International aspects of capital allocation efficiency

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International aspects of capital allocation efficiency

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A fundamental job of the economy is to allocate capital efficiently. This thesis is about capital allocation efficiency: its causes, internal dynamics and contributions to output growth. The conventional explanation for output growth relies on banking development and stock market liquidity (Levine & Zervos, 1998). However, financial liberalization and "big push" strategies for investment smother economic development amid the recovery from the 2008 global financial crisis, thus suggesting that economists may have badly overstressed the role of banking development; the past crises caused by an over-developed credit market have led economies to grow disproportionately. Whereas most previous empirical studies focused on banking and stock market development, little was known about capital allocation efficiency prior to the study by Wurgler (2000), who focused on whether and how financial markets improve the allocation of capital. Capital allocation efficiency has an overarching effect on sustained output growth: if financial markets and institutions do not perform this fundamental allocative function, sustained economic growth will not happen, and without sustained economic growth, development will not happen. Following the inspiration regarding growth dynamics provided by The Growth Report (Commission on Growth and Development, 2008), ten developing countries were identified as having sustained output growth (seven per cent or higher) over the past 25 years. Nine out of these ten countries (90 per cent) registered the highest growth rate in the broad financial intermediation sector, followed by the manufacturing sector. This finding motivates this thesis, a study of how financial capital allocation efficiency is correlated with sustained output growth in developing countries and whether the high output growth of developing countries can be explained and, importantly, repeated.

This thesis aims at providing a better understanding on the aforementioned issues. In particular, it presents three empirical articles, which investigate the following important themes:

1. What is the role of financial capital allocation efficiency in explaining output growth in developing countries?

2. How do external monitoring mechanisms shape a firm's payout policy and improve the firm's capital allocation efficiency through the actions of short sellers?

3. Are developing countries still able to achieve sustained output growth by directing investment into the manufacturing sector? Has the importance of manufacturing in economic development changed?

Predicated on the above research questions, the empirical findings indicate:

1. The role of capital allocation efficiency positively contributes to output growth of developing countries, it also plays a predictive role in short- and long-term output growth.
2. Rigid external monitoring mechanisms can curb managerial misbehaviour and encourage managers to pursue value-maximizing and growth-enhancing investment policies, thus, improving the firm's output growth.
3. The development quality and quantity of the manufacturing sector in developing countries relative to other sectors have not changed over the last 40 years. The findings indicate that it is not the contribution of manufacturing to economic development that has changed and made the path of industrialization more difficult, but that it is country-specific conditions and policies that have made differences in the outcome.

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ABSTRACT

This thesis consists of three stand-alone studies. Chapters 1 and 5 provide a general introduction and conclusion to the three stand-alone studies. Chapters 2 to 4 present the three stand-alone studies, which are related to international aspects of capital allocation efficiency.

Chapter 2 extends the output growth model tested by Levine and Zervos (1998) by including a measure of capital allocation efficiency proxied by the financial incremental capital output ratio (*ICOR*) for developing countries. Over a span of 15 years, capital allocation efficiency has played a key role in explaining the economic development of developing countries after controlling for the variables in Levine and Zervos's (1998) model. Chapter 2 further extends the output growth model to provide a firm-level analysis and confirms that external monitoring mechanisms, as reflected by the stock price informativeness, are a determinant of firm output growth. These results are consistent with Roll's (1988) claim: more information-laden stock prices signal efficient stock markets and therefore stronger output growth. The robustness tests further strengthen chapter 2's findings, confirming that they are not driven by omitted heterogeneity or reverse causality. In addition to the positive contribution of capital allocation efficiency to output growth, the evidence also suggests that capital allocation efficiency plays a predictive role in short- and long-term output growth.

Chapter 2 argues that better capital allocation efficiency corresponds to stronger firm economic performance when managers are more disciplined by external monitoring mechanisms. Chapter 3 continues in this spirit by explicating the actions of short sellers, who act in an external monitoring role as catalysts that

exacerbate situations and lead firms to pay out more to mitigate agency costs. Using firm-level short-selling data over a time span of nine years from 2002 to 2010, across 40 countries, I document a positive correlation between activism in the short-selling market and firm capital allocation efficiency. Taking an exogenous event-based approach (cross-sectional equities announcements across 91-day windows), I provide strong evidence for a causal relationship between short-selling potential and firm payout ratio. Overall, the findings presented in chapter 3 suggest that short-selling potential has a disciplining role vis-à-vis managers, disciplining them to retain less excessive earnings and increase the firm's payout.

Manufacturing has traditionally played a key role in the economic development of developing countries. However, it has recently been argued that the importance of manufacturing has diminished over the last 20-25 years, resulting in premature deindustrialization or non-industrialization in developing countries. Chapter 4 explores whether the low levels of industrialization in developing countries are attributable to long-term changes in the opportunities available to the manufacturing sector worldwide. Chapter 4's findings show that the manufacturing sector's value added and employment contribution to world GDP and employment, respectively, have not changed noticeably since 1970. The declining manufacturing value added and employment share in many developing countries have not been caused by changes in the sector's development potential but have instead resulted from a shift of manufacturing activities to a relatively small number of populous countries, resulting in the concentration of manufacturing activities in specific developing countries. As was the case in the last millennium, industrialization has continued to play a key role in the growth of

developing countries, which have sustained rapid and long-term growth over the last 25 years. Achieving economic development by following the path of industrialization will likely remain important for low-income countries because they are able to take advantage of their backwardness relative to those countries that have already industrialized through a disproportionally large share of manufacturing activities; this will allow them to soon enter a mature stage of industrialization. Therefore, chapter 4 confirms that developing countries are still able to achieve sustained output growth by investing in the manufacturing sector. This is consistent with the key message of this thesis that sustained output growth is achievable when capital is directed to its highest-value use.

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CHAPTER 1

INTRODUCTION

1.1 Research background, objectives, and primary findings of the thesis

A fundamental job of the economy is to allocate capital efficiently. This thesis is about capital allocation efficiency: its causes, internal dynamics and contributions to output growth. The conventional explanation for output growth relies on banking development and stock market liquidity (Levine & Zervos, 1998). However, financial liberalization and "big push" strategies for investment smother economic development amid the recovery from the 2008 global financial crisis, thus suggesting that economists may have badly overstressed the role of banking development; the past crises caused by an over-developed credit market have led economies to grow disproportionately. Whereas most previous empirical studies focused on banking and stock market development, little was known about capital allocation efficiency prior to the study by Wurgler (2000), who focused on whether and how financial markets improve the allocation of capital. Capital allocation efficiency has an overarching effect on sustained output growth: if financial markets and institutions do not perform this fundamental allocative function, sustained economic growth will not happen, and without sustained economic growth, development will not happen. Following the inspiration regarding growth dynamics provided by The Growth Report (Commission on Growth and Development, 2008), ten developing countries were identified as having sustained output growth (seven per cent or higher) over the past 25 years. Nine out of these ten countries (90 per cent) registered the highest growth rate in the broad financial intermediation sector, followed by the manufacturing sector. This finding motivates this thesis, a study of how capital allocation efficiency is correlated with sustained output growth in developing

countries and whether the high output growth of developing countries can be explained and, importantly, repeated.

This thesis aims at providing a better understanding on the aforementioned issues. In particular, it presents three empirical articles, which investigate the following important themes:

1. *What is the role of financial capital allocation efficiency in explaining output growth in developing countries?*

2. *How do external monitoring mechanisms shape a firm's payout policy and improve the firm's capital allocation efficiency through the actions of short sellers?*

3. *Are developing countries still able to achieve sustained output growth by directing investment into the manufacturing sector? Has the importance of manufacturing in economic development changed?*

The first article in Chapter 2 investigates how capital allocation efficiency within the financial intermediation sector corresponds with sustained output growth in developing countries. An economy with better allocation of capital may reflect more rigid governance and better institutions. The findings lend additional empirical support for findings presented in the existing literature, such as those of King and Levine (1993) regarding the importance of financial intermediation development for sustaining high economic growth over long periods of time. Similar to Wurgler (2000), Chapter 2 uses financial intermediation sector data to gauge capital allocation efficiency; this measure quantifies the link between the capital allocation efficiency of the financial intermediation sector and overall economic growth. Capacity and capital utilization concepts, in conjunction with

New Structural Economics theories, jointly explain how and why the allocative function of the financial intermediation sector is a determinant of output growth in developing countries. Chapter 2 recognizes that capital allocation efficiency can be better measured at firm level through stock price informativeness. It attempts to reconcile the results of the external monitoring mechanisms study presented by Holmström and Tirole (1993) with the information-based interpretations of stock prices presented by Chan and Hameed (2006), Durnev, Morck, and Yeung (2004), Fernandes and Ferreira (2008), Ferreira and Laux (2007), Morck, Yeung and Yu (2000), and Piotroski and Roulstone (2004) by showing that rigid external monitoring mechanisms can curb managerial misbehaviour and encourage managers to pursue value-maximizing and growth-enhancing investment policies, thus, improving the firm's output growth.

The second article in Chapter 3 focuses on external monitoring mechanisms. It studies how the actions of short sellers can promote external monitoring mechanisms, which have direct implications for firm payout policies and firm capital allocation efficiency. Following the early literature, short sales help facilitate incorporation of negative information into stock prices (Diamond & Verrecchia, 1987; Miller, 1977), and society can share this negative information through the price system (Hayek, 1945). Corporate stakeholders, such as capital providers, customers, suppliers, managers and other employees, then update their relationships with firms based on the information that they have obtained from stock prices (Baumol, 1965; Bond, Goldstein & Prescott, 2010). Chapter 3 revisits the external monitoring mechanisms study by Holmström and Tirole (1993) to discuss how the actions of short sellers can curb managerial misbehaviour and encourage managers to payout more excessive earnings but

to retain payout when a positive NPV project is identified. The findings in Chapter 3 provide empirical evidence support for the actions of short sellers, who act in an external monitoring role and lead firms to pay out more to mitigate agency costs.

The third article in Chapter 4 focuses on a current debate in development economics regarding whether countries are still able to achieve sustained output growth by directing investment into the manufacturing sector. Kuznets (1966) described the long-term development patterns of countries based on empirical analyses of national accounts and argued that industrialization - or increases in the share of manufacturing in GDP - is a key feature of modern economic growth. The conventional research literature highlights the importance of manufacturing development. Moreover, United Nations Sustainable Development Goal 9 (SDG 9), which is a mandate to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, also demonstrates the emphasis on the role of manufacturing in economic development. Recent empirical studies by Amirapu and Subramanian (2015), Dasgupta and Singh (2006), Ghani and O'Connel (2014), Rodrik (2015) show that premature deindustrialization or non-industrialization has been increasingly noticeable among developing countries that had a lower share of manufacturing in their GDP at their peak; these countries also peaked at a much lower income level than the early industrializers. Although the debate regarding whether or not services can become a new growth-enhancing sector continues, research indicates that premature deindustrialization is currently apparent in developing countries and that manufacturing no longer serves as an engine of growth in these countries. If this is the case, it is no longer efficient to direct capital into the manufacturing

sector to help foster economic growth. Nonetheless, the findings in the Chapter 4 show that the manufacturing sector's value added and employment contribution to world GDP and employment, respectively, have not changed noticeably since 1970. The declining manufacturing value added and employment share in many developing countries have not been caused by changes in the sector's development potential but have instead resulted from a shift of manufacturing activities to a relatively small number of populous countries, resulting in the concentration of manufacturing activities in specific developing countries.

1.2 Contribution of the thesis

This thesis makes several contributions to the empirical studies, which can be categorized into two primary groups. The first group relates to the empirical studies of capital allocation efficiency, and the second relates to development economics. This thesis examines the capital allocation efficiency within two broad economic sectors, namely, the financial intermediation and manufacturing sectors, and how they contribute to output growth in developing countries.

It cannot be debated that labour and capital productivity growth have direct implications for output growth. Strong capital allocation efficiency allows a country to take better advantage of its investment opportunities. If investment is effective, it should increase the long-run aggregate supply of the economy through productive capacity, which could sustain long-term economic output growth. Capital allocation efficiency not only has implications for output growth through effective investment but also increases the trade competitiveness of an economy and reduces its vulnerability to systematic market fluctuations; ultimately, these allow a country to pursue sustainable economic development and experience

capital accumulation. An economy with better allocation of capital increases investment in growing industries and decreases it in declining industries; this leads to a more competitive economy, a higher economic surplus, rapid capital accumulation and rapid upgrading of the factor endowment structure. After decoupling banking and stock market development from output growth in Levine and Zervos's (1998) model, capital allocation efficiency reflects governance quality and institutional development within an economy. Because capital is scarce in developing countries, there is a tendency for a country's capital allocation efficiency to reveal whether a country possesses the necessary capabilities to allocate the investment inflows to the economy efficiently. Furthermore, the levels of absorptive capabilities - primarily capital stocks - are revealed, and these capabilities increase the long-run aggregate supply of the economy through productive capacity and allow it to catch up, i.e. reduce the per capita income gap with higher-income countries. How is capital allocation efficiency positively correlated with output growth in developing countries? This is the central question addressed in this thesis.

First, Chapter 2 empirically investigates whether financial capital allocation efficiency is able to explain economic output growth and firm output growth in developing countries. The results of Chapter 2 support the predictive power of financial capital allocation efficiency, in addition to banking and stock market development, for short- and long-term output growth. Financial capital allocation efficiency plays a key role in explaining how well financial markets and institutions direct an economy's capital and savings to their highest-value uses. To better elucidate financial capital allocation efficiency, Chapter 2 provides further insights and a comprehensive view of the effects of investment – the effects of capital

stocks within the financial intermediation sector on output growth. Following the capacity concept, the results confirm that the conventional "big push"' strategy has a negative or, at best, the least positive contribution to output growth in developing countries. Furthermore, the capital utilization concept and interpretations based on Heckscher-Ohlin's model compliment the capacity concept argument that a "big push" policy is likely to be a comparative advantage-defying strategy for developing countries that will inevitably fail and decrease the ability of developing countries to achieve sustainable economic growth. When financial capital allocation efficiency can be better measured at firm level through stock price informativeness, Chapter 2 confirms that stock price informativeness is positively correlated with firm output growth. By reconciling external monitoring mechanisms and information-based interpretations of stock prices, it can be seen that rigid monitoring mechanisms curb managerial misbehaviour. In a similar fashion to the process described in Jensen's (1986) agency theory, pressure from external investors, in addition to managerial ownership, encourages managers to pursue value-maximizing and growth-enhancing investment policies; thus, stronger firm output growth is expected. How do external monitoring mechanisms improve capital allocation efficiency?

Chapter 3 further investigates external monitoring mechanisms through the particular role of short selling. Chapter 3 confirms that external monitoring mechanisms are strengthened by the actions of short sellers, whose short-selling actions play an external monitoring role by serving as a catalyst that exacerbates situations. Coupling short selling with managerial incentives - including takeovers and compensation contracts, as described by Holmström and Tirole (1993, p. 679) - causes managers to pay out more of the excessive earnings to

shareholders in order to mitigate agency costs. Managers will retain earnings when a project with potentially positive NPV is identified. Chapter 3 illustrates how external monitoring mechanisms perform a fundamental allocative function through the actions of short sellers.

The second empirical study group relates to development economics and manufacturing development. Conventional studies identify the long-term development patterns of countries based on empirical analyses of national accounts and argue that industrialization - or increases in the share of manufacturing in GDP - is a key feature of modern economic growth. Are developing countries still able to achieve output growth by directing investment to the manufacturing sector? Chapter 4 focuses on manufacturing development within developing countries by looking into the premature industrialization or non-industrialization issue. This study rejects the following claims: (i) manufacturing is no longer the driver of economic growth in developing countries (based on Kaldor's formulations) and (ii) the share of manufacturing value added (MVA) and employment relative to that of other sectors have decreased significantly in developing countries. The findings in Chapter 4 are consistent with the capital allocation efficiency interpretation that in an environment with efficient allocation of capital, capital is directed to its highest-value use. This has policy implications for the governments of developing countries: encouraging pro-active intervention that directs investment into growth-enhancing sectors, for instance, the manufacturing sector, is deemed essential to sustain output growth. By developing a unique dataset, Chapter 4 explores the role of manufacturing in explaining output growth by focusing on its economic and employment performance. Despite recent assertions of shrinking opportunities for

manufacturing development in developing countries and a decrease in the importance of manufacturing for their economic development, this study shows that there is no evidence supporting this argument. I do not assume that the trends observed in my analysis will continue in the future. However, given the recent claims about the diminishing significance of manufacturing and the increasing difficulty of pursuing economic development by following the conventional path of industrialization, the evidence presented in Chapter 4, which shows that the significance of manufacturing remained unaltered during the two periods studied (1970-1990 and 1990-2013) is significant. Despite the importance of external monitoring mechanisms, governance quality and institutional development, Chapter 4 lends support to manufacturing development based on co-ordination and externalities. It is also desirable for the government to play a pro-active role in facilitating industrial upgrading and diversification in the development process to improve the allocation of capital and achieve sustainable output growth.

Taken together, the empirical findings documented in this thesis have several important implications for output growth through efficient capital allocation. Financial liberalization and “big push” strategies for investment smother economic development amid recovery from global financial crises. The best way to upgrade a country’s endowment structure and reduce the gap in per capita income with higher-income countries is to develop an economy according to the comparative advantages determined by its given endowment structure at that time. In addition, the results of this thesis also highlight the importance of (i) sound institutional characteristics and a transparent information environment for improving the production and provision of information to the market and (ii) a pro-

active role of government in facilitating industrial upgrading and diversification in the development process, thus improving the allocation of capital and thus contributing to output growth.

1.3 Structure of the thesis

This thesis is organised into five chapters. Chapter 1 provides a general introduction to the three stand-alone studies. Chapter 2 investigates the role of financial capital allocation efficiency in explaining economic and firm output growth. Chapter 3 examines activism in the short-selling market and firm capital allocation efficiency. Chapter 4 investigates whether the manufacturing sector is still the driver of economic growth in developing countries. Finally, Chapter 5 summaries the thesis. Because this thesis is structured as three stand-alone studies that all attempt to address international aspects of capital allocation efficiency, the structure has resulted in some overlaps across chapters, specifically the related literature, datasets and variable construction.

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CHAPTER 2

INTERNATIONAL ASPECTS OF CAPITAL ALLOCATION EFFICIENCY

2.1 Introduction

This chapter extends the Levine and Zervos (1998) model by considering for developing countries whether there is an association between output growth[1] and the ability of an economy to efficiently allocate funds within the financial intermediation sector. The importance of capital allocation efficiency is highlighted by Wurgler (2000, p. 188), who notes that this is a fundamental job of an economy. To achieve efficient allocation, capital should be invested in sectors that are expected to have high returns and withdrawn from those with poor prospects. Thus, the output growth model of Levine and Zervos (1998) is likely to be improved by considering the role of capital allocation efficiency. This chapter confirms that rigid governance and efficient institutions as reflected by better allocation of capital within the broad financial intermediation sector is a determinant of output growth in developing countries, after controlling for the variables in Levine and Zervos's (1998) model. The result holds regardless of whether I gauge capital allocation efficiency at the country level, using the financial incremental capital output ratio (*ICOR*), or at the firm level, using stock price informativeness.

The conventional explanation for economic growth relies on banking development and stock market liquidity; this held true for the 47 selected countries, which included 20 developing countries (Levine & Zervos, 1998).

[1] In Levine and Zervos (1998), output growth is defined as GDP per capita growth.

Schumpeter's (1912) view is that well-functioning banks spur technological innovation by identifying and funding those entrepreneurs with the best chance of successfully implementing innovative products and production processes. Levine (1997) examines the channels through which technological innovation may contribute to output growth and describes the role of banking development[2] in economic development. In his definition, a well-functioning financial system (i) reduces information and transaction costs and (ii) facilitates ownership trading[3] in the economy's productive technologies; as such, the development of financial intermediation is a good predictor of output growth through productivity growth (King & Levine, 1993; Levine, 1997; Levine & Zervos, 1998). The study of Beck, Demirgüç-Kunt and Maksimovic (2008) explains that a dynamic banking system correlates with sustained prosperity and the ready financing of entrants. A more recent study by Morck, Deniz Yavuz and Yeung (2011) shows that capital allocation efficiency plays a complimentary role in explaining economic growth in conjunction with banking development.

In a more-liquid stock market, it is less expensive to trade equities; this reduces the disincentive to invest in long-duration projects because investors can easily sell their stake if they need their savings before the maturity date. In the long run, liquidity facilitates low trading costs and long-duration investments. Importantly,

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[2] A proxy for banking development as measured by bank loans to private enterprises divided by GDP (Levine & Zervos, 1998, p. 542).

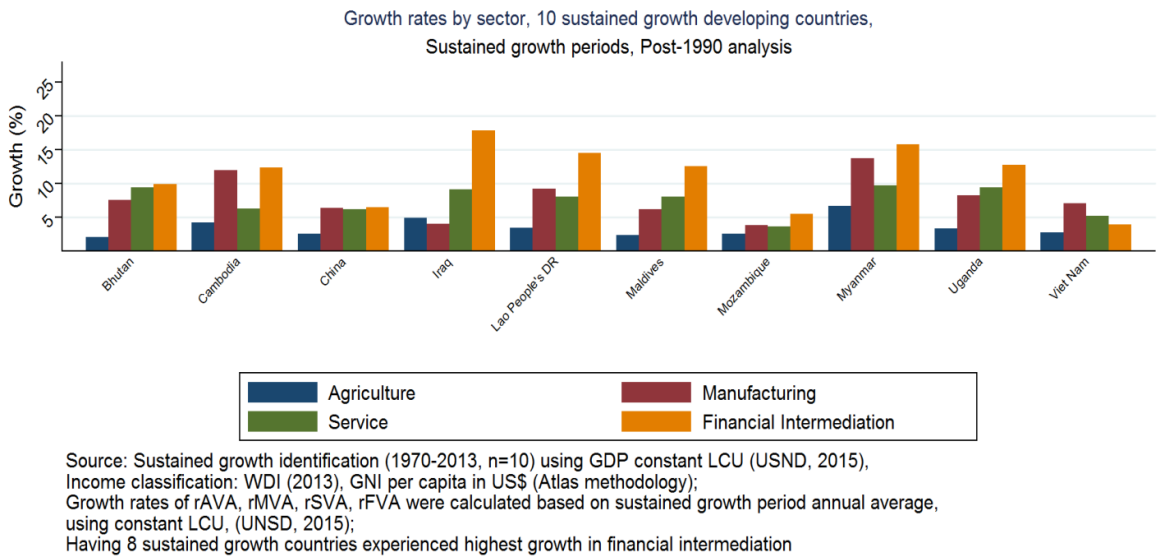
[3] Levine and Zervos (1998) refer to the ability to trade ownership as stock market liquidity, which is measured by value traded; see p. 540 in Levine and Zervos (1998).

if investment is effective, it should increase long-run aggregate supply in the economy through productive capacity, which should then sustain long-term economic output growth (Arestis, Demetriades, & Luintel, 2001; Arestis & Demetriades, 1997; Atje & Jovanovic, 1993; Beck, Levine, & Loayza, 2000; Domowitz, Glen, & Madhavan, 2001; Harris, 1997; Levine, 1997a; Levine & Zervos, 1998; Poterba, 2000). King and Levine suggest that both banks and stock markets have an independent empirical connection with economic output growth (King & Levine, 1993).

Indeed, the performance of the financial intermediation sector has always been considered to be an important factor in explaining economic output growth. The social purpose of a financial system is to allocate an economy's savings to the highest-value use (Aghion & Howit, 1997; Schumpeter, 1912, 1942; Tobin, 1989; Wurgler, 2000). Economic growth thus correlates strongly with financial development (Beck et al., 2000; Beck & Levine, 2002; Demirgüç-Kunt & Levine, 1996; Demirgüç-Kunt & Maksimovic, 1998; King & Levine, 1993, 1993b; Levine, 1997; Levine & Zervos, 1998; Rajan & Zingales, 2003). Recently, capital allocation efficiency has been increasing noticeably within developing countries. A study by Morck et al. (2011, p.274) found that, all else being equal, banking systems controlled by a fraction of elite groups in developing countries tend to experience lower capital allocation efficiency than systems in more developed ones. They further document less-efficient capital allocation amid slower economic and productivity growth, greater financial instability, and greater income inequality in countries whose banking systems are predominantly

controlled by elite groups. This suboptimal capital allocation can substantially retard economic growth (Acemoglu, Johnson, & Robinson, 2001; Fogel, Morck, & Yeung, 2008; Morck, Wolfenzon, & Yeung, 2005; Olson, 1965; Perotti & Volpin, 2007; Stulz, 2005).

Despite the past empirical evidence presented by Denison (1967) and Solow (1962) that indicates the relative unimportance of capital as a determinant of growth for advanced countries, capital may still be considered a very important factor in explaining growth in developing countries for the following reasons. Following Wai (1985), first, these countries have a smaller stock of capital than developed countries. Second, these countries have little specialization in their labour force, which allows the introduction of more diverse processes, thereby increasing productivity in the sector. Third, it is probable that developing countries require more capital to absorb the new technologies created in developed countries. Fourth, having in general less capital per worker, the productivity of capital in these countries is likely to be higher than in developed countries.



Source: Sustained growth identification (1970-2013, n=10) using GDP constant LCU (USND, 2015),
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
Growth rates of rAVA, rMVA, rSVA, rFVA were calculated based on sustained growth period annual average, using constant LCU, (UNSD, 2015);
Having 8 sustained growth countries experienced highest growth in financial intermediation

Figure 2.1: High-sustained-growth developing countries with the highest growth in their financial intermediation sector (1990-2013)

The first section of this chapter examines the correlation between the capital allocation efficiency within the financial intermediation sector and economic output growth in developing economies. In this section, I tease out the importance of financial intermediation development for economic development. Ten developing countries with sustained output growth of seven per cent or higher in the past 25 years have been identified[4]. Nine of the ten countries (90 per cent) registered the highest growth rate in the broad financial intermediation sector.

[4] The data for this analysis are from the National Accounts Main Aggregates Database (NAMAD, 2014) of the United Nations Statistics Division. The 2005 constant prices (LCU) are used to identify high-sustained-growth countries and to measure sectoral growth rates (see the data section for further explanations). For a country to be included in the group of developing countries, the income level must be lower than the threshold level of a high-income country (annually defined by WBAC) for every year from 1990 to 2013 for the post-1990 group.

This result lends additional empirical support to the findings in the literature, such as those of King and Levine (1993), regarding the importance of financial intermediation development for sustaining high economic growth over a long period of time. Wurgler (2000) uses manufacturing sector data to gauge capital allocation efficiency; with better capital allocation efficiency, a country's capital investment is more concentrated in industries with faster value-added growth[5]. Similar to Wurgler (2000), this chapter uses financial intermediation sector data to gauge capital allocation efficiency; I operationalize this by estimating the financial incremental capital output ratio for each selected country using data from the United Nations Statistics Division. Because the financial intermediation sector is one of the broad sectors within an economy, this measure gauges the link between the capital allocation efficiency of the financial intermediation sector and overall economic growth. Its weakness is that it may fail to capture investments that respond to new growth opportunities and still affect output.

I follow the Harrod–Domar growth model[6], in which the rate of output growth is determined by the rate of saving and the *ICOR*. The *ICOR* is a measurement of capital allocation efficiency and could be a key variable that links investment

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[5] Other studies, such as Rajan and Zingales (2003), gauge capital allocation efficiency according to external financing. They argue that industries that are more dependent on external financing should grow more slowly in countries with less-efficient financial systems.

[6] See Harrod (1939) and Domar (1946). They measure the *ICOR* using gross fixed capital formation and output growth of an economy. The financial *ICOR* in this chapter focuses on specific financial intermediation sector in order to gauge the financial capital allocation efficiency.

requirements with targeted rates of output growth[7]. In this chapter, the financial *ICOR* - by measuring the within-sector ratio of capital stock input to final output growth - has a tendency to reflect the governance and institutional quality of financial intermediation sector in a country. For instance, a better allocation of capital would require relatively less quantity of capital stock input to achieve the targeted rates of output growth, because the financial markets and institutions perform fundamental allocative function by directing the capital to its highest-value. Also, the model implies that economic output growth depends on having an active policy to increase investment[8] by increasing savings and then investing those savings more efficiently through technological advances, this highlights the proactive role of institutions in increasing and directing investment to its highest-value use. In the New Structural Economics by Lin (2012, p. 147), despite the importance of the market mechanism, for information, co-ordination, and externality reasons, it is also desirable for the government to play a proactive role in facilitating sectoral upgrading and diversification in the development process. Similar fashion to Lin's New Structural Economics, but in the scope of financial intermediation sector, efficient institutions coordinate investment to promote

[7] It appears that the *ICOR* was utilized for the first time in a 1955 study by the United Nations Economic Commission for Latin America primarily to obtain estimates of the productivity of capital and of the investment required to attain a targeted level of income in the economy.

[8] The model carries the implications that developing countries have relatively abundant labour and scarce capital and hence a tendency towards weaker output growth. Because developing countries may not have sufficiently high incomes to enable sufficient rates of saving, the accumulation of physical-capital stock through investment is limited.

sectoral upgrading and improve the capital and labour productivity through technological advances, this process is deemed necessary to the success of economic development in developing countries. My proposal to use the financial *ICOR* to gauge capital allocation efficiency within the financial intermediation sector is further supported by the capacity and capital utilization concepts; both have direct implications for financial development. Regarding the relationship between the *ICOR* and the output growth rate, several studies provide evidence that they are inversely related[9]. Ajayi and Ndikumana (2014, p. 98) use the *ICOR* to gauge capital allocation efficiency for African countries and estimate that additional income would have been generated if all capital flight had been invested domestically. They posit inverse relationships between the *ICOR* and social development, income and poverty rates. Ohkawa and Rosovsky (1963) identify an inverse relationship by showing a series of graphs of the annual growth rate of GDP and the *ICOR* for Japan in the period from 1905 to 1960 with a seven-year moving average. Leibenstein (1966) also confirms the existence of an inverse relationship between the *ICOR* and the growth rate as a general tendency across 18 countries, whereas Beckerman (1965) identifies this inverse association in 10 European countries and the U.S. during the period from 1956 to 1962. However, to attribute the sustained output growth of developing countries to the development of financial intermediation, one needs to ascertain

[9] The *ICOR* is the additional capital required to increase one unit of output. This ratio is used to measure the efficiency of a capital stock or gross fixed capital formation: lower *ICOR* corresponds to more efficient investment.

not only that financial capital stock is invested effectively but also that it is allocated efficiently and increases productivity in the economy[10]; additions to output require additions to reproducible capital stock because the latter permit (but do not necessarily guarantee) additions to outputs.

In the country-level analysis, I cannot absolutely preclude reverse causation or missing latent variables. Neither event studies nor Granger causality tests are viable tools because the capital allocation efficiency variable, the financial *ICOR*, exhibits low time variability. Furthermore, the number of control variables that I can use is limited because I must use country-level variables, most of which are highly persistent. Commonly used instruments, such as legal origin and majority religion, are unlikely to act exclusively through capital allocation efficiency control. Nonetheless, a range of circumstantial evidence argues against exclusively reverse causality. Within a firm-level analysis, my regression is able to control a collection of dynamic firm-level variables, such as closely held ownership, auditing quality, liquidity, profit margin and others, to isolate the relationship between capital allocation efficiency (stock price informativeness) and firm output growth (firm revenue growth). The second section of this chapter attempts to reconcile the external monitoring mechanisms and the information-based interpretation of stock prices to elucidate the role of capital allocation efficiency in explaining firm output growth. Levine (1997) explains that the ability to acquire

[10] Although the broad financial intermediation sector is a driver of economic output growth, I do not reject the contributions of other broad sectors in an economy.

and process information may have important growth implications. A stock market exhibits functional efficiency if stock prices direct capital to its highest-value use. Stock markets can perform a vital economic role when stock prices are consistently near their fundamental value by generating prices that serve as signals for resource allocation and investment decisions[11]. Wurgler (2000) shows that efficient stock markets help investors to distinguish good investments from bad ones and improve the acquisition and dissemination of information about firms. In a more informative stock market, capital is priced correctly in its different uses; this effect should lead to more economically efficient capital allocation and thus increase the productivity of an economy through effective investment (Durnev, Morck, Yeung, & Zarowin, 2003; Knack & Keefer, 1995; Mauro, 1995; Svensson, 1998; Wurgler, 2000).

As identified by Holmström and Tirole (1993), stock markets play an important role in monitoring firm management. Public trading of a firm's stock can curb managerial misbehaviour by affecting the likelihood of being taken over by competitors and compensation incentives[12]. For instance, if value-decreasing investments made by managers are discovered by the public, it will negatively affect the stock price and effectively punish managers. A manager who values

[11] Wurgler (2000) explains that stock prices are always near their fundamental values in informative stock markets.

[12] Holmström and Tirole (1993) point out that public trading can be costly. However, the early literature shows that public listing has benefits other than managerial monitoring, in particular, risk sharing and the acquisition of capital (Rosenberg & Birdzell, 1985)

control[13] and performance-based compensation would avoid undertaking such value-destroying projects and would instead be incentivized to allocate capital efficiently by undertaking value-increasing projects to expand the portfolio of firms. Hence, stock prices are uniquely suited for compensation purposes, not just because they are accurate but also because they are objective, third-party assessments. Stronger external monitoring mechanisms exist when more firm-specific information is incorporated into stock prices; this disciplines managers to allocate capital more efficiently. However, in developing countries, poor institutional and information environments could prevent information intermediaries from accessing corporate information, and poor protection for investors or a lack of transparency could make firm-specific information less useful (Morck, Yeung & Yu, 2000, Jin & Myers, 2006). In addition, investors in these countries could have less incentive to demand firm-specific information. Therefore, valuable firm-specific information may be more difficult to collect and more costly to produce in developing countries. The high cost of information discovery coupled with the potentially low demand for information could undermine the role of external monitoring mechanisms in explaining firm output growth. However, considering the capital scarcity in developing countries, even with less-strict disclosure requirements, firms are still motivated to voluntarily disclose more about their capital spending decisions when seeking external

[13] When the stock price of a poorly performing firm drops, the firm may become a cheaper target for a takeover. If it is assumed that managers will be fired if a takeover succeeds, this threat will help curb managerial misbehaviour.

financing. More disclosure of capital spending decisions by firms could lower the risk premium demanded by investors and lenders to compensate for the risk of loss from expropriation by opportunistic managers. Thus, disclosure not only enhances the competitiveness of firms by decreasing their cost of capital but also reduces information asymmetry problems between insiders and investors. More firm-specific information regarding capital spending decisions flows to the public and strengthens external monitoring mechanisms. If managers are required to disclose capital spending decisions to outsiders, they become incentivized to maximize firm value and due diligence to increase their performance-based compensation instead of pursuing personal objectives. It is thus easy to believe that external monitoring mechanisms could improve capital allocation efficiency and foster growth in firms' economic output[14]. These observations may also have policy implications for financial regulatory authorities in terms of imposing compulsory disclosure on firms[15] and thereby leveraging external monitoring mechanisms to improve capital allocation efficiency within the economy.

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[14] Studies by Khaveh, Nikhasemi, Yousefi and Haque (2012) document that voluntary disclosure by a firm would affect customers' perceptions about its products or services and, as a result, increase sales and ultimately total revenue.

[15] For instance, the implementation of the Sarbanes-Oxley Act complements the external monitoring mechanisms via the compulsory disclosure of firm financial conditions. Section IV (Section 401, 404 and 409) Enhanced Financial Disclosures of the Sarbanes-Oxley Act requires internal controls for assuring the accuracy of financial reports and disclosures and mandates both audits of and reports on those controls. It also requires timely reporting of material changes in financial condition and specific enhanced reviews by the SEC or its agents of corporate reports.

The difficulty in implementing these external monitoring mechanisms in developing countries appears to be how to identify firm-specific information. Building on Roll (1988), the study by Morck et al. (2000) finds that stock return synchronicity is higher in countries with weaker protection of property rights. They interpret this finding as resulting from less firm-specific information being uncovered and capitalized into stock prices. Jin and Myers (2006) complement Morck et al.'s (2000) finding and document that stock return co-movement is greater in countries with more opaque information environments. They show that a lack of transparency enables insiders to control firm-specific information flows to the public and therefore to absorb some firm-specific variations. Cross-country analysis is extended here to the firm level. Hutton, Marcus, and Tehranian (2009) examine firm-level opaqueness and stock return co-movement and provide evidence consistent with the previous findings that opacity is associated with higher stock return synchronicity. More direct evidence is provided by Durnev et al. (2003), who show that firm-specific return variations are associated with the extent to which stock prices contain information about future earnings in the U.S. market. Overall, indirect evidence from these studies favours the information-based interpretation of stock return co-movement. Other papers that provide evidence supporting the information-based interpretation include Chan and Hameed (2006), Durnev, Morck, and Yeung (2004), Fernandes and Ferreira (2008), Ferreira and Laux (2007), and Piotroski and Roulstone (2004).

These stricter disclosure requirements may make firms less likely to hide unfavourable events and more likely to disclose more reliable information (Sarbanes-Oxley Act, 2002).

Veldkamp's (2006) model of competitive information markets also has implications for how information production affects stock return co-movement. Because information that predicts the value of many assets provides investors with the highest utility and is thus in high demand, competitive producers will supply this type of information to the market in equilibrium. When investors rely on this common information to price assets, co-movement in asset prices increases. When firm-specific relevant information can be directly measured, and if the information-based interpretation of stock prices holds, a positive relationship between stock return co-movement and the direct measure of firm-specific information variation should be observed.

In contrast with the aforementioned view, a body of research suggests that lower stock return synchronicity is associated with stock prices that contain less firm-specific information because of limits on arbitrage or noise. For example, Pontiff (2006) argues that idiosyncratic stock return variety is an arbitrage cost and that higher idiosyncratic volatility prevents arbitrageurs from eliminating market inefficiency. Based on the barriers to arbitrage explanation, Mashruwala, Rajgopal, and Shevlin (2006) find that future abnormal returns are higher for stocks with greater idiosyncratic stock return volatility. Kelly (2007) and Teoh, Yang, and Zhang (2007) find that high firm-specific return variation is related to poor firm-level information environments. Two recent papers have also provided views that differ from the information-based explanation of stock return co-movement. Dasgupta, Gan, and Gao (2010) argue that stocks with prices that are more informative about future firm-specific events may have higher return

synchronicity in the future because there would be little “surprise” when the events actually occur. Hou, Peng and Xiong (2013) show that a stock’s lower return R^2 is associated with more pronounced medium-term price momentum and long-term price reversal, and they cast doubt on the argument that low stock return synchronicity, as measured by a stock’s return R^2, is a measure of market efficiency.

This chapter uses stock price informativeness as a proxy for capital allocation efficiency to explain firm-level output growth through the channel of external monitoring mechanisms. Following Fernandes and Ferreira (2008), stock price informativeness is quantified by firm-specific return variations using an estimate of the relative amount of firm-specific versus market-level information influencing prices over the fiscal year. The first phase of this chapter confirms the role of capital allocation efficiency, as measured by the financial *ICOR*, in explaining economic output growth. Following the capacity and capital utilization concepts, the comparative advantage and “big push” models are explored to explain the importance of capital allocation efficiency for economic development in developing countries. The second phase of this chapter suggests that stronger external monitoring mechanisms are reflected by stronger stock price informativeness, which disciplines managers to allocate capital efficiently by undertaking value increasing projects to expand the firm business portfolio. This argument supports Levine’s (1997) assertion that the capital allocation channel is an integral part of the growth process. I also find that the long-term output growth model of Levine and Zervos (1998) is improved by including the role of

capital allocation efficiency. Capital allocation efficiency reflects the governance and institutional quality of a country, it plays a role complementary to that of banking development in predicting firm output growth and acts as a strong predictor of long-term economic output growth.

I make several contributions in this chapter. First, I examine Levine and Zervos's (1998) model in the context of developing countries and extend the model to a more recent time span. Second, I expand the output growth model to include firm-level analysis, controlling for the variables found in Levine and Zervos (1998) and for other firm characteristics, in 20 developing countries. Third, I address some endogeneity issues within the output growth model: (i) omitted heterogeneity and (ii) reverse causality in the firm-level output growth model. Fourth, I test the predictive role of capital allocation efficiency in output growth. The rest of this chapter is structured as follows. I discuss the setup and hypotheses development in Section 2.2. Section 2.3 presents the sample, summary statistics, and variables. I discuss the main results in Section 2.4 and the sensitivity tests in Section 2.5. Section 2.6 tests the predictor role of capital allocation efficiency in Levine and Zervos's (1998) output growth model. I conclude in Section 2.7.

2.2 Setup and hypothesis development

I model the need for capital allocation efficiency in Levine and Zervos's (1998) output growth model. I then attempt to tease out the causal relationship between capital allocation efficiency and output growth in developing countries. First, I partially replicate the output growth model for 39 selected countries, including

both developed and developing countries. Second, I introduce the role of capital allocation efficiency in explaining output growth for both developed and developing countries to show that allocative function of financial markets and institutions contribute to output growth systematically across all developmental stages. Then, the model extension follows the spirit of this chapter by focusing on the determinants of output growth in developing countries, addressing the influence of the financial *ICOR* on economic output growth. After the country-level extension of Levine and Zervos's (1998) model, the second phase of this chapter takes the degree of stock price informativeness as exogenously given and uses firm-specific return variation as a measurement of stock price informativeness to examine the role of capital allocation efficiency in explaining firm output growth. I follow a concept similar to that found in Levine and Zervos's (1998 p.549) model and use the annual growth of firm revenue[16] as a proxy for firm output growth.

Traditionally, the growth literature uses growth and explanatory variables averaged over long periods. However, this approach is criticized because contemporaneous or persistent shocks to the dependent and explanatory variables during the sample period may drive the empirical findings. The causal relationship between capital allocation efficiency and output growth could also be jointly determined by omitted variables. Hence, regular OLS estimates are biased if the growth resistance or driver is ignored, especially when the data set is a

[16] Annual percentage growth rate of firm revenue (current US$) scaled by total assets (current US$) (World Scope, 2013)

panel (Yu, 2010). To control for time-invariant multilateral growth factors, cross-country studies by Yu (2010) and Rose and Van Wincoop (2001) recommend using country- and time-fixed effects to control for time- and cross-sectional invariant unobservable features, such as land size, natural resource endowment, geographical location and other unobserved country characteristics in the growth model. I use Hausman's (1978) specification test[17] to assess the efficiency and consistency of the fixed-effects model. To adjust the standard errors for correlations across countries and times, I calculate simultaneous correlations along these two dimensions. It is rational to suspect that the residuals of country *i* are correlated across country *j* (for *j*=1 to *n* available countries in the sample, $i \neq j$) and time *t* (for *t* = 1990 to 2010). The statistical inferences are only valid if the residuals are correlated either across time or across countries, but not across both (Thompson, 2011)[18]. I adjust the covariance estimator, which is equal to the estimator clustered by country plus the estimator clustered by time minus the

[17] In the Hausman (1978) test, the null hypothesis H_0 is that the difference between the random-effects and fixed-effects coefficients is not systematic. If the difference in coefficients is systematic, a fixed-effects model is preferred because the random-effects model is inadequate. The random-effects estimator makes an assumption (the random effects are orthogonal to the regressors) that the fixed-effects estimator does not.

[18] I adjust the covariance estimator, which equals the estimator clustered by country plus the estimator clustered by time minus the usual heteroscedasticity-robust (White standard errors) ordinary least squares covariance matrix.

usual heteroscedasticity-robust (white standard errors) ordinary least squares covariance matrix[19]

For firm-level analysis, this chapter uses a firm-year regression to capture the dynamic and fluctuating characteristics of firms. Similar to a country-level analysis, I address the potential omitted heterogeneity by using a firm- and year-fixed-effects model to control for unobserved sources of firm heterogeneity. The fixed-effects method solves joint determination problems in which unobserved time-invariant variables simultaneously determine the relation between stock price informativeness and firm output growth. Using this method is equivalent to looking only at within-firm changes. Furthermore, I calculate the White (1980) robust standard errors clustered by firm and control for the time-variant firm variables of (i) firm characteristics, (ii) ownership structure, (iii) accounting compliance, (iv) liquidity and debt structure, (v) U.S. cross listing (vi), asset utilization and (vii) firm profitability as a sensitivity test to address potential multicollinearity and omitted bias. In the robustness test, the endogeneity issue is addressed using a two-stage regression, and the stock price informativeness is instrumented by the number of financial analysts following a firm. This test dismisses the argument that the main result is driven by reverse causality because one can argue that stock price informativeness is not exogenously

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[19] From Thompson (2011), the Lindberg Levy estimator that equals $A^{-1}BA^{-1}$

$B = \sum_{i.t} \sum_{i,t} x_{it} v_{it} x_{it}' v_{it}'$ where $\sum_{i,t} v_{it}' v_{it} = \sum_{i,t} E(v_{it}, v_{it}')$

The country-level clustering is adjusted based on Thompson (2011) such that

$B = B_{COUNTRY} + B_{time,0} - B_{white,0} + \sum_{I=1}^{L} (B_{time,I} + B_{time,I}') - \sum_{I=1}^{L} (B_{white,I} + B_{white,I}')$`

given[20]. The instrumental variable (IV) estimation is used to address reverse causality (Wooldridge, 2002). To justify the validity of the instrumental variable, I use the Cragg and Donald (1993)[21] and Kleibergen and Paap (2006) Wald tests[22] for the weak-instrument test. Such statistical tests would validate the specification of the first-stage regression. Finally, I use a two-stage regression model to assess the predictive role of capital allocation efficiency in explaining short- and long-term output growth.

2.2.1 Proposition 2.1: High capital allocation efficiency, as measured by the financial incremental capital output ratio (ICOR), positively contributes to output growth in developing countries (country level)

Under the assumptions that (i) capital is the only scarce factor of production in developing countries and (ii) output growth is stable, the financial *ICOR* may determine the levels of investment required to achieve the targeted rates of output growth. Because it is difficult to obtain data regarding capital stock, it is necessary

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[20] Strong output growth could exaggerate or dampen the role of stock price informativeness in explaining output growth.

[21] In the Cragg and Donald (1993) F-statistic Wald test, the null hypothesis H_0 is that the first stage is weakly identified.

[22] The Kleibergen and Paap (2006) F-statistic Wald test, the null hypothesis H_0 is that the first stage is weakly identified.

Although critical values do not exist for the Kleibergen-Paap statistic, I follow the approach suggested in Baum, Mark, and Stephen (2007) and apply the Stock and Yogo (2005) critical values initially tabulated for the Cragg-Donald statistic.

in practice to use a derived relationship, the financial *ICOR*, which is defined as the ratio of an incremental change in financial gross fixed capital formation (GFCF) to an incremental change in financial intermediation output. Both the GFCF and the output data[23] are from the United Nations Statistics Division, National Accounts Official Country Data (2015).

Equation 2. 1

$$Financial\ ICOR\ = \frac{I}{\Delta Y} = \frac{(\Delta K + \delta * K)}{\Delta Y} = \frac{\Delta K}{\Delta Y} + \frac{\delta}{g} * \frac{K}{Y} = the\ net\ ICOR + \frac{\delta}{g} * \frac{K}{Y}$$

where Y = financial intermediation output, K = capital input, I = investment, gross fixed capital formation (GFCF) within the financial intermediation sector, δ = depreciation rate of capital stock, and g = growth

This identity equation shows that the financial *ICOR* is inversely related to the growth rate of financial intermediation. With a high rate of growth *(g)*, the relative difference between the gross and net *ICOR* becomes insignificant, and with a low rate of growth, it becomes large. This relationship implies that the replacement component of total investment is less important when there is a higher rate of

[23] Unlike the gross fixed capital formation (GFCF) of the entire economy, the financial GFCF accounts for financial intermediation, real estate, renting and business activities comprising the broad sector (ISIC Rev 3. J + K) only. The raw data (local currency and current prices) are retrieved from the National Accounts Official Country Data, United Nations Statistics. Data are available only for countries that have reported annual national account data to the UN Statistics Office.

output. The standardized financial *ICOR* may therefore provide a benchmark investment requirement to attain a targeted growth rate. At the same time, if high investment does not lead to higher financial intermediation output growth, the actual financial *ICOR* may exceed the standardized financial *ICOR*, which implies inefficient investment and productivity in the financial intermediation sector, and weak institutions. Because national output growth is a combination of output growth from the financial intermediation sector and from other broad sectors, in this proposition, economic output growth is likely determined by capital allocation efficiency, as a reflection of governance and institutional quality within the broad financial intermediation sector. Implicit in the model is an inverse relationship between economic output growth and the financial *ICOR*.

2.2.2 Proposition 2.2: Stock price informativeness positively contributes to firm output growth in developing countries (firm level)

This study uses firm-specific return variation as a measurement of stock price informativeness. French and Roll (1986) and Roll (1988) showed that a significant portion of stock return variation is not explained by market movements, which measure the rate with which private information is incorporated into stock prices via informed trading. Annual firm-specific return variation is estimated by regressing stock returns on the three factors from the Fama-French model. For each firm-year, the firm-specific return variation is transformed from the R^2 in the regression using biweekly return data from DataStream (Morck et al., 2000):

Equation 2. 2

$$r_{i,t} = \beta_{i,0} + \beta_{i,1} RM_t + \beta_{i,2} SMB_t + \beta_{i,3} HML_t + \varepsilon_{i,t}$$

where $r_{i,t}$ is the return of stock i on day t in excess of the risk-free rate, RM_t is the value-weighted excess market return, SMB_t is the small-minus-big size factor return, and HML_t is the high-minus-low book-to-market factor return. Following Fernandes and Ferreira (2008), a stock's relative firm-specific return variation is the ratio of idiosyncratic volatility to total volatility σ_{ie}^2/σ_i^2. One reason for scaling firm-specific stock return variation by the total variation in returns is that firms in some countries are more subject to economy-wide shocks than others, and firm-specific events can be correspondingly more intense (Fernandes & Ferreira, 2008). This is precisely the 1-R_i^2 of the equation above, similar to the R_i^2 in Morck et al. (2000); given the bounded nature of R^2, this study conducts the tests using a logistic transformation of 1-R_i^2 as presented in

Equation 2. 3

$$\varphi_{i,t} = log(\frac{1-R_i^2}{R_i^2})$$

The efficiency of capital allocation across countries is positively correlated with firm-specific return variation [$\varphi_{i,t} = \log(\frac{1-R_i^2}{R_i^2})$] and negatively correlated[24] with stock price synchronicity (R_i^2) in domestically traded stock returns. The observed

[24] Wurgler (2000) and Durnev et al. (2004) documented a negative relation between the elasticity of industry investments and stock return synchronicity.

relations between low synchronicity and efficient capital allocation decisions indirectly support the interpretation that low stock price synchronicity reflects a greater flow of firm-specific information being incorporated into stock markets.

Stock markets can perform a vital economic role by generating prices that serve as signals for resource allocation and investment decisions as stock prices near their fundamental values. Firms and entrepreneurs prefer capital, financial intermediaries and markets that are better at selecting promising firms and managers (Greenwood & Jovanovic, 1990; Levine, 1997). When more private information is incorporated into stock prices, it triggers external monitoring mechanisms for disciplining managers (Holmström & Tirole, 1993). In a more informative market, a firm will be motivated to disclose more about its capital spending decisions to be competitive when seeking external financing. In both cases, managers are incentivized to direct resources towards projects identified as good and away from projects that are value-decreasing. This incentive improves the capital productivity and economic performance of firms and results in stronger firm output growth.

My interpretation is twofold:

(i) *External monitoring mechanisms:* Using the information-based interpretation of stock co-movement, the inverse relationship between stock return co-movement and firm-specific information flows in the market implies firm-specific information production. More information about firm fundamentals is capitalized into stock prices through the trading activity of risk arbitrageurs, who gather and

possess private information via high-frequency informed trading. The stronger flow of firm-specific information into the market fosters external scrutiny and stronger external monitoring[25] mechanisms for disciplining managers. The external monitoring mechanisms contribute directly to firm economic performance[26] and output growth by enforcing the efficient management of assets in place (for example, timely abandonment of losing projects), better project selection, and reduced expropriation of investors' wealth by managers.

(ii) *Cost of capital:* In a more informative stock market, managers are less likely to impede firm-specific information flows to the public. Considering the capital scarcity in developing countries, these firms are motivated to disclose more about their capital spending decisions[27] when seeking external financing. This

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[25] Holmström and Tirole (1993) explained that stock prices incorporate performance information that cannot be extracted from the firm's current and future profit data.

[26] Given information asymmetry and potentially self-interested behaviour by managers, agency theories argue that pressures from external investors, in addition to formal contracting arrangements, are needed to encourage managers to pursue value-maximizing investment policies (for example, Jensen [1986]). Objective, verifiable firm-specific information facilitates shareholder monitoring, and effective exercise of shareholder rights under existing securities laws enables directors to enhance shareholder value by advising, ratifying, and policing managerial decisions and activities. Thus, a rich array of contractible variables is supplied for determining the financial rewards from incentive plans designed to align executives' and investors' financial interests.

[27] Based on annual financial reports, not intra-day stock prices, Ball (2001) showed that timely incorporation of capital spending decisions, including value decreasing investments and

disclosure can reduce information asymmetry problems between insiders and investors. Better disclosure of firm capital spending decisions by managers can lower the risk premium demanded by investors and lenders to compensate for the risk of loss from expropriation by opportunistic managers. If managers are required to disclose more about capital spending decisions to outsiders to seek external financing at a more competitive rate, they become incentivized to maximize firm value and due diligence to increase their performance-based compensation instead of pursuing personal objectives. For instance, if the public discovers that managers have made value-decreasing investments, it will negatively affect the stock price and effectively punish the managers while also increasing the cost of capital because investors and lenders will require a higher risk premium. A manager who values control[28] and performance-based compensation would avoid undertaking such value-destroying projects. Moreover, the manager would have an incentive to undertake value-increasing

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economic losses, in published financial statements increases the effectiveness of corporate governance, compensation systems, and debt agreements in motivating and monitoring managers. He argued that it also decreases the ex-ante likelihood that managers will undertake negative net present value (NPV) projects and pass on their earnings consequences to a subsequent generation, and it increases the incentive of the current generation of managers to incur the personal cost of abandoning investments and strategies that have ex-post negative NPVs.

[28] When the stock price of a poorly performing firm drops, the firm may become a cheaper target for a takeover. If it is assumed that managers will be fired if a takeover succeeds, this threat will help curb managerial misbehaviour (Holmström & Tirole, 1993).

projects to expand the firm's portfolio, leading directly to a more accurate allocation of capital to the highest-value uses. Lower estimation risk can also reduce the cost of capital, further contributing to firm economic performance and output growth.

2.3 Sample, summary statistics, and variables

This study starts with 44 countries[29] in the World Development Indicators (WDI) between 1990 and 2010. The WDI contains detailed information on the macroeconomic variables used in Levine and Zervos (1998). Developing countries are defined as those that did not reach a high income level in any year prior to 1990[30] based on the threshold income level for high-income countries defined annually by World Bank Analytical Classifications (WBAC)[31]. Because the main focus of this chapter is on developing countries, it is important to ensure that the positive contribution of capital allocation efficiency to output growth in developing countries is not undermined by high income levels due to the normal pattern of structural changes[32]. Next, I measure the financial *ICOR* using data

[29] Please see Table 2.3 for the country list.

[30] Countries are classified as developing countries based on WBAC in 2013, excluding those countries that had a high income status sometime during the period of 1987-2013, such as American Samoa (1987-1989) and Hungary (2008-2011).

[31] World Bank Analytical Classifications (presented in the WDI) using GNI per capita in US$ (Atlas methodology) from calendar year 1987 through 2014

[32] A more-developed country tends to experience a higher capital output ratio not because capital is allocated inefficiently but rather due to structural change within the supply conditions when

from the National Accounts Official Country Data (United Nations Statistics Division, 2015). Unlike the traditional *ICOR*, the financial *ICOR* focuses on the broad sector, including financial intermediation, real estate, renting and business activities (ISIC Rev.3 J + K). Because of pre- and post-economic reforms in some countries, it is important to ensure that the series of local currency is matched between the financial GFCF and the financial output data. For countries reporting two or more series in a year, the latest series is used to measure the financial *ICOR*. For the country-level analysis, the sample consists of 20 developing countries and a total of 307 country-year observations. For the firm-level analysis, the sample consists of 7,789 firms across 20 developing countries and a total of 48,030 firm-year observations. Table 2.1 presents the definitions of our variables.

income per capita increases; for instance, wages rise, and the country then gradually shifts to produce more complex skill- and capital-intensive products.

Table 2.1: Variable definition

A Country-level variables			
Variable	Acronym	Definition	Data Source
Output growth	*Growth*	Annual percentage growth rate of GDP per capita based on local currency (annual percentage).	WDI (2015)
Incremental capital output ratio	*Financial ICOR*	The ratio of gross fixed capital formation (I) at current prices to the output growth (ΔY) in financial intermediation, real estate, renting and business activities (ISIC Rev. 3 J + K), $\frac{I}{\Delta Y}$.	United Nations Statistics Division, National Accounts Official Country Data (2015)
Bank credit	*Credit*	Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, trade credits and other accounts receivable, that establish a claim for repayment as a share of gross domestic product.	WDI (2015)
Value traded	*Shares*	The value of shares traded is the total number of shares traded, both domestic and foreign, multiplied by their respective prices as a share of gross domestic product.	WDI (2015)
Enrolment	*Education*	Total enrolment in secondary education, regardless of age, expressed as a percentage of the population at official secondary education age.	WDI (2015)
Government	*Government*	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees) as a share of gross domestic product.	WDI (2015)
Inflation	*Inflation*	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	WDI (2015)
Trade	*Trade*	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI (2015)
Market capitalization	*Market*	Market capitalization (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies as a share of gross domestic product.	WDI (2015)
B Firm-level variables			
Variable	*Acronym*	Definition	Data Source
Firm-specific return variation	*Firm-specific return variation*	Log ($\frac{1-R^2}{R^2}$) of the Fama-French three-factor regression model using bi-weekly stock returns based on Morck et al. (2000).	Morck et al. (2000)
Number of analysts following	*Analyst*	Log of number of financial analysts following a firm.	Datastream (2013)
Firm output growth	*Firm output growth*	Growth of net sales to total assets ($\frac{Net\ sales_t}{Total\ assets_t} / \frac{Net\ sales_{t-1}}{Total\ assets_{t-1}}$ - 1)	Worldscope (2013)
Firm size	*Size*	Log of market capitalization (US dollars)	Datastream (2013)
Firm age	*Age*	Number of years from the listed date to the current date	Datastream (2013)
Book-to-market ratio	*BM*	Log of book-to-market equity ratio	Datastream (2013)
Close-held ownership	*CH*	Log of fraction of shares closely held by insiders and controlling shareholders	Worldscope (2013)
Big N auditor	*BigN*	A dummy variable that equals one if the firm is audited by one of the Big 4/5 audit firms	Compustat (2013); Worldscope (2013)
International accounting standard	*IAS*	A dummy that equals one if the firm adopts the international accounting standards	Compustat (2013); Worldscope (2013)
Quick ratio	*Quick*	Log of quick ratio [(Cash + Receivables) / Current liabilities]	Worldscope (2013)
Total debt	*Debt*	Log of total debt scaled by total assets [(Total debt) / Total assets]	Worldscope (2013)
Long-term debt	*Long-term debt*	Log of long-term debt scaled by total assets [(Long-term debt) / Total assets]	Worldscope (2013)
American Depository Receipts	*ADR*	An ADR dummy equals one if the firm was cross-listed on a U.S. stock exchange	Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)
Firm asset utilization	*Utilization*	Log of capital expenditure and R&D expenses scaled by total assets [(Capital expenditure + R&D expenses) / Total assets]	Worldscope (2013)
Return on assets	*ROA*	Log of return on assets (Operating income / Total assets)	Worldscope (2013)
Firm profitability	*OPMargin*	Log of operating profit margin (Reported operating earnings / Net sales)	Worldscope (2013)

Table 2.2.1: Summary statistics (country-level)

Growth is the annual percentage growth rate of GDP per capita based on local currency (annual percentage) (WDI, 2015). Credit is the domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, trade credits and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is total enrolment in secondary education, regardless of age, expressed as a percentage of the population at official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. The financial ICOR is the ratio of gross fixed capital formation (I) at current prices to output growth (ΔY) in financial intermediation, real estate, renting and business activities (ISIC Rev. 3 J + K), $\frac{I}{\Delta Y}$ (UNSD, 2015).

Country-level variables for all countries

Variables	Country-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Growth	700	2.39	3.39	-14.35	0.9	2.43	4.09	18.62
Credit	651	76.88	44.94	8.6	34.18	72.49	107.65	202.19
Government	684	16.38	4.79	5.69	11.73	17.1	19.62	28.06
Inflation	700	5.41	10.6	-6.01	1.54	3.02	6	137.96
Education	595	95.72	22.97	21.78	83.66	97.25	108	160.62
Shares	676	58.66	76.18	0.34	13.16	35.05	76.53	741.59
Trade	700	85.75	75.96	15.58	46.85	61.82	89.29	439.66
Market	676	80.58	73.22	3.27	32.74	58.55	105.93	606
Financial ICOR	243	0.04	2.14	-15.38	-0.58	0.09	0.89	8.05

Country-level variables for developed countries

Variables	Country-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Growth	383	1.87	2.8	-8.71	0.81	2	3.26	18.62
Credit	352	98.64	38.28	30.19	70.3	93.62	120.5	202.19
Government	383	18.5	4.39	8.03	16.05	18.73	21.6	28.06
Inflation	383	2.03	2.28	-6.01	0.95	1.97	3.03	15.43
Education	345	108.89	16.17	76.14	98.44	104.76	117.63	160.62
Shares	375	82.65	91.2	0.34	25.86	56.94	113.56	741.59
Trade	383	102.51	92.85	16.57	52.31	70.48	113.54	439.66
Market	375	100.98	81.52	12.45	49.99	79	126.68	606
Financial ICOR	185	-0.08	2.32	-15.38	-0.76	-0.05	0.89	8.05

Country-level variables for developing countries

Variables	Country-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Growth	317	3.02	3.9	-14.35	1.23	3.46	5.48	13.6
Credit	299	51.25	38.2	8.6	24.14	32.04	69.17	165.72
Government	301	13.67	3.82	5.69	10.88	12.33	17.83	22.75
Inflation	317	9.5	14.55	-5.99	3.37	6	9.88	137.96
Education	250	77.55	18.05	21.78	65.58	82.41	89.91	110.8
Shares	301	28.76	32.73	0.56	6.67	17.88	38.57	221.16
Trade	317	65.5	39.87	15.58	41.52	55.87	73.6	220.41
Market	301	55.17	51.09	3.27	22.56	36.03	70.13	304.59
Financial ICOR	58	0.42	1.39	-3.15	-0.11	0.17	0.85	7.72

Table 2.2.2: Summary statistics (firm-level)

Firm output growth is the growth of net sales to total assets ($\frac{Net\ sales_t}{Total\ assets_t}$ / $\frac{Net\ sales_{t-1}}{Total\ assets_{t-1}}$ *- 1) (Worldscope, 2013). Firm-specific return variation is log* ($\frac{1-R^2}{R^2}$) *of the Fama-French three-factor regression model using bi-weekly stock returns based on Morck et al. (2000). Analyst is the log of the number of financial analysts following a firm (Datastream, 2013). Age is the number of years from the listed date to the current date (Datastream, 2013). BM is the log of the book-to-market equity ratio (Datastream, 2013). Size is the log of market capitalization (US dollars) (Datastream, 2013). CH is the log of the fraction of shares closely held by insiders and controlling shareholders (Worldscope, 2013). IAS is a dummy that equals one if the firm adopts the international accounting standards (Compustat, 2013; Worldscope, 2013). BigN is a dummy variable that equals one if the firm is audited by one of the Big 4/5 audit firms (Compustat, 2013; Worldscope, 2013). Quick is the log of the quick ratio [(Cash + Receivable) / Current liability] (Worldscope, 2013). Debt is the log of total debt scaled by total assets [(Total debt) / Total assets]. Long-term debt is the log of long-term debt scaled by total assets [(Long-term debt) / Total assets]. ADR is a dummy that equals one if the firm is cross-listed on a U.S. stock exchange (Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)). Utilization is the log of capital expenditures and R&D expenses scaled by total assets [(Capital expenditure + R&D expenses) / Total assets]. Return on assets is the log of the return on assets (Operating income / Total assets). Firm profitability is the log of the operating profit margin (Reported operating earnings / Net sales).*

Firm-level variables for all countries

Variables	Firm-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Firm output growth	291016	0.01	0.45	-10.37	-0.1	0.01	0.11	12.28
Firm-specific return variation	601729	2.53	2.13	-32.1	1.15	2.2	3.51	28.19
Analyst	243879	1.15	0.98	0	0.12	1.04	1.91	3.94
Age	601542	2.02	0.81	0	1.39	2.08	2.56	3.81
BM	382908	-0.45	1.01	-11.22	-0.99	-0.39	0.16	12.56
Size	408105	11.4	2.18	0	9.98	11.34	12.8	23.03
CH	313881	-1.33	1.31	-9.21	-1.66	-0.94	-0.51	0
IAS	396197	0.1	0.3	0	0	0	0	1
BigN	396016	0.51	0.5	0	0	1	1	1
Quick	348955	0.07	1.19	-10.47	-0.47	0.04	0.62	8.47
Debt	349215	-1.9	1.47	-15.9	-2.38	-1.47	-0.95	0.41
Long-term debt	304919	-2.59	1.72	-15.83	-3.33	-2.14	-1.39	0.4
ADR	601729	0.01	0.11	0	0	0	0	1
Utilization	376996	-3.48	1.68	-14.97	-4.32	-3.12	-2.32	0
ROA	282559	-3.09	1.09	-9.21	-3.7	-2.91	-2.36	0
OPMargin	290842	-2.55	1.12	-14.32	-3.16	-2.44	-1.81	8.7

Firm-level variables for developed countries

Variables	Firm-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Firm output growth	222912	0.01	0.45	-10.32	-0.09	0.01	0.1	12.28
Firm-specific return variation	477936	2.8	2.17	-32.01	1.38	2.45	3.81	28.19
Analyst	203311	1.17	0.99	0	0.15	1.07	1.93	3.94
Age	477800	2.03	0.83	0	1.39	2.08	2.56	3.81
BM	299421	-0.5	0.99	-11.22	-1.01	-0.43	0.1	12.56
Size	321251	11.43	2.23	0	9.99	11.36	12.86	20.21
CH	261113	-1.44	1.35	-9.21	-1.81	-1.04	-0.56	0
IAS	309549	0.1	0.3	0	0	0	0	1
BigN	314546	0.57	0.5	0	0	1	1	1
Quick	269978	0.12	1.22	-10.47	-0.41	0.09	0.69	8.47
Debt	268296	-1.94	1.49	-15.9	-2.45	-1.51	-0.97	0.41
Long-term debt	237754	-2.54	1.71	-15.1	-3.28	-2.09	-1.35	0.4
ADR	477936	0.01	0.11	0	0	0	0	1
Utilization	293594	-3.43	1.7	-14.97	-4.27	-3.07	-2.26	0
ROA	213047	-3.15	1.12	-9.21	-3.81	-2.96	-2.39	0
OPMargin	221255	-2.58	1.13	-14.32	-3.2	-2.48	-1.82	8.7

Firm-level variables for developing countries

Variables	Firm-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Firm output growth	68104	0	0.43	-10.37	-0.13	0.01	0.14	9.9
Firm-specific return variation	123793	1.48	1.59	-32.1	0.53	1.35	2.3	12.26
Analyst	40568	1.03	0.91	0	0	0.85	1.73	3.8
Age	123742	1.99	0.72	0	1.61	2.08	2.56	3.61
BM	83487	-0.28	1.06	-9.41	-0.9	-0.24	0.39	8.86
Size	86854	11.3	1.98	0.69	9.93	11.25	12.59	23.03
CH	52768	-0.82	0.89	-9.21	-0.99	-0.61	-0.35	0
IAS	86648	0.09	0.29	0	0	0	0	1
BigN	81470	0.27	0.44	0	0	0	1	1
Quick	78977	-0.13	1.03	-10.31	-0.65	-0.14	0.37	8.11
Debt	80919	-1.76	1.41	-13.94	-2.14	-1.35	-0.9	0.4
Long-term debt	67165	-2.75	1.73	-15.83	-3.51	-2.31	-1.54	0.4
ADR	123793	0.01	0.12	0	0	0	0	1
Utilization	83402	-3.65	1.61	-14.05	-4.46	-3.32	-2.53	-0.01
ROA	69512	-2.91	0.99	-9.21	-3.42	-2.79	-2.27	0
OPMargin	69587	-2.46	1.09	-13.16	-3.01	-2.35	-1.77	5.86

Table 2.3: Summary statistics for the financial ICOR

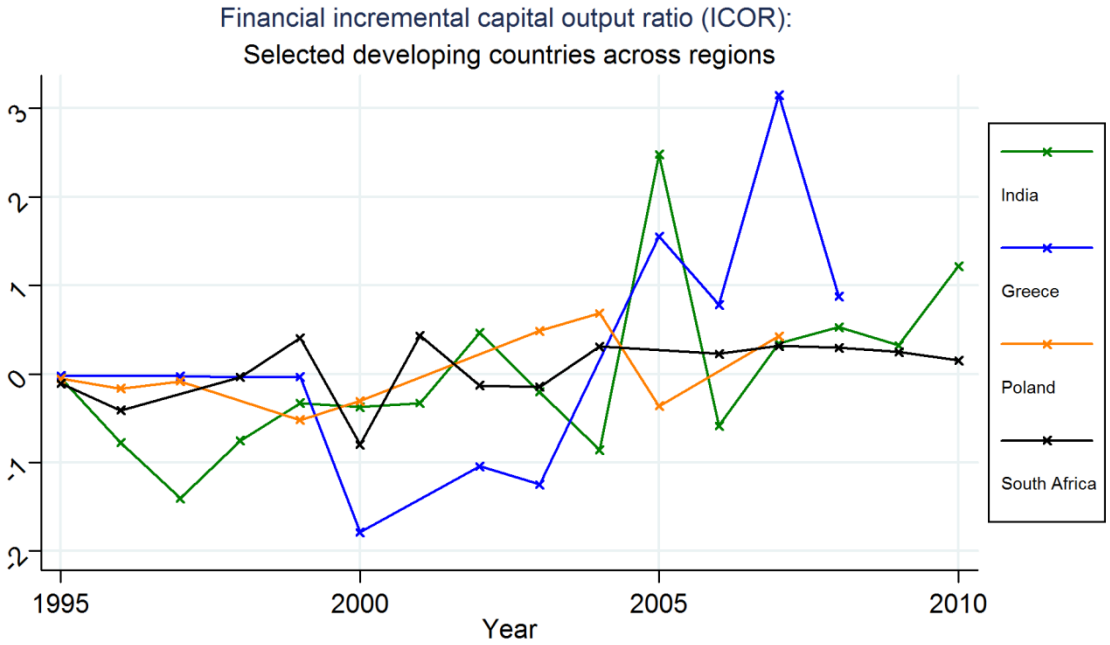
The ratio of gross fixed capital formation (I) at current prices to output growth (ΔY) in financial intermediation, real estate, renting and business activities (ISIC Rev. 3 J + K), $\frac{I}{\Delta Y}$ (United Nations Statistics Division, National Accounts Official Country Data, 2015).

Financial ICOR = $\frac{\Delta k}{\Delta y} = \frac{\frac{\Delta k}{Y}}{\frac{\Delta y}{Y}} = \frac{\frac{I}{Y}}{\frac{\Delta y}{Y}} = \frac{I}{\Delta Y}$ *for Y = Output, K = Capital input, I = Investment*

	Financial incremental capital output ratio ($\frac{I}{\Delta Y}$)			Financial incremental capital output ratio ($\frac{I}{\Delta Y}$)	
	Mean	Median		Mean	Median
Developing countries	*Financial ICOR*		Developed countries	*Financial ICOR*	
Argentina	-	-	Australia	-	-
Brazil	-	-	Austria	-0.58	-0.47
Chile	-	-	Belgium	-0.91	-0.47
China	-	-	Canada	0.12	0.15
Greece	1.14	-0.02	China: Hong Kong SAR	-	-
India	0.25	-0.08	Denmark	-0.26	-0.58
Indonesia	-	-	Finland	0.62	1.12
Kiribati	-	-	France	0.15	0.65
Malaysia	-	-	Germany	-2.1	-1.54
Mexico	-	-	Ireland	-	-
Pakistan	-	-	Israel	-0.09	0.3
Peru	-	-	Italy	-0.31	-0.26
Philippines	-	-	Japan	-	-
Poland	0.23	-0.11	Luxembourg	0.21	0.07
Portugal	0.26	0.27	Netherlands	-0.33	0.54
Russian Federation	-	-	New Zealand	0.52	1.28
South Africa	0.25	0.17	Norway	0.12	0.46
Sri Lanka	-	-	Singapore	-	-
Thailand	-	-	Spain	0.22	-0.61
Turkey	-	-	Sweden	0.55	0.51
			Switzerland	-	-
			Taiwan	-	-
			United Kingdom	-0.49	-0.4
			United States	0.85	0.11
Developing countries	0.42	0.17	Developed countries	-0.08	-0.05

In this section, I discuss the descriptive statistics regarding output growth, the capital allocation efficiency indicators and other control variables at the country and firm levels. Table 2.2 reports the summary statistics for variables across the 38 countries. The average output growth[33] of all countries in the sample is 2.39 per cent; developing countries tend to experience higher average output growth than developed countries, which have growth rates of 3.02 per cent and 1.87 per cent, respectively. Table 2.3 reports the mean and median of the financial *ICOR* for both developing and developed countries. Although the main focus of this chapter is on developing countries, I compare the summary statistics for the financial *ICOR* between developed and developing countries, as performed in similar past studies; this provides a good guide as to whether there are any inherent flaws in the data. The median of the financial *ICOR* across developing countries is 0.17, and it is -0.05 across developed countries.

[33] Measured as real per capita growth, which is the annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources (WDI, 2015).



Source: National Accounts Official Country Data, UN Statistics Division (2015);
Financial ICOR calculation: Financial gross fixed capital formation (LCU at current prices) / Financial output growth (LCU at current prices)
Broad sector definition: Financial intermediation; real estate, renting and business activities (ISIC Rev.3 J+K)
Income classification: WDI (1990), GNI per capita in US$ (Atlas methodology)

Figure 2.2: Financial ICOR for selected developing countries (1995-2013) across regions

Referring to Figure 2.2, it should be mentioned that the financial *ICOR* was increasing in the developing countries, although at different rates, and in selected countries from the various geographical areas, such as Eastern Europe, Southern Europe, Southern Asia and Southern Africa. The pattern in Figure 2.2 is consistent with Kuznet (1960, 1961) in that there is a tendency for the financial *ICOR* to rise with income level both across space and over time. This phenomenon is driven by the simple fact that the replacement component in total investment is less important at a higher growth rate for output, as explained in proposition 2.1 (proposition 2.1).

Table 2.4: Summary statistics for firm-specific return variation

Stock return variation estimated using the Fama-French three-factor model based on the measurement of Fernandes and Ferreira (2008).

	Log $(\frac{1-R^2}{R^2})$			*Log* $(\frac{1-R^2}{R^2})$	
	Mean	Median		Mean	Median
Developing countries	*Firm-specific return variation*		Developed countries	*Firm-specific return variation*	
Argentina	1.29	1.23	Australia	1.52	2.94
Brazil	1.31	1.21	Austria	1.49	2.64
Chile	1.42	1.37	Belgium	1.51	2.82
China	0.87	0.80	Canada	1.67	3.53
Greece	1.34	1.13	China: Hong Kong SAR	1.51	3.13
India	1.82	1.70	Denmark	1.88	2.87
Indonesia	1.52	1.39	Finland	1.51	3.1
Kiribati	1.56	1.41	France	1.61	3.21
Malaysia	1.46	1.34	Germany	1.52	3.3
Mexico	1.32	1.18	Ireland	1.51	3.13
Pakistan	1.81	1.84	Israel	1.49	2.72
Peru	1.63	1.74	Italy	1.35	2.19
Philippines	1.77	1.66	Japan	1.28	2.35
Poland	1.34	1.16	Luxembourg	1.68	3.05
Portugal	1.67	1.51	Netherlands	1.55	2.84
Russian Federation	1.56	1.61	New Zealand	1.37	2.38
South Africa	1.94	1.81	Norway	1.39	2.51
Sri Lanka	1.70	1.60	Singapore	1.38	2.57
Thailand	1.76	1.63	Spain	1.53	2.18
Turkey	0.52	0.43	Sweden	1.4	2.59
			Switzerland	1.35	2.54
			Taiwan	1.24	1.95
			United Kingdom	1.54	3.37
			United States	2.48	4.83
Developing countries	1.48	1.35	Developed countries	2.8	2.45

Table 2.4 presents the summary statistics of firm-specific return variation for developed and developing countries. The median of the firm-specific return variation across developing countries is 1.35, and it is 2.45 across developed countries[34]. The United States has the highest median (4.83) for firm-specific return variation among developed countries, and Pakistan has the highest median (1.84) for firm-specific return variation among developing countries. In this study, I cover a total of 123,793 firm-year observations from 20 developing countries and 477,936 firm-year observations from 24 developed countries over a course of 22 years. On average, the summary statistics suggest that firms in developed countries experience higher firm-specific return variation than those in developing countries; this finding is similar to that of the study by Fernandes and Ferreira (2008).

2.4 Extension of the Levine and Zervos (1998) output growth model

Equation 2. 4

$$Output\ growth_{i,t} = \propto + \beta_1 Financial\ ICOR_{i,t} + \beta_2 Controls_{i,t} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at country level,* t *represents the sample year,* η_i *represents the country dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term.$

[34] For the instrumental variable stock price informativeness, the summary statistics in Table 2.5 show that a higher average number of financial analysts follow a firm in developed countries than in developing countries. On average, 2.27 analysts follow a firm in developed countries, and 1.43 analysts follow a firm in developing countries.

where $Output\ growth_{i,t}$ is the growth of GDP per capita for country *i* in year *t*. $Financial\ ICOR_{i,t}$ is the incremental capital output ratio of the financial intermediation sector for country *i* in year *t*. $Controls_{i,t}$ are the set of macroeconomic control variables in Levine and Zervos (1998), including domestic credit to the private sector (*Credit*), value of shares traded (*Shares*), secondary school enrolment rate (*Education*), government expenditure (*Government*), inflation rate (*Inflation*), market capitalization (*Market*) and trade (*Trade*). Table 2.6 presents five regressions. Column (1) follows the output growth model by Levine and Zervos (1998). Hausman's (1978) test rejects the null hypothesis in Table 2.6, Column (1), which confirms that a fixed-effects model is preferred to a random-effects model[35]. I find results similar to those of Levine and Zervos (1998, p. 549) except for one negative relationship: the coefficient estimate of *Credit* is -0.02 (t=-164.37), which indicates a negative correlation between domestic credit to the private sector and output growth. I apply the output growth model to the developing and developed countries accordingly; still, the evidence in Columns (2) and (3) suggest that the negative relationship between banking development and output growth is systematic, as the coefficient estimates are -0.04 (t=-54.60) and –0.02 (t=-167.22), and both are

[35] The Hausman (1978) test addresses the null hypothesis H_0 that the difference between the random-effects and fixed-effects coefficients is not systematic. If the difference in coefficients is systematic, a fixed-effects model is preferred because the random-effects model is inadequate. The random-effects estimator makes an assumption (the random effects are orthogonal to the regressors) that the fixed-effects estimator does not.

statistically significant.

Table 2.5: Summary statistics for number of analysts following a firm

Number of financial analysts following a firm (Datastream, 2013)					
	Number of analysts following a firm			Number of analysts following a firm	
	Mean	Median		Mean	Median
Developing countries	*Number of analysts*		Developed countries	*Number of analysts*	
Argentina	3.33	1	Australia		
Brazil	2.67	0	Austria	3.68	3.75
Chile	1.04	0	Belgium	5.24	3.5
China	0.55	0	Canada	2.56	0
Greece	2.07	1	China: Hong Kong SAR	6.22	1.8
India	1.04	0	Denmark	4.56	3.33
Indonesia	1.95	0	Finland	6.35	8.33
Kiribati	0.97	0	France	5.61	2.75
Malaysia	2.1	0	Germany	6.88	2.08
Mexico	4.55	1.5	Ireland	3.46	4.58
Pakistan	0.33	0	Israel	0.81	0
Peru	0.62	0	Italy	7.68	6.92
Philippines	2.18	0	Japan	3.32	1.91
Poland	1.18	0	Luxembourg	2.4	0
Portugal	2.97	0	Netherlands	10.37	13.08
Russian Federation	1.51	0	New Zealand	2.94	4.08
South Africa	1.73	0	Norway	4.96	5
Sri Lanka	0.32	0	Singapore	5.83	2.17
Thailand	2.17	0	Spain	9.47	14.58
Turkey	3.54	2.58	Sweden	5.45	3.08
			Switzerland	6.97	7.08
			Taiwan	2.68	1
			United Kingdom	4.12	2.67
			United States	4.86	2.58
Developing countries	1.43	0	Developed countries	2.27	0

Table 2.6: Extension of Levine and Zervos's (1998) output growth model

Growth is the annual percentage growth rate of GDP per capita based on local currency (annual percentage) (WDI, 2015). Credit is domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, trade credit and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is total enrolment in secondary education, regardless of age, expressed as a percentage of the population at official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. The financial ICOR is the ratio of gross fixed capital formation (I) at current prices to the output growth (ΔY) in financial intermediation, real estate, renting and business activities (ISIC Rev. 3 J + K), $\frac{I}{\Delta Y}$ (UNSD, 2015).

The sample consists of 542 country-year observations from the period of 1990-2010. The t-statistics shown in parentheses are based on standard errors adjusted for heteroscedasticity and country-level clustering.

	(1)	(2)	(3)	(4)	(5)
	Growth	*Growth*	*Growth*	*Growth*	*Growth*
	All	Developing	Developed	Developing	Developed
Credit	-0.0220***	-0.0447***	-0.0188***	-0.0961***	-0.0205***
	(-164.3799)	*(-54.6018)*	*(-167.2169)*	*(-49.1803)*	*(-53.9689)*
Government	-0.4081***	-0.4686***	-0.1681***	0.4234***	-0.0536***
	(-67.6662)	*(-36.5868)*	*(-20.5634)*	*(19.5114)*	*(-3.2398)*
Inflation	-0.0937***	-0.0677***	0.0158**	0.3272***	0.3001***
	(-29.4708)	*(-24.6728)*	*(2.2337)*	*(41.4540)*	*(25.0234)*
Education	0.0034***	-0.0733***	-0.0301***	-0.0565***	-0.0381***
	(5.9481)	*(-26.7678)*	*(-40.3591)*	*(-11.9544)*	*(-32.5098)*
Shares	-0.0042***	0.0109***	-0.0034***	-0.0288***	-0.0024***
	(-85.1266)	*(30.0506)*	*(-79.4047)*	*(-33.9500)*	*(-14.6287)*
Trade	0.0119***	0.0261***	0.0352***	0.1896***	0.0516***
	(28.8038)	*(22.4591)*	*(123.6008)*	*(54.8121)*	*(27.4182)*
Market	0.0180***	0.0165***	0.0025***	0.0167***	0.0248***
	(83.7200)	*(34.5721)*	*(16.8820)*	*(23.1032)*	*(30.6933)*
Financial ICOR				-0.0035***	-0.0018***
				(-3.4320)	*(-2.9787)*
Constant	7.7118***	15.8802***	8.8581***	-6.1068***	3.1811***
	(41.1915)	*(58.0939)*	*(72.7867)*	*(-8.4566)*	*(9.0056)*
Observations	542	235	307	56	147
R^2	0.5685	0.5995	0.6631	0.7623	0.5546
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Hausman (1978) specification test Chi-square	50443.32	17422.58	52242.33	6180.03	23481.91

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I explain the negative coefficient of bank credit as being driven by a number of banking crises and “financial difficulties” that countries experienced in the 1990s and 2000s; this explanation is twofold. (i) These economies favoured repressive credit market policies such as loan rate ceilings after these “financial difficulties”. Credit market repression in the form of borrowing constraints may force an economy to save more and thus lead to weaker output growth[36]. (ii) Economists may "badly over-stress" the role of the financial system. The financial literature[37] has highlighted the potential negative effects of “over-stressing” the role of banking development, which leads to credit market liberalization or, more broadly, to an over-developed credit market in economies, industries and firms that rely heavily on external financing and grow “disproportionately”. As a result, growth in credit is not profitable. Following the argument in (ii), there is a need to examine the efficiency and productivity of investment, i.e. financial capital stock within the financial intermediation sector, when explaining economic output growth. After introducing the financial *ICOR* into the growth model, the findings tabulated in Columns (4) and (5) suggest an inverse relationship between the financial *ICOR* and output growth in developed and developing countries: the coefficient estimates are -0.0018 (t=-2.9787) and -0.0035 (t=-3.4320), respectively. My finding suggests that in developing countries, a one-standard-deviation decrease

[36]The supporting literature for point (i) includes Bandiera, Caprio, Honohan, & Schiantarelli (2000); Jappelli & Pagano (1989); Jappelli & Pagano (1994); and Modigliani (1986).

[37]The supporting literature for point (ii) is Robinson (1952).

in the financial *ICOR* is related to a 48.65-basis-point[38] increase in economic output growth, whereas in developed countries, a one-standard-deviation decrease in the financial *ICOR* is related to a 41.76-basis-point[39] increase in economic output growth.

This effect is economically significant and stronger in developing countries. This lends support to my hypothesis (proposition 2.1) that economic output growth in developing countries is likely determined by capital allocation efficiency within the broad financial intermediation sector. To show that the inverse relation between the financial *ICOR* and economic output growth is not explained by omitted heterogeneity, I control for country- and year-fixed effects in the main results in Columns (1) – (5). Because only within-country changes in output growth are taken into account, time-invariant omitted characteristics such as country size, geographical location, policy regime[40] and natural resource endowment cannot

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[38] In developing countries, the standard deviation of the *financial ICOR* at 1.39 (please see Table 2.2) multiplied by the coefficient estimate of the *financial ICOR* at -0.0035 (please see Table 2.6, Column 4) = -0.004865.

[39] In developed countries, the standard deviation of the *financial ICOR* at 2.32 (please see Table 2.2) multiplied by the coefficient estimate of the *financial ICOR* at -0.0018 (please see Table 2.6, Column 5) = -0.004176.

[40] The policy regime is an endogenous feature that country or state did not change in the past, or given the slow-changing nature. As far the orthogonality between growth determinants and unobserved time invariant heterogeneity is concerned, the Hausman (1978) test suggests fixed effects estimation (consistent) than random effects (inconsistent). The between effects (country effects) are relatively strong in financial development, for instance, planned economy is

explain the observed inverse relationship between the financial *ICOR* and output growth. To dismiss contemporary serial correlations among countries as sources of heterogeneity, I adjust the standard errors by country-level clustering following the method in Thompson (2011).

My results support Bagehot's (1873) and Schumpeter's (1912) finding that an efficient financial system greatly promotes economic development through capital productivity because strong capital allocation efficiency helps a country to take better advantage of its investment opportunities. Thus, financial markets and institutions do more than just provide a sideshow to the real economy. They perform a fundamental allocative function that helps investors and managers distinguish between good and bad investments through more accurate measures, as observed in Levine and Zervos's (1998) output growth model (Bagehot, 1873; Boyd & Prescott, 1986; Diamond, 1984; Schumpeter, 1912). Two concepts can help further explain the inverse relationship between the financial *ICOR* and output growth in developing countries. (i) The capacity concept: if technology remains unchanged and the price relationship between labour and capital is stable, then one would expect the financial *ICOR* values to be more or less constant. By comparing countries at a similar level of income, the capacity concept allows for differences in the financial *ICOR* values based on

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contrasted with market economy. However, the within transformation (full demeaned process) in fixed effects model eliminates country and year effects (including the country intervention) for within change analysis, which is the drawback in this application.

whether a country is making a “big push” for economic growth. The “big push” strategy would imply a greater lumpiness of the investment into the financial intermediation sector and hence a higher or rising value for the financial *ICOR*. This investment may not be efficient or productive for value-added creation because more capital input is needed to produce an output. This phenomenon is often expected in poor institutional environments.

(ii) The capital utilization concept: as observed in Column (4), developing countries with a lower financial *ICOR* tend to experience higher output growth. Considering the conditions of abundant labour and scarce capital resources in developing countries, if a developing country defies its comparative advantage in low-cost labour and invests financial capital stocks to produce skill- and capital-intensive goods or services, the factor costs of production tend to be higher than they would in a more-developed country[41]. This could lead to a trade deficit in the free market[42], limiting capital accumulation through trade. This constrains domestic consumption and the institution’s ability to take a proactive role in investment promotion to facilitate labour productivity and output growth.

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[41] The financial capital stock (size) is invested at an increasing rate, but financial output (size) is increasing at a decreasing rate due to the weak tendency of a less developed country to produce skill- and capital-intensive goods or services. Please see Chenery (1960) for the economic structural change in developing countries.

[42] In the free market, I assume that goods and services are freely traded without substitution, trade tariffs, duties or quotas imposed by the government.

Following the Heckscher-Ohlin model, changes in supply conditions arise from changes in relative factor costs as per capita income grows, thereby leading to substitution of domestic production for imports, shifting production to more-capital-intensive sectors and resulting in higher labour productivity and output growth. Workers in local industries in more-developed countries will acquire greater experience in technological and managerial capabilities and higher wages compared with workers in less-developed countries. For both countries to target a similar growth rate, the developed country would require more capital stocks (a rising financial *ICOR*) to attain such growth, mainly due to its tendency to produce capital goods, and would have the least concern regarding capital allocation inefficiency. This is consistent with the findings in Columns (4) and (5) that the inverse relationship between the financial *ICOR* and output growth tends to be stronger in developing countries.

Table 2.7: Firm-level output growth model for developing countries

Firm output growth is the growth of net sales to total assets ($\frac{Net\ sales_t}{Total\ assets_t}$ / $\frac{Net\ sales_{t-1}}{Total\ assets_{t-1}}$ - 1) (Worldscope, 2013). Credit is domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is total enrolment in secondary education, regardless of age, expressed as a percentage of the population at official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies.

Firm-specific return variation is log ($\frac{1-R^2}{R^2}$) of the Fama-French three-factor regression model using bi-weekly stock returns based on Morck et al. (2000). Age is the number of years from the listed date to the current date (Datastream, 2013). BM is the log of the book-to-market equity ratio (Datastream, 2013). Size is the log of market capitalization (US dollars) (Datastream, 2013). CH is the log of the fraction of shares closely held by insiders and controlling shareholders (Worldscope, 2013). IAS is a dummy that equals one if the firm adopts the international accounting standards (Compustat, 2013; Worldscope, 2013). BigN is a dummy variable that equals one if the firm is audited by one of the Big 4/5 audit firms (Compustat, 2013; Worldscope, 2013). Quick is the log of the quick ratio [(Cash + Receivable) / Current liability] (Worldscope, 2013). Debt is the log of total debt scaled by total assets [(Total debt) / Total assets]. Long-term debt is the log of long-term debt scaled by total assets [(Long-term debt) / Total assets]. ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange (Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)). Utilization is the log of capital expenditure and R&D expenses scaled by total assets [(Capital expenditure + R&D expenses) / Total assets]. Returns on assets is the log of return on assets (Operating income / Total assets). Firm profitability is the log of the operating profit margin (Reported operating earnings / Net sales).

The sample consists of 48,030 firm-year observations, from 1990-2010. The t-statistics shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering.

	(1) *Firm output growth*	(2) *Firm output growth*	(3) *Firm output growth*	(4) *Firm output growth*	(5) *Firm output growth*	(6) *Firm output growth*	(7) *Firm output growth*	(8) *Firm output growth*
Firm-specific return variation	0.0047**	0.0044**	0.0061**	0.0039*	0.0039*	0.0047**	0.0058***	0.0063***
	(2.2911)	*(2.3215)*	*(2.4457)*	*(1.6630)*	*(1.9011)*	*(2.2930)*	*(3.0216)*	*(3.6472)*
Credit	-0.0008***	-0.0007***	-0.0013***	-0.0012***	-0.0009***	-0.0008***	-0.0009***	-0.0004**
	(-4.8842)	*(-3.8826)*	*(-6.2471)*	*(-6.2966)*	*(-4.4911)*	*(-4.8995)*	*(-5.1127)*	*(-2.2192)*
Government	-0.0044*	-0.0006	-0.0014	0.0008	-0.0056*	-0.0044*	-0.0030	-0.0003
	(-1.6790)	*(-0.2074)*	*(-0.4211)*	*(0.2718)*	*(-1.9420)*	*(-1.6849)*	*(-1.1177)*	*(-0.1267)*
Inflation	0.0025***	0.0022***	0.0024***	0.0022***	0.0019***	0.0025***	0.0029***	0.0025***
	(5.3703)	*(4.6282)*	*(4.8370)*	*(3.9311)*	*(3.7684)*	*(5.3686)*	*(6.5782)*	*(6.4516)*
Education	-0.0003	-0.0006	-0.0009*	-0.0028***	-0.0006	-0.0003	-0.0003	0.0001
	(-0.8468)	*(-1.2369)*	*(-1.9034)*	*(-5.4562)*	*(-1.4523)*	*(-0.8491)*	*(-0.9237)*	*(0.2000)*
Shares	-0.0004***	-0.0004***	-0.0003***	-0.0003***	-0.0003***	-0.0004***	-0.0003***	-0.0005***
	(-4.2414)	*(-4.1617)*	*(-2.8292)*	*(-2.9040)*	*(-2.9357)*	*(-4.2389)*	*(-3.7016)*	*(-5.6296)*
Trade	0.0006***	0.0005**	0.0008***	0.0011***	0.0009***	0.0006***	0.0007***	0.0009***
	(2.9288)	*(2.4524)*	*(3.0977)*	*(4.5845)*	*(3.6629)*	*(2.9231)*	*(3.2283)*	*(4.1703)*
Market	-0.0000	-0.0001	0.0001	0.0000	-0.0001	-0.0000	-0.0000	-0.0000
	(-0.1882)	*(-0.7160)*	*(0.6046)*	*(0.1506)*	*(-0.9476)*	*(-0.1938)*	*(-0.3734)*	*(-0.1513)*

Age		0.0351***						
		(4.3001)						
BM		-0.0579***						
		(-9.6728)						
Size		-0.0423***						
		(-7.3977)						
CH			0.0102*					
			(1.7584)					
IAS				0.0054				
				(0.4849)				
BigN				-0.0064				
				(-0.8007)				
Quick					0.0055			
					(0.5123)			
Debt					-0.0006			
					(-0.1049)			
Long-term debt					0.0002			
					(0.0777)			
ADR						0.0404		
						(1.3844)		
Utilization							0.0140***	
							(3.7958)	
ROA								0.0478***
								(9.0107)
OPMargin								-0.0303***
								(-6.7462)
Constant	0.0852*	0.4512***	0.0948	0.1762***	0.1186**	0.0850*	0.1186**	0.0397
	(1.7793)	*(6.5073)*	*(1.5952)*	*(2.9708)*	*(2.1775)*	*(1.7739)*	*(2.2869)*	*(0.8654)*
Observations	48,030	45,065	29,847	38,385	35,337	48,030	45,367	36,169
R^2	0.0032	0.0087	0.0045	0.0050	0.0036	0.0032	0.0051	0.0123
Number of firms	7,789	7,674	4,908	6,396	6,405	7,789	7,638	7,146
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausman (1978) specification test								
Chi-square	103.82	225.62	100.98	104.82	78.27	99.61	108.74	186.83

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As discussed in the earlier section, the empirical evidence suggests that the financial *ICOR* contributes to economic output growth in developing countries. It is possible that this country-level evidence is the result of contributions by other countrywide variables. To tease out the role that financial capital allocation efficiency plays in output growth, perhaps at the firm level, a direct measure of capital allocation efficiency through stock price informativeness, such as firm-specific return variation, needs to be identified. If the information-based explanation of stock price informativeness holds, it is expected that firm-specific return variation will be significantly associated with firm output growth, as explained in hypothesis (proposition 2.2). Specifically, this section tests hypothesis (proposition 2.2) regarding firm-specific return variation and firm output growth through the channel of external monitoring mechanisms, using the following regression specification:

Equation 2. 5

$$Firm\ output\ growth_{i,t} = \propto + \beta_1 Firm - specific\ return\ variation_{i,t} + \beta_2 Controls_{i,t} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i represents observations at firm level, t represents the sample year, η_i represents the firm dummy, ω_t represents the year dummy and $\varepsilon_{i,t}$ $represents\ error\ term$.

where $Firm\ output\ growth_{i,t}$ is the growth of revenue scaled by total assets for firm *i* in year *t*. $Firm\ specific\ return\ variation_{i,t}$ is the logistic transformation of $(\frac{1-R^2}{R^2})$, where R^2 is estimated from the model in Proposition 2. $Controls_{i,t}$ are the set of firm-level control variables. In consideration of the prior literature (Chan & Hameed, 2006, Ferreira & Laux, 2007, Fernandes & Ferreira, 2008, Piotroski & Roulstone, 2004), a

battery of firm-specific characteristics is controlled for in the regression, including the log of firm age (*Age*), the log of the book-to-market ratio (*BM*), the log of total assets (Size), the log of the proportion of a firm's shares that are closely held (*CH*), the dummy for international accounting standards (*IAS*), the dummy for firm audited by Big 4/5 audit firms (*BigN*), the log of the firm quick ratio (*Quick*), the log of the total debt scaled by total assets (*Debt*), the log of long-term debt scaled by total assets (*Long-term debt*), a dummy for whether a stock is listed in the United States (*ADR*), the log of firm capital and research expenditure scaled by total assets (*Utilization*), the log of return on assets (*ROA*), and the log of the operating profit margin (*OPMargin*). The panel regression in Table 2.7 is estimated with firm- and year-fixed effects (not reported). The models in Columns (1) – (8) are estimated with robust standard errors adjusted for heteroscedasticity and clustered at the firm level.

Table 2.7 presents the regression estimates of developing countries. The results show strong evidence that firm-specific return variation as a measurement of stock price informativeness plays a significant role in explaining firm output growth. The coefficient estimate of *firm-specific return variation* in Table 2.7, Column (1) is 0.0047 (t=2.2911), controlling for the variables as in Levine and Zervos (1998). This evidence supports my hypothesis (proposition 2.2) that in a more-informative stock market, capital is priced correctly in its different uses; this effect should impose greater monitoring and encourage additional disclosure from firms, thus facilitating the fundamental output growth of firms. A one-standard-deviation increase in stock price informativeness is

related to a 0.75 per cent[43] increase in firm output growth. All coefficient estimates of *firm-specific return variation* from Columns (2) to (8) are highly statistically significant and positive after controlling for firm-specific characteristics. This result shows that the positive contribution of stock price informativeness to firm output growth is not jointly determined by any omitted time-variant variables.

Overall, the results are consistent with the views of Holmström and Tirole (1993) and Faure-Grimaud and Gromb (2004) that in a more informative stock market, the information revealed by stock prices should impose greater external monitoring and additional disclosure, thereby disciplining managers to undertake value-increasing projects. Arguably, this would improve the fundamental capital productivity of the firm and contribute to firm output growth.

2.5 Robustness test

This section presents robustness checks for the reverse causality (at the firm level) found in the previous section. There is a possibility that endogeneity is clouding the relation between stock price informativeness and firm output growth in the fixed-effects regression framework. This would mean that the direction of causation between stock price informativeness and firm output growth could not be reliably inferred because the parameter estimates of Columns (1) – (8) in Table 2.7 may be biased and inconsistent. I therefore estimate the coefficients based on a two-stage least-squares (2SLS) estimation. I use the instrumental variable approach to address possible endogeneity.

[43] In developing countries: the standard deviation of *firm-specific return variation,* 1.59 (please see Table 2.2), multiplied by the coefficient estimate of *firm-specific return variation,* 0.0047 (please see Table 2.7, Column 1) = 0.0075.

Specifically, I instrument firm-specific return variation by the number of analysts following (*Analyst*), an instrumental variable that equals the log of the number of financial analysts following a firm.

First-stage regression:

Equation 2. 6

$$Firm - specific\ return\ variation_{i,t} = \propto + \beta_1 Analyst_{i,t} + \beta_2 Controls_{i,t} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level, t represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term$.

Second-stage regression:

Equation 2. 7

$$Firm\ output\ growth_{i,t} = \propto + \beta_1 Instrumented\ firm - specific\ return\ variation_{i,t} + \beta_2 Controls_{i,t} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level, t represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term$.

We then use the predicted value from the first-stage estimation to instrument the firm-specific return variation in the second-stage estimation; the other control variables are identical to the fixed-effects model in the previous section.

Table 2.8: Two-stage firm-level output growth model for developing countries

Firm output growth is the growth of net sales to total assets ($\frac{Net\ sales_t}{Total\ assets_t}$ / $\frac{Net\ sales_{t-1}}{Total\ assets_{t-1}}$ *- 1) (Worldscope, 2013). Credit is domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is total enrolment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies.*

Firm-specific return variation is log ($\frac{1-R^2}{R^2}$) *of the Fama-French three-factor regression model using bi-weekly stock returns based on Morck et al. (2000). Analyst is the log of the number of financial analysts following a firm (Datastream, 2013). Age is the number of years from the listed date to the current date (Datastream, 2013). BM is the log of the book-to-market equity ratio (Datastream, 2013). Size is the log of market capitalization (US dollars) (Datastream, 2013). CH is the log of the fraction of shares closely held by insiders and controlling shareholders (Worldscope, 2013). IAS is a dummy that equals one if the firm adopts the international accounting standards (Compustat, 2013; Worldscope, 2013). BigN is a dummy variable that equals one if the firm is audited by one of the Big 4/5 audit firms (Compustat, 2013; Worldscope, 2013). Quick is the log of the quick ratio [(Cash + Receivable) / Current liability] (Worldscope, 2013). Debt is the log of total debt scaled by total assets [(Total debt) / Total assets]. Long-term debt is the log of long-term debt scaled by total assets [(Long-term debt) / Total assets]. ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange (Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)). Utilization is the log of capital expenditure and R&D expenses scaled by total assets [(Capital expenditure + R&D expenses) / Total assets]. Return on assets is the log of return on assets (Operating income / Total assets). Firm profitability is the log of the operating profit margin (Reported operating earnings / Net sales).*

The sample consists of 19,059 firm-year observations from 1990-2010. The t-statistics shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering.

VARIABLES	(1) *Firm-specific return variation*	(2) *Firm output growth*	(3) *Firm output growth*	(4) *Firm output growth*	(5) *Firm output growth*	(6) *Firm output growth*	(7) *Firm output growth*	(8) *Firm output growth*	(9) *Firm output growth*
Instrumented firm-specific return variation		0.1104***	0.0681***	0.1419***	0.1032***	0.1164***	0.1122***	0.1266***	0.1185***
		(4.4917)	*(2.7296)*	*(4.6993)*	*(4.7110)*	*(4.5233)*	*(4.5470)*	*(4.4378)*	*(4.1574)*
Analyst	-0.2241***								
	(-14.7787)								
Credit	-0.0080***	0.0004	0.0002	0.0010*	0.0003	0.0002	0.0004	0.0004	0.0009**
	(-11.3235)	*(1.1559)*	*(0.4087)*	*(1.7564)*	*(0.7335)*	*(0.5253)*	*(1.1787)*	*(0.8447)*	*(2.0392)*
Government	0.0559***	-0.0078*	-0.0057	-0.0086*	-0.0047	-0.0106**	-0.0079**	-0.0106**	-0.0061
	(5.2987)	*(-1.9530)*	*(-1.4126)*	*(-1.7888)*	*(-1.0687)*	*(-2.3802)*	*(-1.9778)*	*(-2.5016)*	*(-1.4672)*
Inflation	-0.0060***	0.0039***	0.0030***	0.0043***	0.0040***	0.0036***	0.0040***	0.0043***	0.0036***
	(-5.8933)	*(7.3559)*	*(5.4324)*	*(6.4709)*	*(6.5187)*	*(6.4927)*	*(7.3717)*	*(7.4349)*	*(6.5363)*
Education	-0.0197***	0.0009	-0.0011	0.0024**	0.0002	0.0009	0.0010	0.0014*	0.0012
	(-11.0545)	*(1.3546)*	*(-1.5373)*	*(2.1888)*	*(0.1920)*	*(1.1290)*	*(1.3722)*	*(1.7234)*	*(1.5519)*
Shares	-0.0034***	0.0000	-0.0002	0.0003*	0.0001	-0.0000	0.0000	0.0001	0.0001
	(-11.9285)	*(0.0277)*	*(-1.0595)*	*(1.7215)*	*(0.4041)*	*(-0.0339)*	*(0.0790)*	*(0.5319)*	*(0.3499)*
Trade	-0.0128***	0.0019***	0.0011**	0.0020***	0.0015***	0.0020***	0.0019***	0.0018***	0.0021***
	(-14.5226)	*(4.1092)*	*(2.4528)*	*(4.4759)*	*(3.8922)*	*(4.3066)*	*(4.1336)*	*(3.9736)*	*(4.3545)*
Market	0.0042***	-0.0005***	-0.0004*	-0.0008***	-0.0005***	-0.0006***	-0.0005***	-0.0006***	-0.0007***
	(18.3864)	*(-2.9866)*	*(-1.9501)*	*(-3.7689)*	*(-3.2996)*	*(-2.9496)*	*(-3.0478)*	*(-3.3071)*	*(-3.5807)*
Age			0.0517***						
			(4.1647)						
BM			-0.0330***						
			(-3.1675)						
Size			-0.0210**						
			(-2.0141)						
CH				-0.0056					
				(-1.2590)					
IAS					0.0267*				
					(1.9225)				
BigN					-0.0035				
					(-0.3846)				
Quick						-0.0030			
						(-0.2855)			
Debt						-0.0019			
						(-0.3082)			
Long-term debt						0.0024			

						(0.6638)			
ADR							0.0590*		
							(1.9560)		
Utilization								0.0150*	
								(1.9390)	
ROA									0.0356***
									(4.3364)
OPMargin									-0.0166**
									(-2.2173)
Constant	3.4548***								
	(17.7434)								
Observations	28,281	19,059	18,709	13,428	15,816	14,273	19,059	17,765	15,907
R^2	0.0701	-0.0904	-0.0292	-0.1561	-0.0738	-0.1248	-0.0935	-0.1241	-0.1377
Number of firms	5,897	3,741	3,692	2,592	3,136	2,894	3,741	3,584	3,283
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cragg and Donald (1993) Wald F-statistic		242.667	199.409	158.086	345.513	205.737	240.762	199.949	172.433
Kleibergen and Paap (2006) rk Wald F-statistic		163.994	136.015	101.795	229.378	144.215	162.814	137.693	113.569

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.8 presents the two-stage firm-level output growth model for developing countries. The first-stage estimation in Column (1) shows that analyst coverage negatively covaries with firm-specific return variation in a linear projection. The Cragg and Donald (1993) and Kleibergen and Paap (2006) Wald F-statistics are 172.43 and 113.57, respectively in Column (2); both are well above 10, the threshold of weak exogeneity suggested by Staiger and Stock (1997). This provides strong evidence in support of rejecting the null hypothesis in Table 2.8, Column (1) that the instrumental variable in the first-stage regression is weakly identified. The coefficient estimate of *Analyst* in Column (1) is -0.2241 (t=-14.787); this statistically significant correlation alleviates any concerns about weak-instrument problems. In developing countries, firms that have more analyst coverage have a higher proportion of market-wide information. This result is consistent with Chan and Hameed's (2006) finding that in developing countries, firms that are covered by more analysts incorporate more (less) market-wide (firm-specific) information[44]. In developing countries, a poor institutional and informational environment may prevent information intermediaries, such as financial analysts, from accessing corporate information. For instance, less-strict disclosure requirements may lead firms to hide unfavourable events and disclose

[44] In contrast with conventional studies, which indicate that securities analysts collect and disseminate firm-specific information, their activities are closely related to the theoretical literature regarding firm-specific information acquisition (Admati, 1985; Admati & Pfleiderer, 1986; Bhushan, 1989; Diamond, 1984; Grossman & Stiglitz, 1980; Verrecchia, 1982).

less-reliable information (Fox, Morck, Yeung, & Durnev, 2003; Jin & Myers, 2006). Therefore, valuable firm-specific information may be more difficult to collect and more costly to produce. At the same time, problems such as poor protection for investors or a lack of transparency could make firm-specific information less useful (Morck et al., 2000, Jin & Myers, 2006). Investors in developing countries, therefore, could have less incentive to demand firm-specific information. The high cost of information discovery coupled with the potentially low demand for information could result in financial analysts producing market-wide news that contains minimal firm-specific information[45]. This instrumental variable (*analyst*) also satisfies the exogenous condition because the current firm output growth is likely to be independent of its average analyst coverage during the time.

To strengthen my second hypothesis (proposition 2.2) – that the positive relation between stock price informativeness and firm output growth is not clouded by endogeneity – Table 2.8 columns (2) – (9) are estimated with the *instrumented firm-specific return variation*, controlling for country- and year-fixed effects. As observed, the coefficient estimates for *instrumented firm-specific return variation*

[45] Based on Chan and Hameed (2006), another interpretation of the results is that they are related to the I/B/E/S data used in the sample. If I/B/E/S primarily collects information on U.S. analysts who are following markets in developing countries, given that the cost of collecting firm-specific information for U.S.-based analysts might be high because of distance, language barriers, and accounting differences across countries, it would be of no surprise that U.S. analysts produce predominately market-wide information in developing countries.

remain highly statistically significant, with the expected positive signs across specifications, although some of the coefficient estimates for the control variables in the two-stage regression specification in Table 2.8, Columns (5) and (7) now become significant[46]. Turning to the economic meaning of the estimated coefficients, I observe that the coefficient estimate of stock price informativeness in Table 2.8, Column (2) shows that a one-standard-deviation increase in stock price informativeness is corresponds to a 17.55 per cent[47] increase in firm output growth in the developing countries sample. Equally important, after controlling for the endogeneity of stock price informativeness, the effects of stock price informativeness are amplified relative to the estimate obtained from the fixed-effects panel regression in Table 2.7, Column (1). In the fixed-effects panel regression, the positive effects of stock price informativeness on output growth is underestimated because they are outweighed by the negative effects of output growth on stock price informativeness[48]. With the fixed-effects IV estimates, the accurate magnitudes are hence explicit after controlling for endogeneity.

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[46] Except that the log of the fraction of shares closely held by insiders and controlling shareholders (*CH*) in the two-stage regression becomes insignificant. This variable is intended to control for private information production (as opposed to the public information produced by the media), which could also cause co-movement in stocks.

[47] In developing countries, the standard deviation of *firm-specific return variation,* which is 1.59 (please see Table 2.2), multiplied by the coefficient estimate of *firm-specific return variation,* which is 0.1104 (please see Table 2.8, Column 2) = 0.1756.

[48] For instance, firms with better performance tend to possess stronger governance and transparency.

2.6 The predictive role of capital allocation efficiency in developing countries' output growth

Levine and Zervos (1998) show that banking development and stock market liquidity are predictors of long-term output growth for 47 selected countries using growth and explanatory variables averaged over long periods. As mentioned earlier, however, this approach is criticized because common shocks to the dependent and explanatory variables during the sample period may drive the empirical findings. Furthermore, the regressions used by Levine and Zervos (1998) do not account for the potential endogenous determination of growth and explanatory variables. In this section, I attempt to examine the predictive role of capital allocation efficiency in explaining the short- and long-term output growth of developing countries. Similar to the strategy used in the previous section, I apply predictive modelling to both the country and firm levels, controlling for the lagged variables in Levine and Zervos's (1998) model. To show that the predictive role of capital allocation efficiency is not driven by omitted heterogeneity and serial correlation, the predictive modelling controls country- and year-fixed effects in addition to lagged output growth in the regression framework.

That said, in a more transparent environment (less information asymmetry between insiders and outsiders), less private information is revealed by stock prices (lower firm-specific return variation) through trading activity.

Table 2.9: Predictive role of the financial ICOR in the output growth model for developing countries

Country-level predictive model

$$Output\ growth_{i,t} = \propto + \beta_1 Financial\ ICOR_{i,\ t-x} + \beta_2 Controls_{i,\ t-x} + \beta_3 Output\ growth_{i,\ t-1\ to\ t-x} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at country level,* t *represents the sample year,* η_i *represents the country dummy,* ω_t *represents the year dummy,* $\varepsilon_{i,t}$ $represents\ error\ term\ and\ for\ x = \{1,2,3,4\}$

Growth is the annual percentage growth rate of GDP per capita based on local currency (annual percentage) (WDI, 2015). Credit is domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, trade credits and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is the total enrolment in secondary education, regardless of age, expressed as a percentage of the population at official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. The financial ICOR is the ratio of gross fixed capital formation (I) *at current prices to the output growth* (ΔY) *in financial intermediation, real estate, renting and business activities (ISIC Rev. 3 J + K),* $\frac{I}{\Delta Y}$ *(UNSD, 2015).*

The sample consists of 542 country-year observations from 1990-2010. The t-statistics shown in parentheses are based on standard errors adjusted for heteroscedasticity and country-level clustering.

	(1)	(2)	(3)	(4)
	Growth	*Growth*	*Growth*	*Growth*
	t = (-1)	t = (-2)	t = (-3)	t = (-4)
Lagged (t) Financial ICOR	-0.0013	0.0085*	-0.0027	-0.0138**
	(-0.4570)	*(2.6899)*	*(-0.8205)*	*(-3.8593)*
Lagged (t) Credit	-0.0347	-0.1088***	-0.0553***	-0.0357
	(-1.8252)	*(-5.2951)*	*(-7.4168)*	*(-1.7476)*
Lagged (t) Government	-0.8166*	-0.2225	-0.8764**	-0.5414
	(-2.5135)	*(-0.7893)*	*(-4.1638)*	*(-1.8755)*
Lagged (t) Inflation	0.0982	0.0854	0.0893	-0.0360
	(0.6854)	*(0.7410)*	*(1.2907)*	*(-0.7417)*
Lagged (t) Education	0.0959	-0.0142	-0.0895	-0.0574
	(1.1550)	*(-0.2484)*	*(-1.7816)*	*(-1.1995)*
Lagged (t) Shares	-0.0007	-0.0336**	-0.0085	0.0014
	(-0.1483)	*(-4.5110)*	*(-1.4230)*	*(0.1124)*
Lagged (t) Trade	0.0731	0.0435	0.0269	0.0055
	(0.9584)	*(1.1448)*	*(1.9312)*	*(0.4518)*
Lagged (t) Market	-0.0090	0.0248**	0.0074	-0.0120
	(-0.9528)	*(4.3287)*	*(1.4516)*	*(-1.6122)*
Growth (-1)	-0.1900*	-0.1607	-0.1955*	-0.0474
	(-2.6458)	*(-1.4784)*	*(-2.7139)*	*(-1.5382)*
Growth (-2)		0.0436	-0.0377	0.1249**
		(0.6263)	*(-0.7302)*	*(3.9708)*
Growth (-3)			0.0663	-0.0892
			(1.4325)	*(-2.0946)*
Growth (-4)				0.1218**
				(2.9445)
Constant	8.2373	6.7673	26.5047**	19.6977*
	(1.2129)	*(0.8602)*	*(3.2173)*	*(2.2166)*
Observations	56	56	56	56
R^2	0.7718	0.7880	0.7090	0.7065
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 2.9, Columns (1) to (4), I test the lagged financial *ICOR*'s ability to predict the output growth of developing countries in conjunction with the other lagged variables in Levine and Zevos's (1998) model. The evidence in Table 2.9, Column (4) confirms the role of capital allocation efficiency in predicting long-term economic output growth[49] but not shorter-term growth. Recalling the inverse relationship between the financial *ICOR* and output growth found in the previous section, I find that the inverse relationship remains valid in the predictive modelling: a one-standard-deviation decrease in the financial *ICOR* is related to a 0.019 per cent[50] increase in the long-term output growth of developing countries. In comparison with the ability of the contemporaneous coefficient estimate of the financial *ICOR* to explain output growth[51], I find that the explanatory power of the financial *ICOR* tends to be stronger in explaining long-term output growth than in explaining contemporaneous output growth. This suggests governance and institutional quality tends to have persistent effect on output growth rates. Unlike Levine and Zervos (1998), I do not find that the roles

[49] In Table 2.9, Column (4), the findings suggest that the lagged financial *ICOR* (t-4) predicts growth in economic output (t). The coefficient estimate in the predictive modelling is economically significant.

[50] In developing countries, the standard deviation of the *financial ICOR,* which is 1.39 (please see Table 2.2), multiplied by the coefficient estimate of the *financial ICOR (t-4)*, which is -0.0138 (please see Table 2.9, Column 4), = -0.019182.

[51] In the fixed effects model, a one-standard-deviation decrease in the financial *ICOR* is related to a 48.65-basis-point increase in the economic output growth of developing countries.

of banking development and stock market liquidity jointly predict the long-term economic output growth of developing countries.

Table 2.10: Predictive role of stock price informativeness in the output growth model for developing countries

Firm-level predictive model

$$Firm\ output\ growth_{i,t} = \propto + \beta_1 Instrumented\ firm - speciic\ return\ variation_{i,\ t-x} + \beta_2 Controls_{i,\ t-x} + \beta_3 Firm\ output\ growth_{i,\ t-1\ to\ t-x} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i represents observations at firm level, t represents the sample year, η_i represents the firm dummy, ω_t represents the year dummy, $\varepsilon_{i,t}$ represents error term and for $x = \{1,2,3,4\}$

Firm output growth is the growth of net sales to total assets ($\frac{Net\ sales_t}{Total\ assets_t} / \frac{Net\ sales_{t-1}}{Total\ assets_{t-1}}$ - 1) (Worldscope, 2013). Credit is domestic credit to the private sector and refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, trade credits and other accounts receivable, that establish a claim for repayment (WDI, 2015). Government is general government final consumption expenditure (formerly general government consumption) and includes all government current expenditures for purchases of goods and services (including compensation of employees) (WDI, 2015). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (WDI, 2015). Education is total enrolment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age (WDI, 2015). Shares refer to the value of shares traded and are the total number of shares traded, both domestic and foreign, multiplied by their respective prices (WDI, 2015). Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (WDI, 2015). Market (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies.

Firm-specific return variation is the log ($\frac{1-R^2}{R^2}$) of the Fama-French three-factor regression model using bi-weekly stock returns based on Morck et al. (2000). Age is the number of years from the listed date to the current date (Datastream, 2013). BM is the log of the book-to-market equity ratio (Datastream, 2013). Size is the log of market capitalization (US dollars) (Datastream, 2013). CH is the log of the fraction of shares closely held by insiders and controlling shareholders (Worldscope, 2013). IAS is a dummy that equals one if the firm adopts the international accounting standards (Compustat, 2013; Worldscope, 2013). BigN is a dummy variable that equals one if the firm is audited by one of the Big 4/5 audit firms (Compustat, 2013; Worldscope, 2013). Quick is the log of the quick ratio [(Cash + Receivable) / Current liability] (Worldscope, 2013). Debt is the log of total debt scaled by total assets [(Total debt) / Total assets]. Long-term debt is the log of long-term debt scaled by total assets [(Long-term debt) / Total assets]. ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange (Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)). Utilization is the log of capital expenditures and R&D expenses scaled by total assets [(Capital expenditure + R&D expenses) / Total assets]. Return on assets is the log of return on assets (Operating income / Total assets). Firm profitability is the log of the operating profit margin (Reported operating earnings / Net sales).

The sample consists of 15,968 firm-year observations from 1990-2010. The t-statistics shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering.

	(1) *Firm output growth*	(2) *Firm output growth*	(3) *Firm output growth*	(4) *Firm output growth*
	t = (-1)	t = (-2)	t = (-3)	t = (-4)
Lagged (t) Instrumented firm-specific return variation	0.1420***	0.1193***	0.1233***	0.1047***
	(5.9775)	*(4.5181)*	*(4.1507)*	*(2.9364)*
Lagged (t) Credit	0.0017***	0.0015***	0.0017***	0.0022***
	(4.1407)	*(3.2535)*	*(3.2802)*	*(2.8464)*
Lagged (t) Government	-0.0129**	-0.0177***	-0.0137**	-0.0134*
	(-2.4376)	*(-2.9406)*	*(-2.0642)*	*(-1.9261)*
Lagged (t) Inflation	0.0010	0.0013*	0.0023***	0.0021***
	(1.6413)	*(1.8626)*	*(3.7793)*	*(3.2404)*
Lagged (t) Education	0.0033***	0.0013	0.0013	-0.0009
	(2.9888)	*(1.1153)*	*(1.1136)*	*(-0.6465)*
Lagged (t) Shares	0.0004**	-0.0004**	0.0004**	-0.0005***
	(2.5375)	*(-2.1652)*	*(2.0078)*	*(-2.7582)*
Lagged (t) Trade	0.0016***	0.0021***	0.0029***	0.0017
	(3.2824)	*(3.2834)*	*(4.0586)*	*(1.5384)*
Lagged (t) Market	-0.0007***	-0.0008***	-0.0006***	-0.0003
	(-4.1531)	*(-3.6055)*	*(-2.7809)*	*(-0.9681)*
Firm output growth (-1)	-0.2566***	-0.1238***	-0.1149***	-0.0869***
	(-12.2043)	*(-5.2225)*	*(-4.1753)*	*(-3.5520)*
Firm output growth (-2)		-0.2960***	-0.1773***	-0.1755***
		(-7.9385)	*(-7.0367)*	*(-4.4122)*
Firm output growth (-3)			-0.3717***	-0.2597***
			(-11.5554)	*(-7.7873)*
Firm output growth (-4)				-0.4094***
				(-7.2155)
Observations	15,968	13,081	10,550	8,372
R^2	-0.0950	-0.0270	-0.0013	0.0639
Number of firms	3,268	2,781	2,315	1,830
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To further confirm the role of capital allocation efficiency in predicting output growth, I expand the predictive modelling to a firm-level analysis. Because of the dynamic nature of the firm-level model, I use predictive modelling based on a two-stage regression framework. Controlling for reverse causality at my best effort, I find that stock price informativeness predicts both the short- and the long-term firm output growth in developing countries. The estimated coefficients of stock price informativeness in Table 2.10, Columns (1) to (4) for lagged-one to lagged-four periods are economically significant, controlling for variables in Levine and Zervos (1998). On average, a one-standard-deviation increase in stock price informativeness is related to a 23-basis-point increase in short-term firm output growth and a 17-basis-point increase in long-term firm output growth[52]. Surprisingly, the role of banking development jointly predicts firm output growth with capital allocation efficiency in developing countries. I find that the role of banking development is positive and statistically significant, and the explanatory

[52] In developing countries, the standard deviation of *firm-specific return variation,* which is 1.59 (please see Table 2.2), multiplied by the coefficient estimate of *firm-specific return variation (t-1)*, which is 0.1420 (please see Table 2.10, Column 1), = 0.2258. Similar to the short-term output growth explanation, the standard deviation of *firm-specific return variation*, which is 1.59 (please see Table 2.2), multiplied by the coefficient estimate of *firm-specific return variation (t-4),* which is 0.1047 (please see Table 2.10, Column 4), = 0.1665.

power tends to be stronger over the longer term. However, the predictive role of stock market liquidity is inconclusive[53].

I find that (i) capital allocation efficiency is a good predictor of firm output growth over both the short and long terms but is only a good predictor of economic growth in the long term. (ii) The predictive power of capital allocation efficiency in output growth tends to be stronger (weaker) over the longer term for country- (firm-) level analysis. (iii) Banking development and capital allocation efficiency jointly predict firm output growth but not economic output growth. I show that the predictive ability of the output growth model by Levine and Zervos (1998) can be improved by controlling time-invariant omitted heterogeneity and reverse causality and by considering the additional role of capital allocation efficiency.

2.7 Conclusions

This chapter investigates the empirical contribution of capital allocation efficiency to output growth in developing countries. Controlling for the variables in Levine and Zervos (1998), both the financial *ICOR* and stock price informativeness act as good proxies for capital allocation efficiency in explaining output growth.

The first part of this chapter confirms the role of capital allocation efficiency as measured by the financial *ICOR* in explaining economic output growth. Following the capacity and capital utilization concepts, the comparative advantage and "big push" models are explored to explain the importance of capital allocation

[53] The estimated coefficient of stock market liquidity is positive for Columns (1) and (3) but negative for Columns (2) and (4).

efficiency for economic development in developing countries. The findings suggest that an efficient financial intermediation sector, as reflected by better governance and institutional quality greatly promotes economic development. Strong capital allocation efficiency helps a country to take better advantage of its investment opportunities. If this investment is effective, it should increase the long-run aggregate supply of the economy through productive capacity, which could sustain long-term economic output growth and in turn increase the long-run aggregate supply.

When capital allocation efficiency can be better measured at the firm level through stock price informativeness, the second section results support my conjecture that greater external monitoring mechanisms are reflected by stronger stock price informativeness for disciplining managers. All else being equal, strong external monitoring mechanisms discipline managers to allocate capital efficiently by undertaking value-increasing projects to expand the firm business portfolio. This finding supports Levine (1997), who stated that the channel of capital allocation is an integral part of the growth process.

I also find that the long-term output growth model of Levine and Zervos (1998) is likely to be improved by including the role of capital allocation efficiency. Capital allocation efficiency acts as a strong predictor of long-term economic output growth and plays a role complementary to that of banking development in predicting firm output growth.

2.8 References

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CHAPTER 3

INTERNATIONAL ASPECTS OF CAPITAL ALLOCATION EFFICIENCY: SHORT-SELLING

3.1 Introduction

Short selling has often been regarded as hazardous to the stability of financial markets and has subsequently been banned in many countries; Beber and Pagano (2013, p. 352-353) document short-selling bans in 30 countries[54]. However, is this restriction really beneficial to the financial market? The existing literature points to short selling's contribution to market information efficiency. More specifically, short sales help facilitate incorporation of negative information into stock prices (Diamond & Verrecchia, 1987; Miller, 1977), and society can share this negative information through the price system (Hayek, 1945). Corporate stakeholders, such as capital providers, customers, suppliers, managers and other employees, then update their relationships with firms based on the information that they have obtained from stock prices (Baumol, 1965; Bond, Goldstein & Prescott, 2010). However, although this process does allow the market to be more effective, it can also oversensitize the market to negative information. The pioneering studies by French and Roll (1986) and Roll (1988) show that a significant portion of stock return variation is not explained by market movements, which measure the rate of private information incorporation into stock prices via informed trading. A recent study by Morck, Yeung and Yu (2000) covers the role of arbitrageurs: using an information-based interpretation of stock co-movement, more information about fundamentals is capitalized into stock prices through the trading activity of risk arbitrageurs, who gather and possess private information through high-frequency informed trading. Their role is similar to that of short sellers, who trade against insiders based on private or negative

[54] Please see Table 3.1 for the summary of short-selling bans for 30 countries (Beber & Pagano, 2013 p. 352-353).

information. Because there is a stronger flow of firm-specific information into the market, this information can foster external scrutiny and allow for stronger external monitoring[55] mechanisms to discipline managers. In this chapter, the external monitoring mechanisms are measured by short-selling potential: I investigate the benefits of short selling through the dimension of disciplinary mechanisms against managers who allocate funds inefficiently. My findings show that short sellers are not only able to make stock prices more informative but also able to influence how managers behave by acting as external monitors. The disciplinary role of short selling may arise in two main ways. First, short sellers may amplify the effect of shareholders who are obeying the "Wall Street Rule" and selling the company's shares (e.g., Admati & Pfleiderer, 2009; Edmans, 2009; Edmans & Manso, 2011; Kahn & Winton, 1998; Maug, 1998). Short selling can therefore be seen as a "vote of confidence" regarding managerial behaviour that provides information to the market about the firm. This information negatively affects the stock price, effectively punishing managers. For instance, based on agency theory, managers may have the incentive to retain earnings and allocate funds to non-positive NPV projects or to engage in "empire building" in the pursuit of personal objectives. Short selling could directly reduce such incentives by punishing firms that inefficiently use capital and therefore indirectly – through the effect on managerial actions – increase the payout ratio of excess earnings to shareholders.

[55] Holmström and Tirole (1993) explain that stock prices incorporate performance information that cannot be extracted from the firm's current and future profit data.

Table 3.1: Short-selling ban summary

This table describes the main characteristics of the short-selling bans for 30 countries (Beber & Pagano, 2013 p. 352-353)

Country	Scope of Short-selling Ban	Ban Start Date	Ban Lift Date	Duration (Days)
Australia	All Stocks	22 Sep. 08	25 Ma 09	245
Austria	Financial Stocks	26 Oct. 08	30 Nov. 10	660
Belgium	Financial Stocks	22 Sep. 08	After 31 Dec.10	1084
Canada	Financial Stocks	19 Sep. 08	8 Oct. 08	9
Czech	No Ban	N.A.	N.A.	-
Denmark	Financial Stocks	13 Oct. 08	After 31 Dec.10	253
Finland	No Ban	N.A.	N.A.	-
France	Financial Stocks	22 Sep. 08	After 31 Dec.10	274
Germany	Financial Stocks	20 Sep. 08	After 31 Dec.10	276
Greece	All Stocks	10 Oct. 08	01 Jun. 09	234
Hong Kong	No Ban	N.A.	N.A.	-
Hungary	No Ban	N.A.	N.A.	-
Ireland	Financial Stocks	19 Sep. 08	After 31 Dec.10	277
Israel	No Ban	N.A.	N.A.	-
Italy	Financial Stocks, then all	22 Sep. 08	01 Jun. 09	252
Japan	All Stocks	30 Oct. 08	After 31 Dec.10	236
Luxembourg	Financial Stocks	19 Sep. 08	After 31 Dec.10	277
Netherlands	Financial Stocks	22 Sep. 08	01 Jun. 09	252
New Zealand	No Ban	N.A.	N.A.	-
Norway	Financial Stocks	8 Oct. 08	After 31 Dec.10	257
Poland	No Ban	N.A.	N.A.	-
Portugal	Financial Stocks	22 Sep. 08	After 31 Dec.10	274
Singapore	No Ban	N.A.	N.A.	-
Slovenia	No Ban	N.A.	N.A.	-
South Korea	All Stocks	1 Oct. 08	After 31 Dec.10	265
Spain	All Stocks	24 Sep. 08	After 31 Dec.10	272
Sweden	No Ban	N.A.	N.A.	-
Switzerland	Financial Stocks	19 Sep. 08	16 Jan. 09	119
United Kingdom	Financial Stocks	19 Sep. 08	16 Jan. 09	119
United States	Financial Stocks	19 Sep. 08	8 Oct. 08	19

Second, given that short selling improves price efficiency (Saffi & Sigurdsson, 2011) and that more information facilitates the use of more effective incentive-based contracts for managers (e.g., Hart, 1983; Holmstrom, 1982; Nalebuff & Stiglitz, 1983; Raith, 2003; Schmidt, 1997), short selling should allow for more efficient contracts. Holmström and Tirole (1993) point out that when the stock price of a poorly performing firm drops, it may become a cheaper target for a takeover. If it is assumed that the managers will be fired if a takeover succeeds, this threat will help to curb managerial misbehaviour. Overall, through enhanced punishment, improved price efficiency, and more efficient contracts, short selling should be associated with more aligned managerial incentives and better quality information disclosure.

Using a sample containing 139,393 firm-level observations across 40 countries for the period between 2002 and 2010, I investigate the impact of short-selling potential on total payout using the total balance value of shares on loan as a measure of the short-selling potential.

I start by documenting a strong positive relationship in a simple linear regression between the short-selling potential and total payout, focusing on the U.S. sample. To claim causality, I extend my model by including a variety of firm-level controls, next including ownership variables and then audit quality variables. After each inclusion, I continue to find a strong positive relationship between the short-selling potential and total payout that is not only statistically significant but also economically relevant. As a result, my initial findings are consistent across the inclusion of firm-level, ownership and audit-quality variables. These results

provide the first evidence in favour of short selling as a disciplinary mechanism that influences managers to pay out excess funds.

In documenting the external monitoring role of short selling in punishing inefficient managerial actions, I also recognize that the efficiency of managerial actions depends strongly on the presence of positive NPV projects. By including an interaction between my proxy for positive NPV potential (R&D and Tobin's Q) and my proxy for short-selling potential, I find that while short-selling potential by itself remains positive, the interaction is significantly negative. This result suggests that managers are less willing to distribute excess funds when the firm has positive NPV projects on hand. This finding further elucidates the benefits of the external monitoring role played by short selling.

In this study, I believe that there is an endogeneity issue because not only does strong short-selling potential (proxied by the total balance value (dollars) of shares on loan scaled by market capitalization) influence firms' payout policies but also firms with less cash holdings or higher payout ratios could encourage short-selling potential because they have fewer instruments to protect their stock prices. My causality test confirms the short sale's causal impact on firms' payout policies and rejects reverse causality. As a robustness check, I address the issue of endogeneity and spurious correlations generated by omission of potentially important variables. I employ an instrument that affects the amount of shares lent in the market but is unrelated to the total payout: the negative aggregate event sentiment (*NAES*) score in the specific firm. It has several desirable features in serving as an instrument. Although negative aggregate event sentiment (*NAES*) score should be correlated with the short sellers' decisions, because negative

market sentiment creates opportunities for short selling, I regard negative event sentiment as an exogenous shock to the stock market. My tests indeed confirm that it has a significant effect on the short-selling market. After addressing endogeneity by using negative aggregate event sentiment (*NAES*) score as an instrument, short sales continue to have a significant impact on firms' payout policies. This helps to rule out concerns related to endogeneity.

To further accentuate the robustness of my findings, I extend my entire study to an international level, covering 40 countries. My international findings are consistent with those from the U.S. sample, which further illustrates the consistency of my results across various samples.

My study contributes to the literature in a number of aspects. First, I investigate the effect of short selling on managerial incentives via a new dimension, total payout. The existing literature primarily provides two conflicting views regarding short selling. On one hand, short selling is simply seen as an instrument that exacerbates the response of the market to existing information, thus improving market efficiency. This view tends to focus on linking short sellers' activities to stock returns (Aitken, Frino, McCorry, & Swan, 1998; Asquith & Meulbroek, 1995; Cohen, Diether, & Malloy, 2007; Senchack & Starks, 1993). On the other hand, short selling is also viewed as a disciplinary mechanism for managers by negatively affecting the stock price and punishing managers. I find robust evidence that short selling has a significant impact on firm payouts. My findings contribute to the latter view by linking short sellers' influence to managers paying out extra funds.

My second contribution to this literature is my identification strategy; specifically, I focus on the importance of endogeneity. My focus on market sentiment as an exogenous shock provides a valid instrument for establishing my event-based two-stage regression. The existing literature tends to focus on instruments such as options market trading, ETF ownership (Diether, Malloy, & Scherbina, 2002; Hirshleifer, Teoh, & Yu, 2011) and market-wide short-selling restrictions. However, the use of options market trading and ETF ownership may not be sufficient to address the endogeneity issue: although they are strongly correlated with short selling, they could also be subject to endogeneity. In contrast, although market-wide short-selling restrictions are an exogenous shock that is ideal as an instrument, this instrument can only be used in markets that experience a short-selling restriction. I contribute to the literature by introducing market sentiment as an instrument that is both exogenous and applicable to international studies.

Finally, I contribute to both the short-selling and the agency theory empirical studies. My findings suggest that managers react to short-selling demand differently, depending on the existence of positive NPV potential. My contribution is to show that the short-selling potential has a weaker effect on a firm's payout when the firm has positive NPV projects. This allows me to advocate for short selling not only as a disciplinary mechanism but also as a solution to the agency costs of free cash flow. In other words, short selling not only influences managers to pay out extra funds but also influences managers to use excess funds in the most optimal manner.

The remainder of this chapter is organized as follows. In Section 3.2, I develop my hypothesis. In Section 3.3, I describe my sample, my data sources and the

construction of my variables. In Section 3.4, I provide evidence for a relation between short-selling potential and total payout in U.S. sample. In section 3.5, I consider an additional robustness test with the international sample. I conclude the chapter in Section 3.6.

3.2 Setup and hypothesis development

3.2.1 Proposition 3.1: Short-selling potential positively correlates with firm payouts

I hypothesize that short sellers act in an external monitoring role, serving as a catalyst to exacerbate situations and causing firms to pay out more to mitigate agency costs. Short selling can therefore be seen as a "vote of confidence" regarding managerial behaviour, which in turn provides information to the market about the firm, thus negatively affecting stock prices and effectively punishing managers. Levine (1997) explains that the ability to acquire and process information may have important growth implications. The stock market exhibits functional efficiency if stock prices direct capital to its highest-value use.

I consider the setting of three periods in a year. In period $t = 0$, the manager of a firm can decide whether and how much to pay out; in my case, I scale the total payout by firm earnings (EBIT). Managers can decide whether they should distribute all excess cash to shareholders at rate $E(\theta)$ or retain excess cash within the firm and set the payout at rate $E(\theta - \sigma)$, where σ is the retained excess cash for the private benefit of the manager. Assuming the final-year stock payoff to be $E[p - (\theta - \sigma)]$, where p is the stock price before the payout announcement date, the manager would retain earnings if the private benefits he or she perceives from the retained earnings is not discerned by informed traders

at $E(p-(\theta-\sigma))$. In $t=1$, the firm manager announces the payout decision based on $t=0$ at $E(\theta-\sigma)$. Considering the demand side of short sellers, short sellers possess private information regarding the manager's decision at $t=0$ if they observe both the true payoff rate (θ) and the private benefits of the manager (σ). If the manager does not distribute all excess cash to shareholders but rather retains excess cash for "empire building" or non-positive NPV projects with an opportunity profit of (σ), short sellers will borrow shares from either institutional shareholders or firms with loan fees $E(\tau)$ in specific periods for short-selling potential. During $t=1$, when the manager announces payout $E(\theta-\sigma)$, if the total payout of firm $E(\theta-\sigma)$ is lower than the true payout $E(\theta)$ of the firm as projected by the short sellers, the short sellers would short sell the borrowed shares in the stock market. They sell short because the firm is no longer efficient when the projected true value of the firm is lower than the market determined price at time t = 1; market penetration by informed traders against insiders leads to a share price of $E\{[(p-\theta)-[p-(\theta-\sigma)]\}=-\sigma$, where p is the price before the payout announcement date. In period $t=2$, assuming that the stock market is efficient and that it corrects the share price of the firm by adjusting the share price to its true value, $E[p-(\theta+\sigma)]$, short sellers close their position with a profit at $E\{[p-(\theta-\sigma)]-(p-\theta)-\tau\}=E(\sigma-\tau)$. During period $t=2$, because the manager possesses equity share-based incentives, the drop in share price reduces the manager's payoff and affects the accrual of private benefits by $E\{p-(\theta+\sigma)\}$. With the learning behaviour of the manager, in the next year at $t=0$, the manager will decide how much to pay out $E(\theta_2-\sigma_2)$ in terms of excess cash within the firm by observing the level of total borrowed shares (U.S. dollars, current prices). In $t=0$, the manager's decision is to be

efficient and distribute excess cash from retained earnings to shareholders because there no incentive to retain earnings if any accrued private benefits will be discerned by informed traders $E\{p_2 - [(\theta_2 + \sigma_2)]\}$; thus, the private benefits from retained earnings are affected by the reduction in the stock payoff at the end of the financial year. In time $t = 1$, the firm's stock price is efficient, as managers distribute all excess cash and set the payout at rate at θ_2; this directs the capital to its highest-value use by returning excess cash to shareholders. No private benefits are accrued by the manager, such that $E(\sigma_2) = 0$, and the manager can maximize his or her stock-based incentive payoff with $E\{\pi_2 - [(\theta_2 + (\sigma_2 = 0))]\}$ when $E(\sigma_2) = 0$.

Based on the reasoning above, I expect a positive relation between short-selling potential[56] and a firm's payout ratio. I build my first hypothesis (proposition 3.1) that short-selling potential, as proxied by total balance value on loan (*TBV*), acts in an external monitoring role, serving as a catalyst that exacerbates situations and forces firms to pay out more to mitigate agency costs.

3.2.2 Proposition 3.2: Positive NPV project potential impedes the role of short-selling potential in firm payouts

Proposition 2 tests the effect of NPV potential on the role of short-selling potential in firm payouts. I gauge the NPV project potential for firm i at year t by interacting the short-selling potential (*TBV*) with R&D expenditure and Tobin's Q[57] at year t.

[56] Short-selling potential (*TBV*) as proxied by to total balance value on loan (in current U.S. dollar) scaled by market capitalization (in current U.S. dollars); please see Table 3.3 for the full definition.

[57] R&D expenses are scaled by net sales; please see Table 3.3 for the full definition.

My second conjecture is that the effect of short-selling potential is weaker when firms have stronger positive NPV potential. When a firm sees stronger positive NPV potential, the manager tends to retain more earnings for future development and lowers the payout for that particular financial year t, all else being equal. Based on this reasoning, I expect a negative relation between these interaction terms and firm payout. As an alternative measurement, I gauge the positive NPV potential using an R&D demand dummy: {1 if $\frac{R\&D_{i,t}}{NET\ SALES_{i,t}} - \frac{R\&D_{i,t-1}}{NET\ SALES_{i,t-1}} > 0$ or 0 otherwise} and a Tobin's Q demand dummy: {1 if $Tobin'sQ_t - Tobin'sQ_{t-} > 0$ or 0 otherwise}. The R&D demand dummy and Tobin's Q dummy are change variables: each takes the value of one if the there is an incremental change from year $t-1$ to year t.

3.3 Sample, summary statistics and variables

In this section, I describe the data sources, the construction of my sample and the main variables. I start by collecting the main explanatory variables and short-selling potential, including all common equity from the 40 countries[58] covered in Data Explorers from 2002 to 2010. I measure the negative aggregate event sentiment (*NAES*)[59] score from the RavenPack database to serve as an instrumental variable for the short-selling potential. The main variable and instrumental variable database is then merged[60] with the firm-level variables for

[58] Table 3.2 presents the 40 countries covered in this chapter.

[59] Negative aggregate event sentiment (*NAES*) score as proxied by the inverse of aggregate event sentiment (*AES*) over a 91-day window from RavenPack database; please see Table 3.3 for the full definition.

[60] I use SEDOL and ISIN as common identifiers across databases.

all publicly listed companies from Datastream and Worldscope and with the firm institutional ownership variables from FactSet. My final sample contains 24,932 firm-year observations for the U.S. sample and 30,540 firm-year observations for the 40-country sample from 2002 to 2010.

Table 3.2: Country list

Developing countries include those that did not reach a high income level in any year prior to 1990 based on the threshold income level for high-income countries defined annually by World Bank Analytical Classifications (WBAC). Countries are classified as developing countries based on WBAC in 2013, excluding those countries that had a high-income status from 1987 to 2013, for instance, American Samoa (1987-1989) and Hungary (2008-2011).

Developing countries	Developed countries
Brazil	Australia
China	Austria
India	Belgium
Indonesia	Canada
Kiribati	China: Hong Kong SAR
Malaysia	Denmark
Mexico	Finland
Pakistan	France
Philippines	Germany
South Africa	Greece
Thailand	Ireland
Turkey	Israel
	Italy
	Japan
	Luxembourg
	Netherlands
	New Zealand
	Norway
	Poland
	Portugal
	Russian Federation
	Singapore
	Spain
	Sweden
	Switzerland
	Taiwan
	United Kingdom
	United States

Table 3.3: Variable definition

A Firm-level variables			
A1. Informed trading proxy			
Variable	Acronym	Definition	Data Source
Short-selling potential	*TBV*	Total balance value on loan (in current U.S. dollar) scaled by market capitalization (in current U.S. dollar).	Data Explorers
Negative aggregate event sentiment score	*NAES*	Negative aggregate event sentiment over a 91-day window. The inverse of aggregate event sentiment from RavenPack.	RavenPack
A2. Firm payout variables			
Variable	Acronym	Definition	Data Source
Total payout ratio	*Total payout ratio*	Total dollar amount of common/preferred redeemed, retired, converted, etc., in U.S. dollar, millions (Item # T60 CCD) + total dollar amount of dividends declared on common stock denominated in U.S. dollar, millions (Item # T16 REP) scaled by earnings before extraordinary items denominated in U.S. dollar, millions.	Worldscope
A3. Firm ownership proxies			
Variable	Acronym	Definition	Data Source
Closely held ownership	*Closely held ownership*	Fraction of shares closely held by insiders and controlling shareholders.	Worldscope
Domestic institutional ownership	*Domestic institutional ownership*	Aggregate equity holdings of domestic institutional investors relative to the total number of outstanding shares.	FactSet
Foreign institutional ownership	*Foreign institutional ownership*	Aggregate equity holdings of foreign institutional investors relative to the total number of outstanding shares.	FactSet
A4. Firm audit quality proxies			
Variable	*Acronym*	Definition	Data Source
International accounting standard dummy	*IAS*	A dummy variable that equals one if the firm adopts the international accounting standards and 0 otherwise.	Worldscope
Big N dummy	*Big N dummy*	A dummy variable that equals one if the firm is audited by any of the Big 4/5 auditors and 0 otherwise.	Worldscope
Audit opinion dummy	*Audit opinion dummy*	A dummy variable that equals one if the opinion given by the auditor is unqualified in accordance with the financial	Worldscope

		reporting framework used for the preparation and presentation of the financial statements and 0 otherwise.	
A5. Control variables			
Variable	Acronym	Definition	Data Source
Book value of assets	*Assets (log)*	Book value of assets denominated in U.S. dollar	Datastream
Tobin's Q	*Q*	Log Tobin's Q	Worldscope
Firm size	*Firm size*	Total assets as stock denominated in U.S. dollar	Worldscope
Book-to-market	*Book-to-market (log)*	Book-to-market equity ratio	Datastream
Leverage	*Leverage (log)*	Ratio of total debt to total assets denominated in U.S. dollar	Worldscope
Firm age	*Firm age (log)*	Number of years from listed date to 2011	Worldscope
American depository receipts	*ADR*	ADR dummy equals one if the firm was cross-listed on a U.S. stock exchange.	Depository banks (such as Bank of New York), U.S. stock exchanges and Datastream (2013)
R & D expenditures	*R & D*	Research and development expenses scaled by total assets denominated in U.S. dollar	Worldscope
Illiquidity	*Illiquidity*	Log of average of daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by dollar volume on a given day	Datastream
Cash flows	*Cash flows*	Operating income minus accruals scaled by lagged total assets denominated in U.S. dollar	Worldscope
Cash	*Cash*	Cash and short-term investments scaled by total assets denominated in U.S. dollar	Worldscope
Retained earnings	*Retained earnings*	Retained earnings scaled by total assets denominated in U.S. dollar	Worldscope
Stock return	*Stock return*	Stock return	Worldscope
Stock return standard deviation	*Stock return standard deviation*	Annualized standard deviation of yearly stock returns	Worldscope
Return on assets	*ROA*	Ratio of net income before extraordinary items plus interest expenses to total assets denominated in U.S. dollar	Worldscope

Table 3.4: Summary statistics

Dependent variable, Payout ratio is the log of the total dollar amount of dividends declared on the common stock denominated in millions of U.S. dollars (Item # T60 CCD) plus the total dollar amount of common/preferred redeemed, retired, converted, etc., denominated in millions of U.S. dollars (Item # T16 REP) scaled by earnings before extraordinary items denominated in millions of U.S. dollar. Main explanatory variable, TBV is the total balance value (dollars) of shares on loan scaled by market capitalization. Firm-level characteristic variables, Firm size (log) is the log of firm total assets, Book-to-market (log) is the log of the book-to-market equity ratio, Leverage (log) is the log of total debt scaled by total assets, Firm age (log) is the log of firm age, Illiquidity is the log of the average daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by the dollar trading volume on a given day, Cash flows is the operating income minus accruals scaled by lagged total assets, Cash is cash and short-term investments scaled by total assets, Retained earnings (log) is the log of retained earnings scaled by total assets, Stock return and stock return standard deviation are the stock annual return and annualized stock return standard deviation, and ROA is the ratio of net income before extraordinary items plus interest expenses to total assets. Firm-level ownership proxies, ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange, Close-held ownership is the ratio of shares closely held by insiders and controlling shareholders, and Domestic institutional ownership and Foreign institutional ownership are aggregate equity holdings of domestic and foreign institutional investors relative to the total number of outstanding shares, respectively. Firm-level audit quality proxies, IAS dummy equals 1 if the firm adopts international accounting standards, BIG N dummy equals 1 if the firm is audited by any of the Big 4/5 auditors, and Auditor opinion dummy equals 1 if the opinion given by the auditor is unqualified in accordance with the financial reporting framework used for the preparation and presentation of the financial statements and 0 otherwise. Firm-level information instrumental variable, NAES is the negative aggregate event sentiment score over the 91-day window. Positive NPV variable, R&D is the log of R&D expenditures scaled by net sales, and Tobin's Q is the log of Tobin's Q. Please see Table 3.3 for full definitions and data sources.

	Firm-year (n)	Mean	Standard deviation	Minimum	25th percentile	Median	75th percentile	Maximum
Payout ratio	60498	0.42	0.31	0	0.14	0.42	0.69	1
Payout ratio (log)	70763	-0.5	1.23	-10.89	-0.98	-0.37	0.07	6.36
TBV	96117	0.03	0.04	0	0.01	0.01	0.03	0.53
Firm size (log)	96117	2.84	0.16	1.9	2.76	2.87	2.96	3.1
Book-to-market (log)	93621	-0.71	0.78	-8.91	-1.17	-0.69	-0.21	4.23
Leverage (log)	88621	10.2	2.8	-3.73	8.57	10.46	12.16	15.71
Firm age (log)	96117	3.13	0.54	0	2.71	3.33	3.58	3.85
Illiquidity	70786	-8.32	2.79	-12.55	-10.25	-9.11	-7.01	7.42
Cash flows	95837	0.01	0.01	-0.05	0	0.01	0.01	0.08
Cash	80439	0.01	0.01	0	0	0.01	0.01	0.11
Retained earnings (log)	81479	12.74	2.01	1.69	11.59	13.23	14.24	16.54
Stock return	96113	-0.03	0.63	-5.41	-0.24	0.08	0.31	2.93
Stock return variance	96117	0.77	0.36	0.41	0.57	0.6	1.03	1.39
ROA	96117	0.05	0.1	-0.99	0.01	0.04	0.09	0.87
ADR	96117	0.22	0.41	0	0	0	0	1
Close-held ownership	96117	0.17	0.2	0	0	0.12	0.25	1
Domestic institutional ownership	95547	0.27	0.31	0	0	0.07	0.59	1
Foreign institutional ownership	95547	0.06	0.07	0	0	0.05	0.08	1
Big N dummy	80657	0.9	0.3	0	1	1	1	1
Audit opinion dummy	96117	0.98	0.13	0	1	1	1	1
NAES	94793	1.81	1.77	1	1.23	1.49	1.96	100
R&D	96117	0.12	0.22	0	0	0	0.17	1
Tobin's Q	96043	1.71	1.22	0.29	1.03	1.24	1.92	24.53

Table 3.4 reports the summary statistics of firm-level variables across 40 countries. The summary statistics provide a good guide as to whether there are any inherent flaws within the data. My dependent variable is the log transformed total payout ratio. The total payout ratio is the amount of dividends declared on common stock[61] in U.S. dollars (current prices) plus the share repurchase[62] in U.S. dollars (current prices) scaled by earnings before interest and taxes (EBIT) in U.S. dollars (current prices) of a firm. My sample suggests that on average, firms spend 42 per cent of earnings on dividends and stock repurchases.

My main explanatory variable is short-selling potential (*TBV*), the ratio of the total balance value of stock on loan to the market capitalization of a firm. I compute the ratio using the total balance value on loans (provided by Data Explorers[63] in U.S. dollar current prices) scaled by the market capitalization of a firm (provided by Datastream in U.S. dollar current prices). This provides a ratio between 0 and 1 for the annual average fraction of shares lent out. On average, most firms tend

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[61] Cash flow data, annual item; field 05376. Common dividends (Cash) represent the total cash common dividends paid on the company's common stock during the fiscal year, including extra and special dividends. If the company has ESOP preferred stock, the dividends paid will be the full amount shown on the cash flow statement; this excludes the dividends paid to minority shareholders (Worldscope, 2007).

[62] Cash flow data, annual item; field 04751. Common and preferred redeemed, retired, converted, etc., represents the funds used to decrease the outstanding shares of common and/or preferred stock. It includes but is not restricted to (1) purchase of treasury shares, repurchase of stock, conversion of preferred stock into common stock, retirement of preferred stock and exchange of common stock for debentures (Worldscope, 2007).

[63] Data Explorers provides data at a daily frequency; my model follows an annual frequency because all of my firm-level controls are defined annually.

to experience a ratio of 0.01, i.e., the value of shares lent out is approximately 1 per cent of their market capitalization.

After applying the inverse matrix to my instrumental variable[64], the negative aggregate event sentiment (*NAES*) score reports an average mean of 1.81 and an average median of 1.49, with a 75th percentile at 1.96 (below 50), thus suggesting that negative exogenous events mainly concentrate in the fourth quantile. The firm institutional ownership variables are my additional control variables; on average, firms tend to have 27 per cent of shares held by domestic institutional investors and 6 per cent of shares held by international institutional investors. The data regarding institutional investor ownership is from the FactSet[65] Ownership database, which provides holding information for various funds, such as mutual funds and pension funds. The fund positions are collected globally from mutual fund reports, regulatory authorities, mutual fund associations in different countries, and fund management companies.

In light of the prior literature (Chan & Hameed, 2006; Fernandes & Ferreira, 2008; Ferreira & Laux, 2007; Massa, Zhang, & Zhang, 2015; Piotroski & Roulstone, 2004), a battery of firm-specific characteristics are controlled for in the regression. The firm-level characteristic variables are the log of firm total assets (*Firm size*

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[64] The negative aggregate event sentiment (*NAES*) score represents negative market sentiment if *NAES* > 50 and positive market sentiment if *NAES* < 50 when a piece of news arrives. The *NAES* is the inverse of the aggregate event sentiment (*AES*) score by RavenPack; in the *AES* score, *AES* > 50 represents positive market sentiment, whereas *AES* < 50 represents negative market sentiment. In both cases, neutral market sentiment, *AES* = 50 or *NAES* = 50, is excluded.

[65] The FactSet Ownership database includes the Lionshares Ownership database, which was acquired by FactSet in 2000.

(log)), the log of the book-to-market equity ratio (*Book-to-market (log)*), the log of total debt scaled by total assets (*Leverage (log)*), the log of firm age (*Firm age (log)*), the log of R&D expenditures scaled by net sales (*R&D*), the log of the average daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by the dollar trading volume on a given day (*Illiquidity*), the operating income minus accruals scaled by lagged total assets (*Cash flows*), cash and short-term investments scaled by total assets (*Cash*), the log of retained earnings scaled by total assets (*Retained earnings (log)*), the stock's annual return (*Stock return*), the annualized stock return variance (*Stock return variance*), the ratio of net income before extraordinary items plus interest expenses to total assets (*ROA*). The firm-level ownership variables are the ratio of shares closely held by insiders and controlling shareholders (*Close-held ownership*) and the aggregate equity holdings of domestic (*Domestic institutional ownership*) and foreign institutional investors (*Foreign institutional ownership*) relative to total number of outstanding shares. The firm-level audit quality variables are a dummy equal to 1 if the firm is audited by any of the Big 4/5 auditors (*BIG N*) and a dummy equal to 1 if the auditor's opinion is unqualified in accordance with the financial reporting framework used for the preparation and presentation of the financial statements and 0 otherwise (*Auditor opinion dummy*). The full definitions and data sources for each of these variables are provided in Table 3.3.

Table 3.5: Summary statistics for short-selling potential

Total dollar amount of common/preferred redeemed, retired, converted, etc., in millions of U.S. dollars (Item # T60 CCD) plus total dollar amount of dividends declared on the common stock denominated in millions of U.S. dollars (Item # T16 REP) scaled by earnings before extraordinary items denominated in millions of U.S. dollars.

	2002-2004		2005-2007		2008-2010	
	Mean	Median	Mean	Median	Mean	Median
Australia	0.0095	0.0058	0.0281	0.0225	0.0317	0.0213
Austria	0.0090	0.0051	0.0219	0.0241	0.0152	0.0118
Belgium	0.0123	0.0032	0.0140	0.0072	0.0318	0.0238
Brazil	-	-	0.0006	0.0001	0.0001	0.0001
Canada	0.0213	0.0066	0.0480	0.0403	0.0793	0.0593
China	0.0063	0.0041	0.0301	0.0440	0.0597	0.0714
Taiwan	0.0017	0.0007	0.0006	0.0003	0.0028	0.0015
Denmark	0.0106	0.0066	0.0241	0.0084	0.0128	0.0072
Finland	0.0111	0.0113	0.0283	0.0328	0.0353	0.0315
France	0.0240	0.0220	0.0407	0.0429	0.0343	0.0215
Germany	0.0283	0.0332	0.0450	0.0524	0.0512	0.0552
Kiribati	0.0048	0.0014	0.0036	0.0029	0.0055	0.0020
Greece	0.0007	0.0007	0.0003	0.0003	0.0012	0.0006
China: Hong Kong SAR	0.0051	0.0029	0.0147	0.0120	0.0161	0.0109
India	-	-	0.0007	0.0007	0.0002	0.0001
Indonesia	0.0001	0.0001	0.0016	0.0016	0.0005	0.0007
Ireland	0.0022	0.0007	0.0087	0.0066	0.0126	0.0086
Israel	0.0006	0.0006	0.0081	0.0039	0.0012	0.0005
Italy	0.0201	0.0140	0.0410	0.0340	0.0406	0.0327
Japan	0.0067	0.0039	0.0126	0.0065	0.0115	0.0060
Luxembourg	0.0012	0.0017	0.1719	0.1284	0.0072	0.0078
Malaysia	0.0000	0.0000	0.0010	0.0001	0.0005	0.0001
Mexico	0.0010	0.0004	0.0039	0.0042	0.0057	0.0026
Netherlands	0.0142	0.0127	0.0320	0.0281	0.0366	0.0379
New Zealand	0.0083	0.0021	0.0121	0.0005	0.0134	0.0054
Norway	0.0067	0.0058	0.0268	0.0092	0.0194	0.0112
Pakistan	-	-	-	-	0.0000	0.0000
Philippines	-	-	0.0002	0.0001	0.0006	0.0008
Poland	-	-	0.0001	0.0001	0.0010	0.0006
Portugal	0.0050	0.0029	0.0189	0.0209	0.0161	0.0134
Russian Federation	0.0004	0.0005	0.0002	0.0003	0.0001	0.0001
Singapore	0.0065	0.0039	0.0136	0.0080	0.0149	0.0087
South Africa	0.0052	0.0034	0.0054	0.0037	0.0067	0.0042
Spain	0.0180	0.0132	0.0263	0.0273	0.0296	0.0298
Sweden	0.0090	0.0075	0.0162	0.0122	0.0222	0.0154
Switzerland	0.0145	0.0185	0.0260	0.0257	0.0312	0.0203
Thailand	0.0002	0.0000	0.0004	0.0003	0.0002	0.0003
Turkey	0.0001	0.0001	0.0027	0.0025	0.0019	0.0014
United Kingdom	0.0197	0.0173	0.0268	0.0199	0.0335	0.0246
United States	0.0304	0.0042	0.0397	0.0143	0.0451	0.0159

Table 3.5 presents country-level summary statistics for short-selling potential. Short-selling potential is quantified in terms of the total balance value on loan in U.S. dollars (current prices) scaled by the market capitalization in U.S. dollars (current prices) of a firm. Using a ratio based on market capitalization eliminates price effects, especially in cross-country studies. The total balance value on loan is from Data Explorers, a privately owned financial data and software company that supplies financial benchmarking information to the securities lending industry and short-side intelligence to the investment management community. Data Explorers collects data from custodians and prime brokers that lend and borrow securities and is the leading provider of securities lending data; it tracks short selling and institutional fund activity across all global market sectors. Examining the three-period median[66], Germany, France, and Luxembourg were among the countries with highest total value on loan prior to the pre-2007 Global Financial Crisis; for instance, in Luxembourg, a firm's total value on loan was approximately 17.19 per cent of its market capitalization taken as a three-year average. Examining the post Global Financial Crisis period (2008-2010), Germany, Canada and China were the countries with the highest total value on loan; for instance, in China, a firm's total value on loan was approximately 7.14 per cent of its market capitalization taken as a three-year average.

[66] The three periods are 2002-2004, 2005-2007 and 2008-2010.

Table 3.6: Summary statistics for negative aggregate event sentiment

The summary of negative aggregate event sentiment (NAES) score - the inverse of the aggregate event sentiment (AES) score obtained directly from RavenPack over a 91-day window. The NAES granular score between 0 and 100 represents the ratio of negative events reported for an entity to the total number of events (excluding neutral ones) measured over a rolling 91-day window. Only news items that match a RavenPack event category are included in the computation of AES (before inverse adjustment). After the inverse adjustment, an event with NAES < 50 is counted as a positive entry, whereas one with NAES > 50 is counted as negative.

	2002-2004		2005-2007		2008-2010	
	Mean	Median	Mean	Median	Mean	Median
Australia	1.79	1.56	1.81	1.59	2.01	1.67
Austria	1.38	1.43	1.34	1.30	1.87	1.72
Belgium	1.82	1.48	1.74	1.79	1.69	1.61
Brazil	-	-	1.39	1.32	1.66	1.43
Canada	1.70	1.49	1.71	1.35	1.75	1.33
China	1.75	2.00	1.57	1.49	2.10	1.64
Taiwan	1.33	1.20	1.64	1.43	1.82	1.41
Denmark	2.24	1.62	1.82	2.00	1.91	2.00
Finland	1.23	1.11	1.56	1.39	2.33	1.85
France	1.64	1.54	1.64	1.49	1.62	1.45
Germany	1.66	1.59	1.66	1.45	1.72	1.45
Kiribati	1.27	1.14	1.56	1.41	1.70	1.49
Greece	1.45	1.41	1.58	1.61	2.02	2.00
China: Hong Kong SAR	2.01	1.72	1.51	1.33	1.85	1.45
India	-	-	1.00	1.00	1.49	1.45
Indonesia	1.00	1.00	1.57	1.22	1.35	1.35
Ireland	1.47	1.45	1.67	1.32	1.87	2.00
Israel	1.00	1.00	1.80	1.41	1.65	1.35
Italy	1.43	1.25	1.69	1.82	1.58	1.42
Japan	1.66	1.37	1.67	1.33	2.25	1.82
Luxembourg	1.67	1.49	1.73	1.49	1.50	1.49
Malaysia	-	-	1.44	1.33	1.37	1.10
Mexico	1.40	1.20	1.26	1.30	1.84	1.30
Netherlands	1.61	1.43	1.87	1.72	1.71	1.49
New Zealand	1.51	1.56	1.63	1.24	1.82	1.56
Norway	1.37	1.43	1.52	1.33	1.56	1.63
Pakistan	-	-	-	-	1.25	1.25
Philippines	-	-	1.22	1.20	2.19	2.00
Poland	-	-	1.33	1.33	1.54	1.41
Portugal	1.96	1.59	1.82	1.96	1.82	2.00
Russian Federation	1.11	1.11	1.26	1.32	1.33	1.27
Singapore	2.30	1.82	1.87	1.85	2.00	1.52
South Africa	1.92	2.00	3.29	2.00	1.79	1.33
Spain	1.67	1.37	1.62	1.67	1.85	1.82
Sweden	1.62	1.52	1.58	1.49	1.61	1.48
Switzerland	1.97	1.82	2.23	2.38	2.28	1.92
Thailand	1.22	1.28	1.25	1.22	1.77	1.67
Turkey	1.21	1.21	1.22	1.00	1.64	2.00
United Kingdom	1.68	1.49	1.80	1.67	1.73	1.54
United States	1.51	1.33	1.71	1.33	1.66	1.41

I define my instrument for short-selling potential as the negative aggregate event sentiment (*NAES)* score, which is the inverse of the aggregate event sentiment (*AES*) score obtained directly from RavenPack. RavenPack is the leading provider of real-time news and sentiment analytics. The data are derived in real-time from unstructured text produced by reputable traditional and social media. I treat aggregate event sentiment as an exogenous shock to the stock markets. The news data come from RavenPack News Analytics – Dow Jones Edition, which collects and analyses firm-level business news from all major real-time newswires, such as the Dow Jones Newswire, all editions of the Wall Street Journal, Barron's and other trustworthy sources (e.g., financial sites, and local and regional newspapers). RavenPack measures the news sentiment and flows of approximately 28,000 firms in 86 countries, with the news types covering a wide range of facts, opinions and, in particular, corporate announcements. Specifically, when a piece of news arrives, RavenPack instantly classifies it into a news event category based on its taxonomy and then measures the informational content of the news event using its proprietary algorithms to determine its quantified sentiment score; this indicates whether the news event could have a positive or negative impact on stock prices and how great that impact might be. This score is then assigned to the relevant forms mentioned in the news. The aggregate event sentiment is defined by RavenPack as a granular score between 0 and 100 that represents the ratio of negative events reported on an entity compared to the total count of events (excluding neutral ones) measured over a rolling 91-day window. More specifically, only news items that match a RavenPack event category would receive an event sentiment (*ESS*) score that is

included in the computation of the *AES* score. An event with $ESS > 50$ is counted as a positive entry, whereas one with $ESS < 50$ is counted as negative. Events with $ESS = 50$ are considered to be neutral and excluded from the computation. An *AES* score is published every time an entity is mentioned in the news. Changes in the *AES* score, however, are observed only when a new event category is matched or when it drops out of the 91-day calculation window. The *AES* leverages the RavenPack Taxonomy and is based on RavenPack's Expert Consensus methodology. To simplify my interpretation of the exogenous negative sentiment event and short-selling potential, I apply an inverse matrix to the *AES* score. After adjustment, the negative aggregate event sentiment (*NAES*) score has score > 50 for a negative entry and score < 50 for a positive entry, all else being equal. Because information produced by the media, including both newswire services and print publications, is utilized by most investors for investment decisions, RavenPack provides essential conditions that can serve as an instrument of short-selling potential. For instance, the greater the negative aggregate event sentiment (*NAES*) score is, the greater the incentive for short sellers to borrow shares for short selling; this correlation will be tested in Section 5.

3.4 Short-selling potential and firms' payout policies: evidence from the U.S. sample

The following regression provides a baseline for my multivariate analysis:

Equation 3. 1

$$Totalpayoutratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{i,t} + \beta_3 Firm\ level\ ownership_{i,t} + \beta_4 Firm\ level\ audit\ quality_{i,t} + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level,* t *represents the sample year and* $\varepsilon_{i,t}$ $represents\ error\ term.$

In Table 3.7, estimates of the log total payout ratio using the ordinary least squares (OLS) method are shown. Column (1) presents the OLS result with only the short-selling potential variable (TBV). Column (2) extends the parsimonious model in Column (1) with firm characteristic variables at contemporaneous time t. Column (3) extends the model in Column (2) with firm-level ownership proxies at contemporaneous time t. Column (4) extends the model in Column (3) with firm-level audit quality proxies at contemporaneous time t. To adjust the standard errors for correlations across firms i and year t, I calculate simultaneous correlations along these two dimensions. It is rational to suspect that the residuals of firms are correlated across firm i (for all firms) and year t ($for\ t = 2002\ to\ 2010$) in my ordinary least squares. The statistical inferences are only valid if the residuals are correlated either across years or across firms, but not

across both[67] (Thompson, 2011). Therefore, I expect the result of the multivariate analysis to be robust to serial contemporaneous shocks across firms (for all firms) and across year t ($for\ t = 2002\ to\ 2010$). Another issue here is whether there is enough variation in short-selling potential and firm payout ratios over time such that one can estimate this relation with precision.

[67] I adjust the covariance estimator, which is equal to the estimator clustered by firm i plus the estimator clustered by year t minus the usual heteroscedasticity-robust (White standard errors) ordinary least squares (OLS) covariance matrix. I define the large sample estimator variance to be approximated by

$A^{-1}BA^{-1}$

$B = \sum_{i.t}\sum_{i,t} x_{it}v_{it}x_{it}'v_{it}'$where$\sum_{i,t} v_{it}'v_{it} = \sum_{i,t} E(v_{it}, v_{it}')$

The Petersen (2009) clustering is adjusted according to Thompson (2011) such that

$B = B_{COUNTRY} + B_{time,0} - B_{white,0} + \sum_{I=1}^{L}(B_{time,I} + B_{time,I}') - \sum_{I=1}^{L}(B_{white,I} + B_{white,I}')$

Table 3.7: Total payout ratio and short-selling potential: U.S. sample

Estimates of the log total payout ratio using the Ordinary Least Squares method are shown. Column (1) presents the OLS result with only the total balance value (dollars) of shares on loan scaled by market capitalization (TBV). Column (2) extends the parsimonious model in Column (1) with firm characteristic variables at contemporaneous time t. Column (3) extends the model in Column (2) with firm-level ownership proxies at contemporaneous time t. Column (4) extends the model in Column (3) with firm-level audit quality proxies at contemporaneous time t.

Column (1)
OLS
$Totalpayoutratio_{i,t} = c + \beta_1 TBV_{i,t} + \varepsilon_{i,t}$

Column (2)
OLS
$Totalpayoutratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{i,t} + \varepsilon_{i,t}$

Column (3)
OLS
$$Totalpayoutratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{i,t} + \beta_3 Firm\ level\ ownership_{i,t} + \varepsilon_{i,t}$$
Column (4)
OLS
$$Totalpayoutratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{i,t} + \beta_3 Firm\ level\ ownership_{i,t} + \beta_4 Firm\ level\ audit\ quality_{i,t} + \varepsilon_{i,t}$$

s.t. i represents observations at firm level, t represents the sample year and $\varepsilon_{i,t}$ *represents error term.*

Dependent variable, Payout ratio is the log of the total dollar amount of dividends declared on the common stock denominated in millions of U.S. dollars (Item # T60 CCD) plus the total dollar amount of common/preferred redeemed, retired, converted, etc., denominated in millions of U.S. dollars (Item # T16 REP) scaled by earnings before extraordinary items denominated in millions of U.S. dollars. Main explanatory variable, TBV is the total balance value (dollars) of shares on loan scaled by market capitalization. Firm-level characteristic variables, Firm size (log) is the log of firm total assets, Book-to-market (log) is the log of the book-to-market equity ratio, Leverage (log) is the log of total debt scaled by total assets, Firm age (log) is the log of firm age, Illiquidity is the log of the average daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by dollar trading volume on a given day, Cash flows is the operating income minus accruals scaled by lagged total assets, Cash is cash and short-term investments scaled by total assets, Retained earnings (log) is the log of retained earnings scaled by total assets, Stock return and stock return standard deviation are the stock annual return and annualized stock return standard deviation, respectively, and ROA is the ratio of net income before extraordinary items plus interest expenses to total assets. Firm-level ownership proxies, ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange, Close-held ownership is the ratio of shares closely held by insiders and controlling shareholders, and Domestic institutional ownership and Foreign institutional ownership are the aggregate equity holdings of domestic and foreign institutional investors, respectively, relative to total number of outstanding shares. Firm-level audit quality proxies, IAS dummy equals 1 if the firm adopts international accounting standards, BIG N

dummy equals 1 if the firm is audited by any of the Big 4/5 auditors, and Auditor opinion dummy equals 1 if the opinion given by the auditor is unqualified in accordance with the financial reporting framework used for the preparation and presentation of the financial statements and 0 otherwise. Please see Table 3.3 for the full definitions and data sources.

The sample consists of all firm-year observations from Worldscope and Datastream (Full-Coverage, Primary, Secondary, Tertiary, Research, and Back Files) over the period 2002-2010 that have available data for all of the following explanatory variables. $t-statistics$ *shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering based on Thompson (2011).*

VARIABLES	(1) *Payout ratio (log)*	(2) *Payout ratio (log)*	(3) *Payout ratio (log)*	(4) *Payout ratio (log)*
TBV	3.0459***	2.8273*	3.1442**	3.7365**
	(3.2175)	*(1.7115)*	*(2.0424)*	*(2.0485)*
Firm size (log)		1.5147	1.3369	0.2018
		(0.8841)	*(0.8160)*	*(0.0964)*
Book-to-market (log)		-0.3954***	-0.4026***	-0.4238***
		(-4.0716)	*(-4.0478)*	*(-4.0463)*
Leverage (log)		0.0432	0.0441	0.0887
		(0.9623)	*(0.9730)*	*(1.1372)*
Firm age (log)		0.1528*	0.1358*	0.2156**
		(1.6813)	*(1.6924)*	*(2.2166)*
R&D		0.0043***	0.0040***	0.0043***
		(3.0128)	*(2.8747)*	*(2.6528)*
Illiquidity		-0.0879*	-0.0985*	-0.1278*
		(-1.7186)	*(-1.8468)*	*(-1.9396)*
Cash flows		28.6966	28.1187	14.6201
		(1.4275)	*(1.3987)*	*(0.7837)*
Cash		-2.5557	-3.1060	2.9414
		(-0.3998)	*(-0.4812)*	*(0.3800)*
Retained earnings (log)		-0.0822	-0.0825	-0.0948
		(-1.2395)	*(-1.3068)*	*(-1.5454)*
Stock return		-0.8010***	-0.7743***	-0.8223***
		(-2.6280)	*(-2.7357)*	*(-3.4228)*
Stock return standard deviation		-0.3234	-0.2339	-0.2572
		(-1.5725)	*(-1.5246)*	*(-1.4652)*
ROA		-4.8034***	-4.8358***	-4.8672***
		(-2.9770)	*(-3.0922)*	*(-3.0566)*
Close-held ownership			0.0146	0.0055
			(0.0324)	*(0.0135)*
Domestic institutional ownership			-0.1784	-0.3515
			(-0.8552)	*(-1.1611)*
Foreign institutional ownership			-0.3182	-0.6356
			(-0.2591)	*(-0.5040)*
Big N dummy				0.2156
				(0.6042)
Audit opinion dummy				0.9148**
				(2.3376)
Constant	-0.5604***	-5.3259	-4.8387	-3.3521
	(-7.5666)	*(-1.3676)*	*(-1.2704)*	*(-0.7078)*
Observations	103,927	29,320	29,320	24,938
R^2	0.0117	0.1709	0.1736	0.2033

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 3.7, Column (1), I test the correlation between short-selling potential (TBV) and the firm's payout ratio ($Payout\ ratio\ (log)$). I find that there is a positive correlation between short-selling potential (*TBV)* and firm payout ratio. The coefficient estimate is reported at 3.05 ($t = 3.21$), suggesting a strong correlation between short-selling potential and firm payout in the parsimonious model. I estimate the White (1980) robust standard errors clustered by firm. The results hold across different specifications. In Column (2), I extend the parsimonious model to include firm-level characteristic controls; the coefficient estimate is 2.83 ($t = 1.71$), and short-selling potential remains positively correlated with the firm payout ratio. In Column (3), I further control for firm-level ownership variables, and the short-selling potential coefficient estimate is 3.14 ($t = 2.04$). The results hold after controlling for additional proxies for auditing quality in Column (4). In Column (4), the coefficient estimate of short-selling potential is reported to be 3.74 ($t = 2.05$). Based on the full model in Column (4), a one-standard-deviation increase in short-selling potential is correlated with an increase of 15 basis points[68] in firms payout ratio. The findings from this U.S. study lend support to my hypothesis (proposition 3.1) that short-selling potential is positively correlated with firm payout ratio. The econometric issue here is that although the findings are favourable to my disciplinary hypothesis (proposition 3.1), they may still be subject to endogeneity.

[68] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by the coefficient estimate of short-selling potential (*TBV*) at 3.7365 (please see Table 3.7, Column 4) = 0.0015

Thus, I next address the endogeneity issue using a multi-pronged approach. First, I focus on the issue of spurious correlation due to omitted heterogeneity. Second, with my best effort, I use lagged controls to address potential reverse causality. Endogeneity problems are ubiquitous in empirical research regarding corporate finance. In my setting, there could be many reasons for firm payout ratios and time-varying firm-specific conditions to be jointly determined. I first address omitted heterogeneity using a firm fixed-effects method that controls for unobserved time-invariant firm characteristics. The firm fixed-effects method solves joint determination problems in which unobserved time-invariant variables simultaneously determine both time-varying firm characteristics and firm payout ratios. It is also equivalent to examining within-firm changes in time-varying firm specific conditions. Although the fixed-effects results go a long way toward dismissing omitted variables as sources of endogeneity, because only the effects of within-firm changes on the firm's payout ratio are taken into account, reverse causality between the firm's payout ratio and short-selling potential could cloud my interpretation of the fixed-effects regression because $E(\boldsymbol{\varepsilon_{it}}|\boldsymbol{X_{it}}) \neq 0$. Therefore, in my fixed-effects model, I control for lagged controls at year $(t-1)$ because it is unlikely that the firm's payout policy at year (t) would have a feedback effect on explanatory variables in $(t-1)$.

Table 3.8: Total payout ratio and short-selling potential: U.S. sample with lagged explanatory variables

Estimates of panel regressions of the log total payout ratio using alternative estimation methods are shown. Column (1) presents the firm fixed effects result with only total balance value (dollars) of shares on loan scaled by market capitalization (TBV), which enters into the regression at a contemporaneous time; other controls enter at time lagged by one degree. Column (2) presents the firm-fixed first-stage regression estimates with TBV as the dependent variable, with instrumental variable NAES (negative aggregate event sentiment) score at a contemporaneous time and other controls at time lagged by one degree. Column (3) presents firm-fixed second-stage regression estimates with the log transformed total payout ratio as the dependent variable. The two-stage least squares (2SLS) panel regression uses negative aggregate event sentiment as an instrument for total balance value (dollars) of shares on loan scaled by market capitalization (TBV) and other controls are at time lagged by one degree. Column (4) extends the 2SLS model by controlling for positive NPV project potential for firm i at time t using the proxy of R&D expenses scaled by net sales and Tobin's Q. Column (5) strengthens the model in Column (4) by using the R&D demand dummy {1 if $\frac{R\&D_{i,t}}{NET\ SALES_{i,t}} - \frac{R\&D_{i,t-1}}{NET\ SALES_{i,t-1}} > 0$ *or 0 otherwise} and the Tobin's Q demand dummy {1 if* $Tobin'sQ_t - Tobin'sQ_{t-} > 0$ *or 0 otherwise} to proxy positive NPV project potential.*

Column (1)

Firm fixed effects

$$Total\ payout\ ratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (2)

Firm fixed effects first-stage regression

$$TBV_{i,t} = c + \beta_1 Firm\ level\ instrumental\ variables_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (3)

Firm fixed effects second-stage regression

$$Total\ payout\ ratio_{i,t} = c + \beta_1 instrumented\ TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (4)

Firm fixed effects second-stage regression

$$Totalpayoutratio_{i,t} = c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&D_{i,t} + \beta_3 TBV_{i,t} * Tobin's\ Q_{i,t} + \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} + \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (5)

Firm fixed effects second-stage regression

$$Totalpayoutratio_{i,t} = c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&Ddemanddummy_{i,t} + \beta_3 TBV_{i,t} * Tobin'sQdemanddummy_{i,t} + \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} + \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level, t represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term$.

Dependent variable, Payout ratio is the log of the total dollar amount of dividends declared on common stock denominated in millions of U.S. dollars (Item # T60 CCD) plus the total dollar amount of common/preferred redeemed, retired, converted, etc., denominated in millions of U.S. dollars (Item # T16 REP) scaled by earnings before extraordinary items denominated in millions of U.S. dollars. Main explanatory variable, TBV is the total balance value (dollars) of shares on loan scaled by market capitalization. Firm-level characteristic variables, Firm size (log) is the log of firm total assets, Book-to-market (log) is the log of the book-to-market equity ratio, Leverage (log) is the log of total debt scaled by total assets, Firm age (log) is the log of firm age, Illiquidity is the log of the average daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by dollar trading volume on a given day, Cash flows is operating income minus accruals scaled by lagged total assets, Cash is cash and short-term investments scaled by total assets, Retained earnings (log) is the log of retained earnings scaled by total assets, Stock return and stock return standard deviation are the stock annual return and annualized stock return standard deviation, respectively, and ROA is the ratio of net income before extraordinary items plus interest expenses to total assets. Firm-level ownership proxies, ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange, Close-held ownership is the ratio of shares closely held by insiders and controlling shareholders, and Domestic institutional ownership and Foreign institutional ownership are the aggregate equity holdings of domestic and foreign institutional investors, respectively, relative to the total number of outstanding shares. Firm-level audit quality proxies, IAS dummy equals 1 if the firm adopts international accounting standards, BIG N dummy equals 1 if the firm is audited by any of the Big 4/5 auditors, and Auditor opinion dummy equals 1 if the opinion given by the auditor is unqualified in accordance with the financial reporting framework used for the preparation and presentation of the financial statements and 0 otherwise. Firm-level information instrumental variable, NAES is the negative aggregate event sentiment score over the 91-day window. Positive NPV variable, R&D is the log of R&D expenditures scaled by net sales; Tobin's Q is the log of Tobin's Q. Please see Table 3.3 for the full definitions and data sources.

The sample consists of all firm-year observations from Worldscope and Datastream (Full-Coverage, Primary, Secondary, Tertiary, Research, and Back Files) spanning the period 2002-2010 that have available information regarding all of the following explanatory variables. $t - statistics$ *shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering based on Thompson (2011).*

VARIABLES	(1) *Payout ratio (log)*	(2) *TBV*	(3) *Payout ratio (log)*	(4) *Payout ratio (log)*	(5) *Payout ratio (log)*
TBV	5.9007***				
	(2.9128)				
Instrumented TBV			5.7395***	12.0455***	11.2322***
			(6.3746)	*(4.1326)*	*(4.0714)*
*TBV * R&D*				-1.9014***	
				(-4.0224)	
*TBV * Tobin's Q*				-0.3818***	
				(-3.9272)	
*TBV * R&D demand dummy*					-0.6448***
					(-3.7836)
*TBV * Tobin's Q demand dummy*					-3.4723***
					(-3.9358)
Firm size (log) (-1)	-0.1333	0.0091	-0.2073	0.3290	0.5326
	(-0.7828)	*(1.2337)*	*(-0.6095)*	*(0.7527)*	*(1.0227)*
Book-to-market (log) (-1)	0.0032	-0.0001	0.0168	0.0044	-0.0139
	(0.2746)	*(-0.0761)*	*(0.8227)*	*(0.1716)*	*(-0.4287)*
Leverage (log) (-1)	0.0031	-0.0003	0.0175	-0.0050	0.0113
	(0.5163)	*(-1.0379)*	*(1.6275)*	*(-0.3834)*	*(0.7294)*
Firm age (log) (-1)	-0.0096	0.0004	-0.0085	-0.0051	0.0102
	(-0.7065)	*(0.6965)*	*(-0.3674)*	*(-0.1755)*	*(0.2959)*
Illiquidity (-1)	0.0004	-0.0000	0.0046	0.0162	0.0312
	(0.0567)	*(-0.0972)*	*(0.3669)*	*(0.9985)*	*(1.5582)*
Cash flows (-1)	3.7849*	-0.1957	5.4354	2.9774	9.6060
	(1.6680)	*(-1.5194)*	*(1.1990)*	*(0.5288)*	*(1.4146)*
Cash (-1)	-0.0878	0.0116	2.2924	2.2431	6.5395**
	(-0.0757)	*(0.2859)*	*(1.3159)*	*(1.0190)*	*(2.1821)*
Retained earnings (log) (-1)	0.0041	-0.0003	0.0030	0.0017	0.0012
	(0.5923)	*(-0.9746)*	*(0.2510)*	*(0.1117)*	*(0.0700)*
Stock return (-1)	0.0102	0.0002	0.0172	0.0063	0.0168
	(0.6784)	*(0.2319)*	*(0.6288)*	*(0.1844)*	*(0.4203)*
Stock return standard deviation (-1)	0.0187	0.0006	0.0018	0.0073	-0.0265
	(0.7887)	*(0.6715)*	*(0.0464)*	*(0.1539)*	*(-0.4664)*
ROA (-1)	-0.2738	0.0101	-0.2588	-0.1449	-0.6431
	(-1.4492)	*(0.9297)*	*(-0.7553)*	*(-0.3373)*	*(-1.2576)*
Close-held ownership (-1)	0.0150	0.0005	0.0411	0.0159	0.0873
	(0.4551)	*(0.2099)*	*(0.5807)*	*(0.1806)*	*(0.8318)*
Domestic institutional ownership (-1)	0.0014	0.0002	0.0193	-0.0682	-0.0140
	(0.0561)	*(0.1345)*	*(0.4040)*	*(-1.0949)*	*(-0.1997)*
Foreign institutional ownership (-1)	0.0655	0.0062	0.1504	0.1347	-0.0652
	(0.8115)	*(0.8083)*	*(0.6958)*	*(0.4947)*	*(-0.2049)*
Big N dummy (-1)	0.0274	-0.0036	-0.0186	0.0606	-0.0555
	(0.7139)	*(-1.2772)*	*(-0.2470)*	*(0.6428)*	*(-0.4996)*
Audit opinion dummy (-1)	0.0450	-0.0015	0.0495	0.1176	0.0945
	(1.0466)	*(-0.5459)*	*(0.6777)*	*(1.2515)*	*(0.8681)*
R&D (-1)	0.0000	-0.0000	0.0001		
	(0.4164)	*(-1.6235)*	*(0.2114)*		
NAES		0.1115***			
		(2.6895)			
R&D				0.0748***	
				(3.7504)	
Tobin's Q				5.8565***	
				(3.8910)	
R&D demand dummy					1.4123***
					(3.6064)
Tobin's Q demand dummy					0.9005***
					(3.7258)
Constant	-0.3011	0.0230	-1.4872*	-3.7216***	-4.5943***
	(-0.8083)	*(1.3314)*	*(-1.8431)*	*(-2.8843)*	*(-2.9203)*
Observations	15,070	30,011	14,982	14,903	14,969
R^2	0.0273	0.0010	0.0004	0.0017	0.0016

Number of firms	1,145	2,278	1,123	1,118	1,123
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Hausman (1978) specification test Chi-square	141.53	28.20	-59.41	34.17	48.07
Cragg and Donald (1993) Wald F-statistic	-	-	67.94	-	-
Kleibergen and Paap (2006) rk Wald F-statistic	-	-	68.24	-	-

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 3.8, estimates of panel regressions of the log total payout ratio using alternative estimation methods are shown. Column (1) presents the firm fixed-effects result with only short-selling potential (TBV) entered into the panel regression at contemporaneous time t; other controls are lagged by one degree ($t-1$). The coefficient estimate of the short-selling potential is reported at 5.90 ($t = 2.91$). There is still evidence of a positive relation between short-selling potential and firm payout ratio. Hausman's (1978) specification test[69] chi-square is 141.53, thus suggesting that the fixed-effects model is more efficient and consistent than the random-effects model. In this setting, I also control for firm characteristics, firm ownership and auditing quality lagged by one period. As mentioned earlier, this could address endogeneity bias and the reverse causality issue in the traditional multiple OLS fixed-effects framework. One drawback is that I find a weak R-squared in the lagged controls framework at 0.03 compared to 0.20 in the multivariate OLS. However, the lagged controls do not have strong explanatory power for firm payout ratio for the current time period. By employing the lagged controls framework, I can dismiss the reverse causality issue, but I lose some degree of overall model explanatory power from the other controls.

To further address the reverse causality concern in short-selling potential, I use an exogenous event-based approach in the two-stage least squares (2SLS) framework. My 2SLS method allows me to simultaneously address omitted

[69] In the Hausman (1978) test, the null hypothesis H_0 is that the difference between the random-effects and fixed-effects coefficients is not systematic. If the difference in coefficients is systematic, a fixed-effects model is preferred because the random-effects model is inadequate. The random-effects estimator makes an assumption (the random effects are orthogonal to the regressors) that the fixed-effects estimator does not.

variables and reverse causality issues. The caveat is that unlike the fixed-effects method, it requires stronger assumptions that usually cannot be tested for. Under standard identification assumptions, I apply the 2SLS method to isolate the effect of short-selling potential (TBV) on firm payout ratio. I therefore need an instrument for short-selling potential that is (i) correlated with short-selling potential (this assumption can be tested) in the first-stage regression and (ii) uncorrelated with firm payout ratio, except indirectly through other independent variables. In other words, the instrument should be a variable that can be excluded from the original list of control variables without affecting the results. Following the spirit of the exogenous event-based approach, my endogeneity test of exogenous events in the U.S. sample examines how firm-specific exogenous shock - as an extension to firm-specific short-selling potential - increases firm payout ratios. The main intuition is that I regard the negative aggregate event sentiment (*NAES*) score as a proxy for an exogenous shock to the stock market. I argue that pessimistic market sentiment is positively correlated with short sellers' decisions. A greater negative aggregate event sentiment (*NAES*) score projects a more negative market sentiment ($higher\ NAES$), thus creating potential opportunity for short sellers. I expect firm-level exogenous shocks from negative events as reflected by the $NAES$ to exhibit a similar role to that played by firm-level short-selling potential: to enhance the market disciplinary mechanism vis-à-vis the managers, forcing them to increase the firm payout when there is no or less-positive NPV projects, except that the firm-level exogenous shock from a negative event is correlated with firm payout through the channel of firm-level short-selling potential.

To show the statistical relation between negative sentiment shock as reflected by the negative aggregate event sentiment (*NAES*) score and short-selling potential (TBV), I establish the first stage specification of a model in Table 3.8, Column (2) below:

Firm fixed effects first-stage regression:

Equation 3. 2

$$TBV_{i,t} = c + \beta_1 Firm\ level\ instrumental\ variables_{i,t}$$
$$+ \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1}$$
$$+ \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level,* t *represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term$.

In Table 3.8, Column (2) presents the firm fixed effects first-stage regression estimates with short-selling potential as the dependent variable and the instrumental variable, negative aggregate event sentiment (*NAES*) score, at contemporaneous time t and other controls at time lagged by one degree $t-1$. The negative aggregate event sentiment (*NAES*) is a granular score between 0 and 100 that represents the ratio of negative events reported on an entity compared to the total count of events (excluding neutral ones) measured over a rolling 91-day window; refer to the discussion in Section 3.3. I find a positive correlation between the negative aggregate event sentiment (*NAES*) score and short-selling potential (TBV); the estimate coefficient is reported at 0.11 ($t = 2.69$). A one-standard-deviation increase in the negative aggregate event

sentiment (*NAES*) score is correlated with a 0.19[70] increase in short-selling potential.

Column (3) presents firm fixed-effects second-stage regression estimates with the log transformed total payout ratio as the dependent variable. The 2SLS panel regression uses negative aggregate event sentiment (*NAES*) score as an instrument for short-selling potential (TBV), and other controls are at time lagged by one degree $t-1$.

Firm fixed-effects second-stage regression:

Equation 3. 3

$$Total\ payout\ ratio_{i,t} = c + \beta_1 instrumented\ TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level,* t *represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term$.

The Cragg and Donald (1993) and Kleibergen and Paap (2006) Wald F-statistics[71] are reported at 68.24 and 67.94 respectively in Column (3), well above

[70] The standard deviation of negative aggregate event sentiment (*NAES*) score at 1.77 (please see Table 3.4) multiplied by the coefficient estimate of negative aggregate event sentiment (*NAES*) score at 0.11 (please see Table 3.8, Column 2) = 0.19.

[71] I use Cragg and Donald (1993)[71] and Kleibergen and Paap (2006) rk Wald tests for the weak instrument test. Such various statistical tests would validate the specification of the first-stage regression. In the Cragg and Donald (1993) F-statistic Wald test, the null hypothesis H_0 is that

10, the threshold of weak exogeneity suggested by Staiger and Stock (1997). This result provides strong evidence for rejecting the null hypothesis in Table 3.8, Column (1) that the instrumental variable in the first-stage regression is weakly identified. I provide evidence that is closer in spirit to my tests: I examine the impact of my instrumental variable on firm payout policy through the channel of short-selling potential in a 2SLS framework. To strengthen my within-firm change interpretation, I also demeaned my panel data across the cross-sectional firm dimension and compute my estimates using a 2SLS exogenous event-based model. In Table 3.8, Column (3), I find similar results between the 2SLS fixed regression and the multivariate OLS in Table 3.7, Column (4). In Table 3.8, Column (3) the coefficient estimate is reported at 5.74 ($t = 6.37$). A one-standard-deviation increase in short-selling potential (TBV) is related to a 23[72] basis points increase in the firm payout ratio. My interpretation here is twofold: (i) omitted variables and reverse causality are unlikely to explain the relation between short-selling potential and firm payout policy and (ii) in addition to my 2SLS and multivariate OLS, firm fixed effects address most time-invariant unobserved variables. I find evidence consistent with a causal effect from the multivariate

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the first stage is weakly identified. In the Kleibergen and Paap (2006) F-statistic Wald test, the null hypothesis H_0 is that the first stage is weakly identified. Although critical values do not exist for the Kleibergen-Paap statistic, I follow the approach suggested in Baum, Mark, and Stephen (2007) and apply the Stock and Yogo (2005) critical values initially tabulated for the Cragg-Donald statistic.

[72] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by the coefficient estimate of short-selling potential (*TBV*) at 5.7395 (please see Table 3.8, Column 3) = 0.0023.

OLS; however, traditional multivariate OLS tends to underestimate the correlation between short-selling potential and firm payout policy.

To test the second hypothesis (proposition 3.2), I extend my 2SLS model with the positive NPV project potential proxies.

Firm fixed effects second-stage regression:

Equation 3. 4

$$Totalpayoutratio_{i,t} = c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&D_{i,t} + \beta_3 TBV_{i,t} * Tobin's\ Q_{i,t} + \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} + \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level,* t *represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term.$

In Table 3.8, Column (4), I extend my 2SLS model by including positive NPV project potential for firm *i* at time *t* by using the following proxies: (i) R&D expenses scaled by net sales and (ii) Tobin's Q. I explain that when firms have more positive NPV projects and stronger positive NPV potential as proxied by R&D expenditures and Tobin's Q, they tend to pay out less because they want to retain more earnings for the future development of the positive NPV project. I gauge the effect of positive NPV project potential on short-selling potential by generating interaction terms between short-selling potential and the positive NPV project potential proxy at contemporaneous time t. One issue here is that to avoid

multicollinearity between the interaction terms, I use different scaling denominators. For instance, R&D expenditures is scaled by net sales, and Tobin's Q is scaled by firm size (total assets). I do not expect a feedback effect from the dependent variable to the positive NPV project potential proxies because the firm payout ratio is scaled by EBIT. In Column (4), I find that the interaction terms between both short-selling potential (TBV) and positive NPV project potential, $TBV * R\&D$ and $TBV * Tobin's\ Q$, have negative and highly significant coefficient estimates at a one per cent level of significance. This lends support to my second hypothesis (proposition 3.2) that firms tend to pay out less because they want to retain more earnings for future development of positive NPV projects. To further confirm my results for hypothesis (proposition 3.2), I extend the positive NPV concept by using positive NPV project demand dummies.

Equation 3. 5

$$
\begin{aligned}
Totalpayoutratio_{i,t} \\
&= c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&Ddemanddummy_{i,t} \\
&+ \beta_3 TBV_{i,t} * Tobin'sQdemanddummy_{i,t} \\
&+ \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} \\
&+ \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}
\end{aligned}
$$

s.t. i represents observations at firm level, t represents the sample year, η_i represents the firm dummy, ω_t represents the year dummy and $\varepsilon_{i,t}$ represents error term.

Column (5) strengthens the model in Column (4) by using the R&D demand dummy, {1 if $\frac{R\&D_{i,t}}{NETSALES_{i,t}} - \frac{R\&D_{i,t-1}}{NETSALES_{i,t-1}} > 0$ or 0 otherwise}, and the Tobin's Q

demand dummy, {1 if $Tobin'sQ_t - Tobin'sQ_{t-1} > 0$ or 0 otherwise}, to proxy for positive NPV project potential. In both positive NPV project potential models, Columns (4) and (5), I find a similar-magnitude coefficient of short-selling potential (*TBV*) at 12.05 ($t = 4.13$) and 11.23 ($t = 4.07$) and both are significant at a one per cent level of significance. Using the R&D demand dummy model in Column (5), a one-standard-deviation increase in short-selling potential corresponds to a 45-basis-point[73] increase in the firm payout ratio; however, if there is positive NPV project potential identified, a one-standard-deviation increase in short-selling potential corresponds to a 43-basis-point[74] increase in the firm payout ratio. The results indicate that a firm tends to retain 2 basis points of payout to EBIT for future development if positive NPV project potential is identified.

3.5 Robustness test

One remaining concern is whether short-selling potential is significant for a cross-country sample, including other developed and developing countries. In Table 3.9, I further expand my sample to include 40 countries. The international sample consists of 2,662 firms and additional controls, for instance, U.S. cross listing -

[73] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by the coefficient estimate of short-selling potential (*TBV*) at 11.23 (please see Table 3.8, Column 5) = 0.0045.

[74] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by the [coefficient estimate of short-selling potential (*TBV*) at 11.23 plus coefficient estimate of $TBV * R\&D\ demand\ dummy$ at - 0.65 (please see Table 3.8, Column 5)] = 0.0043.

American Deposit Receipt (ADR) and International Accounting Standard compliance (IAS) dummies.

Table 3.9: Total payout ratio and short-selling potential: International sample two-stage regression and positive NPV project potential

Estimates of panel regressions of the log total payout ratio using alternative estimation methods are shown. Column (1) presents the firm fixed effects estimates with the log transformed total payout ratio as the dependent variable and with control variables at time lagged by one degree for the international sample. Column (2) presents the first stage of the NAES score with total balance value (dollars) of shares on loan scaled by market capitalization (TBV) as the dependent variable and other lagged controls as independent variables. Column (3) extends the 2SLS model to the international sample and controls for positive NPV project potential for firm i at time t by using the proxy of R&D expenses scaled by net sales and Tobin's Q. Column (4) strengthens the model in Column (3) by using the R&D demand dummy {1 if $\frac{R\&D_{i,t}}{NET\ SALES_{i,t}} - \frac{R\&D_{i,t-1}}{NET\ SALES_{i,t-1}} > 0$ *or 0 otherwise} and the Tobin's Q demand dummy {1 if* $Tobin'sQ_t - Tobin'sQ_{t-} > 0$ *or 0 otherwise} to proxy positive NPV project potential.*

Column (1)

Firm fixed effects

$$Total\ payout\ ratio_{i,t} = c + \beta_1 TBV_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (2)

Firm fixed effects first-stage regression

$$TBV_{i,t} = c + \beta_1 Firm\ level\ instrumental\ variables_{i,t} + \beta_2 Firm\ level\ characteristics_{\ i,t-1} + \beta_3 Firm\ level\ ownership_{i,t-1} + \beta_4 Firm\ level\ audit\ quality_{\ i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (3)

Firm fixed effects second-stage regression

$$Totalpayoutratio_{i,t} = c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&D_{i,t} + \beta_3 TBV_{i,t} * Tobin's\ Q_{i,t} + \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} + \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

Column (4)

Firm fixed effects second-stage regression

$$Totalpayoutratio_{i,t} = c + \beta_1 instrumentedTBV_{i,t} + \beta_2 TBV_{i,t} * R\&Ddemanddummy_{i,t} + \beta_3 TBV_{i,t} * Tobin'sQdemanddummy_{i,t} + \beta_4 Firm\ level\ characteristics_{i,t-1} + \beta_5 Firm\ level\ ownership_{i,t-1} + \beta_6 Firm\ level\ audit\ quality_{i,t-1} + \eta_i + \omega_t + \varepsilon_{i,t}$$

s.t. i *represents observations at firm level, t represents the sample year,* η_i *represents the firm dummy,* ω_t *represents the year dummy and* $\varepsilon_{i,t}$ $represents\ error\ term.$

Dependent variable, Payout ratio is the log of the total dollar amount of dividends declared on the common stock denominated in millions of U.S. dollars (Item # T60 CCD) plus the total dollar amount of common/preferred redeemed, retired, converted, etc., denominated in millions of U.S. dollars (Item # T16 REP) scaled by earnings before extraordinary items denominated in millions of U.S. dollar. Main explanatory variable, TBV is the total balance value (dollars) of shares on loan scaled by market capitalization. Firm-level characteristic variables, Firm size (log) is the log of firm total assets, Book-to-

market (log) is the log of the book-to-market equity ratio, Leverage (log) is the log of total debt scaled by total assets, Firm age (log) is the log of firm age, Illiquidity is the log of the average daily Amihud's (2002) measure calculated as the absolute value of stock returns divided by dollar trading volume on a given day, Cash flows is the operating income minus accruals scaled by lagged total assets, Cash is cash and short-term investments scaled by total assets, Retained earnings (log) is the log of retained earnings scaled by total assets, Stock return and stock return standard deviation are the stock annual return and annualized stock return standard deviation, respectively, and ROA is the ratio of net income before extraordinary items plus interest expenses to total assets. Firm-level ownership proxies, ADR is a dummy that equals one if the firm was cross-listed on a U.S. stock exchange, Close-held ownership is the ratio of shares closely held by insiders and controlling shareholders, and Domestic institutional ownership and Foreign institutional ownership are aggregate equity holdings of domestic and foreign institutional investors relative to total number of outstanding shares, respectively. Firm-level audit quality proxies, IAS dummy equals 1 if the firm adopts international accounting standards, BIG N dummy equals 1 if the firm is audited by any of the Big 4/5 auditors, and Auditor opinion dummy equals 1 if the opinion given by the auditor is unqualified in accordance with the financial reporting framework used for the preparation and presentation of the financial statements and 0 otherwise. A firm-level information instrumental variable, NAES is the negative aggregate event sentiment score over a 91-day window. Positive NPV variable, R&D is the log of R&D expenditures scaled by net sales; Tobin's Q is the log of Tobin's Q. Please see Table 3.3 for the full definitions and data sources.

The sample consists of all firm-year observations from Worldscope and Datastream (Full-Coverage, Primary, Secondary, Tertiary, Research, and Back Files) over the period 2002-2010 that have available information on all of the following explanatory variables. $t - statistics$ *shown in parentheses are based on standard errors adjusted for heteroscedasticity and firm-level clustering based on Thompson (2011).*

VARIABLES	(1) *Payout ratio (log)*	(2) *TBV*	(3) *Payout ratio (log)*
TBV	5.7177***		
	(3.7320)		
Instrumented TBV			31.8581***
			(3.0777)
*TBV * R&D*			-3.3263***
			(-3.0397)
*TBV * Tobin's Q*			-1.1086***
			(-3.0280)
*TBV * R&D demand dummy*			
*TBV * Tobin's Q demand dummy*			
Firm size (log) (-1)	0.0997	0.0075*	0.7686
	(0.5442)	*(1.7756)*	*(1.2387)*
Book-to-market (log) (-1)	0.0039	0.0002	-0.0219
	(0.4351)	*(0.4419)*	*(-0.5676)*
Leverage (log) (-1)	-0.0052	-0.0001	-0.0248
	(-0.9917)	*(-0.6265)*	*(-1.2997)*
Firm age (log) (-1)	-0.0050	-0.0001	0.0033
	(-0.5261)	*(-0.1834)*	*(0.0738)*
Illiquidity (-1)	0.0056	0.0002	0.0047
	(0.8056)	*(0.9965)*	*(0.2187)*
Cash flows (-1)	2.5301*	-0.0410	-3.1345
	(1.7353)	*(-0.6216)*	*(-0.4463)*
Cash (-1)	0.0827	0.0146	2.5476
	(0.0951)	*(0.5675)*	*(0.7766)*
Retained earnings (log) (-1)	0.0038	-0.0001	-0.0251
	(0.6782)	*(-0.6508)*	*(-1.0655)*
Stock return (-1)	0.0020	0.0002	-0.0275
	(0.1585)	*(0.3426)*	*(-0.5627)*
Stock return standard deviation (-1)	0.0151	0.0004	-0.0489
	(0.9243)	*(0.7073)*	*(-0.6660)*

ROA (-1)	-0.1504	0.0042	0.1397
	(-1.0855)	*(0.6429)*	*(0.2310)*
R&D (-1)	0.0000	0.0000	
	(0.0026)	*(0.5072)*	
ADR (-1)	-0.0378	-0.0005	0.0388
	(-1.3996)	*(-1.2816)*	*(0.4582)*
Close-held ownership (-1)	0.0026	0.0006	-0.0270
	(0.0824)	*(0.4556)*	*(-0.2223)*
Domestic institutional ownership (-1)	0.0069	0.0001	-0.1741
	(0.2869)	*(0.0791)*	*(-1.3344)*
Foreign institutional ownership (-1)	0.0646	0.0047	0.1106
	(0.8629)	*(1.1636)*	*(0.3007)*
IAS dummy (-1)	0.0089	-0.0006	0.0252
	(0.5372)	*(-0.9056)*	*(0.3566)*
Big N dummy (-1)	0.0022	-0.0003	0.0188
	(0.1105)	*(-0.4837)*	*(0.2028)*
Audit opinion dummy (-1)	0.0611	-0.0014	0.2271
	(1.5862)	*(-0.6560)*	*(1.2783)*
NAES		0.0697**	
		(2.5707)	
R&D			0.0251***
			(2.8594)
Tobin's Q			20.9148***
			(2.9282)
R&D demand dummy			
Tobin's Q demand dummy			
Constant	-1.0670**	0.0143	-8.5592***
	(-2.5700)	*(1.4120)*	*(-3.0049)*
Observations	31,272	51,404	30,457
R^2	0.0152	0.0007	0.0009
Number of firms	2,757	4,426	2,662
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Hausman (1978) specification test			
Chi-square	118.41	314.67	1046.04

Robust *t-statistics* in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 3.9, estimates of the panel regressions for the log total payout ratio are shown using alternative estimation methods. Column (1) presents the firm fixed-effects estimates with log transformed total payout ratio as the dependent variable and control variables at time lagged by one degree ($t-1$) for the international sample. Column (2) presents the first-stage regression of the $NAES$ score with short-selling potential (TBV) as the dependent variable and other lagged controls as independent variables. I test the positive NPV project potential model in Column (3) and the positive NPV project potential demand dummy model in Column (4).

In Table 3.9, Column (1), I extend my fixed-effects regression to the international sample and find that my short-selling potential (TBV) remains significant at a one per cent level of significance. The coefficient estimate is reported at 5.72 ($t = 3.73$). The result is consistent with my main result in Table 3.7, Column (4). Following the 2SLS framework, I test the first-stage regression in Column (2), regressing my endogenous variable, short-selling potential (TBV), on exogenous $NAES$. The instrumental variable is significant at a five per cent level of significance, and the coefficient estimate is 0.07 ($t = 2.57$). From the second-stage fixed-effects regressions in Column (3) and Column (4), I find consistent results from the international study that short-selling potential is positively correlated with firm payout ratio. The international sample extension also confirms my results in the U.S. sample that the interaction terms between positive NPV project potential and short-selling potential (*TBV*) are negative and highly significant at a one per cent level of significance. Following the positive NPV project potential demand dummy model in Column (4), a one-standard-deviation

increase in short-selling potential is correlated with a 92-basis-point[75] increase in firm payout ratio. When there is positive NPV potential identified, on average, a one-standard-deviation increase in short-selling potential is correlated with a 90.76-basis-point[76] increase in firm payout ratio. Hence, short-selling potential can directly reduce agency costs by punishing firms that inefficiently use capital and therefore indirectly – through the role of external monitoring mechanisms in disciplining managers – increase the payout ratio of excess earnings to shareholders. However, this effect tends to be weaker when firms have stronger positive NPV project potential.

3.6 Conclusions

In conclusion, I contribute to both the short-selling and agency theory empirical studies. I elucidate the disciplinary role of short-selling potential in disciplining managers who pay out excess earnings to investors. I find that short sellers act in an external monitoring role because they act as a catalyst to exacerbate situations and force firms to pay out more to mitigate agency costs. Second, I find that managers react to short-selling demand differently depending on the existence of positive NPV project potential. The effect of short-selling potential is weaker when firms have stronger positive NPV project potential. These findings allow me to advocate for short selling not only as a disciplinary mechanism but

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[75] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by the coefficient estimate of short-selling potential (*TBV*) at 22.9739 (please see Table 3.8, Column 5) = 0.0092.

[76] The standard deviation of short-selling potential (*TBV*) at 0.04 (please see Table 3.4) multiplied by [the coefficient estimate of short-selling potential (*TBV*) at 22.9739 plus coefficient estimate of $TBV * R\&D\ demand\ dummy$ at -1.2325 (please see Table 3.8, Column 5)] = 0.009076.

also as a solution to the agency costs of free cash flow. In other words, short selling not only influences managers to pay out excess earnings but also influences managers to use excess funds in the most optimal manner. In future study, event study on short-selling ban in developing countries is suggested, especially during global financial crisis period (2007-10). This would tease out the policy implication on the introduction of short-selling ban in developing countries, to complement the existing study.

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CHAPTER 4

INTERNATIONAL ASPECTS OF CAPITAL ALLOCATION EFFICIENCY: MANUFACTURING

4.1 Introduction

Kuznets (1966) described the long-term development patterns of countries based on empirical analyses of national accounts and argued that industrialization - or increases in the share of manufacturing in GDP - is a key feature of modern economic growth. He further argued that modern economic growth is markedly different from the much lower growth rates observed in the world before the start of the industrial revolution. Kaldor examined the relationship between industrial development and economic growth and, based on empirical results, characterized the manufacturing sector as "the main engine of fast growth" (Kaldor, 1967, p. 48). This description not only held true for the 12 early industrializers examined by Kaldor, ranging from the UK to Japan, but is also characteristic of catching-up countries that have experienced rapid, sustained growth (Felipe et al., 2014; Commission on Growth and Development, 2008, p. 114). At high income levels, and as a standard feature of successful structural change, countries invariably experience deindustrialization, resulting in lower growth rates. Such deindustrialization is attributed primarily to a decline in labour intensity and a shift of manufacturing activities to lower income countries through trade between mature economies and developing countries (Kucera & William, 2003; Rowthorn & Ramaswamy, 1997; Tregenna, 2009).

Recently, however, premature deindustrialization or non-industrialization has been increasingly noticeable among developing countries that had a lower share of manufacturing in GDP at their peak; these countries also peaked at a much lower income level than the early industrializers (Amirapu & Subramanian, 2015; Dasgupta & Singh, 2006; Ghani & O'Connel, 2014; Rodrik, 2015). Although the debate regarding whether services can become a new growth-enhancing sector

continues, studies indicate that premature deindustrialization is currently apparent in developing countries and that manufacturing no longer serves as an engine of growth in these countries.

However, to attribute premature deindustrialization to a fundamental decline in the significance of manufacturing in the world due to changes in global demand and supply rather than to the failures of some countries to develop their manufacturing sector, at least one of the following two conditions needs to be confirmed.

A. *Manufacturing is no longer the driver of economic growth in developing countries based on Kaldor's formulations.*
B. *The share of manufacturing value added (MVA) and employment relative to other sectors have decreased significantly in developing countries.*

The first condition (A) essentially focuses on whether the relationship between the share of manufacturing in the economy and economic growth is positive and stronger than the relationship between the share of other sectors and economic growth. The second condition (B) focuses on the relative contributions of MVA and manufacturing employment to the economy.

For instance, even though manufacturing might be the main driver of economic growth (thus rejecting (A)), one could still consider a scenario in which manufacturing plays a less significant role in the economic development of developing countries than it previously did if its size shrank considerably. In fact, it is widely believed that manufacturing jobs are disappearing globally (Ghani & O'Connel, 2014). In turn, despite remaining the same size, manufacturing could

be considered to be playing a less important role if its ability to boost economic growth has weakened.

If both (A) and (B) can be rejected, one can conclude that the importance of manufacturing in the growth of developing countries has not changed. In that case, one could claim that premature deindustrialization is not caused by changes in any development characteristics of manufacturing—which might have diminished the importance of its role in economic development—but rather that it is due to the inability of some countries to develop their manufacturing sector relative to others.

Several empirical studies have examined condition (A), i.e., the role of manufacturing as a driver of economic growth in developing countries. Szirmai and Verspagen (2015) tested the relationships between the value added share of manufacturing and the GDP growth per capita using Hausman-Taylor estimates and fixed-effects, random-effects and between-effects models for an unbalanced panel of 92 countries. This relationship was examined for the three periods, 1950–1970, 1970–1990 and 1990–2005, and compared with results for the service sector. Focusing primarily on the results of the conservative Hausman-Taylor estimates, this study presents the contribution of manufacturing to GDP per capita growth conditional on the level of education and stage of development. It shows that manufacturing acts as an engine of growth for low- and some middle-income countries provided that they have a sufficient level of human capital. Such growth engine features are not found for the service sector. Interestingly, their findings for more recent periods indicate that a higher level of

human capital (at least seven to eight years of education) is necessary for manufacturing to play a role as an engine of growth for developing countries.

Necmi (1999) tested whether Kaldor's conclusions continued to be valid beyond the heyday of rapid industrialization and catch-up in the 1970s by applying an instrumental variable econometric technique to 45 countries, most of which were classified as developing, during the period of 1960-1994. The results confirmed Kaldor's argument that "manufacturing is an engine of growth" for most of the developing countries studied, with the possible exception of sub-Saharan countries. Even for developed countries, McCausland and Theodossiou (2012) found that Kaldor's thesis largely held true for the period of 1992-2007.

In contrast, the findings of Fagerber and Verspagen (1999) indicated that manufacturing acted as an engine of growth only for developing, i.e. not developed, countries in the 1970s and 1980s. A cross-sectional regression study by Dasgupta and Singh (2006) that included 48 developing countries and considered the period of 1990-2000 concluded not only that manufacturing continued to play an engine of growth role but also that services played a similarly important role during that period.

Chakravarty and Mitra (2009) and Kathuria and Natrajan (2013) examined the engine of growth hypothesis for India, where the services sector has played a key role in the country's economic development (Aggarwal & Kumar, 2015). In the former study (Chakravarty & Mitra, 2009), which covered the period of 1973-2004, manufacturing was found to have been one of the drivers of growth, together with construction and services. Kathuria and Raj (2013) tested the hypothesis for all 15 states of India in the period of 1994-2006 and concluded that

manufacturing had indeed acted as an engine of growth in India, despite its declining share of GDP.

In a series of recent publications, Rodrik (2013) discussed the driving nature of manufacturing, how successful regions have changed their structure to benefit from this driver of economic growth (McMillan, Rodrik & Verduzco-Gallo, 2014) and whether this path of economic development is still available for currently developing countries (Rodrik, 2015). These publications demonstrate that the formal manufacturing sector is exhibiting a rapid unconditional convergence in labour productivity and that Asian countries grew faster than other regions by moving labour from low- to high-productivity sectors, particularly manufacturing. However, Rodrik is pessimistic regarding whether this pattern of economic development will continue for currently developing countries due to premature deindustrialization.

In summary, the evidence from the literature suggests that the engine of growth hypothesis for manufacturing by and large still holds for developing countries - particularly those with a higher level of human capital (given their income level). However, whether the opportunity to use this engine is available to all developing countries, which relates to the second condition (B), appears to be questionable.

The literature discussed above analysed the manufacturing sector's role as a driver of growth by directly measuring the relationship between the growth in the MVA share and GDP. The following empirical analysis indirectly analyses the importance of manufacturing relative to other sectors in developing countries'

sustained growth process by comparing the sectoral growth rates of those countries that had a growth rate of at least seven per cent over 25 years.[77]

To identify differences in the sectoral growth rates of high-sustained-growth countries before and after 1990, countries were classified into pre- and post-1990 groups depending on whether at least 20 out of the 25 years of high growth fell before or after 1990.[78] As Figure 4.1-A illustrates, before 1990, there were nine countries that met the long-term, high-growth conditions. These included countries with very diverse demographic and geographic characteristics, namely large, small, island and natural-resource-rich countries. Out of these nine countries, six (66.7 per cent) recorded the highest growth rate in their manufacturing sector between 1971 and 1990.[79]

Small countries tend to have different development patterns from other countries because their development is more dependent on their geographic and natural endowment conditions (Armstong & Read, 1995; Kuznets, 1971, p. 105; Perkins

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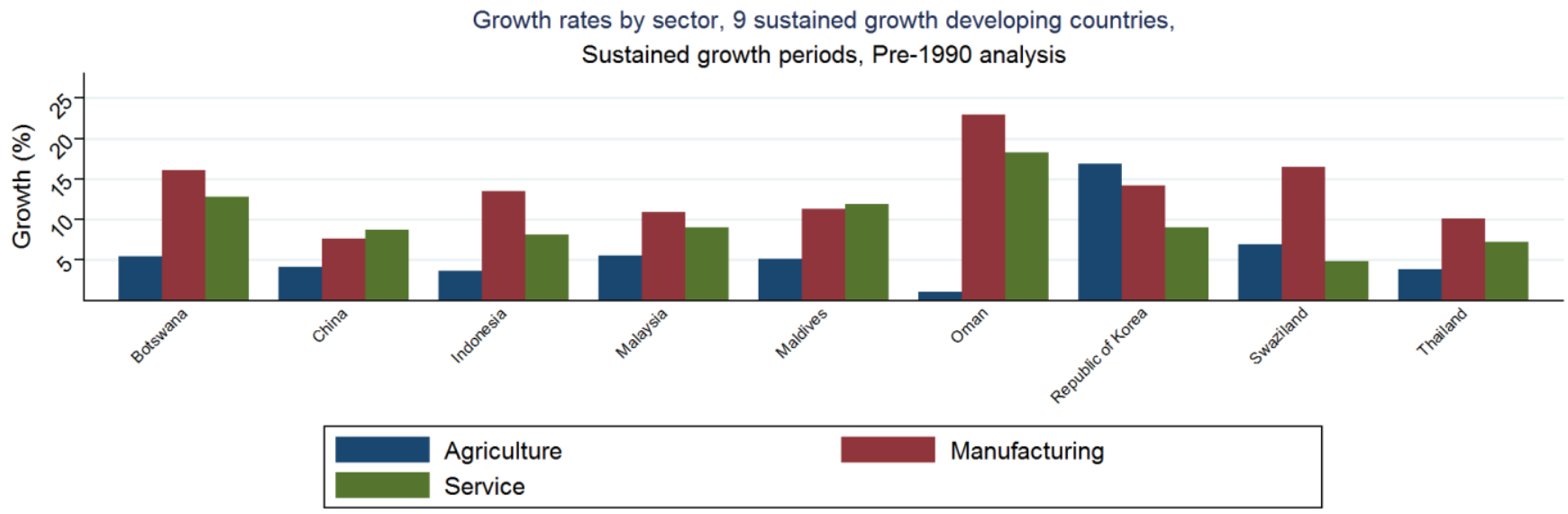
[77] Any period of an annual average growth rate of more than seven per cent for 25 years.

[78] The data for this analysis are from the National Accounts Main Aggregates Database (NAMAD, 2014) of the United Nations Statistics Division. 2015 constant prices (LCU) are used to identify high-sustained-growth countries and to measure sectoral growth rates (see the data section for further details). For a country to be included in the group of developing countries, the income level has to be lower than the threshold level for high-income countries (annually defined by WBAC) for every year from 1987 to 1990 for the pre-1990 group (because the WBAC data are available from 1987 onward) and for every year from 1990 to 2013 for the post-1990 group.

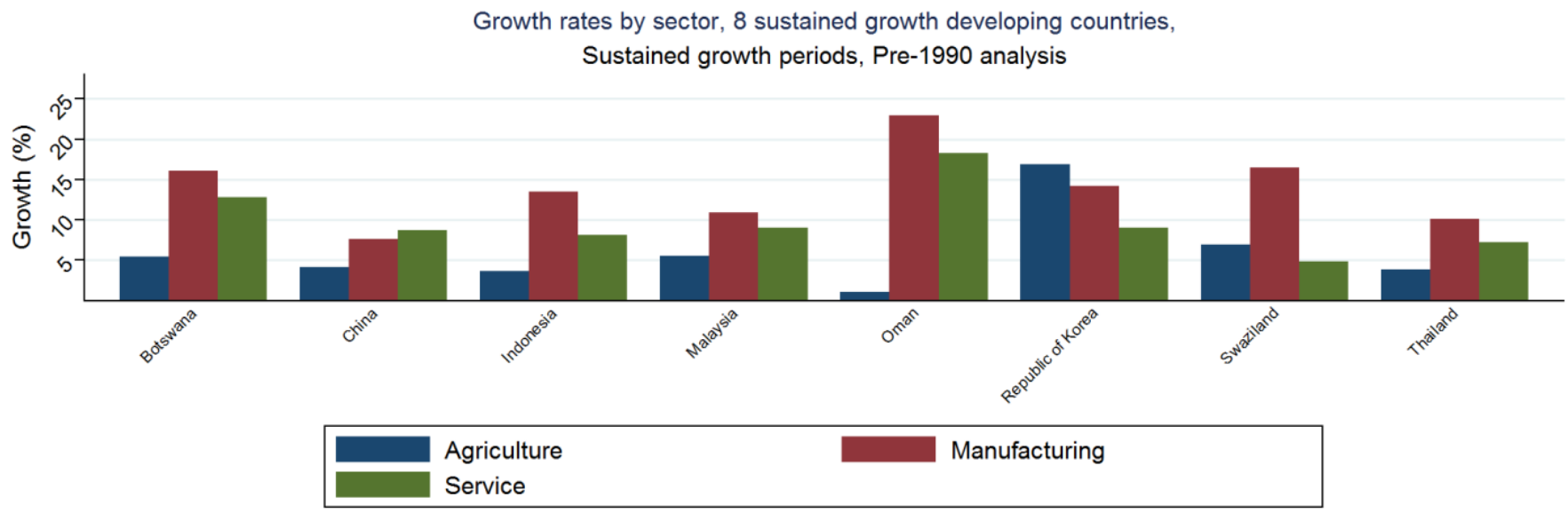
[79] As for the Republic of Korea, the agricultural sector had a very high growth rate in the early 1970s at constant price. For the whole period of this study from 1970 to 2013, the manufacturing sector had the highest growth in the country.

& Syrquin, 1989). In the case of very small countries, in particular, success in one or a few industries, such as financial services, tourism or agri-business, could have a significant impact on their long-term growth rate. Larger countries do not typically follow this development trajectory. Therefore, Figure 4.1-B excludes countries with a population of less than one million. Six out of eight countries with a population of more than one million (75 per cent) had the highest growth rate in their manufacturing sector between 1971 and 1990.



Source: Sustained growth identification (1970-2013, n=10) using GDP constant LCU (USND, 2015);
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
Excluding China: Macao SAR due to missing values in agriculture value added;
Growth rates of rAVA, rMVA and rSVA were calculated based on sustained growth period annual average, using constant LCU, (UNSD, 2015);
Having 6 sustained growth countries experienced highest growth in manufacturing

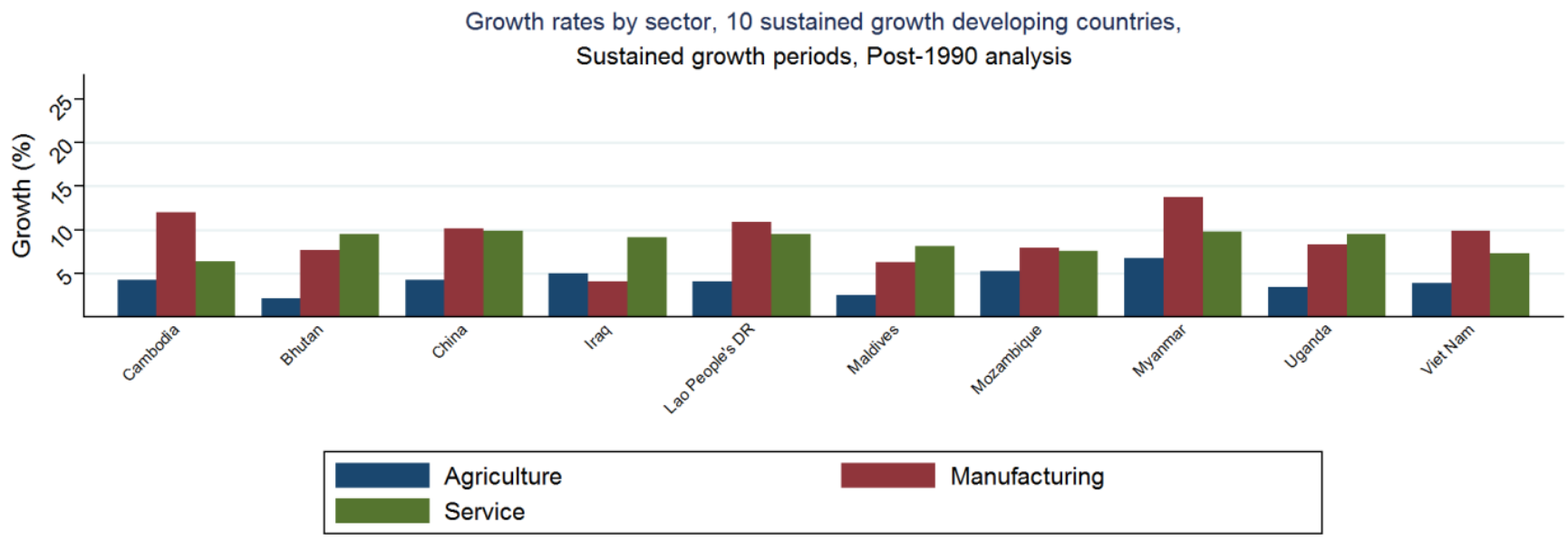
Figure 4.1-A: High-sustained-growth developing countries with the highest growth rate in their manufacturing sector (pre-1990)



Source: Sustained growth identification (1970-2013, n=10) using GDP constant LCU (USND, 2015);
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
Excluding countries with less than 1 million population: China: Macao SAR and Maldives;
Growth rates of rAVA, rMVA and rSVA were calculated based on sustained growth period annual average, using constant LCU, (UNSD, 2015);
Having 6 sustained growth countries experienced highest growth in manufacturing

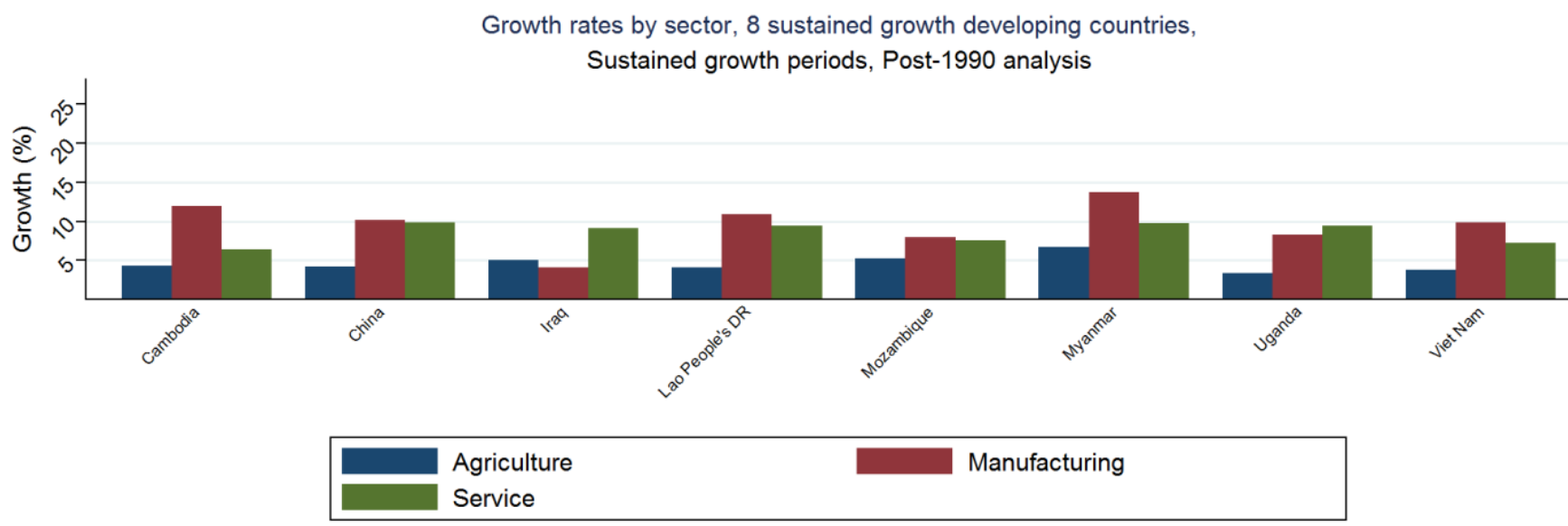
Figure 4.1-B: High-sustained-growth developing countries (population > 1 million) with the highest growth rate in their manufacturing sector (pre-1990)

Post-1990, as illustrated in Figure 4.2-A, ten countries with very diverse demographic and geographic characteristics recorded growth that was seven per cent or higher for 25 years, out of which at least 20 years fell within the period 1990 to 2013. Six of 10 countries (60 per cent) registered the highest growth rate in manufacturing during their sustained high-growth periods. If I remove the countries with populations of less than one million, six of eight countries (75 per cent) are left; these countries had the highest growth rate in manufacturing during their long-term high-growth periods (see Figure 4.2-B). There is thus not much difference in the strong performance of manufacturing relative to other sectors before and after 1990. For countries with populations of more than one million, the number and percentage of countries that recorded their highest growth rate in manufacturing are exactly the same – six of eight countries, or 75 per cent. This result lends additional empirical support to the findings presented in the literature regarding the continued importance of manufacturing growth to sustain high economic growth for a long period of time.



Source: Sustained growth identification (1970-2013, n=10) using GDP constant LCU (USND, 2015);
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
Growth rates of rAVA, rMVA and rSVA were calculated based on sustained growth period annual average, using constant LCU, (UNSD, 2015);
Having 6 sustained growth countries experienced highest growth in manufacturing

Figure 4.2-A: High-sustained-growth developing countries with the highest growth rate in their manufacturing sector (post-1990)



Source: Sustained growth identification (1970-2013, n=10) using GDP constant LCU (USND, 2015);
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
Excluding countries with less than 1 million population: Bhutan and Maldives;
Growth rates of rAVA, rMVA and rSVA were calculated based on sustained growth period annual average, using constant LCU, (UNSD, 2015);
Having 6 sustained growth countries experienced highest growth in manufacturing

Figure 4.2-B: High-sustained-growth developing countries (population > 1 million) with the highest growth rate in their manufacturing sector (post-1990)

Thus, the first condition (A) necessary to support the change in the importance of manufacturing appears weak for developing countries, especially for those with an absorptive capability commensurate with their income level. However, this finding is insufficient to support the argument that manufacturing's importance in economic development has not changed. Although manufacturing remains a driver of growth, if its size is decreasing in the world economy, its impact on economic development would naturally be lower than before, or current developing countries would have fewer opportunities to make use of this driver of economic development. If one is to argue that the importance of manufacturing for developing countries has not changed, the second condition (B) must also be rejected. If manufacturing is still the driver of growth and its size in developing countries has remained the same, one can safely conclude that the significance of manufacturing in economic development has not changed.

Some studies show a downward trend in the MVA share of GDP and manufacturing employment share in total employment across income levels (Ghani & O'Connel, 2014; Palma, 2007; Rodrick, 2015). As observed in Figures 4.3 and 4.4, I confirm a downward trend of MVA and manufacturing employment share since 1990 based on my data.[80]

[80] Vertical dashed lines are drawn at the threshold income level that separates developed countries from developing countries. For the data explanation, refer to the next section.

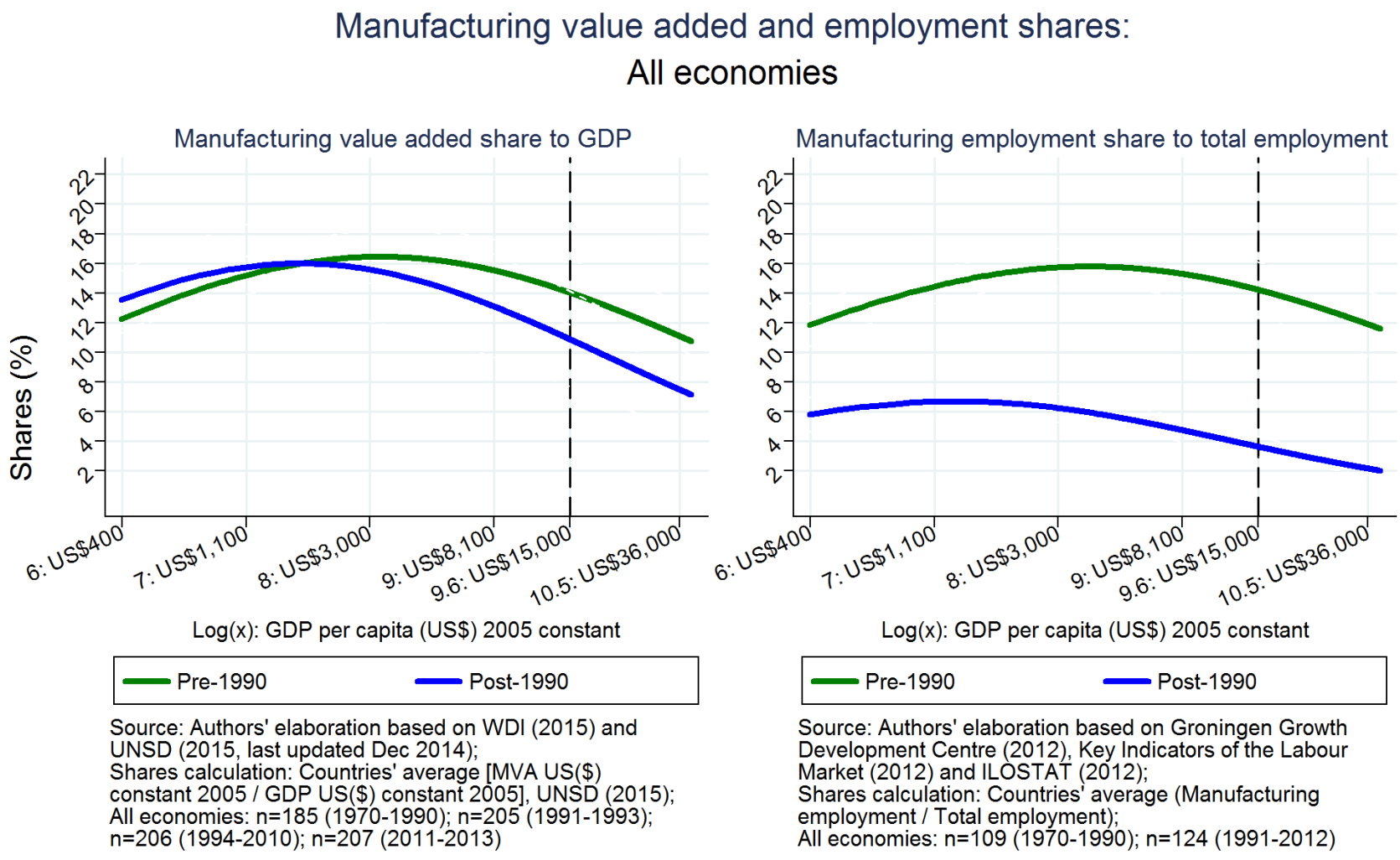


Figure 4.3: MVA share of GDP at constant prices (country average); Figure 4.4: Manufacturing employment share of total employment

The estimated shares of both MVA and manufacturing employment in the post-1990 period are generally lower than those in the pre-1990 period over most of the income levels of developing countries. Moreover, these countries reached their peaks at a lower income level. These results are similar to the findings of previous studies.

To shed some light on the second condition (B), it does not suffice to look at country-averaged shares of MVA and manufacturing employment in the respective totals, as is often the case in the literature regarding premature deindustrialization and is also illustrated in Figures 4.3 and 4.4. It is also important to look at manufacturing shares at the world-aggregate level – the share of world MVA and manufacturing employment in world GDP and employment. On one hand, even though the manufacturing share of a country or region may be decreasing, this decrease might be compensated by a rise in manufacturing activities in other parts of the world if the share of world manufacturing has not changed. On the other hand, if there is a substantial decline in manufacturing share at the world level, it is not a shift among countries but rather changes in global supply and demand conditions that have made manufacturing less important relative to other sectors of the economy. In contrast with studies on the engine of growth hypothesis, there are no studies that have performed a detailed comparison of the results between the country-average and world-aggregate shares of MVA and manufacturing employment. Thus, the empirical analysis of this chapter focuses primarily on the second condition (B).

In my analysis, I will compare MVA in current prices, constant prices and manufacturing employment.

4.2 Data

This section discusses manufacturing value added and the employment database used for the analysis in this chapter, and it describes the definitions of developing and developed country groups for which the analyses were conducted to assess their long-term structural changes in terms of MVA and manufacturing employment shares.

The main data source for sectoral value added is the National Accounts Main Aggregates Database (NAMAD, 2014)[81], which is maintained by the United Nations Statistics Division. The advantage of this database is that it contains national accounts data for essentially all countries over 43 years, i.e., it presents a global picture of changes in sectoral value added based on consistently compiled dataset that includes all countries and is not based on any estimation by the authors. The database contains data in terms of both current and constant prices, which allows me to assess any changes in MVA shares attributable to price changes.

Unlike my manufacturing production data, my manufacturing employment database is based on various sources. Taking the need for intertemporal and international compatibility into consideration, the construction of the database entails four steps and the corresponding approaches and methods, which will be addressed throughout this section. Table 4.A.3 lists the sources used in each step.

[81] Agriculture ISIC A-B, Manufacturing ISIC D, and Services ISIC G-I (United Nations Statistics Division, 2015, last updated December 2014).

Table 4.1: Outline of the estimation procedures

Step 1	Step 2	Step 3	Step 4
Systemic approach: core dataset	Idiosyncratic approach: additional datasets	Extrapolation method: missing observations	Aggregate consistency

The Table 4.1 illustrates the estimation procedure. First, the *systemic approach* combines datasets that include a widely available range of data (across both the international and time spectrums). These databases are merged, and their values for comparable data points (i.e., country X in year Y) compared to determine whether the same definition is maintained. To resolve any discrepancies among the values, several procedures are internalized. First, the data sources are ranked to select the majority of values from the most comprehensive databases [82]. Simultaneously, their patterns are graphically assessed to establish the gravity

[82] In this case, the ranking is GGDC-ASD and GGDC-10SDB, KILM, ILO, GGDC-WIOD (see Appendix 4.2.1: Sources by step). The databases referred to as being "more comprehensive" include (1) a larger sample and (2) less alternative definitions. ILO recently introduced a database used for the World Employment Social Outlook (WESO). The WESO database includes employment data for 174 countries since 1991. The major difference between the WESO and the databases used in this study concerns the employment data of China. The WESO recorded a lower manufacturing employment for China, especially in recent years, and hence a lower share of manufacturing employment in the total employment. This low figure is in contrast with other available employment databases, such as those used by this study, that of the Asian Productivity Organization and China's national census. Nevertheless, the share of industry (including both manufacturing and non-manufacturing sectors) in the total employment between the WESO and

of the problem. Finally, severe outliers are excluded from the sample. A large number of observations are still missing within the required sample after the systemic approach is applied[83]. The *idiosyncratic approach* aims to resolve the majority of these gaps by obtaining data from a multitude of country- or region-specific sources (see Appendix 4.2.1: Sources by step). After the second step, the series' (internally) missing observations are linearly interpolated.

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our databases are much closer in terms of the levels and trends. The WESO allocates less than half of the industry's employment to manufacturing (47.6% in 2012), which seems unrealistic because most non-resource-rich developing countries normally have a much higher share of around 60% or more. Even in many industrialized countries, such as the United States, Japan, Germany, Sweden, the share of manufacturing in industrial employment is larger than 60%. Furthermore, the use of the WESO database results in a very high labour productivity for China in comparison with countries at a similar income level. This indicates that there may be a mismatch between the WESO's data for China and the country's national accounts. The WESO's employment data are more similar to the numbers published by the National Bureau of Statistics and China Ministry of Labour. If the WESO's data for China comes from these sources, the manufacturing employment share in the total employment may be underrepresented because it is likely that these sources did not include town and village manufacturing employment (Banister, 2005). In any case, even using the WESO database, the trend in the aggregate manufacturing employment share is flat (i.e. there is a statistically insignificant time trend) from 1990 to 2010. Our employment figure is slightly higher but much closer to the country's national census than to the WESO figure. Although the census achieves more complete reporting than the official annual compilation, the census, too, seems to undercount manufacturing employment (Banister, 2005). The method and timing with which the census was conducted resulted in it classifying many rural household members as agricultural workers even though some of them are engaged in manufacturing and other industries most of the time (Banister, 2005, p. 18).

[83] The required sample here refers to having a *complete* or *comprehensive* set of countries, i.e. a sample that is not skewed towards a specific income classification, country size or region.

The available series are converted into their percentage contribution to total employment. The remainder of the values (at the lower or upper ends of the time spectrum) are extrapolated in the third phase, the *extrapolation approach*. This approach covers three different groups: (i) countries with a maximum of five missing observations at either side of the time spectrum, (ii) countries with between five and 10 years of missing observations, and (iii) countries with gaps in excess of 10 consecutive years[84]. Group (iii) is immediately excluded from the sample because extrapolation is likely to result in biased estimates. Group (i) undergoes a *linear extrapolation* process, whereas missing information is resolved in group (ii) through extrapolation by means of the *last observation carried forward*[85]. Following these procedures, all percentage values are merged together in a new database, thereby creating the foundation for the fourth and final step.

The final step aims to mitigate internal compatibility issues and thereby improve the consistency at the aggregate data level. As already explained in the previous section, consistency is an important feature of the database. Having derived the shares in the previous steps, they are multiplied in this final step with the aggregate employment values from the Total Economy Database of the Conference Board[86]. This database provides estimates for the total employment

[84] A second metric that was considered is the behaviour of the function (i.e. trend), but this was rejected due to the high likelihood of obtaining assumption-driven rather than data-driven estimates.

[85] Initially, spatial interpolation was considered, but this is likely to drive estimates further away from their true values.

[86] Source: https://www.conference-board.org/data/economydatabase/

levels of a total of 128 countries. The employment series for the remaining nine countries were obtained using idiosyncratic methods[87]. Finally, note that this mechanism still implies that the estimates will better reflect the original data for the series in *percentages* and covering *aggregate* patterns compared with those that are generated on a *level* basis for *individual* countries.

There are two conditions that I must consider when I classify countries into a group of developing countries for the analysis of the group's long-term structural change in terms of MVA and manufacturing employment. First, the countries classified into the developing country group need to have been developing countries throughout the period of analysis. I am interested in determining whether manufacturing opportunities in developing countries increased or decreased over the last 43 years to assess any changes in the significance of manufacturing for their economic development. For a consistent and accurate analysis, mature high-income countries, which usually experience deindustrialization, must be excluded from the group of developing countries for the entire period of analysis. Second, ideally, the same number of countries and geographic coverage has to be maintained throughout the period of analysis to ensure that any changes in MVA and manufacturing employment shares are attributed to changes in the economic activities of the group analysed.

Due primarily to the break-up of the USSR and Yugoslavia in 1990 and the fact that only some of the former USSR and former Yugoslav countries reached high income level after 1990, it is not possible to simultaneously maintain the above two conditions. I therefore have two sets of balanced panel data for developing

[87] See Appendix 4.2.1: Sources by step.

countries, before 1990 and after 1990; geographical coverage is maintained within each of the balanced panel data. The difference between the two datasets is largely related to the break-ups of the USSR and Yugoslavia.[88] Before 1990, the USSR and Yugoslavia are entered into the dataset of developing countries as two individual countries. After 1990, the former USSR and Yugoslavian states are included in the dataset of developing countries, with the exception of Estonia, Latvia, Lithuania, Russia, Croatia and Slovenia, all of which reached a high income level during the period of 1990-2013. The effects of these changes are minimal because I use shares to assess changes in MVA and manufacturing employment, which does not affect the interpretation of my results because I focus on the trend (increasing, decreasing or flat) in each period, i.e. before and after 1990. For the robustness check, I also include the results based on the dataset that excludes all merged or separated countries[89]; thus, I can use a single balanced dataset that contains the same number of developing countries and the same geographic coverage for the entire period of 43 years.

Developing countries include those that did not reach a high income level in any year until 2013[90] based on the threshold income level for high-income countries

[88] Although the (i) break-ups of Ethiopia and Sudan (ii) merger of Yemen occurred after 1990, the former Ethiopian, Sudanese and Yemeni states remained in the developing country group. Hence, within each of the balanced panel data, geographical coverage is still maintained.

[89] They are the USSR, Yugoslavia, Yemen, Ethiopia, Sudan and their merged or separated countries.

[90] In the shares analysis, one period sample is followed in terms of (i) MVA (1970-2013) and (ii) manufacturing employment (1970-2012). Countries are classified as developing countries based

defined annually by World Bank Analytical Classifications (WBAC)[91]. This ensures that declines in MVA shares and manufacturing employment shares experienced by developing countries are not caused by the normal pattern of structural change, which usually leads to deindustrialization at high income levels. For countries that have not been classified by WBAC, I use WDI (2015) and NAMAD (2014)[92] to jointly assess those countries' income levels[93] and subsequently define their level of development based on WBAC. For details regarding the database, see Appendix 4.1.

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on WBAC in 2013, excluding those countries that had a high-income status sometime during the period of 1987-2013, such as American Samoa (1987-1989) and Hungary (2008-2011).

[91] World Bank Analytical Classifications (presented in the WDI), using GNI per capita in US$ (Atlas methodology) from calendar year 1987 through 2014.

[92] By using GDP (current US$) (NAMAD, 2014) per capita, i.e. divided by population (WDI, 2015). The total population (SP.POP.TOTL) is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship, except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are mid-year estimates (WDI, 2014).

[93] Anguilla, the Cayman Islands, the British Virgin Islands and the Turks and Caicos Islands are classified as developed countries in the pre-1990 period. Anguilla and British Virgin Islands are classified as developed countries in the post-1990 period.

4.3 Results

4.3.1 MVA shares at current prices

Figure 4.5-A shows the changes in country-average shares of MVA in GDP within each development group[94]. The shares of developed countries have steadily declined since 1970. Developing countries exhibited a stable trend until 1990 but since then have experienced a statistically significant declining trend (see Table 4.2, Column 2). The result at current prices confirms the lower shares of MVA in developing countries in the post-1990 period. Figure 4.5-B illustrates the changes in the shares of aggregate MVA in the aggregate GDP of each development group as a whole (hereafter called "aggregate share"). Whereas there is no change in the steadily declining trend of developed countries, the aggregate shares for developing countries exhibit a different trend. The aggregate share decreased until 1993 and then remained more or less stable until 2013. This sudden change in the aggregate share trend may not reflect the long-term trends of the world manufacturing share due to the economic collapse of the former Soviet Union and subsequent consolidation of manufacturing industries.

[94] The country-average share of MVA in GDP is calculated as the sum of each country's MVA share of GDP divided by the number of countries, whereas the aggregate share is measured as the world's total MVA divided by the world's total GDP. The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages.

Table 4.2: MVA shares of GDP at current prices

Source: United Nations Statistics Division (2015, updated version as of December 2014); Income classification: GNI per capita in US$ (Atlas methodology), WDI (2013); All developing economies: n=123 (1970-1990); n=136 (1991-1993); n=137 (1994-2010); n=138 (2011-2013); All developing economies (excluding all merged and separated countries): n=117 (1970-2013). Note: t-statistics in parentheses.

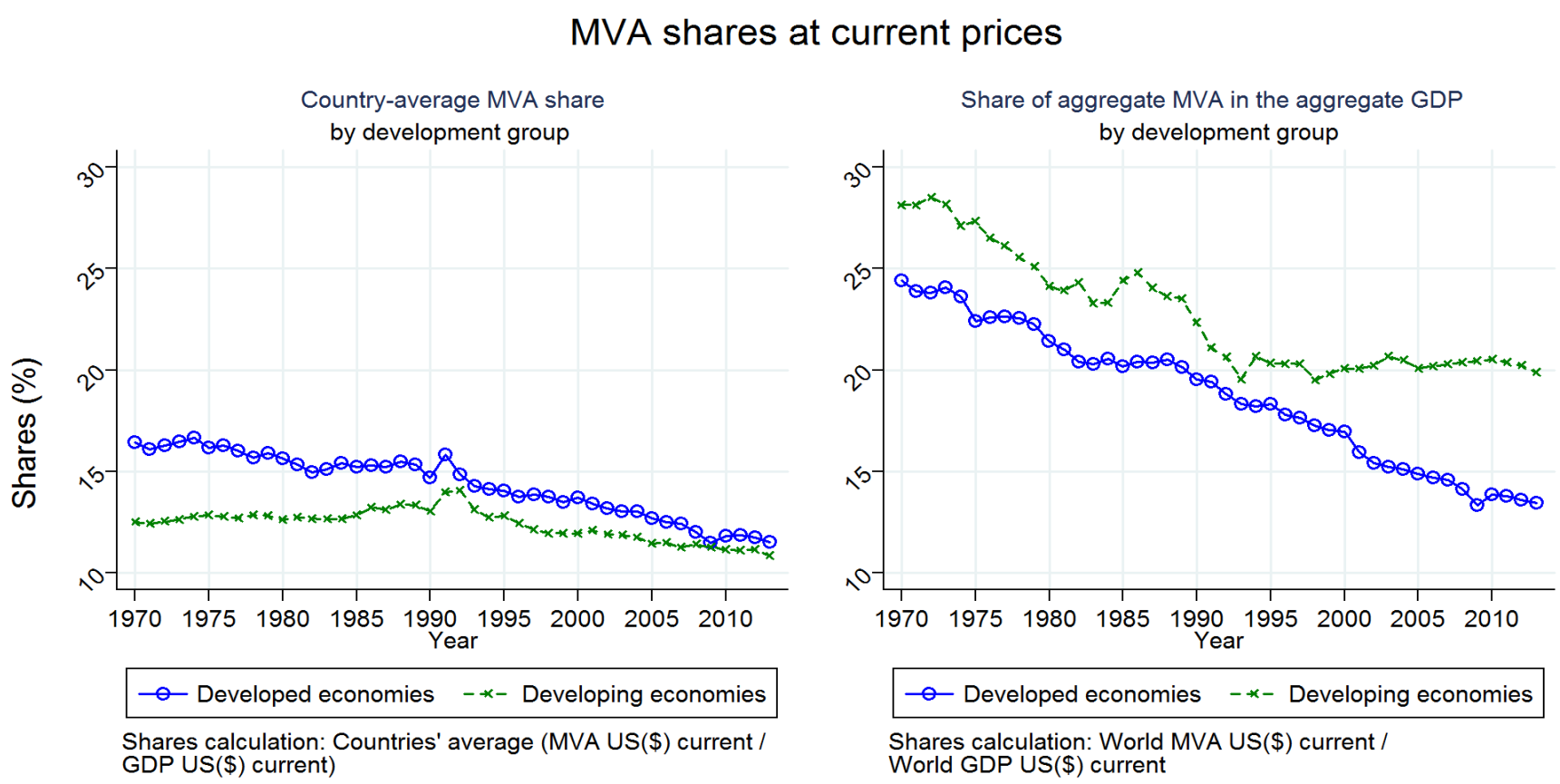
	MVA shares at current prices							
	All developing countries				Excluding all merged and separated countries			
	Country average share		Aggregate share		Country average share		Aggregate share	
	1970-1990	1990-2013	1970-1990	1990-2013	1970-1990	1990-2013	1970-1990	1990-2013
	Share of MVA to GDP	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	0.000330	-0.001144***	-0.002866***	-0.000254	0.000387	-0.000710***	-0.000008	0.000160
	(1.233)	(-5.908)	(-10.712)	(-1.617)	(1.464)	(-3.691)	(-0.021)	(1.498)
Constant	-0.525068	2.410271***	5.928230***	0.712577**	-0.641184	1.536329***	0.217740	-0.116742
	(-0.991)	(6.218)	(11.190)	(2.264)	(-1.223)	(3.990)	(0.278)	(-0.545)
Observations	2583	3274	21	24	2457	2808	21	24
R^2	0.001	0.011	0.858	0.106	0.001	0.005	0.000	0.093

* p<0.1, two-tailed. ** p<0.05, two-tailed. *** p<0.01, two-tailed.

If I exclude the USSR, Yugoslavia and all other merged and separated countries[95] from my dataset, as shown in Figure 4.5-D, there is no statistically significant increasing or decreasing trend over the 43 years. In any case, when either including or excluding merged and separated countries, there is no statistically significant declining trend in the aggregate share of developing countries since 1990 (see Table 4.2, Column 4 and 8).[96]

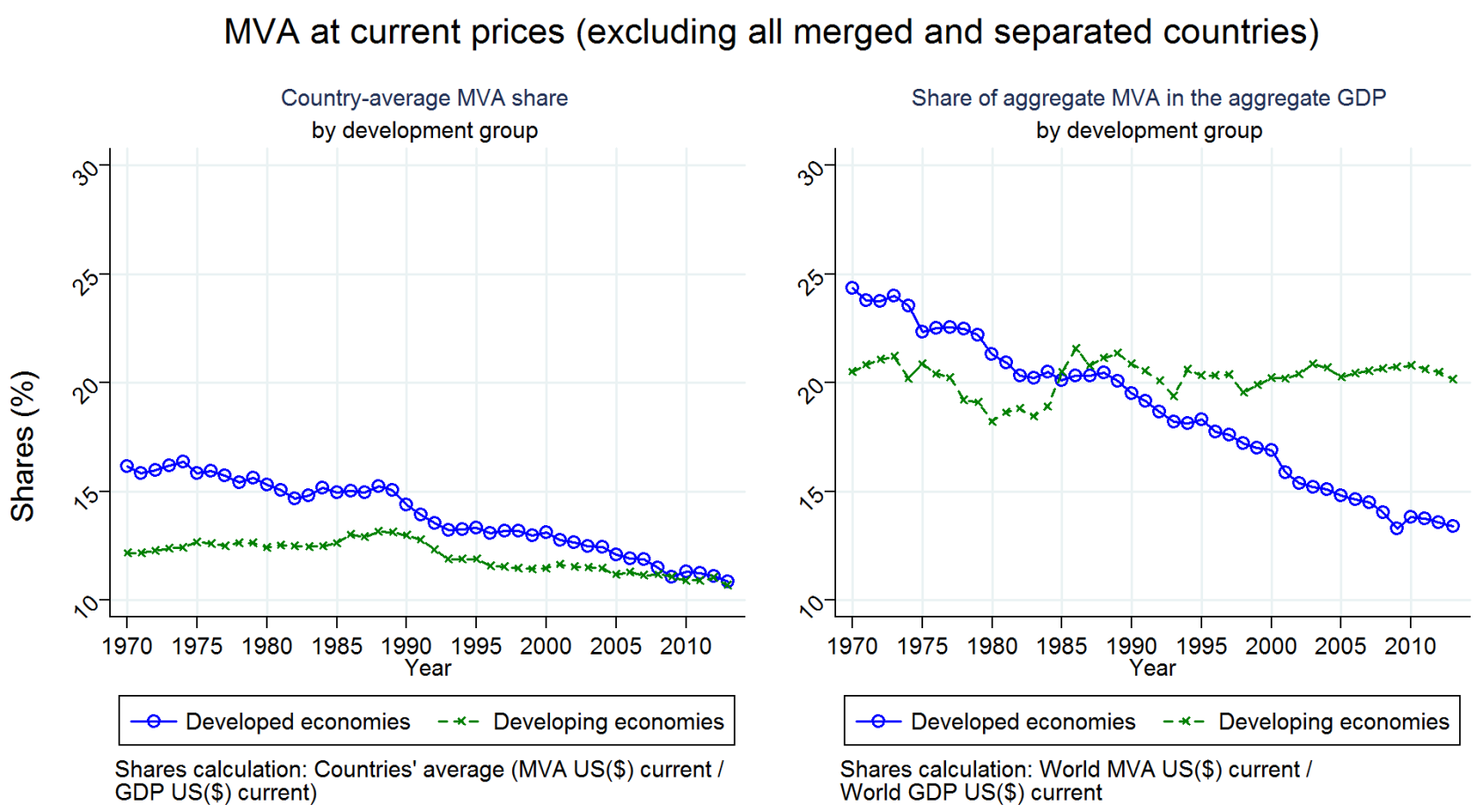
[95] In addition to the USSR and Yugoslavia, Yemen, Ethiopia, Sudan and their merged or separated countries were excluded.

[96] It has a statistically insignificant, slightly negative trend. After 1992, it has a statistically insignificant, slightly positive trend.



Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=185 (1970-1990); n=205 (1991-1993); n=206 (1994-2010); n=207 (2011-2013),
including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.5-A: MVA share of GDP at current prices (country average); Figure 4.5-B: MVA share of GDP at current prices (aggregate average)



Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=178 (1970-2013), excluding all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.5-C: MVA share of GDP at current prices (country average); Figure 4.5-D: MVA share of GDP at current prices (aggregate average)

4.3.2 MVA shares at constant prices

At constant prices, the country-average MVA share of GDP has also exhibited a declining trend in developing countries since 1991 (see Figure 4.6-A and Table 4.3, Column 2). In terms of the aggregate share (Figure 4.6-B), developing countries exhibited a rising trend over the 43 years. In contrast, the share in developed countries decreased until 1993 and has remained constant since then. The result remains the same if I exclude all merged and separated countries from the dataset to apply a single balanced panel data of identical countries for the entire 43-year period (Figures 4.6-C and 4.6-D).

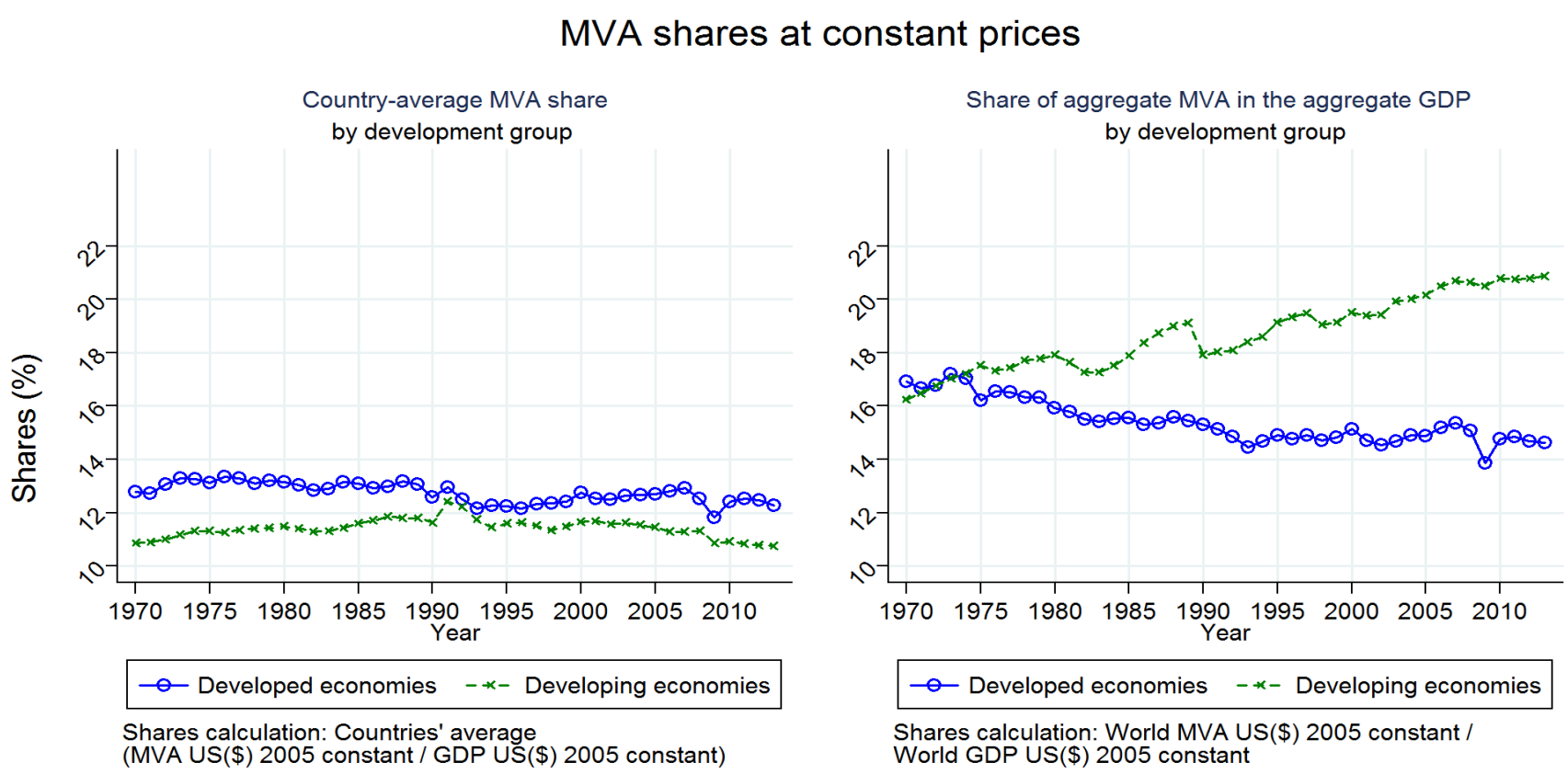
Table 4.3: MVA shares of GDP at constant prices

Source: United Nations Statistics Division (2015, updated version as of December 2014); Income classification: GNI per capita in US$ (Atlas methodology), WDI (2013); All developing economies: n=123 (1970-1990); n=136 (1991-1993); n=137 (1994-2010); n=138 (2011-2013). Note: t-statistics in parentheses.

	MVA shares at constant prices			
	All developing countries			
	Country average share		Aggregate share	
	1970-1990	1990-2013	1970-1990	1990-2013
	Share of MVA to GDP	*Share of MVA to GDP*	*Share of MVA to GDP*	*Share of MVA to GDP*
	(1)	(2)	(3)	(4)
Year	0.000408	-0.000492***	0.001012***	0.001317***
	(1.610)	(-2.723)	(6.946)	(18.649)
Constant	-0.694180	1.099719***	-1.827871***	-2.439718***
	(-1.383)	(3.039)	(-6.335)	(-17.260)
Observations	2583	3274	21	24
R^2	0.001	0.002	0.717	0.941

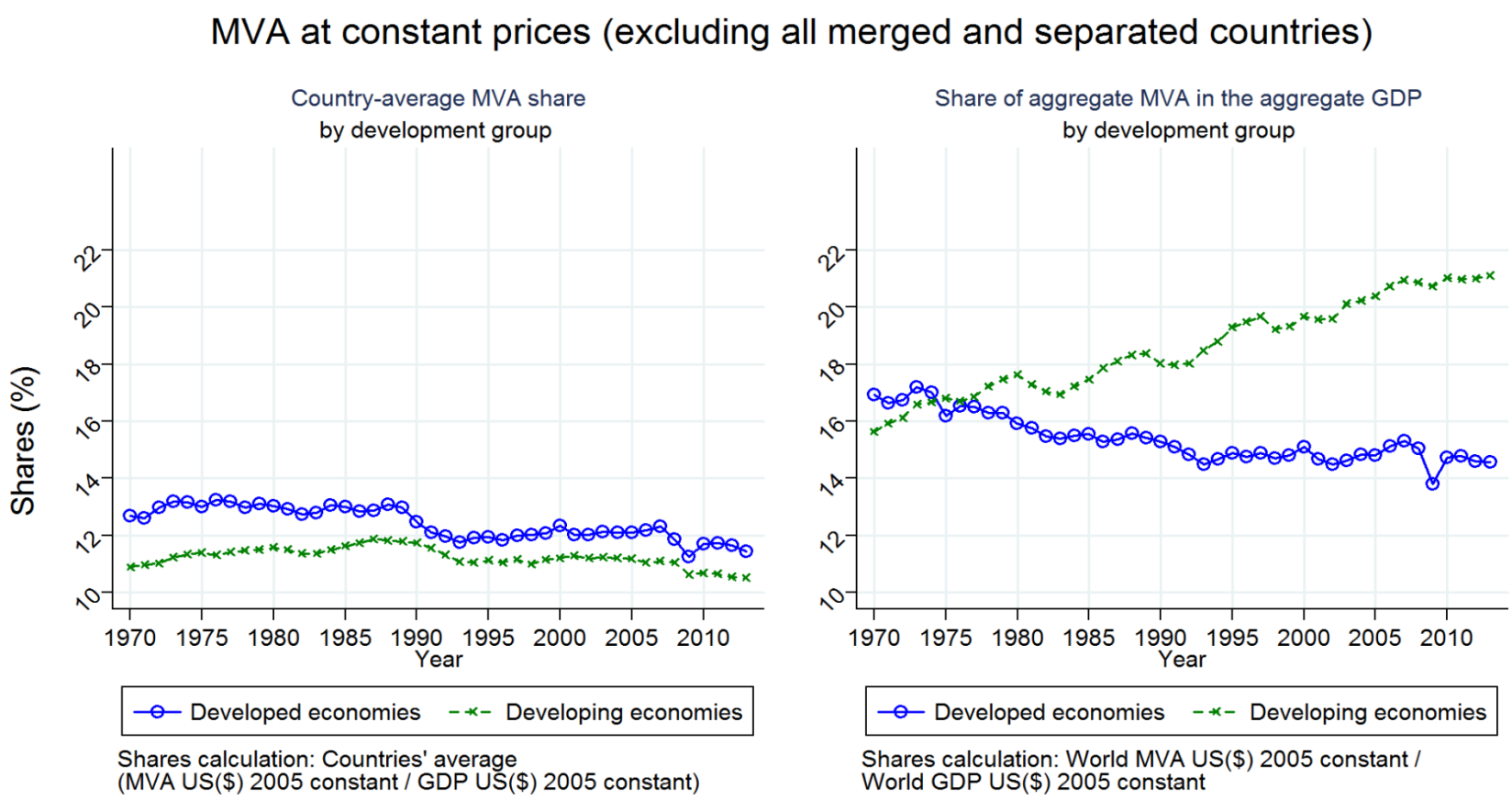
* p<0.1, two-tailed. ** p<0.05, two-tailed. *** p<0.01, two-tailed.

In short, whether at current or constant prices, the country-average share of MVA in GDP has been declining in developing countries for the last 20 years. This is consistent with the premature deindustrialization argument, which reveals a declining manufacturing share based on the average picture of developing countries (see Figures 4.3 and 4.4, for example). However, using either current or constant prices, the size of MVA in developing countries as a whole has remained unchanged, or even increased, since 1990, as evidenced by the trend in the aggregate share. Moreover, if I exclude merged and separated countries (although the difference in the results is caused by the breakup of the USSR alone), MVA shares in developing countries have not changed since 1970, even at current prices.



Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=185 (1970-1990); n=205 (1991-1993); n=206 (1994-2010); n=207 (2011-2013),
including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.6-A: MVA share of GDP at constant prices (country average); Figure 4.6-B: MVA share of GDP at constant prices (aggregate average)



Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=178 (1970-2013), excluding all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.6-C: MVA share of GDP at constant prices (country average); Figure 4.6-D: MVA share of GDP at constant prices (aggregate average)

4.3.3 Manufacturing employment

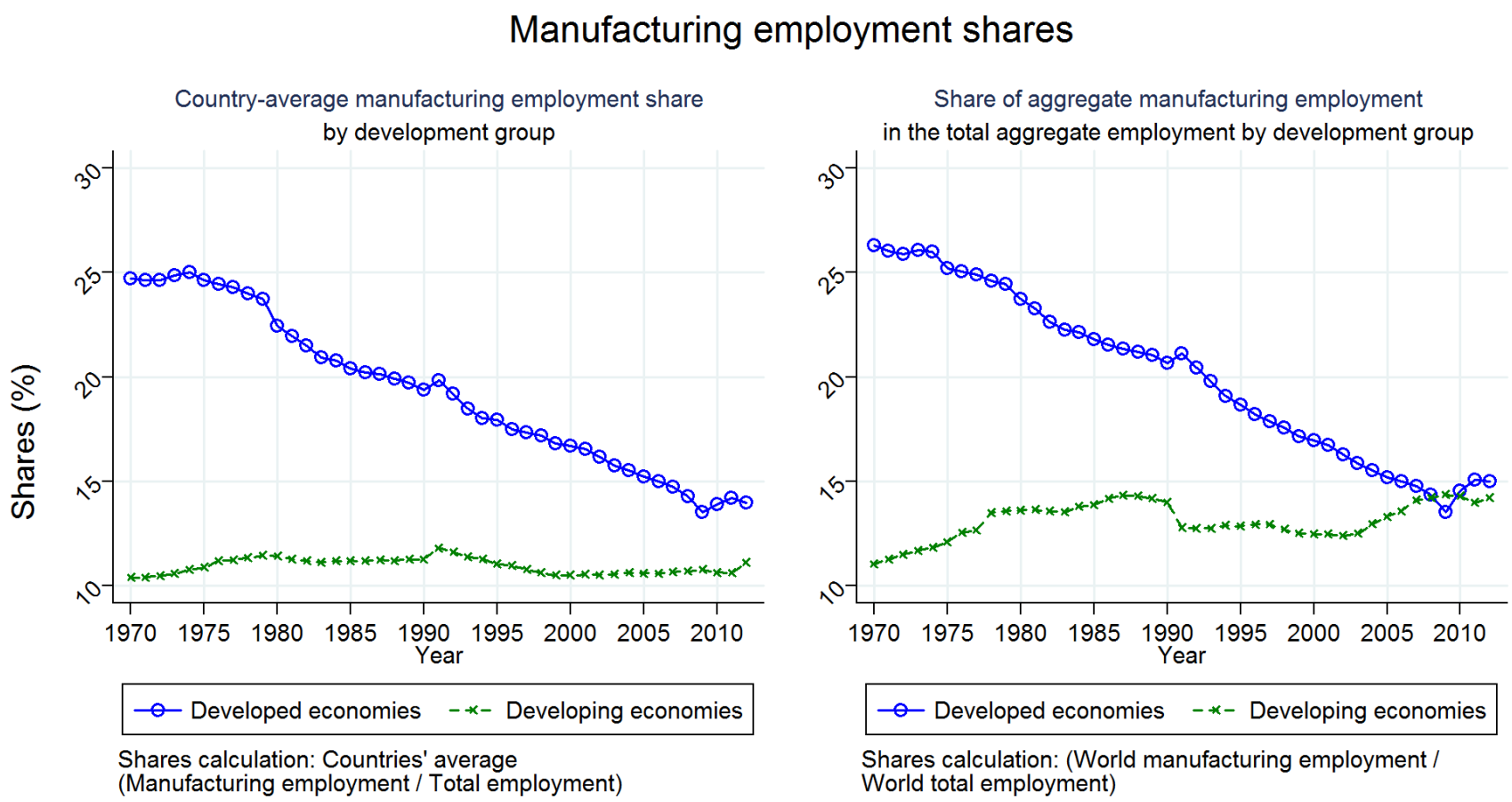
Developed countries have substantially reduced their share of manufacturing employment in total employment over the last 43 years (see Figures 4.7-A and 4.7-B). This is not surprising because countries at high income levels usually experience deindustrialization, with falling numbers of manufacturing jobs as part of the normal pattern of structural change. In the case of developing countries, the country average share has declined since 1991, whereas the aggregate share has shown a statistically significant increasing trend since 1990, as indicated by the statistical results (See Table 4.4, Column 2 and 4). As illustrated in Figures 4.7-C and 4.7-D, developing countries - without the USSR and other merged or separated countries - have exhibited similar trends. However, the declining trend of the country average share since 1990 is statistically insignificant. It is also noteworthy that the aggregate share of world manufacturing employment in total global employment (including both developed and developing countries) has hardly changed since 1970.

Table 4.4: Manufacturing employment share of total employment

Source: Groningen Growth Development Centre (2012), Key Indicators of the Labour Market (2012), and ILOSTAT (2012). Income classification: GNI per capita in US$ (Atlas methodology), WDI (2013); All developing economies: n = 66 (1970-1990); n = 76 (1991-2012).
Note: t-statistics in parentheses.

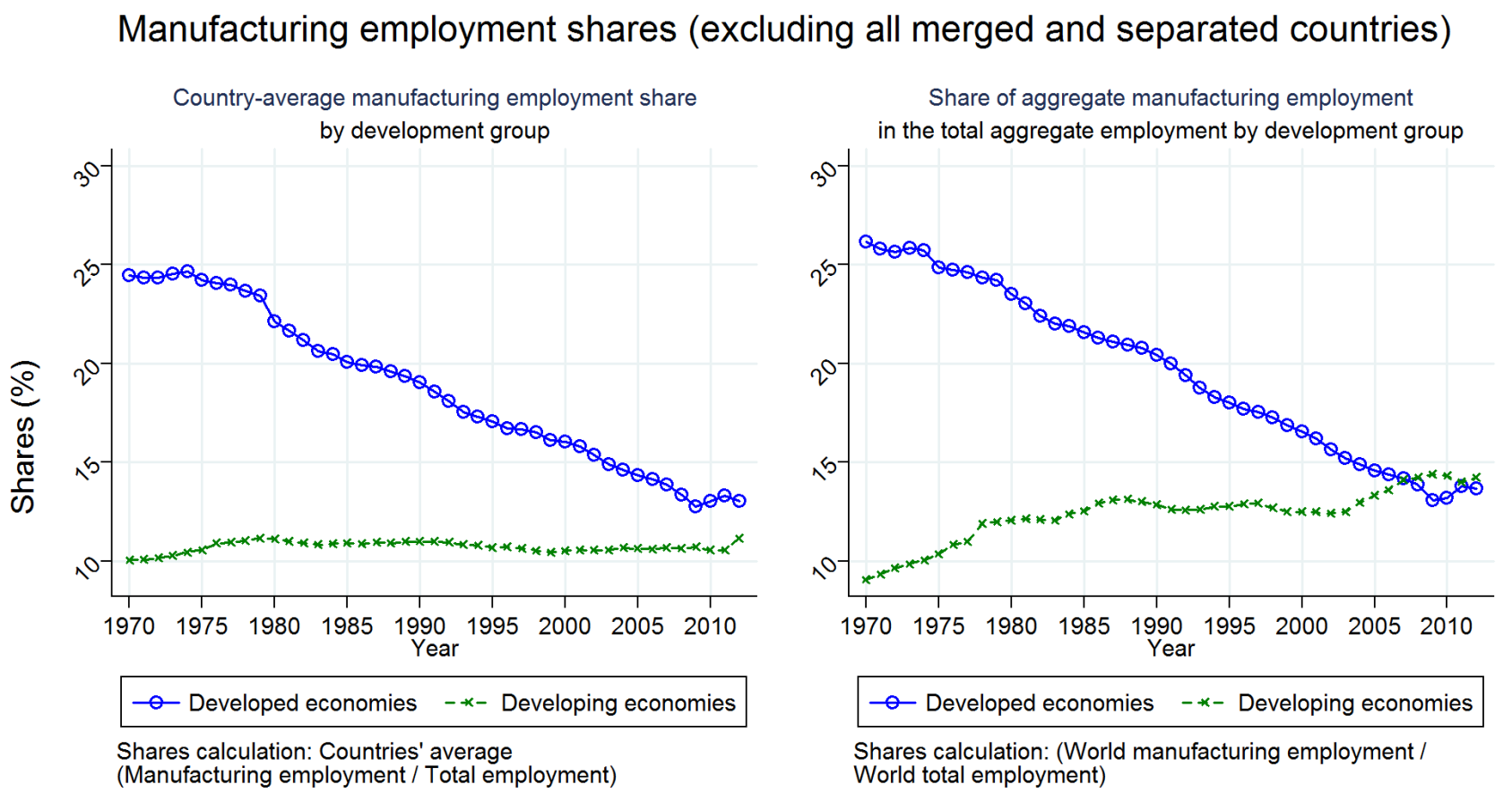
	All developing countries			
	Country average share		Aggregate share	
	1970-1990	1990-2012	1970-1990	1990-2012
	Share of MEMP to total EMP	*Share of MEMP to total EMP*	*Share of MEMP to total EMP*	*Share of MEMP to total EMP*
	(1)	(2)	(3)	(4)
Year	0.000393	-0.000357*	0.001650***	0.000621***
	(1.299)	(-1.718)	(12.188)	(3.487)
Constant	-0.668423	0.823263**	-3.137002***	-1.109564***
	(-1.115)	(1.979)	(-11.700)	(-3.115)
Observations	1386	1738	21	23
R^2	0.001	0.002	0.887	0.367

* p<0.1, two-tailed. ** p<0.05, two-tailed. *** p<0.01, two-tailed.



Source: Groningen Growth Development Centre (2012), Key Indicators of the Labour Market (2012), and ILOSTAT (2012);
n=109 (1970-1990); n=124 (1991-2012), including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.7-A: Manufacturing employment share of total employment (country average); Figure 4.7-B: Manufacturing employment share of total employment (aggregate average)



Source: Groningen Growth Development Centre (2012), Key Indicators of the Labour Market (2012), and ILOSTAT (2012);
n=106 (1970-2012), excluding all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology);
The difference between country and aggregate averages can also be viewed as the difference between unweighted and weighted country averages

Figure 4.7-C: Manufacturing employment share of total employment (country average); Figure 4.7-D: Manufacturing employment share of total employment (aggregate average)

My analysis of value added and employment trends indicates that no matter how I analyse the manufacturing aggregate share in developing countries (i.e. whether in terms of value added at current prices, constant prices or employment and regardless of whether I include the USSR and other merged or separated countries), the shares have not declined (and perhaps even increased) since 1990; this result holds for the entire 43 years since 1970 if the merged and separated countries are excluded. This result is quite noteworthy, especially regarding the increasing trend of manufacturing employment shares in developing countries, because this happened despite the so-called "statistical illusion" as a result of past changes in statistical classifications, which usually reduced the total number of manufacturing jobs by reclassifying certain manufacturing jobs as service jobs (Tregenna, 2015). Because premature deindustrialization has been occurring in Africa and Latin America since the mid-1970s (Timmer et al., 2015; Tregenna, 2015, p. 104), the fact that MVA and manufacturing employment shares have at least maintained their levels since 1970 signifies that the decline of manufacturing share as observed in the country-average share and Figures 4.3 and 4.4 is not caused by any long-term, systemic shift in the global economic structure that has reduced the share of manufacturing relative to those of other industries.

Why, then, has the manufacturing share of GDP been decreasing in developing countries, or why have they been experiencing premature de-industrialization? The differences in the results of aggregate share and country average share seem to indicate the possibility of increasing concentration of manufacturing activities in a small number of (large) developing countries, whereas the MVA share of GDP averaged across developing countries as a whole has not changed.

If this is indeed the case, it makes sense that the aggregate share maintained at least a stable trend while a large number of developing countries' manufacturing shares (country-average shares) have declined in recent years. To test this hypothesis, I examine the level of MVA and employment concentration for developing countries from 1971 to 2013 using the Herfindahl index and Gini[97]. Although the discussion here focuses on developing countries, the following figures also include the results for developed countries for reference purposes.

Figures 4.8 demonstrate how the level of MVA concentration in developing and developed countries has changed since 1970 at current prices based on the

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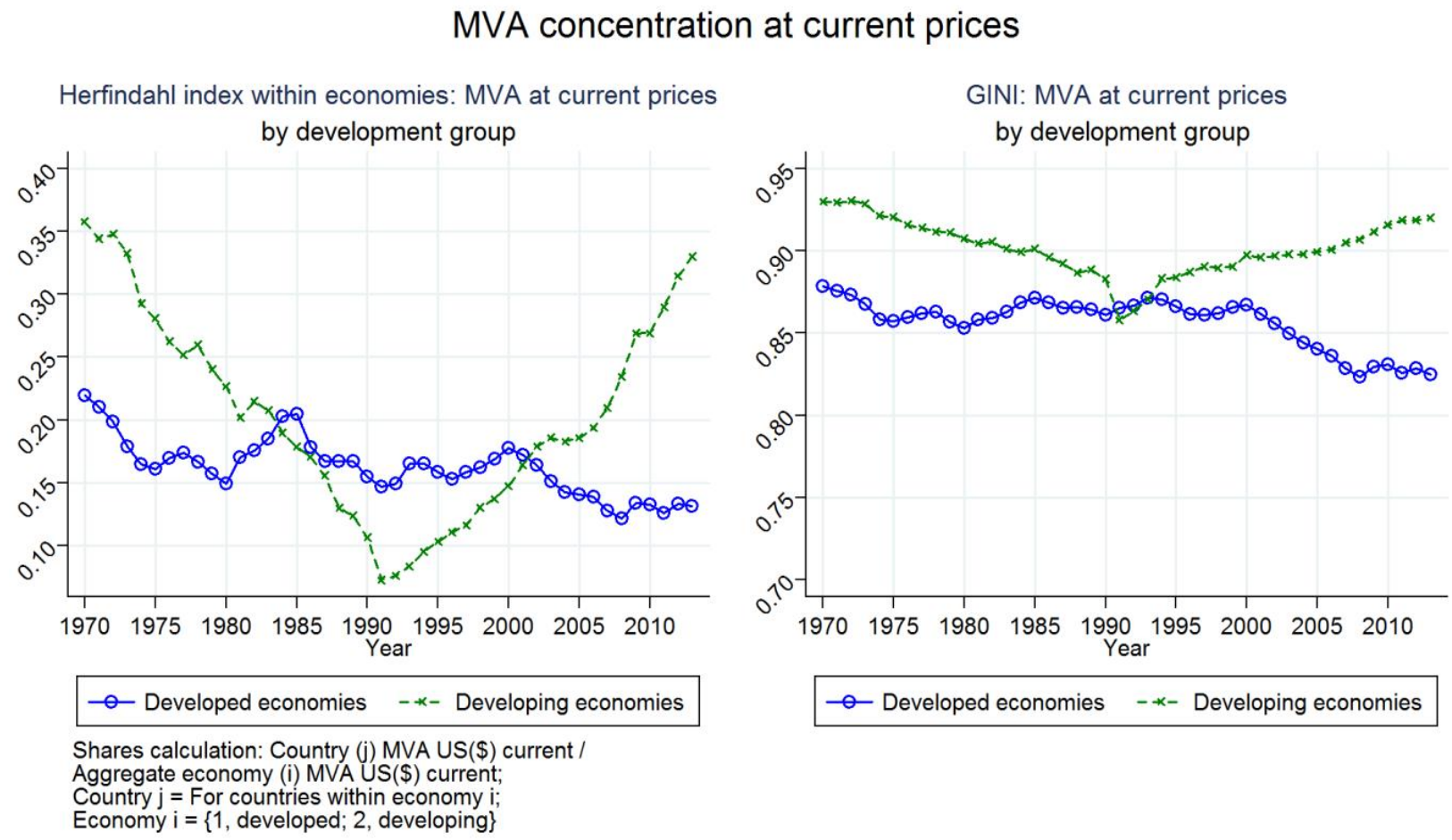
[97] The Herfindahl index, $HI = \sum_{i=1}^{I} share_i^{\propto}$, where ***i*** is an index that specifies individual countries within the development group, ***I*** equals the total number of countries within the development group, and $\propto$ = 2. The HI determines if a country with a dominant share exists, its lower bound is $\frac{1}{I}$, and its upper bound is 1. The HI implicitly takes equipartition as a reference; this implies that lowest degree of concentration is reached if each country has the same share within the development group; the highest degree of concentration is reached if the share is concentrated in one country within the development group. Thus, more weight is given to the country with largest share in the distribution, and lower emphasis is placed on countries with small shares.

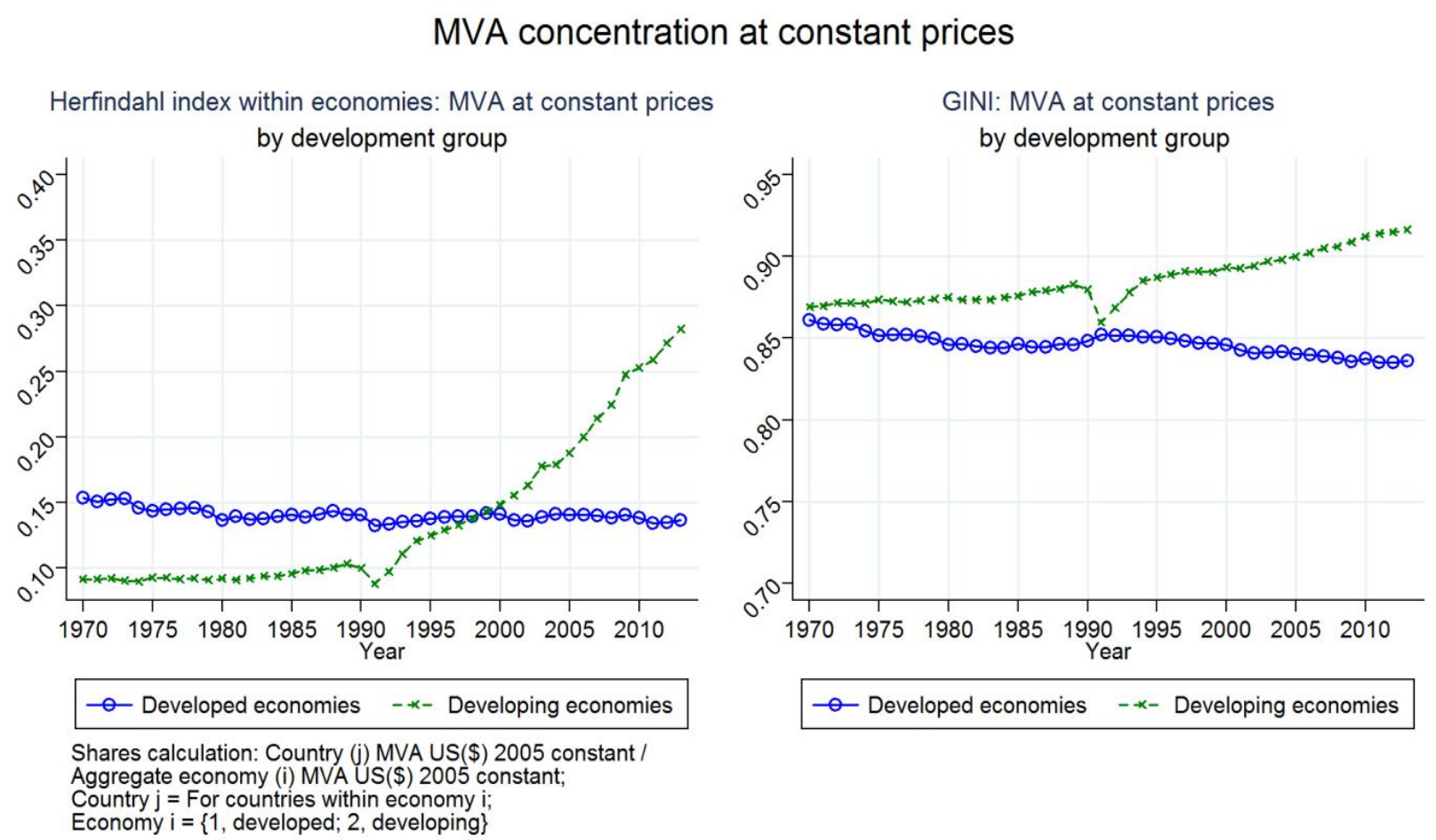
Unlike the HI, Gini does not satisfy the axiom of progressive transfers (Palan, 2010, p. 16). Cowell (2011, p. 27) pointed out the main disadvantage of Gini is that it places a rather curious implicit relative value on change that may occur in different parts of the distribution. The values in the middle part of the distribution are weighted more than values at the tails of the distribution. The Gini coefficient used here is similar to Amiti's (1999, p. 577) elaboration but at country level. Thus, a transfer of share from a country with a larger share to a country with a smaller share within the development group has a much greater effect on the development group's Gini coefficient if the countries are near the middle rather that at either end of the distribution.

Herfindahl index (Figure 4.8-A) and Gini (Figure 4.8-B). The changes are less drastic in Gini, but the concentration trends are similar in both results. In either case, the concentration level has largely remained stable for developed countries over the 43-year period but has increased in developing countries since the beginning of the 1990s. This onset of the increase in concentration corresponds with the point in time when the country-average share began to decline (Figures 4.5-A and 4.5-C).



Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=185 (1970-1990); n=205 (1991-1993); n=206 (1994-2010); n=207 (2011-2013),
including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology)

Figure 4.8-A: MVA concentration at current prices (HI); Figure 4.8-B: MVA concentration at current prices (Gini)

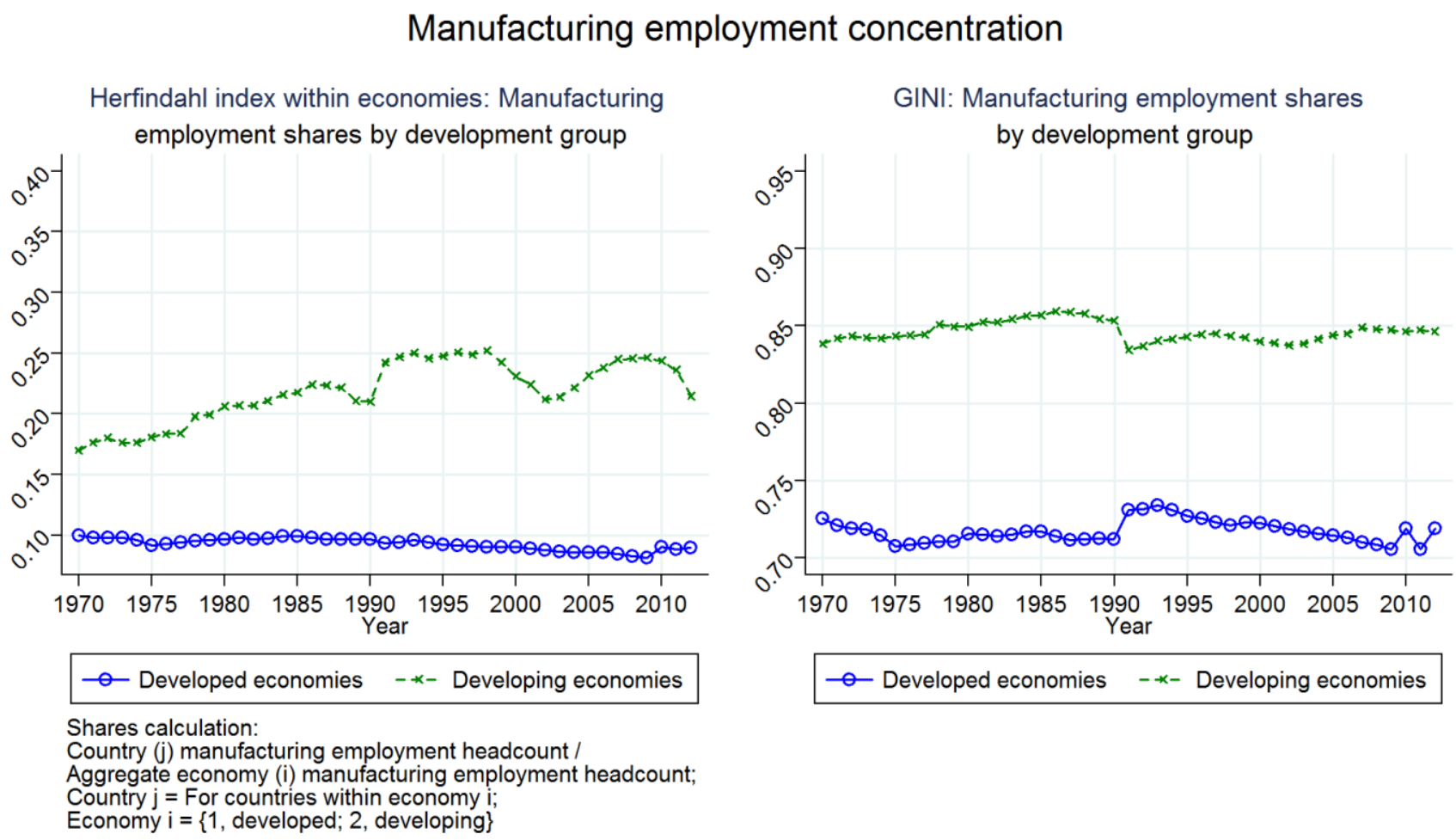


Source: United Nations Statistics Division (2015, last updated Dec 2014);
n=185 (1970-1990); n=205 (1991-1993); n=206 (1994-2010); n=207 (2011-2013),
including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology)

Figure 4.9-A: MVA concentration at constant prices (HI); Figure 4.9-B: MVA concentration at constant prices (Gini)

The trends based on constant prices (Figures 4.9-A and 4.9-B) show the stability of the level of concentration for developing countries until 1990 and a steady and faster increase in developing countries' level of MVA concentration since the beginning of the 1990s.

The case of employment requires a more nuanced interpretation. Employment concentration in developing countries rose until the end of the 1980s according to both the Herfindahl index and Gini (see Figures 4.10-A and 4.10-B). This increasing concentration did not result in a decline in the country-average share (Figure 4.7-A), most likely due to the rise in the share of manufacturing employment in total employment of developing countries as a whole during the first 20 years (Figure 4.7-B). From 1991 through 1998, whereas the employment concentration increased in developing countries, the aggregate share did not change much. This combination is likely to have generated the declining trend in the county-average share (Figure 4.7-A). Finally, from 1998 until 2010, the country-average share has generally been flat due to the declines in both the concentration and the aggregate employment share from 1998 until 2002 and the increases in both the concentration and aggregate employment share from 2002 until 2010.



Source: Groningen Growth Development Centre (2012), Key Indicators of the Labour Market (2012), and ILOSTAT (2012);
n=109 (1970-1990); n=124 (1991-2012), including all merged and separated countries;
Income classification: WDI (2013), GNI per capita in US$ (Atlas methodology)

Figure 4.10-A: Manufacturing employment concentration (HI); Figure 4.10-B: Manufacturing employment concentration (Gini)

I have also tested the above for developing countries, excluding all merged or separated countries from the database, but there was no change in the result of steady and faster increases in the level of MVA concentration from the beginning of the 1990s and in the shifting pattern of employment concentration.

4.4 Conclusions

Despite recent assertions of shrinking opportunity for manufacturing development in developing countries and of a decrease in the importance of manufacturing for their economic development, this study shows that there is no evidence supporting this argument. Even after 1990, the manufacturing sector in developing countries still met the conditions to be described as a driver of economic development, particularly in terms of achieving high sustained growth while retaining at least the same shares of GDP and total employment as in the period of 1970-1990. Thus, the declining MVA and manufacturing employment shares in many developing countries have not been caused by changes in the development quality or quantity of manufacturing activities. Instead, they are mostly attributable to the failures in manufacturing development in a large number of developing countries against a backdrop of rapid manufacturing development in a small number of countries, which has resulted in concentration of manufacturing activities in certain developing countries.

China is an example of an exceptionally successful country in this regard. In recent years, China had MVA shares of more than 30 per cent both at current and at constant prices, when the average share of developing countries was approximately 11 to 14 per cent. In the case of manufacturing employment, China has had a share of more than 15 per cent since the end of the 1980s and an 18-

to-19 per cent share since 2007, in comparison with an average share of 11 to 12 per cent in developing countries for most of the 43-year period under study. In terms of population, China's development is equivalent to that of the 38 average-sized countries that registered rapid simultaneous industrialization. Considering that China's population is greater than the total population of all African countries combined, China's industrialization can also be compared with the rapid industrialization of all African countries together (and more). Although my study did not consider a particular country, the results of this study may not be counterintuitive given the rapid industrialization of some large developing countries in recent years. I do not assume that the trends observed in my analysis will continue in the future. However, despite the recent claims about the diminishing significance of manufacturing or the increasing difficulty of pursuing economic development by following the conventional path of industrialization, I found important evidence that the significance of manufacturing remained unaltered over the two periods studied, i.e., 1970-1990 and 1990-2013. Successful emerging countries, particularly China, will reach their peak of industrialization soon, if they have not already done so, and are thereafter likely to follow the normal pattern of deindustrialization experienced by high-income countries. Once this happens, there may be greater opportunities for current low-income countries to pursue manufacturing activities; manufacturing would then perhaps become more, not less, important for them. Thus, the recommendation for developing countries is to not turn away from manufacturing or to abandon the path of economic development through industrialization but instead to emulate the experience of rapid industrialization that occurred for large populations across the world, even in recent years.

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Appendix 4.1: MVA database

This section describes manufacturing value added data that span a period of 43 years. The main source for the sectoral production data is the National Accounts Main Aggregates Database (NAMAD, 2014)[98] of the United Nations Statistics Division. To avoid double-counting, I revisit **country-specific mergers and separations**[99] to append the ex-ante series to the ex-post series within NAMAD (2014). Secondly, to construct a more balanced panel data set, I use the **comparative compatibility approach** to append the country-year observations[100]. All variables from NAMAD (2014) are obtained as levels[101] but

[98] Agriculture ISIC A-B, Manufacturing ISIC D and Services ISIC G-I (United Nations Statistics Division, 2015, last updated December 2014).

[99] The Union of Soviet Socialist Republics, Yugoslavia, Czechoslovakia, Ethiopia, Sudan and Yemen (see Appendix 4.1.1). Three economies, Ethiopia, Sudan and Yemen, are identified as having duplicated country-year observations during the mergers and separations; the ex-ante series of Ethiopia (Former Ethiopia), for example, ended in 1993; however, the ex-post series of Ethiopia (Ethiopia and Eritrea) started in 1990. Because there are three years of double-counting for Ethiopia in the period of 1990-1993, I append the ex-ante series from the ex-post series subsequent to the last observation of the ex-ante series. I take the same approach for the cases of Sudan and Yemen.

[100] China's manufacturing production data (at current and constant prices) in the NAMAD (2014) covers a short series from 2005 to 2013, and Azerbaijan's manufacturing production data (at constant prices) in the NAMAD (2014) covers a long series from 1992 to 2013. I obtain the manufacturing net output percentage contribution to gross domestic production from the World Bank to append manufacturing value added to the long series from 1970 to 2004 for China and the short series in 1991 for Azerbaijan.

[101] Primary production data, gross value added used in this study. Gross value added is the value of output less the value of intermediate consumption. It is a measure of the contribution to GDP

transformed into shares of GDP and growth to exclude size effects and make the data comparable across countries. The same source is used for the sustained growth analysis of the agriculture, manufacturing and service sectors (see Appendix 4.1.1).

made by an individual producer, industry or sector. Gross value added is the source from which the primary incomes of the System of National Accounts (SNA) are generated and is therefore carried forward into the primary distribution of income account (UNSD, 2015, updated version as of December 2014).

Appendix 4.1.1: Summary of manufacturing value added panel data

Table 4.A.1: Summary of manufacturing value added panel data

National Accounts Main Aggregates Database (2014)							
	All countries				Excluding all merged and separated countries		
Manufacturing value added	All countries	Developed	Developing		All countries	Developed	Developing
1970-1990	185	62	123		178	61	117
1991-1993	205	69	136		178	61	117
1994-2010	206	69	137		178	61	117
2011-2013	207	69	138		178	61	117

Note: Income classification: GNI per capita US$ (Atlas methodology), WDI (2013). In the sustained-growth analysis, I include countries for the pre-1990 sample that had a high-income status between 1987-1989 but not in 1990 in the developed country group, including the Cayman Island, the Turks Caicos Islands, American Samoa, Bahrain, Barbados, Malta, Puerto Rico, Guam, the Isle of Man and Saudi Arabia. For the post-1990 sample, Hungary is included in the developed group because it was a high-income country from 2008 until 2011.

Appendix 4.1.2: Merged or separated countries (1970-2013)
Table 4.A.2: Merged or separated countries (1970-2013)

Ex-ante country	Ex-post country	Year
Czechoslovakia	Czech Republic, Slovakia	1990
Soviet Union (USSR)	Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan	1990
Yemen Democratic Rep. Yemen Arab Rep.	Yemen	1990
Yugoslavia	Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Serbia Slovenia	1990
Ethiopia	Ethiopia, Eritrea	1993
Sudan	Sudan, South Sudan	2010

As indicated in Appendix 4.1.1, the NAMAD (2014) database comprises 123 developing countries in the period of 1970-1990, 136 developing countries in the period of 1991-1993, 137 developing countries in the period of 1994-2010 and 138 developing countries in the period of 2011-2013. The changes in the number of countries are due to mergers and separations of countries. For the robustness test, a balanced panel sample in which the geographical coverage of the groups of developing and developed countries remains the same throughout the sample period from 1970 through 2013 is constructed. After excluding countries that experienced mergers or separations in Appendix 4.2.2, I identify 117 developing countries.

Appendix 4.2: Manufacturing employment database

Appendix 4.2.1: Sources by step

Table 4.A.3: Sources by step

Step	Source
1	ILOSTAT (1970 – 2012) • Labour force surveys (aggregate), excluding those with limited geographical/ demographic scope and other skewed definitions (e.g., unreported sectors). • Official estimates • Comparison with population censuses, household surveys via www.ilo.org/ilostat/ GGDC (Groningen Growth & Development Centre) • African Sector Database (1960 – 2012) • 10 Sector Database (2014 version, 1950 – 2012) • WIOD (1995 – 2012) via http://www.rug.nl/research/ggdc/data/ KILM (Key Indicators of the Labour Market, 1980 – 2012) • Dataset 4: employment by sector • Merged ISIC 2, 3 and 4 digits • Note: excludes observations with geographical/demographic limitations and unreported sectors. Via http://www.ilo.org/empelm/what/WCMS_114240/lang--en/index.htm

2	ADB (Asian Development Bank) • Statistical Database Survey (1988 – 2012) • ADB Key Indicators Yearbook (edition 1999, 1981 – 1998) • Issues: certain industries are merged together; sector-specific numbers are provided for *agriculture*, *industry* or sometimes *mining* and *manufacturing*, and *services* or more often *other than agriculture, mining and manufacturing*. These are segregated using (extrapolated) shares from (i) other databases in comparative years, (ii) comparative countries. via http://www.adb.org/publications/series/key-indicators-for-asia-and-the-pacific and https://sdbs.adb.org/sdbs/ CEPED (Centre Population et Développement, Inventaire des Recensements et des EnquêtesDémographiquesenAfrique) Via http://www.ceped.org/ireda/inventaire/ NSO (National Statistical Office) via country-specific sources United Nations • CEPAL (UN Economic Commission for Latin America): Statistical Yearbooks (1975 – 2012) • UNECE (UN Economic Commission for Europe) WB-HPE (World Bank publication: Historically Planned Economies) • Industrial sector was segregated into its non-manufacturing and manufacturing components (see ADB procedures).

	Via http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/1999/10/14/000178830_98101911114539/Rendered/PDF/multi0page.pdf Miscellaneous • EU publications: Jordan, Libya, Tajikistan • ILO publications: Mauritania, Uganda • IMF publications: Kuwait • OECD Statistics • Princeton University – Iran Data Portal • UNCTAD database • UNU-Merit publication: Sudan • UNDP publications: Sudan • World Bank publications: Macedonia
3	-
4	Total Economy Database (1950 – 1912) • Note 1: Separation of Serbia and Montenegro • Note 2: Merged West- and East-Germany via https://www.conference-board.org/data/economydatabase/ Idiosyncratic databases (see steps 1 and 2) for the countries of: • Botswana, Cuba, El Salvador, Haiti, Honduras, Libya, Mauritius, Mongolia, Nicaragua, Panama, Paraguay, Puerto Rico, Rwanda

Appendix 4.2.2: Summary of manufacturing employment panel data

Table 4.A.4: Summary of manufacturing employment panel data

GGDC (2012), KILM (2012) and ILOSTAT (2012).							
	All countries				Excluding all merged and separated countries		
Manufacturing employment	All countries	Developed	Developing		All countries	Developed	Developing
1970-1990	109	43	66		106	42	64
1991-2012	124	48	76		106	42	64

Note: Income classification, GNI per capita US$ (Atlas methodology), WDI (2013)

Appendix 4.2.3: Merged or separated countries (1970-2012)

Table 4.A.5: Merged or separated countries (1970-2012)

Ex-ante country	Ex-post country	Year
Czechoslovakia	Czech Republic, Slovakia	1990
Soviet Union (USSR)	Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan	1990

In Appendix 4.2.2, the manufacturing employment data consists of 66 developing countries in the period of 1970-1990 and 76 developing countries in the period of 1991-2012. Unlike NAMAD, the employment database is constructed from various sources. Among the merged and separated economies listed in Appendix 4.2.2, only Czechoslovakia and the USSR (with balanced panel data from 1970 through 2012) are included in Appendix 4.2.3. For the robustness test, after excluding countries that experienced mergers or separations in Appendix 4.2.3, 64 developing countries are identified in the balanced sample of employment.

CHAPTER 5

CONCLUSIONS

5.1 Conclusions

This thesis consists of three stand-alone studies. Chapters 2 through 4 describe the three stand-alone studies related to international aspects of capital allocation efficiency. Chapter 2 investigates the empirical contribution of capital allocation efficiency to output growth in developing countries. Controlling for the variables in Levine and Zervos (1998), both the financial *ICOR* and stock price informativeness act as good proxies for capital allocation efficiency in explaining output growth. The first part of Chapter 2 confirms the role of capital allocation efficiency as measured by the financial *ICOR* in explaining economic output growth. Following the capacity and capital utilization concepts, the comparative advantage and "big push" models are explored to explain the importance of capital allocation efficiency to economic development in developing countries. The findings suggest that an efficient financial intermediation sector greatly promotes economic development. Strong capital allocation efficiency helps a country to take better advantage of its investment opportunities. If the investment is effective, it should increase the long-run aggregate supply of the economy through productive capacity, which could sustain long-term economic output growth and in turn would increase the aggregate supply in the long run.

The results presented in the second part of Chapter 2 support my conjecture that greater external monitoring mechanisms are reflected by stronger stock price informativeness for disciplining managers when capital allocation efficiency can be better measured at the firm level through stock price informativeness. All else being equal, strong external monitoring mechanisms discipline managers to allocate capital efficiently by undertaking value-increasing projects to expand the firm business portfolio. This finding supports those of Levine (1997), who stated

that the channel of capital allocation is an integral part of the growth process. I also find that the long-term output growth model by Levine and Zervos (1998) is likely to be improved by including the role of capital allocation efficiency. Capital allocation efficiency acts as a strong predictor of long-term economic output growth and plays a complementary role with banking development in predicting firm output growth.

Chapter 2 argues that better capital allocation efficiency leads to stronger firm economic performance when managers are more disciplined by external monitoring mechanisms. Chapter 3 continues in this spirit by explicating the actions of short sellers, who act in an external monitoring role as catalysts that exacerbate situations and lead firms to pay out more to mitigate agency costs. I contribute to both the short-selling and agency theory empirical studies. I elucidate the disciplinary role of the short-selling potential in disciplining managers who pay out excessive earnings to investors. I find that short sellers act in an external monitoring role because they act as a catalyst to exacerbate situations and force firms to pay out more to mitigate agency costs. Second, I find that managers react to short-selling demand differently, depending on the existence of positive NPV project potential. The effect of the short-selling potential is weaker when firms have stronger positive NPV project potential. The findings of Chapter 3 allow me to advocate for short selling not only as a disciplining mechanism but also as a solution to the agency costs of free cash flow. In other words, short selling not only influences managers to pay out excessive earnings but also influences managers to use excess funds in the most optimal way.

Despite recent assertions of shrinking opportunities for manufacturing development in developing countries and of a decrease in the importance of

manufacturing for their economic development, Chapter 4 shows that there is no evidence supporting this argument. Even after 1990, the manufacturing sector in developing countries still met the conditions to be described as a driver of economic development, particularly in terms of achieving high sustained growth while retaining at least the same magnitude of GDP and total employment as in the period 1970 to 1990. Thus, the declining MVA and manufacturing employment share in many developing countries have not been caused by changes in the development quality or quantity of manufacturing activities. Instead, they are mostly attributable to the failures in manufacturing development in a large number of developing countries against the backdrop of rapid manufacturing development in a small number of countries, which has resulted in concentration of manufacturing activities in certain developing countries. China is an example of an exceptionally successful country in this regard. In recent years, China had MVA shares of more than 30 per cent in terms of both current and constant prices, whereas the average share of developing countries was approximately 11 to 14 per cent. In the case of manufacturing employment, China has had a share of more than 15 per cent since the end of the 1980s and an 18 to 19 per cent share since 2007, in comparison with an average share of 11 to 12 per cent in developing countries for most of the 43-year period under study. In terms of population, China's development is equivalent to that of the 38 average-sized countries that registered rapid simultaneous industrialization. Considering that China's population is greater than the total of all African countries combined, China's industrialization can also be compared with the rapid industrialization of all African countries together (and more). Although Chapter 4 did not look at a particular country, the results of Chapter 4 may not be counterintuitive, given the

rapid industrialization of some large developing countries in recent years. I do not assume that the trends observed in my analysis will continue in the future. However, despite the recent claims about the diminishing significance of manufacturing or the increasing difficulty of pursuing economic development by following the conventional path of industrialization, I found important evidence that shows the significance of manufacturing remained unaltered over the two periods studied, i.e. 1970-1990 and 1990-2013. Successful emerging countries, particularly China, will reach their peak of industrialization soon, if they have not already done so, and are thereafter likely to follow the normal pattern of deindustrialization experienced by high-income countries. Once this happens, there may be greater opportunities for current low-income countries to pursue manufacturing activities; manufacturing would then perhaps become more, not less, important for them. Thus, the recommendation for developing countries is to not turn away from manufacturing or to abandon the path of economic development through industrialization but instead to emulate the experience of rapid industrialization that has occurred for large populations across the world, even in recent years.

In conclusion, the empirical findings documented in this thesis have several important implications for output growth through efficient capital allocation. Financial liberalization and “big push” strategies for investment smother economic development amid recovery from global financial crises. The best way to upgrade a country’s endowment structure and reduce the gap in per capita income with higher-income countries is to develop an economy according to the comparative advantages determined by its given endowment structure at that time. In addition, the results of this thesis also highlight the importance of (i) sound

institutional characteristics and a transparent information environment for improving the production and provision of information to the market and (ii) a pro-active role for government in facilitating industrial upgrading and diversification in the development process and improving the allocation of capital (for instance, directing capital to potential drivers of economic growth, such as the manufacturing sector), thus contributing to output growth.

5.2 References

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