Multinationality and cash holdings: Evidence from Japan*

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This version: 26 August 2024

Abstract

Investors frequently criticise Japanese corporations for excessive cash holdings. On average and on aggregate, cash holdings have increased over the last decade. However, there is substantial variation in cash holdings within and between firms. At the same time, many large Japanese firms' businesses have become more international. This research examines how international factors influence firms' cash holdings via the precautionary motive – through overseas sales, foreign ownership, and cultural differences between the parent corporation and its overseas affiliates. Random effects within-between regression is used to jointly estimate the relationships within firms over time and between firms in the cross-section. Internationalisation through overseas sales has positive within and between firm relationships with cash holdings, but foreign shareholding is associated with lower cash holdings in the time series. Positive within-firm effects dominate the relationship between cash holdings and cultural heterogeneity.

Keywords: Cash holdings, Cultural heterogeneity, Foreign shareholding, Internationalisation, Japanese corporations, Multinationals, Overseas sales, Random effects within-between regression.

JEL Codes: F23, F65, G32, M14, Z10

*I thank Xin Long, Hitoshi Takehara, David Michayluk, Florent Domenach, Kevin Hockmuth, Kyle Shuttleworth, Philip Varghese and the participants of the World Finance and Banking Symposium, Vilnius University, 2023 for helpful discussion and suggestions. I appreciate excellent research assistance by Kokona Iwai, and discussions about earlier versions of this paper. Errors and omissions, if any, are the author's sole responsibility. This research is supported by JSPS KAKENHI Grant No. 22K01576.

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1 Introduction

Corporate cash holdings have trended up substantially over the last 40 years. Bates et al. (2009) observe that the ratio of cash to assets for U.S. industrial firms doubled from 1980 to 2006. Denis and Wang (2024) show that cash and marketable securities were about 25 percent of listed US firms' balance sheets in 2021, three times the average in the early 1070s. Sánchez and Yurdagül (2013) note that in 2011, U.S. firms held four times the level cash held in 1995 and 11 times their holdings in 1979. The increase in cash holdings is a global phenomenon. Dao and Maggi (2018) show that both saving and net lending by non-financial firms in the U.S., U.K., Canada, France, Germany, Italy, Japan, Korea, and the Netherlands increased over the previous two decades. Their work shows that from the early 2000's, non-financial firms became net lenders to the rest of the economy. The Economist (2019) points out that some of the biggest U.S. firms have substantial cash holdings at levels far above the norm for large capitalisation companies.

Japanese firms are renown among international investors for their high level of cash holdings. The Economist (2014) notes that Japanese and South Korean firms are the world's biggest "cash-hoarders". At the time, Japanese firms held 229 trillion yen, equivalent to 44 percent of GDP compared with 11 percent of GDP for U.S. firms. Although small and medium firms have been the main contributors to high cash holdings in Japan, large firms have increased their cash holdings recently (Aoyagi et al., 2017).

Figure 1 shows distributional statistics calculated by year for the cash holdings of Prime (formerly First) section firms listed on the Tokyo Stock Exchange, denominated in trillions of Japanese yen. The solid line shows the mean cash holding and the dashed line shows the median. The shaded area shows the interquartile range. The high mean is a consequence of the extremely large cash holdings of a relatively small number of firms.

Japanese firms' cash holdings decreased over the 1990s, as firms improved their capital efficiency following the end of the 'bubble era'. This continued through much of the 2000s until around the time of the Lehman shock in 2008.[1] Cash holdings increased substantially during the 2010s. The increase in cash held accelerated and became more broad-based across firms from 2020 during the period of the COVID-19 pandemic and after. Much of the period of rising cash holdings corresponds with low interest rates in Japan and the other major economies. The wide and increasing interquartile range, and the mean substantially higher than the median, suggest substantial variation in cash holdings between firms and within firms over time. It should be noted that Figure 1 provides a simple picture of cash holdings where cash is not normalised by firms' assets or sales.

At the same time as cash holdings have increased, a growing number of Japanese firms have taken steps to internationalise their businesses. This has been driven by a number of factors, including low domestic economic growth, high competition in domestic product markets, opportunities abroad in both emerging and developed economies, a domestic labour shortage,

[1] Iskandar-Datta and Jia (2012) note that the cash holdings situation of Japanese firms in the 1980s differed from that in other countries. Banks extracted rents by using their central role in financial intermediation to coerce firms to hold large cash balances. After substantial financial system deregulation through the 1990s, cash holdings approached a more economically based level in the 2000s.

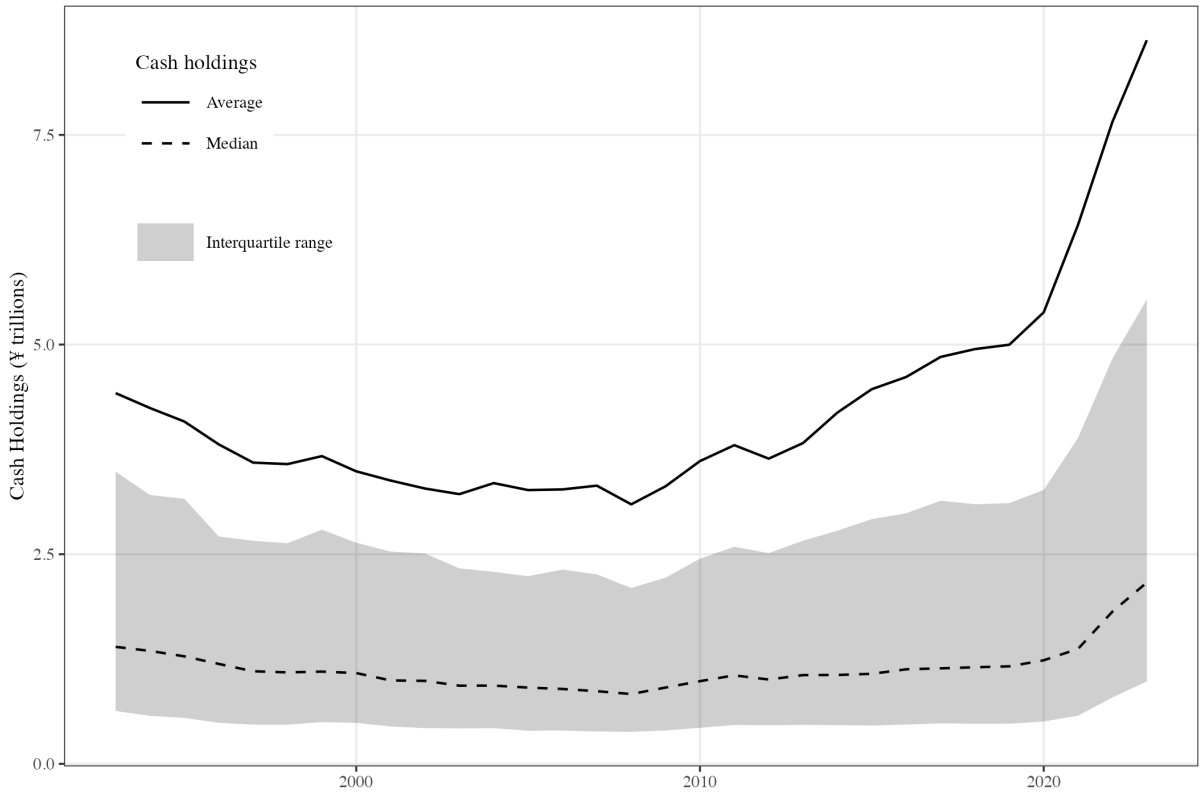

Figure 1: The distribution of cash holdings of Prime section firms by year from 1993 to 2023 in trillions of Japanese yen. The solid line shows the mean and the dashed line shows the median. The shaded area shows the interquartile range (quartiles 2 and 3). The data used to construct this figure include all Prime (or First) Section firms reporting cash, total assets and net sales in the Nikkei NEEDS database between 1993 and 2023, excluding financials, utilities and Japan Post Holdings.

and the ageing population. Both the proportions of ownership and trading of Japanese stocks attributable to foreign investors has risen over the last two decades, to around 30 and 60 percent, respectively (Iwatsubo and Watkins, 2021). Looking at the firms in the sample used in this paper, Figure 2 shows that the average ratio of overseas sales to net sales has almost doubled since 2000. Similarly, the ratio of shares held by foreign entities relative to the total number of shares outstanding has also increased, albeit being lower than the average for the entire Tokyo market.

A large extant literature aims to empirically identify the financial factors that explain corporate cash holding behaviour, primarily at the firm level (Opler et al., 1999; Pinkowitz et al., 2012; Bates et al., 2018; Marwick et al., 2020). The key motivations for firms to hold cash include transactions (Keynes, 1937), precautionary (Keynes, 1937; Han and Qiu, 2007; Bates et al., 2009) and agency (Ferreira and Vilela, 2004; Harford et al., 2008; Jensen, 1986). Other factors influencing cash holdings include taxation (Foley et al., 2007), the cost of earnings repatriation (Gu, 2017), geographical diversification (Fernandes and Gonenc, 2016), and the macroeconomy (Andre et al., 2007; Gruber and Kamin, 2016; Chen et al., 2017; Armenter and Hnatkovska, 2017). Most studies examine US firms, with a relatively small number conducting cross-country studies (Dao and Maggi, 2018; Dittmar et al., 2003; Pinkowitz et al., 2006; Kalcheva and Lins, 2007) or examining Japanese firms (Pinkowitz and Williamson, 2001; Luo and Hachiya, 2005; Ando et al., 2009; Kang and Piao, 2015; Aoyagi et al., 2017; Oku et al., 2018; Honda and Uesugi, 2022;

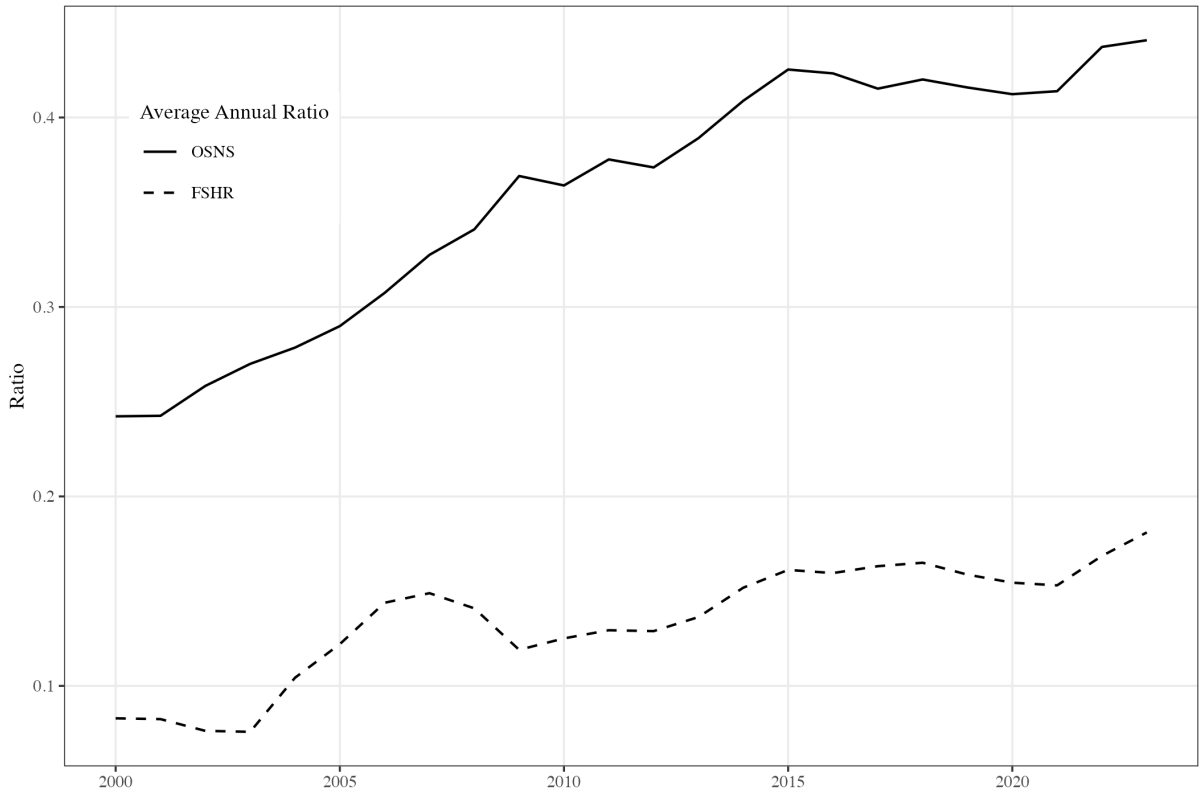

Figure 2: Annual average ratios for overseas sales (overseas sales to net sales, OSNS) and foreign shareholding (share holdings by foreign entities to total shares outstanding) ratios for firms listed in the Prime (First) Section of the Tokyo Stock Exchange for 2000 to 2023. The solid line represents the FSHR ratio and the dotted line represents the OSNS ratio. Note that not all firms disclose OSNS. Financials, utilities and Japan Post Holdings are excluded.

Kim et al., 2023; Fujitani et al., 2023a,b, 2024; Chen, 2024; Kaneko et al., 2024).

Recently, cultural explanations have been explored in studies that relate cash holdings to measures of cultural values. Chang and Noorbakhsh (2009) find a positive relationship between firms' cash holdings and their home country levels of uncertainty avoidance, masculinity and long-term orientation. Chen et al. (2015) argue that cash holdings are negatively associated with individualism and positively associated with uncertainty-avoidance through the precautionary motive. So and Zhang (2022) find that broad measures of cultural heterogeneity – the difference between multinational firms' home national cultural dimensions and those of the countries in which its subsidiaries operate – explain cash holdings.

This research examines the relationship between cash holdings and three international characteristics of Japanese firms that I group together under the term "multinationality". The research sits at the intersection between corporate finance and international business. The first characteristic is the degree to which firms are exposed to overseas sales, either through exports or sales by overseas affiliates. The second is the extent of foreign shareholding in the firm. The third characteristic applies only to firms with overseas affiliates. It represents the cultural heterogeneity between Japan as the home of the parent corporation and the countries in which the firm's overseas affiliates are located. An important aspect of this research is that the relationship between cash holdings and internationalisation is examined both within firms over time

and between firms in the cross-section.

I find that internationalisation through a higher proportion of overseas sales has positive within- and between-firm relationships with cash holdings, but a greater proportion of foreign shareholders is associated with lower cash holdings within firms over time. The relationship between cash holdings and cultural heterogeneity is dominated by positive within-firm effects. Cash holdings are positively associated with lower power distance, uncertainty avoidance, and long-term orientation within-firm. Subsidiaries in more collectivist countries is associated with higher cash holdings while having subsidiaries in more individualist countries is associated with lower cash holdings in the time series. Greater long-term orientation has a positive between-firm relationship with cash holdings, while lower masculinity and uncertainty avoidance are negatively associated with cash holdings between firms.

The paper is structured as follows. Section 2 examines the relevant literature on the determinants of cash holdings. The hypotheses and methods are explained in Section 3, including the three hypotheses, the form of the general model, and the econometric approach employed. Section 4 covers the financial data, measures of cultural heterogeneity, variable construction and descriptive statistics. Section 5 provides the empirical results. The findings and their implications are discussed in Section 6, and Section 7 concludes.

2 Why do Firms Hold Cash and Why are Holdings Increasing?

Several motivations for firms to hold cash have been proposed in the literature. Keynes (1937) discusses the transactions motive, that holding cash reduces transactions costs as firms do not need to liquidate assets to make transactions. Keynes and others discuss the precautionary motive, that firms hold cash to hedge the risk of future cash shortfalls with respect to their requirements for investment and working capital (Han and Qiu, 2007). The precautionary motive may be enhanced by limited access to funds and capital market imperfections. A third motive is the agency motive which focusses on corporate governance and the misuse of cash by managers for their own gain (Ferreira and Vilela, 2004; Harford et al., 2008; Jensen, 1986).

In one of the most widely cited papers in the cash holding literature, Opler et al. (1999) find that firms with strong growth opportunities and riskier cash flows have higher cash to non-cash asset ratios, while access to capital markets is negatively associated with the cash ratio. However, excess cash has little impact on investment, acquisitions and payouts. Bates et al. (2009) make the case that precautionary factors, not agency motives, drove higher cash holdings by U.S. firms between 1990 and 2006, as their cash flows became riskier and their operations became more research and development intensive. Further evidence is provided by Bates et al. (2018) explain the increase in U.S. firms' cash holdings by their investment opportunity set and cash-flow volatility, as well as secular trends in product market competition, credit market risk, and within-firm diversification. Cash holdings may also be related to financial constraints (Almeida et al., 2004; Han and Qiu, 2007; Denis and Sibilkov, 2009). Internal financing via cash holdings allow financially constrained firms to undertake investments they may not otherwise be able to do. Diversified firms hold less cash than specialised firms (Duchin, 2010). Fresard (2010) shows

that high cash holdings are associated with future gains in product market share, known as the product market competitiveness motive. Dittmar and Duchin (2010) argue that cash holdings decline over the corporate lifecyle, as young firms manage cash to target ratios to a greater extent than mature firms. Pinkowitz et al. (2012) argue that U.S. multinational firms' cash holdings are positively related to their R&D intensity and are not explained by the tax treatment of repatriations. Fernandes and Gonenc (2016) find a negative relationship between multinational's geographical diversification, or breadth of operations by country, and cash holdings for firms in 40 countries. Marwick et al. (2020) demonstrate a positive relationship between organisational capital and cash holdings, and show that this relationship is stronger for financially constrained firms and those with high cash-flow risk. Chung et al. (2018) suggests that shareholders place more value on cash in recent years, and that higher cash holdings are driven by institutional investors and accounting conservatism.

Other papers examine institutional factors that may affect business decisions about cash holdings. A taxation motive for cash holdings is explored by Foley et al. (2007). Multinational firms that face higher taxes on the repatriation of earnings tend to hold higher cash balances in their foreign subsidiaries. In a similar vein, Gu (2017) proposes a model by which costly repatriation of overseas earnings induces cash accumulation offshore. The value of cash to a firm increases with increasing cash holdings according to Theissen et al. (2023). This is driven by firms with substantial investment opportunities. There is also a strand of the literature that examines the macroeconomic factors behind rising corporate savings and cash holdings, for example, Andre et al. (2007), Gruber and Kamin (2016), Chen et al. (2017) and Armenter and Hnatkovska (2017).

Although there is a substantial literature on the motivations behind corporate cash holdings, the vast majority of studies examine U.S. firms. Dao and Maggi (2018) conduct a multi-country study. They question whether the studies of U.S. firms generalise more to firms in other countries. Other multi- and cross-country research includes Dittmar et al. (2003), Pinkowitz et al. (2006) and Kalcheva and Lins (2007), all examining governance and the agency motive. Pinkowitz et al. (2016) examines the factors influencing U.S. firms' cash holdings compared with those in other countries, and finds higher cash holdings in the US are due to R&D intensive US firms.

A relatively small number of papers examine the cash holdings of Japanese firms. Earlier published research focuses on governance issues and the influence of banks as before the "big bang" financial deregulation of the 1990s, banks played a relatively important role in financing firms. Pinkowitz and Williamson (2001) conclude that when Japanese banks wielded strong influence over the financing of corporations, they persuaded firms to hold higher cash balances. Similarly, Luo and Hachiya (2005) find that bank relationships play a significant role in determining cash holdings, along with insider ownership. Aoyagi et al. (2017) find that managers of Japanese firms prefer to hold more cash than optimal for shareholders and suggest that weak corporate governance contributes to managers' behaviour. Kang and Piao (2015) find that because Japanese firms have been diversifying their production by investing overseas, they need to accumulate liquid assets to finance foreign direct investment. In recently published work,

Kim et al. (2023) find that the cash holdings of Japanese public and private firms are influenced by the level of intangible capital held and domestic corporate taxation cuts. A higher share of intangible capital is associated with higher cash holdings as intangible capital not easily collateralizable, providing an incentive to self-finance investment with accumulated retained earnings. Recent domestic corporate tax cuts have been associated with higher cash holdings and no impact on investment. Fujitani et al. (2023a) takes a macro perspective to the precautionary motive, showing that domestic and international economic policy uncertainty leads to lower investment and greater accumulation of cash holdings. Also on the precautionary motive, Fujitani et al. (2023b) argue that greater stock liquidity accentuates the risk of a crash in the stock price thereby encouraging firms with highly liquid stocks to accumulate more cash. Fujitani et al. (2024) observe that cash holdings and growth opportunities are positively (negatively) related for firms with a positive (negative) growth outlook. They develop a model of optimal cash holdings that replicates the observed data and provides results consistent with the trend to higher cash holdings following the Global Financial Crisis (GFC) in an environment of lower interest rates but tighter borrowing constraints. Chen (2024) finds that directors' bankruptcy experience at other firms is associated with greater risk-taking and lower cash holdings. Kaneko et al. (2024) provide evidence from the GFC period suggesting that the value of cash is lower for firms closely related to banks.

Zingales (2015) observes that there has been a "cultural revolution" in finance, with researchers paying greater attention to cultural influences on financial decision-making, while Karolyi (2015) claims that an "important research thrust focuses on cultural values for corporate financial policy choices...". Culture may be defined as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation" (Guiso et al., 2006). Recently, cultural explanations for cash holdings have been explored by Chang and Noorbakhsh (2009), Chen et al. (2015) and So and Zhang (2022). Chang and Noorbakhsh (2009) find a positive relationship between firms' cash holdings and their home country levels of uncertainty avoidance, masculinity and long-term orientation. Chen et al. (2015) propose a "cultural motive" for cash holdings arguing that cultural factors explain the variation of cash holdings across countries, and across U.S. states. They find that cash holdings are negatively associated with individualism and positively associated with uncertainty-avoidance through the precautionary motive. The research described in this paper is most closely related to the work of So and Zhang (2022), who find that cultural heterogeneity, a total measure of the difference between multinational firms' home national cultural dimensions and those of the countries in which its subsidiaries operate, explains the cash ratios – cash to total assets, net assets and total sales – of U.S. multinational firms. They find robust evidence for a positive and significant relationship between firms' cultural heterogeneity and cash ratios. The relationship is consistent across measures of cultural heterogeneity based on individual and aggregates of the four and six cultural dimensions of Hofstede (1984) and Hofstede et al. (2010), and measures of heterogeneity based on alternative cultural frameworks.

3 Hypotheses and Methods

Based on three hypotheses explained below, I specify a general model, construct financial and cultural heterogeneity variables and run panel regressions of these variables on measures of cash holdings.

3.1 Hypotheses

I develop three hypotheses based on the three multinationality characteristics introduced in Section 1.

H1: Cash holdings are positively associated with the ratio of overseas to total sales, both within and between firms.

Demographic and competitiveness challenges within Japan and the opportunities in overseas markets have led firms to expand their operations and the markets for their products, overseas substantially over recent decades. A firm that is highly reliant on overseas sales is directly exposed to a variety of international business risks that a firm selling predominantly in the Japanese domestic market is not. Export and foreign subsidiary sales may be more volatile than domestic sales, influenced by exchange rates and the vagaries of international trade. A high reliance on overseas sales suggests greater cash flow risk and corporate risks consistent with the precautionary motive for cash holdings (Kang and Piao, 2015).

The ratio of overseas sales to total or net sales can be used as a measure of global diversification and multinationality, despite the firm not necessarily having assets outside its home nation (Denis et al., 2002; Erel et al., 2020).[2] Overseas sales can be made via export from Japan or through overseas subsidiaries. Kang and Piao (2015) note a high sensitivity of investment to cash flow for Japanese firms with relatively high overseas investment. They also show that Japanese firms with foreign affiliates hold cash overseas for future foreign expansion. This implies firms rely more on internal sourcing of capital for expansion overseas because they are more financially constrained.

Furthermore, costs related to repatriating funds, primarily taxation, inhibit the repatriation of earnings and encourage higher cash balances in foreign subsidiaries. A firm with high overseas sales is more likely to be generating a larger amount of its earnings via foreign subsidiaries and because of greater growth opportunities and constrained financing overseas, the firm will elect to retain those funds in its subsidiary.

On the other hand, overseas sales may provide diversification benefits to the firms, by having a variety of national markets for its products that are exposed to different macroeconomic, political, regulatory and other risks. Fernandes and Gonenc (2016) demonstrate that cash holdings are negatively related to geographic and industrial diversification, suggesting that controlling for diversification is necessary.

[2] Erel et al. (2020) use a threshold of five percent overseas to total sales, above which a firm is defined as multinational.

H2: Cash holdings are positively associated with the degree of foreign ownership within and between firms.

Fujitani et al. (2023b) show that Japanese firms with more liquid stocks hold higher cash balances. They suggest this is because high market liquidity implies a higher crash risk for the firm's stock. The precautionary motivation suggests such firms will hold greater cash balances to hedge the financing risk associated with potential volatility in their stock. A similar argument may be applied to firms with a high foreign shareholding ratio. Foreign investors in the Japanese stock market are active traders and responsible for more than 60 percent of market trading volume while owning a little over 30 percent of listed firms (Iwatsubo and Watkins, 2021). It is reasonable to assume that foreign active investors are relatively likely to sell down their holdings in response to bad news or weak growth forecasts, presenting a crash risk for the firm. Note that, like the ratio of overseas to total or net sales as a criteria of multinationality, the ratio of foreign shareholders does not mean a firm necessarily holds assets or has affiliates overseas.

On the other hand, a high or rising foreign shareholding ratio may be associated with greater financial flexibility. For instance, a firm with an improving reputation and familiarity among foreign investors may need to hold less cash for precautionary reasons because it can raise funds when needed from not only domestic, but also foreign investors. A negative relationship may also due to with greater pressure reduce cash holdings by foreign investors, and in particular, foreign activist investors. Firms with a relatively high proportion of such investors may come under pressure to reduce their cash balances. This implies the possibility of a negative coefficient for the foreign shareholding ratio. Within-firm, higher foreign ownership may not always be associated with greater cash holdings.

H3: The cash holdings of Japanese multinational firms are positively associated with their cultural heterogeneity, both within and between firms.

The third hypothesis is that cash holdings are positively related to cultural heterogeneity, based on two components of the precautionary motive – financing constraints and corporate risks – and the agency agency motive, consistent with the approach in So and Zhang (2022). Cultural heterogeneity can be defined as a measure of the overall cultural distance between the parent and its foreign subsidiaries. Cultural distance can be measured as the difference in cultural values between the countries of the parent and a subsidiary.

Grinblatt and Keloharju (2001) show that distance, language and culture influence equity investment decision-making consistent with a comfort with the familiar effect. The work of Mian (2006) suggests multinational banks are reluctant to lend to culturally distant foreign firms. If a Japanese multinational relies on domestic banks, raising finance for culturally distant subsidiary investment may be constrained. Gong (2003) notes that Japanese multinationals make expensive use of expatriate managers in overseas subsidiaries, and that these managers are loyal to the corporate headquarters. However, agency costs are higher in managing culturally diverse subsidiaries because of information asymmetry between the parent and overseas affiliate regarding local knowledge. Where the parent firm has difficulty controlling a cultur-

ally distant, the firm faces greater corporate risks and will be incentivised to hold higher cash balances for precautionary reasons. Furthermore, information asymmetry provides greater opportunity for the managers of culturally distant subsidiaries to accumulate larger cash holdings for their own purposes, consistent with the agency motivation. Potentially compounding these precautionary and agency mechanisms, Kang and Kim (2008) show that firms acquiring foreign subsidiaries are less likely to monitor those in more culturally distant countries.

Consistent with the precautionary and agency motives for cash holding, the greater the cultural distance between a Japanese multinational and its subsidiaries, the greater the perceived financial constraints and corporate risks, the greater the potential agency costs, and the greater the scope for managers to hoard cash.[3]

As a caveat to the reasoning behind H3, numerous papers including those by Geert Hofstede himself, have noted that the interaction between national cultures, corporate cultures and corporate financial decision-making may be complex. Cultural influences may be bidirectional between the parent and its subsidiaries. The cultural dimensions relevant in some circumstances between multinational and subsidiary may not be relevant in others. This will be discussed further in Section 4.3 where the cultural heterogeneity variables are discussed in detail.

3.2 General model

The specification of the general model is shown in Equation (1). The data, variables, and their construction are discussed in detail in Section 4.

$$\begin{aligned} CASH_{i.t} = \alpha + \beta_1 OSNS_{i,t} + \beta_2 FSHR_{i,t} + \beta_{3,d} CH_{d,i,t} + \delta CONTROLS_{i,t} \\ + \gamma COUNTRY_{i,t} + \phi INDUSTRY_{k,t} + \epsilon_{i,t} \end{aligned} \tag{1}$$

The dependent variable, $CASH_{i.t}$, is a measure of firm i's cash holding in year t. Hypotheses H1, H2 and H3 motivate the inclusion of the following variables of interest: (i) the ratio of overseas sales to net sales ($OSNS_{i,t}$), (ii) the ratio of shares held by foreign entities to total shares outstanding ($FSHR_{i,t}$), and (iii) the cultural heterogeneity ($CH_{d,i,t}$) between each Japanese multinational parent firm i and its overseas subsidiaries for each cultural dimension d in year t. The estimates of interest are β_1, β_2 and $\beta_{3,d}$.

$CONTROLS_{i,t}$ represents a set of firm-level financial control variables consistent with those recommended by Opler et al. (1999) and Bates et al. (2009). Country level control variables, $COUNTRY_{i,t}$, are included in the models in which the cultural heterogeneity variables appear to control for firm-level exposure to country characteristics that may influence cash holdings following So and Zhang (2022). Dummies ($INDUSTRY_{k,t}$) are included to account for k industry effects. $\epsilon_{i,t}$ is the residual.

[3] Chou et al. (2023) postulate that managers in more individualistic and low uncertainty-avoiding cultures – the former somewhat distant from Japanese cultural norms while the latter is very much different – have higher tendency to over-invest. Over-investment may require greater internal financing and raise corporate risks, prompting a multinational to hold higher precautionary cash balances.

3.3 Econometric approach

The empirical strategy of this research aims to distinguish the within-firm (time series) and between-firm (cross section) relationships between cash holdings and international factors. To do so, I use a multilevel modelling method, namely the random effects within-between model (REWB). Estimated on a firm-year panel, the REWB model allows for different effects within firms over time and between firms in the cross section, and provides separate estimates for these effects (Bell and Jones, 2015; Bell et al., 2019; Fairbrother, 2013; Schmidt-Catran and Fairbrother, 2016; Mundlak, 1978). REWB is a more general specification, encompassing the frequently used fixed effects (FE) and random effects (RE) models. FE models estimate only within effects, while pooled ordinary least squares (pooled OLS) and RE models combine the within and between effects (Jordan and Philips, 2022). Although used frequently in corporate finance panel applications, pooled OLS ignores the panel structure of the data. RE models assume the within and between effects are equal and estimate a weighted average of the effects making interpretation difficult where the within and between effects are expected to be different. Jordan and Philips (2022, p.212) note the advantages of REWB: "REWB helps avoid the RE versus FE false dichotomy often discussed by scholars. Practitioners should consider estimating an REWB model to determine whether there are separate within and between effects to uncover." Between effects for meaningful entities, such as firms, should not be ignored and are often enlightening (Bell and Jones, 2015).

Pooled OLS is used frequently in the related literature on cash holdings. For example So and Zhang (2022) find their measure of cultural heterogeneity has a positive and significant influence on cash holdings using pooled OLS regressions. They use a number of alternative methods as robustness checks, including FE. The FE coefficient on their cultural heterogeneity variable is not significant, and they attribute this to the lack of within firm variation in cultural heterogeneity. Chen et al. (2015) also employ pooled OLS.

The REWB model takes the form shown in equation 2, where $y_{i.t}$ and $x_{i,t}$ are variables in a panel data set, with i representing firm and t representing time. The β_W estimate provides the within effect, identical to the FE estimate, and the β_B estimate gives the between effect (Bell et al., 2019). The μ_i represent the firm random effects, assumed to be normally distributed, and the $\epsilon_{i,t}$ are the residuals which are assumed to be homoscedastic and normally distributed. The model includes the mean of the explanatory variable for each firm, $\bar{x}_i$, and the demeaned value of the explanatory variable, $x_{i,t} - \bar{x}_i$. Time-invariant variables may be included, for example z_i, associated with the between coefficient, δ_B.

$$y_{i.t} = \alpha + \beta_W \left(x_{i,t} - \bar{x}_i\right) + \beta_B \bar{x}_i + \delta_B z_i + \mu_i + \epsilon_{i,t} \tag{2}$$

Although the random effects within-between (REWB) model has infrequently been applied to panel estimation in corporate finance applications, it would appear to have substantial advantages where both within and between firm effects are important and these effects differ substantially in magnitude. As both within firm and between firm effects are relevant to the hypotheses I examine and are expected to differ in magnitude, I estimate the general specifica-

tion given in Equation (1) using REWB. For each coefficient shown in Equation (1), the REWB model produces within and between estimates.

4 Data

I examine Japanese firms listed in the Prime (formerly First) section on the Tokyo Stock Exchange. Firms listed in the Prime section are expected to have a large market capitalisation, be liquidly traded and have (relatively) high standards of governance. Annual firm-level financial data is obtained from the Nikkei NEEDS database for the period 2014 to 2023 for firms listed in the Prime (formerly First) Section of the Tokyo Stock Exchange.[4] Prime (or First) section firms are included in the analysis where the firm has at least two years of data. I exclude financial and utilities firms because regulation and non-economic criteria influence their cash holdings (Bates et al., 2009; Chen et al., 2015; So and Zhang, 2022).[5]

Consolidated financial data is used as cultural heterogeneity is expected to influence each multinational firm's cash holding behaviour as a single entity. The exception is the foreign shareholding ratio which is based on unconsolidated data regarding the multinational parent firm's shareholders.

Some Japanese firms change their reporting period from the typical March fiscal year-end for various reasons, including the alignment of their reporting period with foreign affiliates. A change in the reporting period results in two Annual Securities Reports within a 12-month period. In the sample, 64 firms reporting either overseas sales or or foreign shareholding changed their fiscal year end. For all cases, I use the the most recent financial report data in a year where the firm has changed its reporting period.[6]

Descriptive statistics for the firm-level variables, including firms' exposure to country-level controls, are provided in Table 1. The data set contains 18,241 firm-year observations corresponding with 2,218 unique firms for the period January 2014 to December 2023. Although firm-level financial data are available for most firms from 2000, the sample begins in January 2014 because the data on firms' subsidiaries is available from this point in time. Firms are included in the descriptive statistics where either the firm reports overseas sales, data on foreign shareholding is available or the firm has at least one overseas affiliate. Missing financial data is

[4] Data for the period 1993 to 2023 is shown in some figures and tables to provide context for the study.

[5] Although Japan Post Holdings is classified as a services industry firm, the group's subsidiary Japan Post Bank is the nation's largest bank by number of customers one of the largest by assets. I exclude Japan Post holdings from the sample for this reason. The firm's cash holdings are extremely large, on average 57.4 trillion yen and with an average cash to net assets ratio of 24.4 percent over the period 2014 to 2023.

[6] The following Prime (First) Section firms reporting either overseas sales or or foreign shareholding changed their fiscal year ends during the sample: ADWAYS, ASICS, COOKPAD, CYBER COM, DENTSU GROUP, DMG MORI, EBARA, EM SYSTEMS, EZAKI GLICO, FULLTECH, ICHIKOH INDUSTRIES, INPEX, ISEKI, JAPAN TOBACCO, JINUSHI, KAGOME, KEYENCE, KITZ, KOBAYASHI PHARMACEUTICAL, KOSE, KUBOTA, KURARAY, LIFULL, MEC, MOBILE CREATE, NABTESCO, NIKKISO, NIPPON ELECTRIC GLASS, NIPPON EXPRESS, NIPPON PAINT HOLDINGS, NISSHA, NISSHINBO HOLDINGS, NORITSU KOKI, OTSUKA HOLDINGS, PEPTIDREAM, PIGEON, PRESSANCE, RENESAS ELECTRONICS, RENOWN, RESONAC, ROLAND DG, RYOBI, RYOHIN KEIKAKU, SAKATA INX, SANDEN, SEIWA ELECTRIC MFG., SHIKOKU KASEI HOLDINGS, SHISEIDO, SODICK, STAR MICRONICS, SUMITOMO FORESTRY, SUMITOMO HEAVY INDUSTRIES, TADANO, TAIKO PHARMACEUTICAL, THK, TOKYO OHKA KOGYO, TORII PHARMACEUTICAL, TRUSCO NAKAYAMA, UNICAFE, UNICHARM, VINX, WATABE WEDDING, YAMABIKO, YAMAHA ROBOTICS HOLDINGS.

Table 1: Descriptive statistics for the firm financial and country-level variables.

Variable	Mean	Min.	p25	Med.	p75	Max.	SD	WSD	BSD	Skew.	Kurt.
LCASH	9.582	3.135	8.583	9.460	10.451	15.860	1.473	0.330	1.455	0.443	0.415
CATA	0.206	0.000	0.096	0.169	0.274	0.939	0.152	0.045	0.115	1.396	2.210
CANA	0.316	0.012	0.106	0.203	0.377	1.720	0.342	0.091	0.237	2.367	6.002
CANS	0.250	0.000	0.096	0.175	0.309	4.015	0.271	0.074	0.215	4.099	29.443
OSNS	0.421	0.000	0.218	0.400	0.601	1.000	0.235	0.043	0.234	0.305	−0.913
FSHR	0.161	0.000	0.056	0.133	0.234	1.000	0.130	0.032	0.131	1.245	2.328
SIZE	11.444	7.023	10.388	11.320	12.395	18.124	1.616	0.172	1.568	0.444	0.391
MTB	1.907	0.286	0.777	1.190	2.070	12.862	2.127	0.661	1.489	3.149	11.310
CFTA	0.067	−0.242	0.036	0.066	0.099	0.249	0.063	0.041	0.037	−0.479	3.391
CFV	0.040	0.000	0.022	0.032	0.050	0.254	0.028	0.008	0.022	2.172	7.109
NWCTA	0.270	−0.262	0.130	0.267	0.407	0.718	0.199	0.055	0.162	0.030	−0.345
LEVTA	0.162	0.000	0.022	0.124	0.257	0.672	0.157	0.042	0.136	0.964	0.269
CAPTA	0.038	−0.067	0.014	0.031	0.053	0.182	0.036	0.022	0.025	1.208	2.913
RDTA	0.013	0.000	0.000	0.004	0.018	0.099	0.019	0.002	0.021	2.211	5.282
AQTA	0.015	0.000	0.000	0.003	0.016	0.148	0.028	0.006	0.028	3.014	9.888
POTA	0.018	0.000	0.007	0.012	0.022	0.110	0.020	0.010	0.014	2.496	7.151
ROA	0.070	−0.081	0.035	0.060	0.094	0.278	0.059	0.027	0.042	0.990	2.350
ROE	0.080	−0.605	0.045	0.080	0.122	0.360	0.107	0.061	0.059	−2.164	13.201
SEG	2.620	1.000	1.000	2.000	4.000	16.000	1.543	0.232	1.546	1.131	2.282
FDI	0.677	0.243	0.631	0.681	0.737	0.965	0.096	0.026	0.079	−0.512	1.572
FIA	0.509	0.130	0.445	0.504	0.574	0.996	0.120	0.038	0.096	0.218	1.459
FMA	0.477	0.140	0.406	0.483	0.547	1.000	0.121	0.039	0.099	0.031	0.765
TAX	−0.063	−0.205	−0.083	−0.059	−0.045	0.090	0.036	0.021	0.024	0.019	2.399

Note: The table shows the mean (MEAN), minimum (Min.), 25th percentile (p25), median (Med.), 75th percentile (p75), maximum (Max.), standard deviation (SD), between firm standard deviation (BSD), mean of within firm standard deviations (WSD), skewness (Skew.) and excess kurtosis (Kurt.). LCASH is the natural logarithm of cash holdings. CATA is the ratio of cash to total assets. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEV is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. The table is based on a sample of 18241 annual firm-year observations corresponding with 2218 unique firms for the period January 2014 to December 2023. Firm-year observations are included in the sample if the firm reports either OSNS, FSHR or has at least one overseas affiliate. The data for the country control variables exists only for firms with at least one overseas affiliate and for the period 2014 to 2023. There is missing data for some firms. Financial and utilities firms, and Japan Post Holdings, are excluded. Series with large outliers or obvious errors are windsorized at the 1st and 99th percentiles (MTB, CFTA, CFV, NWCTA, LEV, CAPEXTA, RDTA, AQTA, POTA).

a widespread issue in studies using firm-level fundamental data (Bryzgalova et al., 2022). Firm-year observations are included in the regressions presented in Section 5 where data is available for all variables in the model being estimated. Some firms have missing data. In some cases the missing data can be assumed to be zero or negligible, and that has been done where appropriate. The following sections discuss the data and variable construction in detail.

4.1 Measures of cash holdings

The cash data obtained from the Nikkei NEEDS database is defined as firms' deposits and cash equivalents in Japanese yen 100 millions. I use two measures of cash holdings, the natural logarithm of cash ($LCASH$) and the ratio of cash to total assets ($CATA$). This allows cash to be examined in log-levels and relative to firm size. Using two measures of cash aids in assessing the robustness of the empirical results.

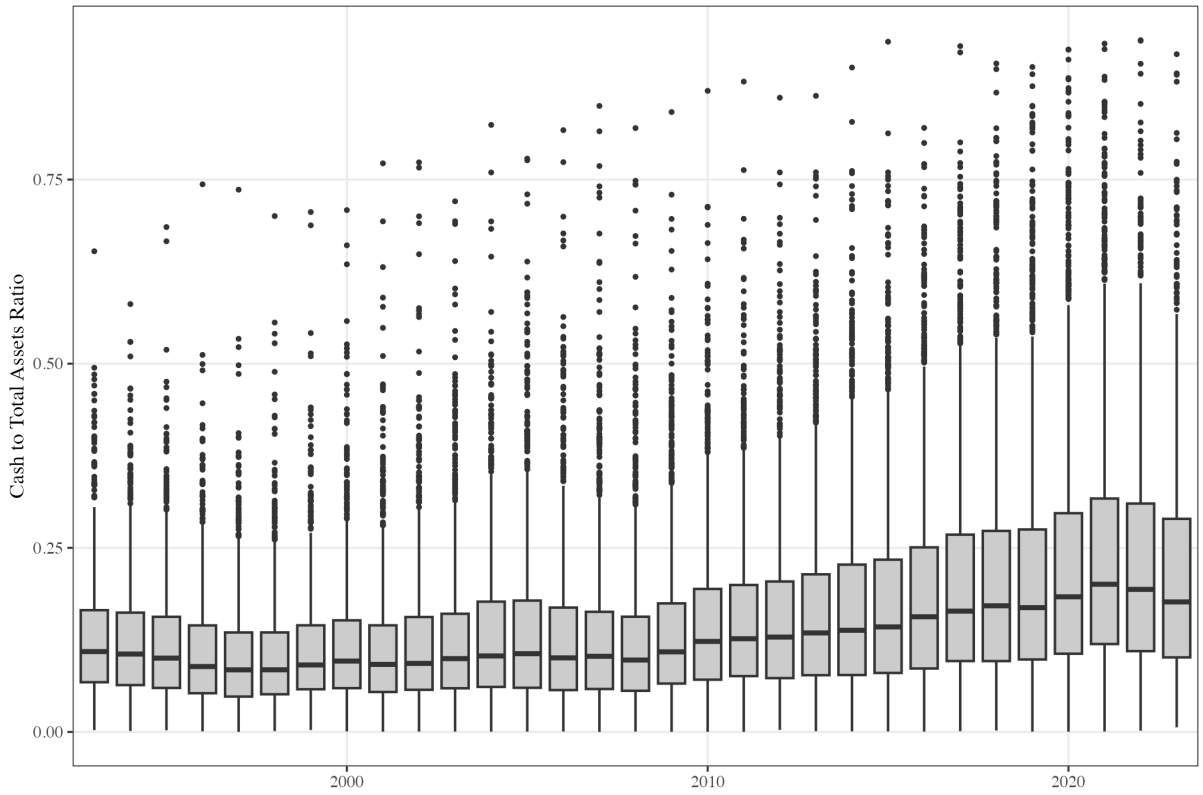

Figure 3: Distribution of the cash to total assets ratio for Prime section firms (excluding financials and utilities) represented by annual box plots. The shaded hinges represent the interquartile range and the horizontal bar represents the median. The upper and lower whiskers extend up to 1.5 times the interquartile range from the 25th and 75th percentiles. Extreme observations beyond the whiskers are represented as dots. The data used to construct this figure include all Prime (or First) Section firms reporting cash and total assets in the Nikkei NEEDS database between 1993 and 2023, excluding financials, utilities and Japan Post Holdings.

Figure 3 provides a detailed picture of firms' cash holdings, with the cash to total assets ratio data for each year from 1993 to 2023 shown as a box plot. The shaded hinges represent the interquartile range and the horizontal bar represents the median. The upper and lower whiskers extend up to 1.5 times the interquartile range from the 25th and 75th percentiles. Extreme observations beyond the whiskers are represented as dots.

The median cash holding has trended up since 2008, following the Lehman shock. The interquartile range has expanded, particularly the third quartile, and the upper whiskers have lengthened, indicating wider and more dispersed cash ratios over time. Extreme high cash to total assets ratios are present every year and have risen in magnitude over time. The descriptive statistics shown in Table 1 for the cash holdings measures indicate that the between firm standard deviation (BSD) is substantially greater than the mean of within firm standard deviations (WSD).

The data suggest that cash holdings vary substantially across firms and industries. Table 1 indicates that CATA ranges between almost zero and 0.939. Figure 4 shows the median CATA ratio for firms in selected low and high ratio industries. Information & Communication and Services firms' cash ratios have increased substantially over the last two decades, while Mining firms' cash holdings have been volatile and risen since 2010. However, Fishery, Agriculture

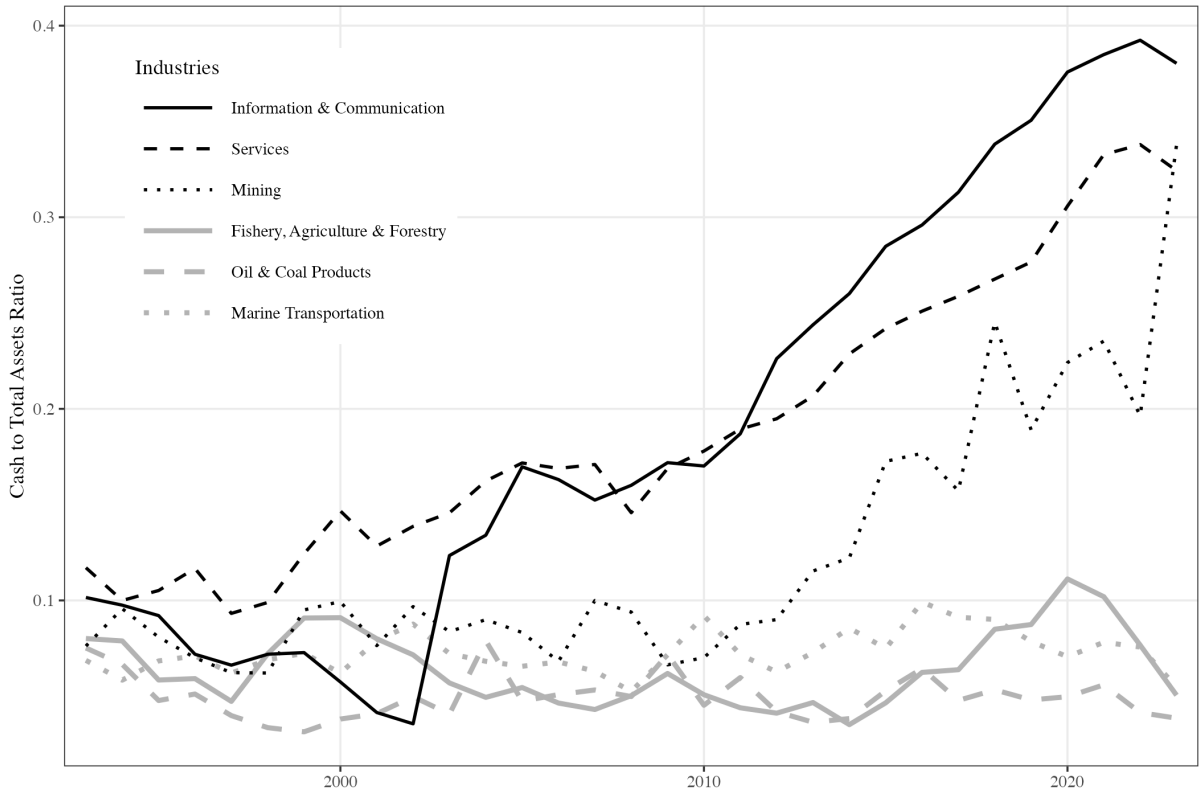

Figure 4: The median cash to total assets (CATA) ratios for selected industries from 1993 to 2023. Industries such as Fishing, Agriculture and Forestry, Oil & Coal Products, and Marine Transportation have maintained relatively low a stable cash holdings to total assets ratio over the last three decades, while those such as Information & Communication, Services and Mining have experienced rising cash holdings to total assets. The data used to construct this figure include all Prime (or First) Section firms reporting cash and total assets in the Nikkei NEEDS database between 1993 and 2023 for the six selected industry classifications.

& Forestry, Marine Transportation and Oil & Coal Products firms' cash ratios have remained relatively low and stable for the last three decades. The industry representation of high cash to total assets ratio firms has also changed over time. Appendix A Table A.1 shows the number of firms that have a cash to total assets ratio above 30 percent each year, the total number of firms in the sample, and the three industries most frequently represented among the firms with high cash ratios. The proportion of firms with CATA greater than 30% has increased substantially since 2010. Typically, the three most frequently represented industries make up the majority of the firms with cash ratios above 30 percent. Earlier in the sample, electrical appliances and machinery firms were overrepresented among high cash ratio firms. Since 2014, information & communications and services firms have been prominent among firms with high cash ratios.

4.2 Firm-level financial explanatory variables

The ratio of overseas sales to net sales (OSNS) represents overseas sales – those by foreign affiliates and through exports – divided by net sales. The foreign shareholding ratio (FSHR) is defined as the ratio of shares in the firm held by foreign entities to total shares on the market. Both the OSNS and FSHR ratios vary over a broad range from around zero to above 0.9 within the sample. For both variables, the between firm standard deviation is substantially greater

than the average of within firm standard deviations. Note that not all firms report overseas sales, and foreign shareholding data is missing for some firms. For the sample from 2000 to 2023, the average overseas sales ratio is 0.42 while the average foreign shareholding is 0.16. The annual cross-sectional averages have been rising over the last two decades as demonstrated in Figure 2.

4.3 Cultural heterogeneity

Hofstede (2011, p.3) defines culture as "the collective programming of the mind that distinguishes the members of one group or category of people from others." Hofstede (1980) proposes four dimensions of national culture, representing cultural values. Power distance (PDI) reflects the strength of social hierarchy, or in other words, the extent to which people accept that power is distributed unevenly. Individualism – collectivism (IND) represents the extent to which people feel independent versus interdependent. Masculinity – femininity (MAS) reflects people's task-orientation versus person-orientation. MAS has also been explained as the extent to which society endorses the use of force. Uncertainty avoidance (UAI) captures people's tolerance for uncertainty and ambiguity.

Fifth and sixth dimensions were added based on the work of Hofstede and Bond (1988) and Minkov (2007), respectively, and included in Hofstede's framework (Hofstede et al., 2010). Long term – short term orientation (LTO) captures people's choice of focus on the future, present or past for guiding their efforts. Indulgence – restraint (IVR) is related to people's choice over gratification versus control of basic human desires related to enjoying life (Hofstede, 2011).

Cultural dimension indices for were obtained from Geert Hofstede's website based on the data in Hofstede (1980), Hofstede (1984), Hofstede (1991), and Hofstede et al. (2010).[7] Some of the indices included in the data apply to regions, and these indices are used for each country in the region. This gives indices for 78 countries, including Japan.[8]

Figure 5 visualises the Hofstede cultural dimension index data for all 78 subsidiary-countries in the study, including Japan. For reference, the index values for Japan are indicated as red dots on the figure. The index values for Japan are 54, 46, 95, 92, 88 and 42 for PDI, IDV, MAS, UAI, LTO and IVR, respectively. According to Hofstede's approach, Japanese culture exhibits high masculinity implying high task orientation and that gender roles are very different, while the uncertainty avoidance and long-term orientation scores are also high. Power distance in Japan is below the median of other countries, while individualism–collectivism is above the median, and self restraint is only slightly below the median of other countries.

[7] https://geerthofstede.com/wp-content/uploads/2016/08/6-dimensions-for-website-2015-08-16.csv, accessed February 2024.

[8] The 78 countries included in the modelling are Argentina, Australia, Austria, Azerbaijan, Belgium, Bangladesh, Bulgaria, Bosnia & Herzegovina, Brazil, Canada, Switzerland, Chile, China, Colombia, Cyprus, Czechia, Germany, Denmark, Algeria, Ecuador, Egypt, Spain, Finland, France, United Kingdom, Ghana, Greece, Guatemala, Hong Kong SAR, Croatia, Hungary, Indonesia, India, Ireland, Iran, Iceland, Israel, Italy, Japan, Jordan, South Korea, Lithuania, Luxembourg, Morocco, Mexico, Malta, Malaysia, Nigeria, Netherlands, Norway, New Zealand, Pakistan, Panama, Peru, Philippines, Poland, Puerto Rico, Portugal, Romania, Russia, Saudi Arabia, Singapore, El Salvador, Serbia, Suriname, Slovakia, Slovenia, Sweden, Thailand, Turkey, Taiwan, Uganda, Ukraine, Uruguay, United States, Venezuela, Vietnam, South Africa.

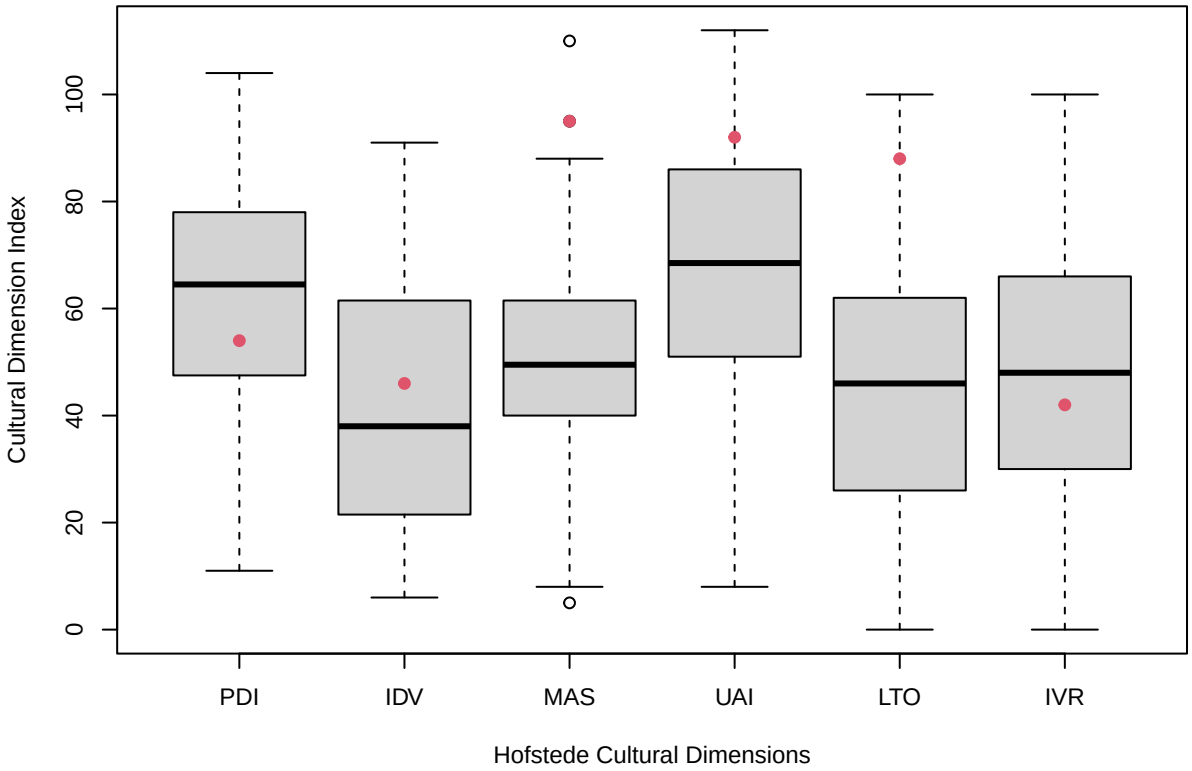

Figure 5: The distributions of the six Hofstede cultural dimensions for the 78 countries in the study, including the index levels for Japan shown as red dots. For reference, the index values for Japan are 54, 46, 95, 92, 88, and 42 for PDI, IDV, MAS, UAI, LTO and IVR, respectively. Note that for some small countries, not all of the 6 dimensions are available.

I calculate the cultural distance between Japan and each of other 77 nations in the sample for each of Hofstede's six cultural dimensions using the Euclidean distance measure described in Konara and Mohr (2019).[9] The Euclidean cultural distance, $CD_{d,j}$, is the square root of the square of the difference between the cultural dimension index ($I_{d,j}$) for country j and Japan ($I_{d,JPN}$), standardised by the in-sample variance of each cultural dimension (V_d), as given in Equation (3).

$$CD_{d,j} = \sqrt{\frac{(I_{d,j} - I_{d,JPN})^2}{V_d}} \tag{3}$$

Average cultural heterogeneity ($CH_{d,i,t}$) is calculated for each cultural dimension (d), Japanese multinational firm (i) in year t by multiplying a subsidiary dichotomous indicator variable ($SUB_{i,j,t}$) by the cultural distance score ($CD_{d,j}$) for each country (j) and dimension, then dividing by the total number of countries in which the multinational has subsidiaries, termed

[9] Konara and Mohr (2019) criticise the commonly used Kogut and Singh (1988) index for cultural distance in that it is biased and represents the square of cultural distance. This leads to erroneous conclusions on the impact of culture as the index progressively amplifies the impact of culture as it increases. Beugelsdijk et al. (2018) is frequently cited in the construction of cultural distance measures based on multiple cultural dimensions> The construction shown in Equation (3) is consistent with their approach to calculating Euclidean distance.

breadth ($BR_{i,t} = \sum_{j=1}^{J} SUB_{i,j,t}$), as shown in Equation (4).[10] The subsidiary dichotomous indicator variable, $SUB_{i,j,t}$, takes a value of one if the firm has at least one subsidiary in country j in year t, and zero otherwise.

$$CH_{d,i,t} = \frac{\sum_{j=1}^{J} SUB_{i,j,t} \times CD_{d,j}}{BR_{i,t}} \tag{4}$$

Japanese listed and major fund-raising firms must submit an Annual Securities Report (ASR), known as the 'Yukashouken Houkokusho' (有価証券報告書) or 'Yuho', to the Financial Services Agency (FSA) within 90 days of their nominated fiscal year end.The mandatory disclosure of domestic and foreign affiliates is required in Section 1(4), Status of Affiliated Companies (関係会社の状況), of the Yuho. The required information includes each affiliate firm's location and the percentage of voting rights held by the Japanese parent firm. Unfortunately the format of Section 1(4) is not standardised. Toyota Motor's affiliate disclosure in its 2023 Yuho is shown in Appendix B, Figure B.1, as an example.

Data on Japanese firms overseas affiliates was collected by machine reading Section 1(4) of each listed firm's Yuho, for each year from 2014 to 2023. The YUHO were be accessed via EDINET, the FSA's publicly available repository of corporate disclosure documents.[11]. EDINET provides a history of firms' Yuho reports for a window of approximately the previous 10 years.

The procedure for obtaining the affiliates data is as follows. A list of documents available on EDINET was obtained via the EDINET application programming interface (API). ASRs were downloaded in text file format for Prime section listed firms for the period 2014 to 2023. The Section 1(4) text block containing firms' affiliate disclosure was extracted from each ASR. The text blocks were then machine-read to extract the overseas affiliates by country.[12] The subsidiary dichotomous indicator variable, $SUB_{i,j,t}$, was constructed using the overseas affiliate information. Affiliate data was also collected manually for 271 firms and used to check the accuracy of the machine-read data. The number of countries in which a firm has at least one subsidiary are referred to as the number of 'subsidiary-countries', or breadth.

Affiliate counts by country and the frequency of overseas affiliates by parent are shown in Appendix C, Figures C.1 and C.2. The top ten locations for affiliates of Japanese multinationals are China, Thailand, United States, Singapore, India, Hong Kong, United Kingdom, Vietnam, Malaysia and Germany.

[10] Cash holdings may be negatively associated with the number of foreign subsidiary-countries, $BR_{i,t}$, due to diversification benefits that accrue from operating cross more countries. Constructing cultural heterogeneity variables based on total rather than average heterogeneity may induce correlation between the cultural heterogeneity variables themselves and with breadth. For these reasons, I measure average not total heterogeneity. So and Zhang (2022) employ total heterogeneity measures and note that their results are similar if average heterogeneity is used. However, for the data in this study, measures of total heterogeneity are highly correlated while measures of average heterogeneity are not.

[11] EDINET can be accessed at https://disclosure2.edinet-fsa.go.jp/

[12] In general, the parent controls more than half of the voting rights in the subsidiaries as indicated in the $SUB_{i,j,t}$ variable. This has been confirmed by manual checks of the machine-read data. I intend to develop the machine reading algorithm such that it collects the percentage of voting rights the parent has in each subsidiary. In a future version of the research, a subsidiary-country will be recorded in $SUB_{i,j}$ if the firm has at least one affiliate in which it controls more than 50.01 percent of the affiliate's voting rights, following the approach of So and Zhang (2022).

So and Zhang (2022) primarily analyse an aggregate measure of cultural heterogeneity based on all six Hofstede dimensions, while providing results for each dimension separately as a robustness check. Chen et al. (2015) examines UAI and IDV as separate variables. While aggregate measures of cultural distance have been used frequently in the literature, there are criticisms of this approach. Shenkar (2001) argues that cultural dimensions are distinct from one another and it may not make sense to combine them in an aggregate index in all circumstances. Hofstede (2001) notes that some cultural gaps may be less disruptive than others, and positive or negative gaps may have different effects, while Lim et al. (2016) observes that elements of cultural distance may complement each other.

Heeding these warnings, I construct two cultural heterogeneity variables for each of the six cultural dimensions, one reflecting a positive distance from Japan, that is, a cultural dimension index value higher than Japan, and the other indicating a negative cultural distance, that is, a lower cultural dimension score relative to Japan. This results in 12 cultural heterogeneity variables, IDVL and IDVH, PDIL and PDIH, MASL and MASH, UAIL and UAIH, LTOL and LTOH, and IVRL and IVRH, where the last letter 'L' ('H') indicates lower (higher) than the cultural dimension index level for Japan. Descriptive statistics for the cultural heterogeneity variables and breadth are provided in Table 2. The between firm standard deviation is substantially higher than the within firm standard deviation for all of the heterogeneity variables. The median firm-year observation has a breadth of 4 subsidiary-countries, but the range is rather wide from 1 to 33. The last column of the table indicates the number of subsidiary-countries defined as the sum of the number of countries in which firms have at least one subsidiary for each heterogeneity variable each year. Note that the number of subsidiary-countries is low for MASH as Japan's MAS score is high. Similarly, UAIH and LTOH are also based on a relatively number of subsidiary-countries.

4.4 Firm- and country-level controls

The set of firm-level control variables are consistent with those recommended by Opler et al. (1999) and Bates et al. (2009), and include the following. SIZE is the logarithm of total assets. MTB is the market to book ratio. CFTA is the net cash-flow, that is, the net cash provided by operating activities, to total assets ratio. Cash-flow volatility (CFV) is constructed following Bates et al. (2009) as the standard deviation of a firm's net cash flow to total assets ratio for the past 10 years, and on a minimum of three annual observations for firms with less than 10 years of cash flow history. NWCTA is the the net working capital to total assets ratio, where net working capital is calculated as current assets minus current liabilities. I include the capital expenditure (CAPEX) to total assets ratio (CAPTA), where CAPEX is calculated as plant, property and equipment on the balance sheet in the current period minus its value in the previous period plus depreciation in the current period. AQTA is the ratio of acquisitions, defined as capital and shares in affiliates, to total assets. POTA is the firm's payouts to shareholders in the form of cash dividends and repurchases to total assets. Leverage (LEV) is defined as short-term debt plus long-term debt to total assets. RDTA is research and development expenditure divided by total assets. Firms with large R&D expenditure such as pharmaceuticals, disclose their expenditure separately while most firms include it within selling, general and administrative (SGA)

Table 2: Descriptive statistics for the cultural heterogeneity variables and breadth.

Variable	Mean	Min.	p25	Med.	p75	Max.	SD	WSD	BSD	Skew.	Kurt.	N.
PDIL	0.464	0.000	0.000	0.646	0.761	1.984	0.380	0.055	0.117	−0.196	−1.386	20147
PDIH	0.908	0.000	0.766	0.923	1.108	2.307	0.326	0.067	0.109	−0.274	2.679	51133
IDVL	0.979	0.000	0.962	1.054	1.108	1.491	0.266	0.044	0.112	−2.796	7.659	42686
IDVH	0.853	0.000	0.000	1.001	1.406	1.917	0.707	0.118	0.233	−0.014	−1.466	28405
MASL	2.343	1.417	2.127	2.357	2.550	5.101	0.407	0.087	0.119	0.567	1.639	71183
MASH	0.007	0.000	0.000	0.000	0.000	0.850	0.074	0.002	0.030	11.256	124.709	97
UAIL	2.155	0.000	1.839	2.123	2.530	3.755	0.523	0.108	0.146	−0.154	1.301	69370
UAIH	0.017	0.000	0.000	0.000	0.000	0.894	0.067	0.005	0.026	6.816	60.853	1905
LTOL	1.326	0.000	1.104	1.373	1.621	2.845	0.589	0.115	0.169	−0.312	0.535	67848
LTOH	0.084	0.000	0.000	0.000	0.000	0.510	0.172	0.017	0.054	1.753	1.396	3270
IVRL	0.592	0.000	0.497	0.657	0.799	1.199	0.284	0.056	0.100	−0.867	0.044	31129
IVRH	0.584	0.000	0.155	0.655	0.910	2.443	0.418	0.076	0.126	0.077	−1.016	38391
BR	5.675	1.000	2.000	4.000	8.000	33.000	4.870	0.655	0.853	1.636	3.296	71410

Note: Summary statistics included are mean (MEAN), minimum (Min.), 25th percentile (p25), median (Med.), 75th percentile (p75), maximum (Max.), standard deviation (SD), mean of within firm standard deviations (WSD), between firm standard deviation (BSD), skewness (Skew.), excess kurtosis (Kurt.) and the number of subsidiary-countries defined as the sum of the number of countries in which firms have at least one subsidiary (N). The table shows the six cultural dimensions power distance (PDI), individualism versus collectivism (IDV), task-orientation versus person-orientation (MAS), uncertainty avoidance (UAI), short-term versus long-term orientation (LTO), indulgence versus self restraint (IVR). For each dimension, cultural heterogeneity is shown separately for countries lower and higher on each dimension than Japan. BR represents the number of countries in which firms have overseas affiliates for each country and year in the sample. The set of countries is limited to the 77 countries excluding Japan for which cultural dimension, taxation and financial development data are available. The sample of cultural heterogeneity and breadth variables begins in January 2014 and ends in December 2023. Missing firm-year data is excluded. The data set contains 12,583 firm-year observations corresponding with 1,541 unique Japanese multinational parent firms for the period from 2014 to 2023. Firm-year observations are included in the sample if the firm has at least one overseas affiliate. Financial and utilities firms, and Japan Post Holdings, are excluded.

expenses. I combine the R&D expense data reported directly and that reported under SGA expenses. Koh and Reeb (2015) note that missing R&D data is a particularly problematic and note that non-reporting firms often have low or negligible R&D expenditure. Following the third option proposed by Koh and Reeb (2015), I assume R&D expenses for non-reporting firms to zero given their expenditure is likely negligible.

Data for the following firm-level controls are windsorized at the 1st and 99th percentiles to ameliorate the effect of extreme observations on the regressions that follow: MTB, CFTA, CFV, NWCTA, LEVTA, CAPTA, RDTA, AQTA, and POTA.

SEG represents the number of business segments that a firm operates in based on the Japan Standard Industrial Classification system, and is included in the control variables to capture the diversification benefits from operating in multiple areas of business. Industry dummies included in the model based on the Tokyo Stock Exchange 33 industry classifications (TSEINDY).[13]

I include two country-level variables for multinational firms in the models in which the cultural heterogeneity variables appear to control for firm-level exposure to country characteristics that may influence cash holdings following So and Zhang (2022). The country-level controls reflect corporate taxation differentials with the subsidiary countries and the level of financial development of the subsidiary country economies. The country-level controls are available for the period 2014 to 2023 and are used in the regression models including the cultural heterogeneity

[13] As financials and utilities are excluded, firms in the following industries were removed: Banks, Securities & Commodity Futures, Insurance, Other Financing Business and Electric Power & Gas. This leaves firms from 29 industries in the data and 28 industry dummies in the models that include industry fixed effects.

variables that are estimated for multinational firms.

Foley et al. (2007) show that taxation influences cash holding behaviour. To control for different potential tax effects, I calculate the differential between the corporate tax rate in each subsidiary country and the corporate tax rate in Japan. For each Japanese multinational, I average over the corporate tax differentials for the countries in which it has overseas affiliates. I use data on national corporate taxation rates compiled by the Tax Foundation as described in (Bray, 2021).[14] As the data end in 2022, I assume that tax rates in 2023 are the same as for 2022.

A multinational may need to hold more cash to fund its operations and investment if its subsidiaries are located in countries with relatively weak financial development and face limited access to funding locally. I use the average across the subsidiary countries of each firm of the International Monetary Fund's country-level Financial Development Indicator (FDI) as described in Svirydzenka (2016) to represent the access to funding in the multinational's subsidiary countries.

5 Results

Tables 3 to 9 provide the empirical results obtained from the 24 REWB models estimated with LCASH and CATA as the dependent variables on the explanatory variables separately and jointly. The separate and joint specifications are provided to assess the robustness of the estimation results. Within- and between-firm estimates are provided for each explanatory variable in all regressions, and for the firm- and country-level controls in the regressions presented in Table 9. Firm-level controls are included in all models. Country-level controls are included in the models in which the cultural heterogeneity explanatory variables appear, since the sample for these models includes only multinational firms. The firm- and country-level controls are provided in Table 9 only, for brevity. Industry fixed effects are included in all models except (21) and (23). The number of firms and firm-year observations included in the data for each model are reported in the results for each regression, and vary depending on data availability. For each regression, the following descriptive statistics are provided: Akaike and Schwarz Bayesian information criteria (AIC and BIC, respectively), the marginal and conditional coefficients of determination (Marg. R^2 and Cond. R^2, respectively). The marginal R^2 reflects the variation in the dependent variable explained by the fixed effects part of the model, while the conditional R^2 represents the variation in the dependent variable explained by both the random and fixed effects components of the model. The data used to estimate the models presented in 3 to 9 begins in January 2014 and ends in December 2023. The number of firms and firm-year observations differs between the models presented. This is because the sample for each regression includes all firms with at least two years of data for the variables included in the model.

Table 3 shows the results for models (1) to (3) in which LCASH is regressed on OSNS and FSHR separately, and on both variables jointly, respectively. The results for the regressions of CATA on the same explanatory variables, as models (4) to (6), are given in Table 4. Both the

[14] The Tax Foundation national corporate taxation rate data was obtained from the Tax Foundation GitHub page, accessed 2 February 2024.

Table 3: REWB regressions of LCASH on OSNS and FSHR.

	Dependent variable: LCASH					
	(1)		(2)		(3)	
	Within	Between	Within	Between	Within	Between
OSNS	0.166^{***}	0.454^{***}			0.162^{***}	0.441^{***}
	(0.059)	(0.080)			(0.059)	(0.081)
FSHR			-0.091	0.292^{**}	-0.161^{**}	0.155
			(0.062)	(0.138)	(0.073)	(0.151)
Intercept		-2.149^{***}		-2.171^{***}		-2.046^{***}
		(0.283)		(0.264)		(0.300)
Controls		Y		Y		Y
Country		Y		Y		Y
Industry		Y		Y		Y
Firms		940		1488		939
Obs.		7762		12265		7748
AIC		3000		6096		3007
BIC		3410		6533		3431
Marg. R^2		0.899		0.870		0.899
Cond. R^2		0.974		0.971		0.974

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable LCASH is the natural logarithm of cash. The explanatory variables are as follows. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

within and between estimates for OSNS are positive and significant at atleast the 5 percent level in models (1) and (3) for LCASH and models (4) and (6) for CATA. The within estimates are around one third the magnitude of the between estimates. The OSNS estimates are reasonably stable between the separate and joint specifications. The models suggest positive within- and between-firm relationships between cash holdings and OSNS, with the between effect being larger. The FSHR within estimates for models (3), (5) and (6) are negative and significant, while the within estimate for model (2) is not significant. However, the between estimate for FSHR in model (2) is positive and significant. There is evidence for a negative within relationship between cash holdings and foreign shareholdings.

In Tables 5 and 6, I present the results for the REWB regressions of LCASH on the cultural heterogeneity variables. Tables 7 and 8 show the results for similar regressions with CATA as the dependent variable. The cultural heterogeneity variables enter the regression grouped by cultural dimension. That is, I group the lower than, and higher than, Japan variables for each cultural dimension in the regressions of dimensions separately. The sample for these models is restricted to firms with at least one overseas affiliate over the period 2014 to 2023 – 1488 unique firms and 12,287 firm-year observations. Firm- and country-level controls, and industry fixed

Table 4: REWB regressions of CATA on OSNS and FSHR.

	Dependent variable: CATA					
	(4)		(5)		(6)	
	Within	Between	Within	Between	Within	Between
OSNS	0.020^{**}	0.062^{***}			0.019^{**}	0.061^{***}
	(0.009)	(0.013)			(0.009)	(0.013)
FSHR			-0.020^{**}	0.012	-0.020^{*}	0.015
			(0.009)	(0.022)	(0.011)	(0.024)
Intercept		0.130^{***}		0.113^{***}		0.140^{***}
		(0.046)		(0.042)		(0.048)
Controls		Y		Y		Y
Country		Y		Y		Y
Industry		Y		Y		Y
Firms		940		1488		939
Obs.		7762		12265		7748
AIC		-25972		-39562		-25909
BIC		-25561		-39125		-25484
Marg. R^2		0.613		0.613		0.611
Cond. R^2		0.909		0.917		0.908

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable CATA is the ratio of cash to total assets. The explanatory variables are as follows. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

effects are included in each model.

In the regressions for LCASH on each cultural dimension separately, that is for models (7) to (12), 14 of a total of 24 within and between coefficient estimates are statistically significant at atleast the 10 percent level. Significant positive within-firm estimates are found for MASL, MASH, LTOL, IVRH and negative estimates for IDVH and IVRL. Significant positive between firm estimates are found for PDIL, IDVL, IDVH, UAIH, LTOH, IVRL, IVRH, while the coefficient of UAIL is negative. More between estimates significant than within estimates, and more significant estimates are positive than negative.

Model (13) provides the results for the regression of LCASH on the explanatory variables for all cultural dimensions. The estimated within coefficients for MASH, UAIL and IVRH are positive and significant, while those for IDVH and IVRL are negative. Several of the between estimates are no longer significant in the presence of the other cultural dimensions, with those remaining positive and significant being LTOH and IVRL, while UAIL remains negative.

The REWB regressions for CATA on the cultural heterogeneity variables are provided in Tables

Table 5: REWB regressions of LCASH on PDI, IDV and MAS variables.

	Dependent variable: LCASH					
	(7)		(8)		(9)	
	Within	Between	Within	Between	Within	Between
PDIL	-0.003	0.145^{***}				
	(0.020)	(0.044)				
PDIH	0.004	0.035				
	(0.021)	(0.045)				
IDVL			-0.011	0.103^{*}		
			(0.021)	(0.059)		
IDVH			-0.022^{**}	0.066^{***}		
			(0.010)	(0.025)		
MASL					0.043^{**}	0.002
					(0.017)	(0.033)
MASH					0.293^{***}	0.262
					(0.083)	(0.186)
Intercept		-2.254^{***}		-2.308^{***}		-2.327^{***}
		(0.270)		(0.262)		(0.259)
Controls		Y		Y		Y
Country		Y		Y		Y
Industry		Y		Y		Y
Firms		1488		1488		1488
Obs.		12287		12287		12287
AIC		6112		6110		6097
BIC		6564		6562		6550
Marg. R^2		0.870		0.870		0.870
Cond. R^2		0.971		0.971		0.971

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable LCASH is the natural logarithm of cash. The explanatory variables are as follows. The six cultural dimensions power distance (PDI), individualism – collectivism (IND), masculinity – femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IVR), are constructed for index levels higher (with the suffix H) and lower (with the suffix L) than Japan. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

7 and 8. The tables show models (14) to (19), in which the heterogeneity variables for each each cultural dimension are included separately, and model (20), that includes the variables for all cultural dimensions. Seven of the 24 cultural heterogeneity estimates in models (14) to (19) are significant. Of the within-firm estimates, LTOL is positive and significant, while IDVL and IVRL are negative. Among the between estimates, PDIL, LTOH and IVRH are positive while UAIL is negative. In model (20), the within estimate for PDIL is positive and significant, while those for IDVH and IVRL are negative and significant. The between estimate for UAIL is negative and significant while the estimate for LTOH is positive.

Table 9 provides the results for the REWB models (21) to (24) which include all of the explana-

Table 6: REWB regressions of LCASH on UAI, LTO, IVR and all cultural distance variables.

	Dependent variable: LCASH							
	(10)		(11)		(12)		(13)	
	Within	Between	Within	Between	Within	Between	Within	Between
PDIL							0.041	0.060
							(0.030)	(0.074)
PDIH							0.014	0.066
							(0.025)	(0.056)
IDVL							−0.002	0.009
							(0.024)	(0.073)
IDVH							−0.061***	0.016
							(0.016)	(0.044)
MASL							0.027	−0.051
							(0.021)	(0.049)
MASH							0.280***	0.161
							(0.083)	(0.186)
UAIL	0.007	−0.074***					0.036**	−0.105***
	(0.014)	(0.027)					(0.017)	(0.038)
UAIH	−0.088	0.460**					−0.108	0.345
	(0.087)	(0.220)					(0.088)	(0.221)
LTOL			0.028**	0.018			0.022	0.003
			(0.013)	(0.022)			(0.017)	(0.035)
LTOH			0.012	0.380***			0.033	0.284***
			(0.041)	(0.083)			(0.044)	(0.091)
IVRL					−0.081***	0.119**	−0.069***	0.103*
					(0.021)	(0.047)	(0.023)	(0.059)
IVRH					0.044**	0.134***	0.079***	0.069
					(0.018)	(0.040)	(0.023)	(0.059)
Intercept		−2.099***		−2.218***		−2.280***		−1.886***
		(0.259)		(0.250)		(0.252)		(0.327)
Controls		Y		Y		Y		Y
Country		Y		Y		Y		Y
Industry		Y		Y		Y		Y
Firms		1488		1488		1488		1488
Obs.		12287		12287		12287		12287
AIC		6104		6097		6086		6143
BIC		6557		6549		6539		6744
Marg. R^2		0.871		0.871		0.871		0.872
Cond. R^2		0.971		0.971		0.971		0.971

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable LCASH is the natural logarithm of cash. The explanatory variables are as follows. The six cultural dimensions power distance (PDI), individualism – collectivism (IND), masculinity – femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IVR), are constructed for index levels higher (with the suffix H) and lower (with the suffix L) than Japan. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

Table 7: REWB regressions of CATA on PDI, IDV and MAS variables.

	Dependent variable: CATA					
	(14)		(15)		(16)	
	Within	Between	Within	Between	Within	Between
PDIL	0.005	0.016**				
	(0.003)	(0.007)				
PDIH	−0.004	0.002				
	(0.003)	(0.007)				
IDVL			−0.005*	0.013		
			(0.003)	(0.009)		
IDVH			−0.001	0.006		
			(0.002)	(0.004)		
MASL					0.003	0.001
					(0.003)	(0.005)
MASH					0.012	0.033
					(0.013)	(0.029)
Intercept		0.122***		0.109***		0.110***
		(0.043)		(0.041)		(0.041)
Controls		Y		Y		Y
Country		Y		Y		Y
Industry		Y		Y		Y
Firms		1488		1488		1488
Obs.		12287		12287		12287
AIC		−39636		−39632		−39635
BIC		−39183		−39180		−39183
Marg. R^2		0.618		0.618		0.617
Cond. R^2		0.917		0.917		0.917

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable CATA is the ratio of cash to total assets. The explanatory variables are as follows. The six cultural dimensions power distance (PDI), individualism – collectivism (IND), masculinity – femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IVR), are constructed for index levels higher (with the suffix H) and lower (with the suffix L) than Japan. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

tory variables, and the firm- and country-level controls. The dependent variable is LCASH for models (21) and (22), and CATA for models (23) and (24). Industry fixed effects are excluded from models (21) and (23), and included in models (22) and (24). The coefficient estimates for the firm- and country-level control variables are included in the table. The models are estimated for the same sample for the period 2014 to 2023, consisting of 939 firms with at least two years of data, and 7,748 firm-year observations. The firms included in the sample disclose their overseas sales, have foreign shareholding data included in Nikkei NEEDS, and have at least one overseas affiliate.

The within-firm coefficients for OSNS are positive and significant for models (21) to (24), while

Table 8: REWB regressions of CATA on UAI, LTO, IVR and all cultural distance variables.

	Dependent variable: CATA							
	(17)		(18)		(19)		(20)	
	Within	Between	Within	Between	Within	Between	Within	Between
PDIL							0.014^{***}	0.014
							(0.005)	(0.012)
PDIH							0.001	0.007
							(0.004)	(0.009)
IDVL							-0.002	0.002
							(0.004)	(0.012)
IDVH							-0.007^{***}	0.000
							(0.003)	(0.007)
MASL							-0.001	-0.007
							(0.003)	(0.008)
MASH							0.011	0.023
							(0.013)	(0.030)
UAIL	0.000	-0.010^{**}					0.003	-0.013^{**}
	(0.002)	(0.004)					(0.003)	(0.006)
UAIH	-0.013	0.024					-0.015	0.012
	(0.013)	(0.035)					(0.013)	(0.035)
LTOL			0.003^{*}	0.002			0.003	0.002
			(0.002)	(0.004)			(0.003)	(0.006)
LTOH			-0.001	0.045^{***}			0.002	0.034^{**}
			(0.006)	(0.013)			(0.007)	(0.014)
IVRL					-0.015^{***}	0.012	-0.014^{***}	0.012
					(0.003)	(0.007)	(0.004)	(0.009)
IVRH					0.001	0.010^{*}	0.000	0.000
					(0.003)	(0.006)	(0.004)	(0.009)
Intercept		0.140^{***}		0.124^{***}		0.114^{***}		0.160^{***}
		(0.041)		(0.039)		(0.040)		(0.052)
Controls		Y		Y		Y		Y
Country		Y		Y		Y		Y
Industry		Y		Y		Y		Y
Firms		1488		1488		1488		1488
Obs.		12287		12287		12287		12287
AIC		-39638		-39642		-39653		-39483
BIC		-39186		-39190		-39201		-38882
Marg. R^2		0.618		0.620		0.618		0.622
Cond. R^2		0.917		0.917		0.917		0.917

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable CATA is the ratio of cash to total assets. The explanatory variables are as follows. The six cultural dimensions power distance (PDI), individualism – collectivism (IND), masculinity – femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IVR), are constructed for index levels higher (with the suffix H) and lower (with the suffix L) than Japan. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. Estimates for the firm- and country-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

the between coefficients are are positive and significant in all models except (23). When industry fixed effects are included, the between estimate is substantially larger in magnitude than the within effect. The within estimate for FSHR is negative and significant in the models including all explanatory variables, in contrast to the positive coefficients found for the partial models. The positive between estimate is not significant once industry fixed effects are included.

The within coefficient estimate for lower power distance, PDIL, is positive and significant at atleast the 5 percent level in all four models. Its magnitude is not affected by the inclusion of industry effects. Similarly, the within estimate for IDVL is positive and significant at atleast the 5 percent level and it magnitude remains similar when industry effects are added. The between estimate is also significant at the 10 percent level in model (24). However, the within estimate for IDVH is negative and significant, and of similar absolute magnitude to IDVL. The between estimate for MASL is negative and significant at the 5 percent level in all four models. UAIL is associated positively with cash holdings within-firm but negatively between firm. LTOL is positively related with cash holdings within-firm at atleast the 5 percent level of significance. LTOH has a positive and significant between-firm relationship with cash holdings in models (21) to (23), but not for model (24). Inclusion of industry effects erodes the magnitude of the LTOH estimates. The within estimates for IVRL are negative and significant at the 10 percent level in models (23) and (24), while the within estimates for IVRH are positive and significant at the 5 percent level in models (21) and (22). None of the within or between estimates for PDIH, MASH and UAIH are significant in any of models (21) to (24).

There are, to my knowledge, no published REWB models of cash holdings that jointly estimate within- and between-firm effects. Previous research, such as Opler et al. (1999), run separate fixed effect and cross-sectional OLS models to examine within- and between-firm effects. Accordingly, I examine the salient features of the within and between estimates of the coefficients for the commonly employed firm-level controls included in models of Table 9.

In the models with LCASH as the dependent variable, the positive relationship with SIZE is greater within-firm than between firms. Looking at the model for CATA, the within effect is positive but the between effect is negative. As firms grow in SIZE, the natural logarithm of total assets, their cash to total assets ratio rises. However, larger firms have lower CATA ratios than smaller firms consistent with larger firms having greater economies of scale in cash (Bates et al., 2009).

The relationship between cash holdings and the MTB valuation ratio is positive. The between firm effect is substantially larger than the within-firm effect, consistent with the idea that higher valued firms with better investment opportunities value cash more as noted in Bates et al. (2009). CFTA has positive within and between relationships with cash holdings, but again the magnitude of the effects can differ. CFTA appears more important between firms than within-firm. CFV has a negative within-firm effect but no significant between firm effect. NWCTA has a positive relationship of somewhat similar magnitude within and between firms.

CAPTA has a negative relationship with cash holdings, both within and between firms, but the between effect is substantially larger. Capital expenditures that create assets can increase

a firm's debt capacity and reduce the need for cash (Bates et al., 2009). Further, Riddick and Whited (2009) show a productivity shock may encourage a firm to increase capital spending, reducing cash holdings.

LEVTA has a positive within-firm effect, but a negative between firm effect. This would suggest that as firms take on leverage they accumulate cash, but firms with high leverage hold less cash than those with low leverage. The relationship between RDTA and cash is negative. The POTA ratio is also negatively related to cash holdings, but only within-firm. The diversification effect of operating in more business segments (SEG) is associated with lower cash holdings within-firm.

FDI, reflecting the level of financial development of the countries where firms' subsidiaries operate, has a negative between-firm effect, but not significant within-firm effect. Firms that have subsidiaries in more financially developed locations may have greater access to capital and greater flexibility than firms with subsidiaries in less financially developed countries.

Firms build cash holdings through retained earnings in overseas subsidiaries that are located in countries with corporate tax rates lower than the multinational parent (Foley et al., 2007). TAX is calculated as the average corporate taxation rate differential between each multinational firm's overseas affiliate countries and Japan, implying negative relationships between TAX and the cash holdings measures are expected. Table 9 shows that TAX has a negative relationship with cash holdings between firms, but a positive relationship within firm. The between effect is reduced by the industry effects and is not significant in model (24) with CATA as the measure of cash holdings.

Industry fixed effects are positive and significant for 22 of the 28 industry effects included in model (22) for LCASH and for 10 industries in model (24) for CATA.[15] The fixed effect estimates for the industries of services, mining, construction, information & communication and retail trade are relatively large in magnitude and significant in both models (22) and (24). The large and significant fixed effects for some industries underscore the substantial differences in cash holdings decision-making between industries that are apparent in the plots of cash by industry.

[15]The Tokyo Stock Exchange New Industry Codes refer to 33 industries plus an unclassifiable category. In the data, 29 industries are represented giving 28 industry fixed effect dummy variables. The reference industry is Fishery, Agriculture and Forestry.

Table 9: REWB regressions of LCASH and CATA on all explanatory variables.

	Dependent variable: LCASH				Dependent variable: CATA			
	(21)		(22)		(23)		(24)	
	Within	Between	Within	Between	Within	Between	Within	Between
OSNS	0.135^{**}	0.159^{**}	0.140^{**}	0.319^{***}	0.016^{*}	0.010	0.017^{*}	0.045^{***}
	(0.060)	(0.080)	(0.060)	(0.083)	(0.009)	(0.013)	(0.009)	(0.013)
FSHR	-0.168^{**}	0.424^{***}	-0.168^{**}	0.164	-0.022^{**}	0.062^{**}	-0.021^{*}	0.016
	(0.073)	(0.157)	(0.073)	(0.151)	(0.011)	(0.026)	(0.011)	(0.024)
PDIL	0.071^{**}	0.046	0.071^{**}	0.028	0.018^{***}	0.015	0.018^{***}	0.012
	(0.035)	(0.077)	(0.035)	(0.074)	(0.005)	(0.013)	(0.005)	(0.012)
PDIH	-0.014	-0.054	-0.013	-0.037	0.000	-0.011	0.000	-0.008
	(0.037)	(0.078)	(0.037)	(0.075)	(0.006)	(0.013)	(0.006)	(0.012)
IDVL	0.077^{**}	0.006	0.075^{**}	0.124	0.011^{**}	0.006	0.010^{**}	0.026^{*}
	(0.034)	(0.101)	(0.034)	(0.096)	(0.005)	(0.016)	(0.005)	(0.016)
IDVH	-0.083^{***}	0.080	-0.084^{***}	0.062	-0.012^{***}	0.009	-0.013^{***}	0.008
	(0.020)	(0.051)	(0.020)	(0.048)	(0.003)	(0.008)	(0.003)	(0.008)
MASL	0.045	-0.135^{**}	0.046	-0.138^{**}	0.000	-0.024^{**}	0.000	-0.025^{**}
	(0.028)	(0.064)	(0.028)	(0.062)	(0.004)	(0.010)	(0.004)	(0.010)
MASH	-0.037	0.114	-0.038	0.101	-0.015	0.012	-0.015	0.014
	(0.100)	(0.181)	(0.100)	(0.170)	(0.015)	(0.029)	(0.015)	(0.027)
UAIL	0.043^{*}	-0.161^{***}	0.042^{*}	-0.190^{***}	0.009^{**}	-0.019^{**}	0.009^{**}	-0.025^{***}
	(0.025)	(0.052)	(0.025)	(0.050)	(0.004)	(0.009)	(0.004)	(0.008)
UAIH	-0.011	0.041	-0.013	0.090	-0.012	-0.037	-0.012	-0.015
	(0.089)	(0.231)	(0.089)	(0.220)	(0.013)	(0.038)	(0.013)	(0.036)
LTOL	0.053^{**}	-0.018	0.052^{**}	0.011	0.012^{***}	0.004	0.012^{***}	0.005
	(0.025)	(0.048)	(0.025)	(0.047)	(0.004)	(0.008)	(0.004)	(0.008)
LTOH	0.044	0.229^{**}	0.045	0.176^{**}	0.004	0.027^{*}	0.004	0.019
	(0.054)	(0.092)	(0.054)	(0.089)	(0.008)	(0.015)	(0.008)	(0.014)
IVRL	-0.025	0.046	-0.024	0.072	-0.009^{*}	0.018	-0.009^{*}	0.019
	(0.034)	(0.077)	(0.034)	(0.075)	(0.005)	(0.013)	(0.005)	(0.012)
IVRH	0.062^{**}	0.024	0.063^{**}	0.017	-0.003	-0.002	-0.003	-0.005
	(0.028)	(0.067)	(0.028)	(0.064)	(0.004)	(0.011)	(0.004)	(0.010)
Intercept		-0.394		-1.271^{***}		0.330^{***}		0.244^{***}
		(0.351)		(0.401)		(0.057)		(0.065)
Controls								
SIZE	1.091^{***}	0.896^{***}	1.089^{***}	0.905^{***}	0.021^{***}	-0.014^{***}	0.021^{***}	-0.012^{***}
	(0.018)	(0.015)	(0.018)	(0.014)	(0.003)	(0.002)	(0.003)	(0.002)
MTB	0.013^{***}	0.089^{***}	0.013^{***}	0.053^{***}	0.004^{***}	0.019^{***}	0.004^{***}	0.012^{***}
	(0.004)	(0.013)	(0.004)	(0.013)	(0.001)	(0.002)	(0.001)	(0.002)
CFTA	1.375^{***}	1.908^{***}	1.373^{***}	1.319^{**}	0.266^{***}	0.625^{***}	0.265^{***}	0.451^{***}
	(0.076)	(0.686)	(0.076)	(0.665)	(0.012)	(0.112)	(0.012)	(0.107)
CFV	-1.127^{***}	1.116	-1.126^{***}	-0.287	-0.271^{***}	0.352^{***}	-0.271^{***}	0.105
	(0.374)	(0.819)	(0.374)	(0.806)	(0.057)	(0.133)	(0.057)	(0.130)
NWCTA	2.043^{***}	1.454^{***}	2.049^{***}	1.713^{***}	0.401^{***}	0.320^{***}	0.403^{***}	0.358^{***}
	(0.057)	(0.148)	(0.057)	(0.145)	(0.009)	(0.024)	(0.009)	(0.023)

Table 9 is continued on the next page.

Table 9 continued.

	Dependent variable: LCASH				Dependent variable: CATA			
	(21)		(22)		(23)		(24)	
	Within	Between	Within	Between	Within	Between	Within	Between
CAPTA	-0.705^{***}	-1.429^{*}	-0.703^{***}	-1.018	-0.133^{***}	-0.569^{***}	-0.133^{***}	-0.537^{***}
	(0.131)	(0.850)	(0.131)	(0.833)	(0.020)	(0.138)	(0.020)	(0.134)
LEVTA	0.341^{***}	-0.831^{***}	0.338^{***}	-0.564^{***}	0.088^{***}	-0.048^{*}	0.089^{***}	-0.028
	(0.066)	(0.156)	(0.066)	(0.155)	(0.010)	(0.025)	(0.010)	(0.025)
RDTA	-0.171	-2.008^{**}	-0.223	-0.505	-0.164^{*}	-0.586^{***}	-0.176^{**}	-0.296^{**}
	(0.577)	(0.785)	(0.577)	(0.925)	(0.087)	(0.128)	(0.087)	(0.149)
AQTA	-0.235	-0.988^{*}	-0.249	-0.030	-0.039	-0.054	-0.039	0.020
	(0.273)	(0.570)	(0.273)	(0.553)	(0.041)	(0.093)	(0.041)	(0.089)
POTA	-0.759^{***}	0.775	-0.765^{***}	0.794	-0.182^{***}	0.213	-0.182^{***}	0.233
	(0.238)	(1.641)	(0.238)	(1.561)	(0.036)	(0.267)	(0.036)	(0.252)
SEG	-0.083^{***}	-0.043	-0.082^{***}	-0.035	-0.017^{***}	-0.009	-0.017^{***}	-0.010^{*}
	(0.027)	(0.035)	(0.027)	(0.034)	(0.004)	(0.006)	(0.004)	(0.006)
FDI	-0.085	-0.730^{***}	-0.076	-0.546^{**}	0.004	-0.114^{**}	0.006	-0.089^{**}
	(0.124)	(0.279)	(0.124)	(0.267)	(0.019)	(0.045)	(0.019)	(0.043)
TAX	0.799^{***}	-2.985^{***}	0.789^{***}	-2.646^{***}	0.097^{***}	-0.294^{**}	0.096^{***}	-0.228
	(0.139)	(0.900)	(0.139)	(0.872)	(0.021)	(0.147)	(0.021)	(0.141)
Controls	Y		Y		Y		Y	
Country	Y		Y		Y		Y	
Industry	N		Y		N		Y	
Firms	939		939		939		939	
Obs.	7748		7748		7748		7748	
AIC	3099		3074		-25806		-25747	
BIC	3496		3665		-25409		-25156	
Marg. R^2	0.891		0.902		0.575		0.623	
Cond. R^2	0.974		0.974		0.910		0.909	

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variables LCASH and CATA are the natural logarithm of cash and the ratio of cash to total assets, respectively. The explanatory variables are as follows. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. The six cultural dimensions power distance (PDI), individualism – collectivism (IND), masculinity – femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO) and indulgence versus restraint (IVR), are constructed for index levels higher (with the suffix H) and lower (with the suffix L) than Japan. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. The country level controls are as follows. FDI represents the weighted average index of financial development calculated over firms' subsidiary countries. TAX is a weighted average of the tax differential between Japan and the firms' subsidiary countries. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations over the period 2014 to 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

6 Discussion

Table 10: Inference summary.

Variable	Within								Between							
	LCASH				CATA				LCASH				CATA			
	Sep.	Sub.	All		Sep.	Sub.	All		Sep.	Sub.	All		Sep.	Sub.	All	
Industry			*N*	*Y*			*N*	*Y*			*N*	*Y*			*N*	*Y*
OSNS	+	+	+	+	+	+	(+)	(+)	+	+	+	+	+	+		+
FSHR		–	–	–	–	(–)	–	(–)	+		+				+	
PDIL			+	+		+	+	+	+				+			
PDIH																
IDVL			+	+	(–)		+	+	(+)							(+)
IDVH	–	–	–	–		–	–	–	+							
MASL	+										–	–			–	–
MASH	+	+														
UAIL		+	(+)	(+)			+	+	–	–	–	–	–	–	–	–
UAIH									+							
LTOL	+		+	+	(+)		+	+								
LTOH									+	+	+	+	+	+	(+)	
IVRL	–	–			–	–	(–)	(–)	+	(+)						
IVRH	+	+	+	+					+				(+)			

Note: The table summarises the results presented in Tables 3 to 9, for models (1)to (24). The explanatory variables are listed in the first column. Within estimates are grouped on the left and between estimates are on the right. The second row indicates the dependent variable. Sep. indicates the models with only one explanatory variable or cultural dimension, that is, models (1, 2, 4, 5, 7-12, 14-19). Sub. represents the sub-group of explanatory variables, that is, models (4, 6, 12, 20). All (shaded in grey) provides the models containing all explanatory variables, that is, models (21-24). For these models, *Y* (*N*) indicate that industry fixed effects and included (excluded). A + symbol represents a positive coefficient estimate at atleast the 5 percent level. A – symbol represents a negative estimate significant at atleast the 5 percent level. (+) and (–) indicate positive and negative estimates significant at the 10 percent level, respectively.

Table 10 summarises the inference for the models presented in Section 5. The within estimates have been grouped on the left side of the table and the between estimates are on the right. The explanatory variables are listed in the first column. The Sep. columns contain the inferences for the models in which each variable regressed separately on the cash holdings measures. The Sub. columns contain the inferences for the variables regressed jointly on cash holdings, that is as the subgroups OSNS and FSHR together, and the cultural heterogeneity variables together. The All columns, shaded in grey, contain the inferences of models in which cash holdings are regressed on all explanatory variables jointly, with and without industry fixed effects indicated as *Y* and *N*. The + and – symbols indicate positive and negative coefficient estimates, respectively, that are significant at the 5 percent or 1 percent levels. The (+) and (–) notations indicate positive and negative coefficient estimates, respectively, that are significant at the 10 percent level. The absence of a symbol means that the coefficient estimate was not significant.

Overall, Table 10 shows that more within than between estimates are significant. Positive estimates are more positive than negative estimates. Most estimates are significant at the 5 percent or one percent level. For some variables, there is empirical support for a relationship in several models, while for other variables there is relatively little support.

Cash holdings and the overseas sales ratio are positively related both within and between firms. Almost all models yield positive and significant coefficient estimates. The only OSNS estimate

not significant is that in model (23), estimated without industry fixed effects. This measure of multinationality has a reasonably robust relationship with cash holdings, supporting hypothesis H1. As a firm's overseas sales ratio rises, the firm is likely to hold a higher level of cash and have a higher cash to total assets ratio. Firms with higher overseas sales ratios hold more cash than firms with lower overseas sales ratios, and this between-firm effect is larger than the within-firm effect. The finding is consistent with the reasoning that the additional corporate risks involved in selling products overseas lead firms to hold more cash for precautionary reasons.

However, the evidence is stronger for the log-level of cash than the cash to total assets ratio when the cultural heterogeneity variables are included. As overseas sales often require a degree of intercultural interaction, there may be interplay between the cultural heterogeneity variables and overseas sales.

Cash holdings and the ratio of foreign shareholding are negatively related within-firm. That is, firms' cash holdings – both in log-level and as the ratio to total assets– decrease as foreign ownership increases. This is the opposite sign to that predicted in hypothesis H2. As noted in Section 3.1, it is possible that greater foreign ownership provides more financial flexibility and thus lower precautionary balances are required. Furthermore, is possible that foreign shareholders exert pressure on firms to decrease cash holdings, and that firms succeed in improving their attractiveness to foreign shareholders by lowering their cash holdings. Government, regulators and the Tokyo Stock exchange have made efforts over the last decade to increase dialogue between investors and Japanese firms. Initiatives include the Stewardship Code for Japanese Institutional Investors initiated in 2014.[16] Numerous articles in the financial press have noted that Japanese firms are becoming more responsive to their shareholders, and as a result, more attractive targets for activist investors (see for example The Economist (2020)).

It is possible that the negative relationship has emerged over recent years as firms have been more responsive to shareholder demands. Tables D.1 and D.2 in Appendix D regress LCASH and CATA on FSHR over a longer sample from January 2000 to December 2023 and suggest a positive within relationship. Note that these regressions include all firms for which FSHR data is available (not only firms with more than one overseas affiliate) and does not include country-level controls.[17]

A positive and significant between-firm cash holdings and foreign shareholding relationship exists in three models, including for LCASH and CATA regressed on all explanatory variables without industry fixed effects (models (21) and (23), respectively). However, the estimates are not significant when industry effects are included in the models.

The results for the cultural heterogeneity variables suggest that different cultural dimensions matter in different ways. Four cultural heterogeneity variables have positive within-firm re-

[16]The latest version of the Stewardship Code can be found here, accessed 26 August 2024.

[17]Another potential interpretation is that foreign investors are more familiar with Japanese multinationals than domestic firms, and the comfort with the familiar effect or access to superior investment information relative to domestic firms, for example because of reporting language and media coverage, means they invest in multinationals more than domestic firms. At the same time, multinationals are likely to hold less cash due to business diversification benefits Duchin (2010).

lationships with both measures of cash holdings – PDIL, IDVL, UAIL and LTOL. IDVH has a negative relationship with both measures of cash holdings, and the absolute value of its coefficient estimates are approximately the same as those for IDVL. The estimates for PDIH, UAIH and LTOH suggest no relationship with cash holdings. Thus we can say that, relative to Japan, firms having subsidiaries in counties with lower power distance, uncertainty avoidance, and long-term orientation is associated with higher cash holdings, both in log-level and relative to total assets, in the time series. However, there is no effect on cash holdings from having subsidiaries in countries with higher power distance, uncertainty avoidance or long-term orientation. The relationship between cash holdings and individuality is approximately linear. Having subsidiaries in more collectivist countries is associated with higher cash holdings while having subsidiaries in more individualist countries is associated with lower cash holdings. These results support hypothesis H3, that cultural heterogeneity is associated with higher cash holdings under the precautionary motive.

IVRH has a positive within relationship with LCASH but not with CATA. IVRL has a negative within relationship with cash holdings, but with the stronger evidence being for the model with CATA as the dependent variable. This may suggest there is a linear relationship between cash holdings and impulsiveness versus restraint, with subsidiaries in more impulsive countries associated with higher cash holdings while those in more restrained societies are associated with lower cash holdings in the time series. However, the evidence is less compelling than for the individuality versus collectivity dimension. There does not appear to be a robust within relationship between the masculinity versus femininity heterogeneity variables and cash holdings.

There are less between estimates that are significant. LTOH has a positive relationship with cash holdings, with the evidence being stronger for the LCASH measure than for CATA. MASL and UAIL have negative between relationships with cash holdings. There is relatively weak evidence for between relationships for PDIL, IDVL, IDVH, UAIH, IVRL and IVRH. The between estimates for PDIH, MASH and LTOL are not significant. Thus firms with subsidiaries in countries with higher long-term orientation than Japan tend to have higher cash holdings in the cross-section, while those with subsidiaries in countries with lower masculinity versus femininity and uncertainty avoidance hold less cash in the cross section.

The results for the cultural heterogeneity variables demonstrate that the relationship between cultural dimensions and the cash holdings of Japanese multinationals through the precautionary motive is complex. Not all cultural dimensions are relevant, and the relative cultural value index levels of subsidiaries and Japan is important. The magnitude and significance of within and between effects are different more often than not.

The study has limitations, including a relatively short sample period of 10 years due to the availability of data on Japanese multinationals' overseas subsidiaries. The study is reliant on cultural values as defined by Hofstede's dimensions.

7 Conclusion

In general, the relationship between cash holdings and the internationalisation of Japanese multinationals is complex, and may incorporate bidirectional influences between the parent firm and its overseas affiliates. Firms hold more cash when they make a greater proportion of their sales overseas, both in the time series and cross section. However, the proportion of foreign investors has a negative relationship with cash holdings in the time series.

Regarding cultural heterogeneity, within effects are more prevalent than between effects, and they are more often positive than negative. Cash holdings are positively associated with lower power distance, uncertainty avoidance, and long-term orientation in the time series. Subsidiaries in more collectivist countries is associated with higher cash holdings while having subsidiaries in more individualist countries is associated with lower cash holdings, also in the time series. Greater long-term orientation has a positive between-firm relationship with cash holdings, while lower masculinity and uncertainty avoidance are negatively associated with cash holdings between firms.

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Appendices

A High CATA Ratio Industries by Year

Table A.1: Firms with cash to total assets greater than 30 percent.

Year	Number	Sample	Industry 1	Industry 2	Industry 3
1993	134	1076	Electric Appliances	Machinery	Chemicals
1994	131	1080	Electric Appliances	Machinery	Chemicals
1995	126	1094	Electric Appliances	Machinery	Pharmaceutical
1996	113	1129	Machinery	Pharmaceutical	Electric Appliances
1997	97	1167	Machinery	Electric Appliances	Chemicals
1998	84	1185	Electric Appliances	Machinery	Pharmaceutical
1999	94	1208	Electric Appliances	Machinery	Services
2000	129	1299	Electric Appliances	Machinery	Services
2001	129	1341	Electric Appliances	Services	Machinery
2002	149	1368	Electric Appliances	Services	Machinery
2003	149	1397	Machinery	Electric Appliances	Services
2004	190	1447	Electric Appliances	Machinery	Information & Communication
2005	186	1524	Electric Appliances	Machinery	Information & Communication
2006	174	1561	Machinery	Electric Appliances	Information & Communication
2007	157	1583	Services	Electric Appliances	Machinery
2008	134	1573	Services	Electric Appliances	Information & Communication
2009	154	1551	Electric Appliances	Machinery	Services
2010	222	1530	Electric Appliances	Machinery	Information & Communication
2011	220	1536	Electric Appliances	Information & Communication	Machinery
2012	231	1559	Information & Communication	Electric Appliances	Services
2013	277	1640	Information & Communication	Electric Appliances	Machinery
2014	293	1719	Information & Communication	Services	Electric Appliances
2015	334	1786	Information & Communication	Services	Electric Appliances
2016	376	1849	Information & Communication	Services	Electric Appliances
2017	471	1906	Information & Communication	Services	Machinery
2018	483	1973	Information & Communication	Services	Machinery
2019	506	2003	Information & Communication	Services	Machinery
2020	603	2036	Information & Communication	Services	Machinery
2021	747	2035	Information & Communication	Services	Machinery
2022	611	1704	Information & Communication	Services	Machinery
2023	398	1328	Information & Communication	Services	Machinery

Note: Number represents the number of firms with cash to total assets greater than 30 percent. Sample provides the total number of firms in the sample for each year. Industry 1 to Industry 3 give the three most frequent industry classifications among the firms with cash to total assets greater than 30 percent. The data used to construct this table include all Prime (or First) Section firms reporting cash and total assets in the Nikkei NEEDS database between 1993 and 2023, excluding financials, utilities and Japan Post Holdings.

B An Example Of Subsidiary Disclosure in the Yuho

名称	住所	資本金又は出資金	主要な事業の内容	議決権の所有割合(%)	関係内容
トヨタ　モーター マニュファクチャリング テキサス㈱　＊1	San Antonio, Texas, U.S.A	千米ドル 510,000	自動車	100.00 (100.00)	当社製品の販売先。
トヨタ　モーター クレジット㈱　＊1＊2	Plano, Texas, U.S.A	千米ドル 915,000	金　融	100.00 (100.00)	当社製品にかかる販売金融。
トヨタ　ファイナンシャル セービング　バンク㈱	Henderson, Nevada, U.S.A	千米ドル 1	金　融	100.00 (100.00)	
カナダトヨタ㈱	Toronto, Ontario, Canada	千加ドル 10,000	自動車	51.00	当社製品の販売先。
トヨタ　モーター マニュファクチャリング カナダ㈱　＊1	Cambridge, Ontario, Canada	千加ドル 680,000	自動車	100.00	当社製品の販売先。
トヨタ　クレジット　カナダ㈱	Markham, Ontario, Canada	千加ドル 60,000	金　融	100.00 (100.00)	当社製品にかかる販売金融。
トヨタ　モーター マニュファクチャリング バハ　カリフォルニア㈲	Tijuana, Baja California, Mexico	千メキシコ・ペソ 3,834,821	自動車	100.00 (100.00)	当社製品の販売先。
トヨタ　モーター マニュファクチャリング グアナファト㈱	Apaseo el Grande, Guanajuato, Mexico	千メキシコ・ペソ 3,395,529	自動車	100.00 (100.00)	当社製品の販売先。
アルゼンチントヨタ㈱	Buenos Aires, Argentina	千アルゼンチン・ペソ 260,000	自動車	100.00 (0.00)	当社製品の販売先。なお、当社より資金援助を受けています。
ブラジルトヨタ㈲　＊1	Sao Paulo, Brazil	千ブラジル・レアル 6,709,980	自動車	100.00	当社製品の販売先。なお、当社より資金援助を受けています。
トヨタ　モーター ヨーロッパ㈱　＊1	Brussels, Belgium	千ユーロ 3,504,469	自動車	100.00	当社製品の販売先、自動車技術の研究開発および渉外・広報活動の委託先。なお、当社より資金援助を受けています。
トヨタ　モーター マニュファクチャリング チェコ㈲	Kolin, Czech	千チェコ・コルナ 5,140,000	自動車	100.00 (100.00)	当社製品の販売先。
トヨタフランス㈱	Vaucresson, France	千ユーロ 2,123	自動車	100.00 (100.00)	当社製品の販売先。
トヨタ　モーター マニュファクチャリング フランス㈱	Onnaing, France	千ユーロ 268,079	自動車	100.00 (100.00)	当社製品の販売先。
トヨタ　モーター ファイナンス （ネザーランズ）㈱　＊2	Amsterdam, Netherlands	千ユーロ 908	金　融	100.00 (100.00)	当社関係会社への資金調達支援。
トヨタセントラルヨーロッパ㈲	Warsaw, Poland	千ユーロ 101	自動車	100.00 (100.00)	当社製品の販売先。
トヨタ　モーター マニュファクチャリング ターキー㈱	Arifiye, Sakarya, Turkey	千トルコ・リラ 150,165	自動車	90.00 (90.00)	当社製品の販売先。

Figure B.1: An example page from Toyota Motor's 2023 Yuho, section 1(4) page 11, disclosing information about subsidiaries (name, location, capital or investment amount, business details, percentage of voting rights held, and other information). The format of this text block in the Yuho is not standardised.

C Japanese Multinational Firms' Overseas Affiliates

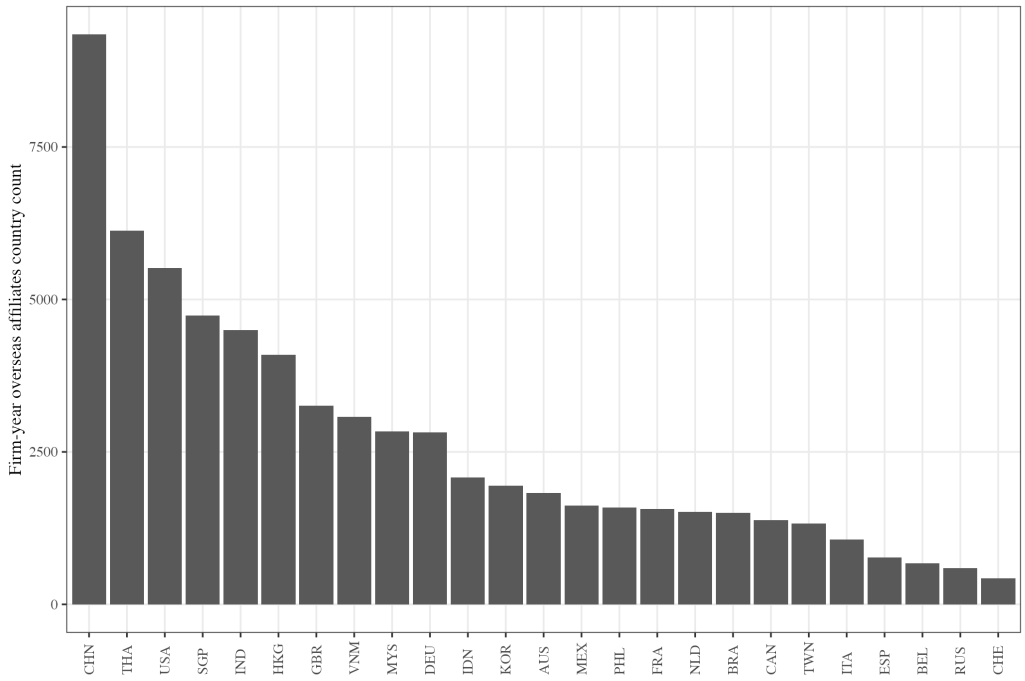

Figure C.1: Firm-year overseas affiliate count by country for the top 25 locations. For each firm, each country is scored as 1 if the firm has at least one affiliate in the country and 0 if not. Countries are represented using their ISO3166 three letter code. Data on overseas affiliates is constructed by machine reading firms' Annual Securities Reports (Yuho) obtained via EDINET. Only firms with at least one overseas subsidiary are included. Financials, utilities and Japan Post Holdings are excluded.

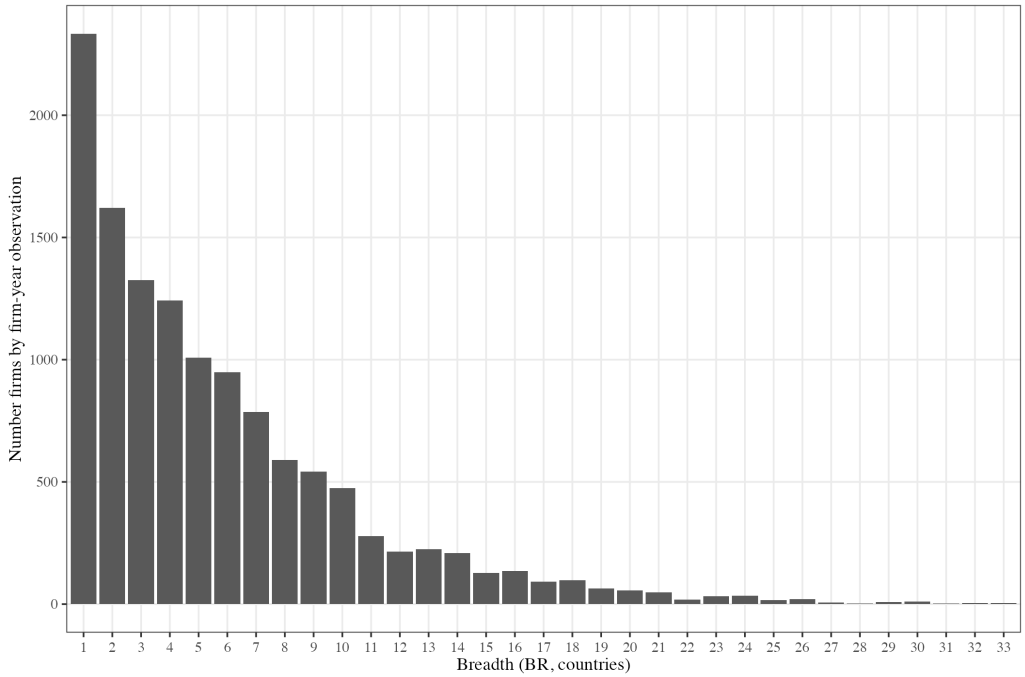

Figure C.2: Firm-year frequency of Breadth (BR) across all countries. For each firm, each country is scored as 1 if the firm has at least one affiliate in the country and 0 if not. Data on overseas affiliates is constructed by machine reading firms' Annual Securities Reports (Yuho) obtained via EDINET. Only firms with at least one overseas subsidiary are included. Financials, utilities and Japan Post Holdings are excluded.

D Models for OSNS and FSHR Estimated Using Data From 2000 to 2023

Table D.1: REWB regressions of LCASH on OSNS and FSHR over the period 2000 to 2023.

	Dependent variable: LCASH					
	(1a)		(2a)		(3a)	
	Within	Between	Within	Between	Within	Between
OSNS	0.489^{***}	0.491^{***}			0.450^{***}	0.508^{***}
	(0.036)	(0.079)			(0.036)	(0.080)
FSHR			0.278^{***}	0.178	0.376^{***}	-0.168
			(0.037)	(0.126)	(0.049)	(0.154)
Intercept		-2.422^{***}		-1.887^{***}		-2.507^{***}
		(0.239)		(0.200)		(0.252)
Controls		Y		Y		Y
Country		N		N		N
Industry		Y		Y		Y
Firms		1325		2546		1324
Obs.		18216		37171		18183
AIC		17159		39199		17095
BIC		17589		39668		17540
Marg. R^2		0.849		0.814		0.849
Cond. R^2		0.948		0.936		0.948

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable LCASH is the natural logarithm of cash. The explanatory variables are as follows. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. Estimates for the firm-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations from January 2000 to December 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.

Table D.2: REWB regressions of CATA on OSNS and FSHR over the period 2000 to 2023.

	Dependent variable: CATA					
	(4a)		(5a)		(6a)	
	Within	Between	Within	Between	Within	Between
OSNS	0.034^{***}	0.061^{***}			0.031^{***}	0.062^{***}
	(0.005)	(0.011)			(0.005)	(0.011)
FSHR			0.023^{***}	0.003	0.031^{***}	-0.004
			(0.005)	(0.019)	(0.006)	(0.021)
Intercept		0.093^{***}		0.165^{***}		0.091^{***}
		(0.032)		(0.030)		(0.034)
Controls		Y		Y		Y
Country		N		N		N
Industry		Y		Y		Y
Firms		1325		2546		1324
Obs.		18216		37171		18183
AIC		-56930		-109360		-56829
BIC		-56501		-108891		-56384
Marginal R^2		0.543		0.586		0.542
Cond. R^2		0.850		0.880		0.850

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Standard errors are included in parentheses. Prob-values are calculated using Satterthwaite degrees of freedom. The dependent variable CATA is the ratio of cash to total assets. The explanatory variables are as follows. OSNS is the ratio of overseas sales to net sales. FSHR is the ratio of shares held by foreign entities to total shares outstanding. Controls indicates whether firm-level control variables are included. The firm-level controls are as follows. SIZE is the natural logarithm of total assets. MTB is the market to book ratio. CFTA is the ratio of cash flow to total assets. CFV is cash flow volatility over the previous 10 years. NWCTA is net working capital to total assets. LEVTA is the ratio of short- and long-term debt to total assets. CAPTA is the ratio of capital expenditure to total assets. RDTA is the ratio of R&D expenditure to total assets. AQTA is the ratio of acquisitions to total assets. POTA is the ratio of payouts, via dividends and repurchases, to total assets. SEG represents the number of business segments that firms operate in. Country indicates whether country-level controls are included. Estimates for the firm-level controls are not presented. INDUSTRY indicates whether industry fixed effects are included as dummy variables. Firms represents the number of unique firms in the sample. Obs. represents the number of firm-year observations included in the sample. Firm-year observations are excluded if data for any variables are missing. Firms with less than two years of data are excluded. The sample consists of annual observations from January 2000 to December 2023. AIC and BIC are the Akaike and Schwarz Bayesian information criteria, respectively. The marginal R^2 reflects the fixed effects part of the model. The conditional R^2 represents both the random and fixed effects components of the model.