Table 2 reports the summary statistics of *ABS_FE* for the pooled sample of 217,959 analyst-firm-month observations. The first row reports unscaled *ABS_FE*, while the second and third rows report *ABS_FE* scaled by stock price at the beginning of the fiscal year and the absolute value of actual earnings, respectively. The unscaled average *ABS_FE* is $0.162. The average *ABS_FE* scaled by absolute actual earnings (price) is 54.65% (9.19%). Similar patterns can be seen for forecast dispersion measures reported in Panel A3. Panel A2 of the table reports corresponding statistics for the signed forecast errors. It can be seen from Panel A2 that all the mean and median values of the forecast errors are negative, consistent with analysts issuing optimistic forecasts on average.

[Table 2 about here]

In the sample, mining firms are firms operating in GICS Sector: Energy and GICS Sector: Material (GICS industry: Metals and Mining). In total, there are 70,261 analyst-firm-month observations for mining firms and 147,698 observations for non-mining firms. The descriptive statistics shown in Panels B1-B3 of Table 2 indicate significant differences in forecast characteristics for mining and non-mining industries. Firms operating in mining and resources industries have much higher average values of forecast errors and greater forecast dispersion.

[Table 3 about here]

Table 3 presents descriptive statistics for the firm-level and analyst-related control variables. Each analyst in the sample provides forecasts for an average of 14 firms per year, and brokerage houses have an average of 25 analysts. On average, approximately 12 analysts provide a forecast for each firm during a year, and (partly by construction) the median forecast horizon is 163 days (around 5.3 months). More than half of the sample observations report a loss for the year, which is much higher than the equivalent value reported using US data (around 15% of loss-making firm-years) in Chourou, Purda and Saadi (2021).

## 4.5 Empirical results

### *4.5.1 The average effect of EPU on analyst behaviours*

#### *4.5.1.1 EPU and analyst earnings forecast characteristics*

Table 4 shows the results from the regression of analyst coverage on the text-based economic policy uncertainty index for Australia and other control variables using the analyst-firm-month sample from 1998 to 2019. These results give empirical support for *Hypothesis 1*, indicating that a doubling of Australian EPU is significantly associated with a 2.8 percentage points increase in analyst coverage, ceteris paribus.[35]

[Table 4 about here]

Tables 5 and 6 report similar regression-based evidence of the association between Australian EPU and analyst earnings forecast characteristics (i.e., forecast error and forecast dispersion). Table 5 and 6 support *Hypothesis 2* and *Hypothesis 3*, namely that Australian EPU is associated with higher analysts' earnings forecast errors and greater forecast dispersion. Table 5 examines the effect of Australian EPU on individual analyst forecast errors, while Table 6 presents regression results using analyst forecast dispersion as the dependent variable. The two tables further control for firm characteristics and other analyst attributes.

[Table 5 about here]

[Table 6 about here]

Specifically, column (1) in Table 5 (Table 6) reports the most parsimonious model by regressing forecast error (forecast dispersion) on the natural logarithm of the monthly value for Australian EPU, and firm-level determinants of analyst accuracy. In column (2), the control variables for three competing sources of uncertainty are added, that is, political risks of

[35] Since both the independent variable *AUEPU* and dependent variable *Analyst Coverage* are log-transformed, the coefficient is interpreted as the percent increase in the dependent variable for every 1% increase in *AUEPU*.

unresolved election outcomes, weak economic conditions during recessions, and the volatility of GDP growth. Finally, column (3) further includes analyst characteristics such as forecast horizon, the number of analysts following a firm, the number of firms covered by one analyst, and brokerage house size. In all specifications, firm fixed effects and analyst fixed effects are employed to control for firm and analyst heterogeneity. Overall, there is strong evidence of a positive association between analysts' forecast error, forecast dispersion and EPU in Australia (i.e., the relevant coefficients are statistically significant at the one percent level).

In terms of economic magnitude, Table 5 indicates that when Australian EPU increases by 100%, individual analyst forecast error increases by 0.089 standard deviations. This equates to an increase of around 22.50% of the average forecast error. Meanwhile, Table 6 shows that when Australian EPU doubles, it leads to a rise in the degree of forecast dispersion of 0.072 standard deviations, which is equivalent to a 18.27% increase in average forecast dispersion. The impact is relatively large, keeping in mind that Figure 1A demonstrates that Australian EPU doubled during the global financial crisis (2008) and more than tripled in periods of Chinese leadership transition and the US fiscal crises (2011).

#### *4.5.1.2 Long and short forecast horizon*

Table 7 examines the role of *forecast horizon* on the association between Australian EPU and analyst forecast properties. Table 7 categorizes the sample into short and long horizon forecasts (greater or less five months prior to a specific firm's financial year-end date) and examines whether economic policy uncertainty continues to contribute to greater forecast error and dispersion significantly. Columns (1), (2) and (3) of the table present results associated with forecast errors while columns (4), (5) and (6) examine forecast dispersion as the dependent variables. In the same manner as the baseline regression, the tests control for competing sources of uncertainty, as well as firm-level and analyst attributes, and find that for both long and short-term forecast subsamples, EPU remains positively associated with an increase in both forecast error and dispersion.

[Table 7 about here]

Long horizon forecasts show larger coefficient estimates relating EPU to analyst forecast characteristics, statistically significant at the one percent level. In contrast, short horizon forecasts show that the negative association between EPU and analyst forecast accuracy is much weaker, and is only statistically significant at the 10 percent level. This is consistent with the literature that analyst forecast accuracy improves as the earnings announcement date approaches (De Bondt and Thaler, 1990; Dhaliwal et al., 2012).

As can be observed from column (3) and column (6), the interaction terms between long horizon and Australian EPU suggest that long-horizon earnings forecast accuracy is more adversely impacted when policy uncertainty is high, whereas there is no difference between the dispersion level of long- and short-horizon forecasts during periods of intensified policy uncertainty in Australia.

#### *4.5.2 Cross-country impacts of policy uncertainty on analysts' earnings forecasts*

This subsection examines whether policy uncertainty originating from the US and China significantly impedes analysts' earnings forecast performance for Australian listed firms. Table 8 reports the regression results of the impact of foreign policy uncertainty on the level of analyst coverage (panel A), forecast error (panel B) and forecast dispersion (panel C) in Australia.

[Table 8 about here]

Panel A of Table 8 indicates that, while domestic EPU is positively related to analyst coverage, Chinese EPU exhibits a negative association with analyst following of Australian firms. In contrast, the US EPU shows no insignificant effect on analyst following. These findings have two important implications. First, they suggest that analysts are less likely to cover a firm when Chinese EPU is heightened. Given that China is Australia's largest market for the export of mining and resources industries, the result indicates the spillover effect of Chinese EPU on Australian capital market participants. Second, the finding that analyst coverage increases with local EPU but reduces with Chinese EPU indicates that, from a demand perspective, the services of financial analysts may prove more useful in the presence of domestic uncertainty but less valuable to their clients in the face of heightened external EPU.

Panel B suggests that both the US and Chinese EPU sources exert strong negative influence on analyst earnings forecast accuracy, even after controlling for local EPU in Australia. In terms of economic significance, when US EPU increases by 100 percent, the absolute forecast errors for Australian firms increases by 0.073 standard deviations or 18.43% of the sample average forecast error (column 2). In comparison, a doubling of the Chinese EPU is significantly associated with a rise of 0.043 standard deviations or 10.85% of the sample forecast error (column 4). However, Panel C shows that only the policy uncertainty originating from China has a significant impact on forecast dispersion levels, beyond that captured in Australian EPU. In sharp contrast, the US EPU has no incremental effect on the degree of forecast dispersion for Australian firms' profitability.

#### *4.5.3 Cross-sectional heterogeneity*

##### *4.5.3.1 Mining and non-mining firms*

Given the central role of mining industries in Australia, Table 9 shows regression results that investigate the impact of *EPU* on the properties of earnings forecasts for mining and non-mining firms in Australia, while controlling for other firm-specific and analyst-related factors.

[Table 9 about here]

Generally, the results confirm a negative association between EPU and forecast accuracy. Nevertheless, some differences can be observed between the results for mining firms (columns

1 and 2) and those for non-mining firms (columns 3 and 4). A doubling of Australian EPU is significantly associated with an increase in average forecast error of 29.54% among mining firms' earnings, which is much higher than an equivalent increase of 17.63% among sample forecast error for non-mining firms.

### *4.5.3.2 Heterogeneity in analyst experience*

Following Chourou et al. (2021), additional consideration is given to the possible effect of analysts' experience on the relation between forecast properties and EPU. Three measures of analyst experience (i.e., overall experience, experience within an industry and experience in forecasting results for a specific firm) are considered. First, each experience measure is included in the baseline regression independently to assess the influence of the average level of analyst experience on forecast error and dispersion. Next, the experience measure is interacted with the contemporaneous value of Australian EPU to establish whether forecasts made by more experienced analysts have smaller error and dispersion in times of heightened policy uncertainty. Table 10 reports the results of these tests.

[Table 10 about here]

It can be seen from Table 10 that there is no evidence that more experienced analysts are able to issue earnings forecasts with less error in the Australian setting. Analysts' overall years of experience and their industry-specific expertise are not significantly associated with more accurate earnings forecasts. Notably, firm-specific experience is positively associated with forecast dispersion, consistent with the findings of Hutton et al. (2012) that earnings can be difficult for analysts to predict if they are driven primarily by managerial decisions rather than external trends.

Regardless of the inclusion of measures of analyst experience, the influence of EPU remains strong. Across all columns of Panels A and B of Table 10, EPU remains positively and significantly associated with an increase in forecast error and forecast dispersion either at the one percent or five percent level. When the interaction terms between national EPU and analyst experience are included, there is no evidence of any statistically significant incremental association with forecast error or dispersion.

### *4.5.4 Robustness analysis*

#### *4.5.4.1 Progressive effect of EPU on analyst forecast performance*

Following Gulen and Ion (2016) and Biswas (2019), the baseline regressions are run in iterations by increasing the timing difference between analyst forecast error (dispersion) and Australian EPU by one month in each iteration. Table 11 reports the empirical results of these tests. In general, the effects of EPU on analyst forecast error and dispersion are positive and significant for all four lagged regressions.

[Table 11 about here]

In untabulated tests, the regressions are processed in 24 iterations. The results reveal not only that policy uncertainty has a significant positive effect on forecast error levels up to four months into the future, but also that this relationship weakens for longer lags, becoming significantly negative after one year and staying that way for lags of up to 24 months. These results lend support to the notion that the degree of analyst forecast error reduces over time with decreased uncertainty about future economic policy.

#### *4.5.4.2 Alternative measures of analyst performance at consensus level*

The primary results reported above are based on analyst-level analysis. However, to further assess the robustness of these results, additional tests are conducted based on consensus forecast values. Hence, tests are based on firm-month observations as the unit of analysis.

These tests are restricted to measures of forecast error. Absolute forecast error ($ABS\_FE$) is calculated as:

$$ABS\_FE_{it} = \left|\frac{Actual_{it} - \overline{Forecast}_{it}}{Actual_{it}}\right|$$

Formally, $ABS\_FE$ is defined as the absolute value of the difference between actual annual earnings per share (EPS) and analysts' earnings forecast for firm $i$, where the earnings forecast is measured by (1) the mean consensus forecast (*ABS_FE_MEAN*), (2) the median consensus forecast (*ABS_FE_MEDIAN*), and (3) the most recent forecast (*ABS_FE_LATEST*) during a specific calendar month. A new forecast error is calculated each month and the value deflated by the absolute value of actual earnings.

[Table 12 about here]

Table 12 reports the results of tests using the consensus measures of forecast error. These results indicate that the positive association between Australian EPU and the degree of forecast error remain statistically and economically significant. In terms of economic magnitude, a doubling of Australian EPU leads to an increase in the *consensus* forecast error by 0.065 standard deviations. This equates to an increase of around 15.77% of the average forecast error level in the sample. However, the coefficients relating Australian EPU to forecast error in *consensus* forecasts indicate less economic magnitude in comparison with those observed in tests based on *individual* analyst forecasts (i.e., Tables 5). Such a result is consistent with the literature suggesting that subsets of individual forecasters are generally inferior to the consensus forecast in terms of accuracy, especially in periods of enhanced uncertainty (Clemen, 1989; McNees, 1992).

### 4.6 Conclusions

Using a newspaper-based index of policy uncertainty, this study finds strong evidence that EPU is associated with increased analyst coverage, and an increase in the magnitude of analysts' earnings forecast errors and forecast dispersion for Australian listed firms. These findings are robust to alternative proxies for forecast accuracy, as well as controlling for other potentially confounding sources of macroeconomic uncertainty, analysts' attributes, and firm-level characteristics. Further analysis also indicates that *foreign* EPU, especially policy uncertainty originating from China, has an incremental adverse effect on analysts' earnings forecast accuracy in Australia. Further, the effects of EPU on analyst forecast performance is not uniform cross-sectionally, being stronger for long-horizon forecasts and for firms operating in mining and resources industries.

Overall, uncertainty surrounding government policies leads to a decline in the quality of information environment for firms and thus increases the complexity of the forecasting task for sell-side analysts. Given the increasing prevalence of policy uncertainty shocks in recent years and the vital moderating role played by financial analysts, these findings have implications for financial analysts, investors, corporate managers and policy makers. The results suggest that in order to improve forecasting accuracy, analysts should pay close attention to not only domestic uncertainty but also external economic policy shocks. Moreover, investors and corporate managers should be more cautious when using analyst earnings forecasts during periods of heightened uncertainty induced by government policies.

One limitation of this study is that changes in corporate disclosure by Australian firms during periods of high policy uncertainty are not evaluated. Voluntary information disclosures and mandatory financial reporting are the fundamental supply of value relevant information for capital market participants. Empirical evidence on the association between corporate disclosure and EPU is mixed. While Chen et al. (2018) suggest that Chinese firms respond to political shocks by reducing the amount and quality of corporate disclosures, Nagar et al. (2019) find that the US managers react to EPU by increasing their voluntary disclosures. It is unclear whether firm disclosure increases or decreases with EPU and how it ultimately impacts the forecasting performance of sell-side analysts. Hence, a possible avenue for future research is to identify the dynamic relationship and interdependency between analyst forecast characteristics and corporate disclosure during periods of high uncertainty and to assess whether the relationship facilitates or impedes the overall quality of information environment for investors and other market participants in Australia.

Other possible directions for future research are to investigate the attributes and key skills of analysts who can cope with the challenge of high EPU periods and provide more accurate forecasts, and to examine whether these analysts have better career paths and are compensated more by the labour markets, such as promotion rates, job satisfaction, and turnover rates. Overall, such research would shed light on analysts' skills and attributes needed to cope with macroeconomic uncertainty, and organizational and institutional factors that can support or hinder these abilities. It would also provide insights into the career paths and compensation of distinguished analysts, which can strengthen industry governance practices.

# Tables

## Table 1. Descriptive statistics and correlation matrix of macroeconomic measures

Panel A: Descriptive statistics

| | N | Mean | Median | SD | Min | P25 | P75 | Max |
|---|---|---|---|---|---|---|---|---|
| Australian EPU | 264 | 100.573 | 88.375 | 57.256 | 25.662 | 60.898 | 118.482 | 337.044 |
| National Election | 264 | 0.269 | 0.000 | 0.444 | 0.000 | 0.000 | 1.000 | 1.000 |
| Recession | 264 | 0.439 | 0.000 | 0.497 | 0.000 | 0.000 | 1.000 | 1.000 |
| Quarterly GDP Growth | 264 | 0.007 | 0.008 | 0.005 | -0.004 | 0.004 | 0.010 | 0.019 |

Panel B: Correlation matrix

| | AUEPU | Election | Recession | ΔQuarterly GDP |
|---|---|---|---|---|
| Australian EPU | 1.000 | | | |
| National Election | 0.101 | 1.000 | | |
| Recession | 0.181*** | -0.193*** | 1.000 | |
| Quarterly GDP Growth | -0.074 | 0.107* | -0.283*** | 1.000 |

Panel C: *t*-test for difference between sub-periods: election years and recessionary period

| | Non-election | | | Election | | | |
|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | *t*-test for difference |
| AU_EPU | 193 | 97.082 | 54.730 | 71 | 110.061 | 63.056 | -1.6383 |
| | Non-recession | | | Recession | | | |
| | N | Mean | SD | N | Mean | SD | |
| AU_EPU | 148 | 91.403 | 59.096 | 116 | 112.271 | 52.791 | -2.9830*** |

The table presents summary statistics for the monthly newspaper-based EPU index (Baker et al., 2016) and other macroeconomic measures used in the analysis for the years 1998-2019. Panel A presents descriptive statistics for Australian EPU index, quarterly GDP growth rate and two indicator variables for federal election and recessionary periods, while Panel B illustrates the correlation matrix of these variables. All variables are measured at the monthly frequency, except for the GDP growth rate on a quarterly basis.

Panel C presents a comparison of EPU levels for the Australian economy across various sub-periods. *Election* is identified by coding one for the months between January and the month of the occurrence of federal elections in election years, suggesting unresolved election outcomes. The months after elections and all other calendar months in non-election years are coded to be zero. The indicator variable for *Recessions* is based on OECD database, indicating alternate periods of expansion and recession. A value of 1 is a recessionary period, while a value of 0 is an expansionary period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 2. Summary statistics of forecast accuracy and forecast dispersion

### Panel A: The total sample

| | N | Mean | Median | SD | Min | P25 | P75 | Max |
|---|---|---|---|---|---|---|---|---|
| Panel A1: Overall sample absolute forecast error ABS_FE | | | | | | | | |
| Unscaled ($) | 217,959 | 0.162 | 0.041 | 0.455 | 0.000 | 0.013 | 0.119 | 3.746 |
| Scaled by price (%) | 217,959 | 9.185 | 0.851 | 49.949 | 0.000 | 0.280 | 2.511 | 458.278 |
| Scaled by the absolute actual earnings (%) | 217,714 | 54.654 | 13.281 | 137.955 | 0.000 | 4.566 | 39.434 | 1012.121 |
| Panel A2: Overall sample signed forecast error FE | | | | | | | | |
| Unscaled ($) | 217,959 | -0.064 | -0.009 | 0.337 | -2.433 | -0.068 | 0.020 | 0.770 |
| Scaled by price (%) | 217,959 | -3.623 | -0.182 | 22.941 | -202.532 | -1.418 | 0.406 | 25.414 |
| Scaled by the absolute actual earnings (%) | 217,714 | -32.301 | -3.077 | 120.213 | -822.222 | -25.449 | 6.250 | 172.289 |
| Panel A3: Dispersion of analyst forecasts DISP | | | | | | | | |
| Unscaled | 196,971 | 0.079 | 0.029 | 0.184 | 0.001 | 0.012 | 0.070 | 1.509 |
| Scaled by price (%) | 196,971 | 2.866 | 0.503 | 12.768 | 0.019 | 0.235 | 1.223 | 115.432 |
| Scaled by the absolute actual earnings (%) | 196,787 | 27.846 | 7.850 | 70.667 | 0.354 | 3.795 | 18.948 | 533.605 |

### Panel B: The subsamples of mining and non-mining firms

| | Mining firms | | | | Non-mining firms | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | Median | SD | N | Mean | Median | SD |
| Panel B1: Subsample absolute forecast error ABS_FE | | | | | | | | |
| Unscaled ($) | 70,261 | 0.237 | 0.075 | 0.539 | 147,698 | 0.126 | 0.031 | 0.404 |
| Scaled by price (%) | 70,261 | 13.743 | 1.743 | 60.683 | 147,698 | 7.017 | 0.593 | 43.765 |
| Scaled by the absolute actual earnings (%) | 70,131 | 95.088 | 30.137 | 185.989 | 147,583 | 35.441 | 9.160 | 102.429 |
| Panel B2: Subsample signed forecast error FE | | | | | | | | |
| Unscaled ($) | 70,261 | -0.098 | -0.024 | 0.423 | 147,698 | -0.048 | -0.005 | 0.287 |
| Scaled by price (%) | 70,261 | -5.613 | -0.580 | 28.515 | 147,698 | -2.676 | -0.107 | 19.674 |
| Scaled by the absolute actual earnings (%) | 70,131 | -55.037 | -10.920 | 161.908 | 147,583 | -21.497 | -1.796 | 92.191 |
| Panel B3: Dispersion of analyst forecasts DISP | | | | | | | | |
| Unscaled | 66,100 | 0.122 | 0.054 | 0.222 | 130,871 | 0.057 | 0.022 | 0.158 |
| Scaled by price (%) | 66,100 | 4.355 | 1.088 | 15.168 | 130,871 | 2.114 | 0.346 | 11.290 |
| Scaled by the absolute actual earnings (%) | 65,995 | 52.961 | 18.174 | 99.674 | 130,792 | 15.174 | 5.381 | 44.965 |

Panel A1 and A2 report the summary statistics for the absolute forecast error (ABS_FE) and signed forecast error (FE) for the total sample of 217,959 analyst-firm-month observations, respectively. Panel A3 presents the descriptive statistics for the dispersion among individual analyst forecast. Meanwhile, Panel B provides descriptive statistics for the subsample of mining firms (first four columns) and non-mining firms (last four columns).

In each panel, the first row reports the statistics for unscaled data (in dollar). The last two rows report the statistics for *ABS_FE, FE, and DISP* (in percentage) after scaling these measures with the stock price at the beginning of the firm's fiscal year (11 months prior to the fiscal year end) and the absolute value of the actual earnings per share, respectively.

## Table 3. Descriptive statistics for analyst-related and firm-level variables

| | N | Mean | Median | SD | Min | P25 | P75 | Max |
|---|---|---|---|---|---|---|---|---|
| Panel A: Firm-level control variables (annual data) | | | | | | | | |
| Firm size | 24,739 | 4.230 | 4.035 | 2.224 | -0.105 | 2.587 | 5.695 | 9.849 |
| Market-to-book ratio | 24,549 | 2.243 | 1.369 | 3.722 | -11.618 | 0.794 | 2.640 | 22.370 |
| Loss | 24,739 | 0.514 | 1.000 | 0.500 | 0.000 | 0.000 | 1.000 | 1.000 |
| Absolute Earnings surprise | 23,192 | 96.108 | 9.217 | 320.614 | 0.000 | 1.955 | 42.943 | 2451.400 |
| Z-score | 21,623 | 6.225 | 2.711 | 29.072 | -140.994 | 0.616 | 7.093 | 150.646 |
| Absolute Accruals | 24,585 | 0.193 | 0.057 | 0.563 | 0.001 | 0.021 | 0.134 | 4.602 |
| Stdev of ROE | 23,460 | 0.888 | 0.156 | 2.427 | 0.005 | 0.054 | 0.545 | 17.915 |
| Panel B: Analyst-related variables | | | | | | | | |
| Number of analysts following a firm in year | 217,959 | 12.334 | 13.000 | 5.607 | 1.000 | 8.000 | 16.000 | 30.000 |
| Number of firms covered by an analyst in a year | 217,959 | 13.455 | 10.000 | 21.963 | 1.000 | 7.000 | 14.000 | 237.000 |
| Brokerage house size | 217,959 | 25.138 | 25.000 | 12.163 | 1.000 | 17.000 | 33.000 | 70.000 |
| Horizon (days) | 217,959 | 176.775 | 163.000 | 93.192 | 1.000 | 112.000 | 258.000 | 365.000 |
| General experience | 217,959 | 6.128 | 5.000 | 5.094 | 0.000 | 2.000 | 9.000 | 20.000 |
| Firm experience | 217,959 | 2.542 | 1.000 | 3.034 | 0.000 | 0.000 | 4.000 | 14.000 |
| Industry experience | 217,959 | 4.558 | 3.000 | 4.586 | 0.000 | 1.000 | 7.000 | 19.000 |

Table 3 presents summary statistics for the firm-level control variables as well as analyst characteristics used in the regression models for testing the determinants of analysts' forecast accuracy. All variables are defined in the Appendix.

**Table 4. Australian economic policy uncertainty and analyst coverage**

| | (1) COVERAGE | (2) COVERAGE | (3) COVERAGE |
|---|---|---|---|
| Australian EPU | 0.049*** | 0.028** | 0.028** |
| | (3.80) | (2.03) | (2.07) |
| Firm size | 0.349*** | 0.371*** | 0.378*** |
| | (15.15) | (16.19) | (16.50) |
| Market-to-book ratio | -0.026** | -0.024** | -0.026** |
| | (-2.57) | (-2.40) | (-2.51) |
| Loss indicator | -0.014 | -0.012 | -0.010 |
| | (-0.77) | (-0.66) | (-0.55) |
| Absolute earnings surprise | -0.013* | -0.011 | -0.010 |
| | (-1.67) | (-1.48) | (-1.34) |
| Z-Score financial distress | -0.022*** | -0.022*** | -0.022*** |
| | (-2.83) | (-2.96) | (-3.02) |
| Absolute accruals | -0.004 | -0.003 | -0.003 |
| | (-0.57) | (-0.48) | (-0.43) |
| Standard deviation of ROE | -0.011 | -0.011 | -0.011 |
| | (-1.29) | (-1.31) | (-1.25) |
| National election | | 0.010 | 0.009 |
| | | (0.80) | (0.77) |
| OECD recession | | 0.141*** | 0.136*** |
| | | (8.45) | (8.40) |
| Quarterly GDP growth | | 5.715*** | 5.467*** |
| | | (4.21) | (4.13) |
| Number of firms following | | | -0.007 |
| | | | (-1.07) |
| Brokerage house size | | | 0.047*** |
| | | | (4.12) |
| Forecast horizon | | | -0.004 |
| | | | (-0.80) |
| Firm fixed effect | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes |
| N | 179,731 | 179,731 | 179,731 |
| Adjusted *R*-squared | 0.167 | 0.203 | 0.206 |

This table presents the results for regressing analyst coverage (i.e., the natural logarithm of the numbers of individual analyst forecasts following a firm) on Australian EPU and other determinants of analyst forecast behaviors for Australian firms for the period from 1998 to 2019. Those variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. *t*-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Table 5. Australian economic policy uncertainty and analyst forecast error**

| | (1) ABS_FE | (2) ABS_FE | (3) ABS_FE |
|---|---|---|---|
| Australian EPU | 0.097*** | 0.094*** | 0.089*** |
| | (4.03) | (3.89) | (3.81) |
| Firm size | -0.060 | -0.055 | -0.064 |
| | (-1.05) | (-1.00) | (-1.02) |
| Market-to-book ratio | -0.055*** | -0.052*** | -0.050*** |
| | (-3.21) | (-3.03) | (-2.93) |
| Loss indicator | 0.095 | 0.095 | 0.095 |
| | (1.58) | (1.58) | (1.58) |
| Absolute earnings surprise | -0.002 | -0.002 | -0.002 |
| | (-0.14) | (-0.09) | (-0.14) |
| Z-Score financial distress | -0.041* | -0.041* | -0.040* |
| | (-1.67) | (-1.68) | (-1.66) |
| Absolute accruals | -0.018 | -0.018 | -0.018 |
| | (-0.92) | (-0.92) | (-0.96) |
| Standard deviation of ROE | -0.003 | -0.004 | -0.004 |
| | (-0.49) | (-0.53) | (-0.55) |
| National election | | -0.064*** | -0.050** |
| | | (-2.80) | (-2.37) |
| OECD recession | | 0.064** | 0.061** |
| | | (2.15) | (2.08) |
| Quarterly GDP growth | | 0.460 | -1.267 |
| | | (0.22) | (-0.63) |
| Number of analysts coverage | | | 0.005 |
| | | | (0.11) |
| Number of firms following | | | -0.015 |
| | | | (-0.95) |
| Brokerage house size | | | 0.005 |
| | | | (0.29) |
| Forecast horizon | | | 0.107*** |
| | | | (10.44) |
| Firm fixed effect | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes |
| N | 179,497 | 179,497 | 179,497 |
| Adjusted $R$-squared | 0.272 | 0.273 | 0.280 |

This table presents the results for regressing the absolute forecast errors on Australian EPU and other determinants of analyst forecast accuracy for Australian firms for the period from 1998 to 2019. Those variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. $t$-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Table 6. Australian economic policy uncertainty and analyst forecast dispersion**

| | (1)<br>DISP | (2)<br>DISP | (3)<br>DISP |
|---|---|---|---|
| Australian EPU | 0.080*** | 0.075*** | 0.072*** |
| | (3.06) | (2.81) | (2.68) |
| Firm size | -0.107 | -0.098 | -0.112 |
| | (-1.33) | (-1.25) | (-1.32) |
| Market-to-book ratio | -0.080*** | -0.078*** | -0.076*** |
| | (-2.99) | (-2.93) | (-2.82) |
| Loss indicator | 0.226*** | 0.227*** | 0.228*** |
| | (2.89) | (2.90) | (2.89) |
| Absolute earnings surprise | 0.010 | 0.010 | 0.010 |
| | (0.34) | (0.38) | (0.37) |
| Z-Score financial distress | -0.089** | -0.089** | -0.087** |
| | (-2.29) | (-2.30) | (-2.30) |
| Absolute accruals | 0.008 | 0.008 | 0.008 |
| | (0.27) | (0.28) | (0.26) |
| Standard deviation of ROE | 0.010 | 0.010 | 0.010 |
| | (0.98) | (0.97) | (1.04) |
| National election | | -0.038 | -0.034 |
| | | (-1.61) | (-1.45) |
| OECD recession | | 0.070** | 0.065** |
| | | (2.07) | (1.99) |
| Quarterly GDP growth | | 2.511 | 1.825 |
| | | (1.10) | (0.83) |
| Number of analysts coverage | | | 0.039 |
| | | | (0.70) |
| Number of firms following | | | -0.002 |
| | | | (-0.13) |
| Brokerage house size | | | -0.007 |
| | | | (-0.31) |
| Forecast horizon | | | 0.036*** |
| | | | (4.24) |
| Firm fixed effect | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes |
| N | 163,297 | 163,297 | 163,297 |
| Adjusted *R*-squared | 0.326 | 0.327 | 0.328 |

This table presents the results for regressing the degree of dispersion of individual analyst forecasts on Australian EPU and other determinants of analyst forecast performance for Australian firms for the period from 1998 to 2019. Those variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. *t*-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 7. Long and short forecast horizon

| | ABS_FE | | | DISP | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Long Horizon | Short Horizon | Full | Long Horizon | Short Horizon | Full |
| Australian EPU | 0.117*** | 0.040* | 0.064*** | 0.075** | 0.063** | 0.068** |
| | (3.74) | (1.70) | (2.87) | (2.24) | (2.00) | (2.46) |
| Forecast horizon | 0.219*** | 0.040*** | 0.047*** | 0.055 | 0.024*** | 0.026*** |
| | (5.67) | (7.67) | (8.40) | (1.49) | (2.75) | (3.02) |
| Dummy_Horizon x AUEPU | | | 0.032*** | | | 0.006 |
| | | | (9.32) | | | (1.63) |
| National election | -0.048 | -0.028 | -0.034* | -0.014 | -0.047 | -0.031 |
| | (-1.43) | (-1.28) | (-1.65) | (-0.52) | (-1.48) | (-1.32) |
| OECD recession | 0.087** | 0.057** | 0.064** | 0.072* | 0.072** | 0.066** |
| | (2.05) | (2.20) | (2.26) | (1.72) | (2.07) | (2.00) |
| Quarterly GDP growth | -3.159 | 1.344 | -1.715 | 2.739 | 1.019 | 1.749 |
| | (-1.08) | (0.69) | (-0.97) | (0.84) | (0.31) | (0.80) |
| Number of analysts coverage | 0.015 | -0.013 | 0.005 | 0.034 | 0.034 | 0.039 |
| | (0.27) | (-0.32) | (0.12) | (0.59) | (0.56) | (0.69) |
| Number of firms following | -0.033 | 0.003 | -0.012 | -0.010 | 0.003 | -0.001 |
| | (-1.61) | (0.22) | (-0.79) | (-0.59) | (0.20) | (-0.10) |
| Brokerage house size | -0.019 | 0.021 | 0.006 | -0.015 | -0.003 | -0.006 |
| | (-0.74) | (1.49) | (0.34) | (-0.62) | (-0.15) | (-0.31) |
| Firm size | -0.020 | -0.093* | -0.064 | -0.116 | -0.093 | -0.112 |
| | (-0.27) | (-1.71) | (-1.01) | (-1.20) | (-1.19) | (-1.32) |
| Market-to-book ratio | -0.053** | -0.044*** | -0.050*** | -0.075** | -0.080*** | -0.076*** |
| | (-2.29) | (-3.19) | (-2.91) | (-2.21) | (-3.40) | (-2.82) |
| Loss indicator | 0.098 | 0.091* | 0.096 | 0.278*** | 0.182** | 0.228*** |
| | (1.29) | (1.88) | (1.58) | (3.46) | (2.33) | (2.89) |
| Absolute earnings surprise | -0.003 | 0.002 | -0.002 | 0.011 | 0.011 | 0.010 |
| | (-0.14) | (0.15) | (-0.11) | (0.37) | (0.46) | (0.38) |
| Z-Score financial distress | -0.053 | -0.029 | -0.040 | -0.070 | -0.104*** | -0.087** |
| | (-1.54) | (-1.38) | (-1.64) | (-1.52) | (-2.96) | (-2.29) |
| Absolute accruals | -0.029 | -0.015 | -0.019 | 0.000 | 0.012 | 0.008 |
| | (-1.19) | (-0.93) | (-0.99) | (0.00) | (0.42) | (0.26) |
| Standard deviation of ROE | -0.001 | -0.003 | -0.003 | 0.018 | 0.007 | 0.010 |
| | (-0.13) | (-0.48) | (-0.50) | (1.49) | (0.56) | (1.04) |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 89,173 | 89,936 | 179,470 | 81,426 | 81,619 | 163,274 |
| Adjusted *R*-squared | 0.316 | 0.281 | 0.283 | 0.361 | 0.330 | 0.328 |

This table reports the effect of EPU on forecast error and forecast dispersion for long and short-term forecasts. Long (short) horizon forecasts are those corresponding to earnings that will be reported in more (less) than the sample median of 162 days (approximately 5 months). All the variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. *t*-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 8. Cross-country effect of EPU and analyst forecast performance

### Panel A: The EPU effect on analyst coverage

| | (1) COVERAGE | (2) COVERAGE | (3) COVERAGE | (4) COVERAGE |
|---|---|---|---|---|
| US EPU | 0.005 | -0.035 | | |
| | (0.24) | (-1.53) | | |
| Chinese EPU | | | -0.029*** | -0.049*** |
| | | | (-2.79) | (-4.40) |
| Australian EPU | | 0.044*** | | 0.055*** |
| | | (2.79) | | (4.00) |
| National election | 0.013 | 0.008 | 0.010 | 0.000 |
| | (1.09) | (0.67) | (0.83) | (0.01) |
| OECD recession | 0.141*** | 0.134*** | 0.133*** | 0.116*** |
| | (8.86) | (8.38) | (8.43) | (7.22) |
| Quarterly GDP growth | 5.568*** | 5.439*** | 5.032*** | 4.460*** |
| | (4.17) | (4.07) | (3.86) | (3.62) |
| Number of analysts coverage | -0.007 | -0.006 | -0.003 | -0.003 |
| | (-0.97) | (-0.93) | (-0.49) | (-0.40) |
| Number of firms following | 0.048*** | 0.045*** | 0.040*** | 0.034*** |
| | (4.32) | (4.11) | (4.08) | (3.56) |
| Brokerage house size | -0.003 | -0.003 | -0.001 | -0.001 |
| | (-0.75) | (-0.68) | (-0.30) | (-0.17) |
| Forecast horizon | 0.381*** | 0.379*** | 0.391*** | 0.389*** |
| | (16.73) | (16.58) | (17.09) | (16.91) |
| Firm size | -0.027** | -0.026** | -0.028*** | -0.027*** |
| | (-2.59) | (-2.56) | (-2.71) | (-2.61) |
| Market-to-book ratio | -0.009 | -0.009 | -0.007 | -0.008 |
| | (-0.49) | (-0.53) | (-0.38) | (-0.44) |
| Loss indicator | -0.010 | -0.010 | -0.010 | -0.010 |
| | (-1.37) | (-1.34) | (-1.37) | (-1.32) |
| Absolute earnings surprise | -0.022*** | -0.023*** | -0.023*** | -0.024*** |
| | (-3.01) | (-3.06) | (-3.13) | (-3.24) |
| Z-Score financial distress | -0.003 | -0.003 | -0.003 | -0.002 |
| | (-0.45) | (-0.44) | (-0.46) | (-0.42) |
| Absolute accruals | -0.010 | -0.010 | -0.009 | -0.010 |
| | (-1.18) | (-1.24) | (-1.10) | (-1.20) |
| Standard deviation of ROE | -0.003 | -0.004 | -0.003 | -0.004 |
| | (-0.51) | (-0.58) | (-0.48) | (-0.60) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes | Yes |
| N | 179,731 | 179,731 | 179,731 | 179,731 |
| Adjusted *R*-squared | 0.204 | 0.207 | 0.207 | 0.213 |

**Panel B: The EPU effect on analyst forecast error**

| | (1)<br>ABS_FE | (2)<br>ABS_FE | (3)<br>ABS_FE | (4)<br>ABS_FE |
|---|---|---|---|---|
| US EPU | 0.124*** | 0.073** | | |
| | (3.93) | (2.13) | | |
| Chinese EPU | | | 0.067*** | 0.043*** |
| | | | (4.41) | (3.45) |
| Australian EPU | | 0.056** | | 0.065*** |
| | | (2.15) | | (2.95) |
| National election | -0.041** | -0.047** | -0.030 | -0.042** |
| | (-2.06) | (-2.27) | (-1.51) | (-2.01) |
| OECD recession | 0.072** | 0.064** | 0.095*** | 0.077*** |
| | (2.50) | (2.18) | (3.27) | (2.61) |
| Quarterly GDP growth | -1.078 | -1.220 | 0.211 | -0.419 |
| | (-0.53) | (-0.62) | (0.10) | (-0.21) |
| Number of analysts coverage | 0.012 | 0.007 | 0.022 | 0.013 |
| | (0.27) | (0.16) | (0.49) | (0.29) |
| Number of firms following | -0.017 | -0.016 | -0.019 | -0.019 |
| | (-1.08) | (-1.06) | (-1.23) | (-1.20) |
| Brokerage house size | 0.012 | 0.009 | 0.024 | 0.017 |
| | (0.70) | (0.51) | (1.37) | (0.96) |
| Forecast horizon | 0.105*** | 0.105*** | 0.103*** | 0.104*** |
| | (10.51) | (10.49) | (10.32) | (10.39) |
| Firm size | -0.066 | -0.067 | -0.078 | -0.077 |
| | (-1.05) | (-1.07) | (-1.22) | (-1.20) |
| Market-to-book ratio | -0.050*** | -0.049*** | -0.050*** | -0.049*** |
| | (-2.90) | (-2.86) | (-2.96) | (-2.86) |
| Loss indicator | 0.095 | 0.094 | 0.095 | 0.093 |
| | (1.59) | (1.56) | (1.58) | (1.55) |
| Absolute earnings surprise | -0.003 | -0.002 | -0.003 | -0.003 |
| | (-0.15) | (-0.14) | (-0.16) | (-0.14) |
| Z-Score financial distress | -0.039 | -0.040 | -0.038 | -0.039 |
| | (-1.61) | (-1.64) | (-1.54) | (-1.60) |
| Absolute accruals | -0.019 | -0.018 | -0.019 | -0.018 |
| | (-0.97) | (-0.96) | (-0.98) | (-0.96) |
| Standard deviation of ROE | -0.003 | -0.004 | -0.003 | -0.004 |
| | (-0.51) | (-0.58) | (-0.48) | (-0.60) |
| | | | | |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes | Yes |
| | | | | |
| N | 179,497 | 179,497 | 179,497 | 179,497 |
| Adjusted *R*-squared | 0.280 | 0.281 | 0.280 | 0.281 |

**Panel C: The EPU effect on analyst forecast dispersion**

| | (1)<br>DISP | (2)<br>DISP | (3)<br>DISP | (4)<br>DISP |
|---|---|---|---|---|
| US EPU | 0.068** | 0.007 | | |
| | (2.24) | (0.21) | | |
| Chinese EPU | | | 0.051*** | 0.032** |
| | | | (3.43) | (2.52) |
| Australian EPU | | 0.069** | | 0.054** |
| | | (2.27) | | (2.04) |
| National election | -0.026 | -0.033 | -0.018 | -0.028 |
| | (-1.18) | (-1.42) | (-0.87) | (-1.23) |
| OECD recession | 0.075** | 0.065** | 0.092*** | 0.077** |
| | (2.29) | (1.97) | (2.78) | (2.35) |
| Quarterly GDP growth | 2.023 | 1.829 | 2.972 | 2.432 |
| | (0.87) | (0.83) | (1.29) | (1.11) |
| Number of analysts coverage | 0.046 | 0.039 | 0.055 | 0.045 |
| | (0.83) | (0.70) | (0.98) | (0.80) |
| Number of firms following | -0.002 | -0.002 | -0.005 | -0.005 |
| | (-0.17) | (-0.14) | (-0.39) | (-0.34) |
| Brokerage house size | -0.002 | -0.006 | 0.008 | 0.002 |
| | (-0.10) | (-0.30) | (0.39) | (0.10) |
| Forecast horizon | 0.035*** | 0.036*** | 0.034*** | 0.034*** |
| | (4.22) | (4.29) | (3.90) | (4.01) |
| Firm size | -0.111 | -0.113 | -0.122 | -0.121 |
| | (-1.30) | (-1.32) | (-1.41) | (-1.41) |
| Market-to-book ratio | -0.077*** | -0.076*** | -0.077*** | -0.075*** |
| | (-2.85) | (-2.81) | (-2.84) | (-2.79) |
| Loss indicator | 0.229*** | 0.227*** | 0.228*** | 0.226*** |
| | (2.92) | (2.89) | (2.90) | (2.88) |
| Absolute earnings surprise | 0.010 | 0.010 | 0.010 | 0.010 |
| | (0.36) | (0.37) | (0.36) | (0.37) |
| Z-Score financial distress | -0.087** | -0.087** | -0.085** | -0.086** |
| | (-2.27) | (-2.30) | (-2.22) | (-2.26) |
| Absolute accruals | 0.007 | 0.008 | 0.007 | 0.008 |
| | (0.25) | (0.26) | (0.25) | (0.26) |
| Standard deviation of ROE | 0.011 | 0.010 | 0.011 | 0.010 |
| | (1.12) | (1.03) | (1.08) | (0.99) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| Cluster by firm | Yes | Yes | Yes | Yes |
| Cluster by time | Yes | Yes | Yes | Yes |
| N | 163,297 | 163,297 | 163,297 | 163,297 |
| Adjusted $R$-squared | 0.327 | 0.328 | 0.328 | 0.328 |

This table presents the average estimated coefficients from the regressions of measures of analyst performance, that is, analyst coverage (Panel A), forecast errors (Panel B) and forecast dispersion (Panel C) on US EPU, Chinese EPU, and Australian EPU. All variables are defined in Appendix. *t*-statistics are reported below the coefficients. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

## Table 9. Subsampling: Mining and non-mining firms

| | Mining firms | | Non-mining firms | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | ABS_FE | DISP | ABS_FE | DISP |
| Australian EPU | 0.151*** | 0.133** | 0.061*** | 0.046*** |
| | (2.84) | (2.08) | (3.46) | (2.79) |
| National election | -0.107*** | -0.066 | -0.021 | -0.013 |
| | (-2.66) | (-1.30) | (-0.98) | (-0.84) |
| OECD recession | 0.094 | 0.105 | 0.036* | 0.032* |
| | (1.34) | (1.27) | (1.80) | (1.89) |
| Quarterly GDP growth | 5.663 | 5.490 | -4.966** | -0.165 |
| | (1.48) | (1.15) | (-2.57) | (-0.15) |
| Number of analysts coverage | 0.027 | 0.067 | -0.019 | 0.006 |
| | (0.32) | (0.57) | (-0.41) | (0.14) |
| Number of firms following | -0.043 | -0.028 | 0.006 | 0.014 |
| | (-1.25) | (-0.93) | (0.55) | (1.51) |
| Brokerage house size | 0.037 | -0.007 | -0.017 | -0.005 |
| | (1.00) | (-0.15) | (-1.07) | (-0.49) |
| Forecast horizon | 0.186*** | 0.097*** | 0.063*** | -0.000 |
| | (8.98) | (6.59) | (8.94) | (-0.03) |
| Firm size | -0.077 | -0.176 | -0.068 | -0.085** |
| | (-0.56) | (-0.98) | (-1.59) | (-1.97) |
| Market-to-book ratio | -0.073* | -0.151*** | -0.040*** | -0.033** |
| | (-1.90) | (-2.90) | (-2.75) | (-2.10) |
| Loss indicator | 0.146 | 0.329** | 0.024 | 0.075 |
| | (1.43) | (2.58) | (0.49) | (1.56) |
| Absolute earnings surprise | -0.023 | -0.002 | 0.017 | 0.024 |
| | (-0.72) | (-0.04) | (1.12) | (1.08) |
| Z-Score financial distress | -0.063* | -0.109** | 0.002 | -0.035* |
| | (-1.85) | (-2.00) | (0.22) | (-1.67) |
| Absolute accruals | -0.016 | 0.008 | -0.028 | -0.017 |
| | (-0.50) | (0.16) | (-1.43) | (-0.94) |
| Standard deviation of ROE | 0.034 | 0.176** | -0.011 | -0.002 |
| | (0.79) | (2.01) | (-1.57) | (-0.20) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| N | 67,685 | 63,842 | 111,754 | 99,412 |
| Adjusted $R$-squared | 0.264 | 0.291 | 0.251 | 0.306 |

This table reports the effect of EPU on forecast error and forecast dispersion for the subsamples of mining and non-mining firms, respectively. All the variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. $t$-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 10. Economic policy uncertainty, forecast performance and analyst experience

### Panel A: The EPU effect on analyst forecast error

| | (1)<br>ABS_FE | (2)<br>ABS_FE | (3)<br>ABS_FE | (4)<br>ABS_FE | (5)<br>ABS_FE | (6)<br>ABS_FE |
|---|---|---|---|---|---|---|
| Australian EPU | 0.101*** | 0.115*** | 0.103*** | 0.112*** | 0.106*** | 0.116*** |
| | (3.81) | (2.97) | (3.92) | (3.32) | (3.81) | (3.39) |
| General experience | -0.011 | 0.030 | | | | |
| | (-1.01) | (0.40) | | | | |
| Gen_exp x AUEPU | | -0.009 | | | | |
| | | (-0.59) | | | | |
| Firm experience | | | 0.006 | 0.052 | | |
| | | | (0.58) | (0.68) | | |
| Firm_exp x AUEPU | | | | -0.010 | | |
| | | | | (-0.62) | | |
| Industry experience | | | | | -0.006 | 0.026 |
| | | | | | (-0.61) | (0.40) |
| Ind_exp x AUEPU | | | | | | -0.007 |
| | | | | | | (-0.52) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 167,481 | 167,481 | 134,621 | 134,621 | 153,924 | 153,924 |
| Adjusted *R*-squared | 0.261 | 0.261 | 0.270 | 0.270 | 0.268 | 0.268 |

### Panel B: The EPU effect on analyst forecast dispersion

| | (1)<br>DISP | (2)<br>DISP | (3)<br>DISP | (4)<br>DISP | (5)<br>DISP | (6)<br>DISP |
|---|---|---|---|---|---|---|
| Australian EPU | 0.084*** | 0.095** | 0.083*** | 0.116*** | 0.090*** | 0.089** |
| | (2.74) | (2.00) | (2.79) | (2.85) | (2.76) | (2.26) |
| General experience | -0.003 | 0.030 | | | | |
| | (-0.19) | (0.34) | | | | |
| Gen_exp x AUEPU | | -0.007 | | | | |
| | | (-0.42) | | | | |
| Firm experience | | | 0.012 | 0.172** | | |
| | | | (0.99) | (2.07) | | |
| Firm_exp x AUEPU | | | | -0.035** | | |
| | | | | (-1.99) | | |
| Industry experience | | | | | 0.000 | -0.003 |
| | | | | | (0.03) | (-0.04) |
| Ind_exp x AUEPU | | | | | | 0.001 |
| | | | | | | (0.05) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 152,696 | 152,696 | 124,614 | 124,614 | 141,184 | 141,184 |
| Adjusted *R*-squared | 0.307 | 0.307 | 0.313 | 0.313 | 0.310 | 0.310 |

This table reports the effect of analyst experience on the association between EPU and forecast error (Panel A) and between EPU and forecast dispersion (Panel B). All variables are defined in Appendix. *t*-statistics are reported below the coefficients. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

## Table 11. Progressive effect of EPU on analyst forecast performance

### Panel A: The lagged EPU effect on analyst forecast error

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | ABS_FE | ABS_FE | ABS_FE | ABS_FE |
| | $Month_{t+1}$ | $Month_{t+2}$ | $Month_{t+3}$ | $Month_{t+4}$ |
| Australian EPU | 0.087*** | 0.078*** | 0.065*** | 0.054** |
| | (4.12) | (3.46) | (2.88) | (2.13) |
| National election | -0.039* | -0.032 | -0.026 | -0.022 |
| | (-1.94) | (-1.59) | (-1.22) | (-1.01) |
| OECD recession | 0.064** | 0.067** | 0.064** | 0.063** |
| | (2.19) | (2.33) | (2.22) | (2.24) |
| Quarterly GDP growth | -1.041 | -0.882 | -1.537 | -1.796 |
| | (-0.51) | (-0.41) | (-0.69) | (-0.82) |
| Number of analysts coverage | 0.004 | 0.003 | 0.005 | 0.006 |
| | (0.08) | (0.07) | (0.12) | (0.13) |
| Number of firms following | -0.016 | -0.016 | -0.016 | -0.017 |
| | (-0.99) | (-1.03) | (-1.00) | (-1.04) |
| Brokerage house size | 0.006 | 0.006 | 0.007 | 0.007 |
| | (0.35) | (0.31) | (0.40) | (0.38) |
| Forecast horizon | 0.107*** | 0.104*** | 0.105*** | 0.109*** |
| | (10.74) | (10.25) | (10.34) | (10.49) |
| Firm size | -0.062 | -0.059 | -0.056 | -0.053 |
| | (-0.98) | (-0.93) | (-0.89) | (-0.84) |
| Market-to-book ratio | -0.050*** | -0.050*** | -0.051*** | -0.051*** |
| | (-2.92) | (-2.94) | (-2.97) | (-2.96) |
| Loss indicator | 0.094 | 0.094 | 0.094 | 0.094 |
| | (1.56) | (1.55) | (1.54) | (1.55) |
| Absolute earnings surprise | -0.002 | -0.002 | -0.002 | -0.002 |
| | (-0.13) | (-0.14) | (-0.13) | (-0.12) |
| Z-Score financial distress | -0.040 | -0.040 | -0.040 | -0.040 |
| | (-1.65) | (-1.63) | (-1.63) | (-1.62) |
| Absolute accruals | -0.018 | -0.018 | -0.018 | -0.019 |
| | (-0.96) | (-0.96) | (-0.95) | (-0.96) |
| Standard deviation of ROE | -0.004 | -0.003 | -0.003 | -0.003 |
| | (-0.54) | (-0.51) | (-0.49) | (-0.41) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| N | 179,193 | 178,791 | 178,296 | 177,700 |
| Adjusted $R$-squared | 0.281 | 0.281 | 0.281 | 0.281 |

**Panel B: The lagged EPU effect on analyst forecast dispersion**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | DISP | DISP | DISP | DISP |
| | $Month_{t+1}$ | $Month_{t+2}$ | $Month_{t+3}$ | $Month_{t+4}$ |
| Australian EPU | 0.067*** | 0.065** | 0.054** | 0.063** |
| | (3.14) | (2.57) | (2.19) | (2.20) |
| National election | -0.026 | -0.021 | -0.015 | -0.009 |
| | (-1.16) | (-0.97) | (-0.70) | (-0.41) |
| OECD recession | 0.069** | 0.071** | 0.069** | 0.065** |
| | (2.10) | (2.21) | (2.13) | (2.08) |
| Quarterly GDP growth | 2.155 | 2.275 | 1.778 | 1.420 |
| | (0.97) | (0.99) | (0.75) | (0.61) |
| Number of analysts coverage | 0.038 | 0.037 | 0.039 | 0.037 |
| | (0.68) | (0.67) | (0.70) | (0.67) |
| Number of firms following | -0.002 | -0.002 | -0.002 | -0.002 |
| | (-0.12) | (-0.16) | (-0.12) | (-0.16) |
| Brokerage house size | -0.005 | -0.006 | -0.005 | -0.005 |
| | (-0.26) | (-0.28) | (-0.22) | (-0.24) |
| Forecast horizon | 0.036*** | 0.034*** | 0.035*** | 0.038*** |
| | (4.24) | (4.03) | (4.04) | (4.39) |
| Firm size | -0.111 | -0.109 | -0.106 | -0.103 |
| | (-1.30) | (-1.27) | (-1.23) | (-1.20) |
| Market-to-book ratio | -0.077*** | -0.076*** | -0.077*** | -0.076*** |
| | (-2.83) | (-2.81) | (-2.84) | (-2.78) |
| Loss indicator | 0.228*** | 0.227*** | 0.228*** | 0.228*** |
| | (2.90) | (2.88) | (2.87) | (2.86) |
| Absolute earnings surprise | 0.010 | 0.010 | 0.010 | 0.010 |
| | (0.37) | (0.37) | (0.37) | (0.38) |
| Z-Score financial distress | -0.087** | -0.087** | -0.087** | -0.088** |
| | (-2.29) | (-2.29) | (-2.28) | (-2.28) |
| Absolute accruals | 0.008 | 0.007 | 0.007 | 0.007 |
| | (0.26) | (0.24) | (0.23) | (0.23) |
| Standard deviation of ROE | 0.010 | 0.011 | 0.011 | 0.011 |
| | (1.06) | (1.08) | (1.09) | (1.13) |
| Firm fixed effect | Yes | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes | Yes |
| N | 163,025 | 162,650 | 162,179 | 161,606 |
| Adjusted *R*-squared | 0.328 | 0.328 | 0.328 | 0.328 |

This table reports the progressive effect of EPU on forecast error (Panel A) and forecast dispersion (Panel B) up to four months into the future for the sample. All the variables are defined in Appendix.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. *t*-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

## Table 12. Alternative measures of analysts' performance at firm-level analysis

### Panel A: Descriptive statistics of firm-level aggregate sample

| | N | Mean | Median | SD | P25 | P75 |
|---|---|---|---|---|---|---|
| *Absolute forecast error ABS_FE* | | | | | | |
| Unscaled ($) | 57,882 | 0.148 | 0.028 | 0.501 | 0.009 | 0.082 |
| Scaled by the absolute actual earnings (%) | 57,769 | 57.793 | 13.603 | 140.291 | 4.441 | 44.083 |
| *Signed forecast error FE* | | | | | | |
| Unscaled ($) | 57,882 | -0.063 | -0.006 | 0.343 | -0.046 | 0.014 |
| Scaled by the absolute actual earnings (%) | 57,769 | -34.291 | -2.885 | 122.556 | -28.053 | 6.169 |

### Panel B: The EPU effect on consensus forecast error

| | (1) | (2) | (3) |
|---|---|---|---|
| | ABS_FE_MEAN | ABS_FE_MEDIAN | ABS_FE_LATEST |
| Australian EPU | 0.065*** | 0.067*** | 0.062*** |
| | (3.59) | (3.62) | (3.50) |
| National election | -0.045** | -0.044** | -0.037* |
| | (-2.24) | (-2.19) | (-1.90) |
| OECD recession | 0.039* | 0.039* | 0.041* |
| | (1.75) | (1.72) | (1.85) |
| Quarterly GDP growth | -0.509 | -0.578 | -0.351 |
| | (-0.31) | (-0.34) | (-0.22) |
| Number of analysts coverage | -0.006 | -0.008 | 0.003 |
| | (-0.18) | (-0.25) | (0.09) |
| Number of firms following | 0.006 | 0.010 | 0.014 |
| | (0.39) | (0.65) | (0.88) |
| Brokerage house size | -0.007 | -0.006 | 0.002 |
| | (-0.40) | (-0.33) | (0.11) |
| Forecast horizon | 0.081*** | 0.083*** | 0.073*** |
| | (11.53) | (11.58) | (11.00) |
| Firm size | -0.014 | -0.016 | -0.022 |
| | (-0.38) | (-0.42) | (-0.58) |
| Market-to-book ratio | -0.036** | -0.035* | -0.034* |
| | (-2.04) | (-1.97) | (-1.92) |
| Loss indicator | 0.079* | 0.079* | 0.095** |
| | (1.68) | (1.68) | (1.99) |
| Absolute earnings surprise | 0.002 | 0.004 | 0.004 |
| | (0.14) | (0.27) | (0.27) |
| Z-Score financial distress | -0.005 | -0.005 | -0.004 |
| | (-0.24) | (-0.29) | (-0.22) |
| Absolute accruals | -0.016 | -0.016 | -0.018 |
| | (-1.12) | (-1.10) | (-1.22) |
| Standard deviation of ROE | -0.011 | -0.010 | -0.008 |
| | (-1.39) | (-1.19) | (-0.97) |
| | | | |
| Firm fixed effect | Yes | Yes | Yes |
| Analyst fixed effect | Yes | Yes | Yes |
| | | | |
| N | 45,768 | 45,783 | 45,783 |
| Adjusted $R$-squared | 0.277 | 0.280 | 0.263 |

This table reports the effect of EPU on forecast error with aggregated sampling, that is, a sample of firm-month observations (rather than analyst-firm-months) by using the consensus of individual analyst forecast in a specific calendar month. Panel A presents descriptive statistics of earnings forecast properties for the aggregate firm-level sample, while Panel B shows the regression results. All the variables are defined in Appendix.

$$ABS\_FE_{it} = \left| \frac{Actual_{it} - \overline{Forecast}_{it}}{Actual_{it}} \right|$$

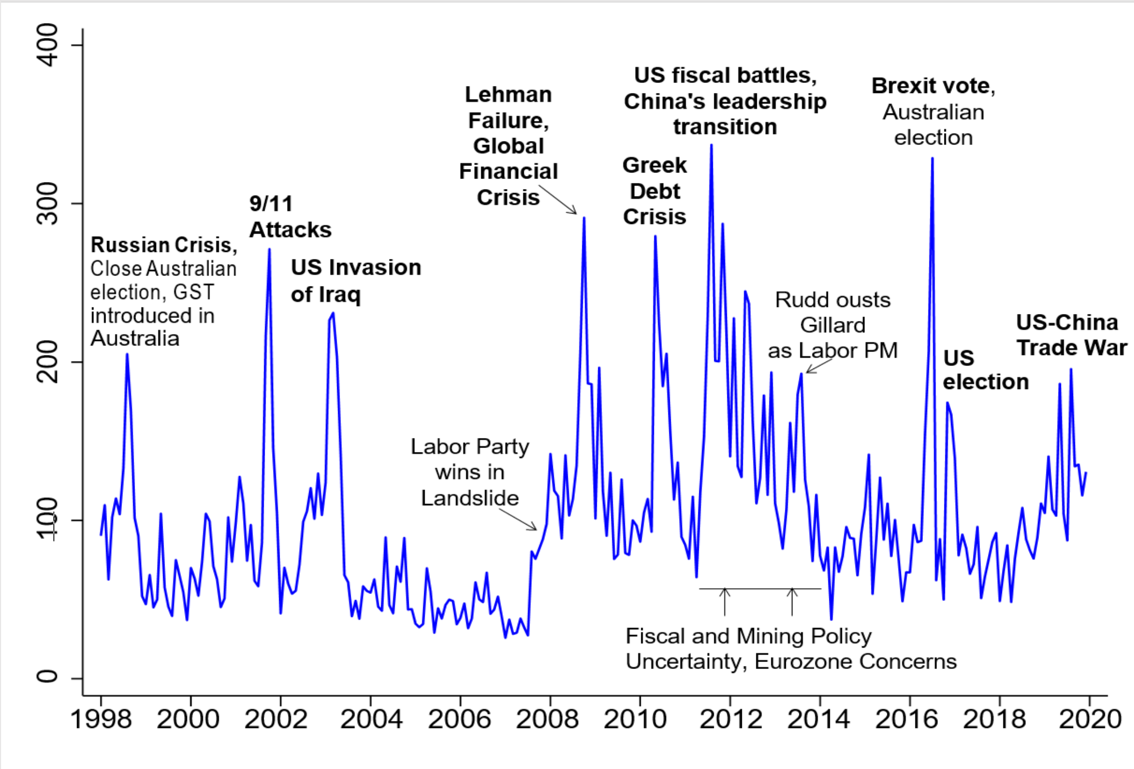
In Panel B, Column (1), (2), and (3) show the regression results for each of the alternative forecast error measures, being one of the following: the mean consensus forecast (*ABS_FE_MEAN*), the median consensus forecast (*ABS_FE_MEDIAN*), and the most recent forecast (*ABS_FE_LATEST*) during a specific calendar month.

All specifications include firm fixed effects and analyst fixed effects. All continuous variables are normalized by their sample standard deviation. Standard errors are clustered by calendar-month and by firm. *t*-statistics are reported below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

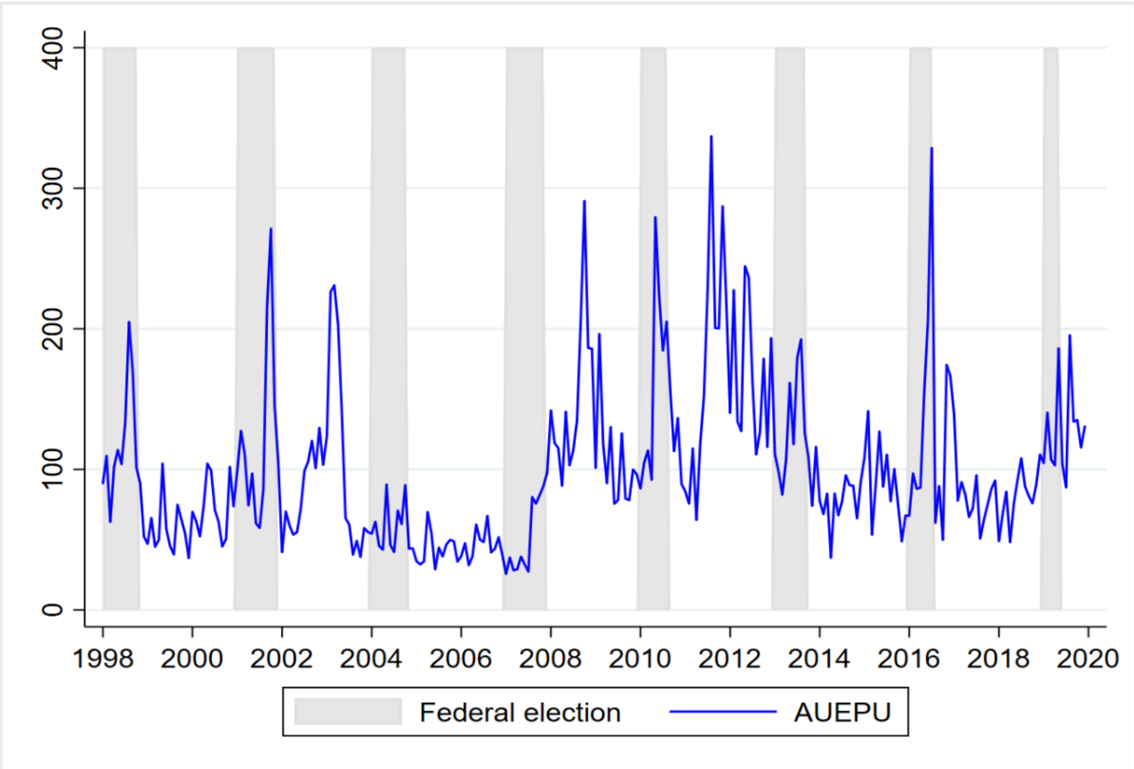
## Figures

### Figure 1. Australian EPU, federal election and recessions

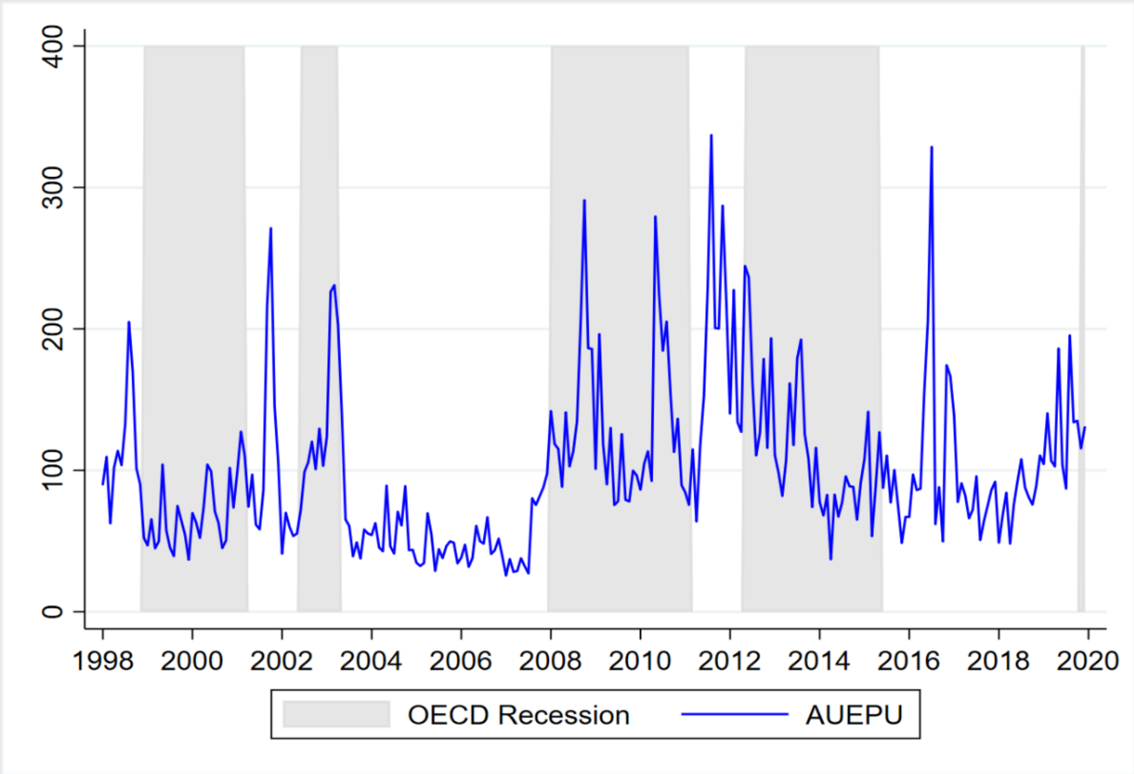
### 1A. Australian EPU index, where *9* out of *10 spikes* are *foreign*




### 1B. Australian EPU and national elections



**1C. Australian EPU and recessionary periods**




Panel A plots the time series of Australian economic policy uncertainty (Baker et al., 2016) over the period from January 1998 to December 2019, with foreign originating events shown in bold. A number of major events and shocks have been identified in accordance with sizeable spikes in uncertainty. Index reflects scaled monthly counts of articles in eight Australian newspapers containing the key terms, such as uncertain or uncertainty, economic or economy, and one or more policy-relevant terms: regulation, Reserve Bank of Australia, RBA, deficit, tax, taxation, taxes, parliament, senate, cash rate, legislation, tariff, war. Data are available at www.policyuncertainty.com.

Panel B plots the time series of Australian economic policy uncertainty and the years with federal elections, while panel B plots the same series with recessionary periods defined by OCED. Recessionary periods include December 1998 – March 2001, June 2002 – April 2003, January 2008 – February 2011, May 2012 – May 2015, and November – December 2019.

# Appendix

## Variable Definitions

| Variables | Description | Data source |
|---|---|---|
| ***Dependent variables*** | | |
| *ABS_FE* | Absolute value of the difference between the actual earnings per share (EPS) and the individual analyst forecast of EPS at time *t*, scaled by the absolute value of actual EPS. | I/B/E/S Database |
| *DISP* | Standard deviation of individual analyst earnings forecast during a month and is deflated by the absolute value of actual earnings per share. | I/B/E/S Database |
| *ABS_FE_ALT* | Absolute value of the difference between the actual earnings per share and the individual analyst forecast, scaled by stock price at the beginning of the firm's fiscal year *t*, i.e., 11 months before the financial year end month. | I/B/E/S Database and SPPR for security price |
| *DISP_ALT* | Standard deviation of individual analyst earnings forecast during a month and is deflated by stock price at the beginning of the firm's fiscal year *t*. | I/B/E/S Database SPPR for security price |
| ***Economic policy uncertainty*** | | |
| AUEPU | Natural logarithm of the weighted average of the Baker et al. (2016) newspaper-based monthly index for Australia over a given month in the year *t*. | Policyuncertainty.com |
| ***Macroeconomic uncertainty variables*** | | |
| Recessions | A dummy variable that takes the value of one for the periods from the peak through the trough of business cycles, and zero otherwise. | OECD Statistics |
| Election | Dummy variable takes a value of one for the months from January to the month of federal elections in election years, proxied for political risks (unresolved election outcomes).<br>The months after elections in the election years and other calendar months in non-election years are coded with the value of zero. | UWA Australian Politics and Elections Database |
| Quarterly GDP Growth | Quarterly growth rate of Australian gross domestic product. | Australian Bureau of Statistics |
| ***Analyst forecast attributes*** | | |
| Ln_N_analysts | The natural logarithm of the number of analysts following a firm *i* during the year *t*. | I/B/E/S Database |
| Ln_Horizon | The natural logarithm of the number of days between the forecast announcement date and the financial year-end date. | I/B/E/S Database |

| | | |
|---|---|---|
| Ln_N_firms | The natural logarithm of the number of firms analyst *j* follows in year *t*. | I/B/E/S Database |
| Brokerage house size | The size of the brokerage house employing analyst *j* in year *t*, measured by the number of analysts employed by the brokerage house. | I/B/E/S Database |
| General experience | General experience measured as the number of prior years the analyst has issued annual forecasts for any firm in the sample. | I/B/E/S Database |
| Industry experience | Industry experience measured as the number of prior years the analyst has issued annual forecasts for any firm in the same six-digit GICS industry classification in the sample. | I/B/E/S Database |
| Firm experience | Analyst's firm-specific experience measured as the number of prior years the analyst has issued annual earnings forecasts for a given firm in the sample. | I/B/E/S Database |
| ***Firm-level controls*** | | |
| Firm size | The natural logarithm of market capitalization at fiscal year *t-1*. | Morningstar |
| MTB Ratio | Market-to-book ratio at fiscal year *t-1*. | Morningstar |
| Financial distress score | Altman's Z-score, measured at year *t-1*, equals 1.2 x (Net working capital/Total assets) + 1.4 x (Retained earnings/Total assets) + 3.3 x (Earnings before interest and taxes/Total assets) + 0.6 x (Market value of equity/Book value of liabilities) + 1.0 x (Sales/Total assets). | Morningstar |
| Absolute Accruals | The absolute value of the difference between net income before extraordinary items and operating cash flows, deflated by total assets at the end of year *t-1*. | Morningstar |
| ***Earnings-related attributes*** | | |
| Loss | An indicator variable coded 1 if a firm makes loss in the fiscal year *t-1*, and 0 otherwise. | Morningstar |
| Absolute Earnings Surprise | Earnings surprise, calculated as the absolute value of the difference between the year's earnings minus last years' earnings, deflated by stock price at time *t-1*. | Morningstar |
| Standard deviation of ROE | Standard deviation of ROE over the previous five years. | Morningstar |

# Chapter 5:

# Conclusions

This thesis examines the impact of uncertainty surrounding government economic policies through three separate studies directly related to fundamental uncertainty, capital investment and earnings forecasts in the Australian setting. The first study explores the association between EPU levels, measured by the newspaper-based Baker et al. (2016) index, and corporate investment decisions by ASX listed firms. The second study investigates the extent to which foreign originating EPU shocks negatively affect aggregate and firm-level fixed investment in Australia. The third study considers whether EPU is a significant predictor for sell-side analysts' earnings forecast properties for Australian firms.

The thesis significantly expands the current literature on the impact of EPU by investigating the spillover effect of foreign uncertainty shocks in Australia. Australia is, by international standards, a small export-oriented economy, which indicates that local EPU may not be as important in comparison with EPU of major closely linked economies such as the US and China. Empirical analyses provide strong evidence that external (i.e., foreign) EPU shocks, especially those originating from China, translate to the Australian setting at the aggregate and firm level to impede investment decisions.

The thesis further expands our understanding of the EPU effect on other stakeholders, going beyond the traditional focus on how firms change investment polies in response to changes in EPU. If ambiguities in government policies have a sizeable impact on the investment decisions of boards and managers, then it is reasonable to expect that such ambiguities will also impact information intermediaries like financial analysts. The results indicate that a rise in EPU is associated with a significant decline in the quality of analysts' earnings forecasts, with higher forecast errors and increased forecast dispersion. This occurs in conjunction with an increase in the extent of analyst coverage.

It is generally acknowledged that uncertainty shocks co-move with business cycles, which raises concerns of how to empirically separate and distinguish the causal effect of heightened EPU. The research methodology proposed in this thesis can be generalized for future research to estimate the causal impact of uncertainty shocks. Based on a structural approach, a multiple general equilibrium models are used to calibrate key aggregate parameters of firms and the economy so as to identify the distinct structural EPU shocks and to quantify their potential effect in Australia. In particular, I estimate SVAR models using quarterly Australian, Chinese and the US data from 1998Q1 to 2019Q2. This structural approach is conceptually grounded; however, it is very sensitive to modelling assumptions. Therefore, I conduct a series of additional analyses under alternative model settings. Robustness tests confirm that EPU shocks generate a more persistent drop in Australian aggregate investment than the well-documented US evidence of a rapid drop and rebound in investment over less than one year (Baker et al., 2016). The results also emphasize that Chinese EPU is five times more important in driving variations in Australian investment than its US and Australian uncertainty counterparts. Overall, the results highlight how multiple sources of uncertainty (i.e., local versus foreign EPU) with different characteristics can differentially impact economic agents' perceptions and behavior.

A corresponding micro-approach is to use OLS regression models for estimating how steep rises in EPU lead to movements in firm-level investment and output. The main empirical challenge faced by this method is that changes in EPU are significantly correlated with general economic volatility and/or are anticipated in advance. In order to alleviate these endogeneity issues, I include several variables as proxies for confounding economic uncertainty and expectations about future economic conditions into the baseline OLS regressions. The results suggest that individual firms have different response to EPU shocks and do not necessarily emulate the response of the aggregate macroeconomy. For instance, both domestic and foreign EPU have a persistent negative impact on firms in mining and exploration industries (up to four years), in contrast to the short-lived EPU effect on non-mining listed firms (only for one year). Additional tests show evidence that the negative EPU impact is more profound for firms that are more capital-intensive, of smaller size, have lower cash-flows, and that report losses.

Moving from the real options channel and towards the information channel, I use the OLS regression models to estimate the average effect of EPU on sell-side analyst behaviors. Both of local and foreign EPU shocks are significant determinants of analysts' forecasting performance. The results lend empirical support to the possibility that higher EPU is negatively associated with the quality of the information environment for ASX listed firms.

There are certain limitations to the thesis which also represent avenues for future research. First, the findings are subject to an investigation of a sample of Australian firms from 1998 through 2019. The results for Australia as a very specific setting may not be generalizable to other countries. Future research may explore whether the Australian findings can be translated well into other small and open economies with different characteristics and regulatory requirements.

Second, the thesis mainly focuses at the aggregate and firm level, rather than at the industry level. I attempt to consider the EPU effect from the industry-level perspective by separately estimating firm-level effects for mining and non-mining firms. Given the large proportion of mining and resources firms listed on ASX (around 40%), the results indicate that firms operating in mining industries, with long-run investment projects being proceeded in many stages, are more affected by EPU shocks. Future research could examine the EPU effect on a wider variety of industries, such as healthcare, manufacturing, construction and financial services, with heterogeneous levels of regulatory sensitivity.

A further possible avenue for future research is to explore how firms respond to local and foreign originating EPU shocks in the process of assimilating information for corporate decisions, for instance, through their own disclosure, learning from peer disclosure or other forms of connectedness. Are there groups of firms that could better evaluate EPU-inducing events and incorporate such informational advantage into their decision making? Addressing these questions can provide additional insight into the effects (positive or negative) of macroeconomic uncertainty and what can be done to minimize the adverse consequences of EPU on firms' outcomes and economic growth.

# Bibliography


Abarbanell, J.S. and Bernard, V.L., 1992. Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. *The Journal of Finance*, *47*(3), pp.1181-1207.

Abarbanell, J.S., 1991. Do analysts' earnings forecasts incorporate information in prior stock price changes?. *Journal of Accounting and Economics*, *14*(2), pp.147-165.

Abel, A.B., 1983. Optimal investment under uncertainty. *American Economic Review*, *73*(1), pp.228-233.

Alexopoulos, M. and Cohen, J., 2009. Uncertain times, uncertain measures. *University of Toronto Department of Economics Working Paper*.

Allayannis, G., Mozumdar, A., 2004. The impact of negative cash flow and influential observations on investment–cash flow sensitivity estimates. *Journal of Banking & Finance*. *28*(5), pp.901-930.

Arellano, C., Bai, Y. and Kehoe, P.J., 2019. Financial frictions and fluctuations in volatility. *Journal of Political Economy*, *127*(5), pp.2049-2103.

Arrow, K.J., 1968. The economics of moral hazard: further comment. *American Economic Review*, *58*(3), pp.537-539.

Atanassov, J., Julio, B. and Leng, T., 2018. The bright side of political uncertainty: The case of R&D. *Working Paper.*

Australian Trade and Investment Commission, 2020. *Australia's export performance in the financial year 2020*.

Baker, S., Bloom, N., Davis, S.J. and Wang, X., 2013. A measure of economic policy uncertainty for China. *Working Paper, University of Chicago*.

Baker, S.R., Bloom, N., Canes-Wrone, B., Davis, S.J. and Rodden, J., 2014. Why has US policy uncertainty risen since 1960?. *American Economic Review*, *104*(5), pp.56-60.

Baker, S.R., Bloom, N., Davis, S.J., 2016. Measuring economic policy uncertainty. *The Quarterly Journal of Economics*. *131*(4), 1593-1636.

Baloria, V.P. and Mamo, K., 2017. Policy uncertainty and analyst performance. *Working Paper.*

Bar-Ilan, A. and Strange, W.C., 1996. Investment lags. *American Economic Review*, *86*(3), pp.610-622.

Bar-Ilan, A. and Strange, W.C., 1998. A model of sequential investment. *Journal of Economic Dynamics and Control*, *22*(3), pp.437-463.

Barron, O.E., Byard, D. and Yu, Y., 2008. Earnings surprises that motivate analysts to reduce average forecast error. *The Accounting Review*, *83*(2), pp.303-325.

Barron, O.E., Byard, D., Kile, C. and Riedl, E.J., 2002. High-technology intangibles and analysts' forecasts. *Journal of Accounting Research*, *40*(2), pp.289-312.

Barth, M.E., Kasznik, R. and McNichols, M.F., 2001. Analyst coverage and intangible assets. *Journal of Accounting Research*, *39*(1), pp.1-34.

Bernanke, B.S., 1983. Irreversibility, uncertainty, and cyclical investment. *The Quarterly Journal of Economics*. *98*(1), pp.85-106.

Beveridge, S. and Nelson, C.R., 1981. A new approach to decomposition of economic time series into permanent and transitory components with particular attention to measurement of the 'business cycle'. *Journal of Monetary Economics*, *7*(2), pp.151-174.

Bhushan, R., 1989. Firm characteristics and analyst following. *Journal of Accounting and Economics*, *11*(2-3), pp.255-274.

Bird, A., Karolyi, S.A. and Ruchti, T., 2017. Political uncertainty and corporate transparency. *Working Paper.*

Biswas, R., 2019. Does Economic Policy Uncertainty Affect Analyst Forecast Accuracy?. *Working Paper.*

Bloom, N., 2009. The impact of uncertainty shocks. *Econometrica*, *77*(3), pp.623-685.

Bloom, N., 2014. Fluctuations in uncertainty. *Journal of Economic Perspectives*, *28*(2), pp.153-76.

Bloom, N., 2017. Observations on uncertainty. *Australian Economic Review*, *50*(1), pp.79-84.

Bloom, N., Bond, S. and Van Reenen, J., 2007. Uncertainty and investment dynamics. *The Review of Economic Studies*, *74*(2), pp.391-415.

Bonaime, A., Gulen, H. and Ion, M., 2018. Does policy uncertainty affect mergers and acquisitions?. *Journal of Financial Economics*, *129*(3), pp.531-558.

Boone, A.L., Kim, A. and White, J.T., 2020. Local policy uncertainty and firm disclosure. *Vanderbilt Owen Graduate School of Management Research Paper*.

Brennan, M.J. and Schwartz, E.S., 1985. Evaluating natural resource investments. *Journal of Business*, pp.135-157.

Brogaard, J. and Detzel, A., 2015. The asset-pricing implications of government economic policy uncertainty. *Management Science*, *61*(1), pp.3-18.

Brown, L.D., 1993. Earnings forecasting research: its implications for capital markets research. *International Journal of Forecasting*, *9*(3), pp.295-320.

Brown, L.D., Call, A.C., Clement, M.B. and Sharp, N.Y., 2015. Inside the "black box" of sell-side financial analysts. *Journal of Accounting Research*, *53*(1), pp.1-47.

Caggiano, G., Castelnuovo, E. and Groshenny, N., 2014. Uncertainty shocks and unemployment dynamics in US recessions. *Journal of Monetary Economics*, *67*, pp.78-92.

Caggiano, G., Castelnuovo, E. and Pellegrino, G., 2017. Estimating the real effects of uncertainty shocks at the zero lower bound. *European Economic Review*, *100*, pp.257-272.

Cao, C., Li, X. and Liu, G., 2019. Political uncertainty and cross-border acquisitions. *Review of Finance*, *23*(2), pp.439-470.

Cao, Y., Guan, F., Li, Z. and Yang, Y.G., 2020. Analysts' beauty and performance. *Management Science*, *66*(9), pp.4315-4335.

Cardia, E., 1991. The dynamics of a small open economy in response to monetary, fiscal, and productivity shocks. *Journal of Monetary Economics*, *28*(3), pp.411-434.

Carrière-Swallow, Y. and Céspedes, L.F., 2013. The impact of uncertainty shocks in emerging economies. *Journal of International Economics*, *90*(2), pp.316-325.

Castelnuovo, E., Lim, G. and Pellegrino, G., 2017. A short review of the recent literature on uncertainty. *Australian Economic Review*, *50*(1), pp.68-78.

Chahine, S., Daher, M. and Saade, S., 2021. Doing good in periods of high uncertainty: Economic policy uncertainty, corporate social responsibility, and analyst forecast error. *Journal of Financial Stability*, *56*, p.100919.

Chen, M., Zhu, Z., Han, P., Chen, B. and Liu, J., 2022. Economic policy uncertainty and analyst behaviours: Evidence from the United Kingdom. *International Review of Financial Analysis*, *79*, p.101906.

Chen, X., Le, C.H.A., Shan, Y. and Taylor, S., 2020. Australian policy uncertainty and corporate investment. *Pacific-Basin Finance Journal*, *61*.

Chen, X., Lu, M., Shan, Y., Zhang, Y., 2020. Australian evidence on analysts' cash flow forecasts: issuance, accuracy and usefulness. *Accounting & Finance*.

Chen, Y., Chen, D., Wang, W. and Zheng, D., 2018. Political uncertainty and firms' information environment: Evidence from China. *Journal of Accounting and Public Policy*, *37*(1), pp.39-64.

Chen, Z., Cihan, M., Jens, C. and Page, T.B., 2018. Political uncertainty and firm investment: Project-level evidence from M&A activity. *Working Paper.*

Cheng, C.H.J., 2017. Effects of foreign and domestic economic policy uncertainty shocks on South Korea. *Journal of Asian Economics*, *51*, pp.1-11.

Chetty, R., 2007. Interest rates, irreversibility, and backward-bending investment. *The Review of Economic Studies*, *74*(1), pp.67-91.

Chourou, L., Purda, L. and Saadi, S., 2021. Economic policy uncertainty and analysts' forecast characteristics. *Journal of Accounting and Public Policy*, *40*(4), p.106775.

Christensen, D.M., Mikhail, M.B., Walther, B.R. and Wellman, L.A., 2017. From K Street to Wall Street: Political connections and stock recommendations. *The Accounting Review*, *92*(3), pp.87-112.

Clemen, R.T., 1989. Combining forecasts: A review and annotated bibliography. *International Journal of Forecasting*, *5*(4), pp.559-583.

Clement, M.B. and Tse, S.Y., 2005. Financial analyst characteristics and herding behavior in forecasting. *The Journal of Finance*, *60*(1), pp.307-341.

Colak, G., Durnev, A. and Qian, Y., 2017. Political uncertainty and IPO activity: Evidence from US gubernatorial elections. *Journal of Financial and Quantitative Analysis*, *52*(6), pp.2523-2564.

Colombo, V., 2013. Economic policy uncertainty in the US: Does it matter for the Euro area? *Economics Letters*, *121*(1), pp.39-42.

Coorey, P., 2019. Treasurer's plea to business. https://www.afr.com/politics/federal/treasurer-s-plea-to-business-invest-20190825-p52kjq/ (accessed 18 February 2022).

Cornell, B., 1999. *The equity risk premium: the long-run future of the stock market*. John Wiley & Sons.

Croce, M.M., Nguyen, T.T. and Schmid, L., 2012. The market price of fiscal uncertainty. *Journal of Monetary Economics*, *59*(5), pp.401-416.

Dai, L. and Ngo, P., 2020. Political uncertainty and accounting conservatism. *European Accounting Review*, pp.1-32.

Daniel, K.D., Hirshleifer, D. and Subrahmanyam, A., 2001. Overconfidence, arbitrage, and equilibrium asset pricing. *The Journal of Finance*, *56*(3), pp.921-965.

Davis, S.J., Liu, D. and Sheng, X.S., 2019. Economic policy uncertainty in China since 1949: The view from mainland newspapers. *Fourth Annual IMF-Atlanta Fed Research Workshop on China's Economy Atlanta*, *19*, pp.1-37.

De Bondt, W.F. and Thaler, R.H., 1990. Do security analysts overreact?. *American Economic Review*, pp.52-57.

DeFond, M.L. and Hung, M., 2003. An empirical analysis of analysts' cash flow forecasts. *Journal of Accounting and Economics*, *35*(1), pp.73-100.

Department of Foreign Affairs and Trade DFAT, 2020. *Australia's Trade and Investment at a glance 2020.*

Dhaliwal, D.S., Radhakrishnan, S., Tsang, A. and Yang, Y.G., 2012. Nonfinancial disclosure and analyst forecast accuracy: International evidence on corporate social responsibility disclosure. *The Accounting Review*, *87*(3), pp.723-759.

Diamond, D.W. and Verrecchia, R.E., 1981. Information aggregation in a noisy rational expectations economy. *Journal of Financial Economics*, *9*(3), pp.221-235.

Dixit, A.K., Pindyck, R.S., 1994. *Investment under uncertainty*. Princeton University Press.

Durnev, A., 2013. The Real Effects of Political Uncertainty: Elections and Investment Sensitivity to Stock Prices. *Working Paper*, *University of Iowa.*

Duru, A. and Reeb, D.M., 2002. International diversification and analysts' forecast accuracy and bias. *The Accounting Review*, *77*(2), pp.415-433.

Edwards, W., 1968. Conservatism in human information processing. *Formal Representation of Human Judgment*.

Eusepi, S. and Preston, B., 2018. Fiscal foundations of inflation: imperfect knowledge. *American Economic Review*, *108*(9), pp.2551-89.

Faff, R.W., 2019. Adopting a structured abstract design to more effectively catch reader attention: An application of the pitching research framework. *Capital Markets Review. 27*(2), pp.1-13.

Fernández-Villaverde, J., Guerrón-Quintana, P., Kuester, K. and Rubio-Ramírez, J., 2015. Fiscal volatility shocks and economic activity. *American Economic Review*, *105*(11), pp.3352-84.

Fernández-Villaverde, J., Guerrón-Quintana, P., Rubio-Ramirez, J.F. and Uribe, M., 2011. Risk matters: The real effects of volatility shocks. *American Economic Review*, *101*(6), pp.2530-61.

Gabauer, D. and Gupta, R., 2018. On the transmission mechanism of country-specific and international economic uncertainty spillovers: Evidence from a TVP-VAR connectedness decomposition approach. *Economics Letters*, *171*, pp.63-71.

Gao, P., and Qi, Y., 2012. Political uncertainty and public financing costs: Evidence from US gubernatorial elections and municipal bond markets. *Working Paper.*

Gauvin, L., McLoughlin, C. and Reinhardt, D., 2014. Policy uncertainty spillovers to emerging markets–evidence from capital flows. *Working Paper.*

Grossman, G.M. and Shapiro, C., 1986. Optimal Dynamic R&D Programs. *The RAND Journal of Economics*, pp.581-593.

Gulen, H., Ion, M., 2016. Policy uncertainty and corporate investment. *The Review of Financial Studies*, *29*(3), pp.523-564.

Handley, K., 2014. Exporting under trade policy uncertainty: Theory and evidence. *Journal of International Economics*, *94*(1), pp.50-66.

Hann, R.N., Ogneva, M. and Sapriza, H., 2012. Forecasting the macroeconomy: analysts versus economists. *Working Paper.*

Harris, M. and Raviv, A., 1993. Differences of opinion make a horse race. *The Review of Financial Studies*, *6*(3), pp.473-506.

Hartman, R., 1972. The effects of price and cost uncertainty on investment. *Journal of Economic Theory*, *5*(2), pp.258-266.

Hassan, T.A., Hollander, S., van Lent, L. and Tahoun, A., 2017. Firm-level political risk. *Working Paper*, *Boston University*.

Hassett, K.A. and Sullivan, J., 2016. Policy uncertainty and the economy. *American Enterprise Institute Research*.

Hill, J.G., 2012. Why did Australia fare so well in the global financial crisis?. *The Regulatory Aftermath of the Global Financial Crisis, Sydney Law School Research Paper,* pp.203-300.

Hodrick, R.J., Prescott, E.C., 1997. Postwar US business cycles: an empirical investigation. *Journal of Money, Credit, and Banking*, pp.1-16.

Hong, H. and Kubik, J.D., 2003. Analyzing the analysts: Career concerns and biased earnings forecasts. *The Journal of Finance*, *58*(1), pp.313-351.

Hope, O.K. and Kang, T., 2005. The association between macroeconomic uncertainty and analysts' forecast accuracy. *Journal of International Accounting Research*, *4*(1), pp.23-38.

Hribar, P. and McInnis, J., 2012. Investor sentiment and analysts' earnings forecast errors. *Management Science*, *58*(2), pp.293-307.

Hutton, A.P., Lee, L.F. and Shu, S.Z., 2012. Do managers always know better? The relative accuracy of management and analyst forecasts. *Journal of Accounting Research*, *50*(5), pp.1217-1244.

Jacob, M., Wentland, K. and Wentland, S.A., 2014. Firm tax uncertainty, cash holdings, and the timing of large investment. *Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, *107*, pp.1-50.

Jegadeesh, N. and Kim, W., 2010. Do analysts herd? An analysis of recommendations and market reactions. *The Review of Financial Studies*, *23*(2), pp.901-937.

Jens, C.E., 2017. Political uncertainty and investment: Causal evidence from US gubernatorial elections. *Journal of Financial Economics*, *124*(3), pp.563-579.

Jones, P.M. and Olson, E., 2015. The international effects of US uncertainty. *International Journal of Finance & Economics*, *20*(3), pp.242-252.

Jotzo, F., Jordan, T. and Fabian, N., 2012. Policy uncertainty about Australia's carbon price: expert survey results and implications for investment. *Australian Economic Review*, *45*(4), pp.395-409.

Julio, B. and Yook, Y., 2016. Policy uncertainty, irreversibility, and cross-border flows of capital. *Journal of International Economics*, *103*, pp.13-26.

Julio, B., Yook, Y., 2012. Political uncertainty and corporate investment cycles. *The Journal of Finance*. *67*(1), pp.45-83.

Jurado, K., Ludvigson, S.C. and Ng, S., 2015. Measuring uncertainty. *American Economic Review*, *105*(3), pp.1177-1216.

Kandel, E. and Pearson, N.D., 1995. Differential interpretation of public signals and trade in speculative markets. *Journal of Political Economy*, *103*(4), pp.831-872.

Kelly, B., Pastor, L. and Veronesi, P., 2016. The price of political uncertainty: Theory and evidence from the option market. *The Journal of Finance*, *71*(5), pp.2417-2480.

Kim, O. and Verrecchia, R.E., 1991. Trading volume and price reactions to public announcements. *Journal of Accounting Research*, *29*(2), pp.302-321.

Kim, S., 2001. International transmission of US monetary policy shocks: Evidence from VAR's. *Journal of Monetary Economics*, *48*(2), pp.339-372.

Kirchner, S., 2019. State of confusion: Economic policy uncertainty and international trade and investment. *Australian Economic Review*. *52*(2), pp.178-199.

Kothari, S.P., So, E. and Verdi, R., 2016. Analysts' forecasts and asset pricing: A survey. *Annual Review of Financial Economics*, *8*, pp.197-219.

Kraft, H., Schwartz, E. and Weiss, F., 2018. Growth options and firm valuation. *European Financial Management*, *24*(2), pp.209-238.

Kumar, A., 2010. Self-selection and the forecasting abilities of female equity analysts. *Journal of Accounting Research*, *48*(2), pp.393-435.

La Cava, G., Richards, T., Shuetrim, G., Vickery, J., 2005. *Financial constraints, the user cost of capital and corporate investment in Australia*. Canberra, Australia: Reserve Bank of Australia.

Lang, M.H. and Lundholm, R.J., 1996. Corporate disclosure policy and analyst behavior. *The Accounting Review*, pp.467-492.

Leduc, S. and Liu, Z., 2016. Uncertainty shocks are aggregate demand shocks. *Journal of Monetary Economics*, *82*, pp.20-35.

Lehavy, R., Li, F. and Merkley, K., 2011. The effect of annual report readability on analyst following and the properties of their earnings forecasts. *The Accounting Review*, *86*(3), pp.1087-1115.

Li, J. and Born, J.A., 2006. Presidential election uncertainty and common stock returns in the United States. *Journal of Financial Research*, *29*(4), pp.609-622.

Li, X., Luo, J. and Chan, K.C., 2018. Political uncertainty and the cost of equity capital. *Finance Research Letters*, *26*, pp.215-222.

Lin, M.C., 2018. The impact of aggregate uncertainty on herding in analysts' stock recommendations. *International Review of Financial Analysis*, *57*, pp.90-105.

Lobo, G.J., Song, M. and Stanford, M., 2012. Accruals quality and analyst coverage. *Journal of Banking & Finance*, *36*(2), pp.497-508.

Loh, R.K. and Mian, G.M., 2006. Do accurate earnings forecasts facilitate superior investment recommendations?. *Journal of Financial Economics*, *80*(2), pp.455-483.

Loh, R.K. and Stulz, R.M., 2018. Is sell-side research more valuable in bad times?. *The Journal of Finance*, *73*(3), pp.959-1013.

Lu, M., Shan, Y., Wright, S. and Yu, Y., 2018. Operating cash flow asymmetric timeliness in Australia. *Accounting & Finance*.

Ludvigson, S., Ma, S. and Ng, S., 2021. Uncertainty and Business Cycles: Exogenous Impulse or Endogenous Response?. *American Economic Journal: Macroeconomics*.

Luk, P., Cheng, M., Ng, P. and Wong, K., 2020. Economic policy uncertainty spillovers in small open economies: The case of Hong Kong. *Pacific Economic Review*, *25*(1), pp.21-46.

Lütkepohl, H., 2005. *New introduction to multiple time series analysis*. Springer Science & Business Media.

Marfatia, H., Zhao, W.L. and Ji, Q., 2020. Uncovering the global network of economic policy uncertainty. *Research in International Business and Finance, 53*, p.101223.

McDonald, R. and Siegel, D., 1986. The value of waiting to invest. *The Quarterly Journal of Economics*, *101*(4), pp.707-727.

McNees, S.K., 1992. The uses and abuses of 'consensus' forecasts. *Journal of Forecasting*, *11*(8), pp.703-710.

Meinen, P. and Roehe, O., 2017. On measuring uncertainty and its impact on investment: Cross-country evidence from the Euro area. *European Economic Review*, *92*, pp.161-179.

Mikhail, M.B., Walther, B.R. and Willis, R.H., 2007. When security analysts talk, who listens?. *The Accounting Review*, *82*(5), pp.1227-1253.

Mizen, R., 2021. Australia's allies are profiting from China trade bans. *Australian Financial Review,* 17 September, viewed 22 March 2023, < https://www.afr.com/politics/federal/australia-s-allies-are-profiting-from-china-trade-bans-20210913-p58rar>

Moore, A., 2017. Measuring economic uncertainty and its effects. *Economic Record*. *93*(303), pp.550-575.

Morikawa, M., 2016. What types of policy uncertainties matter for business? *Pacific Economic Review*. *21*(5), pp.527-540.

Mumtaz, H. and Theodoridis, K., 2015. The international transmission of volatility shocks: An empirical analysis. *Journal of the European Economic Association*, *13*(3), pp.512-533.

Nagar, V., Schoenfeld, J., Wellman, L., 2019. The effect of economic policy uncertainty on investor information asymmetry and management disclosures. *Journal of Accounting and Economics*. *67*(1), pp.36-57.

Nguyen, C.P., Su, T.D., Wongchoti, U. and Schinckus, C., 2020. The spillover effects of economic policy uncertainty on financial markets: a time-varying analysis. *Studies in Economics and Finance*, *37*(3), pp.513-543.

Nguyen, N.H. and Phan, H.V., 2017. Policy uncertainty and mergers and acquisitions. *Journal of Financial and Quantitative Analysis*, *52*(2), pp.613-644.

Ni, X., 2020. How can local policy uncertainty encourage firm innovation: A competitive advantage channel. *Working Paper.*

Nimark, K.P., 2009. A structural model of Australia as a small open economy. *Australian Economic Review*, *42*(1), pp.24-41.

O'Brien, P.C. and Bhushan, R., 1990. Analyst following and institutional ownership. *Journal of Accounting Research*, *28*, pp.55-76.

Oi, W.Y., 1961. The desirability of price instability under perfect competition. *Econometrica: Journal of the Econometric Society*, pp.58-64.

Organisation for Economic Co-operation and Development OECD, 2020. *Australia Economic Snapshot 2020.*

Paddock, J.L., Siegel, D.R. and Smith, J.L., 1988. Option valuation of claims on real assets: The case of offshore petroleum leases. *The Quarterly Journal of Economics*, *103*(3), pp.479-508.

Pastor, L. and Veronesi, P., 2012. Uncertainty about government policy and stock prices. *The Journal of Finance*, *67*(4), pp.1219-1264.

Pastor, L. and Veronesi, P., 2013. Political uncertainty and risk premia. *Journal of Financial Economics*, *110*(3), pp.520-545.

Pindyck, R.S., 1988. Irreversible investment, capacity choice, and the value of the firm. *American Economic Review, 78*, pp.969-985.

Pindyck, R.S., 1993. A note on competitive investment under uncertainty. *American Economic Review*, *83*(1), pp.273-277.

Richardson, S., Teoh, S.H. and Wysocki, P.D., 2004. The walk-down to beatable analyst forecasts: The role of equity issuance and insider trading incentives. *Contemporary Accounting Research*, *21*(4), pp.885-924.

Schipper, K., 1991. Analysts' forecasts. *Accounting Horizons*, *5*(4), p.105.

Schwartz, E.S. and Trigeorgis, L., 2004. *Real options and investment under uncertainty: classical readings and recent contributions*. MIT Press.

Segal, G., Shaliastovich, I. and Yaron, A., 2015. Good and bad uncertainty: Macroeconomic and financial market implications. *Journal of Financial Economics*, *117*(2), pp.369-397.

Seymen, A., 2008. A critical note on the forecast error variance decomposition. *ZEW-Centre for European Economic Research Discussion Paper*.

Sharpe, S.A., 1994. Financial market imperfections, firm leverage, and the cyclicality of employment. *American Economic Review*, *84*(4), pp.1060-1074.

Shleifer, A. and Vishny, R.W., 1992. Liquidation values and debt capacity: A market equilibrium approach. *The Journal of Finance*, *47*(4), pp.1343-1366.

Sims, C.A. and Zha, T., 1999. Error bands for impulse responses. *Econometrica*, *67*(5), pp.1113-1155.

Sims, C.A., 1980. Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, pp.1-48.

Tran, T.L., 2014. Uncertainty and investment: Evidence from Australian firm panel data. *Economic Record*, *90*, pp.87-101.

Varian, H.R., 1985. Divergence of opinion in complete markets: A note. *The Journal of Finance*, *40*(1), pp.309-317.

Wang, Y., Chen, C.R. and Huang, Y.S., 2014. Economic policy uncertainty and corporate investment: Evidence from China. *Pacific-Basin Finance Journal*, *26*, pp.227-243.

Weeds, H., 2002. Strategic delay in a real options model of R&D competition. *Review of Economic Studies*, 69(3), pp.729-747.

White, H., 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*. *48*(4), pp.817-838.

Wu, S., Liu, J. and Wu, Y., 2022. Quiet Quitting or Working Hard: Economic Policy Uncertainty and Analysts' Earnings Forecasts. *Working paper*.

Zhang, D., Lei, L., Ji, Q. and Kutan, A.M., 2019. Economic policy uncertainty in the US and China and their impact on the global markets. *Economic Modelling*, *79*, pp.47-56.

Zhang, G., Han, J., Pan, Z. and Huang, H., 2015. Economic policy uncertainty and capital structure choice: Evidence from China. *Economic Systems, 39*(3), pp.439-457.

Zhang, X.F., 2006. Information uncertainty and analyst forecast behavior. *Contemporary Accounting Research*, *23*(2), pp.565-590.