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ESSAYS IN CORPORATE FINANCE

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SINGAPORE MANAGEMENT UNIVERSITY

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Essays in Corporate Finance

By
LI Bingqiao

Submitted to Lee Kong Chian School of Business in partial fulfilment of the
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Abstract

Based on a constructed index measuring the corporate governance quality of public firms, this paper focus on the role of corporate governance and its association with the performance of Singapore Exchange listed firms. We investigate the following three aspects centred on the topic of firm corporate governance in Singapore.

First, we examine the performance of the Chinese firms listed on the Singapore Exchange (S-Chips) and the role of their corporate governance. S-Chips indeed underperform local firms in terms of Tobin's Q within both univariate and multivariable frameworks, as well as base on size matched and Propensity Score Matching samples. Higher index value indicating good governance is found to be positively related to higher Tobin's Q for the full sample; however, when firms are separated into difference groups based on firm's location characteristics, we find that the above positive relationship vanishes and even reverse sign when applying to firms falling into the S-Chip group. Such negative result is future supported by robustness tests that take size, firm holdings pattern and other firm characteristics into account. The results thus support our view that S-Chips are suffering from low valuation due to their "notorious reputations" caused by the scandalous actions of the managements of some former companies involved with scandals and that governance quality revealed by the S-Chips' managements through public resources are not regarded as trust worthy by the market.

Second, we investigate the relationship between firm's government ownership, particularly the fractions of common stocks held by Temasek Holdings, and firm value within the corporate governance framework based on a sample of Singapore Exchange

listed firms. We make comparison between firm valuation and corporate governance index (SCGI) of firms that have Temasek investments (TLCs) and firms that do not (non-TLCs) and found that TLCs tend to have both higher corporate governance score and Q value and the results are consistent based on the analyses of both multivariable regression and simultaneous regressions. Temasek stock holdings are found to be related to higher firm Tobin's Q value beyond the level of Q that is associated with good corporate governance for the full sample. Better corporate governance of TLCs are robust to matched samples based on firm size and PSM score; however, results for firm value based on matched samples indicates that it is the differences in firm characteristics such as size, leverage and profitability that drive the different firm values between TLCs and their non-TLC counterparties. No statistical significance differences are found for the positive relationship of firm value and corporate governance between TLCs and non-TLCs

Third, we look at the impact of firm's corporate governance practice on reducing agency costs. We choose two proxies to quantify agency costs, namely asset turnover as an inverse measure, and free cash flow as a direct measure. Controlling for growth prospects, we find a positive linear relationship between firm asset utilization (asset turnover) and governance quality, consistent with the notion that effective corporate governance can help mitigate agency problems. Furthermore, we find a nonlinear inverted U-shaped relationship between agency costs and corporate governance when using the interaction of free cash flow and firm growth opportunities as the direct agency costs proxy. Free cash flows are not kept with firms that have the best corporate governance performance when no positive NPV investment opportunities are available. Sub-indices analysis reconfirms the importance of roles of stakeholders and the responsibilities of the board of directors.

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Part I What Happened to S-Chips in Singapore?

Chapter 1.1   Introduction

The Chinese firms listed on the Singapore Exchange (S-Chips) have caught much attention in the recent decades, from once the market darling to nowadays almost the stock poison, their market performances have gone through dramatic changes. According to the 2014 Singapore Exchange (SGX) annual report, 40 per cent of the exchange's listed companies are based outside of Singapore. This makes the Singapore Stock Exchange a world leader in foreign listings. Among the foreign firms, the Chinese firms often regard as S-Chips by the investors have drawn great attention from both the exchanges itself and from the government authorities during the recent decades. This is not because of their good performance but due to the waves of scandals involving them. Since the first S-Chip scandals in 2007, we have seen a handful many from then on. During 2008-2009, there emerged the first wave of scandals of the 'Eight Beauties', namely Sino Environment Technology Group, China Milk Product Holdings, Jiutian Chemical Group, Ferrochina, Celestial Nutrifood, Fibrechem Technologies, China Sun-Biochem and Beauty China. And again in 2011, the cases of China Hongxing Sports and Hongwei Technologies leaded the second wave. All of the above firms were former market darlings, and their scandals have undoubtedly been weakening investors' interests on S-Chips.

Ever since the S-Chip scandals, the prices and transaction volumes of S-Chips stocks have suffered and remained low for a long period. Fingers have been pointed at the poor corporate governance of these firms, putting blame on the governance mechanisms of these companies. Due to their tarnished reputation caused the few involved in the scandals, investor confidence in the sector has been undermined and as a result, the S-Chips sectors as a whole seems to be valued at a rather low level

compared with the local firms as well as other foreign listings. Is the corporate governance really to blame? In this study we focus on the investigation of two major aspects. First, how do S-Chip firms perform when compared to other local or foreign firms? Second, what is the role of these firms' corporate governance?

The quality of firm corporate governance has been proved in the literature to be related to mainly three different aspects of firm performance: 1) operating performance: or the profitability, often measured as ROA or ROE; 2) market value: or the market capitalization relative to book value, by the means of Tobin's Q; 3) stock returns: often controlling for risk and other factors affecting returns. In this paper we will focus mainly on the market value of the firm as measured by Tobin's Q. We also follow the algorithm of Gompers, Ishii, and Metrick (2003) and construct the Singapore Corporate Governance Index (SCGI) based on the OECD governance principles to measure the quality of corporate governance in terms of their practices for firms listed on the Singapore Exchange.

We do find evidence of relatively lower Q ratio for S-Chip firms as compared to the local firms within both univariate and multivariable framework. Furthermore, to address the potential problem that the firm characteristics of an S-Chip firms are different from those of the local group and resulting in incomparable comparison, we consider a matching sample procedure. We use Propensity Score Matching procedure based on a set of control variables and find a matching firm with similar characteristics in the local group for each S-Chip firm in every year from 2008 to 2014. Using these more homogeneous groups of firms with comparable firm characteristics, we further confirm the conclusion that S-Chip firms tend to have lower value conditional on the fact that their other firm characteristics are of similar quality. Moreover, through the investigation of firm value and corporate

governance index relationship, we find results that are not fully consistent with those found in the literature. Overall, the coefficients are significant and positive for the regression of Q on SCGI and control variables with all publicly listed firms on SGX included in the sample. This is consistent with the literature since our measure of corporate governance SCGI is a direct measure. The better the governance the higher the value. Thus a positive coefficient is equivalent to a positive association between a direct measurement of firm corporate governance and firm valuation. However, this positive relationship holds only for local firm (although the result is sensitive to firm size) but vanishes when applying to the S-Chips. Regression results for sub-sample classified based on location identifiers based on the located country of management team of the country from which the largest fraction of revenue is generated show that, when the management team of the firm are located in mainland China, the coefficients for Q and SCGI could be even negative and significant. On the basis of matched firm characteristics, S-Chips are still undervalued compared to their local counterparties, and so is the case controlling for firm holdings patterns. These provide evidence for our suspicion when we were gathering the information to construct the governance index, that the information conveyed by the management regarding their firm corporate governance might not be reliable for the S-Chips. They are not really implementing what they said about governance practices in the view of the market.

Our study differs from those in the literature in that we compare the corporate governance practices of firms that are listed on the same exchange but are having their management teams domiciled in different countries while most studies do not make such distinction. The composition of SGX's listed companies makes it a good sample market for us to study the corporate governance under the foreign listing

structure. Moreover, most of the studies follow the algorithm of GIM and construct an index to be the proxy for corporate governance. The difference between our indices and the GIM index is that our indices examine the corporate governance practices that a firm implements from various prospects according to its internal governance policies whereas GIM index is a composite rating measuring merely at the level of governance policies or more particularly, the takeover protection policies. As such, our way of measuring the quality of corporate governance is more thorough and precise, as well as direct than either the G-index (Gompers, Ishii, and Metrick (2003)) or the E-index (Bebchuk, Cohen and Ferrell (2009)), as referred to by the literature.

The rest of Part I is organized as follow. In Chapter 2 we briefly review the literature of corporate governance and the background of S-Chips. Chapter 3 describes the data, methodologies and construction of the Singapore Corporate Governance Index, as well as the identification of S-Chips. In Chapter 4 the main results are presented and discussed and Chapter 5 concludes the study.

Chapter 1.2   Literature Review

1.2.1   Corporate Governance

Ever since the existence of corporation as a form of economic organization, there is the agency problem resulted from the separation of ownership and management. Jensen and Meckling (1976) elaborate in details about agency problems. Various methods have been adopted aiming at mitigating this problem in order to create an environment of low capital cost and effective protection of both large and minority shareholders. This forms the basic tenet of corporate governance. Defined by Denis and McConnell (2003), corporate governance can be viewed as the set of mechanisms that induce the self-interested controllers of a company to

make decision that maximize the value of the firm to its shareholders. Or, in Shleifer and Vishny (1997)'s words, "Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investments."

Gompers, Ishii, and Metrick (2003) (hereafter referred to as GIM) has been the first paper to quantify firm level corporate governance policies using a governance index (G-index in the literature) as a proxy for the level of shareholder's rights. The authors find abnormal returns by constructing a portfolio longing the lowest decile of the index (strongest shareholder rights) and shorting the firms in the highest decile of the index (weakest shareholder rights. In addition, the G-index is highly correlated with firm value. Further investigation on the same index has been performed by Bebchuk, Cohen and Ferrell (2009). They put forward an entrenchment index (E-index in the literature) based on 6 provisions out of the 24 used by GIM and find that increases in the index level are monotonically associated with economically significant reductions in firm valuation as well as large negative abnormal returns during the sample period. However, the other 18 provisions not in the E-index were found to be uncorrelated with either reduced firm valuation or negative abnormal returns.

While most of the work in this literature has been done on industrialized countries, especially the United States and the United Kingdom, there is a rapidly growing strand of literature that looks at governance in emerging countries. Corporate governance has been receiving increasing attention in developing regions especially ever since the Asian financial crisis in 1997 as well as the sensational stories on corporate scandals involving Asian firms. In the aftermath of corporate scandals in the West and the 1997 financial crisis in Asia, each Asian country has

realized the importance of a reform in corporate governance or else that poor governance could have exacerbated the problems. Follow GIM, Black, Jang and Kim (2006) and Bernard, Love and Rachinsky (2006) has constructed corporate governance index for Korean firms and Russia firms respectively in order to quantify the quality the firm governance.

1.2.2 S-Chips

By the end of 2014, of the 775 firms listed on the SGX, 126 are Chinese firms. These Chinese firms are often referred as S-Chips by the investors. Due to stringent regulatory restrictions in China, companies incorporated in mainland China traditionally had to take the "red-chip" approach in overseas listing by incorporating a non-Chinese holding vehicle and restructuring its assets under such an overseas entity. Incorporated mainly in Singapore, British Virgin Islands, Cayman Islands or Bermuda, these companies that have their main operations and major management teams in China but are listed on the Singapore Stock Exchange are then labelled as S-Chip firms. Since the firms' management teams are rarely in Singapore and thus analysts and investors have limited visibility of these firms and have to rely on companies' own disclosures, which the authenticity of such information is often difficult to verify.

Once actively pursued by the SGX in the late 1990s to boost Singapore's capital markets and to provide local investors the opportunity to tap China's economic growth, S-Chips had a good start and were often the darlings of investors on the SGX in the early 2000s. In 2004, more than 40 China-originated businesses raised more than S$900 million through IPOs on the SGX and enjoyed an average price increase of 21 per cent over their issued price by January 2005. In 2007, approximately 170 S-Chips were listed on the mainboard/subsidiary board of SGX

and three of them were even included in the STI Index. For a while, S-Chips formed an indispensable part of the Singapore stock market.

All these did not last long. Series of scandals related to the S-Chip firms took place over the next few years' time. The first wave of scandals emerged during 2008 and 2009 and involved 6 firms. Things became worse in 2011 as 7 more S-Chip firms were accused of being involved in different level of fraud. Up to this point, investors have lost confidence in the once well beloved S-Chip firms and the share prices of many which remain are still languishing today. Neither first nor only in Singapore, many Chinese companies listed around the world today are still beleaguered by a widespread lack of confidence among foreign investors and regulators. Our corporate governance index was then inspired by these S-Chips scandals since many have pointed figures, putting blame to the corporate governance of these firms. We believe the role of investor protection for corporate governance becomes much more important under such circumstance in the Singapore stock market. As such we investigate in this study the role of corporate governance on the firms that are from Mainland China but are listed on the SGX mainboard. The governance practices are quantified by an index constructed specifically for the market in Singapore.

Chapter 1.3 Data and Methodology

1.3.1   Singapore Corporate Governance Index (SCGI)

One of the main goals of this paper is to investigate the corporate governance of firms listed on the SGX mainboard thus how to quantify the corporate governance is not a trivial question. Here we will describe the index we used to measure the quality of not the corporate governance policy of the firm but the implementation of these policies. The outbreak of 1997 financial crisis has led to

the decisive actions to promote corporate governance and improve trust and transparency by Singapore government, as well as most of the countries in Asia. Required by the government and stock exchange, firms have to comply with the Singapore Exchange (SGX) listing manual and from 2003 onwards, firms have to disclose their corporate governance practices and provide explanations for any deviations from the corporate governance code issued in 2001. In 2005, a new code was issued and came under the purview of MAS (Monetary Authority of Singapore) and SGX with effect from 1st September 2007.

The Singapore Corporate Governance Index (SCGI) is constructed based on the revised OECD Principles (OECD, 2004) and the Singapore Code of Corporate Governance (SCCG, 2005). The questionnaire used to value the governance practices of a firm is a composite of 205 questions (including sub-questions), designed to fit the context of Singapore listed firms and quantify the corporate governance practices of these firms. The questions cover five broad categories: rights of shareholders, equitable treatment of shareholders, role of stakeholders, disclosure and transparency, and board responsibilities. Sources to answer these questions are from the public domain and no non-public information or survey opinions from the managements are used in order to avoid subjectivity. Each of the five categories is corresponding to a sub-index and the final indices are the sum of all the five sub-indices, weighted equally or proportionally. The sub and overall indices are rescaled from 0 (worst) to 100 (best) and further standardized to between

0 and 1 for the purpose of this study. Table I below presents the construction of the value weighted Singapore Corporate Governance Index[1].

TABLE I CONSTRUCTION OF THE SINGAPORE CORPORATE GOVERNANCE INDEX

Sub-indices	OECD Principles	Key Words	No. of Main Questions	Weightage
Sub-index A	Rights of Shareholders	· Rights defined · Rights disclosed · Participation in AGM · Takeover rules	12	17%
Sub-index B	Equitable Treatment of Shareholders	· Shareholders conflict · Proxy voting	10	9%
Sub-index C	Roles of Stakeholders in Corporate Governance	· Obligations to stakeholders	8	14%
Sub-index D	Disclosure and Transparency	· Material information	11	17%
Sub-index E	Responsibilities of the Board	· Monitoring/control	31	43%

Firms are subjected to various regulations for being qualified to be a listed firm on SGX, and among these requirements there is a section focusing on firm corporate governance. Firms have to comply with a minimum level of corporate governance codes in order to be listing on SGX. As such, part of the SCGI is measuring the compulsory part and on top of that are the scores measuring the corporate governance practices adopted voluntarily by the firms.

Table II shows the correlations among sub-indices. All of the five sub-indices have positive and significant pairwise Pearson correlation with each other. From the table we can see that sub-index E is highly correlated with all the other four sub-indices and this somehow indicates the importance of the board's responsibilities and thus this sub-index is given the highest weightage when calculating the overall index according to Table I.

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[1] We do the analysis on both equal-weighted and value-weighted index. In this paper, we report only value-weighted index results. The results based on the equal-weighted index are similar and are available upon request.

TABLE II CORRELATION BETWEEN THE SUB-INDICES

	Sub-Index A	Sub-Index B	Sub-Index C	Sub-Index D
Sub-Index B	0.24***			
Sub-Index C	0.08***	0.16***		
Sub-Index D	0.21***	0.12***	0.28***	
Sub-Index E	0.28***	0.18***	0.32***	0.38***

Figure 1 presents the distribution of the Singapore Corporate Governance Index. Over the 7 years' period, the overall index ranges from 0.09 to 0.89 with a mean of 0.62 and standard deviation of 0.0814. From the graph itself as well as the kurtosis and skewness value, we can see that the distribution of the index follows a normal distribution with slight deviation.

FIGURE 1 DISTRIBUTION OF THE SINGAPORE CORPORATE GOVERNANCE (FY2007 - FY2013)
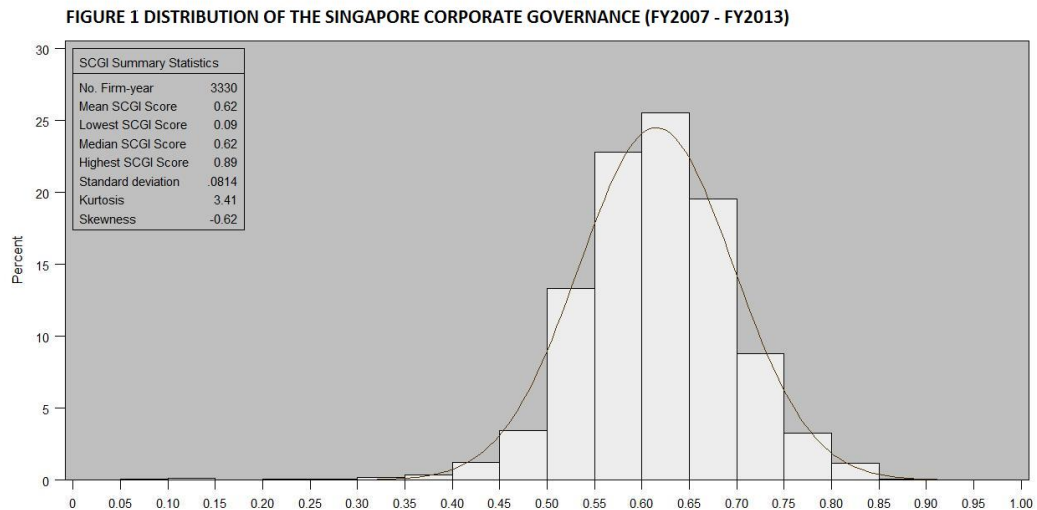
1.3.2 Identification of S-Chips

There is no exact or formal definition for the term S-Chip. Some refer it to those firms that are head quartered in mainland China while others look at the country where the largest proportion of firm revenue comes. Firms that have most of their business targeting at China will be viewed as S-Chips. Thus in our study, to distinguish whether a firm belongs to a local group or an S-Chip group, we choose to use two different firm location identifiers: 1) country of domicile, Bloomberg variable, which returns the country where the company's senior management is

located; 2) country of largest revenue, Bloomberg variable, which refers to the country from which the company generates the largest portion of its revenue based on the latest annual report. The first identifier aims at capturing the country in which the firm management team is based and we believe this is more precise than the location of firm headquarters in capturing the risk associated with having management teams not base in Singapore. The second identifier picks out the country from which most of the revenues are generated.

Figure 2 gives the number of firms in each year classified according to the two different identifiers. More than three quarters of the firm are classified as local firms by means of country of domicile. Of the firms that are not managed locally, more than half of the sample are S-Chip firms. However, firm numbers are much more evenly distributed among the three groups when classed by country of largest revenue compared with that using the first classification identifier.

FIGURE 2 NUMBERS OF FIRMS IN EACH CLASSIFICATION

Country of Domicile

	2008	2009	2010	2011	2012	2013	2014
Foreign (exclude China)	42	42	44	46	43	47	35
China	57	66	64	65	59	60	45
Local	354	389	385	378	371	394	344

Country of Largest Revenue

	2008	2009	2010	2011	2012	2013	2014
Foreign (exclude China)	155	168	166	160	158	173	145
China	132	146	144	146	138	135	109
Local	166	183	183	183	177	193	170
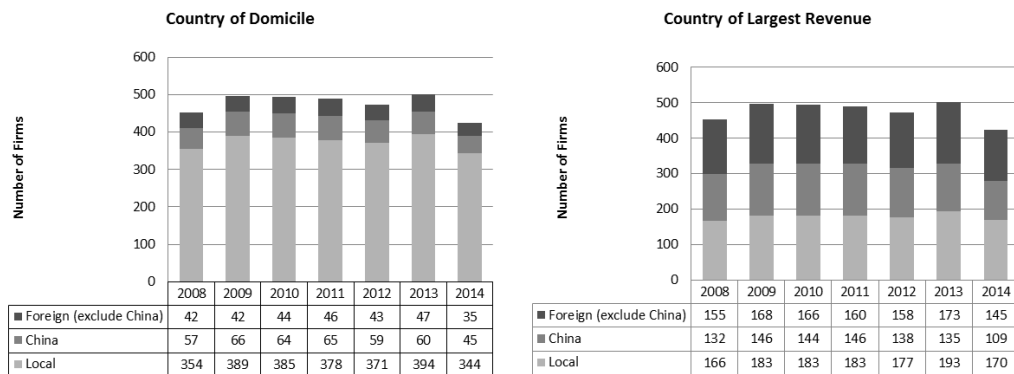
1.3.3 Firm Valuation and Control Variables

In studying the association between corporate governance and firm value, Tobin's Q has been used by majority of scholars in the literature (Demsetz and Lehn (1985), Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), Lang and Stulz (1994), Kaplan and Zingales (1997), Daines (2001), La Porta et al. (2002)).

We follow Bebchuk, Cohen and Ferrell, who follow Gompers, Ishii, and Metrick (2003) and compute firm's Q ratio as

$$Q_{GIM} = \frac{MVA}{BVA} = \frac{BVA + MVCS - BVCS - DFT}{BVA}$$

where MVA is the market value of the firm's assets, BVA is the book value of the firm's assets, MVCS is the market value of the firm's common stocks, BVCS is the book value of the firm's common stocks, and DFT is the firm's deferred tax. When used in the Fama-MacBeth variant analysis explaining the relationship between firm value and governance, this Q variable is industry-adjusted (firm Q minus industry-median Q classified according to Fama-French 12 industries2).

There is also another version of Q ratio calculated as

$$Q_{ALT} = \frac{MVA}{BVA} = \frac{MVCS + LTDT + STDT}{BVA}$$

where LTDT and STDT refer to long-term debt and short-term debt. The logic behind this version of calculation is that the market value of debt will not deviate too much for its book value and thus using the book value of debt to approximate the market value of debt can be feasible under this assumption.

Similarly, we follow the literature to use throughout standard control variables in firm value regression, including firm size (in logs), firm age (in logs). In addition, we also include other controls that have been found to have impact on Q value, such as return on assets, capital expenditures to assets, research and development expenditures to sales, and leverage. In addition, we add a dummy variable if a firm is included in the STI index since Morck and Yang (2001) find a that firms included in the S&P 500 tend to have a higher Q. So we expect to see the same effect if a

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2 Here we Fama-French 12-industry classification rather than the 48-industry classification to ensure that at least there is one firm in each industry.

firm is included in the STI index. Ang and Ding (2006) and Dewenter, Han and Malatesta (2010) find that firms with Temasek investment on average exhibit better performance than those of the non-Temasek firms, even after controlling for firm specific factors such as profitability, leverage, firm size, industry effect, and foreign ownership. As such, we include a dummy variable equals to 1 if a firm is held by Temasek Holdings.

1.3.4 Methodology

1.3.4.1 Regression Analysis

The basic regression model used in this paper is as follow, where we regress firm value in year *t* on SCGI in year *t-1* and control variables in year *t*.

$$Q_{it} = \alpha + \beta \cdot SCGI_{it-1} + \gamma \cdot Controls_{it} + \varepsilon_{it} \tag{1}$$

Follow GIM paper, we apply the variant of Fama-MacBeth regression method that first run a cross-sectional regression on an annual basis and then estimate the mean coefficient across all years with the time series standard errors.

The Fama-MacBeth regression model use the industry-adjusted Q as the dependent variable while for the independent variables, they are not adjusted against industry means. However, scholars have been criticising the use of the "adjusted-Y" method. They argue that any estimation that transforms the dependent variable but not the independent variables will typically yield inconsistent estimates. Gormley and Matsa (2014) suggest to use FE estimators instead of the "adjusted-Y", saying that FE estimators are consistent because they are equivalent to transforming both the dependent and independent variables so as to remove the unobserved heterogeneity. Thus, we employ a pooled OLS regression model that includes industry and year fixed effects using unadjusted dependent and

independent variables and will base our analysis mainly on this regression specification.

To future investigate the differences of the relationship between SCGI and firm value among various groups classified by location characteristics, we perform the following regression equation for the 2 location identifiers respectively,

$$Q_{it} = \alpha + \beta \cdot SCGI_{it-1} + b \cdot SCGI_{it-1} \cdot Locations_i + \text{d} \cdot Locations_i$$
$$+ \gamma \cdot Controls_{it} + \varepsilon_{it}$$

(2)

where Location i (i=Singapore, China) is a dummy variable that takes the value of 1 if a firm has a location value of i and 0 otherwise; $SCGI_{it-1} \cdot Location$ are interaction term of the governance index and firm location dummy. The variable of interest in this regression is thus b, which captures how different the coefficients are between groups.

Well used in the literature is OLS regression with fixed effects, both year fixed effects and firm fixed effects. But because the SCGI is a firm level measurement, adding a firm fixed effect will force the identification of the index coefficient from only the changes of the index while subsume the impact of the index itself hence we do not make our conclusion based the regression results with firm fixed effects3.

1.3.4.2 Propensity score matching (PSM)

Since we are interested in comparing two groups of firms in terms of their firm value we need to take care of the other group specific characteristics that might have an impact in determining the firm value to avoid comparing apples to pears. In order to address this concern, we applied a matching method to take the differences of the control variables between the treatment and the treated group into account, using a "P-score matching" procedure based on the SGCI and the control variables other

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[3] Regression results with both year and firm fixed effects are available upon request.

than the dummies. For each firm-year in the treatment S-Chips group, we find a matched local firm with similar characteristics in same year based on the P-score obtained from performing a logit model in the first stage. We then use these more homogeneous groups of firms with comparable firm characteristics to investigate the differences between S-Chip firms and local firms in terms of firm valuation and the relationship between value Q and governance scores.

There are various ways of performing the matching procedure and we choose three of them in our study to capture various aspects. K-Nearest Neighbour matching is the most straightforward matching estimator. The individual from the comparison group (in our case is the local firms group) is chosen as a matching partner for a treated individual (S-Chips) that is closest in terms of propensity score. Here we choose K to be 3 and allow matching 'with replacement', meaning that an untreated individual can be used more than once as a match and each individual in the treated group will have 3 untreated matched partner of different weightage according to how close the their propensity scores are (the closer the more weight given). Nearest neighbour matching will subject to the risk of bad matches if the closest neighbour is far away. So the second estimator we used is to apply caliper and radius matching. The basic idea of this matching procedure is to use all of the comparison members within the caliper ('propensity range') that is closest in terms of propensity score as a matching partner for a treated individual that lies within the caliper. This approach uses only as many comparison units as are available within the caliper and therefore allows for usage of extra (fewer) units when good matches are (not) available, hence avoids the risk of bad matches. The third estimator used by us is called the local linear matching (LLM). It is a non-parametric matching estimator that use weighted averages of all individuals in the control group to

construct the outcome. Thus, it lowers the variance achieved because more information is used but at the same time bad matches are possibly being used. A proper imposition of the common support condition is of major importance for this estimator. LLM is also advantageous whenever comparison group observations are distributed asymmetrically around the treated observation or when there are gaps in the propensity score distribution.

1.3.4.3 Piecewise Regression

Use the method adopted by Sirri and Tufano (1998) for reference, we also perform our analysis for the relationship between firm value and corporate governance using a piecewise linear regression. Piecewise regression is also known as segmented regression, in which the independent variable is partitioned into intervals and a separate line segment is fitted to each interval. Piecewise regression analysis can also be performed on multivariable data by partitioning the various independent variables. These independent variables, when clustered into different groups, may exhibit different relationships between the dependent variables among these groups.

In our analysis, we are interested in the segmented impact of the corporate governance score SCGI. We follow Sirri and Tufano (1998) to choose to partition the independent variables of interest over five quintiles based on the rankings of the independent variables. The 5th or bottom quintile (RANK1) is defined as min (RANK, 0.2), the 4th performance quintile is defined as min (0.2, RANK-RANK1), and so forth, up to the highest performance quintile (RANK5). Then we substitute the 5 new variables representing the gradual changes of SCGI within each quintiles for the actual value of the independent variables SCGI in equation (1). The coefficients on these piecewise decompositions of fractional ranks thus represent

the slope of the relationship between the dependent and the main independent variables of interest over their range of sensitivity.

1.3.5   Data Source and Sample Criteria

The firm fundamental and market data we used are mainly from Bloomberg. Temasek holdings data are obtained from Capital IQ. Other firm variables are from Capital IQ and DataStream, confirmed and supplemented by the SGX official website.

Our sample consists only of those firms that were or are listed on the main board of SGX where we have obtained their corporate governance practice information. We might not have covered a firm if it filed annual report too late after the end of a particular fiscal year. Firms might dropped out of our sample due to delisting or suspend of trading, and also might enter our sample due to new listing or resume trading. However, we require at least 2 years' data for a firm to be included in our final sample. Firms with price less than 5 cents or price missing consecutively for more than 12 months during the sample period are dropped. Trust or REITs are also excluded. So are the ADRs. Applying all the above criteria, we end up with 3,330 firm year observations which is sufficient to perform the analysis. All firm fundamental data are winsorized at 1%.

Chapter 1.4 Results and Analysis

1.4.1   Summary Statistics

In Table I.1[4], the detailed summary statistics of the index in each year are presented. Panel A reports the descriptive statistics of the overall index along with the means of the sub-indices. Throughout the sample period, the figures do not seem to change monotonically but with some ups and downs over the 7 years' time

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[4] Tables referred to in Part I can be found in Appendix A.

reaching the lowest in year 2009, which is the year that many S-Chip scandals took place. Note from the minimum score row, we can see that the smallest value is in year 2007 and after dropping significantly in 2009, it starts to catch up gradually. This might in some sense indicating that the corporate governance practices of the firms listed in the Singapore Exchange are improving, particularly for the once worst governed firms. The sub-indices means are in general either quite stable or follow an improved path except Sub-index E. Since it weighs the most in generating the overall index, its change by natural will affect the overall index value the most.

In Panel B we break the sample up into groups according to the index value, beginning with a group of firms that have index value less than half of the full mark and finishing with value more than 0.8. These six groups' breakpoints are chosen according to the distribution of the index and they are not identical in size as we can see that the top and bottom tend to have fewer firms while the middle ones have the most numbers of firms in them. One interesting phenomenon to note here is that from the changes in each ranking from 2007 to 2013, it seems that as more strict rules are set up by the authorities, corporate governance scores are adjusted along the way and firms' governance practices have failed to meet very high standards. The group with the largest number of firms fails on the top rank group in 2007 but end up with the middle group in 2013.

In Panel C, we count the total number of firms according to firm's location and firm size. Firms are ranked into five quintiles based on their total assets, with RANK1 having the smallest firms and RANK5 the largest firms. Firms are also classified as either local firms, S-Chips or foreign firms defined by either the country where the management team locates (domicile) or the region where the largest portion of revenues are generated (revenue). Grouped by country of domicile,

we can see that Chinese firms fall in the middle size (RANK3) the most and big size (RANK5) the least. Other size rank groups are basically having even number of firm observations. Grouped by country of revenue, the distribution of firms are different. Although RANK3 still has the largest number of S-Chips, the number is almost twice the size of that in RANK3 grouped by country of domicile. So are the cases with other groups.

Correlations for SCGI with a set of firm characteristics including the two versions of Q ratios are given in Table I.2. In the first column, we can see that other than firm leverage and R&D, all the other variables are significantly correlated with SGCI. The strongest relation is between firm total assets and governance index and the only negative correlation is between capital expenditure and SGCI. This finding is inconsistent with that found in the GIM paper as in their paper, better governance are associated with less capital expenditure, whereas in our finding, better governance is correspond to more capital expenditure. One possible reason for this could be that better governed firms are more likely to generate firm capital consumption into firm value.

1.4.2   Firm Valuation Tobin's Q

1.4.2.1 Univariate Test

The last two columns in Table I.2 give the differences for firm characteristics between the two groups: local firms vs. S-Chip firms. The classification is based on two different identifiers detailed in Section III, namely the country of domicile and the country of largest revenue. The results in the two columns are roughly identical in terms of sign and magnitude, as well as significance. In general, local firm group mean values for Q ratio are both statistically and economically greater than those of the S-Chip firms before or after adjusting for industry factor. Based on this

univariate test, S-Chips underperform local firms by means of Tobin's Q. In addition, the local firms are larger than the S-Chips, older and more profitable on average. However, they spend more on capital but almost the same on R&D expenditure.

Panel B documents the differences of SCGI overall indices and sub-indices between these two groups. As we can see from the table, all the indices are significantly higher for the local firm group no matter how we classify them. Thus, this table simply indicates better governance for the local firms and they are having higher Q ratio at the same time. To further conclude on the underperformance of S-Chips we employ multivariable tests in the next section to control for other firm characteristics that might have an impact on the value of Q.

1.4.2.2 Multivariable Analysis

As shown in Table I.3, we perform a multivariable analysis using two groups each time. A location dummy variable takes the value of 1 if a firm is classified into the group that comes first in the table according to one of the location identifiers and 0 for firms in the other group. Other control variables are also included in the multivariable equation, such as firm size, firm age, leverage ratio, ROA, capital expenditure, R&D to sales, STI index dummy and lastly, Temasek dummy for firms with common shares outstanding held by Temasek Holdings. Temasek dummy is included in the regression due to the fact that firms linked with it have been found to outperform their counterparts in the literature. Since the results are almost identical for the two versions of Tobin's Q calculation, we will report only the results for the version that is adopted by GIM and omit the alternative one to avoid redundancy.

The results for the multivariable analysis are consistent with that of the univariate test. As indicated by the coefficients of the location dummy in the first column, local firms are having higher Q ratios on average than S-Chips significantly, both statistically and economically. In the next column, we also compare the Q ratios between local firms and other foreign firms and find no significant underperformance of the latter. Yet when we compare the Q ratios between S-Chips and other foreign firms in the third column, we find a standardized coefficient of 0.214 which is significant at the level of 1%. For results in the last three columns, the classification of firm location is based on the country from which the largest amount of revenue is generated. The coefficient for the dummy variables are having the same sign and significance but smaller magnitudes when compared with the previous three columns, nevertheless, they indicate the same conclusion. From the comparisons among the three groups, we find evidence empirically for the fact that S-Chips are performing badly not only shown by the poor returns and low trading volumes in the market, but also by the consistently lower market to book measurement Tobin's Q under the analysis within both univariate and multivariable frameworks.

1.4.2.3 PSM Analysis of Firm Value

There is one concern of the analysis results of the previous section regarding the differences between the local firms and the S-Chips. Recall that in Table I.2, we document significant firm variables differences between the local firm groups and the S-Chips. As such, we suspect the results in Table I.3 are not robust due to the fact that these two groups are incomparable, ending up in comparing apples to pears. In this sense, it is not appropriate to conclude that S-Chips are underperformed by local firms. In this section, we try to address for this concern by adopting a matching

sample comparison procedure – Propensity Score Matching (PSM) – to take account of the between firm differences of the independent variables that are likely to influence the Q value of a firm. In general, we try to match each S-Chip firm in the sample with a comparable local firm based on SCGI, firm total assets, firm age and leverage, ROA, CAPEX/assets (the ratio of capital expenditures to assets) and R&D per Sales. Conditional on this matching procedure, we test whether there is still significance difference in terms of firm value Q ratio between the local firms group and the S-Chips group. There are various ways of implementing the PSM procedure and here is this paper, we will adopt three difference methods since each of them imposes different trade-offs between bias and variance.

Table I.4 reports the final results of the between group comparison analysis based on the three PSM procedures. Same as before, groups are classified by the two different location identifiers and results are shown in Panel A and Panel B respectively. In the first row figures are estimated using the unmatched groups while the second row displays the results based on the matched sample. We can see that before implementing the matching procedure, the Q ratio of the treated (S-Chips) group is significantly smaller than that of the controlled (local firms) group in both Panels. After matching by SCGI, firm total assets, firm age, leverage, ROA, CAPEX/assets (the ratio of capital expenditures to assets) and R&D per Sales, the differences never loss their significance and are even larger. Thus, we conclude that S-Chip firms are indeed of lower value due to the reputation damage of the entire sector. Finally we check balancing to see if we can trust the results of the matching methods. In un-tabulated table, we find that the t-tests for equality means in the treated and non-treated groups is significant before matching but are no longer significant after matching for all covariates and this indicate a good balancing. For

the standardized bias, all but one variable drop to below 5% after matching, indicating the matching indeed reduces starting unbalancing[5].

1.4.3 Role of Corporate Governance

Poor governance has been pointed to and blamed for the scandals hitting the S-Chips sector. Corporate governance has been found to matter for firm value in the U.S. and other countries as well. GIM (2003) documented a negative relationship between firm value and the indirect firm corporate governance index constructed using 24 firm takeover defence provisions. In this section, we study the role of firm-specific corporate governance practices and how it is associated with firm valuation for firms listed on the Singapore Exchange main board, particularly the S-Chip sector.

1.4.3.1 Full Sample

Table I.5 shows the summary statistics of firm's Q ratio as a measurement of firm value for the full sample. Firm SCGI are ranked into 5 groups with roughly 660 firms in each group. We adopt two versions of Q ratio and in each row in Panel A, we report both the mean of raw Q ratio as well as the industry-adjusted ratio of each version. The last row reports the difference of these ratios between the highest and the lowest SCGI rankings (5 minus 1). We can see that, the means of all the Q ratios in the highest ranking group 5 in significantly larger than that in the lowest ranking group 1 and the number calculated according to the equation in the GIM paper is more pronounced than the alternative Q value.

In Panel B we perform double sorting to check if the differences documented in Panel A are sensitive to firm size. Firms are sorted on firm total assets into 5 quintiles and then on corporate governance score into another 5 quintiles within

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[5] Results are available upon request.

each size quintile. In the last row of Panel B we report the mean differences between the highest and lowest SCGI ranking groups (5 minus 1) within each size quintile. The results are mixed thus not conclusive but we can see that the most pronounced difference appears in the bottom right corner where we have the largest firms. Nevertheless, we believe that the differences for firm value are not solely driven by size factor.

Firm value Q shows a weak association with governance index SCGI based on the univariate tests above. We then perform a regression analysis using all firms in the Singapore sample to test whether there is indeed association between the two variables and whether the association is consistent with that found in the United States. Table I.6 summarises the results, including the results for the GIM way of calculating Tobin's Q and the results using the alternative calculation of Q ratio. In the first and third columns, we perform a variant of the Fama-MacBeth (1973) methods as of GIM (2003), first estimate annual cross sections regressions by year and report t-statistics based on the standard errors of these annual coefficients, after adjusting for serial correlation using the Newey and West (1987) procedure with 3 lags. As indicate, the standardized coefficients of SGCI (with an unstandardized value of 0.623 for QGIM and 0.437 for QALT) are positive and significant at the 1% level although the magnitude of the coefficient is smaller using the alternative Q ratio. Using industry and year fixed effects in the second and fourth columns, the results are weaker compared with those using Fama-MacBeth variant with industry adjusted dependent variables. Nevertheless, the coefficients are still significant. These results are consistent with those found in the Western countries, that better corporate governance are associated with better firm performance measured by variables that based on both market and book values. Using publicly listed firms'

data in Singapore, we prove the fact that the firm level corporate governance index SCGI is related with firm value Tobin's Q.

For the control variables, we find smaller firms tend to have higher Q ratio. This is on the contrary with what has been found using the U.S. sample. We also find that better governance practices are associated with higher ROA and more capital expenditure (in our data the values of capital expenditures are negative). Firms included as a constituent in the Straits Times Index or held by Temasek Holdings tend to have higher firm value as expected.

1.4.3.2 Country Variations

We move one step further to study the corporate governance practices of the SGX listed firms within country classifications to see if there are any variations in the correlations of SCGI and firm value among different groups of firms that are listed on the same stock exchange, especially the Chinese firms which is our main targets of interest. Similarly, we continue to adopt two ways to classify the firms: country of domicile and country of largest revenue. Unfortunately, for some of the firms in our sample, we failed to obtain the corresponding country information. In each way of identification, we classify firms as local firms if the country value of the particular identification is "Singapore", S-Chips if "China" and foreign (exclude China) firms for the rest. The main interest groups for this paper is the local firms and the Chinese or S-Chip firms as well as the comparison between these two groups.

In this section we will once again estimate regression (1), regressing firms' Tobin's Q on the governance score for each location group separately. We expected to find non-identical results for the two groups of interest: local and S-Chip firms.

Coefficients of panel regression based on equation (1) are reported in Table I.7. As expected, from the first two rows we can see that the positive relationship between SCGI and firm value Q for the overall sample analysed previously does not hold for all groups but the local firms group only. When firms are classified according to the country in which a firm's management team is based, the significance of the index coefficients is lost for the S-Chip group and is even of the opposite sign, indicating that better governance practices are associated with worse firm value measured by Tobin's Q. This would be irrational if SCGI is the true measure of firm corporate governance quality. We believe that this is true for most of the firms but unlikely to be true for all S-Chips. Along the process of constructing the index, we suspected that the information related to corporate governance released by the management for the S-Chips are not reliable. What they actually do back in the place where the management teams are located might not be in line with what they have reported in the place that their firms are listed. It would be hard for the listed country authorities to govern the firms that are headquartered overseas. This would explain the negative results that we have found in the S-Chips group.

In the 4th and 5th columns, the results are slightly different for the classifications based on country of largest revenue. The reason for this is as follow. The classification identifier country of domicile contains the information of the location of management team and it is the management team that is the main influential factor of a firm's corporate governance practices. As a result, the results classified by a pure management team location identifier country of domicile are more pronounced. Classification by the country of largest revenue is not based on the location of the management team but the simply the place of revenue generated.

This classification would not have captured the risk that is mostly likely related with corporate governance thus the results are less pronounced and even insignificant.

1.4.3.3 Difference in Difference Test

To make further comparison for the role of governance between local firms group and the S-Chip group, we perform OLS regression based on equation (2) and report the results in the 3rd and 6th columns in Table I.7. The coefficients of the interaction term, which is our main variable of interest, are positive and significant most of the cases. This is equivalent to the fact there are significant differences for the correlation of the governance score and firm value Q between the local firms group and the S-Chip group. Explained within a difference in difference framework, the same magnitude improvement of corporate governance quality will be associated with a greater level of increase for the local firms compared with the S-Chips and this difference is both statistically and economically significant. This provides evidence for our argument that the role of corporate governance is not as effective for S-Chip firms as it is for local firms.

From the analysis results in Table I.7, as expected, we find that the corporate governance practices do not have a uniformly positive association with the firm value measurement Tobin's Q across all the listings on the Singapore Exchange. This relationship varies mainly across firm's management team locations as well as country of largest revenues. Unsurprisingly, the association is stronger for the firms with a location value equal to "Singapore" than that for "China". This is a reasonable result as it is much easier to monitor and govern the local firms and these firms are thus more transparent to the investors. Nevertheless, the quality of the firm corporate governance seems to be less reliable for the Chinese firms as there have been so many of them being accused of involving in fraud during the past few years.

Investors have lost confidence in these firms. Due to the reputation damage of the entire sector of S-Chips, market does not seem to value the corporate governance of S-Chips in the same way as they do to local firms as indicated by the negative coefficients reported in Table I.7 for SCGI.

1.4.3.4 Segmentation Analysis

SCGI is a score given to a firm to measure its level of corporate governance. As indicated in the previous description of SCGI construction, the information used to calculate the index is based on firms' public information, a fraction of which is required by the stock exchange listing rules. That is to say, a company has to meet a minimum level of corporate governance to be eligible for listing on SGX. As such, it is reasonable to suspect that the sensitivity of firm value Q to the change of SCGI is not linear to SCGI value: the part of index beyond the compulsory codes matters more. To address this concern, we follow Sirri and Tufano (1998) to adopt a piecewise regression to capture the differences in the governance-value relationship over various ranges of sensitivity.

The piecewise regression results for the full sample are shown in the first column in Table I.8. RANK1 represents the slope of the SCGI-Q relationship for the lowest quintile of SCGI value and RANK5 the highest. As indicated by the slope coefficients, the SCGI-Q relationship varies for different ranges of SCGI value. There coefficients for RANK1 to RANK4 lack strong statistical significance while only the top SCGI range is having a positive SCGI-Q relationship statistically significant at the 10% level. This also indicates that the sensitivity of the top quintile differs from that of each of the four remaining quintiles. Such results are consistent with the construction of the SCGI as it measures the both the corporate governance

practices that a firm implemented compulsorily and voluntarily and only the voluntary part will be prices by the investors.

Separated regression results for local firms and S-Chips are presented in the next four columns. Columns 2 & 3 contain the results for the location identification of domicile. For local firms in column 2, the results are almost identical to those of the full sample; whereas, column 3 shows a rather different picture for the S-Chips. The sensitivity of SCGI-Q relationship seems to follow a "zig-zag" pattern throughout the whole range of SCGI value. The slope coefficients change signs every time SCGI moves from one quintile to another. S-Chips are different from their local counterparts due to the fact that S-Chips' management teams are located outside Singapore. It is possible and not as costly for investors or even SGX to verify the facticity of firm released information such as annual reports for firms with executives taking offices in Singapore when compared with S-Chips. With those Chinese firms having their managements back in China, no one can guarantee the truthfulness of what they choose to say and report. Turning to the results in column 4 & 5, we can see that the differences between local firms and S-Chips are statistically weak and this is because here the identification rule is revenue instead of domicile.

1.4.4 Robustness Check

As we known that firm size is one of the main driven factors for the value of Tobin's Q. Including firm size as a control variable in the regression estimation, like what we do in the previous analyses, is not sufficient to rule out the possibility that our results for the difference between local firms and S-Chips could be driven mainly by firm size. Recalled in Panel C of Table I.1, the group with the largest

firm size is having only a small proportion of Chinese firms. So in this section we will focus on dealing with the concern in association with firm size.

1.4.4.1 Scale of Firms

We provide a firm value Q comparison between local firms and S-Chips across size quintiles in Panel C of Table I.5. The most pronounced differences are driven by the smallest quintile firms instead of the largest quintile. Once taking the industry fixed effect into concern, the differences between local firms and S-Chips are virtually the weakest in terms of statistical significance for quintile 5, be it classified by country of domicile or country of revenue. This could serve as an evidence to reject the concern that the differences for Tobin's Q between the local firms and S-Chips are mainly driven by the large firms. And since we are most concerned with the large firms, we then re-estimate the OLS regression coefficients in Table I.7 with a sub-sample excluding the top size quintile firms, both local firms and S-Chips. Results are reported in Table I.9. Compared with the coefficients in Table I.7, we can see that for the local firms, excluding the largest quintile firms leads to a positive SCGI-Q relationship that has lost the statistical significance. So is the case with the interaction term of domicile location dummy and SCGI in the third column; whereas the slope for the S-Chips are still negative and statistically significant, indicating that better corporate governance are related with lower firm value, which is contrary to the literature. Classifying firms according to the location of largest revenue using this sub-sample did not change much of the results when compared with those in Table I.7. Once again, we prove the importance of managements' location when it comes to the corporate governance or more originally, the quality of the firm released information.

1.4.4.2 Matched Sample

The most straightforward way to control for the potential issue of not making the correct comparison and to ensure that we are comparing two firms fairly is to find a matched counterparty from one group for each firm in the other group. Since we are concerning with the impact of firm size, we will match each S-Chip firm with a local firm in the same time period based on firm size. Panel A in I.Table 10 reports the results using only matched sample. Changes are subtle. Note that in this table, both interaction terms lose their significance, pointing to the fact that there are no strong differences for the SCGI-Q relationship sensitivity between local firms and S-Chips. Nevertheless, slope coefficient for firms with domicile country in mainland China is negative and even increase in its statistical significance level compared with that in Table I.9.

In Panel B, we also perform analysis based on not only size but other variables using the PSM method. Our matched sample for the regression analysis here is slightly different from the previous PSM sample used for testing the Q value. Here we adopt a one-to-one match with no replacement allowed based on 5 criteria: SCGI, firm total assets, firm age, ROA and CAPEX/assets (the ratio of capital expenditures to assets). In the PSM procedure, the more variables included as matching criteria the better the matched results but more observations in the control group are needed in order to find a proper match for the treated. However, due to sample size limitation, we have to make a balance between the matching quality and the number of matched sample for the regression analysis to be robust enough. As we can see from the number of observations row, the sample size are nearly identical for the two groups in the matched sample. The interaction term coefficients reported in Panel B are conveying the same information with that in Table 7 but

with slightly stronger results in terms of magnitude. Noted here that for the purpose of matching, the location dummy in Panel B Table I.10 is 1 for S-Chips and 0 for local firms whereas the location dummy is 0 for S-Chips and 1 for local firms in Table I.7. Hence the coefficients for the interaction terms here is negative. Moreover, the SCGI-Q relationship for local firms also resume its statistical significance.

It seems that the higher Q value for local firms is mainly due to their larger scale rather than association with better corporate governance. This is indeed not irrational because for local firms, those with corporate governance quality that is better than the required level and thus better enough to make difference for firm value are mainly those large firms. Governing the management team has its costs and thus not all firms have the incentive to put effort into making improvement for corporate governance beyond the Exchange required level. As for the Chinese firms, they are penalized by gaining lower Q value even having the same firm scale and corporate governance quality as that of the local firms and our explanation for such a phenomenon lies with the "notorious" fame of the Chinese firms due to waves of scandals not only in Singapore but in the U.S.

1.4.4.3 Size Rankings

Either by excluding the largest firms or by performing the matched sample tests, we are dropping observations ending up with not using the full sample. So here we would like to perform another robustness test by substituting the actual firm size value by a firm size ranking dummy. By doing so we will not drop observations and can be able to test for the robustness of the previously found relationship between firm value and firm corporate governance based on difference sizes of firms scales. We sort and rank our firm observations based on 5 quintiles and constructed five

dummy variables for each quintiles. Instead of using the log ratio of firm asset in the regression analysis, we include one firm size dummy one at a time and perform five separate regression analyses for the full sample and for the local firm and S-Chip samples respectively. Results are documented in Table I.11 and we report sub-sample results based on only the classification of firms' country of domicile to distinguish local firms and S-Chips. Consistent with the results in Table I.9 and Table I.10 Panel A, the positive relationship between firm value and firm corporate governance for local firms are sensitive to firm size whereas the negative relationship between firm value and firm corporate governance for S-Chips are robust throughout different firm size groups.

1.4.4.4 Firm Holding Patterns

Aside from the concern that firm scale might be driven our main results, we also look out for the influence of firm holding patterns on firm valuation. Institutional shareholders and individual shareholders or insiders are not equally beneficial for the value of the firm. As such we are concerned that our results are not robust to different patterns of firm holding structure. In order to address this concern, we collect data on firm ownership from Capital IQ for all firms in each of the sample years. We include an additional variable in the regression analysis to control for firm holding patterns and report the results in Table I.12 and include only sub-sample results based on the classification of firms' country of domicile to distinguish local firms and S-Chips. Altogether we make use of five difference variables from column 1 to 5 as a proxy for firm holding patterns respectively. These variables are the percentage of common shares outstanding held by the largest individuals/insiders and that by the largest institutional holders, sum of the percentage of common shares outstanding held by all individuals/insiders and that

by all institutional holders. Lastly, we also construct a dummy variable for those firms that have more common shares outstanding held by institutional holders than by individuals/insiders. Due to missing values for firm ownership data, a large portion of our sample observations will be excluded from the regression analysis. In order not to leave out observations and end up with biased sample, similar to the construction of R&D expenditure to sales, we include a dummy variable for those firms that do not have available data on firm ownership.

From the results in Table I.12 we can see that the relationship between firm value and firm corporate governance is robust to different firm holding patterns, no matter for the full sample, the local firm sample or the sample with only S-Chips. Moreover, indicated by the signs of the coefficients, individual holdings are negatively related with firm value while institution holdings are having a positive correlation with Tobin's Q value, although the significance is rather weak.

Chapter 1.5 Summary of Conclusion

Corporate governance index were born from scandals and crises. The aftermath of the 1997 financial crisis and waves of firm scandals have played a vital role in the government's decision to improve corporate governance among companies and to promote trust and transparency of the firms in Asia. In this paper, we use a corporate governance index in the Singapore market constructed based on public information to measure the quality of not a firm's governance policy but its governance practices. We believe this is a more objective way to quantify the quality of a firm's corporate governance. Using data between 2008 and 2014, we find an overall positive relation between firm's corporate governance practices and its firm value measures as Tobin's Q ratio for Singapore Exchange mainboard listed corporations (excluding GDRs and Trusts). This is consistent with what GIM found

in the U.S. market that uses corporate governance index constructed based on firm takeover provisions. Here in this paper we do not seek to make conclusions about causality.

As an exchange that plays a leading role in foreign listing and due to the notorious Chinese firm scandals, we investigate the market to book measurement of firm valuation for the Chinese firms listed in Singapore and the association of firm governance and firm value according to different firm country characteristics, particular for local firms and S-Chip firms. We find that where the management team of the firm locates matters. Firm's Tobin's Q value are consistently higher for local firms compared with that of S-Chips no matter tested within a univariate or a multivariable framework. In addition, when firms are having their management based in Singapore, the relationship between the SCGI and Tobin's Q are positive as shown in the overall sample regression analysis. However, this relationship is rendered invalid on the other occasion. The positive relation could not be found if the firm's management team are based in China, identified by the country of domicile. We interpret these results as evidence for the argument that market does not value Chinese firms in the same way as they value local firms due to the fact that it is too costly and even not likely to verify the information conveyed by the management teams of the S-Chips. Such distrust is mainly caused by the waves of S-Chips scandals that hit the Singapore market during 2008 and 2011 periods which devastate the investors' faith in the Chinese firms' sector.

In order to rule out the possibility that the lower Q ratio for Chinese firms is due to the discrepancies of firm characteristics between these two groups of firms and to make sure that we are comparing apple to apple, we perform both the matching by size as well as the Propensity Score Matching method in observational

studies to match each Chinese firms with comparable local firms in terms of governance score, firm size, firm profitability, leverage, capital expenditure scaled by assets and firm R&D input relative to sales. Utilizing three different ways of implementing the PSM procedure to allow various trade-offs between bias and variance, we find that the S-Chip firms on average have a lower firm Q ratio than local firms and matching reinforce the difference. To further ensure that our conclusion regarding the SCGI-Q relationship is not driven by the scales of the firms, we perform robustness test regarding firm size. Since most of the biggest firms are local firms thus we exclude the top quintile observations in each year for a sub-sample test. What we have found is that the SCGI-Tobin's Q relationship is still negative and significant for S-Chips whereas for the local firms group, the coefficient on SCGI has lost its significance. So is the case when we managed to find a matching local firm for each S-Chip firm based on firms total assets. The finding regarding the negative association between SCGI and Q ratio for S-Chips is also robust to the one to one PSM sample.

Lastly we also rule out the possibility that the finding for the relationship between SCGI and Q ratio is sensitive to firm holding patterns. From these results we conclude that the entire S-Chips sector is suffering from the aftermath of the scandals. Trust is the most important business currency and when trust is lost, it never easily gained back.

Part II Temasek Holdings on Corporate Governance and Firm Value

Chapter 2.1 Introduction

The pattern of firm's stock ownership can have impact on firms' managerial behaviour and subsequently affecting a firm's performance. Thus ownership structure has been viewed as an internal corporate governance mechanism substituting the board of directors in firm monitoring. Studies have shown that, different types of stock ownership will influence the firm in opposed directions. Managerial and family shareholdings can mitigate the agency problem to some extent but at the same time, concentration of the ownership will lead to expropriation of minority shareholders if the legal environment of the country could not protect shareholders' right efficiently. Whereas block shareholders and institutional investors will have the motivation to monitor the firm when the benefits they obtain from monitoring exceed the cost. Yet when the stakeholders' main objective is no longer purely investment returns but involves some political purpose, the results might not always be economically efficient. Such kind of political motivated investors are represented typically by the government entities.

Literature has been looking at the outcomes of government ownership from corporate governance angle represented by firm's board of directors, looking at the size and composition of corporate boards. So have the impacts of governance intervention on firm valuation and performance, capital structure and cost of debt, etc. being investigated. Results are mixed and one of the main reasons that yield the inconsistent results is the development stage of the economy. Most early studies focus on the firms in the developed U.S. and Europe markets. What they have found regarding the role of government intervention often has a negative tone. However, when scholars start to turn their attention to some developing markets in the recent

years, government ownership has found to be of positive value to firms in emerging economies. For instance, Ang and Ding (2006) investigate the government-linked companies (GLCs) in Singapore under the ownership/control structure of Temasek Holdings. Comparing the financial and market performance of GLCs with non-GLCs, it was found that GLCs have higher valuations than a control group of non-GLCs.

The investment environment in Singapore has some of its unique features. First of all, hostile takeovers are rare in Singapore market; therefore block holders are unlikely to improve corporate governance by facilitating takeovers but to improve monitoring. Second, an important block holder in the Singapore context is the government and this common government ownership of private sector firms might help explain why hostile takeovers are rare in Singapore. Third, the main holding government entity Temasek Holdings and its subsidiaries are incorporated under the Companies Act and are subject to the same regulation as any private commercial enterprises. Although being viewed as a government entity, Temasek Holdings only excess its cash flow rights with no control rights on the firms it holds despite the percentage of shares held. Their role in this sense resembles institutional investors, whose main motivation is return driven rather than politics driven. Due to the previous discussed specialties of the Singapore market as well as Temasek Holdings, we would like to re-analyze the relationship among government ownership, corporate governance and firm value based on a sample of firms on listed the Singapore Exchange. The main focus in this study is the comparison of firm corporate governance and firm value between firms that have common shares outstanding held by Temasek Holdings and firms that do not.

In order to quantify the quality of firm's governance practice, we constructed a corporate governance index based on the OECD Principles that have been served as one of the 12 key standards for international financial stability and form the basis for the corporate governance component in the Asian countries. The detailed description of the index will be provided in the later part of the paper. We then break the sample firms into two groups based on the percentage of common shares held by a government entity, represented by Temasek Holdings in our analysis. Unlike Ang and Ding (2006) who require appointed directors to seat in the board and Temasek being the single largest shareholder with at least 20% share ownership, we relax the criteria by simply requiring Temasek to hold a percentage of shares that surpass a particular threshold, 0% and 5% respectively.

Our main findings can be summarized as follow. Implementing a univariate test, we find that on average, firms that have shares held by Temasek Holdings tend to outperform firms with no government ownership in firm valuation measured by Q ratio throughout the sample years, be it at the raw firm level of industry adjusted level. No surprisingly, those Temasek invested firms have higher corporate governance index at the same time, consistent with the notion that firms with better corporate governance is likely to have higher firm value. This result holds when we change the percentage threshold by which we differentiate the firm as a government linked observation from 0% to 5%. Controlling for other firm characteristics in a multivariable framework or simultaneous regression analysis, the univariate results are not void. Moreover, Temasek stock holdings are also found to be related to higher firm Tobin's Q value beyond the level of Q that is associated with good corporate governance. To further investigate the sensitivity of firm value-corporate governance relationship, we also perform regression tests with interaction terms

between firm governance score and a dummy variable indicating a firm is government-linked status. The sensitivity of firm value to the change of governance is identical between the group of firms with shares held by Temasek and the group that does not. Performing robustness check for the above tests using matched samples, where we matched each Temasek held firm with a non-Temasek held firm in each year during the sample period, based on firm size only or based on the propensity matching score obtained via various firm characteristics, we reject the hypothesis that the above results are driven by improper comparison.

We add to the literature by investigating a unique government entity – Temasek and its role in firm value and firm's corporate governance using an index constructed to measure not the policy of a firm's governance but the practice of its governance codes. As a sovereign wealth fund set up by the Singapore government, Temasek Holdings has its merits compared with pure government holdings like those in China. Its motivation is more return oriented rather than political dominated. As such, it resembles an institutional investor. Additionally, Temasek exercises only cash flow rights but not any control rights. It is only under such a scenario, can we conclude that firms with ownership represented by the government do not underperform. Ang and Ding (2006) argue that government linked firms performs better in terms of corporate governance but provide no empirical data to support their argument. We confirm their arguments finding that the status of Temasek Holdings is indeed highly associated with better firm performance, both in the aspect of firm corporate governance as measured by SCGI and in the aspect of market based performance Tobin's Q ratio. However, at the current stage, we do not have sufficient data to make further investigation on the question that whether such better performance should be credited to the government entity. It is likely that

Temasek Holdings tend to choose firms with better governance quality to hold and such choice is consistent with the results of positive association between corporate governance and firm value. As a successful investment firm, Temasek Holdings knows that the quality of firm's corporate governance is a potential aspect for higher firm value. We will leave this question for future study.

The rest of Part II is organized as follows. Chapter 2 reviews the literature in firm's ownership structure and its role in corporate governance. Sample selection together with the background of Temasek Holdings, and research methodology are followed in the third Chapter. We then analyze our results in Chapter 4, with Chapter 5 summarizes and concludes the study.

Chapter 2.2 Literature Review

2.2.1   Institutional Ownership

The ownership structure of a firm is defined by the distribution of equity with regard to votes and capital but also by the identity of the equity owners. These structures are of major importance in corporate governance because they determine the incentives of managers and thereby the economic efficiency of the corporations they manage. The debate of the connection between ownership structure and performance goes back to the Berle and Means' thesis in 1932, followed by Jensen and Meckling (1976) and Holderness, Kroszner, and Sheehan (1999), and has be an ongoing topic in the literature of corporate finance.

Institutional investors tend to hold large shares of company stocks and become the block holders serving as an outside corporate governance mechanism. By the end of 2014, more than 45% of the U.S total stocks outstanding are held by mutual funds, pension funds, trusts and other financial institutions. As such, the appropriate role of institutional investors in corporate finance, particularly in impacting the

corporate governance of a firm, has become the major interest of academic studies in the 21st century. Hartzell and Starks (2003) show that institutional investors do exert influence on CEO compensation, indicating a monitoring role in mitigating the agency problem. Yet, Parrino, Sias, and Starks (2003) conclude that some institutions are passive investors in the sense that they simply vote with their feet by selling their shares when they are dissatisfied with firm performance. Whether monitoring or trading, Chen, Harford, and Li (2007) argue within a framework of the costs and benefits that institutional investors will monitor rather than trade when monitoring benefits exceed costs. From firm valuation point of view, the fraction of shares owned by institutions was found to have a positive relation with Tobin's Q (McConnell and Servaes (1990)). However, not all institutional investors are equal in characteristics. Ferreira and Matos (2008) show that only the presence of foreign and independent institutions enhances firm performance while the domestic and "grey" institutions do not. Woidtke (2002) shows that firm value is positively related to ownership by private pension funds and negatively related to activist public pension fund due to its conflicts of interest with other shareholders.

2.2.2   Government Ownership

Based on shares held by large shareholders, enterprises can be categorized differently into private firms, partially privatized firms and state-owned firms. Studies have shown that these firms differ due to the role of government ownership. Government's participation has been found in the power and utility industry (L. De Alessi (1974)), in the financial markets (La Porta et. al. (2002)), as well as other various sectors. And it has been found to have effects on firms' stock prices (Eckel and Vermaelen (1986)), on profitability, leverage and labour intensity (Dewenter and Malatesta (2001)), on the resources that firms can have access to (Sapienza

(2004)), on the cost of debt (Borisova and Megginson (2011)) and on firms' corporate governance practice (Borisova, Brockman, Salas, and Zagorchev (2012)).

Government ownership is typically viewed and empirically shown as playing a negative role in affecting firm's performance; however, in emerging markets and transitional economies like China, state ownership seems to be playing a mixed role. On the one hand, Xia and Fang (2005) found that, county and city level government control has negative influence on firm value, but the improvement of institutional environment can mitigate this negative influence. Using partially privatized former state-owned enterprises, Wei, Xie and Zhang (2005) found that significant convex relations exist between Q and state shares, as well as between Q and institutional shares. On the other hand, Sun, Tong and Tong (2002) surprisingly found that in the privatization process, government ownership and firm performance are actually positively related with performance initially and deteriorated as shares are sold to the public, forming an inverse U-shape. Tian and Estrin (2008) found a similar U-shape relationship between firm performance and government ownership for privatised firms. Moreover, government intervention has been proven to be valuable during crisis. Beuselinck et al. (2015) provide evidence for the government playing a positive role in Europe during the global financial crisis. They argue that European firms with government ownership experienced a smaller reduction in firm value than those without government ownership, only if they are located in countries with less corruption and better investor protection.

Chapter 2.3 Data and Methodology

2.3.1   Data Description

The main goal of this paper is to compare the performance of Temasek held firms and non-Temasek held in the aspects of firm valuation and corporate

governance. In this section, we will describe the identification of Temasek held firms we used and the criteria that we used to select the same for the study.

2.3.1.1 Identification of Temasek Held firms

Incorporated in 1974, Temasek Holdings is an active shareholder and investor, investing mainly in Singapore and Asia firms, and is wholly owned by the government of Singapore. Interestingly is that although Temasek Holdings is commonly referred to as a sovereign wealth fund (SWF) and is required to abide by international guidelines for sovereign wealth funds according to a spokesman for the Ministry of Finance, it actually incorporates under the Companies Act as an investment company and is subject to the same regulation as any private commercial enterprises and pays taxes like other commercial investment firms. (Another sovereign wealth fund owned by the government of Singapore is GIC Private Limited, which manages Singapore's foreign reserves.) This special feature of Temasek Holdings makes it of interest for us to investigate.

In order to identify the firms that are held by Temasek Holdings, we obtain the holdings data from Capital IQ. We compute the percentage of common stock outstanding %CSO as the number of shares held by Temasek divided by the total common shares in each year. Firms that are owned directly by Temasek Holdings are called the first-tier subsidiaries. And some of these first subsidiaries have their own associated companies which are also publicly listed. And again, these second level subsidiaries may have third level subsidiaries. Among the subsidiaries, some are cross-holdings. We thus collect data up to the third level and compute the effective percentage ownership by Temasek for the partially owned firms as the sum of the direct %CSO on the three levels. We then choose a particular threshold as identification criteria. Firm is labelled as Temasek held firms (TLCs) if its %CSO

is greater than the chosen threshold and non-Temasek held firms otherwise (non-TLCs). As for the choice of threshold, we make our analysis based on two numbers: first is simply 0%, whether a firm is related to Temasek or not, and the second is 5%. The rationale behind the second number is because investors that hold at least 5 per cent of equity ownership within the firm are often viewed as large-block shareholders, whom in the literature, are found to be more likely to actively voice their concerns over the firm's strategies and governance.

2.3.1.2 Sample Selection

The firm fundamental and market data we used are obtained mainly from Bloomberg. Temasek holding data are obtained from Capital IQ. Other firm variables are from Capital IQ and DataStream, confirmed and supplemented by the SGX official website.

Our sample only consists of those firms that were or are listed on the main board of SGX during the financial period of fiscal year 2007 to 2014 where we have obtained their corporate governance practice information and constructed the governance index. We might not have covered a firm if it filed annual report too late after the end of a particular fiscal year. Firms might dropped out of our sample due to delisting or suspend of trading, and also might enter our sample due to new listing or resume trading. However, we require at least 2 years' data for a firm to be included in our final sample. Firms with price less than 5 cents or price missing consecutively for more than 12 months during the sample period are dropped. Trust or REITs are also excluded. So are the ADRs. All firm fundamental data are winsorized at 1%.

2.3.2 Methodologies and Variable Constructions

To compare firms' performance between firms falling in the two different groups: Temasek held vs. non-Temasek held, we first perform the simplest univariate test and then followed by the multivariable test controlling for relevant characteristics based on equation (1) and (2). Additionally, simultaneous regression that takes the correlation of the equation (1) and (2) into consideration is also performed. We then analyse the impact of ownership structure of the firm, be it a Temasek held firm or a non-Temasek held firm on firm Q value conditional on governance index. As shown in equation (3), firm value Q in year *t* is regressed against SCGI in year *t-1*, dummy variable that equals to 1 for Temasek held firms and 0 other wise, as well as other standard control variables in year *t*. In equation (4), an interaction term between SCGI and Temasek dummy is added to test the difference in the sensitivity of firm value-corporate governance relationship for the two groups.

$$SCGI_{it} = \alpha + \beta_1 \cdot T_{Dummy_{it}} + \gamma \cdot Controls_{it} + \varepsilon_{it} \tag{1}$$

$$Q_{it} = \alpha + \beta_1 \cdot T_{Dummy_{it}} + \gamma \cdot Controls_{it} + \varepsilon_{it} \tag{2}$$

$$Q_{it} = \alpha + \beta_1 \cdot SCGI_{it-1} + \beta_2 \cdot T_{Dummy_{it}} + \gamma \cdot Controls_{it} + \varepsilon_{it} \tag{3}$$

$$Q_{it} = \alpha + \beta_1 \cdot SCGI_{it-1} + \beta_2 \cdot T_{Dummy_{it}} + \beta_3 \cdot SCGI_{it-1} \cdot T_{Dummy_{it}}$$
$$+ \gamma \cdot Controls_{it} + \varepsilon_{it} \tag{4}$$

For the cross-sectional time series panel model, we use the unadjusted Q with industry-fixed effects. We also perform the Fama-MacBeth[6] regression analysis as another alternative check and industry-adjusted Q is used as the dependent variable while for the independent variables, they are not adjusted against industry means.

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[6] Results are not included in this paper but are available on request.

Since we are interested in comparing two groups of firms in terms of their firm value, we need to take care of the other group specific characteristics that might have an impact in determining the firm value to avoid comparing apples to pears. The first firm characteristic that we need to take care of the firm size as firm scale is likely to impact firm performance. In order to address this concern, we applied matching methods to use firms that are of similar size for comparison. Furthermore, we also take the differences of some other firm variables and conduct a "P-score matching" procedure. For each firm-year in the treatment group, we find a matching local firm with similar characteristics of the same year based on the P-score obtained from performing a logit model in the first stage. We then use this more homogeneous group of firms with comparable firm characteristics to re-examine both the univariate and multivariable tests.

We use the same Tobin's Q ratio as that Part I,

$$Q = \frac{MVA}{BVA} = \frac{BVA + MVCS - BVCS - DFT}{BVA}$$

where MVA is the market value of the firm's asset, BVA is the book value of the firm's assets, MVCS is the market value of the firm's common stocks and BVCS is the book value of the firm's common stocks, and DFT is the firm's deferred tax. When used in the regression analysis explaining the relationship between firm value and governance, this Q variable is industry-adjusted (firm Q minus industry-median Q classified according to Fama-French 12 industries). We also follow the literature to use throughout standard control variables in firm value regression, including firm size (in logs), firm age (in logs). In addition, we also include other controls that have been used in regression analysis, such as capital expenditures on assets, firm leverage, return on assets, firm profitability, asset turnover, asset to equity ratio market to book value and cash holdings scaled by firm asset, etc.

Chapter 2.4 Results and Analysis

Based on the data described above, we examine the status of government ownership, represented by the Temasek holdings dummy, on firm corporate governance practice quality, measures by the constructed governance index, and its relevance in firm valuation. Our main goal is to compare the governance practice and firm market based financial performance of Temasek held firms with non-Temasek held firms in the context of Singapore exchange listed firms.

2.4.1   Summary Statistics

Firms are subjected to various regulations for being qualified to be a listed firm on SGX, and among these requirements there is a section focusing on firm corporate governance. Firms have to comply with a minimum level of corporate governance codes in order to be listing on SGX. As such, part of the SCGI is measuring the compulsory part and on top of that are the scores measuring the corporate governance practices adopted voluntarily by the firms. In Table II.1[7], we provide with the basic summary statistics of Singapore Corporate Governance Score.

As shown in Table II.1 Panel A, we can see from the first row indicating the minimum value of SCGI, the number is increasing in general. This means that either the poorly governed firms have dropped out of the public market or that the firms improved in their corporate governance practice. Unfortunately, the average and maximum level of SCGI did not improve together with the minimum value but fluctuate with a downward sloping trend. This might be cause by the recent firm scandals which have revealed the problems hidden behind firms' corporate governance practice. Looking at the sub-indices, their values fluctuate fairly randomly without any consistent trend. Due to the limitation of our data period

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[7] Tables referred to in Part II can be found in Appendix B.

length, we are unable to conclude whether there is any mean reverting trend of the index value. Consistent with Panel A, we can see from Panel B that the concentration of firm SCGI values shifts towards the middle level and tends to behave more symmetric that the beginning of the sample period. This could likely be the results of the stricter governance rules required by the authorities in recent years to conquer the scandals. Panel C reports the numbers of firms in TLC and non-TLC group in each SCGI rankings. More than half of the TLCs are having the highest SCGI values.

We report the summary statistics for firms with common shares outstanding held by Temasek Holdings in Table II.2. From Panel A and B we can see that 90 percent of the firms in the sample do not have any common shares outstanding held by Temasek. Although the highest percentage of holdings can be as high as over 65% or even 100% in some years, the average number of percentage shares held is less than 2% throughout the sample period. Most of the holdings numbers did not exceed 5%.

2.4.2 Univariate Analysis

Ang and Ding (2006) documented that government-linked companies (GLCs) have superior performance when compared with those non-government-linked companies (non-GLCs) in terms of various financial and market measures, such as ROE or ROA, profit margin and P/B ratio. In addition, GLCs also have shown to have higher asset to equity ratio and debt to asset ratio but lower capital expenditure to sales ratio, which indicates lower agency costs, during their 11 years sample period from 1990 to 2000. Moreover, they argue that GLCs should have better corporate governance quality than their non-GLC counterparties. However, they do not provide any empirical results regarding this statement. Follow their paper, we

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perform a univariate test between Temasek held firms and non-Temasek held firms on their firm characteristics, especially on firms' governance quality which we now can quantify using the constructed SCGI. Results are shown in Table II.3.

From the first row of Panel A, we can see that for the firms held by Temasek, they have superior performance in terms of corporate governance practice compared to firms with no shares held by Temasek. The difference between the two groups' non-standardized raw SCGI is 8.38 on average, and ranges from 6.91 to 10.57 during the sample period. This result in consistent with Ang and Ding (2006)'s argument on corporate governance. From this result, government ownership is not harmful for the corporate governance of the firm it held but rather, is associated with better governance performance. However, no causality conclusion could be gained based on this univariate result.

Different from Ang and Ding (2006), our main variable of interest is Tobin's Q, which is used to measure firm performance in the literature of corporate governance. Tobin's Q is found to be statistically and consistently higher for Temasek held firms when compared with non-Temasek held firms for the full sample and throughout the sample years. The same results hold for industry-adjusted Tobin's Q. These results are not surprising as we have proved in our previous paper that among the firms listed on Singapore exchange, higher SCGI will be associated to better Q performance. Thus as firms held by Temasek have better SCGI, relatively they should have higher Q value. The result for market to book value in the last row is consistent with Q ratio.

Moreover, Temasek held firms are larger (size), older (age) and have been listed earlier (IPO age) than their counterparties. Their firm profitability captured by ROA or ROE is also higher in general, albeit not in every year during the sample period.

Similar to Ang and Ding (2006), this profitability outperformance can be explained by profit margin and asset to equity ratio if decomposed according to the DuPont model shown in the table. Nevertheless, Temasek held firms underperform non-Temasek held firms in term of asset turnover. Such result is mainly driven by the much bigger size of Temasek held firms in our opinion.

In the context of agency costs, we look at capital expenditure and cash to assets. Looking at the results of capital expenditure to total assets, for the difference gained by pooling all sample years' data together, TLCs spend no less than non-TLCs. However, the difference values (TLCs minus non-TLCs) are positive from 2007 to 2010 but reverse sign during the latter half of the sample. From 2011 to 2014, firms with no government ownership spend more than firms with government ownership although the overall difference is not significant. As for the ratio of cash to total assets, the presence of government ownership is associated with significantly lower cash holdings for all of the sample years and for the pooled sample. The above results for both capital expenditure to assets and cash to assets indicate that government ownership does not leads to higher agency costs in terms of capital expenditure and cash holdings, but mitigates the agency problem in somehow as lower capital expenditure or less cash holdings has been used as evidence for less severe agency issues. Thus, once again we find proof for the statement that government ownership does not necessarily hurt firms.

Most of the results in Panel B hold and are even more pronounced when we change the threshold of classification from 0 percent to 5 percent, with which now Temasek can be viewed as a block shareholder. However, the result for cash to total assets vanishes in Panel B. One possible reason to explain this change is the fact that about half of the firms that are labelled with a Temasek dummy are

having %CSO less than 5 percent. Hence, grouping them into the counterparty group could have diluted the difference between the two groups.

In addition to the univariate test, we also report the Pearson's correlation matrix among SCGI, Tobin's Q and various other firm financial and market figures in Table II.4. Most of the results shown by the correlation coefficients are consistent with the univariate test results reported in Table II.3. To be more specific, the status of Temasek ownership has a significant and positive relationship with firm's Q ratio, firm size, firm's incorporation age, firm's listed age, as well as firm profitability captured by ROA, ROE and profit margin. On the contrary, the status of Temasek ownership is negatively related to asset turnover and cash holdings. When we change the threshold from 0 percent to 5 percent, most of the correlation coefficients are of the same sign and did not lose the level of significance.

2.4.3   Multivariable Test

2.4.3.1 OLS Regression

Based on the correlation matrix in Table II.4, we move a step further to compare firm performance between Temasek held and non-Temasek held firms on a multivariable basis using OLS regression according to equation (1) and (2). A Temasek status dummy and various control variables that have shown to be correlated with firm's governance (SCGI) and financial performance (Tobin's Q) in Table II.4 are included as independent variables. The multivariable regression analysis results are reported in Table II.5 and Table II.6.

In Table II.5 we are interest in the corporate governance performance of the sample firms thus our dependent variable would be SCGI. From columns 1 to 3 we can see that even control for relative firm characteristics, the results are consistent with those in the univariate tests.   TLCs outperform non-TLCs in corporate

governance performance measured by SCGI and the results are not sensitive to controlling for lagged Tobin's Q. The regression coefficients for the Temasek dummy are positive and significant at the 1% level when we specified the government ownership threshold to be 0 percent. In columns 4 to 6, increasing the specified the government ownership threshold higher to 5 percent level has no significant impact on the results: higher firm's Q value is associated better corporate governance performance as indicated by higher SCGI.

In Table II.6, we turn our attention to firm value Tobin's Q and replace it as dependent variable according to equation (2). In column 1 we can see that TLCs outperform non-TLCs in firm value Q as indicated by the standardized coefficient of 0.06 for the dummy variable. In column 4, results based on the CSO% threshold of 5% are presented and changes are minute. Recalled that in Table 5, we have the evidence that TLCs have higher SCGI values than non-TLCs and we know that firms with better corporate governance are usually firms with higher values. As such, results found in columns 1 and 4 in Table II.6 could be viewed as evidence for TLC held firms having better corporate governance from another perspective. In order to examine if TLC has an impact beyond the level that is highly associated with the quality of corporate governance, we include SCGI as an independent variable as shown in equation (3) and reports the results in columns 2 and 4 for CSO% threshold 0% and 5% respectively. As we can see from the table, the coefficients for the dummy variables are statistically positive and significant controlling for SCGI and the differences for firm value between TLCs vs. non-TLCs indicate by the dummy coefficient are actually larger for CSO% threshold 0%. If not having a positive influence on firm valuation, as an investment entity, Temasek Holdings is in favour of high value firms.

Although we could not answer the question whether Temasek investment is having a causality effect on firm value or not with the data that we currently have, we could investigate the question that whether there is a more sensitive reaction of Q value to the same level of SCGI due to the existence of government ownership? The fact of being held by Temasek Holdings itself might have enhancement effects on firms' performance and governance quality relationship: greater firm value attributed to firms that are targeted by Temasek Holdings with same level of governance index than the non-chosen ones. So we conduct a regression analysis based on equation (4) to answer this question and our variable of interest would be the interaction term between SCGI and the dummy variable indicating a Temasek ownership status. Regression results using the full sample are reported in columns 3 and 6 in Table II.6. We can see that the relationship between Tobin's Q and SCGI still holds but are slightly weaker as the coefficients represent the Q-SCGI relationship for the non-TLCs. Moreover, there is no change of their relationship slope according to the insignificant results of the interaction term which we are interested in. Using either a 0% or a 5% ownership threshold does not change the results significantly. So for the question whether Q value is performing in a more sensitive way to SCGI with the intervention of government ownership, our answer is no.

2.4.3.2 Seemingly Unrelated Regressions

Previously we perform the regression analysis for the differences between TLCs and non-TLCs on their SCGI value and Tobin's Q separately according to equation (1) and (2). But because we know that SCGI and Q value are actually closely related and can have causality and reverse causality issues between themselves, it is very likely that the error terms are correlated across the equations.

Hence, we combine equations (1) and (2) together to perform a simultaneous regression test to counter with the independency and reports the results in Table II.7. No conflictions arise under the simultaneous framework when compared with the individual regressions. TLCs are consistently having better corporate governance quality and higher firm value Q as indicated by the significant and positive coefficients of the Temasek dummy variables.

2.4.4   Matched Sample Robustness Check

There is still one more concern about both the univariate and multivariable analysis results of the previous sections regarding the differences between Temasek held firms and non-Temasek held firms: firm size impact. As we know that large firms are more likely to have higher value. Although we control for firm size in our regression analysis, we still could not address the issue that we might be comparing large firms to small firms and the above results are mainly driven by firm scale discrepancies as most TLCs are large firms. We show this in Table 8 by grouping the sample firms according to their size quintiles and make comparisons between TLCs and non-TLCs within each size quintiles. As indicated by the figures in the columns showing the differences of TLCs vs. non-TLCs, we find that the results are indeed coming from the top two size quintiles and more than half of the TLCs samples are within the largest firm quintile.

2.4.4.1 Sample Matched by Size

To avoid the bias of making unequal comparisons, we match firms by their size to generate a sub-sample with only comparable firms. Each year, a TLC firm is matched to a non-TLC firm that has a total asset value that is closest to its TLC counterparty in the data sample. Pairwise difference test is implemented and tabulated in Panel A, Table II.9. Compare the results with those in Table II.3, the

differences for SCGI values are slightly smaller for the size matched sample whereas Tobin's Q differences are greater; however, the matched sample size is much smaller. Regression results based on the matched sample for equation (1) to (4) and the simultaneous analysis are reported in Panel A, Table II.10. TLC firms are consistently having both higher SCGI and Q values than non-TLC firms (columns 1, 2, 5, 6, 7, 10). The biggest difference found based on the size-matched sample is that TLCs are no longer significantly better than non-TLCs in terms of Tobin's Q after taking the SCGI-Q relationship into account. In columns 3 and 8, the coefficients for the TLC dummies are barely significant. Hence we come to the conclusion that the previous findings in Table II.6 regarding the positive impact of Temasek investment on firm value beyond the level that is associated with corporate governance, is actually driven by firm size. Note that although firms in this sample are matched nevertheless the number of observations is much smaller than the full sample thus sacrificing some of the robustness of the results.

2.4.4.2 Propensity Score Matching

To further ensure that we are comparing apples to pears, we adopt another matching sample comparison procedure – Propensity Score Matching (PSM) – to take account of the between firm differences more than just size. In the PSM procedure, the more variables included as matching criteria the better the matched results but more observations in the control group are needed in order to find a proper match for the treated. However, due to sample size limitation, we have to make a balance between the matching quality and the number of matched sample thus we try to match each Temasek held firm in the sample with a comparable counterparty firm with no Temasek ownership based on 4 criteria's: firm size, firm age, ROA, assets to equity ratio. Conditional on this matching procedure, we test

whether there is significance difference in terms of firm value Q ratio between the treated group (Temasek held firms) and the control group (non-Temasek firms).

There are various ways of implementing the PSM procedure and here is this paper, we will adopt the one to one matching. This is the most straightforward matching estimator. The individual from the comparison group is chosen as a matching partner for a treated individual that is closest in terms of propensity score. Here we choose not to allow matching 'with replacement', meaning that an untreated individual cannot be used more than once as a match and each individual in the treated group will have one untreated matching partner whose propensity scores is the closest to the treated.

Panel B in Table II.9 reports the pairwise univariate test results using the PSM sample. The number of observations for the matched sample is much smaller than the full sample due to the fact that not many firms are held by Temasek Holdings. And this number shrinks even more when we specified the ownership threshold to be 5% instead of 0%. As we can see, the differences values drop in magnitude compared to the full sample in Table 3 and the size-matched sample in Panel A. Re-run the multivariable regression tests using the PSM matched sample, we find that TLCs are still better in corporate governance aspect as indicated by the higher SCGI-TLC dummy coefficients value in columns 1, 5, 6 and 10 in Panel B, Table 10. However, from the aspect of Tobin's Q value, TLCs are no longer superior to non-TLCs in any regression setups (columns 2-5 and 7-10). Noted that we have actually taken most of the firm characteristics that are highly associated with firm value into account when computing the PSM score. If TLCs and non-TLCs are now similar in these aspects in our PSM matched sample, it is not surprising that we see no difference in their firm values as shown above. TLC firms differ from non-TLC

firms is areas such as firm size, firm age, firm profitability and firm capital structure. It is these discrepancies that distinguish TLCs from non-TLCs and it is these discrepancies that drives TLCs to outperform in firm values.

Another point to note here is the coefficients for SCGI. When we used 0% as the threshold to form the group, the coefficient for SCGI is still significant although only at 10% level in column 3 for sample consisting of both TLCs and non-TLCs but becomes insignificant in column 4 for the non-TLCs. This association between SCGI and Tobin's Q becomes insignificant when we increase the threshold from 0% to 5%. We believe such result is by and large caused by the small sample size.

2.4.5   Post Temasek Investment Firm Performance

So far we have found evidence for the fact that having common shares outstanding held by Temasek Holdings is of no harm to the firm in terms of either firm performance or firm corporate governance for the firms listed in Singapore. However, is such outperformance a benefit brought by the investment of Temasek Holdings? Or it could just be the fact that Temasek Holdings, as an investment entity, is good at picking up superior firms, which means those firms that have shares held by Temasek outperformed their counterparties before they were invested by Temasek Holdings. In order to address for this issue, inspired by Dewenter, Han and Malatesta (2010), instead of looking at the announcement period abnormal returns, we perform a test to look at the changes in firm's Tobin's Q and SCGI post Temasek's investment.

We identified the year in which Temasek ownership first appeared as firm's shareholders in its annual report as the event year for Temasek investment. We drop the first year's observations when conducting the event study for our sample period to avoid misspecification. We then compare TLCs' and non-TLCs' Tobin's Q ratio

and governance index SCGI in the following 3 years after Temasek's initial investment in Table II.11 Panel A. From the comparison we can see that firm's SCGI and Q value, as well as sub-indices all tend to be significant higher for Temasek invested firms in year 0 which is the year prior to Temasek's investment. And such tendency continues in subsequent years. In Panel B, to further test on the impact of Temasek investment, we calculate the difference between firm's Tobin's Q ratio and governance index SCGI in the subsequent three years followed Temasek investment with the values of the year prior to Temasek investment in order to examine the direction of the changes. It seems that firm performances deteriorated post Temasek investment for TLCs. When we performed the difference-in-difference test between TLCs and non-TLCs, the results are indicating generally the same conclusion based on the average number of the three years' differences yet the results for each single year are rather mixed and unstable. For example, TLCs' corporate governance performance deteriorated significantly for one year out of the three but insignificantly for the rest two. Looking at the sub-indices, the impact of Temasek on Sub-index E is positive, which is equivalent to boards fulfilling their responsibilities better.

Nevertheless we do not manage to make a conclusive statement based on the results in Table II.11 since there are only limit number of observations and the reasons are mainly due to: 1) Temasek Holdings do not change their investments frequently. Most of Temasek's holdings are long term investments; 2) our sample period for corporate governance index is not long enough to cover sufficient number of Temasek investments events to perform the test. As shown in the table, there are only 49 incidences for Temasek investments. We will leave this post-event

performance test to future analysis as we continue to gather information for firm corporate governance to expand the sample period.

Chapter 2.5 Summary of Conclusion

Based on data of public firms listed on the Singapore Exchange, we study the role of government ownership on firm's corporate governance practice and firm's valuation mainly by comparing the firms with common shares outstanding held by Temasek and firms that do not. Temasek Holdings is an investment entity wholly owned by the Singapore government by Ministry of Finance. However, its differs from the normal term of government entity due to the fact that it operates more like an institutional holding firm with cash flow rights but no operational control. Thus by analysing this unique government investment entity's impact on listed firms, we can isolate out one of the features that has been viewed as being harmful to firms, the political driven motivation of most government intervention.

Our main objective in this part is to make comparisons for TLC firms vs. non-TLC firms in the aspects of corporate governance and firm valuation. Follow the literature, we choose to measure firm value using Tobin's Q and compute it as the ratio of adjusted firm market to book value. Moreover, we constructed the Singapore Corporate Governance Index using over 200 survey questions to capture and quantify firms' governance practice quality. A firm is labelled as Temasek held firm if it has common shares outstanding held by Temasek Holdings and its percentage surpass a particular threshold (0% and 5% respectively in our study). On both univariate and multivariable basis, we found that Temasek held firms do have superior performance in corporate governance and such outperformance is robust to the influences of firm size and other firm characteristics. TLC firms are also having higher Tobin's Q value than non-TLC firms beyond the level of Q that is

closely associated with better corporate governance; however, the outperformance of TLC firms' value Tobin's Q is sensitive to several firm characteristics such as firm size, firm age, firm profitability and firm capital structure. Controlling for the differences between TLCs and non-TLCs for the above firm characteristics, no more firm value superiority exists for TLC firms.

As such, we believe it is reasonable to conclude that Temasek Holdings tends to choose firms with better corporate governance and subsequent higher firm valuation potentials as its investment targets. Temasek Holdings, although being wholly owned by the government, does not bear a political purpose as its priority. Instead, it does act more like an investment firm, investing in firms with growing and return potentials. This is consistent with its investment only purpose. Without the political driven motivation, government intervention is at least not harmful to firms in developing markets like Singapore. Moreover, the choices of Temasek Holdings' investment targets are also in support of the findings that firms applying better corporate governance practices are those that are more likely to deliver higher values.

Part III Agency Costs and Corporate Governance: Evidence from Singapore Market

Chapter 3.1 Introduction

The classic case of corporate agency problem arises when the professional manager who usually owns only a small fraction of ownership, has interests differ from those of firm's owners. Instead of maximizing the value of the firm, the manager may be tempted into empire-building at the expense of the value of the firm or into retaining large amounts of cash even when there is no better usage. Management may even venture onto fraud due to financial reports manipulation which might increase their profits. Agency costs arise from such misalignment of the interests of the owners and managers of firms when the separation of ownership and control occurs (Jensen, 1976). The agency model then identifies a number of governance mechanisms which aim at realigning the interests of agents and principals in order to reduce agency costs.

Studies in the literature of corporate governance have used the internal governance mechanisms (ownership structure or board characteristics) as proxies for the quality of firm corporate governance (a good summary has been provided by Shleifer and Vishny in their 1997 survey paper) until Gompers, Ishii, and Metrick (2003) (hereafter GIM), which is the first to quantify firm level corporate governance using a governance index (G-index in the literature) based on 24 antitakeover and shareholder rights provisions. Utilizing event studies surround capital market announcements or measuring agency costs directly using accounting figures, researches have indeed found evidence for lower agency costs when managerial ownership is higher or board size is smaller or when outside block-holders or outside directors exist. However, to our knowledge, there is no study

found to have investigated the corporate governance policies' (which could be viewed as the outcomes of the governance mechanisms) influence on mitigating the agency problem. We thus contribute to the literature by filling this gap.

The objective of this paper is to investigate the impact of firm's corporate governance practices on mitigating agency costs for the publicly listed firms in Singapore. To quantify for the overall governance quality of a firm, we constructed the Singapore Corporate Governance Index (SCGI) based on the revised OECD Principles (OECD, 2004) and the Singapore Code of Corporate Governance (SCCG, 2005) using public information gathered from various sources to answer questions that we carefully chose for the purpose of evaluating the governance practices of a firm. Detailed description for the index could be found in section 3. For the measurement of agency costs, we follow the works of Ang et al. (2000), Singh and Davidson (2003) and Florackis (2008), which use accounting data, to model the first proxy of agency costs as asset turnover. Asset turnover is the ratio of firm annual sales to total assets and this ratio captures the utilization of firm's assets. If managerial incentives are aligned with shareholders, we should find that this ratio is higher than that of those having more severe agency problems. The second proxy for agency costs we chose is by the means of the interaction of free cash flow and growth opportunities, as Doukas et al. (2000) and McKnight and Weir (2009). This proxy is in line with the free cash flow theory of agency problems in the sense that it captures the free cash flows of a firm conditional on its growth opportunities. For firms with better growth prospects, holding free cash does not necessarily indicates higher agency costs but for firms with no positive NPV projects to invest in, not returning the free cash to shareholders could likely be a sign of managerial perquisites.

We collect data for firms listed on the Singapore Exchange during 2007 to 2014 and analysis the relationship between our constructed governance index and the two agency costs proxies within an OLS regression framework. Our main findings can be summarized as follow. As expected, we find that for firms with higher SCGI in the previous fiscal year, they will end up with higher asset turnover ratios in the subsequent year. This is consistent with what was found in the literature that better corporate governance will help in reducing the costs generated by the conflicts between the agents and the principles. Since both the governance index and the agency costs proxy are direct measurement, positive relationship is found. However, according to the results of the univariate test, we expect a nonlinear relationship between free cash flow Q interactions and SCGI thus we include both the level of SCGI and the square of SCGI to capture the nonlinearity. Our results for this quadratic regression show that there is an inverse U-shaped relationship between this second agency costs proxy and corporate governance quality. Conditional on growth opportunity, firm's free cash flow holdings first increase with the improvement of firm corporate governance quality then decrease when of firm corporate governance quality improve even more. One possible explanation for this phenomenon is that firms with poor governance could not even generate enough cash flows to pile up free cash flows. This is also consistent with the notion that poor governed firms could not operate effectively to bring profits for the investors. Using dummies on SCGI rankings instead of the actual SCGI value confirm the previous findings. Last but not least, we regress agency costs against the sub-indices of SCGI and find that not all five sub-categories of corporate governance are equally influential on mitigating agency problems. The results of the overall governance index seem to be mainly driven by the role of stakeholders and the responsibilities

of boards. Such results are not surprising as the questions related to Sub-index C in the questionnaire are designed to evaluate how well the firm protects the right of the stakeholders. The better the protection of the right, the less severe is the agency problem. Whereas for Sub-index E, the results are complementary evidence for the argument that board of directors, as an essential internal governance mechanism, can help reduce the costs associated with principle-agent problems.

The existing literature does not provide with sufficient evidence on the impact of firm's corporate governance quality on agency costs but mainly on the ownership structure and the governance mechanisms themselves. Our study differs from the previous literature in that we do not look at the corporate governance mechanisms characteristics but focus on the outcome governance practices of the mechanisms to quantify the overall quality of firm's corporate governance. In order to do so, we incorporates important firm specific characteristics that might have an impact on agency costs into the study by constructing governance index that could evaluate the corporate governance practices of each firm listed on the Singapore Exchange based on information gathered from public resources. In addition, our constructed corporate governance index is a continues variable that takes the value between 1 to 100, thus we not only could examine the relationship between agency costs and firm governance quality from a linear framework, but also could analyse the relationship using a quadratic setup. Finally, due to the construction of our index, we could reversely break the overall governance index into more specific sub-indices to examine which particular sub-section of firm governance is more impactful in reducing the costs associated with agency problem. Thus our study contributes to the literature with more through and in deep analysis of the impact

that corporate governance could have on solving the agency problems, which is again, the main role of corporate governance.

The rest of Part III is organized as follows. Chapter 2 reviews the literature in the agency problems of the separation of ownership and control as well as the studies on the role of corporate governance in alleviating such conflicts. Sample selection together with the agency costs proxies, as well as the research methodology used are described in the 3rd Chapter. We then analyze our results in Chapter 4, with Chapter 5 summarizes and concludes the study.

Chapter 3.2 Literature Review

3.2.1   Agency Costs

When a principal hires an agent to represent his or her interests, there exists an agency relationship between the principal and the agent. And when conflicts of interest arise between the principal and the agent, there exists an agency problem. Developed by Coase (1937), Jensen and Meckling (1976), and Fama and Jensen (1983a, 1983b), the essence of the agency problem is the separation of ownership and control. In the view of a firm, there is agency relationship between stockholders and management and the possibility that managerial behavior does not serve the interests of investors creates the agency problems of the modern corporations.

A considerable amount of evidence has documented the prevalence of agency problem in the literature. Many of these evidence come from the capital market in the form of "event" studies. Under the efficiency market hypothesis, stock price will fall when manager announces a particular action that serve the interests of his own rather than those of the shareholders. Acquisition announcement, due to its publicly informed feature, provides some of the clearest evidence on agency problems. For example, Lewellen, Loderer, and Rosenfeld (1985) find that negative returns are

most common for acquisition bidders when their managers hold little equity. This results is consistent with the theory proposed by Jensen and Meckling (1976): "as the owner-manager's fraction of the equity falls, his fractional claim on the outcomes falls and this will tend to encourage him to appropriate larger amounts of the corporate resources in the form of perquisites." Such perquisites can result in less efficient operation of the firm such as not generating the optimal amount of profits for firm assets or not making the best use of firm cash flows. Jensen developed a free cash flow theory in 1986 which argues that managers choose to reinvest the free cash in negative net present value (NPV) projects rather than return it to investors. Lang, Stulz, and Walkling (1991) empirically supports Jensen's (1986) finding that bidder returns are the lowest among firms with low Tobin's Qs and high cash flows, which indicates that the worst agency problems in terms of excess cash occur in firms with poor investment opportunities. Turning from the capital market to firm financials, Ang, Cole and Lin (2000) perform a study of agency costs using data on non–publicly traded firms. Based on firm accounting figures, they found that agency costs increase as the equity share of the owner-manager declines, as predicted by Jensen and Meckling. Singh and Davidson (2003) reports complementary evidence on the impact of corporate ownership structure on agency costs to the work of Ang, Cole and Lin (2000) based on large U.S. corporations.

On top of proving the existence of agency costs, the next step is to reduce or even eliminate this negative effect and this brings us to the role of governance mechanism in tackling with this issue.

3.2.2 Governance Mechanism

Defined by Denis and McConnell (2003), corporate governance can be viewed as the set of mechanisms that induce the self-interested controllers of a company to make decision that maximize the value of the firm to its shareholders. Or, in Shleifer and Vishny (1997)'s words, "Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment." The governance mechanisms that have been studied in the literature can be characterized into two broad groups: internal and external governance. The internal mechanisms of primary interest are the board of directors and the equity ownership structure of the firm. Managerial ownership (Jensen and Meckling, (1976)) and block-holder ownership (Kaplan and Minton (1994)) are two major internal governance mechanisms that help control agency problems. Fama (1980) argues that the board of directors is another central internal control mechanism for monitoring managers, acting as either a complement or substitute for ownership structure.

To study the effectiveness if this governance mechanism, scholars have look at various aspects of the board in terms of structure, particularly from the perspective of board size and board composition. Lipton and Lorsch (1992) and Jensen (1993) proposed that larger boards are less effective. Most empirical researches confirm this proposition finding that board size and firm value or firm performance are negatively related. Studies supporting this view include Yermack (1996) and Eisenberg and Sundgren (1996). However, Holthausen and Larcker (1993) find no such relationship for board size and firm value. If large boards are value-reducing why do they exist? Coles, Daniel and Naveen (2008) try to answer this question by documenting a U-shaped relation between Tobin's Q and board size, which arises

from differences between complex and simple firms: Tobin's Q increases in board size for complex firms but decreases for simple firms. With respect to board composition, the effectiveness of outside directors is not clear. While some scholars argue that outsiders improve the independency of the board and thus lead to better firm governance, others claim that the insiders are the ones that could bring value to the board in that they are more knowledgeable of the firm. For example, Baysinger and Butler (1985) document a positive relation between outsiders and firm performance whereas Hermalin and Weisbach (1991) do not find that more outside directors will increase firm performance. Stuart and Wyatt (1990) examine the wealth effects surrounding outside director appointments and finds significantly positive share-price reactions. On the other hand, Stuart and Wyatt (1997) finds evidence supporting the view that the expected benefits of an inside director's expert knowledge clearly outweigh the expected costs of managerial entrenchment but only when managerial and outside shareholder interests are closely aligned. Coles, Daniel and Naveen (2008) also find some evidence regarding the firm-specific knowledge of insiders. Q increases with the fraction of insiders on the board for R&D-intensive firms, for which the knowledge of insiders is relatively important.

Chapter 3.3 Data and Methodology

3.3.1   Data Description

The main goal of this study is to investigate whether firm's corporate governance has a positive effect on reducing agency costs. In this section, we will describe how we choose to measure the costs of agency problem and also the construction of the sample we used to perform our study.

3.3.1.1 Proxies for Agency Costs

In this paper, we choose to measure agency costs using firm financial data in two ways: first, using the assets turnover ratio; second, by means of the interaction of free cash flow and firm growth prospects. The assets turnover or assets-to-sales ratio has been used in previous studies, such as Ang et al. (2000) and Singh and Davidson (2003), as an indirect measure of agency costs. The rationality for using this ratio is that it measures how efficiently firm's management uses assets to generate sales, which is the source of cash flows that could create firm value for the investors. A high asset turnover ratio indicates low agency costs in that assets are generating significant amount of revenues. In contrast, a low ratio indicates high agency costs and inefficient asset utilisation.

We also follow Doukas, Kim, and Pantzalis (2000) to measure agency costs using the interaction of free cash flow and firm growth opportunities. Jensen (1986)'s free cash flow theory proposed that when firms are facing poor growth opportunities, large free cash flows might suggest higher agency costs caused by greater managerial discretion as retaining free cash flows could reduce the ability of the capital market to monitor the decisions of management. Opler and Titman (1993) finds that firms with high growth prospects are less likely to have excess free cash flows because the available cash will be spent on positive net present value projects. Thus firms that combine low growth opportunities and high free cash flows can be regarded as suffering from high agency costs. When free cash flow is multiplied by a dummy that is used to identify low growth opportunities firms, this interaction proxy will then censor at zero for high growth firms and equal to the actual free cash flows for low growth firms.

3.3.1.2 Sample Selection

The firm fundamental and market data we used are obtained mainly from Bloomberg. Other firm variables are from Capital IQ and DataStream, confirmed and supplemented by the SGX official website.

Our sample only consists of those firms that were or are listed on the main board of SGX during the period from 2008 to 2014 where we have obtained their corporate governance practice information and constructed the governance index. We might not have covered a firm if it filed annual report too late after the end of a particular fiscal year. Firms might dropped out of our sample due to delisting or suspend of trading, and also might enter our sample due to new listing or resume trading. However, we require at least 2 years' data for a firm to be included in our final sample. Firms with stock price less than 5 cents or stock price missing consecutively for more than 12 months during the sample period are dropped. Trust or REITs are also excluded. So are the ADRs. Applying all the above criteria, we end up with 3,330 firm year observations and sufficient data to perform the regression analysis. All firm fundamental data are winsorized at 1%.

3.3.2   Methodologies and Variable Constructions

3.3.2.1 Variable Constructions

The two alternative proxies for agency costs described in the previous section are our dependent variables. Asset turnover is the ratio of annual sales to total assets. This is an inverse proxy for agency costs as it can be interpreted as an asset utilization ratio that shows how effectively management deploys firm's assets. A low asset turnover ratio may indicate poor investment decisions or managerial perquisites thus firms with low asset turnover ratios are expected to experience high agency costs between managers and shareholders. Followed Doukas et al. (2000)

and McKnight and Weir (2009), we construct the Q-FCF interaction as the second proxy for agency costs. A dummy variable is given the value zero for high growth firms and value one for low growth firms with high growth defined as industry adjusted Tobin's Q greater than the sample median and low growth defined as industry adjusted Tobin's Q smaller than the sample median. Free cash flow (FCF) is defined as

$$FCF = \frac{EBITD - TAX - INTEREST - DIVIDENDS}{TOTAL\ ASSETS}$$

The Q dummy is then multiplied by FCF for each firm in each year and a high value for the interactive variable will directly indicate higher agency costs.

We follow the literature to include firm size (in logs) and leverage (debt to asset ratio) as control variables. Firm size may capture the case for economies of scale for large firms that are able to generate higher revenue and debt has found to be used as a bonding instrument to constrain agent's access to cash thus mitigates agency problems (Grossman and Hart (1982) and Jensen (1986)). In addition, we also include variable Q to control for firm's growth opportunities since literature has found that the effectiveness of corporate governance in reducing agency problems is dependent on a firm's growth opportunities. Corporate governance that is likely to mitigate information asymmetry are expected to be more effective for high-growth firms (Smith and Watts (1992) and Gaver and Gaver (1993)); whereas corporate governance would be expected to be more effective for low-growth firms if it is more likely to resolve the conflicts over the use of free cash (Jensen (1986)). Firm's Q ratio is computed as

$$Q = \frac{MVA}{BVA} = \frac{BVA + MVCS - BVCS - DFT}{BVA}$$

where MVA is the market value of the firm's asset, BVA is the book value of the firm's assets, MVCS is the market value of the firm's common stocks and BVCS is the book value of the firm's common stocks, and DFT is the firm's deferred tax. When used to construct the second proxy for agency costs, this Q variable is industry-adjusted (firm Q minus industry-median Q for each year) based on the classification of Fama-French 12 industries). We also include a dummy variable to capture the ownership of government holdings as the involvement of government entity, as a shareholder who could have better motivations to monitor the management teams, might help mitigate agency problems. In the context of our study, such a government entity would be represented by the Temasek Holdings which is wholly owned by the Singapore government. As such we will name this dummy Temasek dummy, which takes the value of 1 if a firm has shares outstanding held by Temasek Holdings during the period and 0 otherwise.

3.3.2.2 Methodologies

We analyse the relationship between the first agency costs proxy − asset turnover and governance index in a linear regression framework as shown in equation (1). Asset turnover ratio in fiscal year *t* is regressed against SCGI in the previous fiscal year *t-1*, as well as control variables size, leverage, Q ratio and dummy for Temasek Holdings in fiscal year *t*. We perform both the fixed effect and random effect OLS regression[8]. We also perform the Fama-MacBeth regression analysis as another alternative check.

$$Asset\ turnover_{it} = \alpha + \beta \cdot SCGI_{it-1} + \gamma \cdot Controls_{it} + \varepsilon_{it} \qquad (1)$$

$$Q * FCF_{it} = \alpha + \beta_1 \cdot SCGI_{it-1} + \beta_2 \cdot SCGI_{it}^2 + \gamma \cdot Controls_{it} + \varepsilon_{it} \qquad (2)$$

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[8] We run a Hausman test for random effects vs. fixed effects and reject the null hypothesis reporting only the results for the fixed-effect regression. However, the random-effect regression results are available upon request.

We carry out a preliminary investigation about the pattern of the relationship between SCGI and the proxies for the agency costs and then propose a non-linear relationship based on the univariate test results in Table 3 for the second proxy – the interaction of free cash flows and growth opportunities. Based on the results for the univariate test (detailed discussions for will be provided in section 4), we specify a quadratic regression as shown in equation (2). In addition to the level of SCGI, we also include the square of SCGI as independent variables.

Chapter 3.4 Results and Analysis

In this chapter, we will report the empirical results based on our analysis set ups as described in the previous section.

3.4.1   Summary Statistics

In Table III.1[9], we provide with the basic summary statistics of the variables during our sample period. Our main variable of interest, asset turnover has an average of 0.8 over the 7 years' time and is higher than the median value. About 70% of our sample firms have an asset turnover ratio that is greater than one. As for the free cash flows that firms held, the mean value is only 3% of firm's total assets. Mean value of free cash flows is smaller than the median number. Since asset turnover is an indirect measure of agency costs while free cash flow is a direct measure, the comparison of the means and medians of these two variables does not show a contradiction of their inverse relationship. When we interact firm growth opportunity measurement Q ratio with free cash flows, we can see that firms holding free cash flows less than the median value are mostly high growth firms as their interaction value is now censored to be zero. For other firm characteristics, the values tilt slightly towards greater size, higher leverage and better growth prospects.

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[9] Tables referred to in Part III can be found in Appendix C.

As for the last row, only a small number of firms have a positive percentage of shares outstanding held by Temasek Holdings.

We report the Pearson correlation table for both the dependent variables and independent variables in Table III.2. Asset turnover is having a positive relationship with free cash flow but is negatively associated with firm's growth opportunity dummy. Surprisingly, the asset turnover ratio is only slightly correlated with the overall SCGI although the correlation is a bit stronger for the sub-indices. Smaller and lower leverage firms seem to have higher asset turnover ratios. Turning our focus to the free cash flow variable, we are surprised to find no significant correlation between this proxy of agency costs with either Q ratio or the growth opportunity dummy based on Q ratio. Moreover, free cash flow holdings are positively related with SCGI and three of the sub-indices. Larger firms tend to hold more free cash and so do more leveraged firms. From the third columns, we find that firm's growth prospect dummy which indicates a low growth firm is having a negative association with the overall governance index value as well as 4 out of the 5 sub-indices. We believe that, as per Jensen's free cash flow theory, how much free cash a firm will choose to hold should depend on its growth prospects. The other information that we could get from Table III.2 is that large firms tend to have better growth opportunities and use more leverage, and are more likely to have shares held by Temasek Holdings.

3.4.2   Univariate Test

We also performed a test on the two proxies of agency costs within a univariate framework. All firms are ranked by SCGI value and divided into 5 groups in each sample year. Table III.3 reports the univariate variable means of each subgroups based on the rankings of SCGI, with ranking 1 having the lowest SCGI value and 5

the highest. According to the second column, the numbers of firms are almost identical in each subgroup with slightly variation since the number of firms in each sample year is not exactly the same. From the third column we can see that the raw asset turnover ratio is increasing with SCGI rankings in a monotonic trend from ranking 1 up to 4 but drop back to a lower ranking level when SCGI value increases to the highest ranking. However, such a reverse trend diminishes when the asset turnover ratio is adjusted against the industry median, as shown in column four. As such we conclude that there is a time variation for the value of asset turnover thus time-fixed effect should be included in the regression analysis. As for the free cash flow variable, it increases initially then stabilized at 0.04. When interact with growth opportunity Q ratio, the interaction term increases first then decreases subsequently. Due to this feature, we employ a quadratic regression analysis for the second agency cost proxy. Other than the monotonically increasing firm size, neither leverage nor Q ratio follow a monotonic trend. In fact, leverage ratio does not vary a lot while the highest Q ratio still falls within the highest ranking group, as indicated by the argument that firm's Q value is associated with its better governance quality.

3.4.3 Regression Analysis

To further look into the impact of firm governance on mitigating the agency problem of corporation, we employ the multivariate analysis. Proxies for agency costs are regressed on the constructed governance index that could measure the governance practice quality of the firm, with controlled variables included in the regression equation.

3.4.3.1 Value-weighted Corporate Governance Index

As described previously, the first proxy that we choose to measure the level of agency costs is the utilization of assets, or to be more specific, the ratio of firm's annual sales over its total assets. We implement the OLS regression based on equation (1). Results are reported in Panel A, Table III.4. As expected, asset turnover ratio, which is an inverse measure of agency costs, is positively related to firm's governance quality at 1% level according to the fixed effect OLS regression coefficients reported in the first column. Efficient utilization of assets is less likely to be found in large firms due to their size. The more efficient a firm makes use of its assets, the better the growth prospect of the firm. This proxy of agency costs does not have any significant association with Temasek Holdings. Random effect OLS regression results are reported in the second column. However, based on the results of the Hausman test for random effects vs. fixed effects, we reject the null hypothesis of no fixed effect. Thus, we would draw our conclusion mainly relying on the results for the fixed-effect regression. Fama-MacBeth variant regression is also performed and the results, which are also reported in the third column, are consistent with those of the panel regression but with higher magnitude.

Panel B reports the results for the second proxy of agency costs: free cash flow. This choice of measurement is based on Jensen's free cash flow theory which indicated that when there is no better investment opportunity than returning the cash to shareholders, holding to more than enough amount of cash would indicate an agency problem. Here, we choose to investigate the relationship between firm free cash flows and its corporate governance according to equation (2). We include both the actual level of SCGI and also the square of the index value to capture the non-monotonic relationship we found in the univariate test. As indicated by the

regression results, there is a significant inverted U-shaped relationship between free cash flows and SCGI conditional on growth opportunity Q ratio. Free cash holdings increases due to better firm performance as governance quality improves at the first stage. Nevertheless, when firm starts to run out of positive NPV investment choices, cash will be return to shareholders for better-governed firms and thus free cash holdings decrease for those firms. This result proves that corporate governance matters in reducing firm's agency costs. At the same time, it also partially provides evidence for the relationship between firm performance and corporate governance quality. Firms with higher SCGI value are more likely to be high growth firms with high Q ratio thus the interaction terms of Q dummy and free cash flow for these firms would be zero. This may also contribute to the inverse U-shaped relationship.

3.4.3.2 SCGI Ranking

To further test the robustness of our results, we substitute the actual SCGI value with SCGI rankings that we have obtained during the univariate analysis. Instead of using SCGI as the main independent variable, we replace it with five SCGI ranking dummies, which take the value of 1 if the firm observation falls into the corresponding group in a particular year and 0 otherwise. Results are in presented in Table III.5. In Panel A we have the results for the first agency costs proxy asset turnover. Recall that in univariate test, the results are not perfectly monotonic; nevertheless, in this multivariate analysis the coefficients for the ranking dummies show a monotonically increasing pattern from the lowest ranking to the highest ranking in terms of both magnitude and significance. Again the panel regression results are identical with those of Fama-MacBeth variant. Pooled regression failed to capture the relationship due to the lack of fixed-effect. Panel B reports the results for the interaction of Q dummy and free cash flow value. Consistent with the

inverted U-shaped relationship, firms with the highest free cash flow holdings conditional on growth opportunities fall into the third group based on SCGI rankings. There are no statistically significant differences between the other groups when compared with the firms in the group with the worst corporate governance.

3.4.3.3 Sub-indices

After looking at the quality of firm's corporate governance practices, we would like to investigate deeper into where the impact of corporate governance comes from. We are able to perform this test due to the construction of our SCGI because the overall index value is the weighted sum of five sub-indices each captures a different aspects of firm's governance (details refer to the previous section). Thus we have the privilege to break the SCGI backward to the five sub-indices to see which area of corporate governance contributes the most to reducing firm's agency costs.

Regressions on the sub-indices are then performed and results are reported in Table III.6, with asset turnover ratio coefficients displayed in Panel A and Q*FCF interaction coefficients in Panel B. Dependent variables agency costs proxies are regressed against each SCGI sub-index respectively together with the control variables in columns 1 to 5. Then the five sub-indices are pooled together in one regression as independent variables in column 6. From Panel A we find positive and significant relationships for asset turnover ratio with sub-index C, D and E, which refers to role of stakeholders, disclosure and transparency, and board responsibilities respectively. However, when pooling all sub-indices together, only coefficient for sub-index C remains significant. Role of stakeholders seems to play the dominant role in corporate governance when agency costs are measured by asset utilization. This is not irrational since the fact that a stakeholder of a firm being well

taken care of is equivalent to mitigating the potential agency problems within related parties, in other words, the stakeholders. In Panel B, the information provided by the regression results is more or less the same. Moreover, with regard to free cash flow and firm growth opportunities, the responsibilities of the board seem to lead the governance role. The more responsible the board, the more the management teams' interests are in line with the shareholders.

Chapter 3.5 Summary of Conclusion

In this study, we empirically test whether firm corporate governance can help in mitigating agency problems by the means of reducing agency costs. The sample we used here are the public firms listed on the Singapore Exchange. In order to find the impact of firm corporate governance on agency costs, we need to quantify them first for subsequent statistical tests. We construct the Singapore Corporate Governance Index using over 200 survey questions to capture and quantify firms' governance practice quality. As for the measurement of agency costs, we choose two accounting ratios that have been used in the literature as proxy for the costs associated with agency problems. Asset turnover ratio calculated as annual sales to total assets is used as the first proxy which measures the agency costs indirectly. The rationale for using this ratio is that it captures the efficiency of a firm's asset utilization. If assets are not used efficiently to generate sales, or further cash flows for the firm, it is likely that the management teams are not making their best efforts to maximize the shareholders' value. Thus the lower the asset turnover ratio, the more severe the agency problem and the higher the agency costs. The second proxy that we choose is based on Jensen's free cash flow theory. Conditional on firm's growth opportunities, free cash flows can be used as a direct proxy for agency costs. Instead of including growth opportunities measured by Q ratio as a control variable,

we interact a dummy variable indicating low growth firms with the actual value of free cash flow as our second proxy for agency costs.

Based on the data from year 2008 to 2014, we find both univariate and multivariate agency costs reductions for firms with higher level of SCGI, which is equivalent to better firm corporate governance practice quality. Comparing mean values for the two agency costs proxies in groups formed by the rankings of SCGI, we find an increase in asset turnover ratios and an inverted U-shape for the interactions of Q and free cash flows. We provide further supporting evidence in addition to our univariate results within a multivariate regression framework. Controlled for firm size, leverage and growth opportunities, we find a coefficient of 0.651 between asset utilization measurement and SCGI, which is both statistically and economically significant. This result is robust to our regression specification as both panel OLS regression and Fama-MacBeth variant yields almost identical results. As for the interaction of Q and free cash flow, we find a nonlinear relationship between the dependent and independent variable SCGI. The coefficient is positive for the actual level of SCGI and negative for the quadratic level of SCGI. This means there is an inverted U-shape between firm's free cash holdings and quality of corporate governance conditional on the growth prospects. Firms with best corporate governance will return free cash to the investors when there are no good investment opportunities that can generate positive net present value for the firm. Substitute the actual value of SCGI in the regression with SCGI ranking dummies, we once again confirm our findings. And last but not least, we break the overall SCGI into its sub-indices components and regress the agency costs proxies against them. Sub-index C is the main driving sub-index for the improvement of asset utilization. Sub-index C measures the role of firm stakeholders and when the

stakeholders are well taken care of in the agency relationships within a firm, sales are more likely to boast up. As for free cash flows, in addition to the role of stakeholders, responsibility of the board, captured by Sub-index E also makes big difference.

To conclude, based on our study, we find empirical evidence that good firm corporate governance can help reduce the agency costs generated by the conflicts among principal and agents in a public firm in Singapore. We contribute to the literature by complementing supportive proof for the positive impact of corporate governance on mitigating agency problems. As most previous studies either look from the perspective of corporate governance mechanisms or from the angle of ownership structure as a complementary or substitute of firm internal corporate governance mechanisms, we aim at examining the outcome of the corporate governance mechanisms, or in other words, the implementation quality of the corporate governance mechanism policies. Better firm corporate governance have been found to add value to a firm and our paper proves that one of the channels is by reducing the value destroying agency costs.

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Appendices

Appendix A Tables for Part I

TABLE I.1 SINGAPORE EXCHANGE LISTED FIRMS SUMMARY STATISTICS

Panel A SCGI summary statistics

	2007	2008	2009	2010	2011	2012	2013
SCGI							
Minimum	0.09	0.34	0.17	0.12	0.25	0.34	0.34
Mean	0.65	0.64	0.57	0.64	0.61	0.59	0.59
Median	0.66	0.64	0.57	0.65	0.61	0.59	0.59
Maximum	0.89	0.83	0.80	0.84	0.82	0.83	0.83
Standard deviation	0.10	0.07	0.08	0.07	0.07	0.07	0.07
Sub-index means							
Sub-Index A	0.48	0.32	0.32	0.32	0.31	0.32	0.34
Sub-Index B	0.88	0.90	0.87	0.88	0.90	0.88	0.91
Sub-Index C	0.46	0.47	0.36	0.58	0.63	0.51	0.55
Sub-Index D	0.76	0.72	0.74	0.75	0.73	0.70	0.69
Sub-Index E	0.70	0.74	0.62	0.71	0.62	0.63	0.60

Panel B SCGI trend by groups

	2007	2008	2009	2010	2011	2012	2013
Total number of firms	453	497	493	489	473	501	424
SCGI groups							
0 (SCGI≤0.50)	19	18	46	7	14	39	43
1 (0.50<SCGI≤0.55)	38	20	121	28	63	96	78
2 (0.55<SCGI≤0.60)	54	75	161	71	129	144	125
3 (0.60<SCGI≤0.65)	88	161	97	145	134	125	101
4 (0.65<SCGI≤0.70)	115	145	48	152	85	54	51
5 (0.70<SCGI)	139	78	20	86	48	43	26

Panel C Number of firms by size and location

Firm size ranking	Domicile				Revenue			
	Local	S-Chip	Foreign	Total	Local	S-Chip	Foreign	Total
1	520	80	62	662	244	163	255	662
2	540	85	43	668	268	213	187	668
3	461	143	64	668	187	276	205	668
4	516	83	69	668	243	185	240	668
5	578	25	61	664	313	113	238	664

Panel A reports the summary statistics of firm corporate governance index SCGI and the corresponding Sub-indices throughout the sample years. Panel B contains the number of firm observations in each group ranked according to the value of SCGI in each sample year. Total numbers of firm-year observations in each size and location group are presented in Panel C. The year in this table is referring to the fiscal year.

TABLE I.2 FIRM CHARACTERISTICS SUMMARY STATISTICS

Panel A Firm variables summary statistics

	Correlation with SCGI	Local vs. S-Chip	
		Domicile	Revenue
Q_{GIM}	0.09***	0.31***	0.29***
		(0.03)	(0.03)
Industry-adj. Q_{GIM}	0.06***	0.27***	0.28***
		(0.03)	(0.03)
Q_{ALT}	0.10***	0.30***	0.26***
		(0.03)	(0.02)
Industry-adj. Q_{ALT}	0.07***	0.28***	0.26***
		(0.03)	(0.02)
Size	0.14***	3509.4***	5362.2***
		(1296.20)	(1226.90)
Leverage	0.004	0.02**	0.007
		(0.01)	(0.01)
Capital Expenditure	-0.20***	-50.67***	-14.94**
		(11.46)	(7.50)
R&D	0.012	-0.53	-1.07
		(0.43)	(0.13)
Revenue	0.101***	655.7***	-135.1***
		(174.10)	(137.80)
ROA	0.09***	0.03***	0.03***
		(0.01)	(0.00)
Age	0.10***	13.60***	14.14***
		(0.89)	(0.69)

Panel B SCGI summary statistics

	Local vs. S-Chip	
	Domicile	Revenue
Value-weighted SCGI	0.042***	0.026***
Equal-weighted SCGI	0.053***	0.033***
Sub-Index A	0.012***	0.010***
Sub-Index B	0.119***	0.081***
Sub-Index C	0.067***	0.041***
Sub-Index D	0.029***	0.009*
Sub-Index E	0.037***	0.023***

This table reports the correlation between governance index SCGI and the corresponding variables of interest as well as the differences of firm various characteristics between local firms and S-Chips. Q_{GIM} is computed as the ratio of the market value of assets to the book value of assets, where the market value of assets is computed as book value of assets plus the market value of common stock less the sum of book value of common stock and balance sheet deferred taxes. Q_{ALT} is an the ratio of the market value of assets to the book value of assets, where the market value of assets is computed as market value of common stock plus book value of debt. Industry-adjusted Tobin's Q is equal to Tobin's Q minus the median Tobin's Q in the industry, where industry is classified according to Fama French (1997) 12 industries. Size takes the value of firm total assets and age is the number of years since firm's incorporation. Leverage is the ratio of long-term debt plus debt due in one year to assets. ROA is the ratio of net income to assets. The results are based on the pooled sample for the period from calendar year 2008 to 2014. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.3 MULTIVARIABLE TEST OF FIRM VALUE

Q_{GIM}	Country of Domicile			Country of Revenue		
	Local vs. S-Chip	Local vs. Foreign	Foreign vs. S-Chip	Local vs. S-Chip	Local vs. Foreign	Foreign vs. S-Chip
SCGI	0.488*	0.613**	-0.248	0.112***	0.083**	0.015
	(0.285)	(0.262)	(0.380)	(0.305)	(0.298)	(0.272)
Location Dummy	0.272***	0.019	0.214**	0.115***	-0.019	0.219***
	(0.061)	(0.064)	(0.102)	(0.0466)	(0.0504)	(0.0486)
Log(Assets)	-0.096***	-0.104***	-0.014	-0.237***	-0.286***	-0.137**
	(0.024)	(0.023)	(0.040)	(0.0272)	(0.0263)	(0.0249)
Log(Company Age)	-0.010	-0.018	0.030	-0.034	-0.039	0.025
	(0.039)	(0.040)	(0.058)	(0.0422)	(0.0458)	(0.0390)
ROA	0.888***	0.956***	0.563*	0.196***	0.160***	0.105*
	(0.258)	(0.303)	(0.326)	(0.262)	(0.335)	(0.273)
Leverage	0.133	0.063	0.425**	0.056	-0.004	0.069*
	(0.128)	(0.134)	(0.178)	(0.130)	(0.156)	(0.139)
CAPEX/Assets	-1.229***	-1.104***	-0.812*	-0.139***	-0.090**	-0.037
	(0.360)	(0.367)	(0.446)	(0.474)	(0.436)	(0.298)
R&D per Sales	1.599	5.607*	6.408	-0.034	0.108*	0.117
	(2.018)	(3.120)	(4.974)	(1.239)	(3.543)	(2.799)
STI	0.452***	0.475***	0.337	0.196***	0.208***	0.103*
	(0.153)	(0.138)	(0.275)	(0.153)	(0.149)	(0.159)
Temasek Dummy	0.483***	0.461***		0.119*	0.155***	0.125*
	(0.172)	(0.173)		(0.224)	(0.174)	(0.221)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	3,008	2,889	707	2,197	2,358	2,049
Adj. R^2	0.181	0.184	0.103	0.258	0.188	0.127

This table reports the multivariable regression tests of Tobin's Q among groups classified by locations according to the identifiers: country of domicile and country of largest revenue. Controls for various firm characteristics are included. The dependent variable Q_{GIM} is computed as the ratio of the market value of assets to the book value of assets, where the market value of assets is computed as book value of assets plus the market value of common stock less the sum of book value of common stock and balance sheet deferred taxes. Two groups are included in the regression and the dummy takes the value of 1 if a firm is classified to the group that comes first according to country of domicile or country of revenue and 0 if classified as the corresponding counter party. The SCGI takes the value in the last fiscal year. Size and age are in log ratios. CAPEX/assets is the ratio of capital expenditures to assets. R&D per Sales is the ratio of research and development expenditures to total sales. Leverage is the ratio of long-term debt plus debt due in one year to assets. STI is a dummy variable indicating the inclusion of a firm in the Straits Times Index. Temasek dummy equals to 1 if a firm is held by Temasek Holdings and 0 otherwise. A dummy for missing R&D data is included in all regressions, but the coefficient (as well as the constant) are omitted. Industry and year fixed effects are included in the regression. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.4 PROPENSITY SCORE MATCHING GROUPS DIFFERENCES

Panel A Country of Domicile

Industry-adj. Q_{GIM}	K-Nearest neighbours matching (K=3)			Radius matching			Local linear regression matching		
	Local	S-Chip	Difference	Local	S-Chip	Difference	Local	S-Chip	Difference
Unmatched	0.187	-0.124	0.310***	0.187	-0.124	0.310***	0.187	-0.124	0.310***
			(0.032)			(0.032)			(0.032)
Matched	0.214	-0.124	0.338***	0.208	-0.124	0.332***	0.211	-0.124	0.334***
			(0.040)			(0.034)			(0.044)
Number of observations matched	678	394		2,551	407		286	288	

Panel B Country of Revenue

Industry-adj. Q_{GIM}	K-Nearest neighbours matching (K=3)			Radius matching			Local linear regression matching		
	Local	S-Chip	Difference	Local	S-Chip	Difference	Local	S-Chip	Difference
Unmatched	0.215	-0.049	0.264***	0.215	-0.049	0.264***	0.215	-0.049	0.264***
			(0.025)			(0.025)			(0.025)
Matched	0.182	-0.048	0.231***	0.172	-0.047	0.219***	0.176	-0.048	0.224***
			(0.039)			(0.037)			(0.046)
Number of observations matched	786	701		1,231	926		410	420	

This table reports the group means of firm's Q value adjusted according to the Fama and French (1997) 12 industries based on Propensity Score Matching samples. Using three different PSM estimators: Nearest neighbour matching, Radius matching and Local linear regression matching. The groups are classified by two different identifiers: country of domicile, and country of largest revenue. The matching procedure are based on various firm characteristics: SCGI, firm total assets, firm age, leverage, ROA, CAPEX/assets (the ratio of capital expenditures to assets) and R&D per Sales. Only the group means of firms adjusted Q ratios are reported in the table. Standards errors appear below the mean estimates and do not take into account that the propensity score is estimated. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.5 UNIVARIATE TEST OF FIRM VALUES AND CORPORATE GOVERNANCE

Panel A Single sort on SCGI

SCGI Ranking	N	Q_{GIM}	Industry-adj. Q_{GIM}	Q_{ALT}	Industry-adj. Q_{ALT}
1	662	1.054	0.132	0.837	0.157
2	668	0.986	0.072	0.773	0.102
3	668	0.985	0.069	0.746	0.073
4	668	1.060	0.132	0.821	0.137
5	664	1.268	0.327	0.984	0.283
Diff. (5 minus 1)		0.214***	0.195***	0.147***	0.126***

Panel B Double sort on Size and SCGI

SCGI Ranking	Size				
	1(smallest)	2	3	4	5 (largest)
1	0.314	0.006	0.066	0.125	-0.005
2	0.169	0.062	0.003	0.039	0.075
3	0.162	0.075	-0.001	0.090	0.037
4	0.233	0.102	0.053	0.178	0.125
5	0.346	0.241	0.040	0.280	0.452
Diff. (5 minus 1)	0.033	0.235***	-0.026	0.154*	0.457***

Panel C Size and Locations

Size	Local vs. S-Chips (Domicile)		Local vs. S-Chips (Revenue)	
	Q_{GIM}	Industry-adj. Q_{GIM}	Q_{GIM}	Industry-adj. Q_{GIM}
1	0.386***	0.439***	0.389***	0.400***
2	0.317***	0.315***	0.265***	0.254***
3	0.269***	0.271***	0.207***	0.195***
4	0.142*	0.149**	0.224***	0.176***
5	0.254***	0.156*	0.220***	0.159***

This table reports the univariate test results of the relationship between firm value Q and governance index SCGI. Firms are ranked and divided evenly into 5 groups based on their SCGI value in each year in Panel A, with ranking 1 having the lowest SCGI value and ranking 5 the highest score in terms of corporate governance. Both raw and industry adjusted Tobin's Q mean values are reported for each group and the differences between ranking 5 and ranking 1 are presented in the last row. In Panel B, firms are first sorted by firm size into quintiles and within each size quintiles firms are then sorted according to SCGI into 5 groups. Panel C displays firms' value Q differences between local firms and S-Chips within each size quintiles. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.6 SCGI AND FIRM VALUE - FULL SAMPLE

Variable	(1) Industry-adj. Q_{GIM}	(2) Q_{GIM}	(3) Industry-adj. Q_{ALT}	(4) Q_{ALT}
SCGI	0.089***	0.080**	0.064***	0.058*
	(0.137)	(0.252)	(0.104)	(0.232)
Log(Assets)	-0.222***	-0.246***	-0.270***	-0.303***
	(0.010)	(0.022)	(0.009)	(0.021)
Log(Company Age)	0.027	0.029	0.036	0.036
	(0.021)	(0.035)	(0.017)	(0.033)
ROA	0.157***	0.160***	0.198***	0.200***
	(0.137)	(0.255)	(0.144)	(0.243)
Leverage	0.043**	0.045	0.094***	0.101***
	(0.059)	(0.121)	(0.055)	(0.112)
CAPEX/Assets	-0.095**	-0.104***	-0.103***	-0.110***
	(0.270)	(0.322)	(0.238)	(0.309)
R&D per Sales	0.053**	0.066	0.054**	0.066
	(0.960)	(2.660)	(0.893)	(2.534)
STI	0.189***	0.187***	0.183***	0.181***
	(0.064)	(0.138)	(0.055)	(0.135)
Temasek Dummy	0.148***	0.146***	0.134***	0.133**
	(0.094)	(0.175)	(0.089)	(0.167)
Number of observations	3,302	3,302	3,302	3,302
Adj. R^2		0.159		0.175
Newey-test	Lag 3		Lag 3	
Year fixed effects		Yes		Yes
Industry fixed effects		Yes		Yes

This table reports the OLS regression of Tobin's Q on firm governance SCGI and other controls variables for the full sample during 2008 to 2014. The dependent variable Q_{GIM} is computed as the ratio of the market value of assets to the book value of assets, where the market value of assets is computed as book value of assets plus the market value of common stock less the sum of book value of common stock and balance sheet deferred taxes. Industry-adjusted Tobin's Q is equal to Tobin's Q minus the median Tobin's Q in the industry, where industry is classified according to Fama French (1997) 12 industries. SCGI takes the value in the last fiscal year. Size and age are in log ratios. CAPEX/assets is the ratio of capital expenditures to assets. R&D per Sales is the ratio of research and development expenditures to total sales. Leverage is the ratio of long-term debt plus debt due in one year to assets. STI is a dummy variable indicating the inclusion of a firm in the Straits Times Index. Temasek dummy equals to 1 if a firm is held by Temasek Holdings and 0 otherwise. A dummy for missing R&D data is included in all regressions, but the coefficient (as well as the constant) are omitted. Columns 1 and 3 provide the Fama-MacBeth estimates, columns 2 and 4 provide the results of OLS regressions with industry and year fixed effects. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.7 INDIVIDUAL REGRESSIONS BY COUNTRY GROUPS

Q_GIM	Country of Domicile			Country of Revenue		
	(1)	(2)	(3) Local vs. S-Chip	(4)	(5)	(6) Local vs. S-Chip
	Local	S-Chip	S-Chip	Local	S-Chip	S-Chip
SCGI	0.086**	-0.206***	-0.083	0.146***	0.004	0.040
	(0.297)	(0.486)	(0.574)	(0.415)	(0.288)	(0.368)
Location Dummy			-0.269			-0.401
			(0.368)			(0.305)
Interaction Term			0.469**			0.537**
			(0.608)			(0.487)
Log(Assets)	-0.278***	0.207**	-0.243***	-0.327***	0.002	-0.242***
	(0.0254)	(0.0410)	(0.0241)	(0.0349)	(0.0291)	(0.0270)
Log(Company Age)	-0.020	0.057	-0.009	-0.068	0.075	-0.031
	(0.0447)	(0.0542)	(0.0385)	(0.0637)	(0.0349)	(0.0423)
ROA	0.146***	0.113	0.150***	0.209***	0.115*	0.197***
	(0.322)	(0.232)	(0.258)	(0.456)	(0.215)	(0.261)
Leverage	0.007	0.208***	0.034	-0.031	0.219***	0.057
	(0.149)	(0.183)	(0.128)	(0.196)	(0.144)	(0.130)
CAPEX/Assets	-0.110***	-0.135	-0.114***	-0.123**	-0.128*	-0.138***
	(0.418)	(0.612)	(0.361)	(0.770)	(0.481)	(0.479)
R&D per Sales	0.049	-0.031	0.033	-0.040**	0.029	-0.034
	(2.751)	(1.255)	(2.010)	(2.261)	(1.335)	(1.258)
STI	0.175***		0.163***	0.221***		0.190***
	(0.155)		(0.154)	(0.179)		(0.152)
Temasek Dummy	0.163***		0.155***	0.142*		0.111
	(0.171)		(0.172)	(0.221)		(0.225)
Number of observations	2,595	413	3,008	1,253	944	2,197
Adj. R²	0.185	0.204	0.183	0.336	0.135	0.261
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the individual regressions results by groups classified according to the two different country identifiers: country of domicile and country of revenue. Regression results with firm location dummy and interaction terms between location dummy and SCGI are also included. The constructions of the variables and specifications of the regressions are the same as that in Table 6 but in this table we leave out the Fama-MacBeth analysis results and report only results using the version Q ratio calculated as that in the GIM paper as dependent variable. We focus on local firms and S-Chips instead of the full sample in this table. Location dummy takes the value of 1 for local firms and 0 for S-Chips. Industry and year fixed effects are included. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by ∗, ∗∗, and ∗∗∗ for 10%, 5%, and 1%, respectively.

TABLE I.8 SCGI AND FIRM VALUE PIECEWISE REGRESSION

	(1)	(2)	(3)	(4)	(5)
SCGI1	-0.008	0.014	0.005	0.011	0.057
	(0.457)	(0.620)	(1.017)	(0.537)	(0.621)
SCGI2	-0.012	-0.025	-0.264*	0.008	-0.100
	(0.266)	(0.325)	(0.757)	(0.449)	(0.409)
SCGI3	0.017	0.005	0.188**	0.030	0.048
	(0.224)	(0.256)	(0.540)	(0.443)	(0.295)
SCGI4	0.057	0.049	-0.175**	0.084	-0.047
	(0.298)	(0.330)	(0.720)	(0.554)	(0.290)
SCGI5	0.080*	0.082*	0.085**	0.046	0.090**
	(0.525)	(0.559)	(1.036)	(0.913)	(0.473)
Log(Assets)	-0.259***	-0.286***	0.230**	-0.329***	-0.003
	(0.022)	(0.026)	(0.045)	(0.035)	(0.029)
Log(Company Age)	0.027	-0.019	0.051	-0.067	0.077
	(0.034)	(0.045)	(0.054)	(0.064)	(0.036)
ROA	0.162***	0.147***	0.102	0.210***	0.116*
	(0.253)	(0.320)	(0.234)	(0.456)	(0.215)
Leverage	0.050	0.011	0.201***	-0.029	0.217***
	(0.120)	(0.148)	(0.189)	(0.194)	(0.143)
CAPEX/Assets	-0.102***	-0.108***	-0.138	-0.122**	-0.132**
	(0.322)	(0.417)	(0.621)	(0.768)	(0.482)
R&D per Sales	0.067	0.049	-0.034	-0.043**	0.030
	(2.655)	(2.752)	(1.310)	(2.247)	(1.347)
STI	0.166***	0.160***		0.215***	
	(0.137)	(0.153)		(0.180)	
Temasek Dummy	0.134**	0.153***		0.146**	
	(0.175)	(0.171)		(0.222)	
Number of observations	3,302	2,595	413	1,253	944
Adj. R^2	0.166	0.188	0.210	0.338	0.138
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes

The table reports the piecewise OLS coefficient estimates using Tobin's Q calculated in GIM as dependent variable, which is equal to the market value of assets to the book value of assets. A firm's rank (RANK) represents its SCGI value relative to other firms in the same period, and ranges from 0 to 1. The piecewise linear regression framework are performed over five quintiles based on firm's rank. The 5th or bottom quintile (RANK1) is defined as min(RANK, 0.2), the 4th performance quintile is defined as min(0.2, RANK-RANK1), and so forth, up to the highest quintile (RANK5). Size and age are in log ratios. CAPEX/assets is the ratio of capital expenditures to assets. R&D per Sales is the ratio of research and development expenditures to total sales. Leverage is the ratio of long-term debt plus debt due in one year to assets. STI is a dummy variable indicating the inclusion of a firm in the Straits Times Index. Temasek dummy equals to 1 if a firm is held by Temasek Holdings and 0 otherwise. A dummy for missing R&D data is included in all regressions, but the coefficient (as well as the constant) are omitted. Columns 1 provides the full sample estimates, columns 2 to 4 provide the results for sub-samples based on location identifier: domicile and revenue respectively. Both Fama-MacBeth and OLS regressions with industry and year fixed effects are adopted but only the coefficient estimates for the latter are reported. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.9 SCGI AND FIRM VALUE - EXCLUDE TOP SIZE RANKING FIRMS

	Country of Domicile			Country of Revenue		
	(1)	(2)	(3)	(4)	(5)	(6)
			Local vs.			Local vs.
Q_{GIM}	Local	S-Chip	S-Chip	Local	S-Chip	S-Chip
SCGI	0.050	-0.191**	-0.011	0.136***	0.016	0.012
	(0.352)	(0.541)	(0.525)	(0.483)	(0.329)	(0.338)
Location Dummy			-0.084			-0.566**
			(0.344)			(0.306)
Interaction Term			0.233			0.602**
			(0.570)			(0.494)
Log(Assets)	-0.160***	0.152	-0.160***	-0.205**	-0.038	-0.172***
	(0.040)	(0.061)	(0.033)	(0.059)	(0.040)	(0.034)
Log(Company Age)	-0.009	0.020	0.018	-0.003	0.043	0.056
	(0.053)	(0.057)	(0.041)	(0.072)	(0.036)	(0.039)
ROA	0.112**	0.121	0.130***	0.201***	0.128**	0.132***
	(0.305)	(0.229)	(0.244)	(0.451)	(0.205)	(0.242)
Leverage	-0.003	0.220***	0.036	-0.024	0.226***	0.038
	(0.168)	(0.193)	(0.130)	(0.227)	(0.137)	(0.133)
CAPEX/Assets	-0.118***	-0.150	-0.124***	-0.155**	-0.136**	-0.120***
	(0.463)	(0.652)	(0.338)	(0.831)	(0.461)	(0.344)
R&D per Sales	0.044	-0.026	0.096	-0.043**	0.034	0.080
	(2.980)	(1.269)	(2.903)	(2.062)	(1.337)	(2.845)
STI	0.092***		0.082***	0.124***		0.077***
	(0.098)		(0.086)	(0.140)		(0.106)
Temasek Dummy	0.093**		0.082**	0.093**		0.086**
	(0.305)		(0.307)	(0.414)		(0.299)
Number of observations	2,017	388	2,638	940	831	2,638
Adj. R^2	0.122	0.190	0.126	0.195	0.131	0.117
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the OLS coefficient estimates using the sample excluding the top size quintile firms. Columns 1, 2, 4 & 5 present the individual regressions results by country groups classified according to the two different identifiers: country of domicile and country of revenue. Regression results with firm location dummy and interaction terms between location dummy and SCGI are included in columns 3 & 6. The constructions of the variables and specifications of the regressions are the same as that in Table 7. Results are based on the version Q ratio calculated as that in the GIM paper as dependent variable. Location dummy takes the value of 1 for local firms and 0 for S-Chips. Industry and year fixed effects are included. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by ∗, ∗∗, and ∗∗∗ for 10%, 5%, and 1%, respectively.

TABLE I.10 MATCHED FIRM SAMPLE REGRESSION

Panel A Firm sample matched by size

Q_{GIM}	Country of Domicile			Country of Revenue		
	(1)	(2)	(3) S-Chip vs.	(4)	(5)	(6) S-Chip vs.
	Local	S-Chip	Local	Local	S-Chip	Local
SCGI	0.009	-0.206***	-0.092	0.102	0.004	0.027
	(0.637)	(0.486)	(0.632)	(0.722)	(0.288)	(0.358)
Location Dummy			-0.079			-0.301
			(0.455)			(0.352)
Interaction Term			0.279			0.423
			(0.745)			(0.551)
Log(Assets)	-0.203*	0.207**	-0.073	-0.307**	0.002	-0.183**
	(0.067)	(0.041)	(0.046)	(0.063)	(0.029)	(0.037)
Log(Company Age)	-0.053	0.057	0.013	-0.074	0.075	-0.012
	(0.066)	(0.054)	(0.049)	(0.064)	(0.035)	(0.037)
ROA	0.024	0.113	0.076	0.223**	0.115*	0.187***
	(0.674)	(0.232)	(0.306)	(0.617)	(0.215)	(0.266)
Leverage	-0.133**	0.208***	0.045	-0.028	0.219***	0.066*
	(0.244)	(0.183)	(0.161)	(0.243)	(0.144)	(0.134)
CAPEX/Assets	-0.162**	-0.135	-0.137**	-0.033	-0.128*	-0.080**
	(0.844)	(0.612)	(0.542)	(0.742)	(0.481)	(0.382)
R&D per Sales	0.100	-0.031	0.024	-0.038	0.029	-0.030
	(7.659)	(1.255)	(2.318)	(3.239)	(1.335)	(1.147)
STI	0.117**		0.109*	0.198***		0.159***
	(0.487)		(0.595)	(0.263)		(0.176)
Temasek Dummy	0.239**		0.207**	0.106*		0.076
	(0.444)		(0.423)	(0.270)		(0.257)
Number of observations	414	413	827	948	944	1,892
Adj. R^2	0.189	0.204	0.135	0.242	0.135	0.176
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

TABLE I.10 MATCHED FIRM SAMPLE REGRESSION *(cont'd.)*

Panel B Propensity score matching sample

Q_{GIM}	Country of Domicile			Country of Revenue		
	(1)	(2)	(3) S-Chip vs.	(4)	(5)	(6) S-Chip vs.
	Local	S-Chip	Local	Local	S-Chip	Local
SCGI	0.091**	-0.206***	0.099*	0.147***	0.003	0.182***
	(0.299)	(0.486)	(0.311)	(0.375)	(0.288)	(0.372)
Location Dummy			0.686**			0.523**
			(0.354)			(0.302)
Interaction Term			-0.770**			-0.617**
			(0.564)			(0.478)
Log(Assets)	-0.378***	0.207**	-0.161*	-0.336***	0.003	-0.240***
	(0.0392)	(0.0410)	(0.0336)	(0.0351)	(0.0291)	(0.0262)
Log(Company Age)	0.048	0.057	0.069	-0.038	0.075	-0.003
	(0.0541)	(0.0542)	(0.0411)	(0.0741)	(0.0349)	(0.0431)
ROA	0.300***	0.113	0.249***	0.268***	0.112*	0.218***
	(0.477)	(0.232)	(0.258)	(0.578)	(0.217)	(0.264)
Leverage	0.156**	0.208***	0.191***	0.010	0.218***	0.096***
	(0.242)	(0.183)	(0.151)	(0.209)	(0.145)	(0.127)
CAPEX/Assets	-0.150*	-0.135	-0.133**	-0.106	-0.128*	-0.125**
	(0.732)	(0.612)	(0.482)	(0.974)	(0.481)	(0.522)
R&D per Sales	-0.017	-0.031	-0.033	-0.030	0.029	-0.024
	(2.226)	(1.255)	(1.084)	(2.038)	(1.336)	(1.180)
STI	0.280***		0.157**	0.231***		0.188***
	(0.182)		(0.203)	(0.167)		(0.141)
Temasek Dummy	0.139**		0.091	0.171**		0.125*
	(0.175)		(0.203)	(0.204)		(0.212)
Number of observations	414	413	827	948	943	1,891
Adj. R^2	0.262	0.204	0.207	0.351	0.133	0.256
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results for the OLS regressions with the same specifications as those in Table 7 on matched sample. Every year, each S-Chip firm is match to a local firm based on a specific criteria. In Panel A, firms are matched based solely on firm size (total assets) and in Panel B firms are matched based on 5 aspects: SCGI, firm total assets, firm age, ROA and CAPEX/assets (the ratio of capital expenditures to assets). We required a one to one matching procedure with no replacement allowed. Location dummy takes the value of 0 for local firms and 1 for S-Chips in Panel B, opposite of that in Panel A where we have location dummy equals to 1 for local firms and 1 for S-Chips. Industry and year fixed effects are included. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE I.11 FIRM VALUE AND FIRM SIZE EFFECT

	Full Sample					Local Firms Sample					S-Chips Sample				
Tobin's Q	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
SCGI	0.052*	0.048	0.050	0.046	0.064**	0.045	0.035	0.036	0.032	0.054	-0.172**	-0.172***	-0.164**	-0.179**	-0.172**
	(0.244)	(0.240)	(0.239)	(0.242)	(0.239)	(0.290)	(0.288)	(0.289)	(0.293)	(0.283)	(0.436)	(0.412)	(0.440)	(0.455)	(0.428)
SIZE5	-0.048*					-0.082***					0.099				
	(0.043)					(0.046)					(0.118)				
SIZE4		-0.010					-0.005					0.118			
		(0.044)					(0.050)					(0.122)			
SIZE3			-0.064***					-0.029					-0.048		
			(0.035)					(0.041)					(0.072)		
SIZE2				-0.025					-0.028					-0.086	
				(0.040)					(0.047)					(0.069)	
SIZE1					0.149***					0.133***					-0.056
					(0.065)					(0.078)					(0.105)
Log(Company Age)	0.007	0.002	-0.004	0.002	0.007	-0.052	-0.062	-0.063	-0.062	-0.048	0.099	0.099	0.099	0.099	0.099
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.046)	(0.046)	(0.045)	(0.046)	(0.045)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
ROA	0.130***	0.128***	0.130***	0.128***	0.160***	0.120**	0.116**	0.117**	0.117**	0.141***	0.099	0.099	0.099	0.099	0.099
	(0.263)	(0.263)	(0.262)	(0.263)	(0.255)	(0.338)	(0.339)	(0.339)	(0.340)	(0.326)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
Leverage	-0.008	-0.015	-0.018	-0.020	0.013	-0.052	-0.067*	-0.069*	-0.072*	-0.038	0.099	0.099	0.099	0.099	0.099
	(0.126)	(0.128)	(0.127)	(0.128)	(0.124)	(0.157)	(0.159)	(0.159)	(0.160)	(0.156)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
CAPEX/Assets	-0.117***	-0.120***	-0.119***	-0.118***	-0.110***	-0.119***	-0.122***	-0.122***	-0.121***	-0.116***	0.099	0.099	0.099	0.099	0.099
	(0.342)	(0.344)	(0.343)	(0.344)	(0.331)	(0.448)	(0.453)	(0.451)	(0.453)	(0.436)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
R&D per Sales	0.059	0.058	0.060	0.057	0.061	0.037	0.034	0.035	0.033	0.040	0.099	0.099	0.099	0.099	0.099
	(2.808)	(2.814)	(2.779)	(2.826)	(2.651)	(2.901)	(2.919)	(2.908)	(2.922)	(2.818)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
STI	0.096**	0.076*	0.069	0.075*	0.083*	0.094*	0.064	0.062	0.063	0.067					
	(0.119)	(0.118)	(0.117)	(0.118)	(0.117)	(0.140)	(0.139)	(0.138)	(0.138)	(0.138)					
Temasek Dummy	0.140**	0.138**	0.138**	0.137**	0.140**	0.151**	0.146**	0.146**	0.145**	0.150**					
	(0.181)	(0.180)	(0.179)	(0.179)	(0.180)	(0.178)	(0.176)	(0.175)	(0.175)	(0.175)					
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	3,302	3,302	3,302	3,302	3,302	2,595	2,595	2,595	2,595	2,595	413	413	413	413	413
Adj. R^2	0.130	0.129	0.133	0.129	0.148	0.152	0.148	0.148	0.148	0.163	0.181	0.183	0.173	0.177	0.173

This table reports the results for the OLS regressions with the same specifications as those in Table 7 on matched sample but substituting the actual value of firm size with firm size ranking dummies. Column 1 to 5 are the results using the full sample. One firm size ranking dummy is included at a time in each column. Column 6 to 10 are results based on local firms only and column 11 to 15 are results obtained using S-Chip firms according to firms' country of domicile. Industry and year fixed effects are included. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by *, **, and *** for 10%, 5%, and 1%, respectively.

TABLE II.12 FIRM HOLDINGS PATTERN AND FIRM VALUE

	Full Sample					Local Firms Sample					S-Chips Sample				
Tobin's Q	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
SCGI	0.078**	0.081**	0.077**	0.079**	0.081**	0.087**	0.087**	0.085**	0.086**	0.086**	-0.166***	-0.171***	-0.170***	-0.173***	-0.181***
	(0.246)	(0.251)	(0.246)	(0.249)	(0.251)	(0.292)	(0.298)	(0.292)	(0.295)	(0.297)	(0.383)	(0.416)	(0.395)	(0.413)	(0.394)
Largest Individual Holdings	-0.036					-0.003					-0.090				
	(0.139)					(0.167)					(0.211)				
Largest Institution Holdings		0.003					0.003					0.029			
		(0.182)					(0.206)					(0.783)			
Total Individual Holdings			-0.062					-0.031					-0.032		
			(0.100)					(0.112)					(0.157)		
Total Institution Holdings				0.057*					0.056*					0.006	
				(0.136)					(0.142)					(0.420)	
Institution Dummy					-0.007					-0.002					0.016
					(0.040)					(0.044)					(0.066)
Log(Assets)	-0.267***	-0.263***	-0.277***	-0.272***	-0.245***	-0.291***	-0.292***	-0.299***	-0.302***	-0.278***	0.187**	0.195**	0.195**	0.198**	0.193**
	(0.024)	(0.023)	(0.024)	(0.023)	(0.023)	(0.027)	(0.026)	(0.028)	(0.027)	(0.026)	(0.038)	(0.040)	(0.037)	(0.041)	(0.038)
Log(Company Age)	0.019	0.024	0.018	0.021	0.028	-0.021	-0.020	-0.023	-0.023	-0.020	0.035	0.044	0.042	0.044	0.051
	(0.034)	(0.035)	(0.034)	(0.035)	(0.035)	(0.045)	(0.045)	(0.044)	(0.045)	(0.045)	(0.054)	(0.052)	(0.052)	(0.052)	(0.051)
ROA	0.154***	0.154***	0.156***	0.155***	0.159***	0.141***	0.142***	0.143***	0.143***	0.146***	0.119	0.116	0.117	0.115	0.118
	(0.250)	(0.251)	(0.251)	(0.249)	(0.254)	(0.317)	(0.319)	(0.319)	(0.317)	(0.319)	(0.230)	(0.232)	(0.228)	(0.232)	(0.230)
Leverage	0.048	0.045	0.052	0.045	0.045	0.009	0.008	0.012	0.008	0.007	0.220***	0.211***	0.213***	0.209***	0.218***
	(0.123)	(0.119)	(0.125)	(0.121)	(0.121)	(0.152)	(0.148)	(0.156)	(0.150)	(0.149)	(0.179)	(0.171)	(0.175)	(0.174)	(0.172)
CAPEX/Assets	-0.105***	-0.105***	-0.105***	-0.106***	-0.105***	-0.110***	-0.110***	-0.109***	-0.111***	-0.110***	-0.136	-0.136	-0.134	-0.134	-0.137
	(0.319)	(0.323)	(0.318)	(0.320)	(0.323)	(0.416)	(0.419)	(0.414)	(0.415)	(0.419)	(0.616)	(0.623)	(0.615)	(0.614)	(0.614)
R&D per Sales	0.068	0.068	0.067	0.069	0.066	0.050	0.050	0.051	0.053	0.049	-0.032	-0.029	-0.030	-0.030	-0.029
	(2.601)	(2.626)	(2.578)	(2.591)	(2.657)	(2.760)	(2.768)	(2.758)	(2.757)	(2.759)	(1.257)	(1.248)	(1.243)	(1.229)	(1.262)
STI	0.183***	0.185***	0.182***	0.184***	0.187***	0.174***	0.175***	0.173***	0.173***	0.175***					
	(0.137)	(0.139)	(0.136)	(0.140)	(0.138)	(0.153)	(0.155)	(0.153)	(0.157)	(0.154)					
Temasek Dummy	0.144***	0.145***	0.143***	0.146***	0.146***	0.163***	0.163***	0.162***	0.163***	0.163***					
	(0.177)	(0.176)	(0.177)	(0.177)	(0.175)	(0.173)	(0.172)	(0.173)	(0.174)	(0.172)					
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	3302	3302	3302	3302	3302	2595	2595	2595	2595	2595	413	413	413	413	413
Adj. R^2	0.165	0.163	0.166	0.166	0.159	0.186	0.186	0.187	0.189	0.184	0.204	0.201	0.201	0.200	0.202

This table reports the OLS regression of Tobin's Q on firm governance SCGI controlling for firm holding patterns. The independent variable measuring the firms' holding pattern is calculated as the percentage of common shares outstanding held by the largest individual owners, the largest institutional owners, sum of all individual owners and sum of all institutional owners, respectively in each column. Institution dummy used in columns 5, 10 and 15 equals to 1 if the sum of all institutional ownership is greater than the sum of all individual ownership for a firm and 0 otherwise. A dummy for missing holdings data is included in all regressions, but the coefficients (as well as the constant) are omitted. Column 1 to 5 are the results using the full sample. Column 6 to 10 are results based on local firms only and column 11 to 15 are results obtained using S-Chip firms according to firms' country of domicile. The results are based on OLS regressions with industry and year fixed effects. Robust standards errors appear below the standardized coefficient estimate and are clustered by firm. Significance levels are indicated by ∗, ∗∗, and ∗∗∗ for 10%, 5%, and 1%, respectively.

Appendix B   Tables for Part II

TABLE II.1 SINGAPORE CORPORATE GOVERNANCE SUMMARY STATISTICS

Panel A SCGI summary statistics

	2007	2008	2009	2010	2011	2012	2013
SCGI							
Minimum	9.33	34.23	17.37	12.13	25.14	34.26	34.31
Mean	65.11	63.96	57.40	64.47	61.36	59.50	58.93
Median	66.01	64.41	57.38	64.87	61.09	58.98	58.87
Maximum	88.85	83.24	80.35	83.68	81.83	83.05	82.96
Standard deviation	10.38	6.89	7.61	6.85	6.68	7.24	7.42
Sub-index means							
Sub-Index A	48.40	32.07	31.57	31.70	31.47	32.48	34.11
Sub-Index B	88.04	90.01	87.15	88.40	90.29	87.97	90.59
Sub-Index C	45.71	46.71	35.67	57.83	63.40	50.92	54.68
Sub-Index D	76.31	71.94	74.48	75.36	73.04	70.23	69.15
Sub-Index E	69.68	73.66	61.95	70.64	62.21	63.10	59.58

Panel B SCGI trend by groups

	2007	2008	2009	2010	2011	2012	2013
Total number of firms	453	497	493	489	473	501	424
SCGI groups							
0 (SCGI≤0.50)	19	18	46	7	14	39	43
1 (0.50<SCGI≤0.55)	38	20	121	28	63	96	78
2 (0.55<SCGI≤0.60)	54	75	161	71	129	144	125
3 (0.60<SCGI≤0.65)	88	161	97	145	134	125	101
4 (0.65<SCGI≤0.70)	115	145	48	152	85	54	51
5 (0.70<SCGI)	139	78	20	86	48	43	26

Panel C SCGI performance of TLC vs. non-TLC

	Number of firms (CSO%=0%)		Number of firms (CSO%=5%)	
SCGI Rank	TLC	Non-TLC	TLC	Non-TLC
1	18	664	3	679
2	22	666	8	680
3	35	652	8	679
4	50	638	13	675
5	190	494	116	568

This table reports the summary statistics of the Singapore Corporate Governance Index. The "year" in Panel A and B refers to the fiscal year. SCGI is the sum of the five sub-indices value weighted proportionately according to Figure 1. In Panel C, TLC refers to firms with common shares outstanding (CSO%) held by Temasek Holdings that exceeds a particular threshold, 0% or 5%. Otherwise firms will be regard as non-TLC.

TABLE II.2 TEMASEK HOLDINGS LINKED FIRM SUMMARY STATISTICS

Panel A %CSO summary statistics

	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
Number of firms	446	508	491	501	508	521	522	440	3,937
CSO%									
Minimum	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean	1.89%	1.75%	1.47%	1.36%	1.36%	1.33%	1.35%	1.65%	1.51%
Median	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Maximum	100.00%	100.00%	61.24%	65.66%	65.62%	65.65%	65.57%	65.51%	100.00%
Standard deviation	9.84%	9.11%	7.70%	7.37%	7.39%	7.27%	7.27%	8.25%	8.03%

Panel B %CSO trend by groups

	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
Total number of firms	446	508	491	501	508	521	522	440	3,937
SCGI groups									
0 (%CSO≤0%)	397	460	442	452	463	484	480	400	3,578
1 (0%<%CSO≤5%)	29	24	28	28	25	16	20	19	189
2 (5%<%CSO≤10%)	1	3	2	4	1	2	4	3	20
3 (10%<%CSO≤15%)	2	4	3	2	3	2	1	1	18
4 (15%<%CSO≤20%)	1	1	2	2	2	4	2	2	16
5 (20%<%CSO≤25%)	2	2	2	2	2	2	3	3	18
6 (25%<%CSO≤30%)	1	1	1	1	2	1	2	1	10
7 (30%<%CSO≤35%)	1	1	1	1	1	1	1	1	8
8 (35%<%CSO≤40%)	1	0	0	0	0	0	0	0	1
9 (40%<%CSO≤45%)	1	1	3	3	3	3	3	3	20
10 (45%<%CSO≤50%)	2	3	0	1	1	0	0	1	8
11 (50%<%CSO)	8	8	7	5	5	6	6	6	51
Fraction of firms (%CSO>0%)	11%	9%	10%	10%	9%	7%	8%	9%	9%

This table reports the summary statistics of firms' percentage of commons shares outstanding (CSO%) held by Temasek Holdings. The "year" in Panel A and B refers to the calendar year in which firms end their fiscal years.

TABLE II.3 UNIVARIATE TEST OF PERFORMANCE AND CHARACTERISTICS MEASURES OF TEMASEK VS. NON-TEMASEK

Panel A Threshold %CSO=0%

Variables	Companies	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
SCGI	Temasek=1	0.7164	0.7160	0.6518	0.7138	0.6838	0.6921	0.6628	.	0.6912
	Temasek=0	0.6472	0.6322	0.5653	0.6378	0.6061	0.5864	0.5831	.	0.6075
	Difference	*0.0691****	*0.0838****	*0.0865****	*0.0760****	*0.0777****	*0.1057****	*0.0797****	*.*	*0.0838****
Tobin's Q	Temasek=1	1.8281	1.3574	1.5012	1.7136	1.4655	1.7674	1.5823	1.6639	1.6062
	Temasek=0	1.5180	0.9465	1.0492	1.1054	0.9741	1.0409	1.1402	1.1088	1.1032
	Difference	*0.3101**	*0.4109****	*0.4521****	*0.6081****	*0.4913****	*0.7265****	*0.4421***	*0.5551***	*0.5030****
Industry-adjusted Q	Temasek=1	0.5390	0.4641	0.4835	0.6543	0.4813	0.8245	0.6021	0.7216	0.5871
	Temasek=0	0.1885	0.1025	0.1016	0.0993	0.0790	0.1282	0.1866	0.1670	0.1304
	Difference	*0.3505**	*0.3616****	*0.3819****	*0.5550****	*0.4023****	*0.6964****	*0.4155***	*0.5546***	*0.4566****
Size	Temasek=1	7.4885	7.6419	7.8798	7.7775	7.9506	7.6717	7.7277	7.9541	7.7585
	Temasek=0	5.3156	5.3645	5.3690	5.4710	5.5642	5.7127	5.7345	5.8190	5.5465
	Difference	*2.1729****	*2.2774****	*2.5108****	*2.3065****	*2.3864****	*1.9590****	*1.9932****	*2.1351****	*2.2121****
IPO Age	Temasek=1	2.6053	2.7226	2.7706	2.6881	2.6723	2.4422	2.7503	2.8128	2.6860
	Temasek=0	1.8550	1.9939	2.1320	2.1626	2.2863	2.3974	2.4649	2.5797	2.2396
	Difference	*0.7503****	*0.7287****	*0.6386****	*0.5256****	*0.3860****	*0.0448*	*0.2854***	*0.2331**	*0.4464****
Age	Temasek=1	3.0760	3.2390	3.2797	3.2036	3.1873	3.1344	3.2709	3.2661	3.2068
	Temasek=0	2.7423	2.7989	2.8798	2.9038	2.9811	3.0345	3.0649	3.1401	2.9461
	Difference	*0.3337****	*0.4400****	*0.3999****	*0.2998****	*0.2062**	*0.0999*	*0.2060***	*0.1260*	*0.2607****
Total liabilities to total assets	Temasek=1	0.1758	0.1671	0.1744	0.1833	0.2067	0.2382	0.2258	0.2239	0.1970
	Temasek=0	0.1816	0.1968	0.1842	0.1774	0.1899	0.1961	0.2022	0.2077	0.1921
	Difference	*-0.0058*	*-0.0297*	*-0.0098*	*0.0059*	*0.0168*	*0.0421*	*0.0235*	*0.0163*	*0.0049*
Capital expenditure to assets	Temasek=1	-0.0407	-0.0435	-0.0447	-0.0400	-0.0572	-0.0794	-0.0647	-0.0745	-0.0542
	Temasek=0	-0.0598	-0.0658	-0.0485	-0.0492	-0.0496	-0.0436	-0.0433	-0.0455	-0.0505
	Difference	*0.0191***	*0.0222****	*0.0037*	*0.0092*	*-0.0077*	*-0.0358***	*-0.0214**	*-0.0290***	*-0.0037*

Panel A Threshold %CSO=0% *(cont'd.)*

Variables	Companies	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
ROA	Temasek=1	0.0879	0.0558	0.0681	0.0642	0.0662	0.0634	0.0582	0.0513	0.0649
	Temasek=0	0.0755	0.0363	0.0224	0.0506	0.0346	0.0172	-0.0046	0.0058	0.0290
	Difference	*0.0123*	*0.0196*	*0.0456****	*0.0136*	*0.0316****	*0.0463****	*0.0628****	*0.0455***	*0.0358****
ROE	Temasek=1	0.2169	0.1602	0.1618	0.1607	0.1653	0.1339	0.1261	-0.0089	0.1433
	Temasek=0	0.1263	0.0526	0.0305	0.0858	0.0594	-0.0001	-0.0728	-0.0404	0.0288
	Difference	*0.0907****	*0.1076**	*0.1313****	*0.0749***	*0.1059****	*0.1340****	*0.1989****	*0.0316*	*0.1145****
Profit margin	Temasek=1	0.3616	0.1517	0.1111	0.1827	0.2133	0.2040	0.2134	0.2186	0.2068
	Temasek=0	0.1550	0.0553	-0.0697	0.1043	0.1168	0.0486	-0.1669	0.0012	0.0286
	Difference	*0.2067***	*0.0964***	*0.1808*	*0.0785*	*0.0966**	*0.1554****	*0.3803****	*0.2174****	*0.1783****
Asset turnover	Temasek=1	0.6365	0.7248	0.6079	0.5684	0.5727	0.6415	0.5560	0.5670	0.6105
	Temasek=0	0.9367	0.9391	0.8404	0.8598	0.8433	0.8120	0.7760	0.7664	0.8458
	Difference	*-0.3002****	*-0.2143**	*-0.2325***	*-0.2914****	*-0.2706****	*-0.1706***	*-0.2201****	*-0.1994***	*-0.2354****
Total assets to equity	Temasek=1	3.2772	3.7387	3.3056	3.2364	3.6138	2.9264	3.3154	3.6041	3.3841
	Temasek=0	2.0143	2.1554	2.0494	2.0002	2.0748	2.2264	2.4226	2.6805	2.2008
	Difference	*1.2629****	*1.5833****	*1.2562****	*1.2362****	*1.539****	*0.7000**	*0.8928**	*0.9236*	*1.1834****
Cash to total assets	Temasek=1	0.1313	0.1501	0.1590	0.1668	0.1399	0.1620	0.1532	0.1331	0.1494
	Temasek=0	0.1856	0.1807	0.1988	0.2000	0.1912	0.1793	0.1828	0.1751	0.1867
	Difference	*-0.0543****	*-0.0306*	*-0.0397***	*-0.0332**	*-0.0513****	*-0.0173*	*-0.0296**	*-0.0420***	*-0.0373****
Market to Book value	Temasek=1	3.0964	1.9477	2.2680	2.7009	2.1891	2.8259	2.6949	2.4297	2.5129
	Temasek=0	1.9454	0.9248	1.1369	1.2057	0.9612	1.1444	1.5619	1.4196	1.2749
	Difference	*1.1510***	*1.0230****	*1.1311****	*1.4952****	*1.2280****	*1.6815****	*1.1330*	*1.0101**	*1.238****

TABLE II.3 UNIVARIATE TEST OF PERFORMANCE AND CHARACTERISTICS MEASURES OF TEMASEK VS. NON-TEMASEK *(cont'd.)*

Panel B Threshold %CSO=5%

Variables	Companies	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
SCGI	Temasek=1	0.7627	0.7344	0.6866	0.7409	0.7258	0.7167	0.7068	.	0.7246
	Temasek=0	0.6498	0.6353	0.5690	0.6408	0.6084	0.5888	0.5844	.	0.6102
	Difference	*0.1129****	*0.0991****	*0.1176****	*0.1000****	*0.1173****	*0.1279****	*0.1224****	*.*	*0.1143****
Tobin's Q	Temasek=1	2.4701	1.5233	1.5610	1.9037	1.6476	1.6237	1.6529	1.6087	1.7407
	Temasek=0	1.5090	0.9587	1.0734	1.1326	0.9918	1.0702	1.1548	1.1368	1.1223
	Difference	*0.9611***	*0.5646***	*0.4876***	*0.7711****	*0.6558****	*0.5535****	*0.4981***	*0.472***	*0.6184****
Industry-adjusted Q	Temasek=1	1.1340	0.6661	0.5900	0.8601	0.7054	0.6929	0.6714	0.6634	0.7440
	Temasek=0	0.1844	0.1104	0.1196	0.1227	0.0904	0.1560	0.2001	0.1951	0.1463
	Difference	*0.9496***	*0.5557***	*0.4704***	*0.7375****	*0.6149***	*0.5369***	*0.4713***	*0.4683***	*0.5977****
Size	Temasek=1	8.0760	7.8224	8.1576	8.2197	8.3678	8.2806	8.3355	8.4528	8.2078
	Temasek=0	5.4359	5.4684	5.5061	5.5862	5.6694	5.7498	5.7875	5.8908	5.6372
	Difference	*2.6401****	*2.3540****	*2.6515****	*2.6335****	*2.6984****	*2.5307****	*2.5480****	*2.5620****	*2.5706****
IPO Age	Temasek=1	2.5194	2.6615	2.7458	2.5730	2.7072	2.6900	2.7779	2.9267	2.7007
	Temasek=0	1.9129	2.0347	2.1716	2.1986	2.3047	2.3882	2.4754	2.5850	2.2619
	Difference	*0.6065****	*0.6268****	*0.5742****	*0.3744**	*0.4025***	*0.3018**	*0.3025**	*0.3417***	*0.4389****
Age	Temasek=1	3.0487	3.2156	3.2568	3.1322	3.2105	3.2514	3.2952	3.3426	3.2205
	Temasek=0	2.7675	2.8230	2.9049	2.9245	2.9907	3.0327	3.0724	3.1422	2.9588
	Difference	*0.2812*	*0.3926***	*0.3519***	*0.2077*	*0.2198*	*0.2187**	*0.2228**	*0.2004*	*0.2616****
Total liabilities to total assets	Temasek=1	0.1650	0.1538	0.1705	0.2111	0.2185	0.2162	0.2355	0.2435	0.2012
	Temasek=0	0.1817	0.1960	0.1838	0.1765	0.1903	0.1985	0.2027	0.2074	0.1921
	Difference	*-0.0167*	*-0.0421*	*-0.0133*	*0.0346*	*0.0282*	*0.0177*	*0.0328*	*0.0361*	*0.0091*
Capital expenditure to assets	Temasek=1	-0.0456	-0.0445	-0.0348	-0.0558	-0.0684	-0.0685	-0.0664	-0.0944	-0.0596
	Temasek=0	-0.0582	-0.0646	-0.0487	-0.0480	-0.0495	-0.0452	-0.0441	-0.0458	-0.0504
	Difference	*0.0126*	*0.0201***	*0.0139***	*-0.0078*	*-0.0189*	*-0.0233*	*-0.0223*	*-0.0486***	*-0.0092*

Panel B Threshold %CSO=5% *(cont'd.)*

Variables	Companies	2007	2008	2009	2010	2011	2012	2013	2014	Full sample
ROA	Temasek=1	0.0941	0.0780	0.0670	0.0808	0.0675	0.0553	0.0533	0.0389	0.0668
	Temasek=0	0.0761	0.0361	0.0252	0.0507	0.0361	0.0190	-0.0019	0.0085	0.0308
	Difference	*0.0181*	*0.0419***	*0.0418***	*0.0302***	*0.0314***	*0.0363***	*0.0552****	*0.0304*	*0.0361****
ROE	Temasek=1	0.2319	0.1910	0.1550	0.2142	0.1679	0.1091	0.1244	-0.0623	0.1415
	Temasek=0	0.1317	0.0564	0.0386	0.0878	0.0647	0.0053	-0.0648	-0.0363	0.0346
	Difference	*0.1002***	*0.1346****	*0.1163****	*0.1265***	*0.1032****	*0.1038***	*0.1892****	*-0.0260*	*0.1068****
Profit margin	Temasek=1	0.2176	0.1630	0.1487	0.1553	0.1754	0.1464	0.1533	0.1306	0.1609
	Temasek=0	0.1758	0.0596	-0.0605	0.1101	0.1233	0.0561	-0.1488	0.0156	0.0397
	Difference	*0.0418*	*0.1034***	*0.2092****	*0.0452*	*0.0521*	*0.0903***	*0.3021****	*0.1150*	*0.1212****
Asset turnover	Temasek=1	0.7372	0.8882	0.6744	0.6442	0.5789	0.6019	0.5855	0.5769	0.6645
	Temasek=0	0.9116	0.9202	0.8234	0.8394	0.8291	0.8082	0.7659	0.7568	0.8315
	Difference	*-0.1743*	*-0.0320*	*-0.1490*	*-0.1952**	*-0.2502***	*-0.2064***	*-0.1805***	*-0.1799**	*-0.1670****
Total assets to equity	Temasek=1	2.8427	2.8475	2.7109	3.3088	3.0598	2.8617	3.1483	3.6538	3.0523
	Temasek=0	2.1207	2.2781	2.1508	2.0691	2.1763	2.2515	2.4657	2.7199	2.2751
	Difference	*0.7221*	*0.5694*	*0.5602*	*1.2397**	*0.8834*	*0.6102*	*0.6826*	*0.9339*	*0.7772****
Cash to total assets	Temasek=1	0.1508	0.1825	0.1898	0.2211	0.1810	0.1661	0.1804	0.1545	0.1785
	Temasek=0	0.1810	0.1776	0.1950	0.1957	0.1869	0.1786	0.1804	0.1722	0.1836
	Difference	*-0.0302*	*0.0050*	*-0.0052*	*0.0254*	*-0.0059*	*-0.0125*	*0.000*	*-0.0176*	*-0.0050*
Market to Book value	Temasek=1	4.3867	2.1689	2.3263	3.3357	2.5934	2.3302	2.3654	2.0675	2.6761
	Temasek=0	1.9631	0.9645	1.2017	1.2651	1.0075	1.2190	1.6217	1.4836	1.3297
	Difference	*2.4235***	*1.2044***	*1.1246***	*2.0706****	*1.5859****	*1.1112***	*0.7437**	*0.5839*	*1.3465****

This table compares the group average of various firm characteristics between Temasek held (Temasek=1) and non-Temasek held (Temasek=0) firms. Group mean values and *t-statistics* for the group differences are reported for each year and for the full sample. Panel A reports the results when 0% is chosen as threshold and 5% for Panel B. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively. Unequal variance is assumed for the t-test.

TABLE II.4 POOLED SAMPLE PEARSON'S CORRELATION TABLE

	Temasek Dummy (threshold=0%)	Temasek Dummy (threshold=5%)	SCGI	Tobin's Q	Industry-adjusted Q	Size	IPO Age	Age
Temasek Dummy (threshold=0%)	1.000		0.308***	0.205***	0.191***	0.440***	0.177***	0.115***
Temasek Dummy (threshold=5%)		1.000	0.296***	0.188***	0.190***	0.347***	0.114***	0.074***
SCGI			1.000	0.153***	0.118***	0.277***	0.071***	0.078***
Tobin's Q				1.000	1.908***	0.010	-0.089***	-0.034**
Industry-adjusted Q					1.000	-0.001	-0.060***	-0.013
Size						1.000	0.293***	0.214***
IPO Age							1.000	0.644***
Age								1.000

TABLE II.4 POOLED SAMPLE PEARSON'S CORRELATION TABLE *(cont'd.)*

	Total liabilities to total assets	Capital expenditure to assets	ROA	ROE	Profit margin	Asset turnover	Total assets to equity	Cash to total assets	Market to Book value
Temasek Dummy (threshold=0%)	0.007	-0.006	0.076***	0.098***	0.066***	-0.110***	0.211***	-0.071***	0.200***
Temasek Dummy (threshold=5%)	0.006	-0.015	0.059***	0.070***	0.033*	-0.058***	0.090***	-0.002	0.162***
SCGI	-0.023	-0.046***	0.130***	0.126***	0.077***	0.020	0.081***	-0.026	0.104***
Tobin's Q	-0.046***	-0.107***	0.180***	0.106***	0.023	0.030*	0.093***	0.167***	1.023***
Industry-adjusted Q	-0.045**	-0.096***	0.155***	0.091***	0.009	0.058***	0.096***	0.169***	0.935***
Size	0.283***	0.070***	0.138***	0.181***	0.170***	-0.214***	0.307***	-0.314***	-0.009
IPO Age	-0.022	0.210***	-0.065***	-0.013	0.045**	-0.147***	0.095***	-0.161***	-0.062***
Age	0.022	0.169***	0.039**	0.055***	0.081***	-0.090***	0.058***	-0.070***	-0.042**
Total liabilities to total assets	1.000	-0.055***	-0.102***	-0.050***	0.000	-0.059***	0.396***	-0.461***	0.018
Capital expenditure to assets		1.000	-0.031*	-0.015	0.032*	0.004	0.017	0.016	-0.104***
ROA			1.000	1.166***	0.686***	0.060***	-0.135***	0.157***	-0.009
ROE				1.000	0.540***	0.044**	-0.112***	0.076***	-0.139***
Profit margin					1.000	-0.016	-0.046***	0.013	-0.106***
Asset turnover						1.000	0.034*	0.071***	0.043**
Total assets to equity							1.000	-0.220***	0.312***
Cash to total assets								1.000	0.107***
Market to Book value									1.000

This table reports the Fisher's z transformation for the Pearson's correlation coefficients among the variables for the pooled sample from 2007 to 2014. The pooled sample correlation test is performed using all firms over the sample period. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE II.5 TEMASEK EFFECT ON CORPORATE GOVERNANCE

SCGI	(1)	(2)	(3)	(4)	(5)	(6)
Temasek Dummy (threshold=0%)	0.190***	0.205***	0.204***			
	(0.0093)	(0.0086)	(0.0090)			
Temasek Dummy (threshold=5%)	0.061*	0.096***		0.200***	0.198***	0.203***
	(0.0033)	(0.0026)		(0.0131)	(0.0118)	(0.0123)
Lag 1-year Q	0.058*			0.066**	0.091***	
	(0.0030)			(0.0032)	(0.0026)	
Lag 2-years Q	0.268***	0.247***	0.210***	0.043		
	(0.0025)	(0.0023)	(0.0022)	(0.0029)		
Size	0.090***	0.074**	0.068**	0.267***	0.254***	0.217***
	(0.0041)	(0.0035)	(0.0032)	(0.0025)	(0.0024)	(0.0022)
Age	0.006	0.019	0.027	0.098***	0.081**	0.073**
	(0.0133)	(0.0125)	(0.0126)	(0.0041)	(0.0035)	(0.0032)
ROA	-0.023	-0.017	-0.037*	0.011	0.022	0.030
	(0.0319)	(0.0274)	(0.0244)	(0.0135)	(0.0128)	(0.0128)
Capital expenditure to assets	0.114***	0.105***	0.085***	-0.028	-0.020	-0.038*
	(0.0035)	(0.0033)	(0.0031)	(0.0322)	(0.0284)	(0.0258)
Asset turnover	-0.001	0.000	-0.006	0.111***	0.102***	0.082***
	(0.0020)	(0.0017)	(0.0014)	(0.0035)	(0.0033)	(0.0031)
Total assets to equity				0.015	0.018	0.011
				(0.0021)	(0.0018)	(0.0015)
Number of observations	2,273	2,816	3,346	2,273	2,816	3,346
Adj. R^2	0.303	0.303	0.257	0.308	0.303	0.259
F-test	23.06	27.51	26.50	26.89	31.58	29.69
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the OLS multivariable regression results using SCGI value as dependent variable. The difference for firm corporate governance quality between TLCs vs. non-TLCs is indicated by the Temasek dummy coefficients. Firm value is measured by Tobin's Q, which is the ratio of firm's assets market value to firm's assets book value. Industry-adjusted values are obtained by deducting the industry median based on the Fama-French 12 industries. In each year *t*, the previous two years' Q value are included in the regression as control variables. Firm's corporate governance practice is quantified by our constructed index SCGI. Temasek dummy is equal to 1 if the firm has (or at least 5% if threshold=5%) common shares outstanding held by Temasek Holdings and 0 otherwise. Variables for firm statistics that are found to be correlated with firm valuation and corporate governance practice in the Pearson's correlation matrix are included in the regression as control variables. Firm size is the logarithm of the firm's total assets. Age is the logarithm of the number of years since the incorporation of the firm. Year-fixed effect is included in all regressions. Robust standard errors clustered by firm are provided in brackets under the coefficients. Adjusted R^2 and F-statistics are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE II.6 TEMASEK EFFECT ON FIRM VALUE

Tobin's Q	(1)	(2)	(3)	(4)	(5)	(6)
Temasek Dummy (threshold=0%)	0.060**	0.068**	0.031			
	(0.0635)	(0.0707)	(0.3517)			
Temasek Dummy (threshold=5%)				0.059**	0.056**	-0.092
				(0.0899)	(0.0921)	(0.3434)
Lag SCGI		0.034**	0.033*		0.034**	0.031*
		(0.1450)	(0.1418)		(0.1459)	(0.1483)
Temasek Dummy*SCGI (threshold=0%)			0.038			
			(0.5145)			
Temasek Dummy*SCGI (threshold=5%)						0.151
						(0.4812)
Size	0.022	0.010	0.009	0.024	0.015	0.014
	(0.0102)	(0.0111)	(0.0111)	(0.0100)	(0.0108)	(0.0108)
Age	0.002	0.017	0.017	0.003	0.019	0.019
	(0.0188)	(0.0207)	(0.0206)	(0.0189)	(0.0206)	(0.0206)
ROA	0.142***	0.133***	0.133***	0.144***	0.134***	0.134***
	(0.2172)	(0.2054)	(0.2055)	(0.2187)	(0.2074)	(0.2073)
Capital expenditure to assets	-0.033	-0.049**	-0.049**	-0.033	-0.049**	-0.050**
	(0.2355)	(0.2654)	(0.2653)	(0.2347)	(0.2637)	(0.2643)
Asset turnover	0.027	0.038*	0.038*	0.026	0.037*	0.037*
	(0.0194)	(0.0198)	(0.0199)	(0.0194)	(0.0198)	(0.0198)
Total assets to equity	-0.154***	-0.136***	-0.136***	-0.150***	-0.133***	-0.132***
	(0.0123)	(0.0115)	(0.0116)	(0.0121)	(0.0114)	(0.0114)
Cash to total assets	0.049**	0.040	0.040	0.046**	0.038	0.037
	(0.1001)	(0.1147)	(0.1146)	(0.0997)	(0.1144)	(0.1144)
Market to Book value	0.785***	0.772***	0.772***	0.787***	0.776***	0.775***
	(0.0322)	(0.0400)	(0.0401)	(0.0321)	(0.0398)	(0.0398)
Number of observations	3,827	3,236	3,236	3,827	3,236	3,236
Adj. R^2	0.646	0.617	0.617	0.646	0.617	0.617
F-test	29.79	20.57	18.88	31.30	21.76	20.93
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the OLS multivariable regression results using firm value Tobin's Q as dependent variable. The difference for firm valuation between TLCs vs. non-TLCs is indicated by the Temasek dummy coefficients. Tobin's Q is the ratio of firm's assets market value to firm's assets book value. Industry-adjusted values are obtained by deducting the industry median based on the Fama-French 12 industries. Firm's corporate governance practice is quantified by our constructed index SCGI. Temasek dummy is equal to 1 if the firm has (or at least 5% if threshold=5%) common shares outstanding held by Temasek Holdings and 0 otherwise. Lagged SCGI is included to test for beyond governance impact of Temasek investment. Temasek dummies are interacted with lagged SCGI value to capture the difference in the sensitivity of Q-SCGI relationship between TLCs vs. non-TLCs. Variables for firm statistics that are found to be correlated with firm valuation and corporate governance practice are included in the regression as control variables. Firm size is the logarithm of the firm's total assets. Age is the logarithm of the number of years since the incorporation of the firm. Year-fixed effect is included in all regressions. Robust standard errors clustered by firm are provided in brackets under the coefficients. Adjusted R^2 and F-statistics are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE II.7 SIMULTANEOUS REGRESSION ANALYSIS

	(1)		(2)	
	SCGI	Tobin's Q	SCGI	Tobin's Q
Temasek Dummy (threshold=0%)	0.191***	0.055***		
	(0.0052)	(0.0351)		
Temasek Dummy (threshold=5%)			0.208***	0.056***
			(0.0071)	(0.0471)
Lag 1-year Q_{GIM}	0.056**		0.063**	
	(0.0025)		(0.0025)	
Lag 2-years Q_{GIM}	0.066**		0.051*	
	(0.0024)		(0.0024)	
Size	0.267***	0.045**	0.263***	0.044**
	(0.0010)	(0.0071)	(0.0010)	(0.0070)
Age	0.079***	0.016	0.087***	0.018
	(0.0022)	(0.0145)	(0.0022)	(0.0144)
ROA	0.004	0.100***	0.011	0.102***
	(0.0115)	(0.0766)	(0.0115)	(0.0765)
Capital expenditure to assets	-0.036**	-0.020	-0.041**	-0.020
	(0.0232)	(0.1531)	(0.0230)	(0.1529)
Asset turnover	0.114***	0.054***	0.106***	0.052***
	(0.0020)	(0.0135)	(0.0020)	(0.0135)
Total assets to equity	-0.022	-0.143***	0.000	-0.138***
	(0.0009)	(0.0062)	(0.0009)	(0.0062)
Cash to total assets		0.050***		0.046***
		(0.0651)		(0.0653)
Market to Book value		0.763***		0.765***
		(0.0055)		(0.0054)
R^2	0.294	0.584	0.302	0.584
p value for Chi^2 test	0.000	0.000	0.000	0.000
Year-fixed effect	Yes	Yes	Yes	Yes
Industry-fixed effect	No	No	No	No

This table reports the seemingly unrelated simultaneous regression results using firm SCGI value as dependent variable according to equation (1) and firm value Tobin's Q as dependent variable according to equation (2). The differences between TLCs vs. non-TLCs for firm corporate governance quality and firm valuation are indicated by the Temasek dummy coefficients. Tobin's Q is the ratio of firm's assets market value to firm's assets book value. Industry-adjusted values are obtained by deducting the industry median based on the Fama-French 12 industries. Firm's corporate governance practice is quantified by our constructed index SCGI. Temasek dummy is equal to 1 if the firm has (or at least 5% if threshold=5%) common shares outstanding held by Temasek Holdings and 0 otherwise. Variables for firm statistics that are found to be correlated with firm valuation and corporate governance practice in the Pearson's correlation matrix are included in the regression as control variables. Firm size is the logarithm of the firm's total assets. Age is the logarithm of the number of years since the incorporation of the firm. Year-fixed effect is included in all regressions. Robust standard errors clustered by firm are provided in brackets under the coefficients. R^2 and p value for Chi square test are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE II.8 FIRM SCALES IMPACT

Panel A CSO% Threshold=0%

Size Rank	Number of firms		SCGI			Tobin's Q		
	Temasek=1	Temasek=0	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
1	7	778	0.576	0.590	-0.0141	1.509	1.248	0.2610
2	22	766	0.639	0.604	0.0344**	1.550	1.052	0.4981
3	22	769	0.634	0.612	0.0213	1.393	1.044	0.3497*
4	78	710	0.651	0.610	0.0414***	1.634	1.071	0.5631***
5	230	555	0.717	0.626	0.0903***	1.625	1.094	0.5312***

Panel B CSO% Threshold=5%

Size Rank	Number of firms		SCGI			Tobin's Q		
	Temasek=1	Temasek=0	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
1	1	784	0.575	0.590	-0.0150	0.853	1.251	-0.3979
2	2	786	0.661	0.605	0.0557	1.216	1.066	0.1505
3	11	780	0.616	0.613	0.0029	1.252	1.051	0.2011
4	27	761	0.684	0.612	0.0722***	1.943	1.097	0.8454***
5	129	656	0.743	0.636	0.1074***	1.755	1.150	0.6046***

In this table firms in the sample are sorted into 5 quintiles according to their total assets values in each year. Temasek takes the value of 1 if the firm has (or at least 5% if threshold=5%) common shares outstanding held by Temasek Holdings and 0 otherwise. Tobin's Q is the ratio of firm's assets market value to firm's assets book value. Industry-adjusted values are obtained by deducting the industry median based on the Fama-French 12 industries. Firm's corporate governance practice is quantified by our constructed index SCGI. Differences for the value of SCGI and Tobin's Q between TLC firms and non-TLC firms in each size quintiles are reported with ***, ** and *, denoting statistical significant for the *t*-test for group means at the 1%, 5% and 10% levels, respectively.

TABLE II.9 MATCHED SAMPLE UNIVARIATE TEST

Panel A Sample matched by size

| Variables | Threshold %CSO=0% | | Variables | Threshold %CSO=5% | |
	Paired Difference	Observations		Paired Difference	Observations
SCGI	0.0793***	310	SCGI	0.1026***	147
	11.06			*10.54*	
Tobin's Q	0.5644***	359	Tobin's Q	0.6836***	170
	9.67			*7.91*	
Adj. Tobin's Q	0.5501***	359	Adj. Tobin's Q	0.6882***	170
	9.67			*8.05*	

Panel B Sample matched by PSM score

| Variables | Threshold %CSO=0% | | Variables | Threshold %CSO=5% | |
	Paired Difference	Observations		Paired Difference	Observations
SCGI	0.0755***	310	SCGI	0.0752***	145
	11.53			*10.15*	
Tobin's Q	0.4450***	277	Tobin's Q	0.5915***	142
	6.34			*5.67*	
Adj. Tobin's Q	0.4441***	277	Adj. Tobin's Q	0.5852***	142
	6.63			*5.63*	

This table reports the pairwise differences of SCGI and Tobin's Q between TLC firms vs. non-TLC firms for the matched samples. In Panel A each TLC firm is matched according to firm size with a non-TLC firm in the sample in each year while in Panel B, firms are matched based on the scores generated by the Propensity Score Matching procedure. Firm characteristics size, age, ROA and asset to equity ratio are used for the matching procedure and one-to-one match without replacement is required. Tobin's Q is the ratio of firm's assets market value to firm's assets book value. Industry-adjusted values are obtained by deducting the industry median based on the Fama-French 12 industries. Firm's corporate governance practice is quantified by our constructed index SCGI. Differences for the value of SCGI and Tobin's Q between TLC firms and non-TLC firms are reported with ***, ** and *, denoting statistical significant for pairwise *t*-test at the 1%, 5% and 10% levels, respectively.

TABLE II.10 MATCHED SAMPLE REGRESSION ANALYSIS

Panel A Sample matched by size

	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	
	SCGI		Tobin's Q		SCGI	Tobin's Q	SCGI		Tobin's Q		SCGI	Tobin's Q
Temasek Dummy (threshold=0%)	0.334*** (0.0147)	0.107** (0.0724)	0.067* (0.0606)	0.012 (0.2581)	0.334*** (0.0078)	0.082*** (0.0434)						
Temasek Dummy (threshold=5%)							0.304*** (0.0180)	0.115** (0.0995)	0.064 (0.0942)	0.234 (0.5554)	0.442*** (0.0115)	0.066** (0.0496)
SCGI			0.108*** (0.3392)	0.100** (0.4074)					0.120*** (0.3726)	0.137*** (0.4527)		
Temasek Dummy*SCGI (threshold=0%)				0.059 (0.4187)								
Temasek Dummy*SCGI (threshold=5%)										-0.182 (0.7722)		
Number of observations	400	698	619	619			198	325	289	289		
Adj. R^2	0.458	0.785	0.802	0.801			0.525	0.868	0.880	0.880		
F-test	12.31	17.61	17.27	16.02			8.356	23.21	26.18	26.03		
R^2					0.409	0.743					0.504	0.851
p value for Chi^2 test					0.000	0.000					0.000	0.000

TABLE II.10 MATCHED SAMPLE REGRESSION ANALYSIS *(cont'd.)*

Panel B Sample matched by PSM score

	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	
	SCGI		Tobin's Q		SCGI	Tobin's Q	SCGI		Tobin's Q		SCGI	Tobin's Q
Temasek Dummy (threshold=0%)	0.219***	0.059*	0.034	-0.194	0.214***	0.044						
	(0.0129)	(0.0598)	(0.0635)	(0.2926)	(0.0071)	(0.0486)						
Temasek Dummy (threshold=5%)							0.405***	0.036	0.033	0.032	0.414***	-0.014
							(0.0156)	(0.0844)	(0.0947)	(0.4276)	(0.0082)	(0.0392)
SCGI			0.049*	0.022					0.027	0.027		
			(0.2785)	(0.2924)					(0.3413)	(0.4088)		
Temasek Dummy*SCGI (threshold=0%)				0.245								
				(0.4792)								
Temasek Dummy*SCGI (threshold=5%)										0.002		
										(0.5797)		
Number of observations	398	620	492	492			198	290	248	248		
Adj. R^2	0.433	0.739	0.780	0.780			0.507	0.868	0.868	0.867		
F-test	15.75	12.55	12.27	11.64			12.66	25.97	21.95	19.92		
R^2					0.469	0.728					0.557	0.902
p value for Chi^2 test					0.000	0.000					0.000	0.000

This table reports results using the matched samples for the regressions performed in Table 5 to 7. Results for univariate test are reported in Panel A. In Panel A each TLC firm is matched according to firm size with a non-TLC firm in the sample in each year while in Panel B, firms are matched based on the score generated by the Propensity Score Matching procedure. Firm characteristics size, age, ROA and asset to equity ratio are used for the matching procedure and one-to-one match without replacement is required. Only coefficients for Temasek dummy (indicating the differences for variable SCGI and Tobin's Q between the two comparing groups), SCGI and interaction terms are reported for simplicity while coefficients for the other control variables are omitted. Year-fixed effect is included in all regressions. Robust standard errors clustered by firm are provided in brackets under the coefficient. Adjusted R^2 and F-statistics are provided for panel OLS regression. R^2 and *p* value for Chi square test are provided for simultaneous regression. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE II.11 POST TEMASEK INVESTMENT FIRM PERFORMANCE

Panel A Firm Performance Post Temasek Investment

t	N	SCGI$_t$			Sub-IndexA$_t$			Sub-IndexB$_t$			Sub-IndexC$_t$		
		Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
0	49	71.43	60.58	10.84***	43.33	34.04	9.29***	96.00	88.48	7.52***	61.42	48.58	12.65***
1	47	70.88	60.14	10.74***	34.83	31.99	2.84***	95.12	89.10	6.02***	69.77	49.31	20.47***
2	40	66.96	59.75	7.21***	35.16	32.01	3.15***	95.15	89.24	5.91***	55.80	50.58	5.22
3	29	72.65	60.42	12.22***	35.02	32.19	2.83**	93.86	89.97	3.90*	76.83	54.45	22.39***
Mean	116	69.97	60.47	9.50***	34.99	32.19	2.80***	94.82	90.00	4.82***	66.72	54.58	12.14***

t	N	Sub-IndexD$_t$			Sub-IndexE$_t$			log(Q$_t$)			Adj. log(Q$_t$)		
		Temasek=1	Temasek=0	Difference				Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
0	49	83.21	72.26	10.94***	76.35	64.84	11.51***	2.0279	1.0890	0.9389***	0.8266	0.1122	0.7144***
1	47	76.67	71.93	4.74***	79.03	64.29	14.74***	1.5418	0.9954	0.5464***	0.6297	0.0720	0.5577***
2	40	78.32	72.04	6.28***	73.15	62.93	10.21***	1.5686	0.9896	0.5790***	0.5659	0.0520	0.5139***
3	29	82.48	71.39	11.09***	78.22	63.29	14.93***	1.7832	0.9752	0.8079***	0.7452	0.0417	0.7035***
Mean	116	78.69	71.45	7.24***	76.8	63.33	13.47***	1.6114	0.9703	0.6411***	0.6366	0.0371	0.5995***

TABLE II.11 POST TEMASEK INVESTMENT FIRM PERFORMANCE *(cont'd.)*

Panel B Difference in Difference Test

t	N	SCGI$_t$ - SCGI$_0$			Sub-IndexA$_t$ - Sub-IndexA$_0$			Sub-IndexB$_t$ - Sub-IndexB$_0$			Sub-IndexC$_t$ - Sub-IndexC$_0$		
		Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
1	47	-0.483	-1.18***	0.692	-8.68***	-2.20***	-6.48***	-0.709	0.689	1.40	8.48**	0.946**	7.54**
2	40	-5.44***	-2.09***	-3.35**	-10.07***	-2.72***	-7.35***	-1.75	0.577*	-2.33	-5.96	2.36***	-8.35*
3	29	-1.53	-1.72***	0.194	-11.15***	-3.49***	-7.66***	-4.37*	1.51	-5.87**	12.93***	9.58***	3.36
Mean	116	-2.45***	-0.942***	-1.51*	-9.78***	-0.791***	-8.98***	-1.98*	0.881***	-2.86**	4.62**	6.26***	-1.64

t	N	Sub-IndexD$_t$ - Sub-IndexD$_0$			Sub-IndexE$_t$ - Sub-IndexE$_0$			$\log(Q_t)$ - $\log(Q_0)$			Adj.$\log(Q_t)$ - Adj.$\log(Q_0)$		
		Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference	Temasek=1	Temasek=0	Difference
1	47	-6.51***	-1.32***	5.19***	2.92*	-1.94***	4.86***	-0.4996***	-0.0846***	0.4150***	-0.2059	-0.0263**	0.1796
2	40	-5.03**	-1.87***	-3.16	-4.23**	-4.04***	-0.182	-0.4885**	-0.0988***	-0.3897**	-0.2554	-0.0375***	-0.2179
3	29	-2.09	-2.77***	0.687	-1.15	-5.04***	3.89*	-0.4624**	-0.1476***	-0.3149	-0.2160	-0.0557***	-0.1602
Mean	116	-4.89***	-2.38***	-2.51**	-0.56	-3.19***	2.63**	-0.4865***	-0.0446***	-0.4419***	-0.2255**	-0.0176	-0.2078**

This table reports the results for the post performance study focusing on Temasek's investment activities. Panel A reports results for the comparisons between TLCs and non-TLCs. The year prior to the first year where Temasek is found to be a shareholder of a particular firm is labelled as year 0 and year 1, 2, 3 subsequently. Panel B reports results for the difference-in-difference test where the post Temasek investment years' firm performances are compared with that of year 0. Temasek is equal to 1 if the firm has common shares outstanding held by Temasek Holdings and 0 otherwise. T-statistics are found in italic. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

Appendix C Tables for Part III

TABLE III.1 SAMPLE SUMMARY STATISTICS

	Mean	STD	Min	25%	Median	75%	Max
Asset Turnover	0.80	0.67	0.00	0.32	0.69	1.07	4.13
Industry adjusted Asset Turnover	0.12	0.59	-0.95	-0.25	0.00	0.31	3.11
Free Cash Flows	0.03	0.13	-1.16	0.01	0.05	0.09	0.31
Q*Free Cash Flows	0.02	0.09	-1.16	0.00	0.00	0.06	0.28
SCGI	0.62	0.08	0.09	0.57	0.62	0.67	0.89
Sub-index A	0.34	0.09	0.00	0.30	0.32	0.36	0.80
Sub-index B	0.89	0.15	0.00	0.94	0.94	0.95	1.00
Sub-index C	0.51	0.19	0.00	0.36	0.49	0.61	1.00
Sub-index D	0.73	0.10	0.09	0.67	0.73	0.80	1.00
Sub-index E	0.66	0.12	0.07	0.59	0.66	0.73	0.99
Size	5.78	1.62	2.87	4.67	5.49	6.62	10.84
Leverage	0.19	0.16	0.00	0.05	0.17	0.31	0.63
Q Ratio	1.07	0.64	0.28	0.73	0.91	1.16	4.46
Temasek Holdings %	1.48%	7.82%	0.00%	0.00%	0.00%	0.00%	100.00%

This table reports the summary statistics of the sample firms. Statistics are measured over the period of 2008-2014 for 913 firms.

TABLE III.2 POOLED SAMPLE PEARSON'S CORRELATION TABLE

	Asset Turnover	Free Cash Flows	Q Dummy	SCGI	Sub-index A	Sub-index B	Sub-index C	Sub-index D	Sub-index E	Size	Leverage	Q Ratio	Temasek Holdings %
Asset Turnover	1	0.114***	-0.082***	0.040*	0.041**	-0.042**	0.024	0.039*	0.041**	-0.202***	-0.091***	0.032	-0.026
Free Cash Flows		1	-0.010	0.088***	0.030	0.026	0.050**	0.094***	0.068***	0.194***	0.050**	-0.023	0.029
Q Dummy			1	-0.119***	-0.036*	0.010	-0.120***	-0.092***	-0.088***	-0.057***	0.024	-0.781***	-0.158***
SCGI				1	0.474***	0.373***	0.703***	0.679***	1.320***	0.244***	-0.010	0.117***	0.308***
Sub-index A					1	0.226***	0.070***	0.215***	0.276***	0.002	-0.019	-0.009	0.114***
Sub-index B						1	0.138***	0.113***	0.163***	-0.004	-0.021	0.019	0.078***
Sub-index C							1	0.276***	0.307***	0.333***	0.061***	0.143***	0.275***
Sub-index D								1	0.379***	0.191***	0.031	0.059***	0.123***
Sub-index E									1	0.154***	-0.048**	0.089***	0.249***
Size										1	0.314***	0.058***	0.346***
Leverage											1	-0.028	-0.025
Q Ratio												1	0.187***
Temasek Holdings %													1

This table shows the Pearson's correlation coefficients among the variables for the pooled sample from 2008 to 2014. The pooled sample correlation test is performed using all firms over the sample period. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE III.3 VARIABLE MEANS OF SUBGROUPS

SCGI Ranking	Number of Observations	SCGI	Asset Turnover	Industry-adjusted Asset Turnover	Free Cash Flows	Q*Free Cash Flows	Size	Leverage	Q Ratio	Temasek Holdings %
Overall	3,330	0.62	0.80	0.12	0.03	0.02	5.78	0.19	1.07	1.48%
1	662	0.51	0.75	0.05	0.01	0.01	5.22	0.19	1.05	0.05%
2	668	0.58	0.78	0.10	0.03	0.02	5.46	0.20	0.99	0.26%
3	668	0.62	0.80	0.10	0.04	0.03	5.60	0.19	0.99	0.19%
4	668	0.65	0.89	0.16	0.04	0.02	5.77	0.18	1.06	0.50%
5	664	0.72	0.79	0.16	0.04	0.02	6.82	0.20	1.27	6.41%

This table reports the univariate test results. Firms are ranked according to its SCGI value in each year and divided into 5 groups with group 1 having the lowest SCGI value and group 5 the highest. Asset turnover is the ratio of firm annual sales over its total assets. Industry-adjusted values are firm raw data deducted by the industry median according to the Fama-French 12 industries classifications. Free cash flow is calculated by subtracting the sum of tax expense, interest expense and dividend pay-outs from operating income and scaled by assets. Firm size is the logarithm of the firm's total assets. Leverage is the debt to asset ratio. Tobin's Q is the ratio of firm's assets market value to firm's assets book value. Percentage of Temasek Holdings is equal to the percentage of shares outstanding held by Temasek Holdings in a particular year.

TABLE III.4 REGRESSION ANALYSIS OF AGENCY COSTS AND SCGI

Panel A

	(1)	(2)	(3) Industry-adjusted
	Asset Turnover	Asset Turnover	Asset Turnover
SCGI	0.078***	0.021*	0.101***
	(0.208)	(0.0913)	(0.179)
Size	-0.099**	-0.245***	-0.105***
	(0.0197)	(0.0221)	(0.00389)
Leverage	0.007	-0.020	0.017*
	(0.130)	(0.0950)	(0.0258)
Q Ratio	0.082***	0.002	0.097***
	(0.0278)	(0.0206)	(0.00933)
Temasek Dummy	-0.014	0.015	-0.018
	(0.0647)	(0.0312)	(0.0411)
Number of observations	3,321	3,321	3,321
Adj. R^2	0.252		
F-statistics	5.666		43.73
Chi^2		27.25	

Panel B

	(1)	(2)	(3)
	Q*FCF	Q*FCF	Q*FCF
SCGI	0.439***	0.215*	1.047***
	(0.146)	(0.127)	(0.259)
$SCGI^2$	-0.455***	-0.181	-1.029***
	(0.122)	(0.104)	(0.212)
Size	0.139***	0.135***	0.145***
	(0.00170)	(0.00163)	(0.00109)
Leverage	0.005	-0.010	0.014
	(0.0143)	(0.0156)	(0.00657)
Temasek Dummy	-0.058***	-0.060***	-0.050**
	(0.00642)	(0.00599)	(0.00549)
Number of observations	2,310	2,310	2,310
Adj. R^2	0.040		
F-statistics	6.626		19.95
Chi^2		26.08	

This table reports the OLS regression analysis on SCGI and agency costs proxies. Asset turnover ratio is used as dependent variable in Panel A while Q*FCF in Panel B. Q*FCF is the interaction term between free cash flow value (FCF) and the dummy for firm growth prospects (Q). Q dummy variable is equal to 1 for low growth firms that have industry adjusted Tobin's Q smaller than the sample median and 0 for high growth firms. Firm growth opportunity is measured by Tobin's Q, which is the ratio of firm's assets market value to firm's assets book value. Temasek dummy is equal to 1 if the firm has common shares outstanding held by Temasek Holdings and 0 otherwise. Firm size and leverage are also included in the regression as control variables. Columns 1 to 3 reports the coefficients for panel regression, pooled regression and Fama-MacBeth regression respectively. Year and industry dummies are included in OLS regressions, but their coefficients (as well as the constant) are omitted. Robust standard errors clustered by firm are provided in brackets under the coefficient. Adjusted R^2 and F-statistics are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE III.5 REGRESSION ANALYSIS OF AGENCY COSTS AND SCGI RANKINGS

Panel A

	(1)	(2)	(3)
			Industry-adjusted
	Asset Turnover	Asset Turnover	Asset Turnover
SCGI R5	0.099***	0.008	0.108***
	(0.0546)	(0.0224)	(0.0322)
SCGI R4	0.080***	0.019	0.091**
	(0.0498)	(0.0221)	(0.0495)
SCGI R3	0.052*	0.014	0.050**
	(0.0488)	(0.0189)	(0.0265)
SCGI R2	0.040	0.012	0.043
	(0.0457)	(0.0197)	(0.0453)
Size	-0.105**	-0.247***	-0.106***
	(0.0195)	(0.0221)	(0.00306)
Leverage	0.008	-0.020	0.017*
	(0.130)	(0.0948)	(0.0310)
Q Ratio	0.082***	0.000	0.100***
	(0.0276)	(0.0207)	(0.00768)
Temasek Dummy	-0.012	0.016	-0.009
	(0.0653)	(0.0310)	(0.0361)
Number of observations	3,321	3,321	3,321
Adj. R^2	0.253		
F-statistics	3.897		44.71
Chi^2		29.22	

TABLEIII. 5 REGRESSION ANALYSIS OF AGENCY COSTS AND SCGI RANKINGS *(cont'd.)*

Panel B

	(1) Q*FCF	(2) Q*FCF	(3) Q*FCF
SCGI R5	-0.005	0.008	0.006
	(0.00674)	(0.00706)	(0.00523)
SCGI R4	0.048	0.049	0.052
	(0.00716)	(0.00783)	(0.00743)
SCGI R3	0.091***	0.082***	0.097**
	(0.00684)	(0.00685)	(0.00820)
SCGI R2	0.048	0.037	0.054
	(0.00737)	(0.00791)	(0.00723)
Size	0.131***	0.138***	0.133***
	(0.00165)	(0.00159)	(0.000845)
Leverage	0.006	-0.010	0.018
	(0.0142)	(0.0155)	(0.00686)
Temasek Dummy	-0.058***	-0.050***	-0.059***
	(0.00623)	(0.00546)	(0.00490)
Number of observations	2,310	2,310	2,310
Adj. R^2	0.043		
F-statistics	6.104		14.67
Chi^2		39.59	

This table reports the OLS regression analysis on SCGI ranking dummies and agency costs proxies. A dummy for each SCGI raking groups is give the value of 1 if a firm falls into a particular group within a year and 0 otherwise. Asset turnover ratio is used as dependent variable in Panel A while Q*FCF in Panel B. Q*FCF is the interaction term between free cash flow value (FCF) and the dummy for firm growth prospects (Q). Q dummy variable is equal to 1 for low growth firms that have industry adjusted Tobin's Q smaller than the sample median and 0 for high growth firms. Firm growth opportunity is measured by Tobin's Q, which is the ratio of firm's assets market value to firm's assets book value. Temasek dummy is equal to 1 if the firm has common shares outstanding held by Temasek Holdings and 0 otherwise. Firm size and leverage are also included in the regression as control variables. Columns 1 to 3 reports the coefficients for panel regression, pooled regression and Fama-MacBeth regression respectively. Year and industry dummies are included in OLS regressions, but their coefficients (as well as the constant) are omitted. Robust standard errors clustered by firm are provided in brackets under the coefficient. Adjusted R^2 and F-statistics are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.

TABLE III.6 REGRESSION ANALYSIS OF AGENCY COSTS AND SUB-INDICES

Panel A

	(1) Asset Turnover	(2) Asset Turnover	(3) Asset Turnover	(4) Asset Turnover	(5) Asset Turnover	(6) Asset Turnover
Sub-index A	-0.006					-0.024
	(0.195)					(0.189)
Sub-index B		-0.022				-0.039
		(0.133)				(0.139)
Sub-index C			0.121***			0.111***
			(0.0824)			(0.0902)
Sub-index D				0.063**		0.039
				(0.183)		(0.193)
Sub-index E					0.056**	0.021
					(0.145)	(0.156)
Size	-0.079*	-0.081*	-0.114**	-0.092**	-0.090*	-0.126***
	(0.0199)	(0.0196)	(0.0191)	(0.0193)	(0.0197)	(0.0183)
Leverage	0.002	0.002	0.007	0.001	0.006	0.005
	(0.130)	(0.131)	(0.129)	(0.129)	(0.130)	(0.128)
Q Ratio	0.089***	0.088***	0.077***	0.086***	0.085***	0.075***
	(0.0279)	(0.0278)	(0.0272)	(0.0274)	(0.0279)	(0.0272)
Temasek Dummy	-0.000	0.002	-0.018	-0.004	-0.008	-0.014
	(0.0631)	(0.0621)	(0.0651)	(0.0643)	(0.0644)	(0.0630)
Number of observations	3,321	3,321	3,321	3,321	3,321	3,321
F-statistics	0.248	0.248	0.257	0.251	0.250	0.260
Adj. R^2	3.543	4.002	9.729	4.859	4.748	6.141

TABLE III.6 REGRESSION ANALYSIS OF AGENCY COSTS AND SUB-INDICES *(cont'd.)*

Panel B

	(1) Q*FCF	(2) Q*FCF	(3) Q*FCF	(4) Q*FCF	(5) Q*FCF	(6) Q*FCF
Sub-index A	0.046					-0.042
	(0.0656)					(0.0712)
Sub-index A^2	-0.079					-0.001
	(0.0803)					(0.0829)
Sub-index B		0.114				0.112
		(0.0687)				(0.0718)
Sub-index B^2		-0.087				-0.076
		(0.0491)				(0.0487)
Sub-index C			0.235**			0.195*
			(0.0430)			(0.0458)
Sub-index C^2			-0.245***			-0.200**
			(0.0368)			(0.0387)
Sub-index D				0.075		-0.186
				(0.102)		(0.131)
Sub-index D^2				-0.076		0.172
				(0.0750)		(0.0927)
Sub-index E					0.359***	0.381***
					(0.0727)	(0.0825)
Sub-index E^2					-0.373***	-0.386***
					(0.0567)	(0.0635)
Size	0.127***	0.129***	0.135***	0.126***	0.136***	0.148***
	(0.00168)	(0.00168)	(0.00165)	(0.00167)	(0.00171)	(0.00165)
Leverage	0.007	0.007	0.007	0.008	0.005	0.003
	(0.0143)	(0.0142)	(0.0143)	(0.0142)	(0.0144)	(0.0144)
Temasek Dummy	-0.070***	-0.075***	-0.065***	-0.071***	-0.063***	-0.060***
	(0.00623)	(0.00654)	(0.00644)	(0.00635)	(0.00631)	(0.00661)
Number of observations	2,310	2,310	2,310	2,310	2,310	2,310
Adj. R^2	0.037	0.037	0.039	0.037	0.040	0.040
F-statistics	5.404	5.348	7.283	4.939	6.691	4.039

This table reports the OLS regression analysis on SCGI sub-indices and agency costs proxies. Asset turnover ratio is used as dependent variable in Panel A while Q*FCF in Panel B. Q*FCF is the interaction term between free cash flow value (FCF) and the dummy for firm growth prospects (Q). Q dummy variable is equal to 1 for low growth firms that have industry adjusted Tobin's Q smaller than the sample median and 0 for high growth firms. Firm growth opportunity is measured by Tobin's Q, which is the ratio of firm's assets market value to firm's assets book value. Temasek dummy is equal to 1 if the firm has common shares outstanding held by Temasek Holdings and 0 otherwise. Firm size and leverage are also included in the regression as control variables. Columns 1 to 3 reports the coefficients for panel regression, pooled regression and Fama-MacBeth regression respectively. Year and industry dummies are included in OLS regressions, but their coefficients (as well as the constant) are omitted. Robust standard errors clustered by firm are provided in brackets under the coefficient. Adjusted R2 and F-statistics are also provided. ***, ** and * denote statistical significant at the 1%, 5% and 10% levels, respectively.