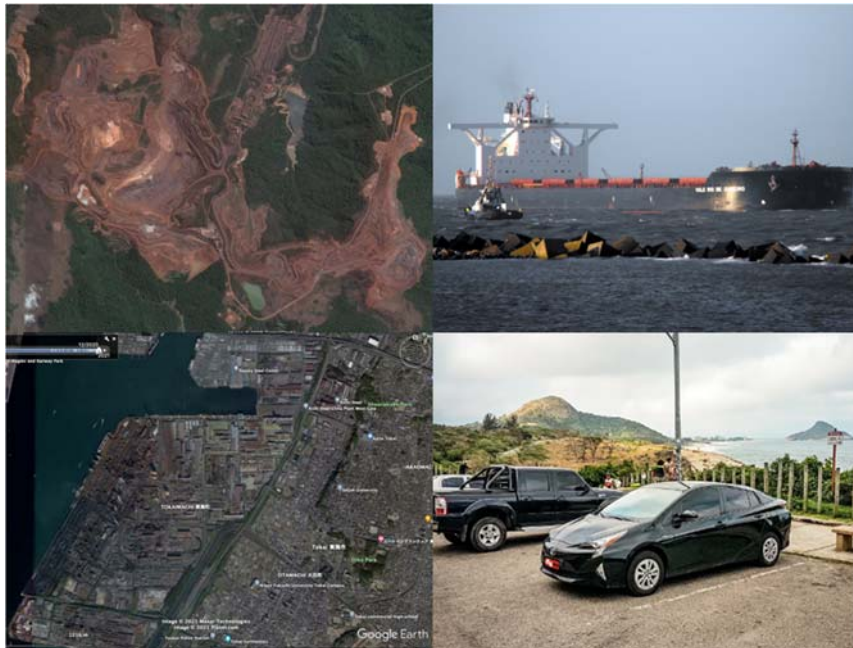# Out of Amazonia

The Light and Shadow of East Asian Development in the Anthropocene Epoch
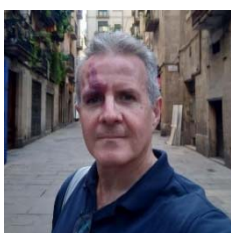
Dr Peter Matanle
Senior Lecturer
School of East Asian Studies
University of Sheffield

In 1997 Toyota Motor Corporation unveiled the world's first mass-produced hybrid vehicle, intending their 'environmentally saving and energy efficient' Prius to be 'the car of the 21st century'. Exactly thirty years earlier some American geologists from US Steel had emergency landed their helicopter on a barren rock in the middle of Brazil's Amazonia. Little did they know that their near-catastrophic accident would lead to the development of possibly the world's longest, most complex, and most environmentally destructive raw materials and consumer supply chain. Beginning deep in the Brazilian jungle and assembled by Mitsui – Japan's oldest corporate conglomerate within which Toyota plays a pivotal role – this supply chain has expanded globally, drawing in countries as distant as South Korea, Australia, Philippines, and the Netherlands, and is instrumental in China's transformation into the world's second largest economy. Amid academic discussions of the Great Acceleration and the dawn of the Anthropocene Epoch, and observing from the perspective in 2023 of the UNFCCC's COP28 meeting hosted by fossil-fuel petrostate the United Arab Emirates, has the Prius fulfilled Toyota's intentions? Does it shine a light or cast a shadow over humanity's and Earth's future?

Peter Matanle is Senior Lecturer in Japanese Studies at the School of East Asian Studies, University of Sheffield. He researches, writes, and teaches about East Asian development, focusing on population and environment, the theory and practice of permanent employment in large organisations, and ESG (Environmental, Social & Governance) investment.
X (Twitter)   LinkedIn   Google Scholar

Productivity and stress in Japanese new teleworkers: mandatory versus voluntary introduction

Georg D. Blind (University of Duisburg-Essen), Stefania Lottanti von Mandach (University of Zurich), David Chiavacci (University of Zurich), Masahiro Kotosaka (Keio University)

In our study of the introduction of teleworking during the COVID-19 pandemic, we avoid a common self-selection bias by controlling for agents' preferences and whether the introduction was voluntary or mandatory. In a survey (n=1500) conducted in December 2020, we inquired about working arrangements and agent preferences in January, April and December 2020.

Productivity levels initially did not significantly differ for newly teleworking individuals after correcting for age, gender, marital status, breadwinner and management roles, childcare gap, area, job type and general health awareness, but were negatively impacted by a preference mismatch (around −3pp) and a cognitive dissonance (not going with one's preference in spite of having a chance to do so, adding another −5pp). By December 2020, individuals in partially remote telework showed a significant positive productivity differential (around 7pp), almost offsetting the mismatch impact. Similarly, stress levels initially did not differ for newly teleworking individuals using largely the same controls as before. By December 2020, stress levels for individuals newly undertaking fully remote telework were significantly lower than for the control group of individuals with unchanged working arrangements, but the preference mismatch contributed significantly to higher stress levels.

Paper Proposal:

Japanese Institutional Investors & Bond Markets -

Stuck Between a Rock & a Hard Place

Alex W. Dryden

Introduction

Over the last two decades, Japanese investors have been prolific buyers in overseas markets. At their peak in early 2020, Yen-based investors held an estimated $3 trillion in overseas bonds (Setser and Etra, 2023). Indeed, as a proxy for international exposure amongst Japanese institutional investors, the Japanese Government Investment Pension Fund (GIPF) has a 25% exposure to foreign-denominated bonds in their portfolio (as of March 31, 2023). Much of this foreign investment exposure, particularly amongst larger pension clients is conducted on a currency-hedged basis in order to reduce the inherent volatility associated with currency markets (Setser and Etra, 2023). However, the evolving global monetary policy backdrop has created significant disruption within both foreign and domestic-bond markets as Japanese investors find themselves caught between a rock and a hard place.

Monetary Policy Backdrop

The U.S Federal Reserve (the Fed) have embarked on their most aggressive rate hiking cycle since the 1970s with the effective Fed Funds Rate rising by 525bps since June 2021. The Fed's hiking cycle has not been conducted in isolation; between them the 15 developed market central banks

have conducted 141 rates hikes since June 2021. Conversely, the Bank of Japan (BoJ) have sought to benefit from this period of global monetary tightening to artificially import inflation overseas via the trade channel in order to end the country's three-decade long deflationary spiral. As of December 2023, the BoJ are the only developed market central bank to have refrained from adjusting interest rate policy in response to higher inflation. Furthermore, they are the sole central bank to continue to be utilizing negative interest rate policy.
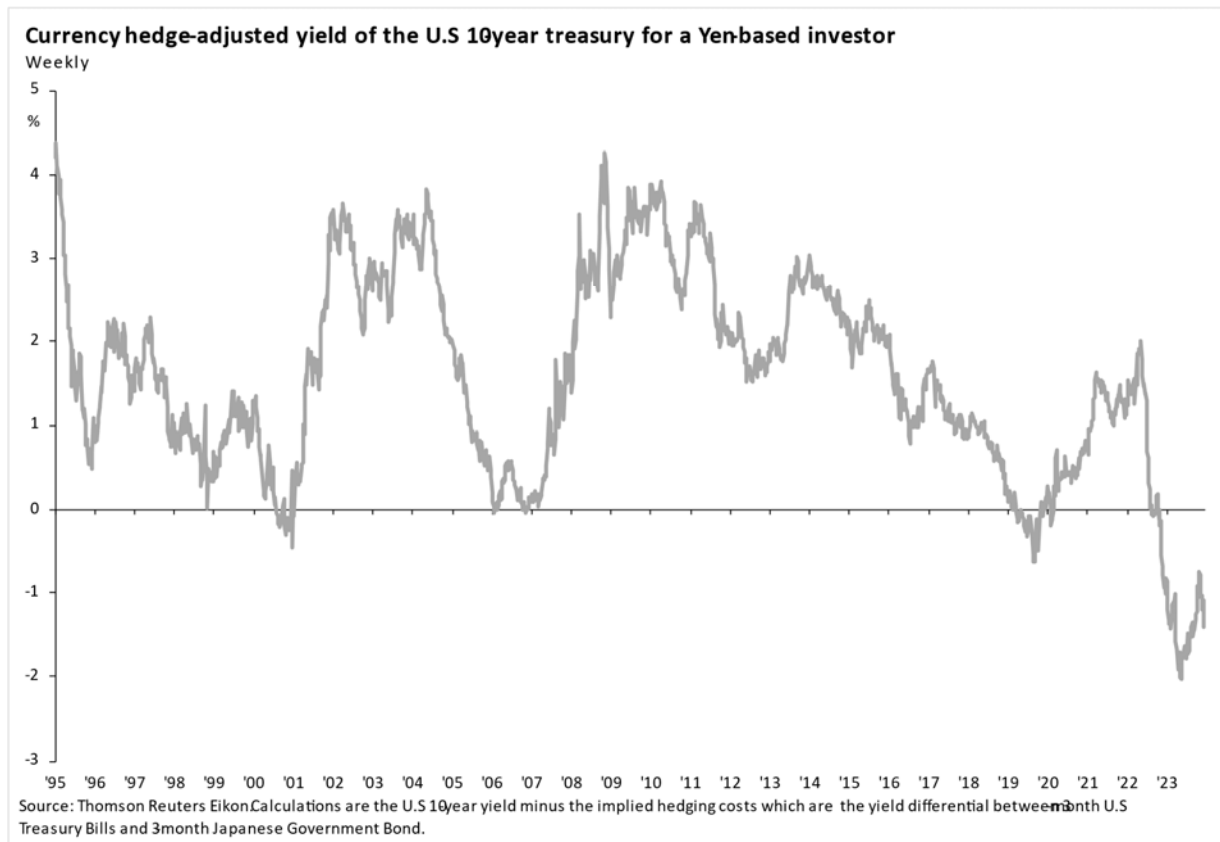
While the effectiveness of the BoJ's policy in igniting inflationary spirits is outside the scope of this paper, their impact on financial markets has been significant. Most notably, the dramatic divergence in short-term interest rates has seen currency hedging costs increase materially. As of June 2021, the effective cost for a Japanese investor to hedge their currency exposure for one year was 15 basis points, as of December 10, 2023 it was the equivalent of 555bps.[1] As demonstrated in chart one, such dramatic hedging costs fundamentally change the attractiveness of overseas government bonds and pose a significant conundrum to Japanese investors and global policymakers alike.

Paper Summary

Exorbitant hedging costs have the potential to trigger a prolonged portfolio rotation amongst Japanese private investors, potentially having disruptive effects on the functionality of domestic bond markets and increasing fiscal challenges in foreign markets, particularly U.S Treasuries. This paper will look to explore these movements and identify the risks for both policymakers and financial market practitioners alike.

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[1] Calculated as the yield differential between 3-month U.S Treasury Bills and 3-month Japanese Government Bond Yields.

Appendix

Currency hedge-adjusted yield of the U.S 10 year treasury for a Yen-based investor

Weekly

Source: Thomson Reuters Eikon. Calculations are the U.S 10 year yield minus the implied hedging costs which are the yield differential between 3 month U.S Treasury Bills and 3 month Japanese Government Bond.

A Proposal for an Asian digital common currency or ADCC（Outline）

Taiji Inui (Member of ISO/TC68 meetings[1])
Wataru Takahashi (Osaka University of Economics)

We are proposing to introduce an Asian common currency in the form of a digital currency (ADCC) by circulating central bank digital currencies in Asian countries.

An Asian common currency would improve the excessive dependences of Asia's trade currencies on the U.S. dollar. It will also contribute to stabilizing exchange rates within the region. As Asia's economic integration progresses, a common currency will advance financial integration. In fact, digital bonds denominated in the Asian digital common currency (ADCC) will be issued as the underlying assets for the ADCC. The issuance of this digital bond will advance the integration of Asian bond markets.

Another feature of this initiative is that the Asian common currency, an international currency, will be governed by an international cooperative system similar to the euro. Currency is a public good, and its international governance is proposed. This will further deepen financial cooperation in Asia.

In our proposal, unlike the euro, the Asian common currency and national currencies coexist. It is no surprise that multiple currencies will be in circulation in the future, as seen with digital currencies such as Bitcoin.

Japan has played a leading role in stabilizing the international financial system in Asia, as seen in the Miyazawa Initiative during the Asian Financial Crisis. In a situation where China's influence is increasing in place of the United States, it is significant for Japan to take the lead in strengthening international cooperation.

Our report is. It is based on previous papers such as the following:

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[1] ISO/TC68 AG5, SC2WG8, and SC2WG17 as well as ISO 20022 Payments SEG and Securities SEG, etc.

Main References:

Taiji Inui, Wataru Takahashi and Mamoru Ishida,"A proposal for an Asian digital common currency," VovEU, CEPR, 2020
A proposal for an Asian digital common currency | CEPR

Takahashi Wataru and Taiji Inui, "Asia Digital Common Currency as a global (international) currency", Discussion Paper Series DP2022-06,　Kobe Univ, 2022
DP2022-06 (kobe-u.ac.jp)

Has a Main Bank relationship proved beneficial for Japanese firms in the post-GFC period?

Govinda Finn
University of Kobe, Graduate School of Economics

December 2023

Abstract

In this paper, we seek to understand whether firms have continued to benefit from the Main Bank relationship in the aftermath of the Global Financial Crisis (GFC). We recognise that the Main Banks influence has waned considerably from its zenith but the decline has not been homogenous, with some firms still wedded to Main Bank lenders while elsewhere they have disappeared entirely. This presents an opportunity to compare the enduring impact of Main Bank ownership on firm performance.

We test the impact of a Main Bank relationship on three separate measures of firm value, while controlling for other variables that may impact firm performance. We seek to improve inference by employing propensity score matching to replicate a randomised experiment with firms divided into those with a treatment group with a Main Bank relationship and those without. Using the matched dataset, we proceeded to conducted regression analysis using standard OLS techniques.

Our analysis indicates that Main Bank's relationship with firm performance is consistently negative and statistically significant across all specifications. The findings are inconsistent with the widely held belief that dual ownership can internalise and hence reduce conflicts between shareholders and creditors, know as the agency cost of debt. In addition, we fail to find evidence that supports the view that the Main Bank's special relationship with management allows it to act as 'delegated monitor' on behalf of others or serves to improve information production.

Instead, our results indicate that Main Banks acts in a manner consistent with the weight of their financial obligations. As such, a Main Bank subordinates its interests associated with holding of a firm's shares in favour of the proportionally larger weight of their claims as a creditor. The resulting shareholder absenteeism may serve to undermine risk-taking behaviour from managers and other large shareholders.

Our findings indicate that the unique arrangements of the Main Bank system such as cross shareholding and special relationship with management are not merited and should continue to be dismantled. Close attention should be given to what would fill the vacuum from withdrawing banks and maintain effective allocation of capital for long term firm growth.

1. Introduction

In this paper, we seek to shed light on the enduring role of the Main Bank relationship. We ask whether their special role in the Japanese system of corporate governance has continued to have an impact on firm performance in the post-GFC period.

The paper begins by setting out the framework by which contractual claimants on a firm's assets and cashflow come into conflict. We draw on corporate finance literature which states the optimal capital structure for a value maximizing firm is one that minimises agency costs (Jensen and Meckling, 1976). Of particular interest for our analysis is the role of agency costs between shareholders and creditors.

We then review the literature of Main Banks as a potential solution for agency problems, due to their role as dual shareholders and information producers on behalf of other stakeholders. We then consider a less favourable interpretation of Main Banks, where bank shareholdings have an adverse effect on firm performance. Having established our motivations for testing the impact of a Main Bank relationship on firm value we set out our hypothesis and empirical approach.

Our analysis replicates a randomised experiment by dividing our dataset into those firms with a Main Bank relationship (the treatment group) and those without through a propensity score matching process. Using the matched dataset, we proceeded to conducted regression analysis using standard OLS techniques.

Our main findings indicate that Main Bank's has a negative and statistically significant impact on firm performance across all specifications. We consider the channels by which Main Bank ownership may have an adverse effect on firm performance. We assert that rather than mitigating agency costs through an internalisation of the conflict of shareholders and creditors or a mitigation of information asymmetry problems, the unique characteristics of Main Banks serve to undermine standard governance measures. This is possible through the absentee ownership associated with shareholdings by main bank and a subsequent undermining of risk-taking behaviour from managers and other large shareholders.

This research contributes to our understanding of the corporate governance system in Japan. Our findings raise questions about the role attributed to Main Banks as a dual owner and as a delegated monitor, capable of information production for other stakeholders. The absence of evidence to support the subsistence of the Main Bank relationship augurs for more rapid reform to remove cross shareholders and improve standard monitoring by shareholders.

2. Literature review

The separation of corporate decision-making functions from risk-bearing functions can positively impact firm performance (Coase, 1937; Williamson, 1979). While decision-making power is enshrined with management, there are numerous financial stakeholders that bear the risk, and reap the rewards, of corporate performance.

A typical corporate capital hierarchy consists of bank loans, senior debt, subordinated debt, preferred equity and common equity, all of which will be held by financial backers with varying degrees of exposure to firm decision-making and risk-protection.

As the only financial stakeholder concerned with the residual value of the company, shareholders are deemed the ideal stewards of company and are afforded powerful control rights (Friedman, 1992; Grantham, 1998; Easterbrook and Fischel, 1983). This includes the ability to appoint the board of directors, who in turn appoints the managing directors and, if agency costs are mitigated, can successfully control the fortunes of the company.

In some circumstances, shareholders self-interests may conflict with the interests of other risk-bearing stakeholders, most noticeably creditors. If creditors believe that management with pursue a strategy that favours shareholders at their expense they may limit credit provision, increasing the firm's cost of capital.

This will result in a sub-optimal capital structure and undermine management efforts to maximise firm value. These conflicts are a special form of agency costs known as agency costs of debt (Jensen and Meckling, 1976; Myers, 1977, Kim et al, 2019).

2.1 Shareholder creditor conflicts

In the next section we consider two important sources of shareholder-creditor conflicts:

The risk-shifting problem

In principle, shareholders' claims on equity offer potentially unlimited rewards. On the other hand, shareholders' liability relates only to the share capital of the company rather than extending to its debt. Limited liability means the costs of a bad outcome are not fully borne by the risk-taking shareholder, but may instead fall, partially or fully, on other financial stakeholders. This results in a moral hazard problem known as the risk-shifting problem.

https://ebrary.net/841/economics/residual_value

We can observe this problem when considering the risk/return dynamic of a shareholder investment. Under the assumption of limited liability, the return on shareholder investment as a function of the profitability is flat when the company is close to bankruptcy or insolvent but slopes upwards when the company is doing well. The structure is similar to a call option and rewards shareholders if the company pursues a riskier strategy (Eisdorfer, 2010, Goodhart, 2020).

Consequently, shareholders seek to shift risk by allocating capital raised from creditors into risky projects, which offer unlimited upside but also raise the risk of the equity and the probability of bankruptcy, Masulis (1976) and Jensen and Meckling (1976).

The debt overhang problem

Another source of shareholder and creditor misalignment relates to the use of proceeds for newly raised finance. If a company is highly indebted or a firm faces high default risk, shareholders may refrain from pursuing new investment opportunities, even if they have a positive net present values, if the rewards are to be directed to servicing existing debt or the gains will accrue proportionally more highly to debtholders.

Debt overhang can be alleviated if the various creditors and shareholders manage to renegotiate their contracts and restructure the balance sheets. This renegotiations are costly because otherwise debt would not discipline managers or reduce risk shifting (Jensen and Meckling (1976), Hart and Moore(1995)).

Both risk-shifting and debt overhang may contribute to an increase in agency cost of debt.

Resolving these conflict

Since the misalignment of shareholders' and creditor incentives were uncovered, many studies have attempted to identify ways to mitigate this problem.

The most common approach is the adoption of covenants in debt contracts as monitoring devices which may include restrictions on key financial ratios or other critical management decisions such as dividend payments or M&A (Bradley, 2015). Other studies have looked at debt maturity (Barnea et al., 1980), convertible debt (Green, 1984), and managerial compensation (Brander and Poitevin, 1992; John and John, 1993).

In practice, the ability of creditors to enforce contractual provisions on debt contracts is not complete. Creditors may resort to litigation through lawsuits to represents the participation of creditors in corporate governance. As pointed out above, existing contractual obligations may serve to undermine future investment decisions if they are overly onerous.

Consequently, creditors have an intrinsic preference for financial prudence and a company's ability to not only repay its credit obligations on a timely basis, but also to maintain a stable and predictable credit risk profile.

2.2 Role of Corporate Governance

As well as documenting the inherent conflicts among financial stakeholders, Jensen and Meckling also offered a potential solution in the form of corporate governance.

Corporate governance architecture is not designed to resolve conflicts between stakeholders but rather to reduce information asymmetry that provides the opportunity for stakeholders to pursue selfish interests at the expense of other claimants.

Corporate governance mechanisms include information production tools such as effective and independent board of directors and management compensation. It may also include external governance such as the market for corporate control.

While some of these tools are designed to limit agency costs between owners and managers, i.e. stock options are designed to align decisions to shareholders interests. Others such as effective corporate boards can serve to reduce agency cost of debt if boards improve firm performance in the way that both shareholders and debtholders jointly gain their benefits.

An improvement in the effectiveness of corporate boards would lead to a reduction in required rate of return of debtholders, and thereby lowering the cost of corporate debt.

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https://koreascience.kr/article/JAKO202026061031285.view?orgId=kodisa&hide=breadcrumb,journalinfo

2.3 Corporate Governance in Japan

Japan's 'lost decades' coincided with a period of relatively poor shareholder returns. The most common explanation is that Japan suffered from acute agency costs; that company solvency and employee stability were prioritized at the expense of shareholders.

Why were shareholder interests not prioritised in Japan? Numerous studies have examined how corporate governance failed to mitigate agency costs between management and owners, entrenching management teams and undermining shareholder value.

However, fewer researchers have looked at the agency costs between shareholders and creditors. This despite, or possibly because of, the unique role relationship banks, or Main Banks, play in the firm's corporate governance (Ogawa, 2012).

2.4 The Main Bank model

A Main Bank is typically the firm's largest lender and offers standard services of relationship banking including the provision of credit and liquidity through the cycle, risk-sharing and assistance in times of corporate distress (Sang).

https://www.adb.org/sites/default/files/publication/157231/adbi-rp56.pdf

The Main Bank relationship in Japan has several supplementary linkages that serve to deepen the firm-bank relationship (Sheard, 1989, Aoki, 1990, Aoki et al., 1994, Ueda, 1994, Kawai et al., 1996, Hoshi and Kashyap, 2001). For example, a Main Bank is frequently a major shareholder in the borrowing firm. It may also monitor and participate in firm management through board representation, and rescues and restructures firms when firms fall into a financial distress (Kang, Shivdasani, and Yamada (2000).

Before we proceed to our analysis, we consider the motivation of the Main Bank relationship as characterised above in more detail.

2.5 Main Bank as dual owner and information producer

The price of agency cost between shareholders and creditors is higher costs of capital and credit rationing. (Mayer, 2013). One novel way to protect creditor interests is to internalise the conflict of interest between shareholders and creditors by simultaneously holding equity and debt (Dewatripont and Tirole 1994, John et al. 1994, Chu et al., 2019).

Shareholders who are also creditors have an incentive to monitor and prevent managers and/or other large shareholders from taking actions that expropriate creditors because they internalize (at least partially) the cost to creditors arising from the opportunistic behaviour of shareholders.

Numerous studies find that dual owners are effective in internalising conflict and aligning incentives between shareholders and bondholders, (Jiang, Li and Shao, 2010). While Main Banks have reduced their shareholdings of client firms considerably since their peak, most Main Bank relationships are still characterised by dual creditor-shareholder ownership.

If shareholder-creditor conflicts are significant enough to affect the value of the firm, we would expect to see an improvement in firm performance when Main Banks are present.

Another way to reduce agency cost of debt is to improve information generation capabilities for financial stakeholders. Main Banks closeness to a borrowing firm is a source of unrecorded information capable of overcoming asymmetric information problems that non-relationship lenders cannot secure (Watanabe, 2005).

Furthermore, Aoki (2001) points to a role for Main Banks to act as a delegated monitor of management, with monitoring obligations carried out on behalf of other financial stakeholders. According to Fukumitsu (2001), main banks act in concert with other shareholders to exercise corporate governance, and they reduce agency costs generated by the asymmetric information. If Main Banks were indeed capable of altruistic monitoring then we would expect such action to lower agency costs between financial stakeholders.

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https://www.rieti.go.jp/jp/publications/dp/05e028.pdf

2.6 An ambiguous influence

Since the Main Bank system had been largely dismantled before our period of interest, any enduring influence on firm performance is likely to be by default rather than design.

Unsurprisingly, the literature has evolved over time with the evidence far from unanimous regarding the role the Main Bank system plays on agency costs of debt. A particularly controversial aspect of the Main Bank relationship relates to the dual credit-shareholder relationship. Hiraki (2003) finds evidence to suggest that shareholdings of main banks and client firms have a negative effect on firm valuation.

This is corroborated by Miyajima 2005, which points out that Main Bank shareholdings was consistent with a loss of management discipline and poor firm performance. Furthermore, this work find that banks with dual ownership used their ownership stake to encourage client firms to take on projects with low profitability instead of preventing asset substitution.

Main Bank shareholdings were also deemed problematic as they reduce the portion of shares traded in public markets, serving to limit the market for control and facilitating managers to seek private benefits (Arikawa, 2004).

Based on these findings, we also consider the possibility that the existence of Main Banks relationships may increase agency costs of debt by undermining the effectiveness of financial claimants through absenteeism or a neglect of ownership rights.

https://www.sciencedirect.com/science/article/abs/pii/S0927538X03000234

https://www.rieti.go.jp/jp/publications/dp/05e006.pdf

https://www.rieti.go.jp/jp/publications/dp/04e017.pdf

3. Hypothesis development

Before we turn to our main analytical question, it is worth reminding ourselves that the influence of Main Banks in Japan have waned considerably in recent decades. Initially, this was a consequence of a period of deregulation that began at the end of the 1970s, allowing firms to access greater capital market funding at the expense of bank loans. More recently, it has reflected more stringent standard for bank capital requirements in light of the bad debt problem through the 1990s and a need to reduce cross-shareholdings because of changing accounting requirements.

The declining in relationship banking in firms financing patterns in Japan has not been homogenous, with some types of firms still wedded to past Main Bank relations while elsewhere they have disappeared entirely (Hori, 2002). This presents an opportunity to compare the impact of Main Bank ownership on firm performance, if we are able to control for other variables that may impact firm performance.

Hypothesis 1

Our null hypothesis states that Main Bank relationships have no impact on firm performance. We would expect there to be a positive and statistically significant if Main Banks serve to alleviate agency costs of debt through internalisation of conflicts.

The mechanism for the positive inference relates to the interest alignment problem. Shareholders who are also creditors have an incentive to monitor management and prevent large shareholders from expropriating wealth from bondholders through excessive risk taking or opportunistic behaviour.

An internalisation of incentive alignment should lower the chance of risk-shifting, and the company should benefit from a reduction in cost of debt. Importantly, for an internalisation of conflicts by MB to be effective the relationship should not exacerbate conflicts by overly stating the credit constraint and preventing profitable risk-taking.

We also consider the possibility that MB relationships have a negative and statistically significant impact on firm performance. In this instance, the MB is not considered a fiduciary of firm value. Instead, the holding of shares is simply a mechanism to limit the influence of shareholders and add proportional weight to the standard claims of a creditor. This in turn serves to undermine risk-taking behaviour from managers and other large shareholders.

4. Data

The sample consisted of publicly-listed firms of the TOPIX 500, excluding financial firms, from 2008-2021. Firm performance data for this study were obtained from Bloomberg Markets (BM).

We introduce three alternative variables of firm performance. ROA is relatively straightforward to calculate by dividing net income by total assets. ROE is net income divided by the number of shares of common stock issued. Tobin Q is calculated by dividing the market value of equity, preferred shares as well as publicly traded debt and book value of remaining liabilities by the book value of assets and liabilities, where book value is the same as the balance sheet figure.

Data related to ownership structure were obtained from the Nikkei NEEDS CGES. To investigate the effect of corporate governance structure, we divide the sample into companies with Main Bank relationship and those without.

As for other financial data, it was obtained from Bloomberg Markets and Nikkei NEEDS CGES databases.

Table 1 shows the summary statistics or firm performance, ownership and governance characteristics for the period 2008-2021. The data includes the median, mean, standard error, confidence interval for the arithmetic mean, variance, standard deviation, and coefficient of variation.

Table 1 – Summary statistics

	ROA	ROE	AVEQ	FCFASS	DETASS	IDRAT	LTOTASS	ANAT
median	3.92	8.14	1.72	0.04028	14.21	0.1429	311000000000.0	5.00
mean	4.38	9.31	1.74	0.04668	14.14	0.1472	246544293777.8	6.11
SE.mean	0.73	1.46	0.22	0.00685	2.31	0.0328	49107684307.6	1.17
CI.mean.0.95	1.69	3.36	0.50	0.01581	5.32	0.0756	113242523083.6	2.70
var	4.86	19.10	0.42	0.00042	47.87	0.0097	21704081922492748268220.0	12.36
std.dev	2.20	4.37	0.65	0.02056	6.92	0.0983	147323052922.8	3.52
coef.var	0.50	0.47	0.37	0.44057	0.49	0.6676	0.6	0.58

5. Methodology

Our main research question is whether Main Bank relationships has a positive or negative impact on firm performance. To assess the magnitude of MB relationship effects we replicate a randomised experiment, which can provide a reliable basis for inferring causation.

We seek to replicate a randomised experiment by divided the dataset into those firms with a Main Bank relationship (the treatment group) and those without. In principle, the process of dividing the sample between the treatment and control group should be random. The status of a Main Bank relationship has to be independent of the underlying characteristics of the firms.

Propensity score matching allows to apply some quasi-randomness as to whether the Main Bank relationship exists or not. In this way, treatment selection bias is eliminated.

Our analytical process follows a number of clear steps. First, we pre-process our panel of observational data through propensity score matching. The matching process reduces imbalance in the empirical distribution of both observed or unobserved confounding factors (Stuart, 2010, p.13). We used the R package *MatchIt* to generate the balanced treatment and control groups (Ho, et al. 2011).

The second step of our analysis was to determine the propensity score matching method. The process of grouping observations with similar values can vary based on a range of settings. These include the ratio of treated observations matched to untreated observations, the identifying algorithm for matches, whether replacements are used for matches and whether matches are based solely on propensity scores or also uses covariate values.

We conducted analysis using numerous methods including exact, nearest matching and coarsened exact matching (cem) approaches. The results of our analysis are published in the results section.

Matching to the nearest neighbour simply consists of finding the untreated observation with the closet propensity score to the propensity score of each treated observation. Matching is done using a logistic regression model to estimate the propensity score, defined as the probability of receiving treatment, conditional on the covariates.

The third step was to check the balance of covariates between treatment and control groups. To evaluate covariate balance we compare the mean of the treatment group to the sample group across all covariates.

Finally, using the matched dataset, we proceeded to conducted regression analysis using standard OLS techniques. We measure the fit of our results through a standard error framework.

We specify our model as below:

Equation

$$\delta_{i,t} = \alpha + \beta_1.MBO + \beta_2.FCFASS + +\beta_3.ANA + \beta_4.DETASS + \beta_5.ID\_RAT + \beta_6.LTOTASS + \varepsilon_{it}^*$$

Firm perfromance is the dependent variable represented by three competing proxy variables ROA, ROE and Tobin's Q. ROA and ROE are accounting-based representations of firm performance, while Tobin's Q represents the market value of a firm's assets.

Main Bank relationship is our independent variables, which is derived from the Nikkei NEEDS Corporate Governance Evaluation Systems (CGES) database. In line with previous studies, we control for firm characteristics such as firm size, financial leverage, free cash flow. Firm size was measured as the logarithm of firm assets. Financial leverage was used to control for firm capital structure.

We also control for some corporate governance variables such as independent director ratio and the number of analysts (Sakawa and Watanabel, 2020).

6. Results

Our analysis considers whether firms continue to benefit from the Main Bank relationship in 2008-2021. If so, what effect does Main Banks relationship have on firm performance in this period?

We pre-processed the data using a propensity score matching technique. Propensity score matching is used for inferring casual impact. It attempts to balance treatment groups on confounding factors to make them comparable to control group and reduces treatment selection bias. The balance statistics for the matching process are plotted in Table 1.

Table 1 – Balance statistics (TBC)
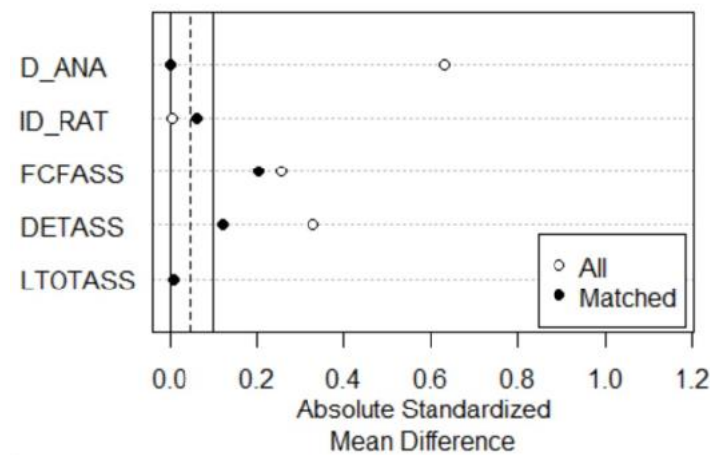
Values greater than 0 indicate deviations between the groups in some part of the empirical distributions. However, a mean differences below 0.1 ensured our threshold for analysis was met.

Using our new matched dataset, we proceeded to test the impact of a main bank relationship on three separate measures of firm performance and improve inference using robust standard errors. We find evidence that our null hypothesis of no causality is false, with a statistically significant coefficient for Main Banks across all three measures of firm performance.

We find evidence that our null hypothesis of no causality is false, with a statistically significant coefficient for Main Banks across all three measures of firm performance.

With also find consistent evidence across all models of a negative coefficient for the presence of a Main Bank relationship (see Table 1,2,3).

Table 1 – Main Bank Ownership and Return on Asset

```
> coeftest(roa.out, vcov. = vcovCL, cluster = ~ weights)

t test of coefficients:

              Estimate Std. Error  t value  Pr(>|t|)
(Intercept) 10.634586   2.369606    4.4879 7.384e-06 ***
MBO         -0.656110   0.128894   -5.0903 3.730e-07 ***
D_ANA        0.424093   0.165797    2.5579  0.010565 *
ID_RAT       0.281518   0.249925    1.1264  0.260056
FCFASS      36.358277   1.246982   29.1570 < 2.2e-16 ***
DETASS      -0.051963   0.002131  -24.3837 < 2.2e-16 ***
LTOTASS     -0.247195   0.086986   -2.8418  0.004508 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 2 – Main Bank Ownership and Return on Equity

```
> coeftest(roe.out, vcov. = vcovCL, cluster = ~ weights)

t test of coefficients:

              Estimate Std. Error t value  Pr(>|t|)
(Intercept)  0.214757   5.254945  0.0409  0.967403
MBO         -1.991557   0.242494 -8.2128 2.843e-16 ***
D_ANA       -0.044633   0.253070 -0.1764  0.860015
ID_RAT      -1.757659   0.614075 -2.8623  0.004227 **
FCFASS      80.632202   2.561990 31.4725 < 2.2e-16 ***
DETASS      -0.023948   0.011260 -2.1269  0.033489 *
LTOTASS      0.254694   0.195661  1.3017  0.193087
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 3 – Main Bank Ownership and Tobin's Q

```
> coeftest(aveq.out, vcov. = vcovCL, cluster = ~ weights)

t test of coefficients:

              Estimate Std. Error t value  Pr(>|t|)
(Intercept)  9.5584190  2.3626827  4.0456 5.313e-05 ***
MBO         -0.3281438  0.0411237 -7.9794 1.878e-15 ***
D_ANA        0.4633387  0.0646408  7.1679 8.946e-13 ***
ID_RAT       0.9662379  0.1356961  7.1206 1.257e-12 ***
FCFASS       6.8756737  2.0164346  3.4098 0.0006562 ***
DETASS       0.0052862  0.0014508  3.6437 0.0002720 ***
LTOTASS     -0.3130109  0.0909741 -3.4407 0.0005859 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

7. **Discussion**

Our results have meaningful implications for our understanding of the influence of Main Banks on firm performance in Japan.

Firstly, we find no evidence that relationship banks' position as dual owners have a positive effect on firm performance. One possible explanation is that the intensity of shareholder-creditor conflicts depends on the financial health of the company.

For companies with relatively healthy balance sheets and in the mid/upper investment grade spectrum both creditors and shareholders want management to maintain sustainable financial performance to generate cash flows for debt service, as well as earnings growth, dividend payments, capital retention and capital appreciation.

On the other hand, when a company is in, or approaching bankruptcy the interests of creditors and shareholders may have little alignment; in extremis they can be at odds with one another (Keswani et al, 2020; Ayotte et al., 2013).

Numerous studies have pointed to a weakening of market discipline in Japan during the lost decades period, which propped up inefficient zombie firms through evergreen lending (Peek and Rosengren (2005) and Caballero, Hoshi, and Kashyap(2008). There is certainly observational evidence that bankruptcy rates fell consistently during our period of analysis.

The softening of the budget constraint may partly explain why the incentives to internalise conflicts between shareholder and creditors may be weaker in Japan than elsewhere (Hosono).

https://web.econ.keio.ac.jp/staff/masaya/dl/forthcomingpaper/sbc.pdf

Another possible explanation for the ineffectiveness of Main Banks in reducing agency costs is the diminished importance of a Main Bank close relationship with management.

In Aoki's benevolent view of the Main Bank system, Main Bank's act as the 'delegated monitor' of management acting on behalf of other stakeholders (Aoki, 2001). Other financial stakeholders defer to the main bank because they are "well equipped to assess the organisation and managerial ability of firms". Proponents of main banks still point out "the main bank has a leadership function, serving as a "compass" for the other banks serving the client" Goto, 2023.

https://asia.nikkei.com/Opinion/Japan-s-main-bank-system-has-unique-merits-and-strengths

The question of whether Main Banks responsibilities extend in someway beyond their financial obligations is critical to interpreting our results. Within the Main Bank framework described above the Main Bank has some duty to act on behalf of those stakeholders whom have delegated the role of monitoring to them.

Our results are inconsistent with the idea that Main Bank relationships are a powerful tool for reducing information asymmetry. results are also consistent with Sakawa 2014 that information production of Main Banks has no benefits for outside shareholders.

This may not necessarily just reflect inadequacy on the part of Main Banks but an improvement in information provision by firms as a result of new reporting obligations. It is also possible that improving information efficiency and an alignment of interests among institutional investors served to dimmish the role of Main Banks in reducing information asymmetry. Nozawa (2019) argues that, "large institutional creditors can play an important role; by mitigating the problem of information production, they can facilitate capital reallocation."

While we can speculate on why Main Banks are less effective at reducing agency cost of debt in Japan, the fact that there was no positive relationship between Main Banks and firm performance was not the most striking result from our analysis. A more telling result was the statistically significant and negative relationship between Main Banks and firm performance across multiple models.

This result suggests that Main Banks have a corrosive effect on firm performance, when we control for other firm specific and governance variables. We interpret our findings as an indication that Main Banks

are primarily driven by their financial obligations. Rather than internalising conflicts between their position as shareholder and creditor they simple weigh up the stakes of firm action on their competing incentives.

This may have two consequences. Firstly, since in most cases the financial liabilities are higher for their debt holdings than for their equity holdings the Main Bank sides with management action that protects creditor interests. Secondly, in incidences where Main Banks become absentee shareholders choosing not to fully pursue their interests as shareholder it may results in a loss of management discipline and poor firm performance.

For those firms where the Main Bank relationship is absent, the lack of absentee shareholders serves to improve capital allocation and firm performance.

https://www.sciencedirect.com/science/article/abs/pii/S1059056013001238

https://www.cirje.e.u-tokyo.ac.jp/research/dp/2001/2001cf131.pdf

8. Conclusion

Our analysis sheds light on the impact of Main Banks relationship on the competing claims from financial stakeholders on a firm's assets and cashflow. We find that the supplementary characteristics of shareholder ownership and close relationships with management that distinguish Main Banks from other lenders are not effective in reducing agency costs in the post-GFC period.

Instead, we find evidence that the firm's with a Main Bank relationship are less valuable. We point to shareholder absenteeism as a cause of value hinderance either through an proportional shift in creditor influence or through a loss of management discipline and the pursuit of private benefits.

Our results augurs for further reforms to prise Main Banks away from the privileged position they enjoy in influencing a firm's capital policy. This includes a further unwinding of cross shareholders as well as continued improvements in monitoring from competing financial stakeholders, including shareholders and creditors.

In terms of future work, we would like to extend the research to include earnings quality, where there is evidence that the Main Banks relationship has had a positive impact in the post-GFC period (Kojima, 2017).

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International Comparison of Climate Change News Index with an Application to Monetary Policy[*]

Takuji Fueki[†] Takeshi Shinohara[‡] and Mototsugu Shintani[§]

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Abstract

We construct a Climate Change News (CCN) index which measures attentions to climate change risk for Japan, based on text information from newspaper articles. Our index is compared with the original WSJ Climate Change News index of Engle et al. (2020) for the U.S. (WSJ-CCN index), as well as other measures of macroeconomic uncertainty. We find that our CCN index for Japan is more correlated with the WSJ-CCN index than the other macroeconomic uncertainty measures in Japan. We also find that, for both Japan and the U.S., CCN index has significantly negative effects on economic sentiment, but has ambiguous effects on industrial production. This contrasts the fact that macroeconomic uncertainty measures have negative effects on both economic sentiment and industrial production. As an application of the CCN indexes, we investigate if the effectiveness of monetary policy can depend on the degree of attention to climate change risks.

JEL Classification: E32, E52, Q54

Keywords: Climate Change; Text Analysis; Monetary Policy; Non-linear Local Projection

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[†]Kagawa University (e-mail: takuji.fueki@gmail.com).

[‡]Bank of Japan (e-mail: takeshi.shinohara@boj.or.jp).

[§]The University of Tokyo (e-mail: shintani@e.u-tokyo.ac.jp).

1 Introduction

Climate change has been at the forefront of academic and policy debates. A growing body of literature has explored the impacts of climate change on the real economy, such as rising temperature or sea level and increasing frequency of extreme weather events (Burke et al. (2015), Colacito et al. (2019), Kim et al. (2022)). Climate change also has significant impacts on the financial markets (Ortega and Taşpınar (2018), Alok et al. (2020), and Addoum et al. (2023)). More recently, the relationship between climate change risk and financial markets is discussed, as in Engle et al. (2020), Krueger et al. (2020), and Bua et al. (2022). However, there is little empirical studies on the impact of uncertainty/risk related with climate change on the real economy.

The recent literature finds that uncertainty has significant impacts on the real economy, pioneered by Bloom (2009).[1] Some papers argue that increases in uncertainty related with economic policies, which is called Economic Policy Uncertainty (EPU), negatively affects the real economy (Baker et al. (2016), Caldara et al. (2019), and Husted et al. (2020)). As in Jurado et al. (2015), Scotti (2016), and Redl (2020), macroeconomic uncertainty (MU) has a detrimental effect on the real economy. In addition, the financial market volatility (VI) adversely influences the real economy (Bloom (2009), Bonciani and Ricci (2020) and Ludvigson et al. (2021)). However, there is a lack of understanding regarding the impacts of uncertainty/risk associated with climate change on the real economy.

This paper aims to fill these gaps. We ask how increasing uncertainties/concerns related to climate change affect the real economy. To this end, following Engle et al. (2020), we construct a Climate Change News (CCN) index which measures attentions to climate change risk for Japan, based on text information from newspaper article. Engle et al. (2020) extract a climate news series using text analysis based on the Wall Street Journal and build the index of attention to climate change for the US. We apply their contributions to Japan and measure the extent to which the climate change risks are paid attention in Japan. Based on the indexes, we statistically investigate the link between climate change uncertainty/risk and the real economy.

The main contributions of this paper are twofold. First, we investigate the statistical properties of the CCN indexes. Focusing on the US and Japan, we compare the indexes

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[1] Bloom [2014] stresses that uncertainty is "a broad concept, including uncertainty over the path of macro phenomena ..., micro phenomena ..., and noneconomic events like war and climate change."

with three uncertainty-related indexes which are extensively used in the uncertainty literature: EPU, MU, and VI. Second, we examine the impacts of changes in the CCN indexes on the real economy. with particular focus on economic sentiment and industrial production. Some theoretical studies pay attention to the expectations channel through which the expectations about climate change have an impact on the real economy (e.g. Dietrich et al. (2021) and ECB (2021)). The intuition is simple. An increase in probabilities of disaster related to climate change is bad news for people, and thus this news depresses current economic activity. We aim to empirically test the theoretical implications of this channel.

In addition, as an application of the CCN indices, we examine how the attention to climate change risks influences the transmission of monetary policy shocks. We apply the local projection method developed by Jordà (2005). Departing from Jordà (2005), the key feature of our approach is to introduce a smooth regime switching between a regime of high and low attention to climate change risks. In this model, the transmission mechanism of monetary policy shocks is potentially allowed to change depending on the state of the attention to climate change risks. Hence, we can estimate the regime dependent impact of monetary policy shocks

Our main findings are as follows:

- the CCN index for Japan is more correlated with the WSJ-CCN index than the other macroeconomic uncertainty measures in Japan.

- For both Japan and the U.S., the CCN index has significantly negative effects on economic sentiment, but has ambiguous effects on industrial production. This contrasts the fact that macroeconomic uncertainty measures have negative effects on both economic sentiment and industrial production.

- The transmission of monetary policy becomes weaker as the climate change risk becomes higher. In other words, responses of economic activity and inflation become significantly weaker as the climate change risk becomes higher, for both the US and Japan.

Contact with the literature

Many studies empirically find that climate change affects the economy. For example, Burke et al. (2015) use panel data for 166 countries and show that there is a nonlinear relation-

ship between annual temperature and productivity growth. Colacito et al. (2019) conduct a panel analysis using U.S. state- and sector-level data and find a statistically significant negative relationship between summer temperature and GDP growth. Dell et al. (2014) review the empirical studies which examine how climate variables such as temperature, precipitation, and windstorms influence economic outcomes.

Several studies focus on the impact of rare disasters including natural disasters on expectation formation. Barro (2006) and Gourio (2012) show that rare-disaster expectations could be an important driver of asset prices and the business cycle[2]. Isoré and Szczerbowicz (2017) estimate a New Keynesian model with a small time-varying probability of disaster. They show that even without the occurrence of disaster, an increase in its probability decreases consumption and wages. They argue that this effect can be interpreted as a shift in agents' degree of patience.

Expectations of natural disasters due to climate change are an example of rare-disaster expectations. Dietrich et al. (2021) conduct a survey in the U.S. to measure expectations about the economic impact of climate change. They find that the respondents change their expectations with various factors including media consumption and tend to assign large probabilities to natural disasters. They also calibrate a New Keynesian model with rare disasters and show that disaster expectations can lower the natural rate of interest. Motivated by these theoretical papers, we empirically confirm the mechanism and quantify how monetary policy transmission is affected.

This paper also contributes to a growing empirical literature that estimates state-dependent effects of fiscal and monetary policy shock. Auerbach and Gorodnichenko (2012) combine the local projection method of Jordà (2005) with a smooth regime-switching model to estimate the effects of fiscal policy during booms and recessions. Tenreyro and Thwaites (2016) construct the local projection model with regime-switches to study the efficacy of monetary policy shocks during booms and recessions. They find that monetary policy is less powerful during recessions. Falck et al. (2021) estimate the effects of monetary policy under high and low disagreement about inflation expectations. They show that a contractionary U.S. monetary policy shock leads to a statistically significant increase in inflation and inflation expectations in times of high disagreement, whereas in times of low dis-

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[2]They define "rare-disaster" as an infrequent and large macroeconomic shock including not only natural disasters but wars or financial crisis.

agreement it leads to a significant decline in these variables. They also reconcile this result with a New Keynesian model which includes dispersed information. Departing from these papers, we focus on the attention to climate change.

The remainder of this paper is organized as follows. Section 2 presents the way to measure attention to climate change risks. In section 3, we conduct the statistical analysis of the CCN indexes. As an application of the CCN indexes, section 4 presents if the effectiveness of monetary policy can depend on the degree of attention to climate change risks. Finally, section 6 concludes with some thoughts for future research.

2 Climate Change News index

This section aims to describe how to construct the CCN index. First of all, we introduce the methodology developed in Engle et al. (2020). They propose the indexes to measure the attention to the climate change for the U.S. Next, we discuss how we apply their method to Japan.

2.1 Index Measuring climate change news: Engle et al. (2020)

Engle et al. (2020) propose the index measuring innovations in news on climate risk, which is called the the Wall Street Journal climate change news (WSJ-CCN) index. They construct the index extracting news on climate change by using textual analysis from the Wall Street Journal (WSJ). They follow three steps to develop the WSJ-CCN index.

First of all, they quantify the intensity of climate news coverage in the WSJ. To this end, they compare the news content to a corpus of climate change-related risks appeared in authoritative reports. More specifically, they refer to climate change white papers such as the Intergovernmental Panel on Climate Change (IPCC), the Environmental Protection Agency (EPA), and the U.S. Global Change Research Program. In addition to these white papers, they collect climate change reports published by the United Nations, NASA, the IPCC, the EPA, and others. They aggregate these text documents into a "Climate Change Vocabulary (CCV)." The CCV amounts to the list of unique terms and the frequency with which each term appears in the aggregated corpus. The list includes extreme weather events (e.g., floods, hurricanes, droughts, wildfires and extreme temperatures), physical changes to the planet (e.g., sea level changes, glacial melting and ocean temperatures),

regulatory discussions, technical progress in alternative fuel delivery, and the price of fossil fuels.

Next, they make term frequency–inverse document frequency scores, that is $tf - idf$ scores, for the CCV. To this end, they create a list of term counts for the WSJ on a daily basis. Each edition of the WSJ is regarded as a "document," and term counts are calculated separately for each document. They convert these term counts into $tf - idf$ scores. tf means term frequency and is the count of occurrences of a term in a given document. If a term j is rare in a document i, the term j does not characterize the document i and $tf_{i,j}$ will be small. idf means inverse document frequency, which is the log of one over the share of documents containing a certain word. If a term j appears in most documents, it earns low idf_j because the term j is less informative about any individual document's content. The $tf - idf_{i,j}$ is calculated by multiplying $tf_{i,j}$ and idf_j for each term j and each document i. Therefore, the $tf - idf_{i,j}$ defines the most representative term in a given document to be those that appear infrequently overall, but frequently in that specific document.

Finally, they construct their daily climate change index as the "cosine similarity" between the $tf - idf$ scores for the CCV and each daily WSJ edition. Days in which the WSJ uses the same terms in the same proportion as the CCV earn an index value of one, while days in which the WSJ uses no words from the CCV earn an index value of zero. Approximately speaking, their raw WSJ Climate Change News (WSJ-CCN) Index describes the fraction of the WSJ dedicated to the topic of climate change each day, as defined by the texts that underlie the CCV. They scale this index by a factor of 10,000 to allow interpretation of the magnitudes of innovations in the index.

Figure 2 shows the WSJ-CCN index for the U.S. constructed in Engle et al. (2020). The WSJ-CCN index spikes when domestic or international climate events happened such as Copenhagen Accord in December 2009 and the publication of the Third National Climate Assessment in May 2014. It also indicates that the intensity of climate news coverage has steadily increased and remained high since the mid-2000s in the U.S. We use this WSJ-CCN indices to capture attentions to climate change risks in the U.S.[3]

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[3]Engle et al. (2020) point out that this index is constructed under assumption that news about climate change are all bad news or related to risks. To justify this premise they also construct another index that is designed to focus on negative news about climate change. They confirm that both indices spike around salient climate events and indicated high correlation across these measures. In conclusion, they argue that both indices capture common elements of climate change risk.

2.2 Applying to Japan

We apply Engle et al. (2020) to extract the CCN index for Japan. We are based on textual news coverage in the Mainichi Shinbun newspaper articles from 1994 onward, which is one of the major newspapers in Japan, covering a wide range of Japanese and world news.[4] We also collect the Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan issued by the Ministry of the Environment from 1997 to 2021. The white papers cover a variety of topics, including industrial waste and biodiversity. Therefore, we extract the chapter on the climate change from the white papers. Appendix table 3 presents the full list of these authoritative texts. The collected documents consist of statements about climate change, such as the increase in natural disasters due to climate change and actions to mitigate climate change.

Following Engle et al. (2020), we construct our CCV for Japan from the climate change-related reports. Figure 1 provides an illustration of the CCV for Japan in the form of a word cloud. The term sizes are proportional to their frequency. The CCV are mainly composed of words such as "environment" and "emissions," which is consistent with Engle et al. (2020). These words would imply some kind of the physical risk like increase in extreme weather events. In addition, the CCV includes other aspects of the climate risk such as the transition risk. Terms such as "countermeasure", "reduction", and "implementation" are representative of the transition risk topic.[5]

Then, we make term frequency–inverse document frequency scores, that is $tf - idf$ scores, for the CCV. To this end, we create a list of term counts for the newspaper on a daily basis. Each edition of the Mainichi Shinbun is regarded as a "document," and term counts are calculated separately for each document. We convert these term counts into $tf - idf$ scores. The $tf - idf_{i,j}$ is calculated by multiplying $tf_{i,j}$ and idf_j for each term j and each document i. Therefore, the $tf - idf_{i,j}$ defines the most representative term in a

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[4]We also used data from Nikkei Shinbun to create a climate change attention index to check robustness. Like the Mainichi Shinbun, the Nikkei Shinbun also covers Japanese and world news, but has a relatively large number of articles related to financial markets and corporations. While the Mainichi Shinbun is a media sources mainly consumed by household, the Nikkei Shinbun is that consumed more by financial market participants. As discussed in more detail below, there are no major differences between the indices using the Mainichi Shinbun and the Nikkei Shinbun in Japan. Therefore, for the empirical analysis, we use an index based on the Mainichi Shinbun because it has a longer sample.

[5]Both Engle et al. (2020) and our study focus on climate change risks from a broad perspective and do not identify them in detail. In this regard, Bua et al. (2022) use a similar methodology to ours to extract physical and transition risks for the euro area, respectively.

given document to be those that appear infrequently overall, but frequently in that specific document.[6]

Next, as in Engle et al. (2020), we convert term counts of the CCV into $tf - idf$. We treat the CCV as a single document when calculating term frequencies ($tf_{CCV,j}$), and apply the inverse document frequency (idf_j) calculation from the newspaper corpus. Multiplying $tf_{CCV,j}$ and idf_j, we get the $tf - idf_{CCV,j}$ for each terms of the CCV.

Finally, we construct our daily index on the attention to climate change news as the cosine similarity between the $tf - idf$ vector for the CCV ($tf - idf_{CCV,j}$) and for each daily newspapers($tf - idf_{i,j}$). If the newspaper on a given day used the same terms in the same frequency as the CCV, an index value will be one, while if the newspaper on a given day used no terms in the CCV, an index value will be zero. This index can be regarded as the fraction of the articles dedicated to the topic of climate change each day, as defined by the texts that underlie the CCV. We take the monthly average of this index and scale it by a factor of 10000 to allow interpretation of the magnitudes of innovations in the index.

Figure 3 shows our CCN index, covering from January 1994 to December 2021. The thin line represents original series of the CCN index, and the solid line indicates six months backward moving averages of the original series. The index rose steeply when global climate treaties and major global conferences to prevent climate change were adopted. As is shown in next subsection, this is consistent with the indexes observed in the U.S.

As a robustness check, we use another Japanese major newspaper, Nikkei Shinbun, to construct CCN index. Appendix Figure 17 illustrates the developments of the CCN index from Nikkei. The figure indicates that the CCN indexes from both the Mainichi Shinbun and the Nikkei Shinbun increase in the same periods. Also, the correlation between the two CCN indexes is 0.79 so that our CCN index is robust in terms of the data source.

3 Statistical Analysis on Climate Change News index

In this section, we aim to clarify the statistical properties of the CCN indices, comparing the CCN indexes with three uncertainty-related indexes. We also investigate the impacts of changes in the CCN index on economic sentiment and industrial production, as well as three uncertainty measures.

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[6]See Gentzkow et al. (2019).

3.1 Three measures on macroeconomic uncertainty

In this section, we compare the CCN indices with three uncertainty-related indexes which are commonly used in previous empirical studies on uncertainty in macroeconomics. First measure is the economic policy uncertainty indexes, called EPU, for the U.S. and Japan. The EPU for the U.S. is calculated by Baker et al. (2016), and Arbatli et al. (2022) estimate the index for Japan. These indexes reflect the frequency of articles in major newspapers that contain certain terms relevant to "economy", "policies", and "uncertainty." [7] The EPU is computed as the ratio of the number of articles that include at least one word listed in all three categories: "economy", "policy", and "uncertainty" to the total number of articles. It tends to spike during events that are ex-ante likely to cause increases in perceived policy uncertainty, such as debates over the stimulus package, the debt ceiling dispute, wars and financial crises.

Second index is the macroeconomic uncertainty indexes which measure uncertainty by computing the common factor of the time-varying volatility of the forecast errors from a large number of economic time series. This implies that they simply but comprehensively capture the uncertainty caused by various macroeconomic factors. For example, the macroeconomic uncertainty index for Japan rises sharply during not only economic downturn such as the Global Financial Crisis, but also other events like the Great East Japan Earthquake in March 2011. This index is developed by Jurado et al. (2015) for the U.S. and the index for Japan is estimated by Shinohara et al. (2020).

Finally, we utilize the stock market volatility index, used by Bloom (2009), as an indicator of uncertainty. It represents the degree of real-time implied volatility quantified by the financial markets. This implies that it would mainly capture the uncertainty in financial conditions as perceived by market participants. We use the VIX for the U.S. and Nikkei VI for Japan.

We pick up three uncertainty-related indices we discuss above, because there are extensive empirical literature on studying the statistical properties of these measures and thus these properties are well understood. Therefore, comparing the CCN indices with three measures, we can improve our understanding on how different the climate change related

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[7]The number of newspapers used for the EPU is ten in the U.S. and four in Japan. The index for the U.S. includes USA Today, Miami Herald, Chicago Tribune, Washington Post, Los Angeles Times, Boston Globe, San Francisco Chronicle, Dallas Morning News, Houston Chronicle, and Wall Street Journal. For Japan, Asahi Shinbun, Nikkei Shinbun, Mainichi Shinbun, and Yomiuri Shinbun are used for calculation.

issues are from economic uncertainty.

3.2 Correlation among indices

First of all, we compute the correlations between the indexes, based on monthly measures.[8] Table 1 summarizes the correlation coefficients for each pair. The upper table presents the results for Japan. Three findings are worth noting. First, looking at the first column of the upper table, we know that the correlations between the CCN index and other macroeconomic uncertainty measures are significantly positive. Specifically, the correlation of the CCN index with EPU is 0.23, and the correlation with macro uncertainty and stock market volatility index are 0.26 and 0.19 respectively. Second, more importantly, the correlation between the CCN index and the WSJ-CCN index is 0.45. Therefore, the CCN index is more correlated with the WSJ-CCN index than other macroeconomic uncertainty measures for Japan. Thirdly, the correlations among other macroeconomic uncertainty measures are significantly positive and higher than the correlations of other macroeconomic uncertainty measures with the CCN index, except for the correlation between EPU and macro uncertainty. The correlation coefficient between EPU and macro uncertainty is 0.25, which is comparable to the correlation of the CCN index with other uncertainties. However, the correlation between EPU and volatility index is 0.53, and the correlation between macro uncertainty and volatility index is 0.49, which implies both are higher than the correlation of the CCN index with other uncertainties.

Looking at the results for the U.S. (the lower table), we also know the same implications as Japan. The WSJ-CCN index has the largest correlation with the CCN. The correlation between the WSJ-CCN index and macro uncertainty is 0.18, although the correlations of the WSJ-CCN index with other two measures of uncertainty are not significant. In addition, the correlation coefficient between the EPU and the macro uncertainty index is 0.27, and correlations of volatility index with EPU and macro uncertainty are 0.45 and 0.58, respectively, which indicates that the correlations among uncertainty measures tend to be significantly high relative to the WSJ-CCN index.

To check whether there is a prior-lagging relationship in the CCN index and the WSJ-CCN index, we calculate the cross correlations between them. We find that there is no prior-lagging relationship between the attention to climate change risk for Japan and the

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[8]The results are robust when using quarterly data in both Japan and the U.S..

U.S.. Figure 4 shows the results of calculating the cross correlations between them. It is worth noting that the correlation coefficients are the largest when there is no time lag and the cross correlations are symmetric around lag zero. Therefore, the CCN index and the WSJ-CCN index moves similarly in response to some events related to climate change.[9]

To wrap up, the results discussed above suggest that climate change concerns are driven by the common factor in Japan and the U.S such as salient global climate events or global trends of discussion on climate change risks. In addition, the developments of attention to climate change risks are different from other macroeconomic uncertainties.

3.3 Impacts on sentiment and economic activity

We aim to investigate the impacts of the CCN indices on the macroeconomy, comparing those of other uncertainty measures.

In particular, we focus on the effects on the economic sentiment and the industrial production. The economic sentiments of the U.S. are estimated by Shapiro et al. (2022), and UTEcon also assesses the sentiment for Japan.[10] Both are developed by extracting sentiment from economic and financial newspaper articles using textual analysis. Shapiro et al. (2022) point out that the news sentiment has a predictive power of movements of survey-based consumer sentiment and their developments can affect on real variables such as consumption and output.

3.3.1 Correlations with sentiment and industrial production

The upper of Table 2 shows the correlation coefficients for Japan. What is worth noting are twofold. First, the correlation between the CCN index and economic sentiment is significantly negative, although the correlations of the CCN index with industrial production is not significant. Second, however, the correlations of macroeconomic uncertainty measures with economic sentiment and industrial production have significantly negative. The correlation between the news sentiment and EPU, macro uncertainty, and stock market

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[9]There is still room for further scrutiny, including comparisons based on higher frequency data such as weekly or daily rather than monthly data. Furthermore, trends in another countries, such as Europe, can be influencing the attention to climate change risks in the U.S. and Japan

[10]See the website of UTEcon.

volatility index are -0.59, -0.34 and -0.63 for Japan,. In addition, the correlation of industrial production with EPU, macro uncertainty and stock market volatility are -0.12, -0.24 and -0.28.

Looking at the lower of Table 2, we know that the two findings discussed above are also true for the U.S.. Therefore, it could be stressed that the CCN indices, as well as other uncertainty measures, negatively correlates with economic sentiments. On the other hand, at least in the short-run, there are no obvious relation between attention to climate change and industrial production, which contrasts the fact that other uncertainty measures have significantly negative correlations with industrial production.

3.3.2 VAR

The implications discussed above also hold in a structural vector autoregressive framework. To see this, we investigate how the CCN index and other uncertainty indices affect the news sentiment and industrial production. Following a literature relying on recursively identified structural VAR models such as Basu and Bundick (2017), and Bekaert et al. (2013), and Caggiano et al. (2014), the our benchmark VAR model is collected in the vector the vector $X_t = [a_t, b_t]$, where a_t represents industrial production or economic sentiment. b_t stands for one of uncertainty measure or the CCN indices. We estimate the bivariate recursively identified structural VAR models as follows:

$$X_t = BX_{t-1} + C\epsilon_t, \tag{1}$$

where ϵ_t refers to structural shocks. a_t is ordered after real activity variables in our VAR model.

Figure 5 lays out the responses of the news sentiment or industrial production to one standard deviation shocks to the CCN index or other uncertainty measures for Japan. As is shown in the figures, the news sentiment is significantly decreased after increases in uncertainty measures and the CCN index. On the other hand, with respect to industrial production, the uncertainty measures have significantly negative impacts on industrial production, consistent with the findings of Bloom (2009), although the CCN index has ambiguous impacts on industrial production.

Figure 6 shows the results for the U.S. data. The implications are also true for the U.S..

The response of industrial production to the CCN index in panel (a) is not significant, although increases in uncertainty measures have significant negative impacts on industrial production. Therefore, there is a clear difference between the CCN index and other uncertainty indices in terms of their impact on the industrial production, but not on economic sentiment. These results imply that, while the attention to climate change risks can exacerbate economic sentiment, it does not necessarily lead to an immediate stall of economic activity.[11]

Local Projection framework

We also estimate a bivariate Local Projection using the same variables as follows

The estimation results are shown in . The impulse responses from the Local Projection are consistent with the VAR results with respect to uncertainty measures. An increase in the macroeconomic uncertainty or stock market volatility significantly reduces industrial production in the U.S.. In addition, for both Japan and the U.S., CCN index has significantly negative effects on economic sentiment. However, the impulse responses to increases in the CCN index have different implications from the VAR results. Increases in the CCN indexes have significantly negative impacts on industrial production for the U.S. and Japan. These results indicates that the CCN indexes has ambiguous effects on industrial production.

To wrap up this section, what is worth noting are twofold. First, our CCN index for Japan is more correlated with the WSJ-CCN index than the other macroeconomic uncertainty measures in Japan. Second, We also find that, for both Japan and the U.S., CCN index has significantly negative effects on economic sentiment, but has ambiguous effects on industrial production. This contrasts the fact that macroeconomic uncertainty measures have negative effects on both economic sentiment and industrial production.

4 Application of the CCN indexes

This section presents our empirical approach to estimate how the attention to climate change risks influences the transmission of monetary policy shocks. To quantify it at hand, we apply the local projection method developed by Jordà (2005). Departing from Jordà

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[11]They are robust to estimating three-variable VARs using industrial production, News Sentiment, and each uncertainty index, as well as to changing the order of the variables in the VAR models.

(2005), the feature of our approach is to allow smooth regime-switches, following Auerbach and Gorodnichenko (2012) and Tenreyro and Thwaites (2016). The regime is identified by the attention to climate change risks in our estimation. Based on this model, the transmission mechanism of monetary policy shocks is potentially allowed to change depending on the state of the attention to climate change risks. In what follows, we describe our econometric model and the data sources.

4.1 Econometric Methodology

To examine how the attention to climate change risks affects the transmission of monetary policy, we extend the local projection model by Jordà (2005) to introduce a smooth regime-switching mechanism as follows:

$$y_{t+i} = \tau_i t + (\alpha_i^H + \beta_i^H \epsilon_t + \gamma_i^H \boldsymbol{x}_t) F(z_t) + (\alpha_i^L + \beta_i^L \epsilon_t + \gamma_i^L \boldsymbol{x}_t)(1 - F(z_t)) + u_t \quad (2)$$

where $i \in [0, I]$ indicates the number of periods after the shock hits the economy. A time trend ($\tau_i t$) is included. We control for regime-specific constants α_i^λ, regime-dependent effects of the monetary policy shock β_i^λ, and a set of regime-specific coefficients γ_i^λ for the vector of control variables $\boldsymbol{x}_t$. We include the industrial production, consumption, firms' capital investments, consumer price and corporate bond spreads as controls. We use corporate bond spreads as a control variable because it could be a source of business cycle fluctuations (Gilchrist and Zakrajšek (2012))[12]. $\lambda = H, L$ refers to the high (H) and low (L) attention regime, respectively. The regression residual is denoted by u_{t+i}.

The regimes are identified with the regime-indicating variable z_t. z_t represents six months backward moving averages of the CCN Index, reflecting the level of the attention to climate change risks. The continuous function $F(z_t)$ has the following logistic function:

$$F(z_t) = \frac{\exp\left(\theta \dfrac{z_t - c}{\sigma_z}\right)}{1 + \exp\left(\theta \dfrac{z_t - c}{\sigma_z}\right)} \quad (3)$$

where c corresponds to the mean and σ_z to the standard deviation of z_t. The function is increasing in z_t. The parameter θ determines the curvature of $F(z_t)$ and, hence, how

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[12]Bu et al. (2021) adds excess bond premium to their VAR model for the same reason.

strongly the probability function reacts to changes in attention to climate change risks. Previous studies did not estimate the degree of regime-switching but calibrated it (Auerbach and Gorodnichenko (2012); Tenreyro and Thwaites (2016); Falck et al. (2021)). We follow these literature and use a value of $\theta = 5$. However, our results are robust to a wide range of values as mentioned in the section 4.4.

To estimate impulse responses, we use local projections which provide a direct estimate of the response of the dependent variable i periods after the shock ϵ_t, depending on whether the economy is in a high- or low-attention regime when the shock hits. The estimation of Eq.(1) is repeated for each horizon i and the set of β_i^λ reflects the impulse response function for y_t within the I periods.

By introducing $F(z_t)$, it is allowed that there are two regimes with respect to the attention to climate change risks and these regimes are characterized by potentially different macroeconomic dynamics. The responses of the endogenous variables, y_{t+i}, to a monetary policy shock ϵ_t depending on the probability of being in the high- or low-attention to climate change risk regime, $F(z_t)$. Hence, the effects of monetary policy shocks are potentially conditioned on the probability to be in a high or low-attention regime.

In addition, our approach also captures potential regime switches after the shock. The empirical model controls for the probability of being in the high-climate risk attention regime when the shock occurs but makes no assumptions about the state of the economy in subsequent periods. If attention to climate change risk responds to the shock or the economic conditions, this would implicitly be captured in the estimated coefficients.

We estimate the econometric model for the U.S. and Japan separately. Comparing the estimation results in the U.S. with Japan, we could examine the robustness or the difference across two countries.

In our benchmark specification, the control variables are twelve lags in the U.S. and seven lags in Japan, determined by AIC. The results are unchanged when we change lag length of the control variables as mentioned in section 4.4.

4.2 Data

We use monthly data for the U.S. and Japan. As mentioned above, the data includes the industrial production, consumption, firms' capital investments, consumer price and corporate bond spreads. The estimation periods cover from October 1997 to December

2019 because of corporate bond spreads availability. We exclude 2020 because COVID-19 affected economies dramatically and it might distort our estimation.

Price index for the U.S. is PCE deflator excluding food and energy, although we use consumer price index (CPI) excluding fresh food and energy for Japan. We use manufacturers' value of shipments (nondefense capital goods excluding aircraft) for the U.S. and domestic shipments and imports of capital goods for Japan as firms' capital investments. The index of consumption is PCE for the U.S. and retail sales value for Japan. Indices for industrial production, price, firms' capital investment and consumption are three months moving averages for smoothing. The corporate bond spreads are ICE BofA US High Yield Index (option-adjusted spread) for the U.S. and BBB-rated corporate bonds spreads for Japan. We take the logarithm of the indices other than corporate bond spreads.

With respect to monthly monetary shocks, we use the exogenous monetary policy shocks as is common in the literature. We follow Bu et al. (2021) for the U.S. and Kubota and Shintani (2022) for Japan. Both papers develop shock series which stably bridge periods of conventional and unconventional monetary policy. These series are largely unpredictable from available information on the economy, and contain no significant central bank information effect. Hence, cleaner inference on the transmission of exogenous monetary policy shock is allowed.

4.3 Results

4.3.1 Identifying periods of high and low attention to climate change risks

Figure 9 and Figure 10 show $F(z_t)$, the probability of being in a regime with high attention to climate change risks, for the U.S. and Japan respectively. It should be highlighted that regimes have repeatedly switched over the sample period. This indicates that the model which preserves the degree of freedom of regime-switching is more suitable than the model in which regime changes are not allowed.

More specifically, the probability of being in low attention regimes is relatively high throughout the first half of the sample period both in the U.S. and Japan. However, the probability of being in a high attention regime has become higher after mid-2000s both in the two countries. This implies that more people have become concerned about climate change risks in recent years. In addition, unlike the U.S., a probability of being in a high attention regime is high between 1998 and 2002 in Japan. This is because Japan held the

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Kyoto Protocol and more Japanese had been paying more attention to climate change risks in those period.

4.3.2 The regime-dependent transmission of monetary policy shocks

Figure 11 and Figure 12 show the impulse responses of industrial production, consumer price, firms' capital investment, and consumptions to a expantionary 100 basis points monetary policy shock in the U.S. and Japan respectively. The upper rows of Figure 11 and Figure 12 show the results of the linear model that is estimated without assuming regime changes, which implies that state-dependent effects are not considered. On the other hand, the lower panels of both figures show the results of our regime-switching approach. The responses in the regimes with high and low attention to climate-change risks are presented. The red solid lines represent the impulse responses in the high attention regime, and the blue dotted lines imply the responses in the low attention regime.

To start with, the upper panels of Figure 11 and Figure 12 indicate that all variables are significantly increased by an expantionary monetary policy shock. This is consistent with the implications of standard New Keynesian models and related empirical studies.

Turning to the lower panels in these figures, what is worth noting are twofold. First, the responses in the high climate change news regime are significantly different from those in the low climate change news regime. This implies that the transmission of monetary policy shocks is regime-dependent, and the extent to which climate change risks considered plays an important role in propagating monetary policy shocks.

Second, the transmission of monetary policy becomes significantly weaker in the regime of high attention to climate change risk. More specifically, the responses to the monetary policy shocks in a low attention regime are almost same as the responses of the linear model. In other words, all variables are significantly increased in the low attention regime in response to expantionary monetary policy shocks. Figure 11 shows that, after twenty months, the industrial production significantly increases by about 0.01 percentage points and the inflation rate also rises about one percentage points in the U.S. On the other hand, the responses of all variables to expantionary monetary policy shocks in a high climate change news regime are not significant, which implies that the transmission of monetary policy becomes weaker[13].

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[13]Some empirical papers explore if economic uncertainty alters the monetary policy effectiveness (Aastveit

This is also true for Japan. The lower panels of Figure 12 show the responses to an expantionary monetary policy shock in the regime with high and low attention to climate change risks in Japan. The first column shows that the response of industrial production significantly increases by about 0.03 percentage points after twenty period in a low-CCN regime. In contrast, the response is insignificant in a high-CCN regime. On the third and fourth columns, the responses of firms' capital investment and consumption in a low climate change news regime (red solid lines) are statistically significant. However, the responses in a high-CCN regime (blue dotted lines) is small and statistically insignificant.

The lower panels of Figure 11 and Figure 12 also indicate that the responses of almost all variables are statistically different in the regime of high and low attention to climate change risk in both the U.S. and Japan.

4.4 Robustness check

The robustness of the application is assessed along several dimensions. We examine three types of exercises to check if our results are robust or not: alternative choices of the intensity of regime-switching θ, lags of control variables, and smoothness of regime variable.

First exercise is to show that our results are robust with respect to the choices of θ. To this end, we re-estimate the regressions with different value of θ. θ determines the intensity of regime-switching and we set $\theta = 5$ in the baseline specification. Figure 13 for the U.S. and Figure 14 for Japan show how the results are changed when we set θ to three or eight. In both figures, the responses to an expantionary monetary policy shock are well within the confidence bands of the baseline estimates, and regardless of different value of θ, the responses of all variables to monetary policy shocks tend to be weaker in high-CCN regimes compared to those in low-CCN regimes. It indicates that the baseline results are robust with respect to the intensity of regime-switching.

Second one is to examine if the results are robust when we change the lag length of control variables. The baseline regression Eq.(1) contains twelve lags of control variables for the U.S. and seven lags for Japan. As is discussed before, this lag structure is optimal as indicated by AIC. We re-estimate our model to check whether our results are robust or

et al. (2017); Castelnuovo and Pellegrino (2018); Pellegrino (2021)). They employ non-linear structural VAR models and show that monetary policy shocks are less powerful when uncertainty is high. Aastveit et al. (2017) argues that the results are consistent with the hypothesis that agents gather more information and postpone decisions under high uncertainty, and this "wait-and-see" behavior makes them less responsive to changes in the economic environment such as interest rates.

not when we change the lag length. Figure 15 and Figure 16 show the impulse responses estimated in a regression model with the different lag structure for the U.S. and Japan, respectively. Figure 15 indicates that in the U.S., the impulse response is broadly in line with the baseline impulse response even when the length of the lag is changed, except when the lag of the control variable is short, such as the lag length is three. The estimation results using Japanese data in Figure 16 show that when the number of lags is twelve, the response of the inflation in the high-CCN regime deviates from the baseline. Otherwise, the results of the empirical analysis are robust with respect to the lag length of control variables in Japan.

Third and the last exercise is to check whether the results would vary if we change how long the CCN index was moving-averaged. They show that the qualitative message of the earlier analysis is unchanged in both the U.S. and Japan.

5   Conclusion

This paper statistically investigates the impacts of attentions to climate change risk on Japan and the U.S.. We find that, for both Japan and the U.S., the CCN index has significantly negative effects on economic sentiment, but has ambiguous effects on industrial production, which is not consistent the fact that macroeconomic uncertainty measures have negative effects on both economic sentiment and industrial production.

We apply the CCN indexes to investigate how changes in attentions to climate change risk alter the transmission of monetary policy. Out finding is that, if the effectiveness of monetary policy can depend on the degree of attention to climate change riskss.

For future research, we construct a model to interpret our empirical findings and provide some policy analysis. For example, we can include a mechanism of the transmission of transition risk in addition to physical risk. It can let us consider more channel of climate change risk. Another possible approach is that we apply a smooth transition VAR. It can let us investigate how the transmissions of structural shocks, such as demand and supply shocks, depend on the state of climate change risk.

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Figure 1: Climate change vocabulary in Japan.

Notes: Each word is originally in Japanese and is translated into English by Google Translation. Term sizes are proportional to their frequency in the corpus.

Table 1: Correlation coefficients

(a)Japan

	Climate Change News for Japan	EPU	Macro Uncertainty	Stock Market Volatility
Climate Change News for Japan	1.00 –			
EPU	0.23*** (3.94)	1.00 –		
Macro Uncertainty	0.26*** (4.49)	0.25*** (4.34)	1.00 –	
Stock Market Volatility	0.19*** (3.24)	0.53*** (10.43)	0.39*** (6.99)	1.00 –
WSJ-CCN	0.45*** (8.34)			

(b)the U.S.

	WSJ-CCN	EPU	Macro Uncertainty	Stock Market Volatility
WSJ-CCN	1.00 –			
EPU	0.06 (0.98)	1.00 –		
Macro Uncertainty	0.18*** (3.06)	0.27*** (4.64)	1.00 –	
Stock Market Volatility	-0.07 (-1.16)	0.45*** (8.38)	0.58*** (11.96)	1.00 –
Climate Change News for Japan	0.45*** (8.34)			

Notes: The upper number represents the correlation coefficient and the lower bracketed number represents the t-statistics. *** denotes statistical significance at the one percent level. Estimation period is from January 1994 to June 2017.

Table 2: Correlation with News Sentiment and Industrial Production

(a)Japan

	Climate Change News for Japan	EPU	Macro Uncertainty	Stock Market Volatility
News Sentiment	-0.20*** (-3.37)	-0.59*** (-12.36)	-0.34*** (-6.10)	-0.63*** (-13.56)
Industrial Production	-0.05 (-0.87)	-0.12** (-2.02)	-0.24*** (-4.22)	-0.28*** (-4.88)

(b)the U.S.

	WSJ-CCN	EPU	Macro Uncertainty	Stock Market Volatility
News Sentiment	-0.17*** (-2.81)	-0.61*** (-12.75)	-0.50*** (-9.56)	-0.53*** (-10.39)
Industrial Production	-0.05 (-0.81)	-0.24** (-4.09)	-0.49*** (-9.38)	-0.21*** (-3.57)

Notes: The upper number represents the correlation coefficient and the lower bracketed number represents the t-statistics. *** and ** denote statistical significance at the one percent and five percent levels, respectively. Estimation period is from January 1994 to June 2017. Industrial Production is converted to month-over-month.
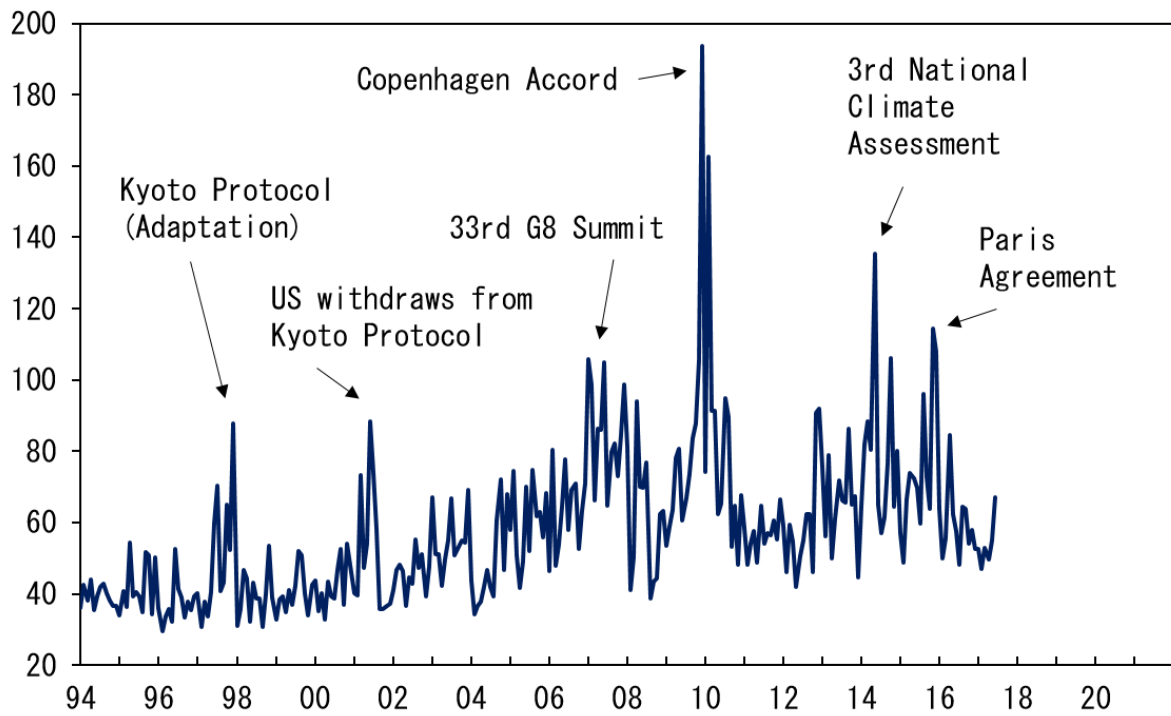
Figure 2: Climate Change News index in the U.S. (WSJ-CCN index)

Notes: This figure shows the U.S. Climate Change News index extracted from the WSJ, constructed by Engle et al. (2020). The unit of the vertical axis is a basis point.
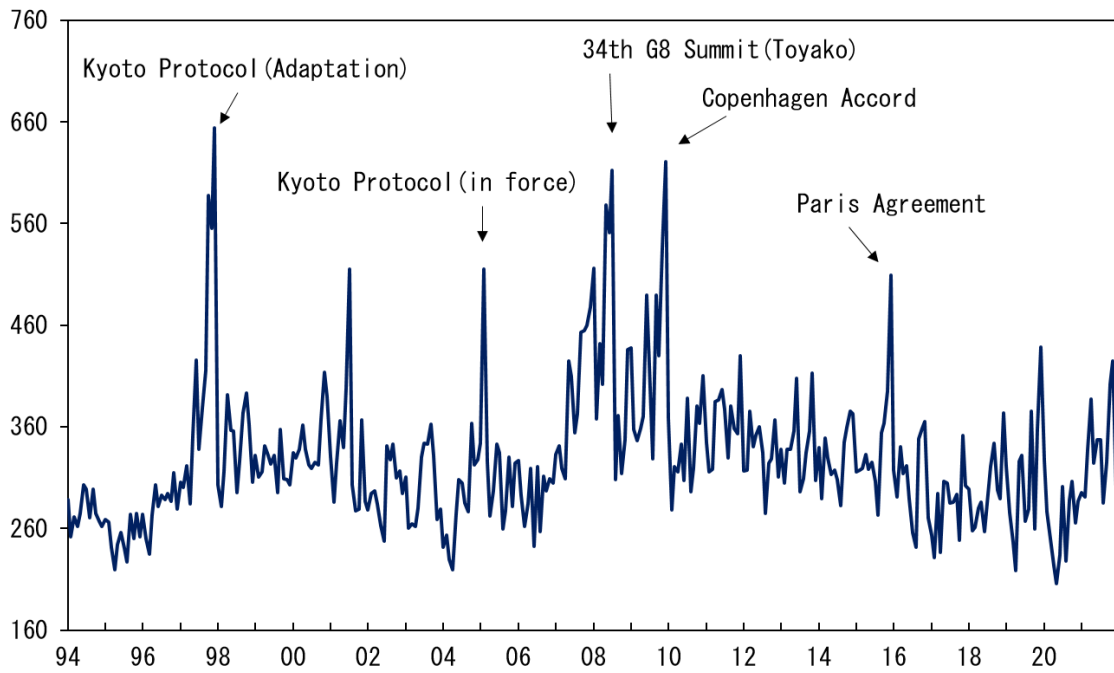
Figure 3: Climate Change News index in Japan.

Notes: This figure shows the Japanese Climate Change News index extracted from the Mainichi Shinbun. The unit of the vertical axis is a basis point.
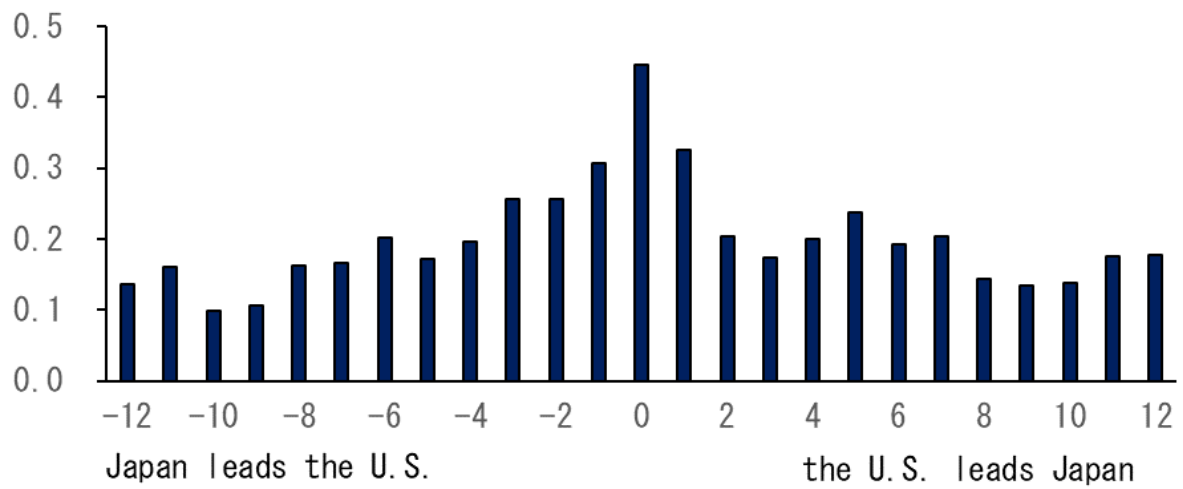
Figure 4: Correlation of Climate Change News index between Japan and the U.S.

Notes: The figure indicates correlation coefficients between the Climate Change News index in Japan and the U.S. under different lags. Estimation period is from January 1994 to June 2017.
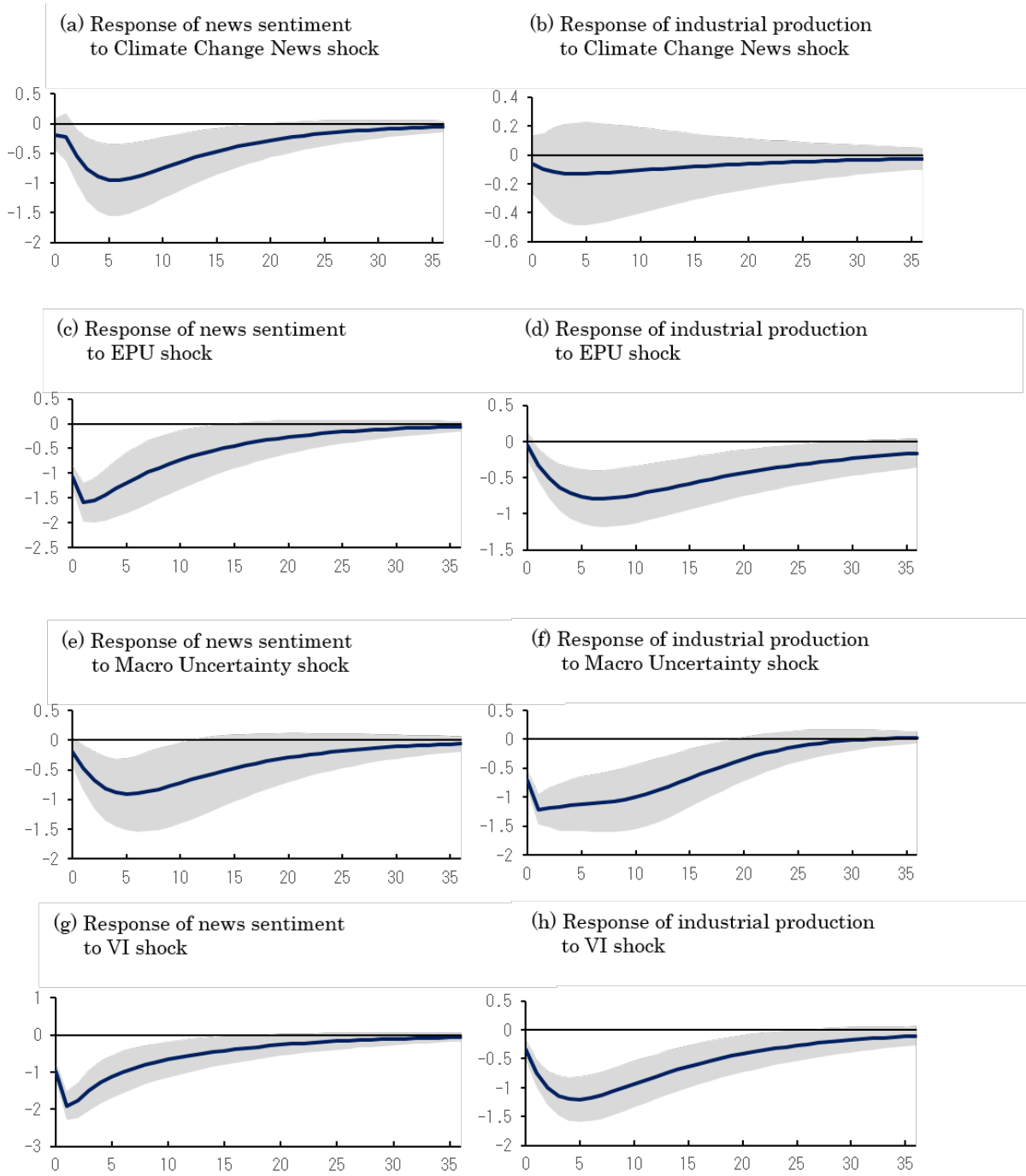
Figure 5: VAR impulse response in Japan

Notes: These panels show the impulse responses to one standard deviation shock from bivariate VAR. The sample period is from January 1994 to June 2017. The lag length in each VAR is set based on BIC. The shaded area indicates 95 percentile confidence bands.
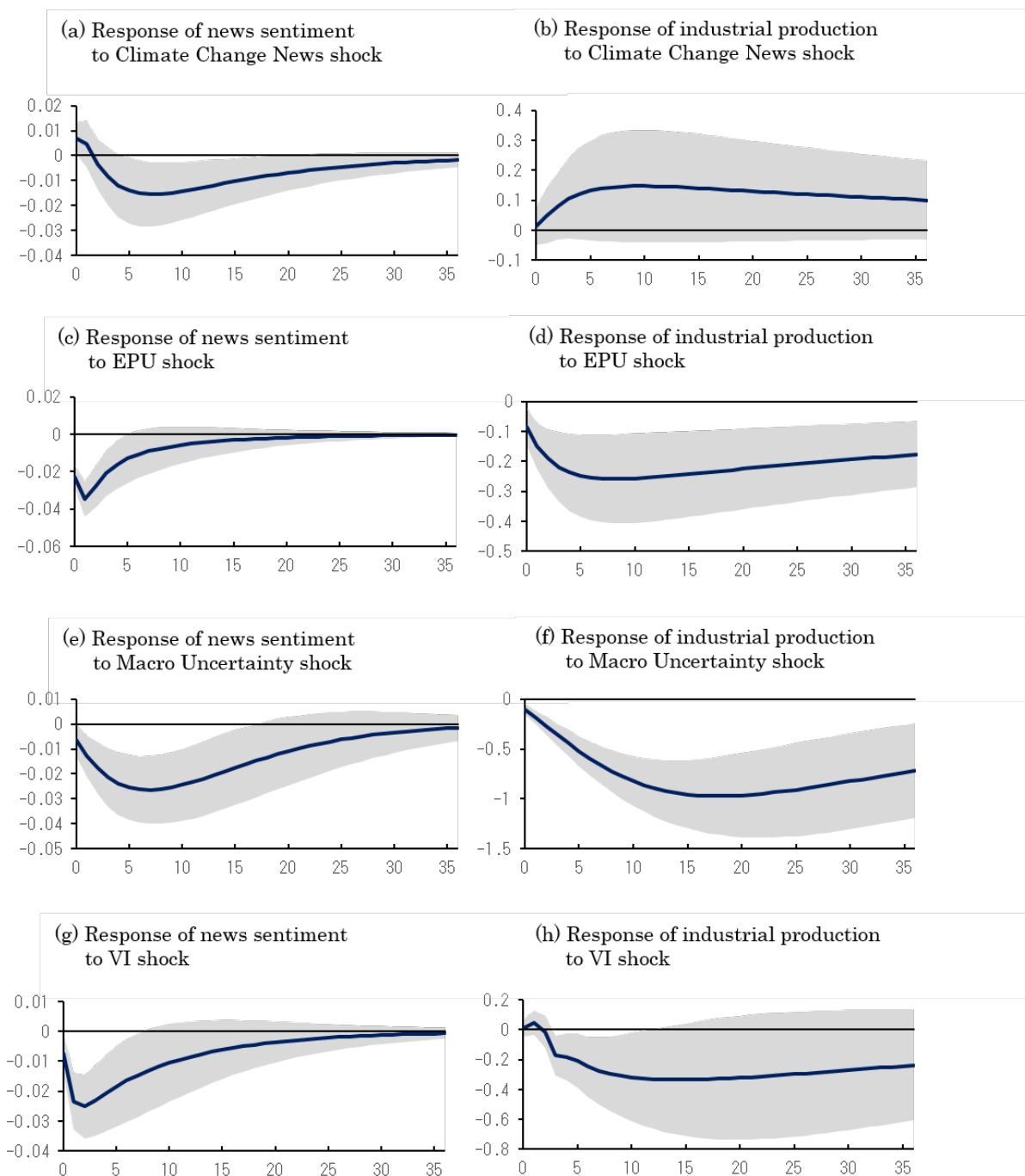
Figure 6: VAR impulse response in the U.S.

Notes: These panels show the impulse responses to one standard deviation shock from bivariate VAR. The sample period is from January 1994 to June 2017. The lag length in each VAR is set based on BIC. The shaded area indicates 95 percentile confidence bands.
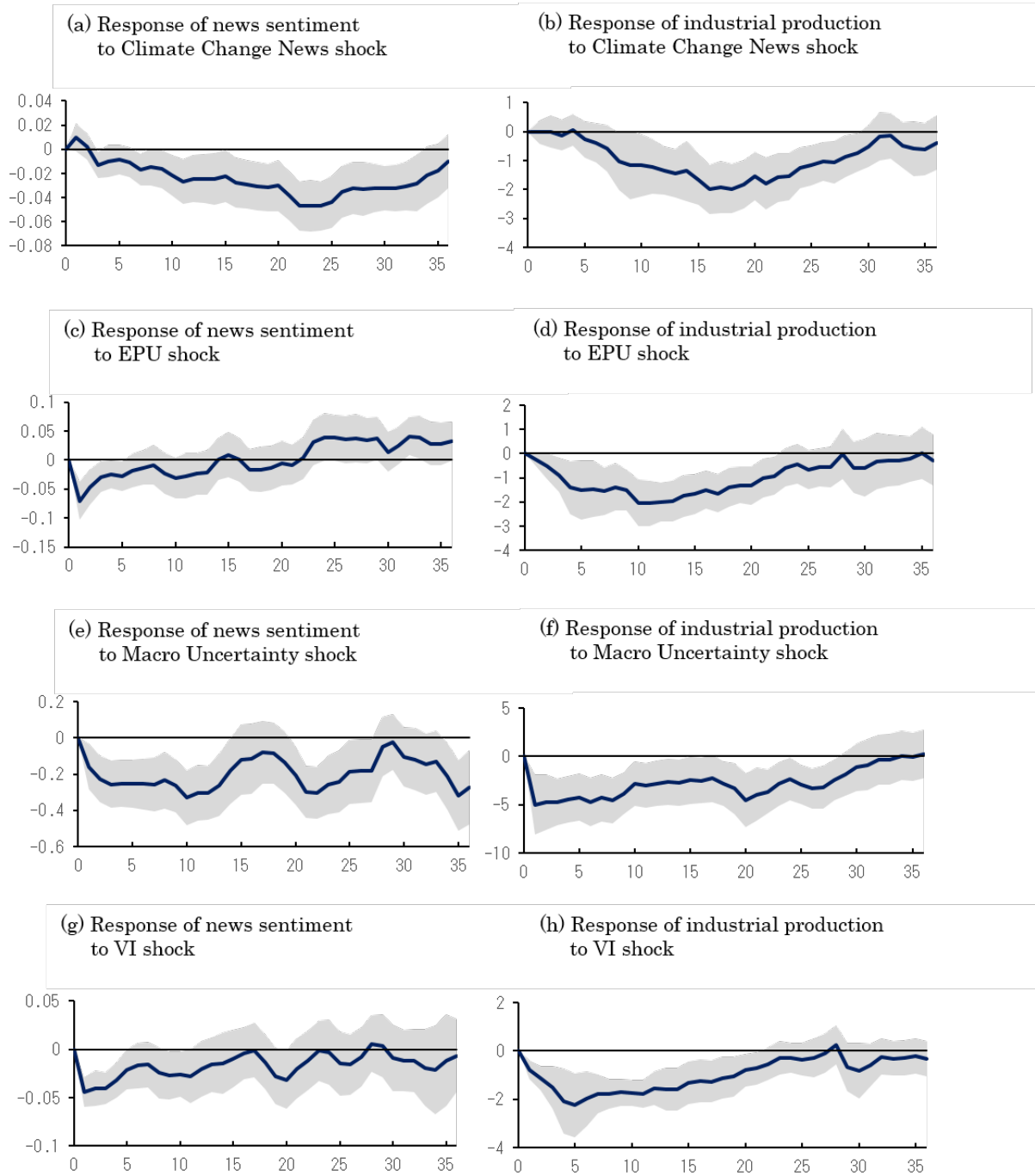
Figure 7: Local Projection impulse response in Japan

Notes: These panels show the impulse responses to one standard deviation shock from bivariate Local Projection model. The sample period is from January 1994 to June 2017. The lag length in each Local Projection model is the same with the VAR model. The shaded area indicates 95 percentile confidence bands.
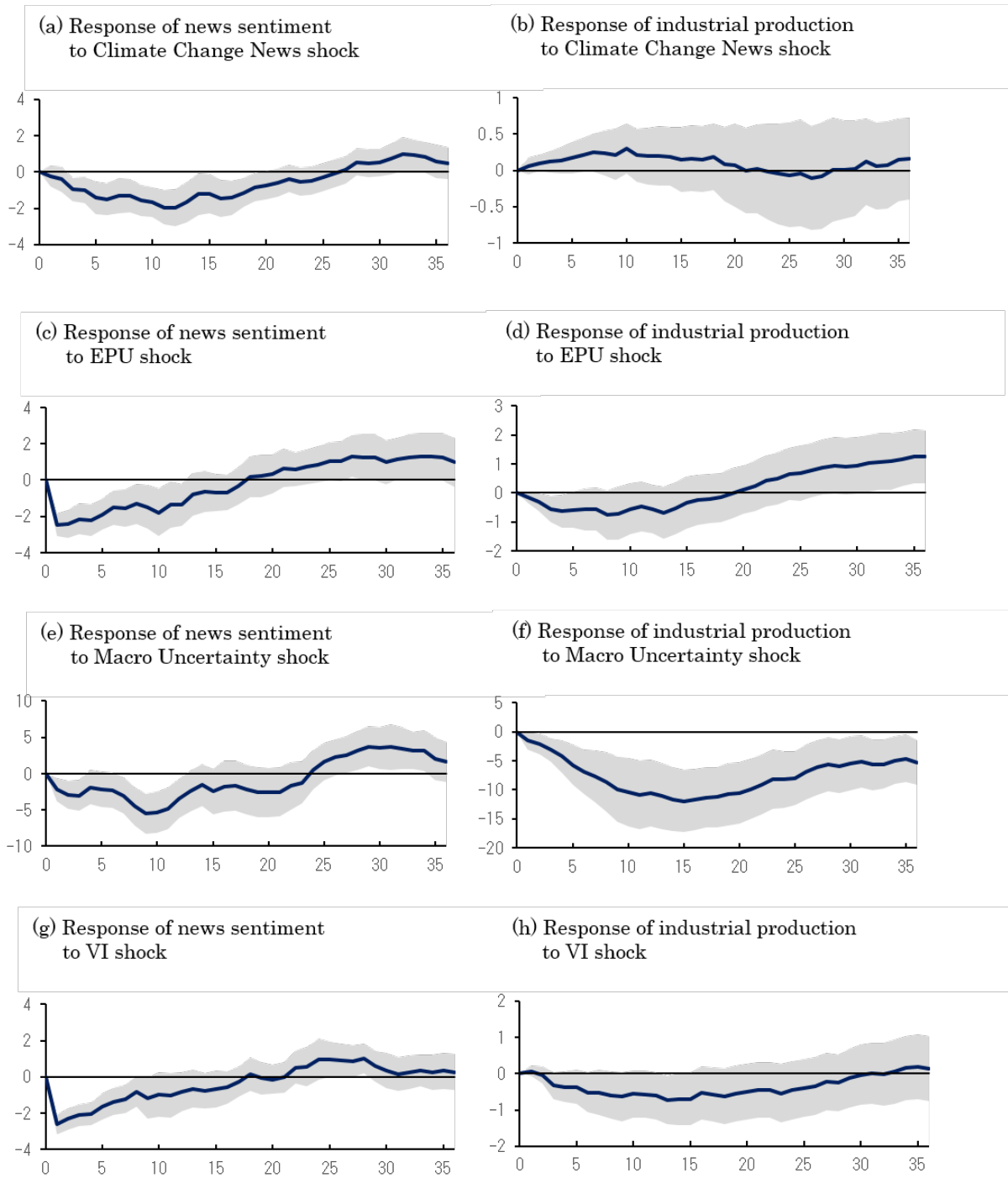
Figure 8: Local Projection impulse response in the U.S.

Notes: These panels show the impulse responses to one standard deviation shock from bivariate Local Projection model. The sample period is from January 1994 to June 2017. The lag length in each Local Projection model is the same with the VAR model. The shaded area indicates 95 percentile confidence bands.
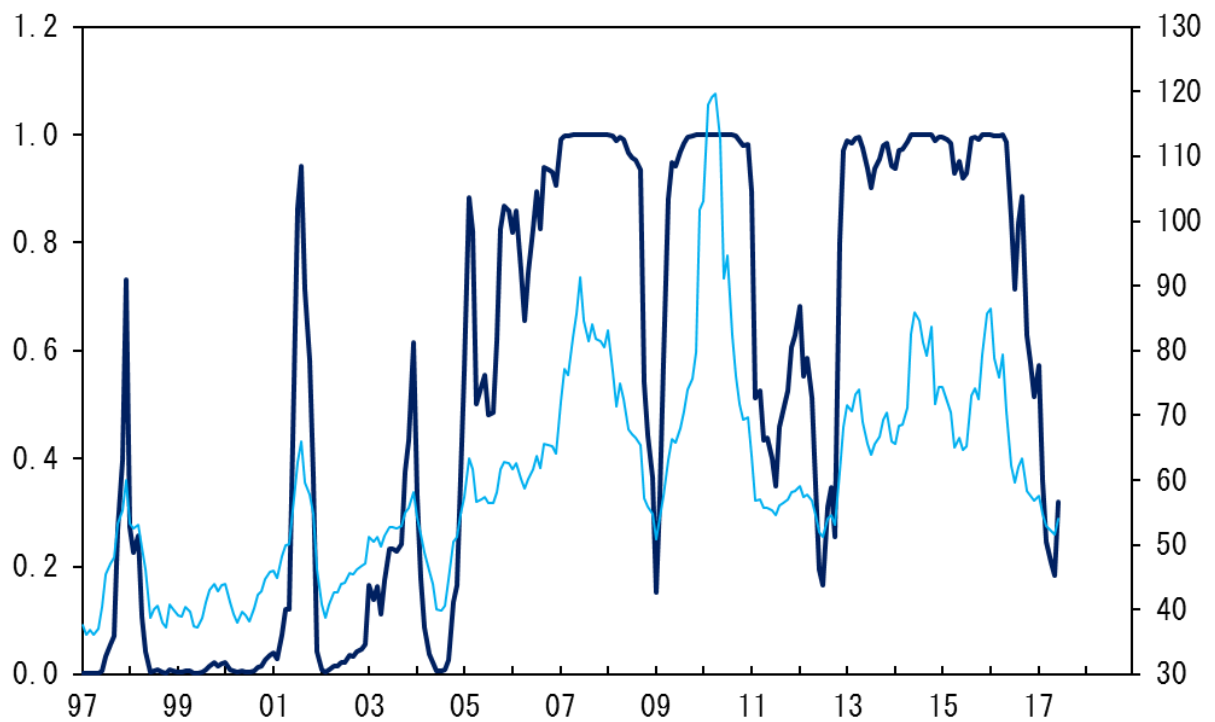
Figure 9: Probability of being in the high attention to climate change regime in the U.S.

Notes: The thin line represents six months backward moving averages of the CCN Index (right axis) and the solid line indicates the probability of being in the high attention to climate change regime (left axis) in the U.S.
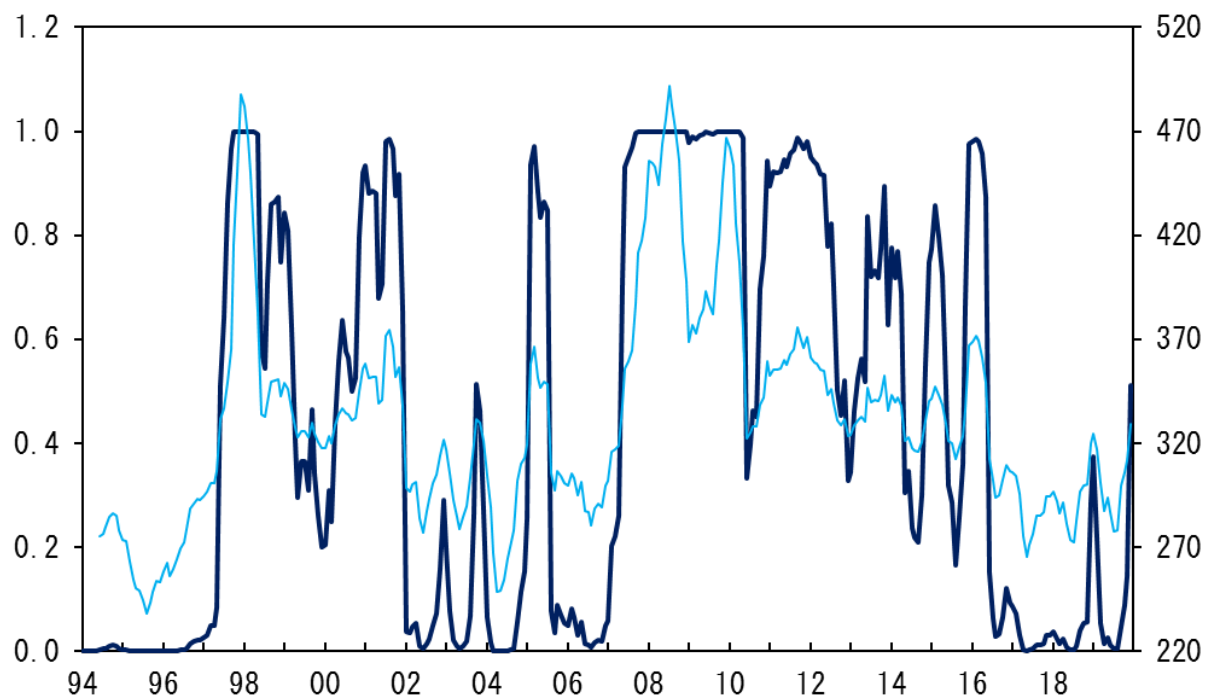
Figure 10: Probability of being in the high attention to climate change regime in the Japan.

Notes: The thin line represents six months backward moving averages of the CCN Index (right axis) and the solid line indicates the probability of being in the high attention to climate change regime (left axis) in Japan.
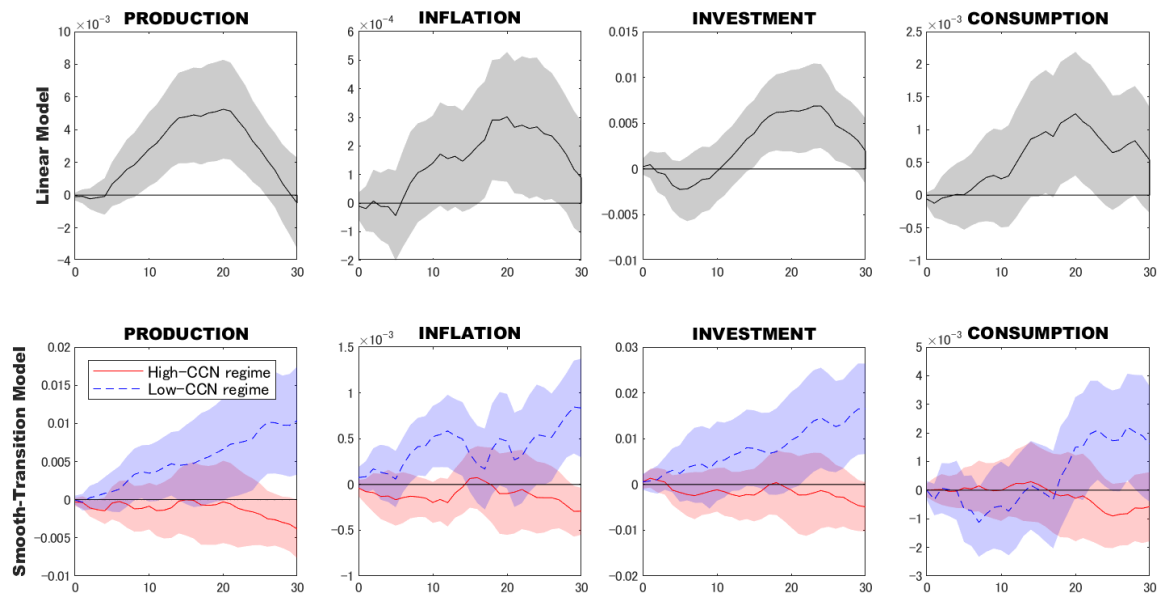
Figure 11: Responses to an expantionary monetary policy shock in the U.S.

Notes: This figure shows the impulse responses to an expantionary monetary policy shock in the U.S. The coefficients reflect the response to a 100 bps monetary policy shock. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors. INFLATION means PCE deflator. The upper panel shows the state independent responses (linear local projection model). In the lower panel, solid red (dashed blue) lines denote the responses during high attention to climate change (low attention to climate change).
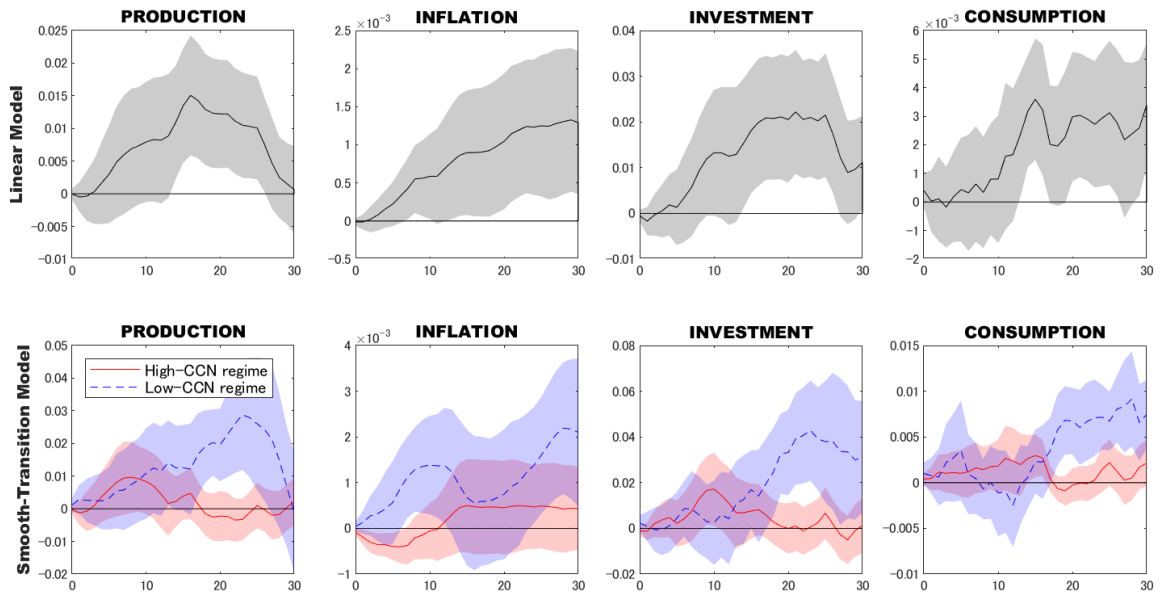
Figure 12: Responses to an expansionary monetary policy shock in Japan.

Notes: This figure shows the impulse responses to an expantionary monetary policy shock in Japan. The coefficients reflect the response to a 100 bps monetary policy shock. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors. INFLATION means consumer price index. The upper panel shows the state independent responses (linear local projection model). In the lower panel, solid red (dashed blue) lines denote the responses during high attention to climate change (low attention to climate change).
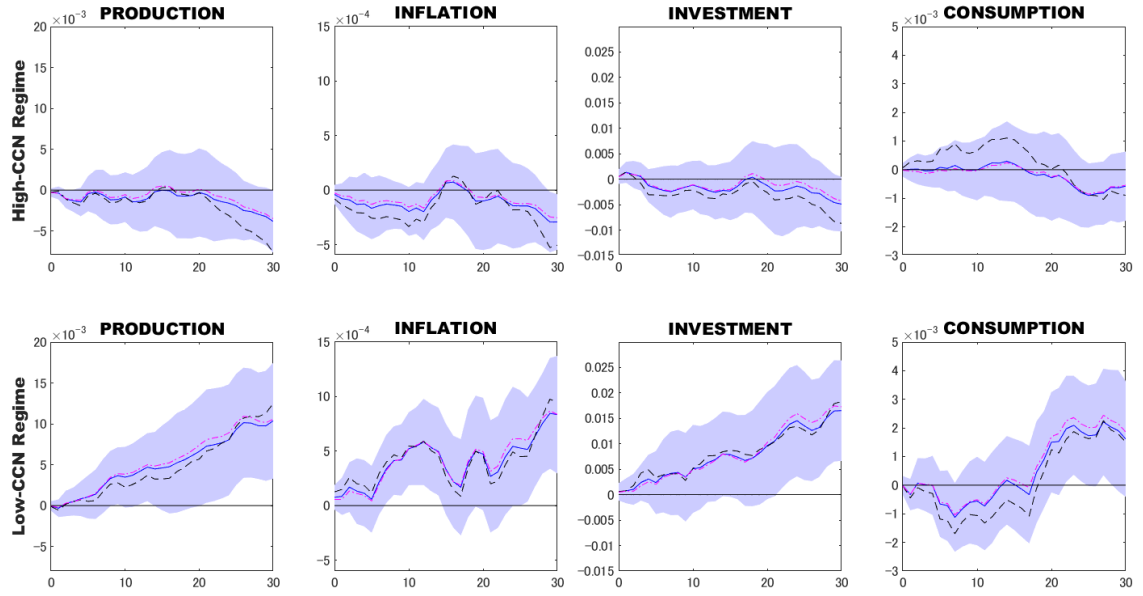
Figure 13: Robustness of the different value of θ in the U.S.

Notes: The upper panel shows the responses during high attention to climate change in the U.S. and the lower panel shows the responses during low attention to climate change. The solid line denotes the responses in $\theta = 5$(baseline), the dashed line denotes that in $\theta = 2$ and the dot-dash line denotes that in $\theta = 8$, respectively. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors around the baseline responses.
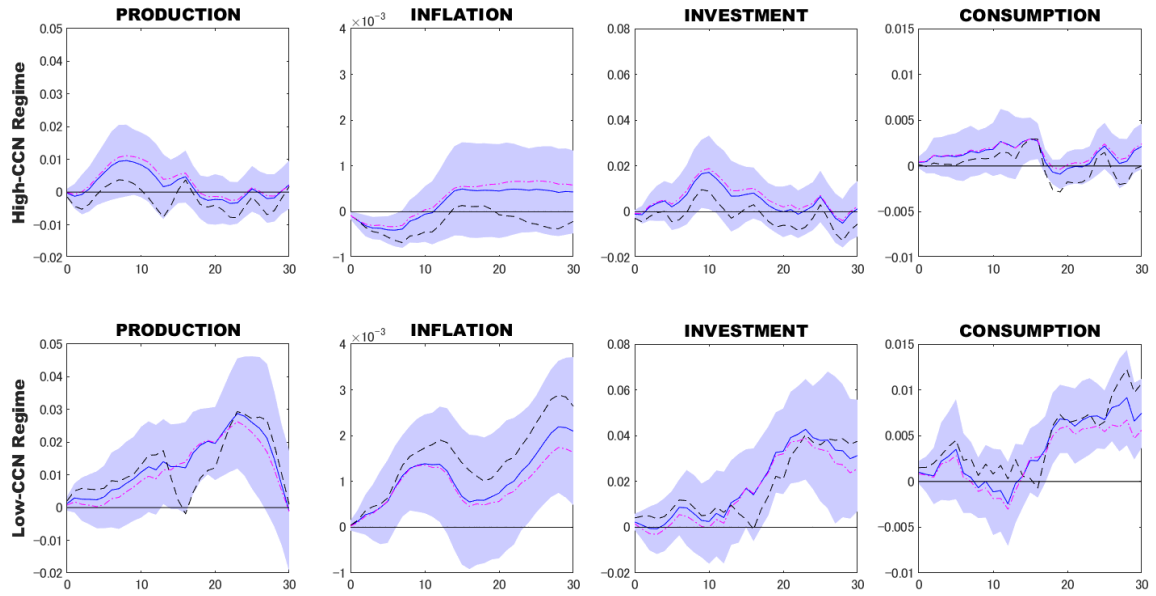
Figure 14: Robustness of the different value of θ in Japan.

Notes: The upper panel shows the responses during high attention to climate change in Japan and the lower panel shows the responses during low attention to climate change. The solid line denotes the responses in $\theta = 5$(baseline), the dashed line denotes that in $\theta = 2$ and the dot-dash line denotes that in $\theta = 8$, respectively. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors around the baseline responses.
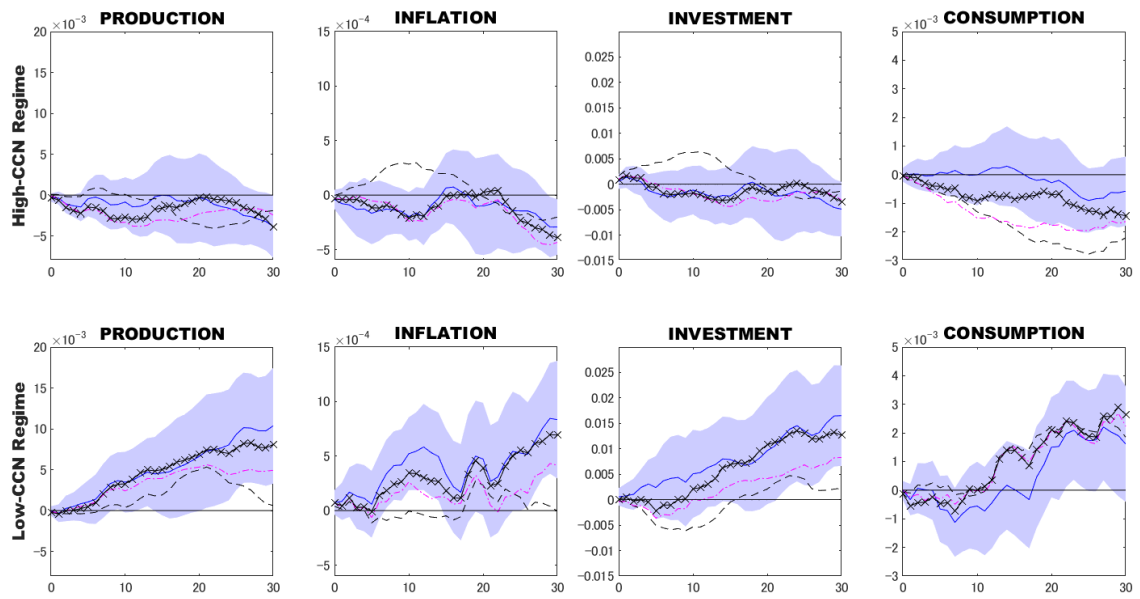
Figure 15: Robustness of the different lag of control variables in the U.S.

Notes: The upper panel shows the responses during high attention to climate change in the U.S. and the lower panel shows the responses during low attention to climate change. The solid line denotes the responses when the lag length is twelve (baseline), the dashed line denotes that when the lag length is three, the dot-dash line denotes that when the lag length is six and x denotes that when the lag length is nine, respectively. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors around the baseline responses.
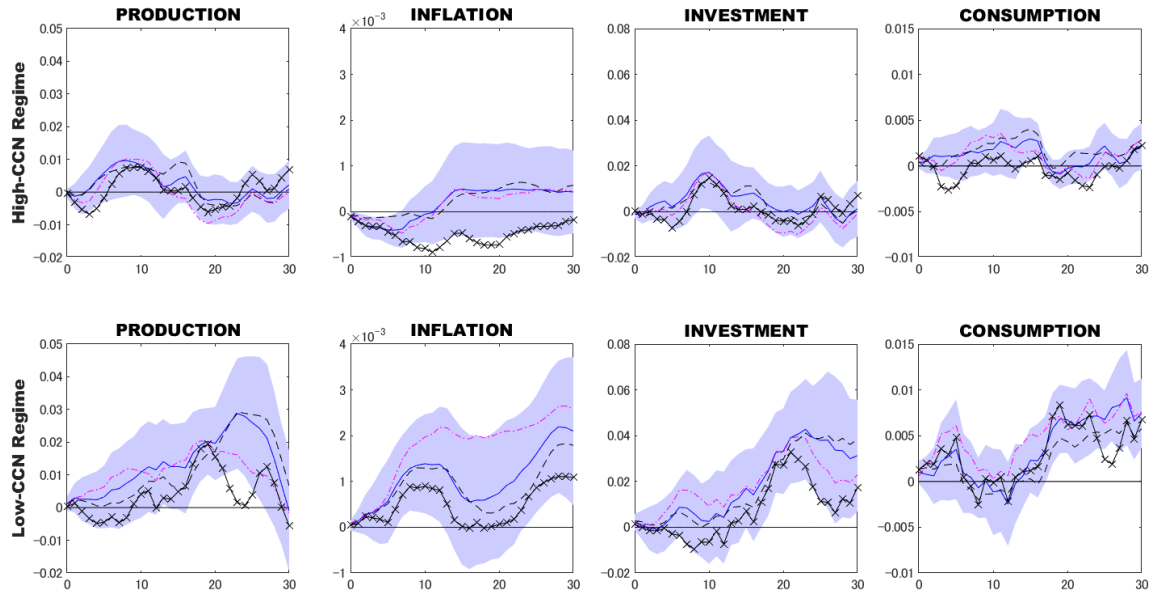
Figure 16: Robustness of the different lag of control variables in Japan.

Notes: The upper panel shows the responses during high attention to climate change in Japan. and the lower panel shows the responses during low attention to climate change. The solid line denotes the responses when the lag length is seven (baseline), the dashed line denotes that when the lag length is three, the dot-dash line denotes that when the lag length is nine and x denotes that when the lag length is twelve, respectively. The shaded areas display 90% confidence bands based on Newey and West (1987) standard errors around the baseline responses.

A Source of Japanese Climate Change Vocabulary

To create the Climate Change Vocabulary (CCV) in Japan, we collect Japanese climate change white papers issued from the ministry of the environment from 1997 to 2021. We extract the chapter on climate change from these white papers as shown below.

Table 3: List of climate change white papers

Year	Part	Chapter(Section)	Year	Part	Chapter (Section)
1997	1	1(1,2,3)	2011	3	1(1,2)
1998	1	0(1), 3(1), 4(1)	2012	1	4(1,2)
1999	1	4(1)	2012	2	1(1,2,3), 6(8)
2000	1	0(1)	2012	3	1(1,2)
2001	1	2(2)	2013	1	2(3)
2001	3	1(1)	2013	2	1(1,2,3), 6(2)
2002	2	1(1)	2013	3	1(1,2)
2002	3	1(1)	2014	1	1(1), 3(2,3,4)
2003	2	1(1)	2014	2	1(1,2,3), 6(2)
2004	2	1(1,3), 7(3)	2014	3	1(1,2)
2004	3	1(2)	2015	2	1(1,2,3), 6(2)
2005	1	1, 2, 3	2015	3	1(1,2)
2005	2	1(1,3), 7(3)	2016	1	1(1,2)
2005	3	1(2)	2016	2	1(1,2,3), 6(2)
2006	2	1(1,3), 7(3)	2016	3	1(1,2)
2006	3	1(2)	2017	1	2(1,2,3)
2007	1	1, 2(3), 3(1,2,3,4,5)	2017	2	1(1,2,3), 6(2)
2007	3	1(2), 7(8)	2017	3	1(1,2)
2007	4	1(1)	2018	1	1(1,2)
2008	1	1(1,2,3)	2018	2	1(1,2,3), 6(2)
2008	2	1(2), 7(8)	2018	3	1(1,2)
2008	3	1(1)	2019	1	2(1,2,3,4,5,6,7)
2009	1	3(1,2,3)	2019	2	1(1,2), 6(2)
2009	2	1(1,2,3), 6(8)	2019	3	1(1,2)
2009	3	1(1,2)	2020	1	1(1,2,4), 2(1,2), 3(1,2)
2010	1	2(1,2,3,4), 5(1,2,3,4)	2020	2	1(1,2), 6(2)
2010	2	1(1,2,3), 6(8)	2020	3	1(1,2)
2010	3	1(1,2)	2021	1	1(2,4), 2(1)
2011	1	4(3)	2021	2	1(1,2), 6(2)
2011	2	1(1,2,3), 6(8)	2021	3	1(1,2)

B   Japanese CCN index using another source

We use another major newspaper in Japan, Nikkei Shinbun, to construct CCN index.

Appendix Figure 17 illustrates the developments of CCN index based on Nikkei Shinbun which is also one of major newspapers in Japan. As shown in the figure, our baseline CCN index based on Maichi shinbun is almost consistent with Nikkei-based CCN index. Also, the correlation between the two indices is 0.72. The correlation between the two CCN indices become 0.79, when they are converted to six-months backward moving average. The high correlation between two indices indicates that our CCN index is robust in terms of the data source[14].
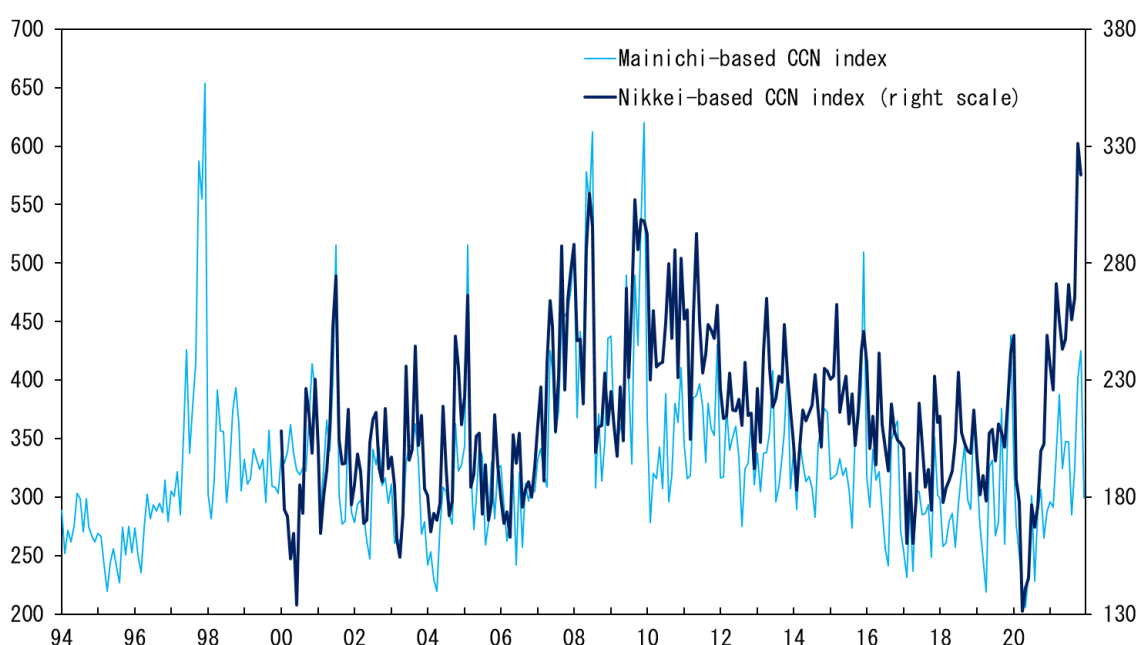
Figure 17: Japanese CCN index from Nikkei Shinbun

Notes: Each lines indicate six months backward moving averages.

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[14]There are some differences in the developments of both indices. In particular, these indices are different in 2000, 2001, and after 2021, which suggests that newspapers may have different decision-making for how much they report on climate change.

Fiscal Inflation in Japan: The Role of Unfunded Fiscal Shocks

December 2023

Takeki Sunakawa[1]

Hitotsubashi University

The increasing Japanese government debt has become a concern. After fiscal measures such as subsidies during the COVID-19 pandemic, the ratio of general government debt to GDP has reached around 250%. This is a very high value compared to other countries. Due to supply constraints after the pandemic and the surge in raw material prices caused by the Ukraine war, both the United States since 2021 and Japan since 2022 have experienced high inflation rates. During this period, while the Federal Reserve Board (FRB) has raised interest rates in response to inflation, the Bank of Japan has continued with accommodative monetary policies such as negative interest rates.

In this context, some research point out that fiscal factors may contribute to the rise in inflation. According to the Fiscal Theory of the Price Level (FTPL), when monetary policy is passive and fiscal policy is active regarding inflation, the real debt (nominal debt divided by the price level) adjusts not through increased tax revenue but through an increase in the price level in response to the rise in nominal government debt (Leeper, 1991). In the United States, Bianchi et al. (2023) noted that post-pandemic inflation and the inflation of the 1970s during the implementation of President Johnson's "Great Society" policies can be explained by fiscal factors.

In Japan, to what extent are there fiscal factors contributing to such inflation? In Japan, since the burst of the bubble in the 1990s, there has been a prolonged period of low growth and low inflation. During this time, government debt has consistently risen, accompanied by several large fiscal stimuli. Therefore, analyzing the fiscal factors of inflation is not only important for understanding the current high inflation but also crucial for explaining past periods of low inflation.

In this study, following Bianchi et al. (2023), a new general equilibrium model is employed to analyze the fiscal factors of inflation in Japan. The model suggests that shocks to government

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expenditures without repayment guarantees by fiscal authorities explain sustained inflation. In response to shocks to funded government transfers (with repayment guarantees), monetary authorities control inflation while fiscal authorities stabilize debt. In contrast, for shocks to unfunded transfers (without repayment guarantees), monetary authorities tolerate sustained movements in inflation and real interest rates to stabilize debt.

According to the model estimated using Japanese data, the historical trends in inflation can be explained as follows: Unfunded fiscal shocks, excluding the bubble period, have pushed up the inflation rate in Japan. In particular, the large fiscal stimuli following the burst of the bubble and recent fiscal policies such as subsidies during the COVID-19 pandemic have acted as factors contributing to the rise in the inflation rate. However, mainly due to non-policy shocks to the real economy, the actual inflation rate has remained low. During this period, policy shocks, including monetary policy, have been working in the direction of pushing up the inflation rate.

Inflation

GDP growth
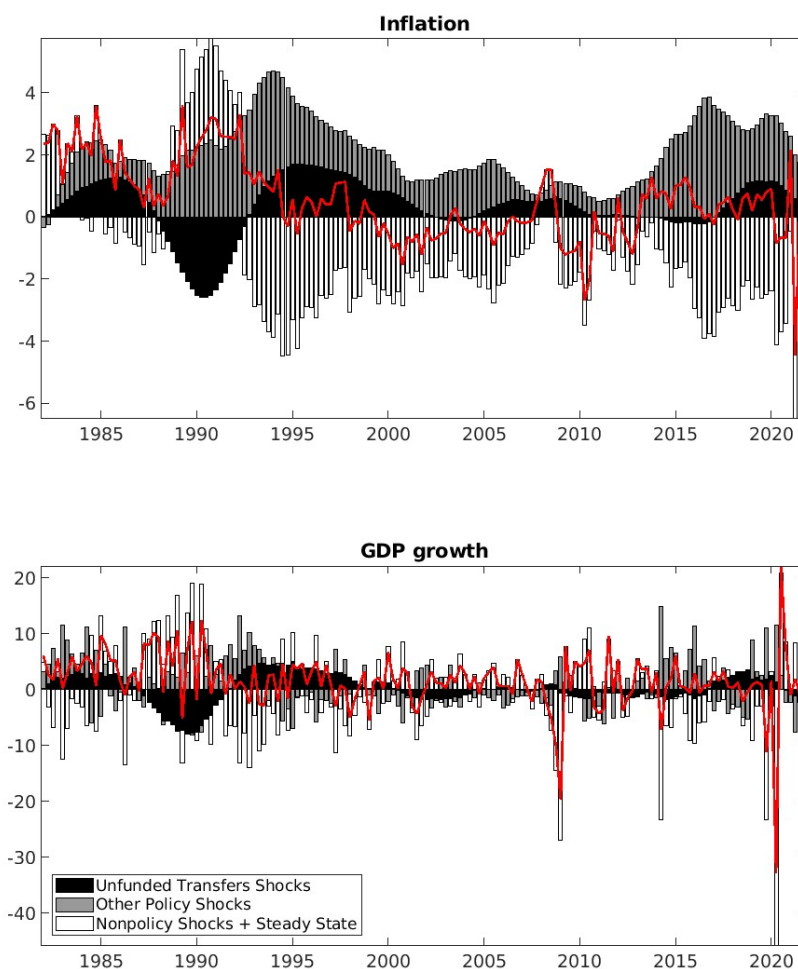
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Leeper, Eric M., 1991. "Equilibria under 'active' and 'passive' monetary and fiscal policies," *Journal of Monetary Economics*, 27(1), 129-147.

Counting Or Growing the Beans: The presence and strategic impact of Chief Financial Officers (CFOs) in Japanese firms

Key words: Chief Finance Officer (CFO), Japan, corporate governance, institutional logics, stakeholder-oriented, performance

INTRODUCTION

Generally, Chief financial officers (CFOs) are considered the financial stewards of their companies and arguably second in importance only to the Chief Executive Officer (CEO) in corporate hierarchies (Hoitashi, Hoitash and Kurt, 2016). Indeed, following the Enron crisis, the importance of the role a CFO plays is now fully recognized by regulators. For example, the Sarbanes-Oxley Act of 2002 requires both the CEO and CFO of a publicly traded U.S. firm to personally certify the material accuracy and completeness of the financial information and disclosures released to the public (Liu, Wei and Xie 2016). Thus, in the U.S., the CFO is legislatively elevated to the same level of the CEO in terms of financial reporting and oversight (Geiger and North 2006).

CFOs, particularly in a US corporation, oversee the implementation of accounting principles and procedures and the preparation of financial reports (Mian, 2001). They are also responsible for establishing and maintaining internal controls and reporting any deficiencies to the audit committee and the external auditors (Agrawal and Cooper, 2016). As a result, CFOs must work closely with internal auditors in order to identify any potential internal control weaknesses.

CFOs can potentially influence the quality of financial reporting by monitoring the expertise of accounting personnel, by their attitude toward internal controls, and through their role as conduits of information to directors, other managers, and auditors. Because they link with other functional directors, the CEO and auditors, their role in the firm is more strategic than operational. As such CFOs have also become key players in strategic planning, mergers and acquisitions, implementing information technology initiatives and managing associations with venture capitalists and the investing public (Aier, Comprix, Gunlock and Lee, 2005).

Five decades ago, the role of CFOs was never this complicated nor seen as this strategic, at a time when corporate finance was a back-office function performed by treasurers or

controllers, whose duties were confined to tasks like bookkeeping, preparing tax statements, monitoring debt and capital structures (Zorn, 2004). Decision-making was the prerogative of operational managers from manufacturing to sales and marketing, while the corporate treasurer was mainly involved with creating the budget, usually after production decisions had been made (Gerstner and Anderson, 1976; Whitley, 1986).

Extant literature offers two reasons behind the rise of the finance manager from the traditional role of bookkeeping to the level of chief. The first argument is predicated on the firms' dependency on capital, particularly during times of financial crises or following the passing of unfavourable legislation that impacted on earnings statements. The salience of external financing suggested that management had to restructure the locus and nature of financial expertise within firms in order to meet firms' funding needs (Prechel, 2000). The uncertainty associated with external financing due to fluctuations in stock markets and interests (Hoitash, 2016) made the presence of a financial expert in the boardroom even more exigent.

The second reason was borne out of the central theme of the shareholder system that the firm should be taken as a vehicle for investment, involving assessment of risk and investing in less risky but potentially value-enhancing projects (Faleye, Kovac, and Venkateswaran, 2014). Consequently, this had the effect of casting managers with a background in finance as best equipped to run corporations (Fligstein, 1990), leading to the transfer of control from production to finance. Consequently, companies "started looking for financial officers who could do more than cut costs…so CFOs tossed aside their green eyeshades and turned to more creative pursuits" (Kahn, 2002: 199). A similar sentiment was expressed by Roberto Goizueta, the late chairman and CEO of Coca-Cola between 1981-1997 when he said that today's CFOs are being asked to grow new beans in addition to counting the company's existing beans (Favaro, 2001). It can be argued, therefore, that changes to the role of CFOs came as a result of the need for firms to pay attention to the whims of financial markets, a development that

saw the finance manager move from the tail-end of corporate decision-making to its strategic apex as part and parcel of the shareholder movement.

Despite the importance of the CFO position, at least in U.S. firms, very little attention in academia has been paid to the role a CFO plays in corporate finance, especially in other countries. Of the few studies that exist, mainly on U.S. firms, Zorn (2004) provides an account of the historical rise of the CFO. Mian (2001) examines why firms replace their CFOs and finds that CFO turnovers are largely disciplinary. Geiger and North (2006) study earnings management surrounding CFO turnovers and find that discretionary accruals decreased significantly following the appointment of a new CFO. Jiang, Petroni and Wang (2010) compare CFOs and CEOs in relation to earnings management and find that CFOs have more influence than CEOs in earnings management decisions. Hoitash et al (2016) find that in high-growth industries, firms with accountant CFOs invest less in research and development and capital expenditures and are less likely to engage in external financing.

Beyond the U.S., studies on the role of CFOs are scarcer but encouragingly rising (Liu, Tong and Zhang, 2022). As a result, we know little about whether our current understanding of the role of the CFO holds in a non-U.S. context. In Japan, a country with a different corporate governance model from that of the U.S., arguably noted for relatively weak market-based governance, the appointment or the use of the title CFO is a recent thing, with most firms still without the role.

Owing to the contrasting corporate governance logics, we have reason to anticipate that the role and importance of the CFO may take a different meaning in Japan. Nevertheless, some Japanese firms have appointed executives with the title CFO, however, we know very little, if anything, about the nature of firms that tolerate the presence of the CFO role and whether the appointed officers have the same effect on firm performance with those found in the context of the U.S. (Hoitash et al, 2016).

Drawing on the theoretical lens of institutional logics, this paper seeks to remedy this omission by examining the characteristics of firms that welcome the appointment of the CFO and their impact in Japanese firms, hoping to establish whether CFOs in Japan assume the traditional accounting role of 'counting the beans' or embrace the strategic role of 'growing new beans' manifest in the creation of firm value. Put differently, is the role of the CFO in Japan perceived in the same way as it is in the U.S.? Specifically, when it comes to accounting performance and firm value-creation do the institutional logics embedded in Japanese corporate governance prescribe the behaviour of the CFO differently with consequent divergent outcomes from that of the U.S.?

Japan provides an interesting and suitable context to understand divergent perceptions and impacts of the CFO role owing to her contrasting nature of corporate governance logics from that of the shareholder-oriented models (Aguilera and Jackson, 2003) First, Japanese firms have a notable history of rejecting foreign management or governance practices (Ahmadjian and Robbins, 2005; Chizema and Shinozawa, 2012; Yoshikawa, Phan and David, 2005). The fact that some companies have adopted the CFO role while others seemingly reject it, is certainly an intriguing prospect. This situation is similar to many of the management and governance initiatives that have been imported in the past, only to face minimum acceptance (Chizema and Shinozawa, 2012). Indeed, the CFO as a strategic managerial concept and title derives from the US and is consistent with the shareholder-oriented form of corporate governance. Like other corporate governance practices deriving from the Anglo-American model in the past, the question is whether the management practice of the CFO is likely to face the same fate, if not in form, then in substance (Gilson and Milhaupt, 2005). Indeed, even in circumstances where management practices have been adopted, there is evidence that they have been translated to suit the Japanese-style of management. For example, Chizema and

Shinozawa (2012) found that the so-called independent directors in Japanese firms are recruited from their affiliates or are previous employees of the firm.

Second, Japanese management and business literature suggests that there is a general trend of conservatism in viewing accounting and finance functions within the corporate structure (Shuto and Takada, 2010). While a lot of effort and attention is given to issues around the operating or manufacturing efficiencies and technology, concerns of the accounting and finance functions have hardly changed, continually focused on the functional roles of earnings management (Teshima and Shuto, 2008) and reporting. It is plausible, therefore, that the CFO in Japan may operate differently from the one in a US firm that has, on average, been dramatically transformed from a bean counter to a corporate spin doctor (Zorn, 2004).

Our study makes several contributions. First, we add to the scant literature on the role of CFOs by examining their effect on performance in a context that is traditionally not associated with this managerial office. Second, we apply the theoretical lens of institutional logics to understanding the role of CFOs in Japan and consequently add to the body of literature particularly by providing evidence on the course of action, or lack of it, by an actor when faced with competing institutional logics. Third, we add voice to the call made by practice and professions (e.g., Deloitte Touche Tohimatsu, 2018; Ikegawa and Michels-Kim, 2018) to take the role of CFOs seriously in Japan by providing empirical evidence of the economic impact of the office.

The rest of the paper is organised as follows. The next main section discusses theory, literature and develops hypotheses in the process. This is then followed by a discussion of the methodology section, that provides an explanation of the study sample, variables and the econometric techniques used to analyse the data. This is then followed by a discussion of the results and the last section provides a general discussion and a conclusion.

THEORY AND HYPOTHESES

Institutional logics

There is no consensus among organizational scholars about how to define institutional logics, or even the location and scope of logics, however, they are generally understood as macro-level belief systems that shape cognitions and influence decision-making processes in organizational fields (Ocasio, 1997; Thornton, 2004). For those organizations within a field, these logics act as ''taken-for-granted social prescriptions'' (Battiliana and Dorado, 2010: 1420) that define goals and expectations, legitimate activity (Thornton and Ocasio, 1999; Thornton, 2002, 2004), and often become embodied in organizational structures and practices (Thornton, 2004; Dunn and Jones, 2010).

Institutional logics can also be considered as "socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules" that create norms around "the way a particular social world works" (Thornton and Ocasio, 1999: 804). As such, logics provide guiding principles for selecting and applying appropriate types or forms of practices to specific problems, justifying the approaches to be used, to be changed or to be rejected by organizations (Lawrence and Suddaby, 2006).

An organization may operate in accordance with a market-oriented institutional logic, wherein shareholder returns are of utmost importance, or a professional-oriented institutional logic, wherein the organization is expected to function largely through peer-to-peer relationships instead of hierarchy (Thornton, 2002). In both instances, such expectations or actions "provide both a logic of action and reinforce a set of cultural and material values" for the organization (Ocasio, 1997: 196).

Institutional logics are often viewed as originating from a 'supra-organizational' source, hence the macro-level view, such as from within institutional sectors that span societies (Thornton and Ocasio, 2008: 101). However, an organization's dominant logic may be most

tangibly reflected in various organization-level factors, such as organizational missions (Thornton, 2002; Thornton and Ocasio, 2008) and the way its functions are organised. Indeed, logics are not pure abstractions—they concretely affect day-to-day affairs of an organization, manifest in the structure and routines of the organisation.

A particular logic determines not only the meaning and legitimacy (Thornton, 2002) of the organization's attributes, but also it focuses the attention of organizational actors on a limited set of issues and solutions that are consistent with it (Thornton, 2002), thereby placing bounds on the latitude of decision-makers. Thus, to the extent that ownership and governance affect the impact of managerial decisions, the underlying force of this effect may derive, in part, from the associated institutional logic, specifically the normative expectations it creates regarding how the organization should conduct its affairs and the objectives toward which it should strive. These expectations have far-reaching implications and may even influence power dynamics in and around organizations, such as the direct constraints that owners and other stakeholders may place on organizations. As Thornton and Ocasio (1999) have noted, the source of "power, its meaning and its consequences are contingent on [the relevant] higher-order institutional logics" (Thornton and Ocasio, 1999, pg. 802).

Nevertheless, because normative expectations are indirect, values-based beliefs regarding how people and organizations should behave, institutional logics may affect the opportunity for management or its constituent actors to impact performance, independent of owner-board-CEO power dynamics. In other words, working through socio-cognitive channels (rather than lending meaning and force to a direct demonstration of power), institutional logics can constrain management's perceived range of action by simply solidifying in the minds of organizational members the norms and values the organization should be upholding, which necessarily restricts the management's decisions to only those considered acceptable.

Corporate governance logics: Japan versus the U.S.

Corporate governance is an institutional element of a nation's business system that reflects economic, social structures and norms of key stakeholders in a society (Ahmadjian and Robbins, 2005; Fiss and Zajac, 2004). Corporate governance models or systems can be viewed as institutional logics. They are distinct and institutionalised at the national level as a result of their historically path-dependent development in the unique cultural and political configurations of their national contexts (Whitley, 1999; Guillen, 2001). Viewing corporate governance systems as institutional logics matter not only because they affect the approach to board monitoring (Desender et al, 2016), but also because they shape beliefs about legitimate and efficient corporate structures and strategies. For that reason, organisations, through embedded agency, may be inclined to rely on institutional logics, that are embodied in national governance models, in their operations and decision-making (Hall and Soskice, 2001).

One of the clearest distinctions among corporate governance systems is between the stakeholder-oriented economies exemplified by Germany and Japan (Gilson and Milhaupt, 2005; Hall and Soskice, 2001; Yoshikawa, Phan and David, 2005) and the shareholder-oriented economies of the Anglo-American countries (Aguilera and Jackson, 2003), led by the U.S. and the UK. The stakeholder-oriented or network-oriented corporate governance system of Japan is characterized by long-term relationships between different stakeholders who have a substantial influence on strategic decision-making (Lincoln and Gerlach, 2004). Japanese firms tend to more actively manage the interests of their stakeholders. The resulting stakeholder management is highly institutionalized and anchored in laws, social rules and norms.

Thus, Japanese firms usually exhibit a very active stakeholder management. Earlier work described the Japanese firm as a coalition of employees and a coalition of shareholders, which is integrated and mediated by management to strike a balance between the interests of the two parties (Aoki and Patrick, 1994). Here, core workers are entitled to life-long employment and domestic investors hold shares for the implicit purpose of business goodwill,

information exchange, and mutual monitoring. These corporate shareholders, like bank shareholders, hold shares not necessarily to earn investment returns but to stabilize trading relationships and long-term alliances (Gilson and Milhaupt, 2005). The main bank owns a large portion of the network's equity and serves as a lead lender to the keiretsu firms. As a large debt holder, the main bank often acts as an advisor and agent to the firm's cash management and financial planning activities (Sheard, 1989). In addition to the banks, many non-financial firms also hold stocks of other firms, often on a reciprocal basis. For that reason, Japanese investors typically fall under Aguilera and Jackson's (2003) category of investors with strategic interests as opposed to financial interests.

The logics of Japanese firms, therefore, rooted in stakeholder or relationship-oriented system of corporate governance are, in the main, centered on maximizing the well- being of relevant stakeholder groups, including employees. Here, the governance system has been institutionalized to empower some organizational actors such as domestic institutional owners and employees, while constraining others such as arm's length investors (Geng, Yoshikawa and Colpan, 2016). Such empowered stakeholders are concerned about long-term relationships, in an environment where firms develop and implement strategies based on long-term goals (Desender et al., 2016). Indeed, domestic institutional investors, also referred to as relational owners, tend to value long-term growth and maximize mostly market share, objectives that provide greater benefits to key stakeholders. This is in stark contrast to the U.S. corporate governance logic that emphasizes short-term profitability or higher share price to provide benefits to return-oriented investors.

Indeed, the corporate governance model of the U.S. is categorically about shareholder supremacy (Fama and Jensen, 1983), a governance logic of that is ideologically rooted in agency theory (Jensen and Meckling, 1976).

While the governance structures and ownership of firms in the Anglo-American model of corporate governance may typically permit internal determination of structures, processes and strategic direction (Cuervo and Villalonga, 2000), however, these firms are subject to the boundaries of an underlying market-oriented logic, tied to the central purpose of the firm's existence. While details may be idiosyncratic to each firm, however, corporate governance mechanisms, such as CEO incentives and pay packages, and governance structures, such as the use of the committee system, are largely organized so as to achieve the overriding goal. Similarly, organizational norms and values as well as external formal institutions, such as capital markets and regulatory bodies, will often develop in ways that reinforce this core objective of shareholder-value maximization. Here, the CFO and other executives are a collective agency whose behavior and decisions should always be about optimizing shareholder value (Jensen and Meckling, 1976)

In the context of this study, dominant logics from both the shareholder-value, residing in the original conception and source of the CFO role, and from the stakeholder-oriented approach, residing in the institutional context to which the CFO idea is transplanted, are bound to clash (Ahmadjian and Robbins, 2005; Desender et al, 2016). Drawing on extant literature on institutional logics and their effect on corporate decisions, one of the two central arguments in this study is that CFOs are more likely to implement their duties in a manner that is congruent with the true nature of the role when the aims and assumptions of the role are congruent with the institutional logic of the organizational field. Moreover, their presence in the firm is likely to be determined by whether the firm, as an organization, has the characteristics that are accepting of an alternative governance logic.

In the following sections, in the context of Japanese firms, we discuss the conditions under which CFO presence in Japanese firms is possible and their subsequent effects on both accounting-based and market-based performance.

Explaining the Presence of the CFO in Japanese Firms

The role of ownership structure

We argue that the coexistence and contestation of alternative institutional logics in corporate governance is well demonstrated in the context of Japanese firms through ownership structure (Yoshikawa et al, 2005), board governance (xxx) and global pressures (xxx). As discussed above, for example, the majority of domestic institutional owners, including and mainly banks, follow the stakeholder logic that protects the interests of stakeholders (e.g., employees and business partners), whereas foreign institutional investors are proponents of the shareholder logic that prioritizes the interest of shareholders (Ahmadjian and Robbins, 2005).

We provide argumentation on the effects of corporate ownership, board governance and global pressures on the presence of CFOs, developing our hypotheses in the process.

Ownership Structure

Foreign ownership

Scholars believe that in today's globalized world, foreign capital has had some influence even in some governance systems that are famous for resisting alternative models (Ahmadjian and Robbins, 2005). Indeed, with their growing investments abroad, foreign institutional investors, mostly from the US and the UK (Geng et al, 2016), have become important actors in stakeholder systems. For example, Ahmadjian and Robbins (2001) found that foreign ownership led to downsizing in Japanese firms, a decision at tangent with traditional Japanese custom of life-time employment for core employees. Chizema and Shinozawa (2012) found that firms with higher proportions of foreign ownership are more likely to adopt U.S.-style board committees. In spite of clashing governance logics in Japan, we argue that foreign ownership will be in favor of promoting an environment that is consistent with global management practices thus preferring the appointment of CFOs in Japanese firms. We, therefore, hypothesize that:

Hypothesis 1: Foreign ownership will be positively associated with the presence of the CFO.

Crossholdings

As pointed out earlier, the concept of the CFO is new in Japan and certainly not a characteristic of the *keiretsu* networks in Japan, where companies are connected through crossholdings, inter-trading, and interlocking directorships (Lincoln and Gerlach, 2004). In the past, cross-held firms have been observed to resist the adoption of shareholder-oriented practices. Against this background, a natural expectation is that cross-held firms would resist the idea of the CFO, an institution deeply seated in the shareholder-value model of corporate governance. We, therefore, conclude that:

Hypothesis 2: Cross-held firms will be negatively associated with the presence of the CFO.

Bank ownership

Japanese firms have traditionally relied heavily on bank financing, through both bank loans and shareholdings. This bank-centered nature of horizontal keiretsu makes such banking ties especially important, as ties through equity holdings are reinforced by other forms of ties, including lending ties, personnel exchange, and board memberships (Morck & Nakamura, 1999; Aoki, Jackson, and Miyajima, 2007; Gedajlovic and Shapiro, 2002). This means that main banks' influence on Japanese firms can be significant in more than one way. As argued earlier, these banks are at the core of the Japanese variety of corporate governance logic.

Previous studies have provided evidence for the corporate governance role of main banks in terms of personnel-related matters particularly on executive turnover as well as replacement of outside directors following significant performance decline (Kang & Shivdasani, 1997). This suggests that banks would have an interest in matters related to the presence of the CFO in Japanese firms. Given, therefore, their power and influence over companies and indeed an institutional environment that share their logic, they are likely to prefer a situation where very minimum of the foreign environment influence is tolerated. We

argue, therefore, that bank ownership will be less in favor of the appointment of CFOs in companies.

Hypothesis 3: Bank ownership will be negatively associated with the appointment of the CFO.

Controlling shareholders

Principal-principal agent theory suggest that larger shareholders exploit smaller shareholders (Chizema and Kim, 2010; Young et al., 2008). Because majority shareholders are in control, extracting rents from the current system, they would be less willing to accept a change in the status quo. They are, therefore, more likely to reject the idea of having CFOs, who might promote higher levels of transparency and financial disclosure. Indeed, fair representation and consideration of all shareholders' interests is likely to be achieved with the CFO in office, whose institutional logic is more consistent with the maximization of shareholder value and fair treatment of shareholders. Thus, minority and not majority shareholders are more likely to encourage the presence of CFOs.

Hypothesis 4: Controlling shareholders will be negatively associated with the presence of the CFO, while the opposite is expected from minority ownership.

Board governance

Independent directors

The idea of outside directors, particularly where they are independent, is consistent with the shareholder-oriented logic. In principle, independent directors promote the interests of shareholders, thus a higher proportion of independent directors would support changes that ensure the presence of CFO in firms.

Hypothesis 5: The proportion of independent directors will be positively associated with the presence of the CFO.

Average age of board directors

Older directors would prefer the status quo and are more embedded in the traditional Japanese corporate governance logic of stakeholder value, and thus would prefer that firms do not appoint US-style CFOs. On the other hand, younger directors with less emotional and experiential investment in the past successes of the Japanese model of corporate governance are more likely to be receptive to alternative forms of governance.

Hypothesis 6: The average age of board directors will be negatively associated with the presence of the CFO.

Globalization pressure

The rise of globalization and trading on international markets means that Japanese firms are internationally exposed such that they face pressures to comply with the demands of other stakeholders beyond Japan. From an institutional theory perspective, internationally exposed firms are guided by both coercive and mimetic pressures (DiMaggio and Powell, 1991) to comply with regulations from other jurisdictions, meeting foreign customers' expectations and imitating management practices from their competitors. For instance, some Japanese firms provide disclosure materials in English. Moreover, some firms that have higher proportions of foreign sales are more likely to go beyond the minimum standards of operation, embracing new practices that are likely to be seen favourably by their global customers. We argue, therefore, that firms that are already accustomed to dealing with global pressures are more likely to welcome the presence of the CFO.

Hypothesis 7(a): Firms that provide their disclosure materials in English are more likely to have the presence of the CFO.

Hypothesis 7(b): Firms with larger proportions of foreign sales are more likely to have the presence of the CFO

The Impact of the CFO on Firm Performance

Institutional logics and CFO discretion

In order to make an impact on firm outcomes, executives must have strategic leeway (Child, 1972) or discretion (Hambrick and Finkelstein, 1987). While managerial discretion has been identified at various levels (individual, organization, industry), our interest, in this study, lies in managerial discretion that exist within the framework of the dominant logic that emanates from a national corporate governance system, i.e., national level (Hall and Soskice, 2001).

Regardless of the level at which it is observed, managerial discretion is a function of two broad factors (Crossland and Hambrick, 2011). First, to have discretion, the executive must have (and be aware of) an array of alternatives that key stakeholders would view as relatively unobjectionable. If potential actions by the executive are considered to be excessively risky or radical or are a basic violation of stakeholder expectations, then managerial discretion is reduced. Second, discretion exists to the extent that stakeholders lack the power to block or nullify objectionable actions, and/or lack the power to sanction the executive for taking such actions.

We argue that this conceptualization and qualification of managerial discretion is consistent with the theorization of institutional logics and applies one of the key insights from institutional theory, that agency is institutionally embedded, to the idea of CFO discretion (Friedland and Alford 1991; Thornton and Ocasio 2008). Here, the extent to which CFOs achieve their goals is dependent on the leeway granted them by the dominant logic that exists both within and without the firm. We argue further that, taking Japan as the national context and indeed as the organizational field, the dominant logic shared by relevant actors will only sanction the CFO's action to the extent that it balances the interests of multiple stakeholders without prioritizing those of shareholders.

We admit that the argument we make here depicts CFOs not as agents with objective interests and preferences, but rather as institutionally constructed actors whose values, interests,

and practices are to a large extent determined by the institutional logics that structure the organizational fields in which they operate. But this observation is not far-fetched for an institutional environment that is highly homogeneous and that has consistently upheld its societal values for a long time.

CFO's discretion and firm performance

The second reason why the fundamental redistribution of managerial roles from which the CFO's position became only second to the CEO can be linked to the shareholder-value orientation, a view that Fligstein (1990) alludes to in his seminal study. According to Fligstein (1990), finance managers, at a time when changing antitrust legislation was limiting firms from creating value, succeeded in convincing corporate boards and investors that their management specialty held the key to corporate efficacy. Put differently, finance managers, who then rose to CFOs, sold an institutional logic of value creation to relevant stakeholders, that they would make corporations prosperous if managerial discretion was granted to them. In the U.S. the institutional logic of shareholder-value creation remains, and investors, boards, regulators and CFOs alike work on this assumption. Moreover, both formal and informal institutions are complementary in this variety of capitalism (Aguilera and Jackson, 2006).

However, in Japan the situation is different. As discussed above the institutional logic of the purpose of the firm is not to maximize shareholder value, but instead to satisfy a host of stakeholders. Thus, while CFOs may have been appointed in some Japanese firms, their emphasis on the strategic role that consequently drives firm performance might not be the same as that by their counterparts in the U.S. For instance, given that financial interests such as short-term profitability are commonly associated with shareholder-oriented logics, and not with relationship-oriented logics, CFOs in Japan are unlikely to emphasize this concern over and

above other stakeholders' concerns. There are good reasons for this. First, although Japanese firms have introduced shareholder-oriented practices, they are still embedded in an institutional setting characterized by strong stakeholder rights, cooperation between constituencies and a coordinated market economy (Capron and Guillen, 2009; Hall and Soskice, 2001). While pursuing short term profits in the U.S. is an acceptable thing to do, in the institutional setting of Japan, the same practice may be seen as illegitimate. Indeed, a practice can be viewed as illegitimate when it contradicts the dominant logic (Chung and Luo, 2008). For example, because it is typically accompanied by downsizing, divesture has long been considered illegitimate in Japan, where an institutional logic of balancing the needs of multiple stakeholders, including providing lifetime employment for core workers, prevails (Ahmadjian and Robbins, 2005).

Second, internal stakeholders such as employees, the board and even the CEO may oppose any action by the CFO that points at the achievement of shareholder value. The dominant logic manifest in societal expectations and in the broader formal and informal institutions, rooted in the history of the national environment, is restrictive such that the CFO's discretion may be limited, with no impact on firm financial performance. This is particularly the case in the case of Japan, a context characterized with low levels of individualism (Hofstede, 2001) and managerial discretion (Crossland and Hambrick, 2011).

We therefore hypothesize that:

Hypothesis 8: The presence of the CFO will be negatively related to firm performance.

METHODOLOGY

Sample and Data

Our primary data source of individual CFOs is collected from the Nikkei NEEDS Board Member Data. As for financial data, we use the Nikkei NEEDS Corporate Governance Data

Financial and Quick Astra Manager. Our sample firms are limited to non-financial firms that were listed on the Tokyo Stock exchange from 2017 to 2021. Firms with missing variables are excluded from our sample data. Following this selection criteria, 1740 firms enter our sample, yielding 8900 firm-year observations.

Dependent variables

For the first hypothesis, on the determinants of having a CFO in the firm, we use one dependent variable, *cfodummy*, which is 1 when the company has CFO presence and 0 otherwise. For the hypotheses on the effects of the CFO on market value performance, we use two dependent variables: Tobin's Q and annualized value of daily returns. The proxy for Tobin's *q* is the ratio of the firm's market value to its book value. The firm's market value is calculated as the book value of assets minus the book value of equity plus the market value of equity. We derive annual returns by converting daily returns using the formula:

$$\text{Annual return} = [(\text{Daily return} + 1)^{365} - 1)] \times 100. \tag{Eq. 1}$$

We also use two measures for firm's accounting performance: return on assets (ROA) and return on equity (ROE). ROA is the net profit ratio before extraordinary items and discontinued operations to its book value of assets and ROE is the net profit ratio attributable to parent firms' owners to shareholders' equity.

Explanatory variables

For the hypotheses on CFO determinants, we use several independent variables: foreign ownership, controlling shareholder ownership, minority ownership, cross-ownership, bank ownership, proportion of independent directors, board average age, number of subsidiaries, foreign sales, and disclosure materials in English. Foreign ownership is the percentage of shareholding by foreigners. Controlling shareholder ownership is the percentage of the total shareholding by the block shareholders with more than 15% of the outstanding share in a firm.

Minority ownership in our analysis refers to the shareholding by those who own less than the number of tradable share numbers. Cross ownership is the shareholdings by other firms in the same business group to which the firm in question belongs. Bank ownership is the percentage of shareholding by a Japanese main bank in the same business group to which the firm in question belongs. Board independence is the fraction of independent directors on the board expressed as a proportion of the total board size. Board average age and number of subsidies are self-explanatory. Foreign sales is the percentage of oversea sales over the total sales of a firm. Disclosure material in English is a dummy variable of 1 for a firm providing disclosure materials in English to overseas investors and 0 otherwise.

Control variables

For the hypothesis on the effects of the CFO, we control for several corporate governance attributes, ownership, as well as other firm characteristics, namely, female board member ratio, firm sales size, and firm experience. Female board member ratio is the fraction of independent directors on the board expressed as a proportion of the total board size. Firm size is measured as the natural logarithm of the firm's total sales. Firm experience and year from listing are the number of years since the firm was established and years since the firm was listed on the Japan stock exchange respectively. Moreover, two financial variables, debt and cash flow management, measuring key tasks for CFOs are included as control variables for analysis (Bragg, 2010). As for debt management, leverage is defined as the proportion of total debt to total assets, whilst cash flow is the ratio of free cash flow to the total asset of a firm. To control for the outlier effects, higher/lower than the top/bottom 1% of the variables for each year are winsorized to the values corresponding to the top/bottom 1% and 99% of the variables.

Estimation Strategies

Logit regression

To study the determinants of CFO presence in firms (hypotheses 1-7), we used logistic regression analysis. In a logistic regression a binary variable indicating whether a firm has a CFO or not is regressed on several explanatory variables expected to influence the presence of the CFO. Specifically, we estimate the following logistic regression model:

$$Y_i = \beta_1 + \beta_2 X_i + \beta_3 X_i + \cdots . \beta_n X_n + \mu_i \qquad \text{(Eq. 2)}$$

where Yi, CFO presence is an indicator variable taking the value 1 if the firm employs a CFO and 0 otherwise. For logit regression, the dummy variable is the logarithm of the odd that a firm has a CFO or not. Xi are the explanatory and control variables in the preceding section. As our data contains firms with clustering on 29 industry categories, our logit regression models use cluster-robust standard errors for controlling the industry sector effect.

System GMM

We then test hypothesis 8 using system GMM. Our empirical specification is follows:

$$y_{i,t} = \alpha y_{i,t-1} + \beta x'_{i,t} + \mu_i + \varepsilon_{i,t} \qquad \text{(Eq. 3)}$$

In this expression, $y_{i,t}$ is firm performance for firm i in period t, $x'_{i,t}$ represents a vector of variables influencing firm performance, μ_i represents the unobservable firm-specific effect, and $\varepsilon_{i,t}$ is the error term. Based on this econometric model, we test our hypotheses employing system GMM, a tool that mitigates the endogeneity problem with explanatory variables (Arellano & Bond, 1991). System GMM is also able to correct unobserved country heterogeneous problems, omitted variable bias and measurement error.

RESULTS

Table 1 provides descriptive statistics for the independent variable (CFO dummy), independent and control variables. Table 1 also splits the sample into two distinctive statuses, firms with CFO and firms without CFO. Table 2 shows the distribution of presence of CFO

among the sample firms by each sample year together with means of each performance variable. Table 2 also contains subsections for with and without CFOs in similar fashion to Table 1.

Table 1 about here

A quick inspection on Table 2 reveals two noteworthy features. First, the presence of CFOs is not common to firms in Japan, accounting for only 1 out of 10 firms even in recent years. Second, firms with CFOs appear to perform better than firms without CFOs across the performance measures, except for annual total share return. The volatility of the share return of firms with CFOs is much higher than those of firms without CFOs. The observation indicates that the nature of business that firms with CFOs engage in may be riskier than that of firms without CFOs. Hence, the presence of CFOs can be attributable to the nature of risk that the firm faces in that CFOs are expected to manage the firm risk.

Tables 2 and 3 about here

Table 3 presents the t-test results for comparing four performance variables between the firms with and without CFOs. The results indicate that on average, firms with CFOs outperform those without CFOs. Table 4 provides the correlation matrix, showing all of the variables are not highly correlated.

Table 4 about here

Table 5 presents the results of the logit regression analysis. The first five models are annual cross-sectional logit regression for each sample year from 2017 to 2021. The last model is the five-year pooled logit model with the four-year dummy variables. Each regression result in Table 5 contains three columns for the variable outcomes: coefficient, odd ratio and margins. Our main interpretation for the results is centered on the third column of margins to understand

the magnitude of change. Note that the range of change for the variables remains almost constant for firm i over the five years, the results of the annual cross-sectional logit models are consistent with those of the pooled logit model. The common findings across the models are that foreign ownership is not statistically significant to the presence of CFOs.

The result fails to support the first hypothesis. The second hypothesis is supported in that cross-holding ownership is negatively and significantly related to the presence of CFOs in year regressions as well as in the pooled model. The five-year pooled model shows the margin effect of the crossholding on the presence of CFOs is -0.003, suggesting that with an increase of one per cent in the cross-shareholding of a firm, the probability of having a CFO decreases 0.3 percentage points. The third hypothesis that predicts the negative effect of main bank shareholding on the presence of the CFO is supported. Across the models, the coefficient and odd ratio are negative and statistically significant at the 1, 5 and 10% levels. The interpretation is that with an increase of one per cent of a main bank's shareholding, the probability of the firm having a CFO decreases 1.2 percentage points.

Table 5 about here

The fourth hypothesis on controlling and minority shareholders is not supported, given the statistically insignificant coefficients across the models. The coefficient for the independent director ratio is positive and statistically significant, showing in the pooled model, for example, (β=0.023, p<0.01). The margin result from the pooled model indicates that with an increase of one per cent in the independent director ratio of a firm, the probability of having a CFO increases by 0.2 percentage points.

Our results also show that the age of board directors matters for the presence of CFOs as the coefficient of the variable is negatively related to the dependent variable at the statistically significant level of 5%. The interpretation from the pooled model is that with an

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increase of one year of the board average age of a firm, the probability of having a CFO decreases by 0.5 percentage points.

Both hypothesis 7a and 7b are supported as the coefficient of the dummy variable on the availability of disclosure materials in English and that of foreign sales are both positive and statistically significant at the 1% level. The margin of the former exceeds 0.05 across the model. This means that with disclosure materials in English that a firm provides, the probability of having a CFO increases by at least 5 percentage points.

Table 6 about here

As for the eighth hypothesis on performance, the GMM results in Table 6 show that the presence of the CFOs has a positive impact on Tobin's Q and annual share return but no effect on ROA and ROE. Given the fact that the two performance variables, Tobin's Q and annual share return, are market-based measures whilst the other two performance variables, ROA and ROE, are based on accounting financial ratios, we can argue that the presence of CFOs are highly perceived by market participants. On the other hand, however, the presence of CFOs hardly contributes to improve the state of the firm's business.

DISCUSSION

This study sought to understand the effect of the CFO in Japanese firms. As pointed out earlier, the concept of the CFO started in the U.S. and its entry in Japan is a recent phenomenon that has been adopted by some firms. While in the U.S. the dominant logic is that of shareholder-value maximization, in Japan the focus is on the balancing of the interests of multiple stakeholders. Understanding the role of the CFO in the contexts of the U.S. and Japan is, therefore, based on different assumptions about how organizations and individuals behave. For the U.S. a natural theoretical lens to understand the behaviour of individuals and firms is agency

theory that emphasizes intrinsic interests and agency costs as the driving forces behind strategic decision making (Jensen and Meckling 1976). In Japan, a stakeholder approach is necessary to understand the attitude of individuals and organisations as they make decisions that affect multiple stakeholders.

In this study, because of the two contrasting governance logics, brought about by the introduction of a shareholder-oriented practice in stakeholder-oriented space, we employed a neo-institutional approach that holds that both the goal and the means to achieve the goal are shaped by the dominant institutional logics in society (Thornton and Ocasio, 2008), seen as collectively constructed assumptions, values, beliefs, formal and informal rules, and practices.

Thus, drawing on the perspective of institutional logics, we set to test several hypotheses in order to establish the characteristics of firms that have CFOs. We went further to test whether the presence of the CFO in Japanese companies translates to better firm performance. Consistent with the institutional logic of Japanese corporate governance, our results on the factors that explain the presence of the CFO confirm most of our hypotheses. Specifically, our findings reveal that a firm that has more independent and younger directors on the board, that discloses its materials in English and sells more abroad and relies less on cross-shareholding and main bank shareholding tends to have CFO presence.

Our findings on the effect of the CFO on firm performance show no impact on accounting-based performance but a positive impact on market-based performance. This means that CFOs in Japanese firms may not be necessarily effective, but the market views them favorably.

For instance, the negative and significant coefficients on the impact of cross shareholdings and bank ownership on firm performance underscores the fact that, despite the so-called reforms, continuity of the old institutional logic and not change is the current state of

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Japanese corporate governance. Furthermore, our study extends the institutional logics

argument by investigating organizational responses to conflicting institutional logics.

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Table 1: Descriptive Statistics

Variables	All Sample	Mean	SD	Max	Min	Without CFO	Mean	SD	With CFO	Mean	SD
CFO Presence (Dummy)	8900	0.106	0.308	1	0	7957	0	0	943	1	0
Foreign Shareholders (%)	8900	0.066	0.643	16.9	0	7957	0.063	0.656	943	0.093	0.523
Cross Shareholding (%)	8900	8.369	9.614	60.4	0	7957	8.843	9.779	943	4.367	6.897
Main Bank Shareholding (%)	8900	1.589	1.736	13.1	0	7957	1.676	1.760	943	0.852	1.297
Controlling/Block Shareholders (%)	8900	11.337	17.441	89.4	0	7957	11.290	17.221	943	11.736	19.209
Minority Shareholdings (%)	8900	13.509	10.267	89	0	7957	13.826	10.396	943	10.837	8.659
Independent Director Ratio (%)	8900	30.333	11.702	88.9	0	7957	29.623	11.270	943	36.330	13.443
Female Director Ratio (%)	8900	5.788	7.009	60	0	7957	5.491	6.803	943	8.290	8.134
Average Board Members Age	8900	60.995	4.563	80	0	7957	61.113	4.408	943	60.001	5.613
Presentation in English	8900	0.220	0.415	1	0	7957	0.184	0.388	943	0.524	0.500
Foreign Sales (%)	8900	19.172	26.031	100	0	7957	17.807	25.172	943	30.692	30.021
Years from listing	8900	37.034	22.478	72	0	7957	37.372	22.196	943	34.185	24.553
Total Sales (Yen million)	8900	375,594	1,252,333	30,000,000	587	7957	309,362	1,108,977	943	934,460	2,019,720
Market Capitalization (Yen Million)	8900	298,488	998,603	28,000,000	2056	7957	249,937	905,812	943	708,158	1,517,510
Firm Age for Experience	8900	59.835	27.622	140	1	7957	60.720	27.108	943	52.369	30.637
Number of Subsidiaries	8900	34.174	86.028	1556	0	7957	27.838	60.354	943	87.643	189.605
Leverage (%)	8900	45.271	18.376	89.5	8.7	7957	44.503	18.316	943	51.754	17.595
Cash Flow (%)	8900	-0.133	6.022	21.2031	-26.356	7957	-0.214	5.879	943	0.544	7.082

Table2 Distribution of CFOs (Panel A) and means of performance variables for each sample year (Panel B).

Panel A

Year	2017	2018	2019	2020	2021	Total
Total Sample	1,780	1,780	1,780	1,780	1,780	8,900
Without CFO	1,604	1,596	1,610	1,585	1,562	7,957
With CFO	176	184	170	195	218	943

Panel B

	2017	2018	2019	2020	2021	Total
ROE (total sample)	9.458	10.046	8.828	6.482	4.907	7.944
Without CFO	9.405	9.762	8.623	6.509	4.888	7.855
With CFO	9.946	12.504	10.774	6.268	5.047	8.701
ROA (total sample)	7.535	7.809	7.419	6.185	5.390	6.868
Without CFO	7.466	7.695	7.295	6.185	5.350	6.807
With CFO	8.167	8.802	8.586	6.186	5.675	7.381
Tobin's Q (total sample)	1.392	1.531	1.381	1.287	1.433	1.405
Without CFO	1.352	1.476	1.338	1.252	1.378	1.359
With CFO	1.755	2.007	1.787	1.573	1.821	1.788
Annual Share Return (total sample)	36.335	47.041	-12.660	-4.058	50.035	23.339
Without CFO	36.647	45.412	-13.147	-3.636	48.322	22.597
With CFO	33.500	61.179	-8.048	-7.486	62.313	29.596

Table 3.Comparison of performance variables between firms with and without CFOs.

5 year-Performance	Without CFO	With CFO	T statics Difference
Average ROE(%)	7.855	8.701	-2.372
Average ROA (%)	6.807	7.381	-2.66
Average Tobin's Q	1.359	1.788	-11.439
Average Share Return(%)	22.60	29.60	-3.193

Table 4: Correlations (**bold** indicates the 5% statistically significant level)

		1	2	3	4	5	6	7	8	9	10	11
1	CFO Presence (Dummy)	1										
2	ROE	0.025	1									
3	ROA	0.028	0.783	1								
4	Tobin's Q	0.12	0.355	0.606	1							
5	Annual Total Share Return (%)	0.034	0.249	0.228	0.281	1						
6	Foreign Shareholders (%)	0.014	-0.002	0.008	0.036	0	1					
7	Cross Shareholding (%)	-0.143	-0.123	-0.203	-0.277	-0.039	-0.058	1				
8	Main Bank Shareholding (%)	-0.146	-0.102	-0.173	-0.245	-0.008	-0.059	0.505	1			
9	Controlling/Block Shareholders (%)	0.008	0.04	0.062	0.043	0.018	-0.019	-0.271	-0.239	1		
10	Minority Shareholdings (%)	-0.09	-0.196	-0.231	-0.109	-0.064	0.001	-0.024	0.082	-0.096	1	
11	Independent Director Ratio (%)	0.176	-0.027	0.004	0.1	0.03	0.02	-0.122	-0.103	-0.132	-0.065	1
12	Female Director Ratio (%)	0.123	-0.002	0.031	0.115	0.003	0.002	-0.13	-0.132	-0.019	-0.066	0.276
13	Average Board Members Age	-0.075	-0.135	-0.233	-0.323	-0.066	-0.036	0.28	0.237	-0.134	-0.092	0.048
14	Presentation in English	0.252	0.079	0.05	0.094	0.02	0.044	-0.126	-0.166	-0.073	-0.215	0.211
15	Foreign Sales (%)	0.152	-0.046	-0.039	-0.065	0.046	0.04	0.076	0.077	-0.126	-0.169	0.168
16	Years from listing	-0.044	-0.149	-0.278	-0.32	-0.06	-0.067	0.482	0.301	-0.174	0.013	-0.005
17	Total Sales (Yen million)	0.154	0.029	-0.059	-0.061	-0.014	-0.019	-0.019	-0.081	-0.086	-0.138	0.123
18	Market Capitalization (Yen Million)	0.141	0.096	0.073	0.115	0.055	-0.013	-0.041	-0.102	-0.075	-0.19	0.128
19	Firm Age for Experience	-0.093	-0.159	-0.272	-0.339	-0.059	-0.068	0.475	0.314	-0.169	0.004	-0.023
20	Number of Subsidiaries	0.214	0.023	-0.068	-0.056	0.009	-0.019	-0.019	-0.081	-0.109	-0.153	0.16
21	Leverage (%)	0.121	-0.104	-0.355	-0.194	-0.019	0.011	-0.013	-0.027	-0.013	0.162	-0.014
22	Cash Flow (%)	0.039	0.481	0.577	0.333	0.176	-0.022	-0.081	-0.073	0.041	-0.183	0.037

Table 3 (cont): Correlations (**Bold** indicates the 5% statistically significant level)

		12	13	14	15	16	17	18	19	20	21	22
12	Female Director Ratio (%)	1										
13	Average Board Members Age	-0.096	1									
14	Presentation in English	0.204	0.058	1								
15	Foreign Sales (%)	-0.009	0.226	0.241	1							
16	Years from listing	-0.077	0.414	0.047	0.264	1						
17	Total Sales (Yen million)	0.143	0.141	0.324	0.172	0.16	1					
18	Market Capitalization (Yen Million)	0.143	0.117	0.324	0.222	0.122	0.751	1				
19	Firm Age for Experience	-0.063	0.413	-0.034	0.253	0.813	0.085	0.06	1			
20	Number of Subsidiaries	0.148	0.148	0.356	0.228	0.2	0.679	0.607	0.146	1		
21	Leverage (%)	0.016	0.033	0.108	-0.065	0.115	0.186	0.031	0.036	0.195	1	
22	Cash Flow (%)	0.043	-0.069	0.07	0.077	-0.077	0.008	0.08	-0.073	-0.001	-0.174	1

Table 4: Logistic Regression

Variables	Year 2017			Year 2018			Year 2019		
	Coefficient	Odd Ratio	Margins	Coefficient	Odd Ratio	Margins	Coefficient	Odd Ratio	Margins
Foreign Shareholders (%)	-0.055	0.947	-0.004	0.03	1.031	0.002	-0.083	0.92	-0.006
	(-0.051)	(-0.048)	(-0.004)	(-0.069)	(-0.071)	(-0.005)	(-0.952)	(-0.081)	(-0.006)
Cross Shareholding (%)	-0.026***	0.975***	-0.002***	-0.032**	0.969**	-0.002**	-0.045***	0.956***	-0.003***
	(-0.010)	(-0.010)	(-0.001)	(-0.013)	(-0.013)	(-0.001)	(-3.267)	(-0.013)	(-0.001)
Main Bank Shareholding (%)	-0.196***	0.822***	-0.014***	-0.185***	0.831***	-0.014***	-0.131**	0.877**	-0.010**
	(-0.058)	(-0.048)	(-0.004)	(-0.058)	(-0.048)	(-0.005)	(-2.056)	(-0.056)	(-0.005)
Controlling/Block Shareholders (%)	0.004	1.004	0	0.001	1.001	0	0.001	1.001	0
	(-0.004)	(-0.004)	(0.000)	(-0.005)	(-0.005)	(0.000)	(-0.144)	(-0.004)	(0.000)
Minority Shareholdings (%)	-0.013	0.987	-0.001	-0.018	0.983	-0.001	-0.017*	0.983*	-0.001*
	(-0.010)	(-0.010)	(-0.001)	(-0.012)	(-0.012)	(-0.001)	(-1.765)	(-0.009)	(-0.001)
Independent Director Ratio (%)	0.028***	1.028***	0.002***	0.023***	1.023***	0.002***	0.019**	1.020**	0.001**
	(-0.009)	(-0.009)	(-0.001)	(-0.008)	(-0.008)	(-0.001)	(-2.257)	(-0.009)	(-0.001)
Female Director Ratio (%)	0.016**	1.017**	0.001**	0.023**	1.023**	0.002**	0.025*	1.025*	0.002*
	(-0.008)	(-0.008)	(-0.001)	(-0.011)	(-0.011)	(-0.001)	(-1.823)	(-0.014)	(-0.001)
Average Board Members Age	-0.046**	0.955**	-0.003**	-0.043**	0.958**	-0.003**	-0.050**	0.951**	-0.004**
	(-0.020)	(-0.019)	(-0.001)	(-0.018)	(-0.017)	(-0.001)	(-2.537)	(-0.019)	(-0.001)
Presentation in English	0.783***	2.187***	0.058***	0.708***	2.031***	0.055***	0.759***	2.137***	0.055***
	(-0.190)	(-0.417)	(-0.016)	(-0.191)	(-0.389)	(-0.016)	(-4.067)	(-0.399)	(-0.016)
Foreign Sales (%)	0.015***	1.015***	0.001***	0.016***	1.016***	0.001***	0.016***	1.016***	0.001***
	(-0.004)	(-0.004)	(0.000)	(-0.004)	(-0.004)	(0.000)	(-4.062)	(-0.004)	(0.000)
Total Sales (Yen million)	-0.199**	0.820**	-0.015*	-0.160**	0.852**	-0.012**	-0.071	0.932	-0.005
	(-0.098)	(-0.080)	(-0.008)	(-0.070)	(-0.060)	(-0.006)	(-0.745)	(-0.088)	(-0.007)
Number of Subsidiaries	0.422***	1.525***	0.031***	0.335***	1.399***	0.026***	0.203**	1.224**	0.015**
	(-0.104)	(-0.159)	(-0.008)	(-0.130)	(-0.182)	(-0.010)	(-2.123)	(-0.117)	(-0.007)
Firm Age for Experience	-0.275**	0.760**	-0.020**	-0.418***	0.658***	-0.032**	-0.467**	0.627**	-0.034**
	(-0.123)	(-0.093)	(-0.009)	(-0.160)	(-0.105)	(-0.014)	(-2.094)	(-0.140)	(-0.017)
Years from listing	0.004	1.004	0	0.005	1.005	0	0.008	1.008	0.001
	(-0.005)	(-0.005)	(0.000)	(-0.005)	(-0.005)	(0.000)	(-1.154)	(-0.007)	(0.000)
Leverage (%)	0.024***	1.024***	0.002***	0.023***	1.024***	0.002***	0.024***	1.024***	0.002***
	(-0.006)	(-0.006)	(0.000)	(-0.006)	(-0.006)	(0.000)	(-3.636)	(-0.007)	(0.000)
Cash Flow (%)	0.024**	1.024**	0.002**	0.025*	1.025*	0.002	0.035***	1.036***	0.003***
	(-0.012)	(-0.012)	(-0.001)	(-0.015)	(-0.015)	(-0.001)	(-2.827)	(-0.013)	(-0.001)
	3.205	24.657		3.027*	20.637*		1.548	4.704	
	(-2.049)	(-0.531)		(-1.713)	(-5.353)		(-0.605)	(-2.041)	
Observations	1,780			1780			1,780		
Pseudo R2	0.203			0.197			0.19		
Prob > chi2	0.000			0.000			0.000		

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 (cont): Logistic Regression

Variables	Year 2020 Coefficient	Odd Ratio	Margins	Year 2021 Coefficient	Odd Ratio	Margins	5 Year-Pooled Coefficient	Odd Ratio	Margins
Foreign Shareholders (%)	-0.115	0.892	-0.009	-0.11	0.896	-0.01	-0.06	0.942	-0.005
	(-1.036)	(-0.099)	(-0.009)	(-1.121)	(-0.088)	(-0.008)	(-0.915)	(-0.062)	(-0.005)
Cross Shareholding (%)	-0.028**	0.973**	-0.002**	-0.035***	0.965***	-0.003***	-0.033***	0.968***	-0.003***
	(-2.327)	(-0.012)	(-0.001)	(-3.004)	(-0.011)	(-0.001)	(-3.568)	(-0.009)	(-0.001)
Main Bank Shareholding (%)	-0.119**	0.888**	-0.010**	-0.098*	0.907*	-0.009*	-0.145***	0.865***	-0.012***
	(-2.192)	(-0.048)	(-0.005)	(-1.934)	(-0.046)	(-0.005)	(-3.282)	(-0.038)	(-0.004)
Controlling Shareholders (%)	0.003	1.003	0	0.002	1.002	0	0.002	1.002	0
	(-0.777)	(-0.004)	(0.000)	(-0.537)	(-0.004)	(0.000)	(-0.629)	(-0.004)	(0.000)
Minority Shareholdings (%)	-0.016	0.984	-0.001	-0.01	0.99	-0.001	-0.014	0.986	-0.001
	(-1.400)	(-0.011)	(-0.001)	(-0.908)	(-0.011)	(-0.001)	(-1.466)	(-0.010)	(-0.001)
Independent Director Ratio (%)	0.025***	1.025***	0.002***	0.018**	1.019**	0.002**	0.023***	1.023***	0.002***
	(-3.658)	(-0.007)	(-0.001)	(-2.217)	(-0.008)	(-0.001)	(-3.404)	(-0.007)	(-0.001)
Female Director Ratio (%)	0.014	1.014	0.001*	0.008	1.008	0.001	0.016*	1.016*	0.001*
	(-1.584)	(-0.009)	(-0.001)	(-0.596)	(-0.013)	(-0.001)	(-1.795)	(-0.009)	(-0.001)
Average Board Members Age	-0.069**	0.933**	-0.006***	-0.079***	0.924***	-0.007***	-0.057***	0.945***	-0.005***
	(-2.431)	(-0.026)	(-0.002)	(-2.618)	(-0.028)	(-0.002)	(-2.792)	(-0.019)	(-0.001)
Presentation in English	0.815***	2.258***	0.067***	0.776***	2.173***	0.070***	0.771***	2.162***	0.061***
	(-4.726)	(-0.389)	(-0.015)	(-5.325)	(-0.317)	(-0.015)	(-5.274)	(-0.316)	(-0.013)
Foreign Sales (%)	0.016***	1.016***	0.001***	0.014***	1.014***	0.001***	0.015***	1.015***	0.001***
	(-4.506)	(-0.004)	(0.000)	(-3.887)	(-0.004)	(0.000)	(-4.431)	(-0.003)	(0.000)
Total Sales (Yen million)	-0.005	0.995	0	0.079	1.082	0.007	-0.062	0.94	-0.005
	(-0.101)	(-0.053)	(-0.004)	(-1.130)	(-0.075)	(-0.006)	(-1.007)	(-0.058)	(-0.005)
Number of Subsidiaries	0.159*	1.172*	0.013*	0.144	1.154	0.013	0.240***	1.271***	0.019***
	(-1.762)	(-0.106)	(-0.007)	(-1.435)	(-0.116)	(-0.009)	(-2.577)	(-0.118)	(-0.007)
Firm Age for Experience	-0.404**	0.667**	-0.033*	-0.445**	0.641**	-0.040**	-0.379**	0.684**	-0.030**
	(-2.103)	(-0.128)	(-0.017)	(-2.550)	(-0.112)	(-0.017)	(-2.572)	(-0.101)	(-0.013)
Years from listing	0.002	1.002	0	0.004	1.004	0	0.004	1.004	0
	(-0.232)	(-0.007)	(-0.001)	(-0.610)	(-0.007)	(-0.001)	(-0.741)	(-0.005)	(0.000)
Leverage (%)	0.017***	1.017***	0.001***	0.017***	1.017***	0.002***	0.021***	1.021***	0.002***
	(-2.611)	(-0.007)	(0.000)	(-2.898)	(-0.006)	(0.000)	(-3.597)	(-0.006)	(0.000)
Cash Flow (%)	-0.017	0.983	-0.001*	-0.003	0.997	0	0.009	1.009	0.001
	(-1.577)	(-0.011)	(-0.001)	(-0.382)	(-0.009)	(-0.001)	(-1.315)	(-0.007)	(-0.001)
	1.312	3.715		0.251	1.285		1.656	5.237	
	(-0.758)	(-6.433)		(-0.125)	(-2.591)		(-1.009)	(-8.595)	
Observations	1780			1,780			8,900		
Pseudo R2	0.186			0.178			0.187		
Prob > chi2	0.000			0.000			0.000		

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: System GMM results of CFO's impact on firm performance

Dependent Variable (DV)	Accounting performance		Market performance	
	ROE	ROA	Tobin's Q	Annual returns
DV (t-1)	0.459***	0.809***	0.343***	0.059***
	(0.088)	(0.069)	(0.058)	(0.020)
CFO presence	-1.359	0.369	0.169**	16.048*
	(1.454)	(0.635)	(0.088)	(8.933)
Foreign ownership	0.117	0.147	-0.005	-0.088
	(0.339)	(0.129)	(0.019)	(3.133)
Crossholdings	0.076	-0.045	0.004	1.122*
	(0.091)	(0.032)	(0.004)	(0.592)
Bank ownership	-0.023	0.078	0.018***	9.705***
	(0.130)	(0.053)	(0.007)	(1.135)
Dominant shareholder	0.036	0.02	-0.001	0.227
	(0.049)	(0.022)	(0.003)	(0.341)
Independent directors	0.013	0.017	0.001	0.281
	(0.027)	(0.013)	(0.002)	(0.206)
Female directors	-0.028	0.024	0.004	-0.262
	(0.049)	(0.022)	(0.003)	(0.363)
Board age	0.054	-0.017	-0.002	-0.523
	(0.126)	(0.040)	(0.005)	(0.652)
AGM in English	-0.746	0.206	0.039	5.487
	(1.893)	(0.864)	(0.133)	(15.700)
Years since listed	-1.315*	-0.467***	-0.009	6.898***
	(0.768)	(0.082)	(0.012)	(1.056)
Foreign sales	-0.052	0.032	-0.006*	-0.04
	(0.074)	(0.029)	(0.003)	(0.254)
Logfirmage	-6.814	-3.083	-0.537**	-107.845***
	(4.349)	(1.940)	(0.239)	(31.182)
Logtotalsales	21.165	8.592***	-0.285**	-37.782***
	(2.152)	(1.020)	(0.128)	(7.847)
Logsubsidiaries	-4.947***	-1.693***	-0.173**	-3.822
	(1.454)	(0.620)	(0.080)	(8.634)
Minority ownership	0.018	-0.041**	-0.006***	-1.396***
	(0.040)	(0.019)	(0.002)	(0.327)
Year dummies	Yes	Yes	Yes	Yes
Constant	-445.369***	-181.848	11.234***	1164.109***
	(54.072)	(24.746)	(3.309)	(221.982)
Wald chi2(16) =	575.07***	585.32***	111.400***	184.04***
N	1780	1780	1780	1780
Observations	7120	7120	7120	7120

Navigating Financial Turmoil: Assessing Distress in Japanese Companies through Readability and Length Cues.

Noriyuki TSUNOGAYA,
Yoshikatsu SHINOZAWA
Graduate School of Business Administration
Hitotsubashi University, Tokyo, Japan

Abstract

Purpose: This research scrutinizes the narrative disclosure information, specifically "Management Discussion and Analysis (MD&A)," within the quarterly flash earnings reports submitted by bankrupt firms on the Japan Stock Exchange. The primary objective is to explore potential differences in readability and content between insolvent and solvent firms in Japan.

Design/Methodology/Approach: The sample comprises 80 bankrupted firms listed on the Exchange in Japan between 2009 and 2019, matched with 80 solvent firms of similar sales size and industry. Employing text mining techniques, we conduct both syntactic and content analyses. Syntactic analysis involves assessing readability through metrics such as sentence length, the proportion of verbs, and particle content. Content analysis involves classifying words in the text as positive or negative. Regression analyses, incorporating control variables (size, age, debt ratio, industries, and years), examine the relationship between readability, content, and the bankruptcy dummy variable. Additional analysis includes regressing readability and content measures against the dummy variable distinguishing "liquidation" and "reconstruction" firms within the bankrupted sample.

Findings: The results support our hypothesis, revealing that MD&A documents from bankrupt firms exhibit lower readability, characterized by shorter sentences and a more negative sentiment compared to their solvent counterparts. However, no significant differences emerge between "liquidation" and "reconstruction" firms within the bankrupted sample in terms of readability, sentence length, and sentiment.

Originality: This study addresses a gap in the existing literature by considering non-quantitative data in the analysis of financial statements, leveraging advancements in AI technology, particularly in text mining. Unlike previous studies employing univariate analyses without accounting for firm diversity, our research controls for certain firm characteristics while focusing on the unique context of Japanese firms.

Table 1: Descriptive Statistics of the dependent variables with T-test results

Panel A	Dependent Variable (1) Readability	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]	T Test	
	Solvent Firms	80	0.498	0.057	0.514	0.384	0.613		
	Bankrupt Firms	80	0.308	0.064	0.568	0.182	0.435		
	All Samples	160	0.403	0.043	0.549	0.318	0.489		
	Difference		0.190	0.086		0.021	0.359	t=2.2158	p=0.0281
Panel B	Dependent Variable (2) Length of Sentences (the decimal logarithm)								
	Solvent Firms	80	3.729	0.043	0.385	3.643	3.815		
	Bankrupt Firms	80	3.612	0.027	0.244	3.558	3.666		
	All Samples	160	3.670	0.026	0.327	3.619	3.721		
	Difference		0.117	0.051		0.016	0.218	t=2.2977	p=0.0229
Panel C	Dependent Variable (3) Sentiment								
	Solvent Firms	80	0.355	0.012	0.107	0.331	0.379		
	Bankrupt Firms	80	0.498	0.015	0.130	0.469	0.527		
	All Samples	160	0.426	0.011	0.139	0.404	0.448		
	Difference		-0.143	0.019		-0.180	-0.106	t=-7.5730	p=0.000

Table 2: Descriptive Statistics of the control variables.

Total Sample	Mean	SD	Maximum	Minimum
Z-score	-0.875	26.150	30.604	-258.524
Firm Size (the decimal logarithm)	9.486	0.768	11.462	7.584
Firm Age	38.856	25.950	106.000	-11.000
Debt Ratio (debts with interest over total asset)	34.063	76.332	869.231	0.000

Sub-sample (bankrupted firms)

	Mean	SD	Maximum	Minimum
Z-score	-6.356	36.007	11.434	-258.524
Firm Size (the decimal logarithm)	9.173	0.691	11.462	7.584
Firm Age	34.438	26.031	106.000	-11.000
Debt Ratio (debts with interest over total asset)	55.888	102.390	869.231	0.000

Sub-sample (solvency firms)

	Mean	SD	Maximum	Minimum
Z-score	4.607	4.355	30.604	0.468
Firm Size (the decimal logarithm)	9.798	0.716	11.448	8.508
Firm Age	43.275	25.263	99.000	7.000
Debt Ratio (debts with interest over total asset)	12.238	16.692	60.451	0.000

Table 3: The regression results (I)

VARIABLES	(Model 1) Readability	(Model 2) Readability	(Model 3) Sentences	(Model 4) Sentences	(Model 5) Sentiment	(Model 6) Sentiment
Bankruptcy Firm (dummy)	-0.206**	-0.162*	-0.162***	-0.115**	0.125***	0.115***
	(0.0983)	(0.0880)	(0.0558)	(0.0524)	(0.0210)	(0.0211)
Bankruptcy Year (dummy)	0.0316	0.0102	0.0130	-0.0189	-0.00851	0.00990
	(0.0865)	(0.0897)	(0.0484)	(0.0610)	(0.0188)	(0.0208)
FirmSize(decimal logarithm)	-0.0606	-0.0162	0.000265	0.0429	-0.0272*	-0.0368**
	(0.0661)	(0.0765)	(0.0312)	(0.0376)	(0.0139)	(0.0150)
Firm Age	-0.00132	0.00165	-0.00452***	-0.00289***	0.000588	0.000165
	(0.00158)	(0.00188)	(0.000920)	(0.00109)	(0.000447)	(0.000453)
Debt Ratio	-0.000754	-0.000476*	0.000129	-6.23e-06	0.000148***	8.89e-05
	(0.000486)	(0.000250)	(0.000254)	(0.000205)	(5.36e-05)	(6.88e-05)
Constant	1.142*	-0.0348	3.914***	3.298***	0.598***	0.797***
	(0.647)	(0.767)	(0.314)	(0.394)	(0.132)	(0.166)
Industry Sector Controlled	No	Yes	No	Yes	No	Yes
Year Controlled	No	Yes	No	Yes	No	Yes

Observations	160	160	160	160	160	160
R-squared	0.052	0.419	0.157	0.400	0.301	0.547

Table 4: The regression results (II)

VARIABLES	(Model 7) Readability	(Model 8) Readability	(Model 9) Sentences	(Model 10) Sentences	(Model 11) Sentiment	(Model 12) Sentiment
Reconstruction Firm (dummy)	-0.0841	-0.0403	0.108**	0.0952	0.0175	0.0147
	(0.132)	(0.144)	(0.0534)	(0.0726)	(0.0318)	(0.0306)
Bankruptcy Year (dummy)						
	-0.0146	-0.0430	-0.000152	0.0279	0.00138	-0.00396
	(0.132)	(0.0956)	(0.0532)	(0.0404)	(0.0294)	(0.0230)
Firm Size (decimal logarithm)	-0.0400	-0.0122	0.0751**	0.111***	-0.0366*	-0.0324
	(0.104)	(0.126)	(0.0319)	(0.0410)	(0.0208)	(0.0195)
Firm Age	-0.00155	0.00140	-0.000213	-0.000463	-0.000492	-0.000818
	(0.00224)	(0.00273)	(0.000776)	(0.00118)	(0.000648)	(0.000890)

Debt Ratio	-0.000427	-0.000472*	-0.000147	-0.000115	0.000158**	0.000135
	(0.000381)	(0.000237)	(0.000209)	(0.000207)	(6.28e-05)	(0.000122)
Constant	0.803	-0.195	2.882***	2.440***	0.831***	0.906***
Industry Sector Controlled	No	Yes	No	Yes	No	Yes
Year Controlled	No	Yes	No	Yes	No	Yes
Observations						
R-squared	80	80	80	80	80	80
R-squared	0.022	0.735	0.118	0.665	0.060	0.697

Figure 1.

Sample Distribution by Industry Sector

Sector	Value
Services	16
	4
Electrical equipment	23
	4
Transportation equipment	4
	8
Precision equipment	4
	4
Marine transportation	4
	8
Information and…	9
	4
Wholesale Trade	32
	4
Real Estate	16
	8
Other Products	8
	8

Figure 2

Sample Distribution by Year

Year	Value
2009	24
2010	40
2011	28
2012	16
2013	10
2014	10
2015	10
2016	8
2017	4
2018	4
2019	4
2020	2