Home country uncertainty and cash holdings: evidence from multinational subsidiaries in South Korea

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Abstract

Using data on Korean subsidiaries with 18 different countries of origin and a newspaper-based economic policy uncertainty (EPU) index, we investigate the effect of uncertainty transmission on multinationals' key decisions. Subsidiaries of multinational corporations face host and home country uncertainty. We document that Korean subsidiaries significantly increase their cash holdings when EPU increases in their home countries, indicating that national uncertainty shocks are transmitted to other countries through the multinational networks. We further show a more pronounced home EPU effect when parent companies hold a greater share of subsidiary equity. The home EPU effect is robust to include additional home country factors and alternative definitions of home EPU and cash holdings. Additionally, we find that subsidiaries cut down capital expenditures when their home EPU increases.

Keywords: Multinational corporations, policy uncertainty, country of origin, cash holdings, Korea
JEL classification: D80, E22, F23, G32

1. Introduction

A growing body of literature investigates the network of multinational affiliates as a channel through which local economic fluctuations escalate to cross-country correlations at the global level (Bena, Dinc, & Erel, 2021; Kleinert, Martin, & Toubal, 2015). Cravino and Levchenko (2017) estimate that 20–40% of a foreign affiliate's shock has a home country origin. Several recent articles show that country-of-origin factors are transmitted across national borders and largely influence the decisions of multinational affiliates. Tang and Zhang (2021) and Li, Griffin, Yue, and Zhao (2011) show that the home country's culture significantly affects foreign affiliates' employment and capital structure decisions. As emerging markets try to host many affiliates of large multinational corporations headquartered in developed countries, their concern is shocks originating in developed countries being transmitted to their local economies through foreign subsidiaries.

This study attempts to understand how home country uncertainty affects the cash holdings of subsidiaries operating in other countries. Pinkowitz, Stulz and Williamson (2016) show that increased cash holdings occur worldwide, with a more pronounced increase in the United States. Several studies identify precautionary motive as the main driver of cash accumulation (Bates, Kahle, & Stulz, 2009; Han & Qiu, 2007; Opler, Pinkowitz, Stulz, & Williamson, 1999). Therefore, it is important to provide empirical evidence on how home country uncertainty affects foreign subsidiaries' precautionary motives. Given the evidence that rising cash levels are an important phenomenon for multinational corporations (Fernandes

& Gonenc, 2016), investigating the uncertainty transmission through multinational networks might provide one answer to the question of why multinationals hold more cash than domestic firms.

We conjecture that foreign subsidiaries increase their cash holdings when the country-of-origin uncertainty increases. Prior studies on the effect of uncertainty on cash holdings suggest that parent firms would delay their investments and accumulate cash holdings until resolving uncertainty. If parent and subsidiary businesses are highly related, subsidiaries are also likely to hold off their investments when parents delay their investments. Even if subsidiary and parent investments are not highly related, subsidiaries are likely to accumulate cash holdings because parent companies may hold off internal investments and accumulate funds in the internal capital markets when home country uncertainty is high. Subsidiaries may want to accumulate more cash for smooth operations and future investment opportunities because the parents may not assign sufficient resources until the home country's uncertainty is resolved.

We employ unique data on foreign multinational subsidiaries operating in Korea from the 2006–2017 Survey of Business Activities (SBA) conducted by the Korean Bureau of Statistics. The heterogeneity in the foreign subsidiaries' origin and the significant variation in their uncertainty movement over time allow us to identify the impact of home country uncertainty on the cash holdings of subsidiaries operating outside the home country. To

measure home country uncertainty, we use the newspaper-based economic policy uncertainty (EPU) index developed by Baker, Bloom and Davis (2016) and identify the uncertainty of 18 home countries. The index captures uncertainty on the expected monetary or fiscal policy, the tax or regulatory regime, or electoral outcomes that influence political leadership and, hence measures the country-specific uncertainty better than other measures of general macroeconomic uncertainty. The panel regressions with subsidiary fixed effects show that rising home country uncertainty leads foreign subsidiaries to increase cash holdings after controlling for host country uncertainty. This is consistent with the transmission of uncertainty shock from home to host countries. Additionally, we document the strong and positive home EPU effect on subsidiary cash holdings after controlling the difference of foreign subsidiaries from Korean local firms in the sample.

To bolster our argument on the home EPU effect, we test whether the effect is more pronounced when the link between subsidiaries and parent firms is stronger. We show a stronger home-EPU effect when parent firms own larger shares of foreign subsidiaries. We find that large parents' ownership reduces subsidiaries' cash accumulation needs, but increases subsidiaries' response to home country shocks. We also measure the link between parents and subsidiaries using intra-firm trades and whether they operate in the same industry. However, the home EPU effect is not greater when subsidiaries have more trade within their multinational networks or operate in the same industries as their parents. The findings confirm that common

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productivity shocks to firms within the same multinational do not drive the home EPU effect. The analysis supports our argument that the internal capital market drives the home EPU effect and confirms that home EPU shocks indeed trigger subsidiaries to increase their cash holdings.

We conduct a series of robustness tests. First, we control for various home country-level factors that may influence subsidiary cash holdings to ensure that home EPU does not capture other home country effects. After including private credit, GDP growth, inflation, the number of patent applications, and the level of labor regulation, all measured at the home country level, the effect of home EPU is statistically significant and positive. Additionally, we reexamine the effect using alternative definitions of home EPU and cash holdings and confirm that our results are robust.

Finally, we identify how firms can increase their cash holdings. If subsidiaries accumulate cash holdings than usual, they must reduce some activity expenditures. The precautionary motive of cash holdings suggests that when firms face increased uncertainty, they withhold their planned investments and accumulate cash holdings until the uncertainty is resolved. Consistent with this conjecture, we find that subsidiaries significantly reduce their capital expenditure when the home country EPU increases. However, no significant reduction exists in advertising expenditure, innovation, and employment.

This study contributes to the literature on policy uncertainty. Prior studies show that policy uncertainty depress domestic investments by examining firm-level capital investment

(Bloom, 2009; Gulen and Ion, 2016; Julio and Yook, 2012), M&A activities (Nguyen and Phan, 2017), and innovation activities (Bhattacharya et al., 2017). Duong, Nguyen, Nguyen, and Rhee (2020) and Demir and Ersan (2017) document the positive effect of EPU on corporate cash holdings in the U.S. and emerging markets, respectively. Nevertheless, little is known about the effect of policy uncertainty beyond the national borders. We document the first empirical evidence that the national policy uncertainty is transmitted through multinational subsidiaries and significantly alter their cash holdings decisions in emerging markets. This study is closely related to Li et al. (2011) that show home country culture matters in financing decisions of foreign subsidiaries in China. This study also complements studies investigating what determines multinational corporations' cash holdings (e.g., Foley, Hartzell, Titman, & Twite, 2007; Fernandes & Gonenc, 2016; Al-Najjar, 2013). This study suggests that uncertainty transmission through the network of multinational affiliates is possibly another reason for the high cash holdings of multinationals.

This study is closely related to the growing literature on the international transmission of local shocks through multinational networks. Some studies empirically examine the spillover of local economic shocks by using foreign affiliates' investments (Bena et al., 2021), employment (Hjort, Li, & Sarsons, 2020) and sales (Biermann & Huber, 2021). Desai, Foley, and Hines (2009) show that U.S. manufacturing companies increase their investment in the U.S. when their foreign investment increases. Unlike the economic shocks previously

examined, the effect of uncertainty transmission is largely unexplored. This study complements prior evidence on investments and helps us better understand how the international transmission of uncertainty affect multinationals' key decisions.

The remainder of this paper proceeds as follows. The next section presents a brief overview of the relevant literature and develops our main hypothesis regarding the impact of home uncertainty on foreign subsidiary cash holdings. After that, we describe our data and empirical strategy. Then we discuss our empirical findings. The final section concludes.

2. Literature review

2.1. Effects of uncertainty on corporate cash holdings

Since the research by Opler et al. (1999), the determinants of corporate cash holdings have been broadly studied. Many studies including Bates, Kahle, and Stulz (2009), Han and Qiu, (2007), and Opler et al. (1999), find the precautionary motive supports the observed cash accumulation. Firms hold excess cash to ensure continuous investment when cash flow is low relative to investment needs and when external funds are expensive. Moreover, as uncertainty decreases asset returns and increases the cost of external financing, which exacerbates firms' financial constraints (Brogaard & Detzel, 2015; Gilchrist, Sim, & Zakrajšek, 2014; Pástor & Veronesi, 2013), firms are motivated to increase cash reserves to buffer against financial shocks and maintain smooth operations.

The precautionary motive for cash holdings suggests that uncertainty should increase corporate cash holdings, as it leads firms to delay their investments and accumulate cash for future investments. A real option perspective also predicts that firms may choose to delay investment amid high uncertainty. Consistent with these views, several empirical studies present evidence that firms reduce their investment expenditures during times of high uncertainty. Julio and Yook (2012) show that firms reduce investment expenditures until the election is over. Baker et al. (2016) and Gulen and Ion (2016) show that increased EPU decreases corporate investments. Further, Nguyen and Phan (2017) and Bonaime et al. (2018) test the effect of the EPU on mergers and acquisitions and show that uncertainty significantly discourages M&A activities.

Several researchers have documented empirical evidence on the positive relationship between uncertainty and corporate cash holdings. For example, Baum, Caglayan, Ozkan, and Talavera (2006) document that U.S. firms increase their liquid asset holdings when macroeconomic or idiosyncratic uncertainty increases. Similarly, Duong et al. (2020) find a strong positive relationship between EPU and cash holdings, especially for financially constrained firms. The positive relationship between cash holdings and uncertainty is also documented in other countries. Bhaduri and Kanti (2011) find that Indian firms increase their cash holdings when uncertainty increases. Demir and Ersan (2017) show that EPU has a significant positive effect on corporate cash holdings in BRIC countries. Additionally, Ramírez

and Tadesse (2009) and Chen et al. (2015) focus on the impact of culture and show that higher uncertainty avoidance positively affects corporate holdings of liquid assets.

Contrary to the works mentioned above, we investigate whether the effect of uncertainty on corporate cash holdings goes beyond national borders. Specifically, we examine whether a shock in the level of uncertainty in the country of origin can significantly alter the cash holding decisions of subsidiaries of multinational corporations in a setting where subsidiaries operate and make decisions outside their home countries. The next section discusses literature on the transmission of a local shock through multinational networks.

2.2.   Transmission of local shocks through multinational affiliates

Recently, a growing number of studies have documented that multinational affiliates' networks are an important source of overall co-movement of the global economy. For example, Boehm, Flaan, and Nayar (2019) show that multinational corporations are the channel of transmitting the effect of the Tohoku earthquake to other countries. Several studies also show that a shock in the home country significantly affects the important decisions of foreign affiliates. Hjort et al. (2020) show that shocks to minimum wages and exchange rates in the home country or state significantly affect the employment decisions of their foreign establishments. Tang and Zhang (2021) show that the home countries' gender equality culture significantly affects the female share of employment in multinational subsidiaries and local

firms in China. Our work is related to Li et al. (2011), who show that home country culture significantly affects the capital structure of foreign joint ventures operating in China. This suggests the home country effect extends beyond national borders.

While it is plausible to observe a rise in parents' cash holdings when home country uncertainty rises, it is not evident that affiliate cash holdings may also increase. A likely channel for the transmission of home uncertainty to subsidiaries in other countries is intra-firm trade within MNCs (Bena et al., 2021). If parent companies need to cut their investment due to increased uncertainty in their countries, subsidiaries that heavily depend on parent firms for generating sales may need to cut down their investments; hence, their cash holdings may increase subsequently. Additionally, the high correlation between parent and subsidiary investments, documented by Desai et al. (2009), may imply a high correlation between investment opportunities between affiliates, which can also generate a high cash correlation between them.

A very likely channel of the home EPU effect on subsidiary cash holdings is the internal capital market. Parent firms' decisions can significantly affect subsidiary cash holdings as firms under the same ownership are connected by sharing internal capital markets, and parents effectively redistribute internal resources across affiliates (Desai et al., 2004; Lamont, 1997; Stein, 1997). Parent companies may ask all subsidiaries to hold off on their investment plans and accumulate cash reserves in the internal capital market because they do not know

future investment opportunities until home uncertainty is resolved. They may want to accumulate and draw on internal funds in the future when external financing is costly. Delays in investments may include internal investments in foreign affiliates. If home country uncertainty increases, parent companies may postpone internal resource allocation to foreign subsidiaries. When foreign subsidiaries face fewer available resources on the internal capital markets and uncertain access, they must accumulate cash holdings for smooth operations and future investment needs.

3. Estimation strategy

3.1. Data

To examine the relationship between home country uncertainty and subsidiary cash holdings, we use the EPU index constructed by Baker et al. (2016) for selected countries.[1] The EPU index is based on the frequency of articles in a country's major newspapers that focus on uncertainty about future economic policy. After adjusting the raw article counts to reflect the total number of articles in each newspaper, they aggregate the article counts across the ten major newspapers and then normalize the counts. This index captures uncertainty about the expected upcoming monetary or fiscal policy, the tax or regulatory regime, or uncertainty over electoral outcomes that influence political leadership. Consequently, the index can measure

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[1] The data are available at www.policyuncertainty.com.

home-country-specific uncertainty better than other measures of general macroeconomic uncertainty. The index is used in recent literature to investigate the impact of exogenous uncertainty shocks on corporate decisions such as investments (Gulen & Ion, 2016), mergers and acquisitions (Bonaime et al., 2018; Nguyen & Phan, 2017), and foreign direct investments (Nguyen, Kim, & Papanastassiou, 2018).

The sample of subsidiaries of foreign multinational corporations that operate in Korea is drawn from the 2006–2017 Survey of Business Activities (SBA). The Korean Bureau of Statistics surveys all firms with at least 50 full-time employees whose equity capital is greater than or equal to 300 million KRW (approximately $0.3 million). Therefore, subsidiaries of foreign multinational corporations meeting the above criteria also report to the survey. The SBA identifies the home countries where the parent firms are located if the parent's ownership share is 50% or more, but it does not reveal information about parent firms except for their ownership in Korean subsidiaries and their industry classification. Additionally, the SBA provides information on some balance sheet items such as revenue and sales, general and administrative expenses, employment structure, and industry code.

We merge the SBA and the Korean Information System (KIS) database to obtain more financial details, such as cash and cash equivalents. Further, the KIS-value contains extensive information on the accounting statements of Korean firms subject to external audits. The number of observations in the merged dataset was 90,783. Additionally, we collect data on

various country-level variables for our analysis. The country's tax rate is the highest corporate

marginal tax rate obtained from the Corporate Tax Guides of Ernst & Young and KPMG.

Furthermore, we obtain information on real GDP per capita, private credit provided by banks,

GDP growth rate, and inflation rate from the World Bank's World Development Indicators.

Finally, we obtain data on labor market regulations from the Economic Freedom of the World.

3.2. Model specification and variables

To investigate whether home country EPU significantly alters the cash holding

decisions of subsidiaries in Korea, we consider a firm-level panel regression model to control

for unobserved time-invariant subsidiary characteristics as follows:

$$Cash_{i,t} = \beta_1 HEPU_{i,t-1} + \beta_2 X_{i,t-1}^s + \beta_2 X_{i,t-1}^c + \delta_i + \tau_t + \varepsilon_{i,t} \tag{1}$$

The dependent variable is $Cash_{i,t}$ measured by cash and cash equivalents plus marketable

securities divided by net assets for firm *i* in year *t*, following Opler et al. (1999). As the EPU

index is available monthly, we convert it into an annual value. As our main measure of home

EPU (*HEPU*), we use the simple average of all monthly EPU values in a given year *t*.

Additionally, we conduct robustness tests using alternative methods to construct the annual

EPU measure. $X_{i,t-1}^s$ and $X_{i,t-1}^c$ denote firm (subsidiary)-level and country-level control

variables, respectively. We include firm and year fixed effects denoted as δ_i, and τ_t,

respectively. The firm fixed effect absorbs any time-invariant subsidiary and parent firm

characteristics that derive the unique relationship between cash holdings and policy uncertainty. The year fixed effects capture the Korean economic conditions and the Korean policy uncertainty, significantly affecting all firms operating in Korea every year. All standard errors are clustered at the home country level.

We first include subsidiary-level control variables following the existing literature (Demir & Ersan, 2017; Opler et al., 1999) to exclude alternative explanations for the association between home EPU and cash holdings. Firm-level control variables include *NWC*, net working capital divided by book assets, *Size*, the natural logarithm of total assets, *CF*, operating income divided by total assets, *Leverage*, total liabilities divided by total assets, and *R&D*, R&D expenditures divided by total assets. Tobin's Q is a widely accepted determinant of cash holdings, but information on the market values of subsidiaries is unavailable as subsidiaries are mostly private firms. Information on dividend payments was also not available. Firm fixed effects can capture their effects as long as the firm-specific factors that affect its investment opportunities and dividend propensity do not change much over time.

Additionally, we include two country-level variables to control for home country factors. The factors specific to the host country, Korea, are controlled by the year fixed effect. As EPU can be highly related to a country's economic conditions (Gulen & Ion, 2016), we include the natural logarithm of real GDP per capita of the home country, *RGDPPC*, as a control variable to isolate the policy uncertainty effect. As the repatriation costs of

multinational corporations significantly affect their subsidiaries' cash holdings (Foley et al., 2007), we additionally control for tax rates of the home countries, *Tax*.

Following prior studies on corporate cash holdings (Opler et al., 1999), we exclude firms in the financial industry because their operations are subject to industry-specific regulations, such as capital and liquidity requirements, which differ from non-financial firms. Our final sample includes 5,802 subsidiary-year observations for the period 2006–2017. Table 1 presents the summary statistics of the main firm-level variables of all Korean firms included in the SBA and the subsidiaries of foreign multinational corporations in the final sample. Although our main sample for most of the analyses in the paper includes only subsidiaries of foreign multinationals, we report key statistics of all SBA firms to identify characteristics of the subsidiaries compared to local Korean firms. All firm-level variables are winsorized at the 1st and 99th percentiles. Consistent with prior literature, multinational subsidiaries hold more cash than local firms. They also have more working capital and operating income than local firms while investing less in R&D. The higher average tax rate of home countries compared to Korean tax rates may explain the higher cash holdings of multinational subsidiaries, consistent with the argument that tax rates are important consideration in multinationals' finance and investment decisions.

Table 2 reports key characteristics for the sample of foreign subsidiaries. These are averaged at the home country level and reported for the top seven countries regarding the

subsidiary number in Korea. We match the subsidiary data with home country EPU for 18 home countries.[2] The foreign parent firms from 18 home countries have approximately 85% of subsidiaries in the SBA. Among subsidiaries owned by 18 home countries, approximately 80% were concentrated in the top four countries—Japan, the USA, Germany, and the Netherlands, in that order. In the sample, Japan has the greatest number of subsidiaries in South Korea—2,239 out of 5,802, representing 38.6%. The USA is the second greatest, which has 1,148 subsidiaries in Korea. At first glance, the average values of EPU vary across countries. As many factors affect cash holdings, the subsidiary cash holdings averaged at the country level do not seem to correlate closely with the home country EPU.

Although the statistics reported in Tables 1 and 2 may not indicate a clear association between home EPU and subsidiary cash holdings, Figure 1 suggests a potentially significant association, supporting our conjecture. Figure 1 depicts the time trends of EPU and cash holdings of foreign multinational subsidiaries in Korea for four major home countries: Japan, the USA, Germany, and the Netherlands. The natural logarithm of home country EPU and subsidiary cash holdings tend to move together in each panel. Notably, EPU moves differently over time across countries. While showing different yearly movements, EPUs of major countries tend to increase over time, consistent with the increasing trend of corporate cash holdings worldwide (Pinkowitz et al., 2016).

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[2] The 18 home countries include Singapore, India, Japan, China, Greece, Netherlands, Germany, Russia, Sweden, Spain, Ireland, U.K., Italy, France, USA, Canada, Mexico, and Australia.

4. Estimation results

4.1. Baseline results: The effect of home EPU on subsidiary cash holdings

Table 3 presents the main results of the baseline regression on the relationship between uncertainty in the country of origin and subsidiary cash holdings. The dependent variable in all regression models is cash and cash equivalents plus marketable securities divided by net assets. All regression models include subsidiary and year dummies, and standard errors are clustered at the home country level. Column 1 reports the regression of cash holdings on home EPU alone. The positive coefficient estimate of *HEPU* indicates that foreign multinational subsidiaries tend to hold more cash when uncertainty increases in their home countries. The regression model of column 2 additionally includes the subsidiary-level control variables. The effect of net working capital and leverage is significant and negative, and cash flows are positively associated with cash holdings. The other control variables are not statistically significant, but their signs are consistent with prior studies. Given that existing theories on optimal cash holdings are developed to explain the financing choices of firms in developed countries, we note that the same set of firm characteristics has similar explanatory power for foreign subsidiaries' cash holdings in Korea.

Column 3 reports estimation results of the regression model including country variables to control for the level of economic development and profit tax in home countries.

The coefficient estimate of EPU in Column 3 is 0.041, which is statistically significant. A one-standard-deviation increase in *HEPU* leads to a 1.4% increase in subsidiary cash holdings relative to net assets. As the home EPU is in natural logarithm, we can interpret the estimate in terms of % changes: when US EPU increased by 120% from 2006 to 2021, Korean subsidiaries of US multinationals would increase their cash holdings on average by approximately 5% of net assets. The coefficient estimates in Table 3 support our conjecture that home country uncertainty is transmitted to other countries through multinational subsidiaries. The added country-level control variables do not significantly explain subsidiary cash holdings. Including the additional subsidiary and country variables has little effect on the estimated impact of home EPU on subsidiary cash holdings.

Column 4 reports the estimation results based on all SBA firms, including Korean local firms and Korean subsidiaries of foreign multinationals, to ensure that we can obtain a similar effect of home EPU when we include Korean local firms in the regression sample. The results in columns 1 to 3 are based on our main sample of this study, which includes only Korean subsidiaries of foreign multinationals. This might raise a concern that the home-EPU effect is driven by the special features common to foreign subsidiaries. To control for unobserved factors specific to foreign subsidiaries, we include a dummy variable that indicates a firm with a foreign parent, denoted by *FP*. The home-EPU effect is captured by the interaction between *FP* and *HEPU*. After controlling for the difference between local firms and subsidiaries of

foreign MNCs using *FP*, the coefficient estimate of the interaction is still significant and negative. Thus, when policy uncertainty increases in the home countries, subsidiaries operating in foreign countries also increase their cash holdings.

4.2.   Potential channels of the home-EPU effect

To bolster our argument that home country uncertainty drives the negative relationship between home EPU and subsidiary cash reserves, we investigate whether the negative relationship is more pronounced when the link between parent firms and subsidiaries is stronger. If the main channel of home EPU effect is the internal capital markets, subsidiary cash holdings would respond to home country uncertainty because the headquarters in home countries want to accumulate internal funds until the uncertainty is resolved. We conjecture that the home EPU effect is more pronounced when the parent firms' control over subsidiaries is stronger. The most plausible measure of parents' control should be its equity stakes in subsidiaries. When the parent firm owns a greater share of subsidiary equity, its control should be stronger.

The second measure of the intensity of parent-subsidiary relationships is the share of intra-firm trade within a multinational corporation out of total sales. The SBA provides information on exports and imports between a Korean subsidiary and other affiliated firms (including parents) within the same multinational corporation. Information on the trade amount between a parent and its Korean subsidiaries is unavailable separately. If the intra-firm trade

within multinational corporations is a channel of the home EPU effect, we should observe a greater impact on subsidiaries with great internal trades. A subsidiary may have high cash holdings because it has a significant business relationship with other affiliates within the multinational, and the intra-firm trade may be highly correlated with the productivity shocks to the parent (Boehm, Flaan, & Nayar, 2019). Our final measure of relationship intensity is whether a parent and a subsidiary are in the same industry. There may be a concern that the apparent association between home EPU and subsidiary cash holdings is driven by the productivity shock specific to the common industry, not by the causal effect of home EPU. If a positive industry shock increases the cash flows of parents and subsidiaries, they may accumulate more cash holdings (Almeida, Campello, & Weisbach, 2004). Therefore, we test whether the positive effect of home EPU is greater when the parent and its subsidiary are in the same industry.

Table 4 reports estimation results of the regression models including measures of the parent-subsidiary relationship and their interaction with *HEPU*. The dependent variable is the cash to net assets ratio, and all regression models include the same control variables as the models in Table 3. Column 1 reports a significant and positive coefficient estimate of the interaction between *Ownership* and *HEPU*, indicating a stronger effect of home EPU when parent firms in the home countries hold greater shares of subsidiary equity. However, the coefficient of *HEPU* is not significant when its interaction with parent ownership is included

in the regression model. This suggests that the home country EPU does not significantly alter subsidiary cash holdings when the parent company has limited control over subsidiaries. The interaction coefficient indicates that a one-standard-deviation increase in the home country EPU leads to approximately a 1.9% increase in cash holdings to net assets of a subsidiary on average when its parent firm has 100% ownership in the subsidiary. It is also interesting to note that the coefficient estimate of *Ownership* is significant and negative, indicating that subsidiaries whose parents hold greater equity ownership tend to accumulate cash less. The negative effect of parents' ownership supports our internal capital market explanation for the home EPU effect. When parents have greater equity stake in subsidiaries, they are more likely to assign resources to their subsidiaries if needed and, hence the subsidiaries do not need to maintain high cash reserves. However, the greater control by parents lead subsidiaries to adjust their cash holdings more in response to home country shocks.

As reported in columns 2 and 3, the interactions of *HEPU* with intra-firm trade and the same-industry dummy are not statistically significant. However, the home EPU coefficient is statistically significant and positive, confirming our earlier findings. The insignificant interactions indicate that intra-firm trade and exposure to the same industry shock do not drive the relationship between home EPU and subsidiary cash holdings. The insignificant effect of intra-firm trade may be consistent with Ramondo et al. (2016) showing that intra-firm trade within multinationals is not widely observed.

Overall, the results in this section suggest that the channel of the home EPU effect on subsidiary cash holdings is the internal capital markets. The results also suggest that the productivity shocks shared by parents and subsidiaries do not drive the home EPU effect, bolstering the causal effect that changes in home EPU indeed lead subsidiaries to change their cash holdings.

4.3. Other home country characteristics

One possible concern regarding the interpretation of our baseline regression result is that home EPU may capture the effects of other home country factors that alter subsidiary cash holdings. We test whether we can still observe the significant effect of home EPU after including other home country factors in our regression models. As additional home country characteristics, we consider the ratio of domestic credit provided by banks to GDP, GDP growth rate, inflation, the number of patent applications, and labor regulation. Domestic credit to GDP and inflation are key determinants of multinationals' financing decisions (Desai et al., 2004). Policy uncertainty tends to be countercyclical. Firms may hold more cash during a recession, suggesting that our observed positive relationship between policy uncertainty and subsidiary cash reserves is driven by business cyclicality; thus, we include home country GDP growth rate. Moreover, as firms hold more cash when growth opportunities increase, the relationship between home EPU and foreign subsidiary cash holdings may be driven by the

increase in investment opportunities of the home country, which can be captured by GDP growth. Another important consideration in cash holdings is innovation. Internal funds and equity normally finance innovative activities. If the home country has high technologies, firms hold more cash to finance their innovation, which we capture using the number of patents applications aggregated at the home country level. Finally, we control for labor regulations, as Karpuz, Kim and Ozbas (2020) show that labor regulation significantly affects cash holdings.

Table 5 reports the results after including the additional characteristics of home countries to test whether other home country characteristics drive the relationship between the home EPU and subsidiary cash holdings. Each column (1–5) shows a significant home EPU effect when we control for each home country characteristic. In column 6, we confirm the significant and negative relation between home EPU and subsidiary cash holdings after controlling for all five home country characteristics. The five home characteristics do not significantly explain the subsidiary cash holdings in all columns.

4.4. Robustness tests

In this section, we test the robustness of the main findings. In particular, we reexamine the relationship between home EPU and subsidiary cash holdings using alternative definitions of EPU and cash holdings. Our main analysis uses an annual EPU variable, constructed by taking the average of monthly EPU values in a given year. We use alternative definitions of

EPU following Gulen and Ion (2016) to ensure the robustness of the results. First, we replace the simple average with the weighted average, where we assign higher weights (one for the first month, two for the second month, and finally, twelve for the last month of the year) to the EPU levels that are closer to the year-end. *HEPU_w* is the natural logarithm of the weighted average of monthly EPUs in the year using the weights 1/78, 2/78, ..., 12/78. The second definition of home EPU is like the first one, but we use monthly EPUs of only three months near the end of the year because the most recent change in uncertainty may be what firms are most concerned about when making corporate decisions. *HEPU_3m* is the natural logarithm of the weighted average of the monthly EPUs using the weights 1/6, 2/6, and 3/6. Finally, *HEPU_end* is the natural logarithm of the EPU value of the end month. Finally, we reexamine the home EPU effect when calculating cash holdings, excluding marketable securities. *Cash2* is calculated as cash and cash equivalents divided by net assets.

The regression results using alternative EPU variables are given in Table 6, columns 1 to 3. The coefficient estimates for home EPU are positive and statistically significant in all columns. Further, the magnitude of the *HEPU_w* is similar to those obtained in the baseline regressions (Table 3). The magnitudes of other *HEPU_3m* and *HEPU_end* are smaller than those obtained in the baseline regressions, indicating that whole year uncertainty, rather than more recent changes in uncertainty, is more important in cash holdings decisions. The results show that the particular definitions of home EPU do not drive our findings. Finally, column 4

reports the regression results for the alternative definition of cash holdings, which exclude

marketable securities. Again, the coefficient estimate of home EPU is significant and positive,

and the magnitude is also similar to the estimate reported in previous tables. Overall, our

robustness tests confirm that home country uncertainty is transmitted to host countries through

multinational subsidiaries' networks.

4.5.   Home EPU effect on subsidiary investment

The results presented in the previous sections indicate that firms tend to accumulate

cash holdings until the uncertainty is resolved. Furthermore, previous studies show that firms

delay their investment plans (Gulen & Ion, 2016), which can be associated with the increase of

cash holdings. Therefore, if subsidiaries decide to hold more cash than before, they must reduce

their investment spending. To support our argument on the precautionary motive, we test

whether investment expenditures of foreign subsidiaries decline when the home country's EPU

increases. We examine four different types of investments: capital expenditure, innovation

output, advertising expenditure, and employment.

Table 7 reports regression results on home EPU on affiliate investments. The

dependent variables are the following: *Capex*—capital expenditure divided by total assets

(column 1); *Patent*—the natural logarithm of 1 plus the number of subsidiary patents;

Advertising—the advertising expenditure divided by total assets; *Employment*—the natural

logarithm of the number of employees. We use the same set of control variables as in the cash holding regressions except for net working capital. All regression models include subsidiary and year dummies, and standard errors are clustered at the home country level. Consistent with our conjecture, the home EPU significantly depresses subsidiary capital expenditures as reported in column 1. The results suggest that subsidiaries cut their investments by almost 50% of their assets on average when their home EPU doubles. A part of this capital expenditure cut should be associated with the increase in cash holdings documented in the previous sections. There is no evidence of the other sources of cash accumulation. As reported in columns 2 to 4, the home EPU does not significantly affect subsidiary innovation, advertising, and employment outcomes, although the coefficient estimates of *HEPU* in patents and employment regressions are negative.

Overall, the results in this section indicate that as policy uncertainty is temporary, subsidiaries want to hold off their investment plans and increased cash holdings should provide flexibility that allows them to exploit future profitable investment opportunities when uncertainty recedes.

5. Conclusions

Given the importance of multinational corporations in leading the global economy, it is important to understand how national shocks can spread to emerging markets through

multinational networks. Unlike previous studies examining the effect of national uncertainty on firms in the country, we exploit a sample of multinational subsidiaries operating in one country whose countries of origin vary to investigate whether the effect of uncertainty goes beyond national borders. Utilizing the heterogeneity in the home countries of multinational subsidiaries in Korea, this study documents the first empirical evidence that the uncertainty of home countries significantly alters the cash holdings of multinational subsidiaries located outside the home countries. We further show a greater home EPU effect when parents' ownership is higher in the subsidiaries, supporting our argument that the home EPU affect subsidiary cash holdings through the internal capital market. Furthermore, the positive effect of home EPU on subsidiary cash holdings is robust to alternative definitions of EPUs and cash holdings. Moreover, it is still significant after controlling for various home country characteristics. Finally, we show that subsidiaries cut down on capital expenditure when home EPU increases.

Observing what may happen to parent companies' cash holdings and their investments together with subsidiaries' decisions would better our understanding of the complete picture of home EPU transmission through multinationals. Based on prior studies, we assume that parent firms may increase their cash holdings and cut their investments when country EPU increases. However, we do not consider parent and subsidiary companies together to examine the home EPU effect due to data limitations, which can be interesting for future research. Additionally,

although we focus on the effect of home EPU on subsidiary cash holdings, it would be

interesting to investigate the effect of host country uncertainty on parent firms.

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Appendix. Variable definitions

Variable	Definition	Source
Cash	Ratio of cash and cash equivalents plus marketable securities to net assets	KIS-Value
Cash2	Ratio of cash and cash equivalents to total assets	KIS-Value
HEPU	Logarithm of the simple average of all monthly Economic policy uncertainty values in the year	Baker et al. (2016)
HEPU_w	Logarithm of the weighted average of all monthly Economic policy uncertainty values in the year	Baker et al. (2016)
HEPU_3m	Logarithm of the weighted average of latest three months	Baker et al. (2016)
HEPU_end	Logarithm of EPU of the end month of a year	Baker et al. (2016)
FP	A dummy variable indicating whether a firm has a foreign parent	SBA
NWC	Ratio of working capital to total assets	KIS-Value
Size	Logarithm of real total assets	SBA
CF	Ratio of EBITDA to total assets	KIS-Value
R&D	Ratio of R&D expenditures to total assets	SBA
Leverage	Ratio of total liabilities to total assets	KIS-Value
RGDPPC	Logarithm of real GDP per capita in the home country	World Bank Indicator
Tax	Highest corporate marginal tax rate of the home country	Ernst & Young and KPMG
Ownership	Share of a parent firm	SBA
Intrafirmtrade	Ratio of exports to related parties and imports from related parties to sales	SBA
SameIndustry	Dummy for whether to be in the same industry	SBA
Private Credit	Ratio of private credit lent by deposit money banks to GDP in the home country	World Bank Indicator
GDP Growth	Annual GDP growth rate of the home country	World Bank Indicator
Inflation	Contemporaneous percentage change in the home country's GDP deflator	World Bank Indicator
Patent	Logarithm of patent applications	World Bank Indicator

Labor market regulation	This index measures the degree to which country institutions and policies in the labor market support economic freedom. This index ranges from 0 to 10, with 0 indicating the lowest and 10 the greatest economic freedom	Frazer Institute
Capex	Capital expenditure divided by total assets	SBA
Patent	The natural logarithm of 1 plus the number of subsidiary-level patents	SBA
Advertising	The advertising expenditure divided by total assets	SBA
Employment	The natural logarithm of the number of employees	SBA

Figure 1. Tine trends of log(EPU) and subsidiary cash holdings for the top four home countries

Panel A: Japan
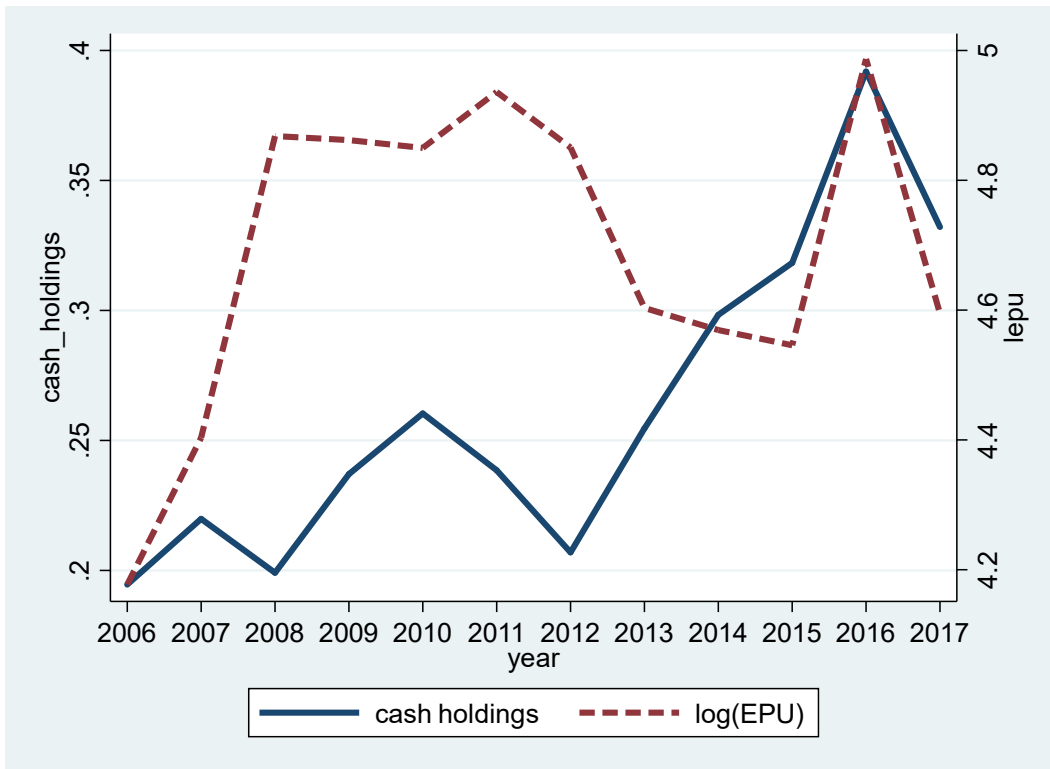
Panel B: USA
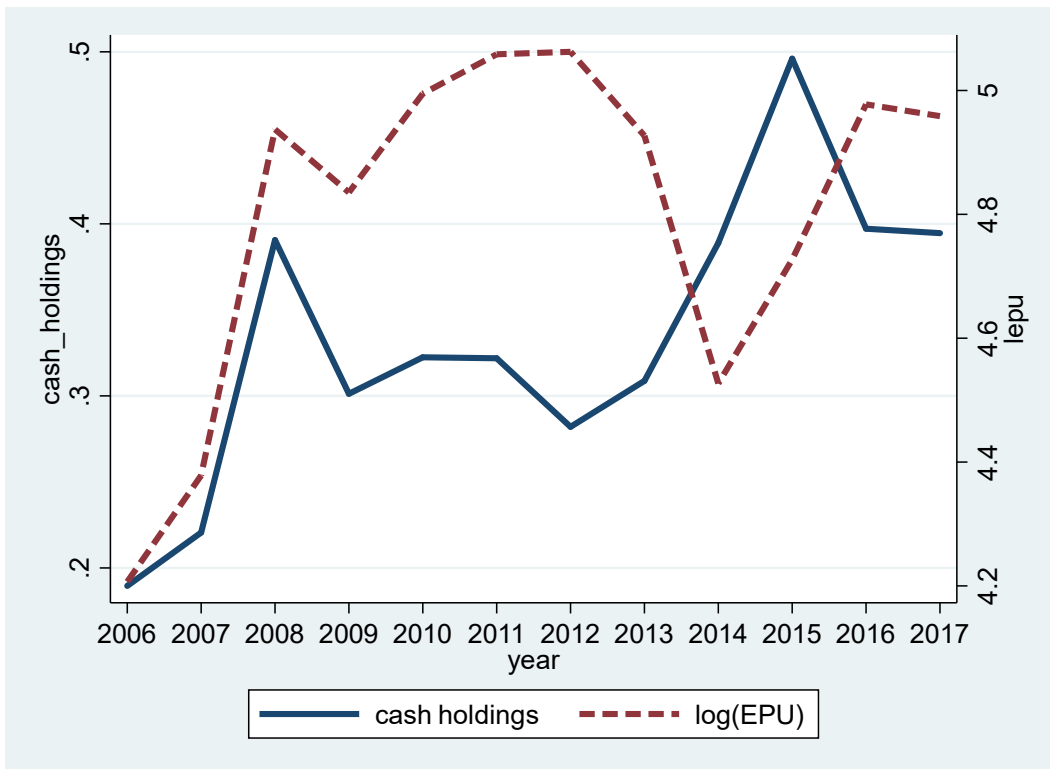
Panel C: Germany

Panel D: Netherlands

Table 1. Summary statistics of main variables

The table reports the descriptive statistics of the key variables used in the analyses. They are defined in the Appendix and calculated based on a sample of Korean firms required to report to the Survey of Business Activities (SBA) conducted by the Korean Bureau of Statistics for 2006–2017. Pa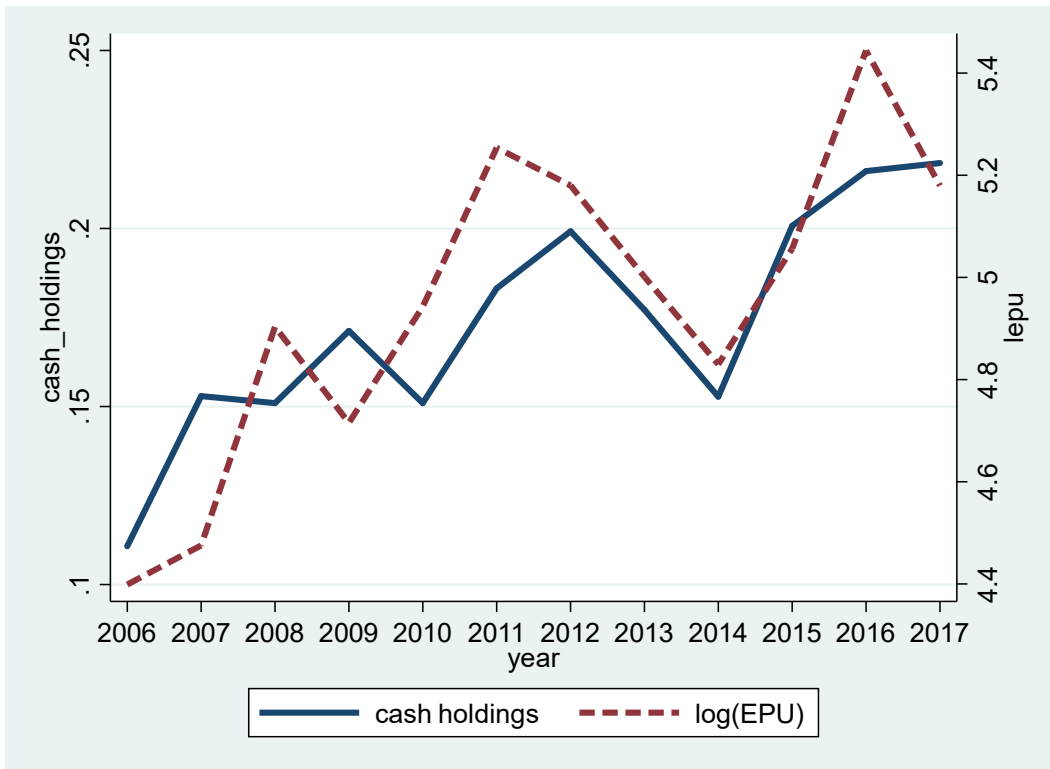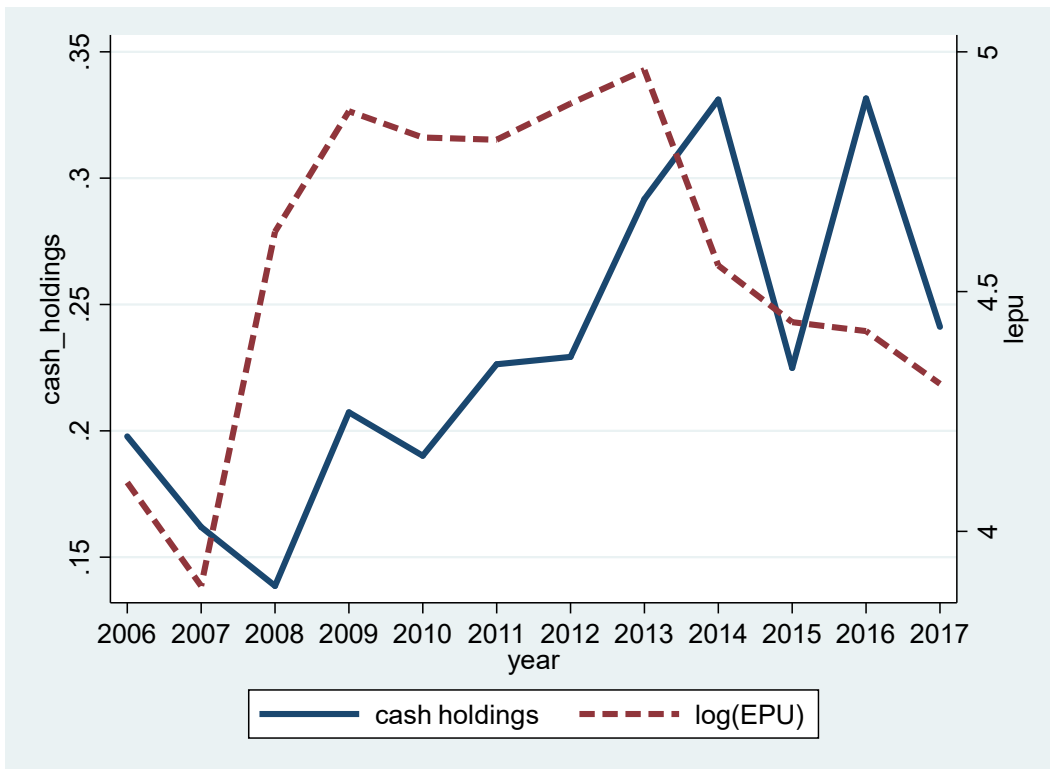nel A (All) provides the characteristics of all SBA firms, and Panel B is for SBA firms that are subsidiaries of foreign multinational corporations. All values are winsorized at the 1st and 99th percentiles.

	Panel A: All					Panel B: Firms with foreign parents				
	25th	Median	75th	Mean	S. D.	25th	Median	75th	Mean	S. D.
Cash	0.013	0.047	0.127	0.108	0.165	0.048	0.138	0.308	0.229	0.254
HEPU	4.854	4.991	5.095	4.914	0.265	4.475	4.862	5.254	4.853	0.342
NWC	-0.129	0.029	0.195	0.027	0.259	-0.157	0.136	0.451	0.135	0.251
Size	23.86	24.56	25.45	24.78	1.256	23.59	24.85	26.44	24.96	1.170
CF	0.023	0.056	0.101	0.063	0.083	-0.019	0.085	0.242	0.096	0.109
R&D	0	0.002	0.016	0.014	0.025	0	0	0.027	0.009	0.021
Leverage	0.334	0.527	0.695	0.524	0.255	0.164	0.441	0.802	0.471	0.257
RGDPPC	10.00	10.07	10.15	10.10	0.204	10.63	10.75	10.87	10.70	0.389
Tax	24.20	24.20	24.20	24.84	3.250	24.00	33.86	40.69	33.08	7.077
Capex	0.034	0.609	2.475	1.905	4.194	0.038	0.337	1.203	0.982	2.866
Patent	0	0.693	2.197	1.192	1.447	0	0	1.099	0.782	1.354
Advertising	0.00004	0.0004	0.003	0.007	0.020	0.00006	0.0009	0.008	0.016	0.035
Employment	4.382	4.852	5.509	5.021	0.976	4.431	5.024	5.693	5.140	0.999
# of observations	77,397					5,176				

Table 2 Country-level averages of key variables

This table reports key variables averaged at the home country level. The countries reported in the table represent the top seven countries that have the greatest number of subsidiaries operating in Korea. The data were obtained from the Survey of Business Activities (SBA) conducted by the Korean Bureau of Statistics. The sample excludes firms in financial industries. The first column reports the number of affiliates that originate from each country. The numbers in parentheses are percentages of the total number of foreign affiliates operating in Korea. The other columns report the average values of the key variables at the home country level. All variables are defined in the Appendix.

Home countries	Number of firms	Average Size	Average Cash	Average HEPU	Average RGDPPC	Average Tax
Japan	1,979 (38.3%)	24.88	0.239	4.723	10.74	36.70
USA	991 (19.2%)	24.90	0.283	4.850	10.82	40.00
Germany	580 (11.2%)	24.86	0.173	5.008	10.69	30.31
Netherlands	436 (8.4%)	25.32	0.226	4.598	10.85	25.13
France	283 (5.5%)	24.80	0.152	5.339	10.63	33.33
U.K.	271 (5.2%)	24.96	0.232	5.468	10.62	23.58
Singapore	204 (3.9%)	24.70	0.264	4.874	10.83	17.30

Table 3. Baseline results: the home EPU effect on subsidiary cash holdings

This table reports the panel regression results for the sample of 5,176 Korean subsidiaries of foreign multinational corporations for 2006–2017. The sample excludes firms in financial industries. Columns 1 to 3 report estimates based on subsidiaries of foreign multinational corporations, and column 4 is based on all Korean firms, including subsidiaries of foreign multinationals required to respond to the Survey of Business Activities (SBA). The dependent variable is *Cash*—cash and cash equivalents plus marketable securities divided by total assets. The independent variable of interest is *HEPU,* the natural logarithm of economic policy uncertainty (Baker et al., 2016) of subsidiaries' home countries. FP is a dummy variable indicating whether a firm has a foreign parent. All other variables are defined in the Appendix. Standard errors clustered at the home country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable: Cash				
	(1)	(2)	(3)	(4)
$HEPU_{i,t-1}$	0.040**	0.042***	0.042***	0.018
	(0.016)	(0.014)	(0.014)	(0.013)
$HEPU_{i,t-1} \times FP_{i,t-1}$				0.018**
				(0.008)
$FP_{i,t-1}$				-0.058
				(0.039)
$NWC_{i,t-1}$		-0.239***	-0.240***	-0.023
		(0.051)	(0.051)	(0.016)
$Size_{i,t-1}$		0.007	0.007	-0.016***
		(0.019)	(0.020)	(0.002)
$CF_{i,t-1}$		0.174***	0.174***	0.120***
		(0.045)	(0.045)	(0.012)
$R\&D_{i,t-1}$		0.005	0.005	0.057***
		(0.156)	(0.155)	(0.013)
$Leverage_{i,t-1}$		-0.281***	-0.281***	-0.056***
		(0.060)	(0.060)	(0.015)
$RGDPPC_{i,t-1}$			-0.007	-0.013*
			(0.007)	(0.008)
$Tax_{i,t-1}$			0.0003	-0.001
			(0.0008)	(0.001)
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
R^2	0.030	0.075	0.075	0.022
No. of observations	5,176	5,176	5,176	77,397

Table 4. Channels of the home EPU effect

This table reports the panel regression results for the sample of 5,176 Korean subsidiaries of foreign multinational corporations for 2006–2017. The sample excludes firms in financial industries. The dependent variable is *Cash*—cash and cash equivalents plus marketable securities divided by total assets. The EPU is the natural logarithm of the economic policy uncertainty (Baker et al., 2016) of subsidiaries' home countries. The interactions between HEPU and *Ownership, Intrafirmtrade, and SameIndustry* were included in the regression models. *Ownership* is the percentage ownership of parents in Korean subsidiaries. *Intrafirmtrade* is the percentage of intra-firm trade with other affiliates that belong to the same multinational out of a subsidiary's total sales. *SameIndustry* is a dummy that takes one if subsidiaries and their parents belong to the same industry and zero otherwise. All firm (subsidiary)- and country-level control variables reported in Table 3 are included in all specifications; their coefficient estimates are not reported to save space. Standard errors clustered at the home country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable: Cash			
	(1)	(2)	(3)
$HEPU_{i,t-1}$	-0.006	0.043***	0.040***
	(0.031)	(0.014)	(0.014)
$HEPU_{i,t-1} \times Ownership_{i,t-1}$	0.055**		
	(0.023)		
$Ownership_{i,t-1}$	-0.245**		
	(0.108)		
$HEPU_{i,t-1} \times Intrafirmtrade_{i,t-1}$		-0.024	
		(0.016)	
$Intrafirmtrade_{i,t-1}$		0.128	
		(0.079)	
$HEPU_{i,t-1} \times SameIndustry_{i,t-1}$			0.006
			(0.008)
$SameIndustry_{i,t-1}$			-0.032
			(0.039)
Year fixed effects	YES	YES	YES
Firm fixed effects	YES	YES	YES
Set of controls	YES	YES	YES
R^2	0.076	0.075	0.075
No. of observations	5,176	5,176	5,176

Table 5. Controlling for home country variables

This table reports the panel regression results for the sample of 5,176 Korean subsidiaries of foreign multinational corporations for 2006–2017. The sample excludes firms in financial industries. The dependent variable is *Cash*, —cash and cash equivalents plus marketable securities divided by total assets. *HEPU* is the natural logarithm of the economic policy uncertainty (Baker et al., 2016) of subsidiaries' home countries. Additional home country characteristics are added to check the robustness of the home EPU effect. *Private credit* is the credit offered by banks divided by the country's GDP. *GDP growth* is the annual growth rate of GDP. *Inflation* is the annual rate of change in consumer price. *Patents_Country* is the aggregate number of patents applied at the country level. *Labor market regulation* is a labor regulation index published by the Economic Freedom of the World. All firm- and country-level control variables reported in Table 3 are included in all specifications; their coefficient estimates are not reported to save space. Standard errors clustered at the home country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable: Cash

	(1)	(2)	(3)	(4)	(5)	(6)
$HEPU_{i,t-1}$	0.044***	0.042***	0.042***	0.042***	0.041***	0.043***
	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)	(0.013)
$Private\ Credit_{i,t-1}$	0.00002					-0.00007
	(0.0002)					(0.0002)
$GDP\ Growth_{i,t-1}$		-0.00002				0.0003
		(0.002)				(0.002)
$Inflation_{i,t-1}$			0.002			0.002
			(0.002)			(0.003)
$Patents\_Country_{i,t-1}$				-0.003		-0.003
				(0.003)		(0.003)
$Labor\ market\ regulation_{i,t-1}$					0.004	0.005
					(0.005)	(0.005)
Year fixed effects	YES	YES	YES	YES	YES	YES

Firm fixed effects	YES	YES	YES	YES	YES	YES
Set of controls	YES	YES	YES	YES	YES	YES
R^2	0.075	0.075	0.075	0.075	0.075	0.076
No. of observations	5,161	5,176	5,176	5,166	5,176	5,161

Table 6. **Alternative definitions of home EPU and cash holdings**

The table reports the regression results using alternative definitions of home EPU and cash holdings. The sample includes 5,176 Korean subsidiaries of foreign multinational corporations for 2006–2017 and excludes firms in financial industries. The dependent variable is *Cash*, —cash and cash equivalents plus marketable securities divided by total assets. Another dependent variable is *Cash2*—cash and cash equivalents divided by net assets. *HEPU* is the natural logarithm of the economic policy uncertainty (Baker et al., 2016) of subsidiaries' home countries. *HEPU*_w is the natural logarithm of the weighted average of monthly EPU values in the year, whether the weights are 1/78, 2/78, …, 12/78 to assign higher weights to EPU values closer to the year-end. *HEPU_3m* is the natural logarithm of the weighted average of monthly EPU values of only three months closest to the year-end, using the weights 1/6, 2/6, and 3/6. *HEPU_end* is the natural logarithm of EPU in the year-end month. All firm- and country-level control variables reported in Table 3 are included in all specifications; their coefficient estimates are not reported to save space. Standard errors clustered at the home country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable:	$Cash_{i,t}$	$Cash_{i,t}$	$Cash_{i,t}$	$Cash2_{i,t}$
	(1)	(2)	(3)	(4)
$HEPU_{i,t-1}$				0.041***
				(0.014)
$HEPU\_w_{i,t-1}$	0.041***			
	(0.013)			
$HEPU\_3m_{i,t-1}$		0.038***		
		(0.010)		
$HEPU\_end_{i,t-1}$			0.028**	
			(0.013)	
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Set of controls	YES	YES	YES	YES
R^2	0.075	0.075	0.075	0.075
No. of observations	5,176	5,176	5,176	5,176

Table 7. Investments

This table reports panel regression results for the sample of Korean subsidiaries of foreign multinational corporations for 2006–2017. The sample exclude firms in financial industries. The dependent variable is investments measured in four ways: *Capex* is the capital expenditure divided by total assets, *Patent* is the natural logarithm of 1 plus the number of subsidiary-level patents, *Advertising* is advertising expenditure divided by total assets, and *Employment* is the natural logarithm of the number of employees. *HEPU* is the natural logarithm of Economic Policy Uncertainty (Baker et al., 2016) of subsidiaries' home countries. Standard errors clustered at the home country level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable:	Capex	Patent	Advertising	Employment
	(1)	(2)	(3)	(4)
$HEPU_{i,t-1}$	-0.493***	-0.079	0.00005	-0.021
	(0.147)	(0.125)	(0.002)	(0.032)
$Size_{i,t-1}$	-1.273***	0.051*	-0.0006	0.355***
	(0.110)	(0.028)	(0.0005)	(0.018)
$CF_{i,t-1}$	1.299***	0.206	0.0005	0.288***
	(0.415)	(0.127)	(0.003)	(0.063)
$R\&D_{i,t-1}$	3.371	-0.373	0.008	0.939*
	(3.737)	(0.579)	(0.022)	(0.483)
$Leverage_{i,t-1}$	-0.523**	-0.205***	-0.0007	-0.079
	(0.240)	(0.039)	(0.002)	(0.068)
$RGDPPC_{i,t-1}$	-0.283	-0.009	0.00008	0.008
	(0.181)	(0.045)	(0.0006)	(0.019)
$Tax_{i,t-1}$	-0.007	-0.007***	0.00005	0.0002
	(0.011)	(0.002)	(0.00005)	(0.0009)
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
R^2	0.042	0.046	0.013	0.235
No. of observations	5,176	5,176	5,176	5,176