Export, technological innovation, and economic policy uncertainty: Evidence from Japan

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Abstract

This paper investigates the effect of economic policy uncertainty (EPU) on exports, using approximately 4,000 Japanese listed firms per year from 1998 to 2022. The EPU index proposed by Baker et al. (2016) is employed as the measure of policy uncertainty. IV estimation employing EPU in Japan as the instruments suggests that EPU leads to a decrease in exports through a reduction in investment. This mechanism underscores the crucial role of investment as a channel through which EPU impacts international trade.

Keywords: export; R&D; investment; uncertainty; firm-level data

JEL classifications: F14; F13; F61; D25; D80

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1. Introduction

The aim of this paper is to investigate the effect of declining investment, amidst rising economic policy uncertainty (EPU) on firm export. Political and regulatory decisions frequently alter the business environment, with periods of political instability or contentious election campaigns often introducing substantial uncertainty about future policies. In the United States, for example, debates over the debt ceiling, threats of trade agreement cancellations, and potential fiscal expansions financed by tax changes have contributed to greater EPU. In Japan as well, EPU increased during periods when the ruling Liberal Democratic Party (LDP) suffered major losses in elections, such as in the late 1990s and the late 2000s. Increasing political polarization and instability across various countries in recent years have drawn further attention from both academics and policymakers to the effects of EPU.

Economic theory suggests that uncertainty can significantly influence firm investment behavior. According to seminal work by Bernanke (1983) and Dixit and Pindyck (1994), heightened uncertainty increases the value of the option to delay investment, particularly when investments are partially irreversible. This delay in investment tends to result in lower capital expenditure. Empirical studies have consistently demonstrated a link between high policy uncertainty and reduced capital investments (Gulen and Ion, 2016; Stokey, 2016), decreased merger and acquisition (M&A) activity (Bonaime et al., 2016), and higher cash holdings (Julio and Yook, 2012; Fujimoto et al., 2022).

On the hand, there is a well-documented firm-level relationship between exports and innovative activity. Empirical research, such as Bernard et al. (1999) shows that exporters are more likely to engage in research and development (R&D) and capital investment. Studies by Bustos (2011) and Lileeva and Trefler (2010) highlight that trade liberalization encourages firms to invest in new technology. These findings suggest that increasing economic policy uncertainty may dampen corporate investment and lead to a reduction in exports.

This paper derives predictions about firm export behavior under economic policy uncertainty by integrating real options theory with a heterogeneous trade model. It implies that increased policy uncertainty leads firms to postpone technological upgrades, which, in turn, results in reduced export activities. To test this hypothesis, we analyze a comprehensive dataset of approximately 4,000 Japanese firms spanning 1998 to 2022. Our results align with the predictions, indicating that heightened uncertainty discourages firms from investing in technology, adversely affecting their export performance.

The remainder of this paper is structured as follows: Section 2 reviews related literature, Section 3 discusses a model of trade and investment under policy uncertainty and derives predictions. Section 4 outlines our data sources, Section 5 presents the models employed in this study, Section 6 elaborates on the results, and Section 6 concludes the paper.

2. Related literature

This study contributes to the existing literature that explores the impact of policy uncertainty on international trade. Most of which emphasizes the crucial role of policy uncertainty in international trade, indicating its reduction stimulate export growth. Handley and Limão (2015), and Handley and Limão (2017) have focused on trade policy uncertainty (TPU) and conducted investigations through natural experiments, such as Portugal's accession to the European Community and China's accession to the WTO. In both cases, these studies have found that reduced trade policy uncertainty has a significantly positive effect on trade flows.[1] Greenland et al. (2019) have demonstrated that increase in economic policy uncertainty (EPU) proposed by Baker et al. (2016), diminishes trade flows, particularly affecting the extensive margins, using aggregate bilateral trade data from 18 countries ranging from 1995 to 2013. Matzner et al. (2023) focus on the differences in the effects of uncertainty between the exporting country and the importing country. They employed the World Uncertainty Index (WUI) developed by Ahir et al. (2022) and found that an increase in WUI in the exporting country reduces trade, while an increase in it in the importing country stimulates trade, based on US Comtrade data covering the years 2000 to 2018.[2] Tam (2018) studied the effect of economic policy uncertainty (EPU) emanating from China and the US on trade. Using a global vector autoregressive model, she found that EPU leads to lower overall levels of trade.[3]

A growing body of literature has examined the impact of uncertainty on international trade at the firm level and uncovered its underlying mechanisms. Novy and Taylor (2020) examined the effects of uncertainty shocks on monthly US imports, building a model in which firms source intermediate inputs from both domestic and foreign suppliers and manage an inventory of these inputs to minimize fixed ordering costs. In response to increased uncertainty, particularly measured by stock market volatility, firms tend to reduce inventory holdings of foreign intermediate inputs, resulting in a more-than-proportional decline in trade relative to total output. De Sousa et al. (2020) observed that an increase in demand uncertainty, which is measured by industry-level expenditure volatility, affects export entry/exit decisions (extensive margin) as well as export sales (intensive margin). They employed French firm-level data ranging from 2000 to 2009 and found that the most productive exporters are more affected by higher industry-wide expenditure volatility than the least productive exporters. Zhou and Wen (2022) obtain the similar results, analyzing the effect of trade policy uncertainty (TPU) on firm export behavior with panel data from Chinese listed companies in the industrial sector. They showed that high uncertainty in trade policy significantly inhibits both the

[1] Handley and Limão (2022) review the literature related with TPU. They provide a conceptual framework for modeling TPU and methods of estimating and quantifying its effects.

[2] Baley et al. (2020) show that uncertainty can promote trade in a general equilibrium model with information frictions.

[3] In addition, Carballo et al. (2022) show that trade agreements can mitigate uncertainty in bilateral trade relationships by reducing the overall bilateral trade cost.

extensive and intensive margins of firm exports.[4] Although a number of studies have examined the effect of uncertainty on international trade, there are relatively little research weighing the importance on the role of investment in the context of the uncertainty impact on international trade. This paper aims to fill this gap by examining the effect of policy uncertainty on exports through the reduction in investment, employing data on Japanese firm-level trade and investment for several decades.

3. A theoretical analysis

To guide our empirical predictions, we incorporate the investment uncertainty framework from Dixit and Pindyck (1994) into the theoretical model of Melitz (2003). Our approach to modeling corporate investment is informed by the studies of Bustos (2011) and Lileeva and Trefler (2010), which posit that firms can enhance productivity by incurring an additional fixed cost. However, unlike their settings, we treat the additional costs associated with technology upgrades as sunk costs. We assume that firms can pay a fixed sunk cost prior to market entry, leading to a permanent productivity increase across all subsequent periods. Firms will invest if the discounted present value of the resulting profit increase exceeds the sunk cost. If the sunk cost is sufficiently low, all firms will invest in new technology and entry to the market, thereby boosting export volumes.

Following Dixit and Pindyck (1994), uncertainty arises from the potential fluctuation in profit gains, which may occur with some probability in future periods. This uncertainty incentivizes firms to delay investment until conditions become clearer, to avoid the risk of incurring sunk costs unnecessarily. As a result, export volumes may be lower than anticipated until the uncertainty is resolved.

3.1. Consumer preferences

There are two countries, Home and Foreign, and we will describe the home economy below. Home has a population L, who supplies labor inelastically. In both countries, there is a continuum of firms who produce differentiated products. Preferences are characterized by a CES utility function.

$$U = \left[\int_{\omega \in \Omega} q(\omega)^{\rho} d\omega\right]^{\frac{1}{\rho}}$$

where $q(\omega)$ is the consumption of a variety ω and Ω is the set of available varieties in the home country. These goods are substitutes, implying $0 < \rho < 1$ and an elasticity of substitution between any two goods of $\sigma = 1 / (1-\rho)$. The elasticity of substitution across varieties σ is assumed to be larger than one and identical in both countries.

The demand function for a variety ω is given by:

[4] Additionally, Sudsawasd and More (2006), Choi, et al. (2021), Jardet, et al. (2022) and Inada and Jinji (2023) indicate that the increase in policy uncertainty reduces foreign direct investment.

$$q(\omega) = \left(\frac{p(\omega)}{P}\right)^{-\sigma} \frac{Y}{P}$$

where Y is the home total expenditure, $p(\omega)$ is the price of the variety ω faced by home consumers, and the aggregate price is given by $P = [\int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega]^{\frac{1}{1-\sigma}}$

3.2. Production

Labor is the only input in the economy. Each firm produces a unique variety and faces both fixed cost, f and variable costs of production. The labor input required for the production of differentiated goods with quantity x is given by $l = f + x/\varphi$. Producers are heterogeneous in their productivity φ. Firms face a monopolistic competition. The profit-maximizing price set by a firm is a markup over marginal cost:

$$p = \frac{1}{\rho\varphi}$$

Let labor be the numeraire good and set w=1. The firm revenue is expressed as follows.

$$r(\varphi) = R(P\rho\varphi)^{\sigma-1}$$

The firm profit with productivity φ is expressed as follows:

$$\pi = \frac{R}{\sigma}(P\rho\varphi)^{\sigma-1} - f$$

where R is the total revenue from the production of differentiated goods.

3.3. Entry and Exit

Firms enter the market by paying a fixed entry cost, f_e, and draw their productivity level φ from a common distribution $G(\varphi)$. Upon observing their productivity, firms decide whether to produce or exit the market. Firms will enter the market until the expected profits of entry are driven to zero. The free entry condition is given by:

$$v_e = [1 - G(\varphi^*)]\frac{\overline{\pi}}{\delta} - f_e = 0$$

where v_e is the net value of entry, $\overline{\pi}$ is the average productivity of firms that have entered the market and δ represents the ex-ante survival probability.

3.4. Exporting

Firms that choose to export face additional fixed costs f_x and variable trade costs in the form of "iceberg" costs, where $\tau > 1$ units must be shipped for one unit to arrive. For a firm with productivity φ, the revenues earned from the Foreign is given by:

$$r_x(\varphi) = \tau^{1-\sigma} R (P\rho\varphi)^{\sigma-1}$$

3.5. Investment in the deterministic case

Next, we incorporate investment decisions into the model. We assume that firms can incur an additional sunk fixed cost, f_R which leads to an increase in productivity by a factor of α, where $\alpha > 1$. While this setup is informed by the studies of Bustos (2011) and Lileeva and Trefler (2011), the difference in our setting is that we treat these additional fixed costs as sunk cost. This allows us to examine the impact of investment irreversibility on the export volume, rather than on post-entry technology choices. If a firm invests in new technology, its profit increases by $\alpha^{\sigma-1}$.

$$\pi_R = \frac{R}{\sigma}(P\alpha\rho\varphi)^{\sigma-1} - f$$

where π_R represents the firm's profit after investing. The free entry condition can then be rewritten as:

$$v_e = \begin{cases} \text{If it does not invest in new technology,} & [1 - G(\varphi^*)]\dfrac{\bar{\pi}}{\delta} - f_e = 0 \\ \text{If it invests in new technology,} & [1 - G(\varphi^*)]\dfrac{\bar{\pi}_R}{\delta} - f_e - f_R = 0 \end{cases}$$

Here, $\bar{\pi}_R$ is the average productivity of firms that have invested in new technology. A firm will invest in new technology if the value of the latter exceeds that of the former, i.e., if the product of the ex-ante probability of successful entry and the difference in discounted expected profits between investing and not investing exceeds the sunk cost of investment. This condition can be rewritten as follows.

$$f_R < [1 - G(\varphi^*)]\left(\frac{\bar{\pi}_R - \bar{\pi}}{\sigma}\right)$$

Under the above conditions are satisfied, if a firm with productivity φ makes an investment, its export volume increases by $\alpha^{\sigma-1}$.

$$r_x^R = \tau^{1-\sigma} R (P\rho\alpha\varphi)^{\sigma-1} > r_x = \tau^{1-\sigma} R (P\rho\varphi)^{\sigma-1}$$

where r_x^R denotes the revenues from exports for a firm with productivity φ after the firm has invested in new technology.

3.6. Investment under uncertainty

Uncertainty is introduced such that in period *s*, there is a probability *p* that productivity will increase at a rate of β, and a probability of $1-p$ that it will increase at a rate of γ. β is assumed to be greater than one while γ is assumed to be smaller than one. This setting implies that firms may experience either a positive or a negative shock to productivity at period *s*. We have configured the

setting to account for either positive or negative shocks, anticipating events such as changes in government at some future point. We also assume that this productivity change remains unchanged after period s +1. This formulation of uncertainty is attributed to Dixit and Pindyck (1994).

In this setting, firms compare the expected profit of starting investment from the beginning of the period, $t = 0$ with the expected profit of waiting until the event with probability p occurs in period s. If the latter is greater, they will postpone investment until period s. As a result, productivity does not increase until uncertainty eliminates, and firm export also decrease compared to the case without uncertainty. In this case, the free entry condition can be rewritten as follows.

$$v_e = \begin{cases} \text{If it does not invest in new technology,} \\ [1 - G(\varphi^*)]\dfrac{\bar{\pi}}{\delta} - f_e = 0 \\ \text{If it invests in new technology from the beginning of the period, } t = 0, \\ [1 - G(\varphi^*)]\left[\dfrac{\bar{\pi}_R\{1-(1-\delta)^s\}}{\delta} + p \cdot \dfrac{\beta^{\sigma-1}\,\bar{\pi}_R(1-\delta)^s}{\delta} + (1-p)\dfrac{\gamma^{\sigma-1}\,\bar{\pi}_R(1-\delta)^s}{\delta}\right] - f_e - f_R = 0 \\ \text{If it invests in new technology from the period } s, \\ [1 - G(\varphi^*)]\left[\dfrac{\bar{\pi}\,\{1-(1-\delta)^s\}}{\delta} + p \cdot \dfrac{\beta^{\sigma-1}\,\bar{\pi}_R(1-\delta)^s}{\delta}\right] - f_e - pf_R = 0 \end{cases}$$

Here are six possible cases of size relationships. Depending on the relative values, firms choose between non-investment, immediate investment or investment starting from period s. However, we focus on the case where f_R is sufficiently low so firms invest in new technology. In this case, firms will postpone investing until the periods if the sunk cost of the investment exceed the product of the ex-ante probability of successful entry and the sum in expected profit between investing from the beginning and defer it until the period s. This condition is given by:

$$[1 - G(\varphi^*)]\left[\frac{(\,\bar{\pi}_R - \bar{\pi}\,)\{1-(1-\delta)^s\}}{\delta(1-p)} + \frac{\gamma^{1-\sigma}\bar{\pi}_R(1-\delta)^s}{\delta}\right] < f_R$$

This equation implies that the larger the sunk cost of investment, f_R, the more the firm will postpone investment. The smaller the probability of productivity increase p, the more the firm will postpone investment. This implies that the higher the probability that the scenario of lower productivity is realized, the smaller the expected value of the sunk cost. In addition, the more productivity declines in period s, the more firms postpone investment. The above results are similar to

those obtained with Dixit and Pindyck (1994). The lower the entry probability $[1 - G(\varphi^*)]$, or the higher the exit probability $[G(\varphi^*)]$, the more firms will postpone investment. The postponement of investment as described above leads to a decrease in export volume compared to if the investment had been made.

4. Description of data

Our empirical analysis utilizes the Economic Policy Uncertainty (EPU) measure, which is based on the research conducted by Baker et al. (2016). This data is accessible through the Economic Policy Uncertainty website (https://www.policyuncertainty.com). The authors have made the EPU indexes for approximately 30 countries publicly available, each of which is created by individual researchers. To create the index, each researcher initially counts the monthly occurrences of articles in national newspapers that include keywords related to the economy (E), policy (P), and uncertainty (U) in their respective countries. This monthly article count is subsequently normalized by dividing it by the total number of articles for the same month and undergoes seasonal adjustments. The index is then adjusted to have an average value of 100 over the sample period. Therefore, EPU indexes indicate the relative frequency of newspaper articles in each country that address topics related to the economy, policy, and uncertainty.

Figure 1 shows the monthly trend of the Japanese EPU index from our sample period. This index is disclosed by Elif et al. (2022) in the Economic Policy Uncertainty website, reflects significant shifts in Japan's economic and political landscape. The sharp spike in 1998 followed the ruling LDP's defeat in the Upper House election, leading to a split parliament. In the early 2000s, the index climbed due to reduced parliamentary seats for the ruling party and debates surrounding former Prime Minister Koizumi's policies. Throughout the mid-2000s, the index stabilized somewhat, fluctuating between 50-100. However, the 2008 global financial crisis caused a significant surge, with the index peaking at over 239 in October 2008. This was followed by marked increases during key events such as the Great Tohoku Earthquake in March 2011, the postponement of the consumption tax hike in July 2016, the onset of the COVID-19 pandemic in 2020, and the ongoing Ukraine crisis from 2021 onward.

We derived firm-level data from security reports of listed firms. All listed firms in Japan are required to submit annual security reports to Japanese government, which contain standard corporate variables. The reports contain detailed information on sales, the number of employees, asset, R&D spending and other standard financial variables in B/S and P/L. This data is extracted from the NIKKEI NEEDS database. While our sample covers all the stock markets in Japan, this paper has excluded the financial sector, including banks, insurance, securities, and other financial institutions. Our analysis considers data for Japanese listed companies excepting financial sectors from 1998 to 2022.[5] The

[5] This paper excludes three companies with negative revenue or export values.

sample remains approximately 4,000 firms per year, for a total of around 100,000 firms over twenty-five years.

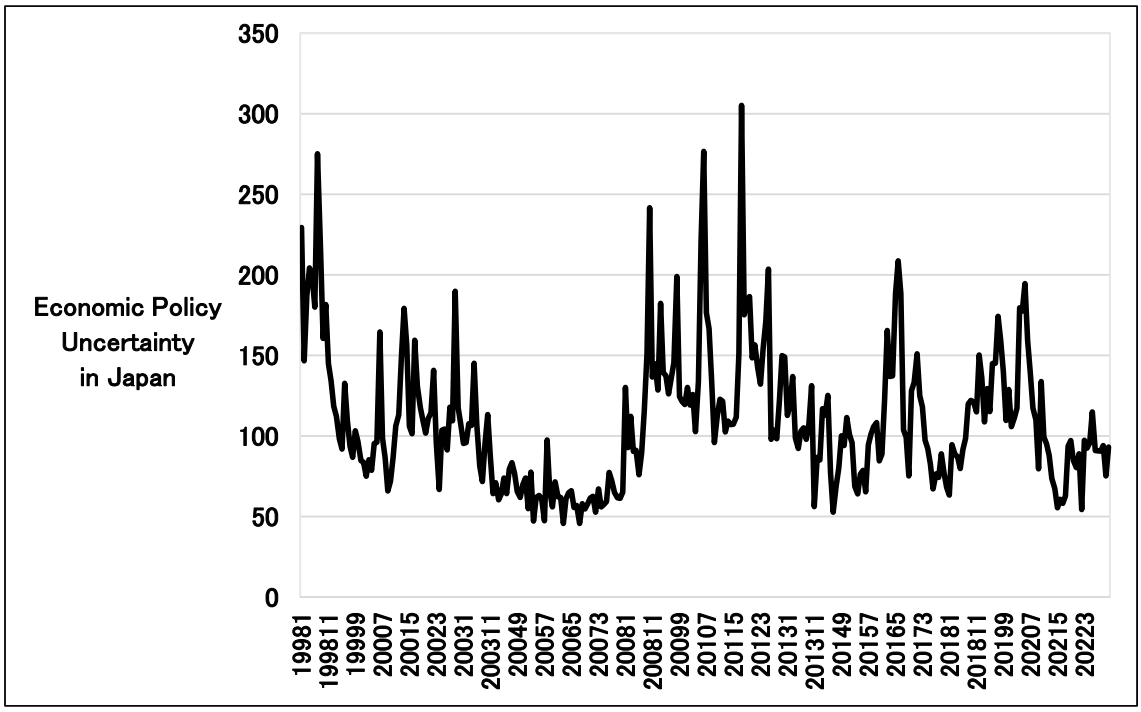

Figure 1 The time trend of Japanese News-based Economic Policy Uncertainty Index

The firm-level export data is also extracted from the securities reports. Each firm reports their export values in the quarterly reports ("kessan-tanshin" in Japanese).[6] Both of firm-level research and development (R&D) expenditure and capital investment are obtained from the same reports as the variables of firm-level investment. GDP data are sourced from the World Bank Open Data website. The yen-dollar exchange rate was obtained from the Bank of Japan.

Table A1 in the appendix provides summary statistics for the variables used in our regression analysis. We observe the following key characteristics. First, approximately 30% of the firms in our sample are involved in exporting. This export participation rate is roughly three time higher than that of the entire population of firms in many countries, including Japan. However, the observation of a high exporter ratio is reasonable within our sample of listed firms, which tend to be larger in size and more capital-intensive. Second, both R&D intensity (measured as R&D / Sales) and capital investment intensity (measured as capital investment / Sales) stand at around 7% and 3%, respectively, at the mean. These percentages are also slightly high, likely due to the inclusion of listed firms in our sample.[7]

[6] The securities reports do not provide information on the destination countries of exports, so the total export value is used in our analysis.

[7] The summary statistics are presented in the Table A1 in the appendix.

5. Regression specification

This paper initially employs the following specification to assess the effect of economic policy uncertainty (EPU) on firm-level exports:

$$ln\,Export_{ijt} = \beta_1\, ln\,EPU_t + \beta_2\, Invest_{ijt} + \boldsymbol{X\gamma} + \delta_i + \varepsilon_{ijt} \qquad (1)$$

In this equation, *i* represents a specific firm, *j* denotes the industry, and *t* indexes the year. The dependent variable is the logarithm of firm-level export values.[8] EPU, one of variables of our interest, is the measures of economic policy uncertainty in Japan. This analysis also converts the policy uncertainty index into categorical variables and considers indicators for Japan's main trading partners, the United States and China. The theoretical framework suggests that heightened policy uncertainty increases the value of delaying investment, potentially leading to reduced exports due to a slowdown in investment. This paper examines both R&D expenditure divided by sales and capital investment divided by sales as measures of firm investment. We form our proxy of investment based on the notion that the funds used for R&D and capital investment are irrecoverable regardless of the success or failure of the business, and are thus irreversible. *X* is a vector of control variables, including the logarithm of sales, given the well-established relationship between firm size and export behavior. Recent heterogeneous-firms trade models, such as Navas et al. (2020), consider market size at both the exporting and destination countries, even at the firm level. Consequently, this study incorporates the GDP of the world (excluding Japan) and Japan's GDP to control for the market size of both exporting and destination countries. We also consider the exchange rate, specifically the annual average yen-to-dollar value for each year. ε represents the error term.

We next employ the fixed effects instrumental variables method. Since corporate investment behavior is an endogenous and much studies, including Bustos (2011) have highlighted the learning effects that trade liberalization encourages firms to invest in technological innovation. It concerns that the estimator of β_2 for equation (1) may be biased. In the first stage of the estimation, we use EPU in Japan is as an instrumental variable to regress R&D intensity and capital investment ratio on export. We use a macro-level economic policy uncertainty index because our identification strategy is founded on that any individual Japanese firm cannot influence this uncertainty index, allowing it to be considered an exogenous variable. For instance, political decisions such as postponement of the rise in the corporate tax, or the disasters such as the Great East Japan Earthquake and COVID-19 cannot be triggered by any company. On the other hand, it is considered that Japan's EPU does not affect firm export, which are linked to demand for the countries of export destination. For example, Japan's

[8] For companies with zero export volume, this paper added the value of 10^{-8} and then took the natural logarithm.

political stability or fiscal situation is separate from that of other countries, and even if they are expected to deteriorate, it is believed that this will not affect foreign market demand and, consequently, will not impact exports.

One of the concerns with using macro-level uncertainty as an instrumental variable is that the spillover effects of uncertainty across countries. According to Biljanovska et al. (2021) and Lakdawala et al. (2021), the uncertainty indices of various countries are correlated, suggesting that the uncertainty in one country can spill over to others. For instance, the international financial crisis that occurred in 2008, originating from the United States, spread to countries worldwide, increasing uncertainty during this period not only in the United States but also in other countries. The COVID-19, originating from China, quickly spread around the world, leading to a surge increase in policy uncertainty in all over the country. Our data also observed a positive correlation between the global uncertainty index and Japan's uncertainty index.[9] To address this issue, we conducted an analysis excluding periods of heightened global uncertainty such as the international financial crisis and the infectious period of coronavirus. We expect that uncertainty in Japan's EPU will negatively impact Japanese corporate investment in the first-stage estimation. It will result in reduced exports due to a slowdown in investments.

6. Results

6.1. Baseline estimation results

Our baseline estimation results are presented in Table 1. All columns include firm fixed effects, and robust standard errors clustered at the firm level are reported in parentheses. In Column (1), the EPU index is excluded, though control variables and a constant term are included. We observe a positive correlation between sales and exports, consistent with the well-documented relationship in the heterogeneous firm trade literature (Bernard et al., 1999). Additionally, GDP is found to be significant, aligning with findings from previous studies such as Navas et al. (2020). The exchange rate coefficient is positive, suggesting that a depreciation of the Japanese yen corresponds to an increase in exports.

In Column (2), the Japanese EPU index is introduced alongside the control variables. We find a significantly negative coefficient for the effect of Japanese EPU on exports, indicating that higher EPU levels lead to a reduction in firm-level exports. This result implies that a 1% increase in EPU leads to an approximately 0.4% reduction in exports though replacing zero export values with a small positive value. Columns (3) and (4) include lagged EPU variables for one and two periods prior, respectively. The coefficients for these lags decrease in magnitude, with the coefficient for the two-period lag becoming statistically insignificant. This result suggests that the effects of EPU that arise in a given

[9] The correlation matrix is presented in the Table A2.

period persist for around a year.

Turning to the investment variables in Columns (5) through (7), we include R&D intensity as a measure of capital investment. The coefficient for R&D intensity is positive and statistically significant, indicating that a 1% increase in R&D intensity is associated with a 0.1% increase in exports. This result is comparable with Aw et al. (2011), which reported that a 1% increase in R&D investment leads to a 0.03% to 0.1% increase in exports. In Columns (8) through (10), we replace R&D intensity with the capital investment ratio. The capital investment ratio also shows a positive and statistically significant relationship with export values. These findings suggest that investments in both R&D and capital enhance firm productivity, thereby boosting exports, consistent with the findings of Aw et al. (2011).

6.2. Robustness check results

Table 4 presents the results of our robustness checks. First, we focus on the manufacturing sector in Columns (1) and (2), given that Japanese exports are strongly influenced by fluctuations in the manufacturing sector, particularly in automobiles and machinery. Even when excluding the service sectors, our findings remain robust. Second, we transform global and Japanese GDP into GDP growth rates in Columns (3) and (4), reaffirming the significance of EPU and investment variables. Third, considering that EPU affect firms' financial constraints, we control for financial variables, specifically the ratio of long-term debt to total assets in Columns (5) and (6). The results remain consistent. Fourth, we exclude the COVID-19 pandemic period, an extraordinary event that led to widespread production suspensions due to government-imposed lockdowns in Columns (7) and (8). Separate analyses, excluding data from 2020 to 2022, show that our main results are unaffected. Fifth, we address the substantial variation in export values. As seen in other advanced economies, a few large Japanese firms—such as Toyota, Honda, Mazda, Canon, Panasonic, and general trading companies—account for a significant share of export values. To ensure robustness, we exclude these "superstar" firms from the analysis. Columns (9) and (10) report estimation results from a sample excluding firms in the top 25% of export values. Lastly, to account for the unbalanced nature of the dataset, with firms entering and exiting the sample during the study period, we conduct a similar analysis using a balanced sample in Columns (11) and (12). The results are consistent with our main findings.

6.3. Results with categorical EPUs and foreign policy uncertainty

Tables 3 and 4 further explore the effect of EPU by replacing it with Japan's different type of policy uncertainty and global and foreign economic policy uncertainty. We consider the indices of Japan's main trading partners, the U.S. and China. The signs for all four measures of Japanese policy uncertainty—fiscal, monetary, trade, and exchange rate policies—are negative and statistically significant. Although the coefficient magnitude is smallest for fiscal policy, it remains larger than that

for overall economic policy uncertainty in Table 1. This is partly consistent with Fujitani (2022) which reported that fiscal and exchange rate policies were most influential among categorical EPUs.

For the U.S. economic policy uncertainty index, the three components index which is composed of news coverage, tax code expiration data, and economic forecaster disagreement is positive and significant, while the index based on newspaper articles is not significant. Among the categorical indicators, fiscal and monetary policies are positive and significant, with only trade policy showing a negative and significant effect. For China, EPU is negative and significant. Global economic policy uncertainty, on the other hand, is not significant, whether price adjustments are included or not. The negative sign for China's policy uncertainty may be attributed to the significant presence of Japanese production facilities in China, potentially influencing the results. This result is partly consist with the existing literature, such as Greenland et al. (2019) and Matzner et al. (2023), which indicate that exports decline as destination policy uncertainty and global policy uncertainty rise. Our findings suggest that Japanese exports are negatively affected by policy uncertainty within Japan and from the main trading partners, U.S. trade and China.

6.4. Result for IV estimation

Next, we present the results of the IV estimation in Tables 5 and 6. Table 5 displays the first-stage results of the instrumental variable method. Columns (1) and (2) show results for the full sample period from 1998 to 2022, while Columns (3) and (4) present results for a sample excluding the periods of the international financial crisis from 2008 to 2010 and the COVID-19 pandemic from 2020 to 2022. The uncertainty indexes also include a one-period lag variable. The result shows that the capital investment ratio is negative and significant for uncertainty, while R&D intensity is not significant in either sample period. An F-test for joint significance confirms that the coefficients are not equal to zero. The F-statistics exceed the commonly accepted threshold of 10 for R&D over the full sample period and for capital investment excluding the international financial crisis and COVID-19 periods.

In the second stage of estimation, the signs of the coefficients on R&D intensity and capital investment ratio are positive and statistically significant, except in Column (1). The magnitude of the coefficients is larger than the OLS estimates, indicating that the effect of investment was likely underestimated in the OLS. Based on the instrumental variable estimation, we conclude that investment variables have a positive impact on exports.

7.Conclusion

This paper investigates the effect of EPU on international trade. Utilizing data from approximately 4,000 Japanese listed firms ranging from 1998 to 2022, we found that increase in policy uncertainty in Japan have significant negative effects on firm-level exports. Our results offer strong support for the notion that economic policy uncertainty has a significant detrimental effect on

international trade flows. In terms of indicators by category, fiscal policy and contributed the most. In addition, by country, indicators of trade policy in the U.S. and the EPU in China were negatively correlated with exports. Furthermore, our IV estimation reveals that firms which invest capital and R&D more are tend to reduce their exports more when confronted with heightened uncertainty. This finding is consistent with the interpretation that firms delay undertaking irreversible investments in the face of increased uncertainty. This supports the growing literature that emphasizes the effect of uncertainty on real economic activities and its mechanisms.

The findings of this paper have important policy implication. During periods of rising policy uncertainty, industries reliant on substantial investments are more susceptible to export declines. Consequently, government support for such industries becomes crucial in mitigating the downturn in exports. Conversely, in industries with lower investment requirements, the effect of uncertainty is relatively modest, making export promotion within these sectors a viable action to offset the overall decrease in exports.

While this paper provides informative firm-level insights, several important avenues for further research remain unexplored. For example, it will be difficult but desirable to find a more reliable proxy of investment. Our current data does not distinguish between domestic and foreign investments. Structural estimations developed by Aw et al. (2011) would also be useful to mitigate endogeneity problems for firms' choice between export and investment. Fruitful findings will emerge in future independent studies if improvements such as these are accomplished.

Table 1 Baseline regression results

	ln (Export value)									
	(1)	(2)	(3)	(4)	(8)	(9)	(10)	(5)	(6)	(7)
ln (EPU)		-0.4567			-0.4565			-0.4177		
		(0.1100)***			(0.1099)***			(0.1094)***		
ln (EPU) (one-year lag)			-0.3111			-0.3117			-0.2500	
			(0.1395)**			(0.1395)**			(0.1396)*	
ln (EPU) (two-year lag)				-0.1356			-0.1358			-0.1166
				(0.1121)			(0.1121)			(0.1120)
R&D / Sales					0.0090	0.0094	0.0088			
					(0.0019)***	(0.0019)***	(0.0019)***			
Capital investment / Sales								3.2684	3.2235	1.9902
								(0.6821)***	(0.6852)***	(0.6953)***
ln (Sales)	1.2792	1.2825	1.4111	1.4505	1.2879	1.4176	1.4569	1.262	1.3963	1.4461
	(0.0944)***	(0.0945)***	(0.1073)***	(0.1191)***	(0.0948)***	(0.1077)***	(0.1196)***	(0.0949)***	(0.1075)***	(0.1191)***
ln (GDP of Japan)	7.3847	6.6975	6.6406	7.0808	6.6968	6.6359	7.0744	6.8316	6.7963	7.0727
	(1.1207)***	(1.1828)***	(1.2464)***	(1.0814)***	(1.1827)***	(1.2463)***	(1.0814)***	(1.1815)***	(1.2464)***	(1.0827)***
ln (GDP of world excluding Japan)	0.5756	0.6035	0.4548	0.1898	0.5998	0.4510	0.1867	0.5681	0.4253	0.1787
	(0.1791)***	(0.1777)***	(0.1810)**	(0.1862)	(0.1778)***	(0.1811)**	(0.1863)	(0.1772)***	(0.1805)**	(0.1861)
ln (Exchange rate)	8.4723	7.7554	7.6713	8.5263	7.7509	7.6628	8.5172	7.8723	7.8356	8.5082
	(1.0388)***	(1.1023)***	(1.1921)***	(1.0108)***	(1.1023)***	(1.1920)***	(1.0108)***	(1.1006)***	(1.1915)***	(1.0114)***
Constant	-130.9096	-119.9206	-119.3083	-125.2644	-119.9089	-119.2517	-125.1974	-121.3019	-121.3222	-125.0997
	(14.3554)***	(15.4461)***	(16.6136)***	(13.8738)***	(15.4453)***	(16.6126)***	(13.8729)***	(15.4311)***	(16.6138)***	(13.8853)***
Adjusted R2	0.023	0.0234	0.022	0.0202	0.0234	0.0221	0.0202	0.0238	0.0225	0.0204
Observations	100101	100101	97772	91784	100101	97772	91784	99984	97656	91674

Notes: All specifications include firm fixed effects. Robust standard errors, clustered at the firm level, are reported in parentheses. Statistical significance is indicated by asterisks: *** for 1%, ** for 5%, and * for 10%. Notes to Table 1 also apply to all the tables in what follow.

Table 2 Robustness checks

	ln (Export value)											
	Manufacturing industry		GDP growh rate		Liquidity		Excluding the COVID period		Outlier firms omitted		Blansed sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ln (EPU)	-0.999	-0.8443	-0.2786	-0.2273	-0.4561	-0.4178	-0.5899	-0.5420	-0.4565	-0.4177	-1.0898	-1.1237
	(0.1869)***	(0.1846)***	(0.0950)***	(0.0947)**	(0.1098)***	(0.1093)***	(0.1115)***	(0.1109)***	(0.1099)***	(0.1094)***	(0.1521)***	(0.1519)***
R&D / Sales	0.0228		0.0109		0.0091		0.0494		0.0090		38.3191	
	(0.0041)***		(0.0021)***		(0.0019)***		(0.0181)***		(0.0019)***		(5.3424)***	
Capital investment / Sales		11.2804		3.6769		3.268		4.0389		3.2684		3.7407
		(1.6736)***		(0.7000)***		(0.6822)***		(0.6950)***		(0.6821)***		(1.2349)***
Long-term debt / total assets					0.0268	0.0147						
					(0.3164)	(0.3142)						
ln (Sales)	3.0928	2.9087	1.6139	1.5828	1.2913	1.2621	1.2346	1.2002	1.2879	1.2620	1.7858	1.6441
	(0.2406)***	(0.2387)***	(0.1035)***	(0.1033)***	(0.0948)***	(0.0950)***	(0.0961)***	(0.0961)***	(0.0948)***	(0.0949)***	(0.2195)***	(0.2235)***
ln (GDP of Japan)	6.0012	6.5325	0.3844	0.4427	6.6917	6.830	6.8077	6.9788	6.6968	6.8316	4.6218	4.1897
	(1.9875)***	(1.9833)***	(0.2940)	(0.2930)	(1.1826)***	(1.1803)***	(1.1704)***	(1.1696)***	(1.1827)***	(1.1815)***	(1.4787)***	(1.4821)***
ln (GDP of world excluding Japan)	1.131	1.0163	2.1083	2.1869	0.5992	0.5683	0.3429	0.2882	0.5998	0.5681	0.0924	0.1944
	(0.2872)***	(0.2863)***	(0.3624)***	(0.3631)***	(0.1782)***	(0.1774)***	(0.1943)*	(0.1937)	(0.1778)***	(0.1772)***	(0.2216)	(0.2205)
ln (Exchange rate)	6.7548	7.2709	2.1704	2.2409	7.7364	7.8709	7.1531	7.2688	7.7509	7.8723	6.1305	5.6774
	(1.8609)***	(1.8559)***	(0.3285)***	(0.3258)***	(1.1020)***	(1.0996)***	(1.0690)***	(1.0679)***	(1.1023)***	(1.1006)***	(1.3745)***	(1.3779)***
Constant	-124.0916	-128.9768	-34.4897	-34.8705	-119.8229	-121.2862	-114.0756	-115.484	-119.9089	-121.3019	-90.0692	-83.2446
	(25.6825)***	(25.6315)***	(1.9004)***	(1.8798)***	(15.4406)***	(15.4158)***	(14.9908)***	(14.9822)***	(15.4453)***	(15.4311)***	(19.1396)***	(19.1686)***
Adjusted R2	0.0436	0.0454	0.0207	0.0213	0.0234	0.0238	0.0184	0.0191	0.0234	0.0238	0.0209	0.0161
Observations	41401	41377	97772	97656	99984	99984	87769	87653	100101	99984	54279	54241

Table 3 Different types of policy uncertainty indices (R&D intensity)

	ln (Export value)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fiscal Policy Uncertainty in Japan	-0.4304											
	(0.0979)***											
Monetary Policy Uncertainty in Japan		-0.3107										
		(0.0672)***										
Trade Policy Uncertainty in Japan			-0.2853									
			(0.0507)***									
Exchange Rate Policy Uncertainty in Japan				-0.1089								
				(0.0413)***								
Economic Policy Uncertainty in U.S. (Three components)					0.2194							
					(0.0999)**							
Economic Policy Uncertainty in U.S. (News based)						0.0872						
						(0.0830)						
Fiscal Policy Uncertainty in U.S.							0.1393					
							(0.0545)**					
Monetary Policy Uncertainty in U.S.								0.2795				
								(0.0473)***				
Trade Policy Uncertainty in U.S.									-0.093			
									(0.0367)**			
Economic Policy Uncertainty in China (Mainland Newspapers)										-0.1219		
										(0.0544)**		
Economic Policy Uncertainty in the World (Current)											-0.0189	
											(0.0950)	
Economic Policy Uncertainty in the World (PPP)												-0.0024
												(0.0953)
R&D / Sales	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
ln (Sales)	1.2748	1.2719	1.2701	1.2703	1.27	1.2713	1.2713	1.2672	1.2736	1.2741	1.2721	1.272
	(0.0943)***	(0.0942)***	(0.0942)***	(0.0943)***	(0.0942)***	(0.0942)***	(0.0942)***	(0.0942)***	(0.0943)***	(0.0943)***	(0.0943)***	(0.0943)***
ln (GDP of Japan)	6.6167	6.324	10.4744	6.8816	7.7026	7.2861	7.9223	7.9431	9.6331	7.919	7.3878	7.3458
	(1.1847)***	(1.1809)***	(1.0987)***	(1.1596)***	(1.1993)***	(1.0984)***	(1.2301)***	(1.1395)***	(1.0942)***	(1.0393)***	(1.0323)***	(1.0292)***
ln (GDP of world excluding Japan)	0.5298	0.5977	0.6474	0.5094	0.4643	0.5167	0.4961	0.6015	0.5159	0.6627	0.5644	0.5524
	(0.1807)***	(0.1774)***	(0.1735)***	(0.1809)***	(0.1785)***	(0.1761)***	(0.1781)***	(0.1785)***	(0.1842)***	(0.1791)***	(0.1786)***	(0.1799)***
ln (Exchange rate)	7.4579	7.5035	10.5606	7.8985	8.8742	8.4038	9.1295	8.8791	10.2829	8.9631	8.4729	8.4337
	(1.1268)***	(1.0891)***	(1.0096)***	(1.0852)***	(1.1424)***	(1.0281)***	(1.1824)***	(1.0549)***	(0.9874)***	(0.9651)***	(0.9546)***	(0.9512)***
Constant	-117.1394	-116.1276	-166.3665	-122.712	-135.2796	-129.5021	-138.2987	-139.01	-157.4398	-138.1201	-130.7046	-130.1111
	(15.6398)***	(15.2561)***	(13.6820)***	(15.0396)***	(15.5621)***	(14.1224)***	(16.0072)***	(14.6386)***	(13.3214)***	(13.1848)***	(13.0327)***	(12.9739)***
Adjusted R2	0.024	0.0238	0.0242	0.0236	0.0236	0.0236	0.0237	0.0239	0.0237	0.0237	0.0236	0.0236
Observations	100101	100101	100101	100101	100101	100101	100101	100101	100101	100101	100101	100101

Table 4 Different types of policy uncertainty indices (Capital investment)

	ln (Export value)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fiscal Policy Uncertainty in Japan	-0.4034											
	(0.0975)***											
Monetary Policy Uncertainty in Japan		-0.2968										
		(0.0670)***										
Trade Policy Uncertainty in Japan			-0.2873									
			(0.0508)***									
Exchange Rate Policy Uncertainty in Japan				-0.085								
				(0.0411)**								
Economic Policy Uncertainty in U.S. (Three components)					0.2428							
					(0.0998)**							
Economic Policy Uncertainty in U.S. (News based)						0.1042						
						(0.0829)						
Fiscal Policy Uncertainty in U.S.							0.1492					
							(0.0545)***					
Monetary Policy Uncertainty in U.S.								0.2842				
								(0.0474)***				
Trade Policy Uncertainty in U.S.									-0.0877			
									(0.0367)**			
Economic Policy Uncertainty in China (Mainland Newspapers)										-0.0942		
										(0.0544)*		
Economic Policy Uncertainty in the World (Current)											0.0077	
											(0.0947)	
Economic Policy Uncertainty in the World (PPP)												0.0243
												(0.0950)
Capital investment / Sales	3.25	3.3867	3.4531	3.3772	3.5176	3.494	3.5076	3.4673	3.4326	3.286	3.4695	3.4769
	(0.6821)***	(0.6843)***	(0.6848)***	(0.6842)***	(0.6827)***	(0.6826)***	(0.6833)***	(0.6839)***	(0.6838)***	(0.6830)***	(0.6812)***	(0.6813)***
ln (Sales)	1.2616	1.258	1.2557	1.2568	1.2549	1.2564	1.2565	1.2526	1.2592	1.2604	1.2574	1.2573
	(0.0949)***	(0.0948)***	(0.0948)***	(0.0948)***	(0.0948)***	(0.0948)***	(0.0948)***	(0.0948)***	(0.0949)***	(0.0949)***	(0.0948)***	(0.0948)***
ln (GDP of Japan)	6.7822	6.4906	10.622	7.1035	7.8664	7.4004	8.0888	8.0779	9.6259	7.9077	7.4439	7.4001
	(1.1838)***	(1.1796)***	(1.1001)***	(1.1577)***	(1.1984)***	(1.0984)***	(1.2290)***	(1.1392)***	(1.0975)***	(1.0403)***	(1.0333)***	(1.0301)***
ln (GDP of world excluding Japan)	0.5232	0.5865	0.6384	0.5094	0.4447	0.5	0.4819	0.5923	0.5084	0.6291	0.5349	0.5213
	(0.1800)***	(0.1766)***	(0.1728)***	(0.1804)***	(0.1775)**	(0.1752)***	(0.1773)***	(0.1779)***	(0.1836)***	(0.1777)***	(0.1772)***	(0.1785)***
ln (Exchange rate)	7.6186	7.6454	10.6793	8.1154	9.0252	8.5024	9.2829	8.9897	10.2796	8.9412	8.5124	8.4714
	(1.1250)***	(1.0874)***	(1.0098)***	(1.0824)***	(1.1410)***	(1.0275)***	(1.1809)***	(1.0542)***	(0.9896)***	(0.9656)***	(0.9549)***	(0.9515)***
Constant	-119.2751	-118.0694	-167.9858	-125.6418	-137.1886	-130.7491	-140.238	-140.5098	-157.2219	-137.6045	-131.0883	-130.4542
	(15.6269)***	(15.2433)***	(13.6965)***	(15.0136)***	(15.5529)***	(14.1231)***	(15.9974)***	(14.6389)***	(13.3576)***	(13.1936)***	(13.0430)***	(12.9842)***
Adjusted R2	0.0239	0.0237	0.0241	0.0236	0.0236	0.0236	0.0236	0.0238	0.0236	0.0236	0.0235	0.0235
Observations	99984	99984	99984	99984	99984	99984	99984	99984	99984	99984	99984	99984

Table 5 Results of the first stage of IV

	1998-2022		1998-2007・2011-2019	
	R&D / Sales	Capital investment / Sales	R&D / Sales	Capital investment / Sales
	(1)	(2)	(3)	(4)
ln (EPU)	-0.0493	-0.0043	-0.0124	-0.0547
	(0.0667)	(0.0006)***	(0.0106)	(0.0171)***
ln (EPU) (one-year lag)	0.0839	-0.0192	-0.0079	-0.0492
	(0.0690)	(0.0006)***	(0.0069)	(0.0017)
ln (Sales)	-0.6910	0.0058	0.0118	0.0129
	(0.0303)***	(0.0002)***	(0.0004)	(0.0004)***
ln (GDP of Japan)	0.4502	-0.0563	-0.0673	-0.5000
	(0.7793)	(0.0065)***	(0.1128)	(0.0271)***
ln (GDP of world excluding Japan)	0.4070	0.0091	-0.0087	-0.0178
	(0.0540)***	(0.0004)***	(0.0094)	(0.0022)***
ln (Exchange rate)	0.8650	-0.0626	-0.0419	-0.5190
	(0.6225)	(0.0052)***	(0.1342)	(0.0322)***
Constant	-5.3520	0.7587	1.0043	6.9997
	(9.2516)	(0.0775)***	(1.5647)	(0.3756)
F statistic	6.27	10.03	16.31	6.03
Observations	100101	97,656	40,396	40,355

Table 6 Results of the second stage of IV

	1998-2022		1998-2007・2011-2019	
	ln (Export)			
	(1)	(2)	(3)	(4)
R&D / Sales	-0.2546		82.736	
	(1.1064)		(42.0884)**	
Capital investment / Sales		18.0732		23.0883
		(4.0363)***		(4.3510)***
ln (Sales)	1.2371	1.3105	1.5499	0.9434
	(0.7672)	(0.0477)***	(0.2396)***	(0.0896)***
ln (GDP of Japan)	7.2013	7.4819	-4.6677	-6.9895
	(1.1537)***	(1.0529)***	(6.2214)	(2.3137)***
ln (GDP of world excluding Japan)	0.5629	0.2940	0.8774	0.9184
	(0.4513)	(0.0820)***	(0.5260)*	(0.1936)***
ln (Exchange rate)	8.4523	8.5967	-4.9543	-7.7827
	(1.2104)***	(0.8321)***	(6.3255)	(2.3160)***
Constant	-128.5680	-130.1064	27.5366	66.9257
	(13.3954)***	(12.3373)***	(80.7342)**	(29.9375)**
Observations	97772	97656	40396	40355

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Appendix

Table A1 Summary statistics of the basic variables

	Mean	Std. Dev.	Min	Max	Obs.
Total sales	161,761.000	729,656.500	0	31,400,000	100,259
Number of employess	3,381.832	14,663.880	0	384,586	100,259
Export values	44,165.780	396,775.100	0	25,000,000	100,259
GDP of Japan	4,918.127	531.408	4098.363	6,272.363	100,259
World GDP excluding Japan	58,534.230	21,280.690	27454.49	96,330.870	100,259
R&D / total sales	0.078	5.159	0	1,009	100,101
Capital investment / total sales	0.035	0.048	0	1.436	100,139
Yen dollar rate	109.282	13.025	79.620	131.793	100,259
Economic Policy Uncertainty in Japan	109.287	26.884	64.897	184.155	100,259
Fiscal Policy Uncertainty in Japan	108.616	32.010	57.646	188.828	100,259
Monetary Policy Uncertainty in Japan	110.986	32.989	64.466	202.121	100,259
Trade Policy Uncertainty in Japan	132.534	114.840	45.524	524.161	100,259
Exchange Rate Policy Uncertainty in Japan	88.414	52.736	40.261	260.694	100,259
Economic Policy Uncertainty in U.S. (Three components)	120.721	38.860	71.329	242.987	100,259
Economic Policy Uncertainty in U.S. (News based)	135.393	52.263	67.136	326.320	100,259
Fiscal Policy Uncertainty in U.S.	110.103	53.582	41.704	255.723	100,259
Monetary Policy Uncertainty in U.S.	90.296	33.867	39.492	168.620	100,259
Trade Policy Uncertainty in U.S.	114.543	164.670	28.740	797.122	100,259
Economic Policy Uncertainty in China (Mainland Newspapers)	146.514	104.910	35.567	390.388	100,259
Economic Policy Uncertainty in the World (Current)	137.773	68.067	62.677	318.380	100,259
Economic Policy Uncertainty in the World (PPP)	139.278	71.446	64.333	326.222	100,259

Table A2 Correlation matrix

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Economic Policy Uncertainty in Japan	[1]	1.000													
Fiscal Policy Uncertainty in Japan	[2]	0.954	1.000												
Monetary Policy Uncertainty in Japan	[3]	0.791	0.745	1.000											
Trade Policy Uncertainty in Japan	[4]	0.213	0.256	0.215	1.000										
Exchange Rate Policy Uncertainty in Japan	[5]	0.528	0.605	0.549	-0.139	1.000									
Economic Policy Uncertainty in the World (Current)	[6]	0.344	0.195	0.242	0.452	-0.144	1.000								
Economic Policy Uncertainty in the World (PPP)	[7]	0.326	0.176	0.224	0.454	-0.162	0.999	1.000							
Economic Policy Uncertainty in U.S. (Three components)	[8]	0.474	0.430	0.340	0.243	0.178	0.783	0.773	1.000						
Economic Policy Uncertainty in U.S. (News based)	[9]	0.462	0.374	0.325	0.363	-0.013	0.876	0.864	0.930	1.000					
Fiscal Policy Uncertainty in U.S.	[10]	0.440	0.468	0.364	0.132	0.252	0.566	0.551	0.911	0.818	1.000				
Monetary Policy Uncertainty in U.S.	[11]	0.395	0.287	0.431	-0.201	0.183	0.426	0.416	0.452	0.490	0.437	1.000			
Trade Policy Uncertainty in U.S.	[12]	0.170	0.194	0.023	0.881	-0.209	0.485	0.490	0.223	0.389	0.070	-0.011	1.000		
Economic Policy Uncertainty in China (Mainland Newspapers)	[13]	0.334	0.200	0.060	0.448	-0.143	0.872	0.876	0.584	0.701	0.357	0.239	0.569	1.000	
Economic Policy Uncertainty in China (The South China Morning Post)	[14]	0.219	0.060	0.113	0.505	-0.274	0.968	0.973	0.642	0.770	0.390	0.376	0.592	0.891	1.000