Corporate Cash Holding in Asia*

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Received 29 January 2014; accepted 26 August 2014

In this paper, we analyze the determinants of corporate saving in the form of changes in cash holdings for 11 Asian economies using firm-level data from the Oriana Database for the 2002–2011 period. We find some evidence that cash flow has a positive impact on the change in cash holdings (i.e. that the cash flow sensitivity of cash is positive) and that the positive impact of cash flow on the change in cash holdings is larger and more significant in the case of smaller and presumably more constrained firms than in the case of larger and presumably less constrained firms in both developed and developing economies. Both of these findings corroborate the importance of financial constraints in Asian firms. In addition, we find that the cash flow sensitivity of cash declined after the global financial crisis and that Tobin’s $q$ has a positive impact on the change in cash holdings, especially in the case of larger and presumably unconstrained firms.

Keywords: Asia, borrowing constraints, cash flow, cash flow sensitivity of cash, cash holdings, corporate investment, corporate saving, financial constraints, firm size, global financial crisis, liquidity management, Tobin’s $q$, Oriana Database.

JEL classification codes: D22, D92, E21, E22, G11, G32, O16, O53.

doi: 10.1111/asej.12039

I. Introduction

Corporate saving has always played an important role, but it has shown a substantial upward trend in many, if not most, of the developed and Asian economies for the past 2 decades, as pointed out by Karabarbounis and Neiman (2012), and, therefore, is of even more importance now. Yet most previous analyses of saving have focused on household (or personal) saving or national (or domestic) saving, and there have been relatively few analyses of corporate (or firm) saving (refer to

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the papers in the references section for a representative sampling of previous theoretical and empirical analyses of corporate saving).

In the case of Asia, the high overall saving rates have been referred to a ‘saving glut’ and have been blamed for the pre-global financial crisis ‘global imbalances’, and both academics and policy-makers have expended much effort in trying to understand the saving behavior of this region generally (see e.g. Horioka and Terada-Hagiwara, 2012), but the factors driving the surge in corporate saving in Asia have yet to be disentangled. The objective of this paper is to fill this void by doing an empirical analysis of the saving behavior of Asian firms.

The recent literature on corporate saving has proposed two main explanations for the excess corporate saving in emerging markets. First, emerging markets have a limited supply of financial assets and are financially constrained (see e.g. Almeida et al. (2004), Dooley et al. (2005), Khurana et al. (2006), Matsuyama (2007), Ju and Wei (2006, 2010) and Caballero et al. (2008); see Almeida et al. (2013) for an excellent survey of this literature). In this explanation, the underdeveloped financial sector serves as the main driver of corporate saving behavior.

The second strand of the literature on corporate saving focuses on the role of the precautionary motive. In this explanation, excess saving and, thence, net capital outflows result from precautionary saving arising from idiosyncratic risk (see e.g. Benhima 2008; Mendoza et al., 2009; Sandri, 2010). In these precautionary saving models, rising uncertainties cause a decline in corporate investment, as has been particularly noticeable in some of the South-East Asian economies.

The goal of this paper is not to directly address the macroeconomic phenomenon of the saving glut, but, rather, to understand the process whereby firms accumulate liquid assets or saving by analyzing firm-level income statement data. In particular, we are interested in why firms channel their cash flow into liquid assets (defined to include cash as well as other financial assets) rather than into physical capital (capital formation) or into shareholder distributions (dividends). We also seek to determine whether and when corporate saving behavior can serve as a useful indicator of the extent to which firms face external financial constraints. Thus, we focus on two specific determinants of corporate saving: income uncertainty and the cost of external finance. By so doing, we wish to shed light on whether these two factors are of importance in Asia, and, in particular, we are interested in knowing if financial constraints are binding in Asia, where financial sector development has lagged behind.

In this paper, we analyze the determinants of corporate saving in the form of changes in cash holdings for 11 Asian economies using firm-level data from the Oriana Database for the 2002–2011 period, with a focus on estimating the cash flow sensitivity of cash.\(^1\) This paper is similar in spirit to Almeida et al. (2004), Khurana et al. (2006) and Riddick and Whited (2009), but it makes an original

\(^1\) Debuque-Gonzales (2013) does a similar analysis of the cash flow sensitivity of R&D investment and Ogawa (2013) does a similar analysis of the cash flow sensitivity of investment and cash holdings using the same data set.
contribution by focusing on the Asian economies and including economies not previously included, China, Hong Kong and Vietnam. (Almeida et al. (2004) use data only for firms in the USA, Khurana et al (2006) use data for firms in 35 countries from throughout the world, and Riddick and Whited (2009) use data on firms in Canada, Japan, France, Germany, the UK and the USA.) Moreover, the paper subdivides the sample by firm size to test for the importance of financial constraints following Almeida et al. (2004), uses the generalized method of moments (GMM) to control for measurement error in Tobin’s $q$ following Riddick and Whited (2009), and tests whether the global financial crisis had any impact on the saving behavior of firms.

Figure 1 shows trends in the median of our measure of corporate saving during the sample period. The change in cash holdings (as a share of total assets) was positive throughout the sample period, which indicates that cash holdings have been increasing throughout this period. This supports the view that there was a ‘saving glut’ in Asia. However, some variations can be observed across time and among groupings of economies. Firms in our sample continued to save more cash until 2010 despite the slight dip in 2008, and the cash saving rate peaked in 2010 before dropping quite sharply in 2011. This general trend can be observed in both developed and developing economies, but firms’ cash holdings increased significantly more in developing countries than in developed countries in 2004–2006 and significantly more in developed economies than in developing economies in 2007 and later.

**Figure 1  Change in the cash holdings to total assets ratio (median)**

Source: Bureau Van Dijk Oriana Database (https://oriana.bvdinfo.com).
To preview our main findings, we find some evidence that cash flow has a positive impact on the change in cash holdings (i.e. that the cash flow sensitivity of cash is positive) and that the positive impact of cash flow on the change in cash holdings is larger and more significant in the case of smaller and presumably more constrained firms than in the case of larger and presumably less constrained firms in both developed and developing economies. Both of these findings corroborate the importance of financial constraints in Asian firms. In addition, we find that the cash flow sensitivity of cash declined after the global financial crisis and that Tobin’s $q$ has a positive impact on the change in cash holdings, especially in the case of larger and presumably unconstrained firms.

The remainder of the paper is organized as follows. We discuss theoretical considerations in Section II, the estimation model and the estimation method in Section III, the data source in Section IV and the estimation results in Section V. The summary, conclusions and policy implications are presented in Section VI.

II. Theoretical Considerations

In this section, we consider the determinants of corporate saving from a theoretical perspective. Our discussion draws heavily on the analyses of Almeida et al. (2004), Khurana et al. (2006), Acharya et al. (2007), Riddick and Whited (2009) and Almeida et al. (2013) (see also Karabarbounis and Neiman (2012) and Huang (2011), who also discuss the importance of financial constraints as a motive for corporate saving).

Households and firms are very different economic entities with very different objective functions, with households consuming in order to maximize their utility and firms investing in plant and equipment and using that plant and equipment in order to produce goods and services and make profits. There are, nonetheless, many similarities between the two types of economic entities. For example, in the same way that households save to finance their future consumption, firms save to finance their future investment. Moreover, in the same way that households have a choice between financing their consumption by borrowing or by drawing down their previously accumulated saving, firms have a choice between financing investment by borrowing, issuing equity or by drawing down their previously accumulated saving. Furthermore, in the same way that financial (borrowing) constraints and borrowing costs will influence households’ decisions about how to finance their consumption, financial (borrowing) constraints and financing costs will also influence firms’ decisions about how to finance their investment.2

If firms did not face financial constraints, they could finance their investment in plant and equipment by borrowing as much as they needed from external sources at market rates or by issuing equity and, therefore, would not need to hold financial assets in preparation for the sudden and unexpected appearance of

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2 Samphantharak and Townsend (2010) argue that the behavior of households operating family businesses is very similar to that of firms.
profitable investment projects (i.e. projects with a positive net present value). However, if firms faced financial constraints, as a result of which they had to pay more than the market rate of interest when borrowing from external sources or incurred various transactions costs when issuing equity, they might choose to hold at least some financial assets at all times to ensure that they were able to take advantage of any profitable investment projects that might suddenly and unexpectedly arise without having to borrow from external sources or issue equity, thereby saving on expected future financing costs.

Note, however, that holding financial assets confers costs as well as benefits. One cost of holding financial assets is that doing so reduces the amount of current investments that can be financed from internal sources, and in the case of financially constrained firms, this, in turn, may reduce the amount of current investments the firm can make. Another cost of holding financial assets is that the firm must pay taxes on the interest income earned on holdings of financial assets. Thus, firms must balance the costs of holding financial assets (i.e. the cost of foregone current investment projects and the tax liability on the interest income accruing to holdings of financial assets) against the benefits of doing so (i.e. the reduction in expected future financing costs) when deciding how much of their assets to hold in the form of financial assets.

We turn next to what these theoretical considerations imply about the ‘cash flow sensitivity of cash’, that is, the impact of cash flow on how much firms save in the form of cash, where cash is construed broadly to include all liquid financial assets. According to Almeida et al. (2004), an increase in cash flow will cause firms to want to increase current investment as well as future investment. A firm that is not financially constrained will not necessarily increase its cash holdings in response to an increase in its cash flow and may use the entire increase in its cash flow to finance current investment because it knows that it will be able to finance future investment using external funds without any difficulty. Thus, an increase in cash flow will not have a systematic impact on how much unconstrained firms save in the form of cash; that is, the so-called ‘cash flow sensitivity of cash’ of unconstrained firms would be expected to be zero. Conversely, a decrease in cash flow will cause firms to want to decrease current investment as well as future investment. A firm that is not financially constrained will not necessarily decrease its cash holdings in response to a decrease in its cash flow and may reduce current investment by the entire decrease in its cash flow because even though its desired level of future investment has declined it was not necessarily holding a commensurate amount of cash in the first place because it knew that it would be able to finance future investment using external funds without any difficulty. Thus, a decrease in cash flow will also not have a systematic impact on how much unconstrained firms save in the form of cash; that is, the so-called ‘cash flow sensitivity of cash’ of unconstrained firms would be expected to be zero in the case of a decrease in cash flow as well.

However, a firm that is financially constrained will use at least part of the increase in its cash flow to increase its cash holdings so that it will be able to
increase its future investment without relying on external funds. Thus, an increase in cash flow will cause financially constrained firms to save more in the form of cash; that is, the ‘cash flow sensitivity of cash’ of financially constrained firms will be positive. Conversely, when a financially constrained firm’s cash flow decreases, it will not be able to save as much as before in the form of cash in preparation for future investment opportunities and, therefore, its ‘cash flow sensitivity of cash’ will be positive in this case as well.

Riddick and Whited (2009) extend the theoretical analysis of Almeida et al. (2004) and show that the cash flow sensitivity of cash may be negative in the case of financially constrained firms. They obtain a very different prediction regarding the sign of the cash flow sensitivity of cash because they assume that the firm faces positively serially-correlated productivity shocks. A positive productivity shock will cause the firm’s capital to become more productive and its cash flow to increase, and its productivity will revert to its mean only slowly. This will induce the firm to shift its assets from cash to physical capital, and if this substitution effect is strong enough to offset the income effect identified by Almeida et al. (2004) and discussed above, the firm will invest and draw down its cash holdings in response to an increase in cash flow caused by a positive productivity shock. Thus, an increase in cash flow will cause financially constrained firms to save less in the form of cash; that is, the ‘cash flow sensitivity of cash’ will be negative. Conversely, a negative productivity shock will cause the firm’s capital to become less productive and its cash flow to decrease, which, in turn, will cause the firm to shift its assets from physical capital to cash. Thus, a decrease in cash flow will cause financially constrained firms to save more in the form of cash, and in this case as well, the ‘cash flow sensitivity of cash’ will be negative.

Thus, the sign and magnitude of the ‘cash flow sensitivity of cash’ is theoretically ambiguous and will depend on whether or not firms are financially constrained and on whether or not increases in cash flow are accompanied by increases in productivity. Empirical analysis is needed to determine the sign and magnitude of the ‘cash flow sensitivity of cash’.

III. Estimation Model and Estimation Methods

In this section, we describe our econometric model, which is based on the theoretical considerations discussed in the previous section, as well as the estimation methods used to estimate our model.

Following Almeida et al. (2004), Khurana et al. (2006) and Riddick and Whited (2009), we estimate the following baseline equation:

\[
CHCASHA(i,t) = a_0 + a_1 \times CFA(i,t) + a_2 \times q(i,t) + a_3 \times SIZE(i,t) + e(i,t),
\]

where \(CHCASHA(i,t)\) is the ratio of the change in cash holdings to total assets, \(CFA(i,t)\) is the ratio of cash flow to total assets, \(q(i,t)\) is Tobin’s \(q\), and \(SIZE(i,t)\) is firm size measured by total assets of firm \(i\) at time \(t\). \(e(i,t)\) is an error term of firm \(i\) at time \(t\).
As explained in the previous section, Almeida et al. (2004) predict that the coefficient of cash flow, $a1$, will be positive in the case of financially constrained firms but that it will be indeterminate in the case of unconstrained firms. This prior implies that firms should increase their stocks of liquid assets in response to positive cash flow innovations if they are financially constrained. By contrast, unconstrained firms should not display such systematic behavior when managing their liquidity; that is, their cash flow sensitivity of cash should not be statistically different from zero.

This prediction of a positive propensity to save out of cash flow for financially constrained firms is due primarily to the assumption in Almeida et al. (2004) that an increase in cash flow is not accompanied by higher capital productivity. Therefore, the firm has no incentive to transform liquid assets into physical assets, and an increase in cash flow produces a pure positive income effect on saving. Riddick and Whited (2009), in contrast, stress the importance of the substitution effect. The substitution effect implies that the firm saves less in the form of liquid assets because it wants to shift some of its liquid assets into physical assets that have become relatively more productive. If this substitution effect dominates, the propensity to save out of cash flow of financially constrained firms will be negative.

We tried using two definitions of Tobin’s $q$ ($q1$, the ratio of market price to book value, and $q2$, the sum of market capitalization and debt as a ratio of total assets). However, as the results were not very sensitive to the definition of Tobin’s $q$, we report only the results for $q1$. Because Tobin’s $q$ presumably reflects productivity shocks, a positive coefficient on Tobin’s $q$ supports Riddick and Whited’s (2009) story that positive productivity shocks cause the firm’s capital to become more productive and its cash flow to increase.

We do the estimations with and without one-digit industry dummies, and although the results were not found to be very sensitive to the inclusion of industry dummies, we report the results with and without industry dummies. We considered including country dummies but did not do so because we included industry dummies and assumed that firms in the same industry would be relatively homogeneous regardless of the country of origin.

Finally, in addition to estimating the baseline regression (Equation 1), we also tried augmenting the regression with three additional explanatory variables (capital expenditures, working capital and short-term debt), but because the results were not significantly affected, we have not shown the augmented results (they can be found in Horioka and Terada-Hagiwara (2013)).

Following Riddick and Whited (2009), we estimate this equation using the generalized method of moments (GMM) because it is likely that there is measurement error in Tobin’s $q$. However, for comparison purposes, we also try estimating the equation using OLS and the procedure proposed by Fama and MacBeth (1973), which consists of estimating the equation for each year using OLS, then pooling the yearly estimates.

We do the estimates for the full sample, for the subsamples of developed economies and developing economies, and for individual economies.
In addition, to gauge the impact of the global financial crisis on the saving behavior of firms, we divide the time period of our analysis into pre-crisis (2002–2007) and post-crisis (2008–2011).

Finally, we divide the sample into various subsamples by firm size on the grounds that firm size will be a good proxy for financial constraints. Firm size has been widely used as a proxy for financial constraints (see e.g. Almeida et al., 2004) as the variable has proven to associate very closely with the level of financial constraints in direct surveys, such as the World Business Environment Survey (see Beck et al., 2005). In particular, we divide the sample into firms above and below the mean (median) and into firm size quintiles on the grounds that firms that are relatively small will be more likely to be financially constrained whereas firms that are relatively large will be less likely to be financially constrained.

Turning to a brief survey of previous empirical studies, different authors obtain different results. For example, Almeida et al. (2004), using a large sample of US manufacturing firms for the 1971–2000 period, regress the increase in cash holdings on cash flow and other variables and find that the coefficient of cash flow is statistically insignificant for unconstrained firms but that it is positive and statistically significant for financially constrained firms, regardless of what criterion (payout ratio, asset size, bond ratings, commercial paper rating and index of firm financial constraints) is used to partition firms into constrained and unconstrained firms. Khurana et al. (2006) obtain empirical support for the Almeida et al. (2004) hypothesis using firm-level data on 35 countries from throughout the world, while Riddick and Whited (2009) find, using firm-level data for Canada, France, Germany, Japan and the USA, that the results are sensitive to the estimation method used and that the results based on the preferred estimation method (generalized method of moments) fail to support the Almeida et al. (2004) hypothesis.

IV. Data Source

In this section, we discuss the source of the data used in our analysis. The data we use in our analysis are taken from the Bureau Van Dijk Oriana Database (https://oriana.bvdinfo.com/), a comprehensive database that contains financial information on public and private companies. We use data from 11 Asian economies: Australia, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. We use data for the 10-year period from 2002–2011.

3 Almeida et al. (2004) use five measures of financial constraints to split their sample of firms into constrained and unconstrained firms and find that four of the five measures are highly correlated with one another, with firms with less assets having lower payout ratios and being less likely to have had their bonds or commercial paper rated during the sample period. This suggests that firm size is a good proxy for the probability of being financially constrained, and, thus, we appear to be justified in dividing the sample into constrained and unconstrained firms using firm size as a proxy for the probability of being financially constrained.
When we divide the sample into developed economies and developing economies, we classify Australia, Hong Kong, Japan, New Zealand and Singapore as developed economies and China, Indonesia, Korea, Malaysia, the Philippines, Thailand, and Vietnam as developing economies.

Turning to sample selection, following Riddick and Whited (2009), we deleted firm-year observations with missing data and for which total assets, the gross capital stock, or sales are either zero or negative, selected the longest consecutive time series of data for each firm, and deleted firms with only one observation. Following Riddick and Whited (2009), we also omitted all firms whose primary Standard Industrial Classification code is between 4900 and 4999, between 6000 and 6999, or greater than 9000 because our model is not appropriate for regulated, financial or quasi-public firms. Finally, we also excluded outliers (defined as the top and bottom 1 percent of firms) and firms from economies with relatively few observations.

Appendix Table A1 shows the variable definitions and data sources for the variables used in the empirical analysis, whereas Appendix Table A2 shows the summary statistics for these variables.

V. Estimation Results

In this section, we discuss our estimation results, which are shown in Tables 1–7. Table 1 shows the GMM estimates by economy, and, as can be seen from this table, the coefficient of cash flow, the coefficient of greatest interest, is statistically significant in 9 out of the 11 economies in the sample and is positive in all cases in which it is statistically significant.

The coefficient of Tobin’s \( q \) (defined as the ratio of market price to book value) is statistically significant in only 4 out of the 11 economies in the sample and is positive in 3 out of the 4 economies in which it is statistically significant. These findings provide some evidence in support of Riddick and Whited’s (2009) productivity shock story, as noted earlier.

The results are not shown due to space limitations, but we also tried using OLS and Fama and MacBeth’s (1973) procedure and obtained broadly consistent results. In the OLS estimates, the coefficient of cash flow is positive and statistically significant in all of the 11 economies in our sample regardless of whether or not industry dummies are included, and in the Fama and MacBeth (1973) estimates, the coefficient of cash flow is still positive but statistically significant in fewer countries (6 out of the 11 economies in the sample when industry dummies are included and in 9 out of the 11 economies in the sample when industry dummies are not included). Turning to the coefficient of Tobin’s \( q \), in the OLS estimates, it is statistically significant in 7 (6) out of the 11 economies in the sample (positive and significant in 5 (5) economies, and negative and significant in 2 (1) economies when industry dummies are included (omitted), whereas in the Fama and MacBeth (1973) estimates, it is not statistically significant in any of the
### Table 1  Generalized method of moments estimates by economy

**Panel A Without industry dummies, excluding outliers, countries with small number of firms, and industries related to finance, real estate, management and government**

|         | q1    | CF     | Firm Size | Constant | Number of observations |
|---------|-------|--------|-----------|----------|------------------------|
| Australia | 0.005834 | 0.05223 | 0.001593 | −0.008168 | 506                    |
|          | (0.0065) | (0.1074) | (0.0044)  | (0.0504)  |                        |
| China    | 0.0007004 | 0.1239*** | 0.004780*** | −0.04473** | 5837                   |
|          | (0.0007) | (0.0274) | (0.0011)  | (0.0151)  |                        |
| Hong Kong | 0.01075*** | 0.09956** | −0.0001322 | 0.00142   | 2139                   |
|          | (0.0022) | (0.0383) | (0.0011)  | (0.0149)  |                        |
| Indonesia | 0.00142 | 0.1560*** | 0.002531 | −0.03506* | 790                    |
|          | (0.0025) | (0.0392) | (0.0015)  | (0.0168)  |                        |
| Japan    | −0.007000*** | 0.2204*** | −0.0003701 | 0.01238** | 10751                  |
|          | (0.0008) | (0.0156) | (0.0003)  | (0.0040)  |                        |
| Korea    | 0.003975** | 0.08211** | 0.00245  | −0.003612 | 3132                   |
|          | (0.0013) | (0.0273) | (0.0006)  | (0.0079)  |                        |
| Malaysia | 0.003636 | 0.1709*** | 0.001449 | −0.02009 | 2293                   |
|          | (0.0030) | (0.0298) | (0.0010)  | (0.0113)  |                        |
| Philippines | 0.003541 | 0.1597*  | 0.001958 | −0.03836 | 219                    |
|          | (0.0037) | (0.0691) | (0.0037)  | (0.0421)  |                        |
| Singapore | 0.0002139 | 0.2828*** | −0.000837 | 0.004674 | 1063                   |
|          | (0.0033) | (0.0496) | (0.0016)  | (0.0203)  |                        |
| Thailand | −0.0009633 | 0.1003** | −0.000432 | 0.00405  | 1282                   |
|          | (0.0024) | (0.0326) | (0.0011)  | (0.0130)  |                        |
| Vietnam  | 0.01778*  | −0.01343 | 0.002742 | −0.04496 | 423                    |
|          | (0.0075) | (0.0642) | (0.0031)  | (0.0332)  |                        |
Table 1  (continued)

Panel B With industry dummies, excluding outliers, countries with small no. of firms, and industries related to finance, real estate, management & government

| Country     | q1       | CF       | Firm Size | Constant | Number of observations |
|-------------|----------|----------|-----------|----------|------------------------|
| Australia   | 0.002591 | 0.1335   | 0.0008672 | −0.01304 | 506                    |
|             | (0.0055) | (0.0943) | (0.0036)  | (0.0409) |                        |
| China       | 0.0007998| 0.1242***| 0.004727***| −0.04488**| 5837                   |
|             | (0.0007) | (0.0272) | (0.0011)  | (0.0149) |                        |
| Hong Kong   | 0.01101***| 0.09472* | −0.0001486| 0.001305 | 2139                   |
|             | (0.0022) | (0.0379) | (0.0011)  | (0.0146) |                        |
| Indonesia   | 0.001956 | 0.1617***| 0.001227  | −0.02134 | 790                    |
|             | (0.0024) | (0.0382) | (0.0014)  | (0.0151) |                        |
| Japan       | −0.007211***| 0.2150***| −0.0001852| 0.009503*| 10751                  |
|             | (0.0008) | (0.0154) | (0.0003)  | (0.0040) |                        |
| Korea       | 0.003778**| 0.07744**| 0.000335  | −0.004584| 3132                   |
|             | (0.0012) | (0.0270) | (0.0006)  | (0.0077) |                        |
| Malaysia    | 0.004382 | 0.1631***| 0.001508  | −0.02312*| 2293                   |
|             | (0.0028) | (0.0290) | (0.0010)  | (0.0110) |                        |
| Philippines | 0.005612 | 0.1163*  | 0.001099  | −0.02692 | 219                    |
|             | (0.0031) | (0.0588) | (0.0029)  | (0.0323) |                        |
| Singapore   | 0.001944 | 0.2702***| −0.001099 | 0.006726 | 1063                   |
|             | (0.031)  | (0.0486) | (0.0016)  | (0.0198) |                        |
| Thailand    | −0.003503| 0.1072***| −0.00005619| 0.001397| 1282                   |
|             | (0.0023) | (0.0316) | (0.0011)  | (0.0122) |                        |
| Vietnam     | 0.01797* | 0.001126 | 0.001828  | −0.03583 | 423                    |
|             | (0.0072) | (0.0593) | (0.0029)  | (0.0313) |                        |

Notes: q1 = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001.
### Table 2: Generalized method of moments estimates: Full sample

**Full sample: Excluding outliers, countries with small no. of firms, and industries related to finance, real estate, management and government**

|                       | Full period (2002–2011) | Pre-GFC period (2002–2007) | GFC period (2008–2011) |
|-----------------------|-------------------------|-----------------------------|------------------------|
|                       | q1 | CF  | Firm size | Constant | R² | Number of observations |                         |
| Without industry dummies | 0.002770*** | 0.1111*** | 0.0009037*** | −0.009476** | 0.0132 | 28 435 |
|                       | (0.0004) | (0.0122) | (0.0002) | (0.0031) |                         |                         |
| With industry dummies  | 0.002796*** | 0.1092*** | 0.0009457*** | −0.01021*** | 0.0129 | 28 435 |
|                       | (0.0004) | (0.0119) | (0.0002) | (0.0030) |                         |                         |
| Without industry dummies | 0.003318*** | 0.1494*** | −0.0006043 | 0.0003078 | 0.0221 | 11 309 |
|                       | (0.0007) | (0.0159) | (0.0004) | (0.0044) |                         |                         |
| With industry dummies  | 0.003392*** | 0.1471*** | −0.0004437 | −0.002051 | 0.0215 | 11 309 |
|                       | (0.0007) | (0.0156) | (0.0003) | (0.0043) |                         |                         |
| Without industry dummies | 0.002042*** | 0.07024*** | 0.002071*** | −0.01623*** | 0.0105 | 17 126 |
|                       | (0.0005) | (0.0163) | (0.0003) | (0.0042) |                         |                         |
| With industry dummies  | 0.002024*** | 0.06894*** | 0.002066*** | −0.01630*** | 0.0103 | 17 126 |
|                       | (0.0005) | (0.0158) | (0.0003) | (0.0041) |                         |                         |

Notes: q1 = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001. CF, cash flow; GFC, global financial crisis.
Table 3  Generalized method of moments estimates: Developed economy sample

Pooled developed countries: Excluding outliers, countries with small no. of firms, and industries related to finance, real estate, management and government

|                      | q1        | CF         | Firm size    | Constant   | Number of observations |
|----------------------|-----------|------------|--------------|------------|------------------------|
|                      |           |            |              |            |                        |
| Full period (2002−2011) |          |            |              |            |                        |
| Without industry dummies | −0.0005918 | 0.1963***  | −0.0007222* | 0.01053*   | 14 459                 |
| (0.0012)            | (0.0235)  | (0.0003)   | (0.0043)     |            |                        |
| With industry dummies | −0.0007207 | 0.1844***  | −0.0005972   | 0.009401*  | 14 459                 |
| (0.0011)            | (0.0216)  | (0.0003)   | (0.0043)     |            |                        |
| Pre-GFC period (2002−2007) |          |            |              |            |                        |
| Without industry dummies | −0.001994 | 0.2569***  | −0.0002982   | −0.00486   | 6499                   |
| (0.0018)            | (0.0261)  | (0.0005)   | (0.0058)     |            |                        |
| With industry dummies | −0.001794 | 0.2428***  | −0.000125    | −0.00685   | 6499                   |
| (0.0016)            | (0.0248)  | (0.0005)   | (0.0057)     |            |                        |
| GFC period (2008−2011) |          |            |              |            |                        |
| Without industry dummies | 0.002911  | 0.07187*   | −0.001155*   | 0.02742*** | 7960                   |
| (0.0017)            | (0.0318)  | (0.0005)   | (0.0061)     |            |                        |
| With industry dummies | 0.002015  | 0.06617*   | −0.001089*   | 0.02742*** | 7960                   |
| (0.0016)            | (0.0292)  | (0.0004)   | (0.0060)     |            |                        |

Notes: q1 = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001. CF, cash flow; GFC, global financial crisis.
Table 4  Generalized method of moments estimates: Developing economy sample

|                          | q₁     | CF     | Firm size | Constant | Number of observations |
|--------------------------|--------|--------|-----------|----------|------------------------|
| **Full period (2002−2011)** |         |        |           |          |                        |
| Without industry dummies | 0.003107*** | 0.09630*** | 0.003165*** | −0.03635*** | 13 976                |
|                         | (0.0004) | (0.0119) | (0.0004)  | (0.0047)  |                        |
| With industry dummies   | 0.003089*** | 0.09510*** | 0.003199*** | −0.03689*** | 13 976                |
|                         | (0.0004) | (0.0118) | (0.0004)  | (0.0047)  |                        |
| **Pre-GFC period (2002−2007)** |         |        |           |          |                        |
| Without industry dummies | 0.003572*** | 0.08204*** | 0.002300*** | −0.02607*** | 4810                  |
|                         | (0.0007) | (0.0190) | (0.0006)  | (0.0076)  |                        |
| With industry dummies   | 0.003550*** | 0.07592*** | 0.002624*** | −0.03011*** | 4810                  |
|                         | (0.0007) | (0.0189) | (0.0006)  | (0.0074)  |                        |
| **GFC period (2008−2011)** |         |        |           |          |                        |
| Without industry dummies | 0.002888*** | 0.1058***  | 0.003597*** | −0.04175*** | 9166                  |
|                         | (0.0005) | (0.0151) | (0.0005)  | (0.0060)  |                        |
| With industry dummies   | 0.002880*** | 0.1042***  | 0.003551*** | −0.04118*** | 9166                  |
|                         | (0.0005) | (0.0149) | (0.0005)  | (0.0060)  |                        |

Notes: q₁ = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001. CF, cash flow; GFC, global financial crisis.
### Table 5  Generalized method of moments (GMM) estimates: Full sample, breakdown by firm size

**GMM estimation on base model (full sample without industry dummies)**

| Grouping based on firm size | q1          | CF          | Size         | Constant      | Number of observations |
|----------------------------|-------------|-------------|--------------|---------------|------------------------|
| All firms grouped by quintiles based on median size of each firm |             |             |              |               |                        |
| Bottom quintile            | 0.0001693   | 0.1825***   | 0.009165***  | −0.09584***   | 3505                   |
|                            | (0.0010)    | (0.0305)    | (0.0015)     | (0.0172)      |                        |
| 2nd quintile               | 0.002124*   | 0.1641***   | 0.007107***  | −0.08442***   | 4173                   |
|                            | (0.0009)    | (0.0250)    | (0.0012)     | (0.0144)      |                        |
| 3rd quintile               | 0.002144*   | 0.1473***   | 0.005957***  | −0.07489***   | 4381                   |
|                            | (0.0009)    | (0.0246)    | (0.0010)     | (0.0128)      |                        |
| 4th quintile               | 0.001904*   | 0.1054***   | 0.002381*    | −0.02854*     | 4611                   |
|                            | (0.0008)    | (0.0230)    | (0.0009)     | (0.0127)      |                        |
| Upper quintile             | 0.003018**  | 0.09135***  | −0.0007777   | 0.01325       | 4367                   |
|                            | (0.0010)    | (0.0200)    | (0.0007)     | (0.0104)      |                        |
| All firms grouped by quintiles based on mean size of each firm |             |             |              |               |                        |
| Bottom quintile            | −0.0001236  | 0.1756***   | 0.008299***  | −0.08611***   | 3489                   |
|                            | (0.0010)    | (0.0308)    | (0.0015)     | (0.0172)      |                        |
| 2nd quintile               | 0.002499**  | 0.1698***   | 0.006781***  | −0.08105***   | 4183                   |
|                            | (0.0009)    | (0.0245)    | (0.0012)     | (0.0145)      |                        |
| 3rd quintile               | 0.001805    | 0.1460***   | 0.005758***  | −0.07190***   | 4364                   |
|                            | (0.0009)    | (0.0260)    | (0.0010)     | (0.0132)      |                        |
| 4th quintile               | 0.002574**  | 0.08654***  | 0.002150*    | −0.02519*     | 4609                   |
|                            | (0.0009)    | (0.0216)    | (0.0009)     | (0.0127)      |                        |
| Upper quintile             | 0.002965**  | 0.1025***   | −0.0007736   | 0.01255       | 4392                   |
|                            | (0.0009)    | (0.0200)    | (0.0006)     | (0.0094)      |                        |

Notes: q1 = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001.
Table 6 Generalized method of moments (GMM) estimates: Developed economy sample, breakdown by firm size (Australia, Hong Kong, Japan, New Zealand and Singapore)

| Grouping based on firm size | GMM estimation on base model (pooled developed countries with industry dummies) |
|-----------------------------|----------------------------------------------------------------------------------|
|                             | q1  | CF   | Size    | Constant | Number of observations |
| All firms grouped by quintiles based on median size of each firm |      |      |         |           |                       |
| Bottom quintile             | −0.007304 | 0.2541*** | 0.002576 | −0.01951 | 1801                 |
|                            | (0.0044)  | (0.0424) | (0.0031) | (0.0359) |                       |
| 2nd quintile                | −0.002171 | 0.1928*** | 0.007598** | −0.08909** | 2175                |
|                            | (0.0024)  | (0.0386) | (0.0027) | (0.0329) |                       |
| 3rd quintile                | −0.002923 | 0.2433*** | 0.004896* | −0.06344* | 2280                |
|                            | (0.0020)  | (0.0319) | (0.0020) | (0.0261) |                       |
| 4th quintile                | −0.004134* | 0.1713*** | 0.001675 | −0.01732 | 2401                |
|                            | (0.0019)  | (0.0331) | (0.0019) | (0.0261) |                       |
| Upper quintile              | −0.005367** | 0.1704*** | 0.001482 | −0.01545 | 2322                |
|                            | (0.0019)  | (0.0333) | (0.0009) | (0.0128) |                       |
| All firms grouped by quintiles based on mean size of each firm |      |      |         |           |                       |
| Bottom quintile             | −0.004538 | 0.2405*** | 0.003686 | −0.03426 | 1789                |
|                            | (0.0044)  | (0.0426) | (0.0031) | (0.0358) |                       |
| 2nd quintile                | −0.001983 | 0.1752*** | 0.006542* | −0.07557* | 2186                |
|                            | (0.0022)  | (0.0379) | (0.0027) | (0.0327) |                       |
| 3rd quintile                | −0.005083* | 0.2679*** | 0.005023** | −0.06385** | 2269               |
|                            | (0.0021)  | (0.0325) | (0.0019) | (0.0246) |                       |
| 4th quintile                | −0.002738 | 0.1578*** | 0.001953 | −0.02221 | 2409                |
|                            | (0.0019)  | (0.0325) | (0.0019) | (0.0263) |                       |
| Upper quintile              | −0.005739** | 0.1842*** | 0.001625 | −0.01803 | 2326                |
|                            | (0.0018)  | (0.0307) | (0.0008) | (0.0122) |                       |

Notes: q1 = Market price to book. Robust standard errors are reported below estimates in parentheses. *p < 0.05, **p < 0.01, ***p < 0.001.
Table 7  Generalized method of moments (GMM) estimates: Developing economy sample, breakdown by firm size (China, Indonesia, Korea, Malaysia, Philippines, Thailand and Vietnam)

| Grouping based on firm size | $q_1$       | CF          | Size         | Constant      | Number of observations |
|-----------------------------|-------------|-------------|--------------|---------------|------------------------|
| All firms grouped by quintiles based on median size of each firm |             |             |              |               |                        |
| Bottom quintile             | 0.00004152  | 0.1599***   | 0.01191***   | −0.1209***    | 1704                   |
|                            | (0.0011)    | (0.0005)    | (0.00024)    | (0.00250)     |                        |
| 2nd quintile                | −0.0006656  | 0.1326***   | 0.01502***   | −0.1628***    | 1998                   |
|                            | (0.0012)    | (0.0012)    | (0.00024)    | (0.00255)     |                        |
| 3rd quintile                | −0.001056   | 0.1273***   | 0.01776***   | −0.2037***    | 2101                   |
|                            | (0.0012)    | (0.0024)    | (0.00023)    | (0.00267)     |                        |
| 4th quintile                | 0.0005884   | 0.08414**   | 0.01290***   | −0.1542***    | 2210                   |
|                            | (0.0011)    | (0.0029)    | (0.00022)    | (0.00274)     |                        |
| Upper quintile              | 0.003701*** | 0.05135*    | 0.006222***  | −0.07790***   | 2045                   |
|                            | (0.0011)    | (0.0025)    | (0.00017)    | (0.00230)     |                        |
| All firms grouped by quintiles based on mean size of each firm |             |             |              |               |                        |
| Bottom quintile             | 0.000005213 | 0.1273**    | 0.008906***  | −0.08897***   | 1700                   |
|                            | (0.0011)    | (0.00408)   | (0.00025)    | (0.00261)     |                        |
| 2nd quintile                | −0.0003153  | 0.1544***   | 0.01556***   | −0.1702***    | 1997                   |
|                            | (0.0012)    | (0.00307)   | (0.00023)    | (0.00249)     |                        |
| 3rd quintile                | 0.0002169   | 0.09367**   | 0.01475***   | −0.1680***    | 2095                   |
|                            | (0.0012)    | (0.00330)   | (0.00023)    | (0.00263)     |                        |
| 4th quintile                | 0.0003572   | 0.06870*    | 0.01283***   | −0.1514***    | 2200                   |
|                            | (0.0012)    | (0.00269)   | (0.00023)    | (0.00284)     |                        |
| Upper quintile              | 0.003899*** | 0.06090*    | 0.006066***  | −0.07585***   | 2066                   |
|                            | (0.0011)    | (0.00250)   | (0.00016)    | (0.00220)     |                        |

Notes: $q_1$ = Market price to book. Robust standard errors are reported below estimates in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. 
11 economies in the sample regardless of whether or not industry dummies are included.

We also obtained the GMM results for the full sample of economies, the developed economy sample, and the developing economy sample, and the results are shown in Tables 2, 3 and 4, respectively. As can be seen from these tables, the coefficient of cash flow is positive and statistically significant in every case.

The fact that the coefficient of cash flow is generally positive suggests that the income effect analyzed by Almeida et al. (2004) is more important than the substitution effect analyzed by Riddick and Whited (2009), as a result of which the net impact of cash flow on the change in cash holdings is positive (i.e. firms save more in the form of cash when their cash flows are higher).

The coefficient of Tobin’s $q$ is positive and statistically significant in the full sample of economies and the developing economy sample. Thus, there is some evidence that the impact of Tobin’s $q$ on the change in cash holdings is positive but the results are not very clear-cut. These findings provide some evidence in support of Riddick and Whited’s (2009) productivity shock story, as noted earlier.

Turning to the results for the pre-global and post-global financial crisis periods, the coefficient of cash flow is almost always higher during the pre-crisis period than during the post-crisis period, which is reasonable because the greater pessimism about future prospects caused by the global financial crisis presumably reduced the demand for cash holdings in preparation for the sudden and unexpected appearance of profitable investment opportunities. The only exception to this pattern is in the case of the regression results for the developing economy sample.

We now divide the sample into subsamples according to firm size (asset size) to test for the possibility of the differential sensitivity of the change in cash holdings to the cash flow variable by asset size. In this exercise, we use the asset size of firms to divide the sample of firms in each economy into five groups (quintiles). The grouping is based on the average or median asset size of firms in each economy, and, thus, for firms in an economy in which average (median) asset size is relatively large, such as China, Japan and Korea, some of the firms in the bottom quintile might be larger than those in the highest quintile in other economies such as Vietnam where average asset size is relatively small.

The results are shown in Tables 5, 6 and 7, for the full sample of economies, the sample of developed economies, and the sample of developing economies, respectively (only the results for the variants with industry dummies are shown due to space limitations). The estimates for both the developed economy sample and the developing economy sample show that the coefficient of cash flow is almost always positive and is often statistically significant when it is positive, whereas it is never negative and statistically significant, contrary to what Riddick and Whited (2009) predict. This finding constitutes strong support for the income effect posited by Almeida et al. (2004), and there is no evidence of a shift from cash flow to physical assets.

Turning to patterns by firm size, as explained earlier, Almeida et al. (2004) predict that the coefficient of cash flow, $a1$, will be positive in the case of financially
constrained firms but that it will be indeterminate in the case of unconstrained firms. Because smaller firms are more likely to be financially constrained, we would expect the coefficient of cash flow, $a_1$, to be larger and more highly significant in the case of smaller firms, and our results are consistent with this expectation.

As the results for developed economies in Table 6 show, the coefficient of cash flow is positive and significant in the case of the lowest firm size quintile but is not statistically significant in any other quintile. Moreover, as the results for developing economies in Table 7 show, the coefficient of cash flow is positive and statistically significant in the case of all firm sizes, but its significance level and absolute magnitude decline with firm size. Thus, the results for both developed and developing economies are consistent with our prior that smaller firms are more likely to be financially constrained and that they would be expected to have a stronger tendency to save when cash flow is high.

Turning finally to the results concerning Tobin’s $q$, its coefficient is positive and significant in all but the lowest quintile for the full sample, in the two or three highest quintiles for the developed country sample, and only in the highest quintile for the developing country sample. The fact that the impact of Tobin’s $q$ is significant only in the case of larger firms suggests that Riddick and Whited’s (2009) productivity shock story is more relevant for unconstrained firms, which is just as one would expect.

VI. Summary and Conclusions

In this paper, we analyzed the determinants of corporate saving in the form of changes in cash holdings for 11 Asian economies using firm-level data from the Oriana Database for the 2002–2011 period, with a focus on estimating the cash flow sensitivity of cash. We found some evidence that cash flow has a positive impact on the change in cash holdings (i.e. that the cash flow sensitivity of cash is positive) and that the positive impact of cash flow on the change in cash holdings is larger and more significant in the case of smaller and presumably more constrained firms than in the case of larger and presumably less constrained firms in both developed and developing economies. Both of these findings corroborate the importance of financial constraints in Asian firms. In addition, we found that the cash flow sensitivity of cash declined after the global financial crisis and that Tobin’s $q$ has a positive impact on the change in cash holdings, especially in the case of larger and presumably unconstrained firms. The fact that the impact of cash flow on the change in cash holdings is weaker in the case of larger and presumably unconstrained firms and that the impact of Tobin’s $q$ is stronger in the case of such firms suggests that Riddick and Whited’s (2009) productivity shock story applies in the case of such firms.

Turning next to directions for further research, in order to better understand the behavior of Asian firms, particularly in developing economies, future research might include measures of uncertainty (such as the serial correlation and variance of income), following Riddick and Whited (2009), to test the hypothesis that
uncertainty is at least as important a determinant of the change in cash holdings as financial constraints.

Turning finally to the policy implications of our findings, our findings suggest that the behavior of Asian firms is heavily influenced by financial constraints and that financial sector development would reduce the need for liquid saving in the form of cash holdings, especially in the case of smaller firms, and induce Asian firms to invest more in physical assets.

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**Appendix**

**Table A1**  Variable definitions and data sources

| Variable list                        | Source      | Definition (Oriana)/Derivation                                           |
|--------------------------------------|-------------|--------------------------------------------------------------------------|
| CCE                                  | Raw data    | Amount of cash in the bank and on hand of the company                    |
| Change in CCE                        | Derived     | Change in CCE between time (t) and time (t − 1)                          |
| Cash savings: Ratio of change in CCE to total assets | Derived     | Change in CCE divided by total assets                                    |
| Ratio of CCE to total assets         | Derived     | CCE divided by total assets                                              |
| Cash flow                            | Raw data    | Profit for period + Depreciation                                         |
| Ratio of cash flow to total assets   | Derived     | Cash flow divided by total assets                                        |
| Firm size                            | Derived     | In (total assets)                                                       |
| Total assets                         | Raw data    | Fixed assets + Current assets                                            |
| Market price to book value ratio     | Derived     | Market price year-end divided by book value per share                    |
| Tobin’s q                            | Derived     | Ratio of the sum of market capitalization and total debt to total assets |
| Market capitalization                | Raw data    | Market value of a listed company is calculated by multiplying its share price by the number of shares outstanding |
| Total debt                           | Derived     | Sum of current and non-current liabilities                               |

CCE, cash and cash equivalents.
| Country          | Cash and cash equivalents ($ thousand) | Cash savings ($ thousand) | Ratio of cash and cash to total assets | Cash flow ($ thousand) | Ratio of cash flow to total assets | Total assets ($ million) | Tobin's q | Market capitalization ($ million) | Total debt ($ thousand) | Number of observations |
|------------------|----------------------------------------|---------------------------|----------------------------------------|------------------------|-----------------------------------|--------------------------|-----------|-----------------------------------|--------------------------|------------------------|
| **Australia**    | 10 663                                 | 0.0401                    | 0.1988                                 | 9463                   | 0.127                             | 85 804                   | 1.478033  | 80                                | 37 583                   | 1025                   |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
| **China**        | 123 838                                | 0.0292                    | 0.1823                                 | 55 651                 | 0.0728                            | 728 842                  | 1.707129  | 595                               | 433 903                  | 6418                   |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
| **Hong Kong, China** | 183 554                           | 0.0251                    | 0.1833                                 | 133 949                | 0.1008                            | 1 428 113                | 1.214296  | 1034                              | 704 121                  | 2773                   |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
| **Indonesia**    | 53 000                                 | 0.0146                    | 0.1213                                 | 47 667                 | 0.1016                            | 399 197                  | 1.397483  | 458                               | 222 228                  | 1082                   |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
| **Japan**        | 188 815                                | 0.0144                    | 0.1672                                 | 100 953                | 0.0646                            | 1 450 882                | 1.062062  | 838                               | 829 441                  | 13 289                 |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
| **Korea**        | 56 802                                 | 0.0095                    | 0.0892                                 | 42 975                 | 0.0644                            | 722 769                  | 1.132627  | 454                               | 422 999                  | 4134                   |
|                  | Mean                                   |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Median                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Standard deviation                      |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Minimum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
|                  | Maximum                                 |                           |                                        |                        |                                   |                          |                       |                                   |                          |                       |
### Table A2 (continued)

|                | Cash and cash equivalents ($ thousand) | Savings ($ thousand) | Ratio of cash and cash to total assets | Ratio of cash flows to total assets | Total assets ($ thousand) | Tobin’s q | Market capitalization ($ million) | Total debt ($ million) | Number of observations |
|----------------|----------------------------------------|----------------------|----------------------------------------|------------------------------------|--------------------------|------------|---------------------------------|-----------------------|------------------------|
| **Standard deviation** | 178 748 | 0.062 | 0.0836 | 165 775 | 0.0488 | 2 080 305 | 0.5468624 | 1552 | 1 364 849 |
| **Minimum**     | 1       | -0.2675 | 0 | 96 | 0.0026 | 7744 | 0.4364686 | 4 | 263 |
| **Maximum**     | 2 158 257 | 0.2884 | 0.7325 | 3 380 055 | 0.3272 | 18 927 784 | 4.204416 | 24 405 | 17 700 000 |
| **Malaysia**    | 29 691 | 0.0142 | 0.1328 | 18 381 | 0.0851 | 213 869 | 1.012785 | 147 | 103 367 |
| **Mean**        | 69 438 | 0.0201 | 0.1421 | 65 325 | 0.1114 | 480 806 | 1.337886 | 467 | 266 322 |
| **Median**      | 11 992 | 0.0071 | 0.1001 | 8238 | 0.0919 | 120 753 | 1.077721 | 69 | 53 703 |
| **Standard deviation** | 175 276 | 0.0759 | 0.1372 | 190 022 | 0.0841 | 981 950 | 0.8583651 | 1320 | 634 766 |
| **Minimum**     | 29 | -0.2735 | 0.0001 | 6 | 0.0019 | 1086 | 0.3818043 | 1 | 145 |
| **Maximum**     | 1 389 315 | 0.4401 | 0.7848 | 1 648 965 | 0.5729 | 5 363 550 | 4.924468 | 7142 | 3 589 091 |
| **Philippines** | 60 832 | 0.0299 | 0.1902 | 34 439 | 0.0999 | 363 540 | 1.169542 | 279 | 199 856 |
| **Mean**        | 15 408 | 0.0171 | 0.155 | 8805 | 0.0887 | 98 321 | 1.009793 | 55 | 41 909 |
| **Median**      | 184 797 | 0.0872 | 0.1389 | 86 956 | 0.0607 | 919 174 | 0.5635185 | 792 | 619 628 |
| **Standard deviation** | 46 | -0.3542 | 0.0017 | 61 | 0.0071 | 4558 | 0.4465593 | 2 | 452 |
| **Minimum**     | 2 707 978 | 0.4526 | 0.9218 | 1 050 150 | 0.4465 | 10 234 409 | 5.150048 | 8663 | 8 407 740 |
| **Maximum**     | 3103 | 3103 | 3103 | 3103 | 3103 | 3103 | 3103 | 3103 | 3103 |
| **Singapore**   | 29 691 | 0.0142 | 0.1328 | 18 381 | 0.0851 | 213 869 | 1.012785 | 147 | 103 367 |
| **Mean**        | 69 438 | 0.0201 | 0.1421 | 65 325 | 0.1114 | 480 806 | 1.337886 | 467 | 266 322 |
| **Median**      | 175 276 | 0.0759 | 0.1372 | 190 022 | 0.0841 | 981 950 | 0.8583651 | 1320 | 634 766 |
| **Standard deviation** | 46 | -0.3542 | 0.0017 | 61 | 0.0071 | 4558 | 0.4465593 | 2 | 452 |
| **Minimum**     | 1 389 315 | 0.4401 | 0.7848 | 1 648 965 | 0.5729 | 5 363 550 | 4.924468 | 7142 | 3 589 091 |
| **Maximum**     | 2 707 978 | 0.4526 | 0.9218 | 1 050 150 | 0.4465 | 10 234 409 | 5.150048 | 8663 | 8 407 740 |
| **Thailand**    | 29 691 | 0.0142 | 0.1328 | 18 381 | 0.0851 | 213 869 | 1.012785 | 147 | 103 367 |
| **Mean**        | 69 438 | 0.0201 | 0.1421 | 65 325 | 0.1114 | 480 806 | 1.337886 | 467 | 266 322 |
| **Median**      | 175 276 | 0.0759 | 0.1372 | 190 022 | 0.0841 | 981 950 | 0.8583651 | 1320 | 634 766 |
| **Standard deviation** | 46 | -0.3542 | 0.0017 | 61 | 0.0071 | 4558 | 0.4465593 | 2 | 452 |
| **Minimum**     | 1 389 315 | 0.4401 | 0.7848 | 1 648 965 | 0.5729 | 5 363 550 | 4.924468 | 7142 | 3 589 091 |
| **Maximum**     | 2 707 978 | 0.4526 | 0.9218 | 1 050 150 | 0.4465 | 10 234 409 | 5.150048 | 8663 | 8 407 740 |
| **Vietnam**     | 29 691 | 0.0142 | 0.1328 | 18 381 | 0.0851 | 213 869 | 1.012785 | 147 | 103 367 |
| **Mean**        | 69 438 | 0.0201 | 0.1421 | 65 325 | 0.1114 | 480 806 | 1.337886 | 467 | 266 322 |
| **Median**      | 175 276 | 0.0759 | 0.1372 | 190 022 | 0.0841 | 981 950 | 0.8583651 | 1320 | 634 766 |
| **Standard deviation** | 46 | -0.3542 | 0.0017 | 61 | 0.0071 | 4558 | 0.4465593 | 2 | 452 |
| **Minimum**     | 1 389 315 | 0.4401 | 0.7848 | 1 648 965 | 0.5729 | 5 363 550 | 4.924468 | 7142 | 3 589 091 |
| **Maximum**     | 2 707 978 | 0.4526 | 0.9218 | 1 050 150 | 0.4465 | 10 234 409 | 5.150048 | 8663 | 8 407 740 |

**Source:** Bureau Van Dijk Oriana Database (https://oriana.bvdinfo.com/).