DOES THE ESTABLISHMENT OF SME STOCK EXCHANGES LEAD TO BETTER ECONOMIC DEVELOPMENT IN EMERGING COUNTRIES?

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By

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ABSTRACT

This paper links stocks market and SMEs together with the idea of SME stock exchange, and it explores the effect of SME stock exchanges on economic development in 22 emerging countries. Using a fixed-effect regression, the paper controls for almost all relevant time-invariant factors and avoids circularity issues in the causal relationship analysis. While it finds no strong causal effect of SME board adoption on overall economic performance, the paper provides potential explanations and explanatory tests, suggesting areas for future studies.

Key words: SMEs, Stock Market, SME Stock Exchange, Inclusive development, GDP Growth, Emerging Markets, Fixed Effects, Panel Data.
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# TABLE OF CONTENTS

I. INTRODUCTION ............................................................................................................. 1

II. LITERATURE REVIEW .................................................................................................... 2

III. CONCEPTUAL FRAMEWORK AND DATA .................................................................... 7

IV. RESEARCH METHOD .................................................................................................... 11

V. RESEARCH RESULTS AND DISCUSSION .................................................................... 12

VI. CONCLUDING REMARKS ............................................................................................ 17

VII. APPENDIX: FIGURES AND TABLES .......................................................................... 21

VIII. REFERENCES .............................................................................................................. 26
I. INTRODUCTION

The stock market has been through ups and downs in the past decades, and the trend has created waves of confidence, optimism, panic or worries about the entire financial market healthiness and stability. Meanwhile, professionals from the private sector and an increasing number of researchers gradually detected a close relationship between stock market performance and the overall economic development: the correlation was evident during different financial crisis with slumps of stock market indexes and stock prices. As a result, research focus has shifted from the stock market development itself or only the economic growth models to linkages between these two areas, trying to determine causality and to provide policy recommendations. With economic studies under the context of stock market development starting to gain popularity among researchers, policy makers and politicians, small or medium-sized enterprises (SMEs) are regularly praised as the “backbone of economic growth” in elective speeches, at academic conferences and in even daily conversations. Additionally, existing studies and firm-level surveys suggest SMEs need more capitals for operation and development, but they face financing barriers and thus are actively seeking for alternative capital raising venues. Is there any way to link stock market and SMEs to promote economic growth? This paper tries to answer this question; specifically, **Does the introduction of SME stock exchanges help promote economic growth?** To answer the question, the paper looks innovatively at panel data on 26 SME boards in 22 emerging countries from 1987-2016, using fixed-effect regression analysis.

The rest of the thesis paper is constructed in the following way: Section two presents a review on previous studies of the relationship between stock market development and economic growth, pointing out the empirical limitations of the literature and showing that this thesis can fill the gap by focusing on cross-country, time-series analysis of emerging markets. Section three explains the
conceptual framework of my analysis, variables of interest and the data sources of these variables. The purpose of this section is to explain model specification and help readers understand visually the relationship between the variables included. Section four details the research method applied in this thesis, followed by section five which reports research results based on the empirical model and discusses findings. Then, the thesis concludes with limitations, suggestions for future research, and policy implications of the research findings. Lists of figures and tables as well as a full list of references are also included at the end of the thesis.

II. LITERATURE REVIEW

Stock Market Development and Economic Growth

There is an intensive literature on financial development and economic growth, for example, Atje and Jovanovic (1993) examined the stock market as a separate component of financial markets and assessed its impact on the real economy. Based on data from 40 countries between 1970-1988, their research shows that stock market liquidity increases the growth rate of real GDP per capita. While their study used simple and limited OLS regression, it established a foundation for studies in the relationship between stock market and economic growth. Thus, Levine and Zervos (1998) followed Atje and Jovanovic’s model to reveal a strong correlation between stock market development and economic growth measured by GDP per capita, financial depth, and inflation rate. But their cross-sectional approach limited their findings regarding country specific effects and time related effects. Because of this empirical limitation, subsequent studies have focused on specific countries or regions, and with stronger empirical methods. For instance, Nieuwerburgh Buelens and Cuyvers (2006) looked at the relationship in Belgium and found that institutional changes affecting the stock exchange are the explanatory factors of the time-varying nature of the
correlation. Also, Nazir, Nawaz and Gilani (2010) examined the role of stock market development in Pakistan and emphasized the importance of stock market size and market capitalization.

On general, the literature on developing countries finds a positive impact of stock market development on economic growth. For instance, Mohtadi and Agarwal’s (2001) dynamic panel research on 21 emerging countries over 21 years found that stock market liquidity has a positive impact on economic growth, and that market size can affect investment levels and, in turn, promote economic growth. In addition, Adjasi and Biekpe (2006) found that the positive influence of stock market development on economic growth is significant for upper-middle income economies in selected African countries and more recent study conducted by Ishioro (2013) showed a unidirectional causality from stock market activities to economic growth in Zimbabwe.

However, some studies of the correlation in developing countries point in an opposite direction. Harris (1997) found that the development of an administratively-driven market stock market generally does not contribute positively to economic growth in developing countries. Moreover, Sharma and Roca (2011) concluded that stock markets in developing economies may have been a “detraction and/or misallocation of scarce resources” and study of five Euronext countries by Ake (2010) suggests that the causal relationship only exists when the stock market is large, liquid, and highly active. Additionally, in Alshammary’s (2014) study of Saudi Arabia from 1993 to 2009, he warns that a volatile stock market might hinder economic growth.

Given these different findings on the effects of stock market development on economic growth, one question has become especially policy-relevant: How should developing countries develop their stock markets to promote economic growth? Many studies have focused on the role of stock exchanges. For example, Greenwood and Jovanovic (1990) found that a new stock exchange can increase economic growth by aggregating information about firms’ prospects and directing
capital to investments with higher returns. Also, Adak (1997) found a positive relationship between Turkey’s annual economic growth and the number of companies whose shares were traded in the Istanbul Stock Market between 1986 and 2009. Baier, Dwyer Jr., and Tamura (2004) used an empirical panel analysis of data points out that a stock exchange increases the growth rate of output primarily by increasing growth of productivity, and that the speed of financial deepening experiences a diminishing return after the creation of a stock exchange. In addition, Ake and Ognaligui (2010) found systematic evidence that market capitalization positively affects GDP and encouraged Cameroon’s government to push companies to initiate IPOs to increase capital investment. Similarly, Baghebo and Adjejevwe Oghenetega (2013) found that the Nigerian Stock Exchange mobilizes capital resources among numerous competing alternatives, thereby encouraging more productive wealth allocation.

Nonetheless, most existing studies focus on firm-level analysis, and very few incorporate the idea of the establishment of stock exchanges. In what is the most relevant research on the effect of stock exchange establishment, De Sousa et al. (2016) studied the success and failure of 59 newly established stock exchanges since 1975 in their first 40 years of activity. Using lagged variables, they found that “the size of the banking sector at the time of nascent market establishment and the development of national savings over the life of the stock market help to understand variation in nascent market success”. Despite their well-structured analysis, however, this study did not investigate the effect of establishing new stock exchanges on country-level economic performance. In contrast, Oliver Wyman report (2014) estimates that capital market operations of SMEs could add 0.1%-0.2% to the contribution of SMEs to general GDP each year and support the creation of hundreds of thousands of new jobs globally.
**SMEs and Economic Growth in Developing Countries**

The OECD defines SMEs as independent, non-subsidiary firms. Small firms generally employ fewer than 50 employees, while medium-sized firms usually have an upper limit of 200 employees. The standards in SME often vary from country to country. In the United States, for example, companies with fewer than 500 employees are considered medium-sized and fall into the SME category (Firoozmand, Haxel, Jun & Suominen, 2015). But while standards differ, SMEs are the backbone of a country’s economy regardless of the level of development. Therefore, in developing countries, SMEs play a particularly important role, because they are the most important source of poverty reduction, macroeconomic growth, employment generation and general social uplift (Akhtar, Raees & Salaria 2011). Also, Beck, Demirgüç-Kunt and Levine (2005), using a sample of 45 countries, found a strong, positive association between the activities of SMEs and growth in GDP per capita but did not establish a causal relation. Fida (2008) argues that SMEs can contribute to economic development by augmenting rural and urban employment, providing development sustainability, and by stimulating innovative growth strategies. Syed, Ahadamani, and Shaikh (2012) used descriptive statistics from a survey of individual SMEs in the textile industry in Pakistan to show that SMEs are positively correlated with foreign exchange earnings, create the fastest export growth, drive GDP growth, create employment, and eventually alleviate poverty.

However, most SMEs fail within the first five years (Zimmerer, Searborough & Wilson 2008; Hodges & Kuratko 2004). Many researches have attributed this high rate of failure to financing barriers. Indeed, the growth of most small firms is constrained by internal finance, together with a small leverage effect (Carpenter & Petersen, 2002). Beck, Demirgüç-Kunt, Laeven and Maksimovic (2006) observe that small firms consistently report higher financing obstacles than medium-sized and large enterprises. Similarly, Cole and Duflo (2004), in an examination of the
loan behavior of 253 Indian SMEs, found that these firms were credit constrained before receiving subsidized credit. And Ahiawodzi and Adade (2012), combining surveys and econometric model, showed that access to credit has a significant positive effect on growth of SMEs in the Ho-Municipality of Ghana. They also recommended that the Ghana government try to meet the credit needs of SMEs in the country in order to accelerate national growth.

The literature explaining SMEs failure has provoked many studies on ways of reducing financing barriers. In this regard, researchers have paid increasing attention to the role of stock markets. Berger and Udell (1998) argued that when SMEs become more informationally transparent, listings on stock exchanges become a marketable financing alternative, thus reducing their reliance on money markets. The Oliver Wyman report (2014) argues that SME stock market operations could narrow the SME financing gap by 5%-10%. The ADB’s Working Paper Series on Regional Economic Integration (2014) also pointed out that equity financing venues for SMEs have been mostly created under stock exchange operations. Policy memos and other research papers have also urged SMEs to participate in stock markets for raising capital. For example, Fung, Liu, and Yau (2007) analyzed China’s “second board” stock market1 and suggested that, given a large presence of SME economics in China and an increasing need for financing, Chinese SMEs should enter the stock market. Oladepo and Ajoseh (2015) analyzed the effects of the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE) reforms agenda on SME financing barriers and urged the Nigerian government encourage diverse ways of capital raising through venture capital and private equity. Nevertheless, limitations in the general literature regarding the correlation, if any, among SMEs, stock exchange operations and economic growth call for additional empirical analysis. Also, the current literature lacks a set of cross-country studies

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1 The board for SMEs to list on a stock exchange in China.
or regional analyses to further confirm the causality between SME stock exchanges and economic development, and also cover financial deepening, financial inclusion, and real economic growth.

The present study tries to fill the literature gap by conducting an empirical, cross-country analysis that examines the effects of introducing SMEs stock exchanges on economic growth through. The study aims to provide specific policy recommendations to developing countries on stock exchange development.

III. CONCEPTUAL FRAMEWORK AND THE DATA

Dependent Variable

As for the dependent variable, I borrow previous research’s models and measure how the economy is doing in terms of real economic growth. The World Bank Group World Development Indicators Database has yearly updated statistics for the countries in my interest. Particularly, some widely used indicators are real economic performance such as GDP per capita, GDP, GNP, exchange rate and CPI (Wongbangpo & Sharma, 2002; Gunasekarage, Pisedtasalasai & Power, 2004). In this thesis, I use GDP per capita growth rate, in purchasing power parity, to control for the population and household headcounts differences as well as the differences in development progress among the chosen countries. The statistics are available on the World Bank’s World Development Indicator Databank, and they were originally retrieved from the World Bank national accounts and OECD National Accounts data files.

Key Independent Variable

The unit of analysis of this thesis is country year. I decided to use a dummy variable as the independent variable, $SMEB_{it}$, with 1 designating an establishment of SME stock exchange and 0 designating no SME stock exchange across the examined periods. The dataset for 26 SME Exchanges in 22 emerging countries and the time when they were established was originally
scripted from local exchanges and then co-compiled by Milken Institute and the World Federation of Exchanges. These sets of data allow sufficient level of variations and are therefore worth examining. First, the year when these countries established SME stock exchanges varies. The earliest launch of an SME exchange is Malaysia’s Second Board in 1988, while the newest SME stock exchange was founded in 2014 in Zambia. In addition, more variations are available when some SEM stock exchanges later merged back with the main stock exchange.

**Confounding Variables**

Based on the literature review, I’ve categorized some commonly studied factors which have correlation with economic development and stock market performance into 1) market-level factors, and 2) macro-level factors. Market-level factors focus primarily on the stock exchanges themselves and how they evolve as time goes by; the year when the selected countries founded their first stock exchange, and the domestic stock market capitalization, which captures the scale and liquidity of the stock exchange, are categorized under this category. On the other hand, macro-level factors are also essential as they reflect the economic development, particularly the development of capital markets and private sectors. There are three kinds of indicators under this category: financial fragility, financial assets, and financial access. These indicators not only relate to SMEs growth, but also reflect how the SMEs are influenced by banks, financial institutions, and in turn, affect the economic development.

**Market-level Factors**

A set of time-varying factors could be indicators of stock exchange performance throughout the examined period. These indicators are market capitalization, number of SMEs listed and turnover ratio, used by many researchers (Levine 1998; Mohtadi & Agarwal, 2001; Nazir, Nawaz & Gilani, 2010). Because of the limited availability of all these potential explanatory variables, I can only
choose close equivalents listed below. These variables, to some degree, can convey similar message about the market performance and tendency to adopt different types of stock exchanges.

1. Timeline for Main Stock Market Installation: Since there is currently no a panel database which provides time-series data on these commonly used indicators of all the selected 22 countries or for the selected time range, I thus include the time when the market stock exchange was first introduced in these countries. This variable, $MainStockMarket_{it}$, will provide additional insights about the variance among these economies in the level of financial market development. Moreover, it allows us to see clearly how long after the establishment of the main stock exchange did the selected emerging markets introduce separate stock markets specifically for SMEs. This implication is consistent with previously reviewed literature and sheds lights on the collective influence of stock markets performance and SMEs on economic development.

2. Stock Market Capitalization: Although the World Bank Data-Bank of Development Economic Indicators has not yet updated some values of this factor in certain years, the introduction of the time when main stock exchanges are founded in this study significantly increase the data coverage ratio. Before clarifying the formation timeline, there are 60% of missing data, which dropped to 15% after replacing the missing values with “0” when there were no yet main stock markets. Stock market capitalization is a quantified indicator of listed companies’ asset scale, reflecting the overall development of the capital market.

**Macro-level Factors**

1. Financial Fragility: This mainly refers to the prevalence of financial crisis. It is worth noting that a major financial crisis might affect the performance of the stock exchange and the timing to revitalize the stock market (Ali1 & Afzal, 2012; Lim, Brooks & Kim, 2008). There is no
well-defined concept for financial crisis, but scholars and economists commonly see financial assets suddenly lose a large part of their nominal value during financial crisis. There are four major types of financial crisis and they all relate to both the stock market development and economic growth. In order to control for the effect of financial crisis on the economic development of the selected countries, I include the dummy variable, \( \text{FinCri}_{i,t} \), to indicate if there is a major financial crisis happening near the launching time certain year, with 1 indicating the presence of a major financial crisis and 0 indicating no financial crisis.

2. Financial Assets: Private sector development and investment are critical for poverty reduction by creating productive jobs and higher incomes. Private investment, especially in emerging markets, has tremendous potential to contribute to economic growth and capital market development (World Bank Definition; Tinoco-Zermeño, Venegas-Martínez & Torres-Preciado, 2014; Banerjee & Ahmed, 2017).

3. Financial Depth: According to IMF research papers, financial depth is another common measurement of economic development and credit-to-GDP ratios are commonly studied indicators. One of the popular indicator is \textit{domestic credit to private sector by banks}. This indicator measures financial resources provided to the private sector through loans, purchases of non-equity securities and trade credits by other depository corporations.

However, these ratios are likely to ignore heterogeneity in credit demand across countries and pose a risk of circularity in causal relationship between my independent and dependent variables, because capital market developments and economic condition are main drivers of such heterogeneity. To avoid this complexity and circularity and provide more accurate results, I also use the Claims on Private Sector (annual growth as \% of broad money), \( \text{Claims}_{i,t} \). This indicator measures the financial system’s gross credit to individuals, enterprises, and marginal
nonfinancial public entities and financial institutions not included anywhere else. More importantly, it goes hand in hand with the economic condition and financial quality: demand for credit declines because firms are likely to cut output and households tend to reduce consumption when economic conditions weaken. Second, banks tightened lending standards in the face of greater uncertainty, weakening capital positions, and rising loan losses (IMF, 2010). The data are also retrievable from on the World Bank’s World Development Indicator Databank, and they were originally displayed in International Monetary Fund, International Financial Statistics and data files. Figure 1 describes the conceptual framework of this thesis and table 1 lists definitions of all the variables studied and their sources.

IV. RESEARCH METHOD

Some previous studies regressing continuous variables like the above-mentioned stock performance measurements raise the concerns of reverse causality: a strong economy might lead to a better-performing stock exchange rather than the other way around. By using a dummy independent variable, this thesis is eliminating the risk of circularity. Because the purpose of this thesis is to answer the question whether the establishment of an SME stock exchange will lead to economic growth, a time-series analysis is needed to compare before and after the treatment. More specifically, a fixed-effect regression analysis is used in this thesis with a country-level panel data. The panel lists the 22 countries, from 1987 to 2016. The reason for the choice of time window is two-fold. First, Malaysia is the first among all 22 countries to establish an SME stock exchange in 1988. Normally, fixed-effect analysis included one year before the treatment to show the effects, so 1987 is a reasonable starting point. Second, the examined period will allow the researcher to control for the effect of financial crisis because this time range covers four commonly accepted incidences of financial crisis: 1987, 1997, 2001, and 2008. The most important advantage of fixed-
effect regression is that it can automatically control almost all time-invariant variables existing among the chosen countries. Some of these fixed variables can be geographic character, cultural habits, consumption patterns, and/or scale of informal economy of these economies. Without the fixed-effect mechanism, it is not possible to include all the variables which correlate with both the dependent variable and independent variables and the omitted variable bias will likely to occur.

As for the dependent variable, GDP per capita growth rate, and one of the control variables, stock market capitalization, I used inverse hyperbolic sine (IHS)-transformation to better fit the model. This is because, unlike natural log or simple log models, this transformation automatically detects string variables and keeps them from abruptly ending. Additionally, variables identifying panel and time within a panel dataset are also kept from the process of generating new variables. As a result, the specification can handle datasets that are in wide format and allows for missing observations such as negative growth rate. The model is constructed as the following:

\[ \text{Ihs\_GDP}_{i,t} = B_0 + B_1 \times \text{SMEB}_{i,t} + B_2 \times \text{FinCri}_{i,t} + B_3 \times \text{BankCrdPri}_{i,t} + B_4 \times \text{Claims}_{i,t} + \\
B_5 \times \text{MainStockMarket}_{i,t} + B_6 \times \text{Ihs\_MrkCap}_{i,t} + \Sigma \beta_n \times FE_{i,t} \]

\[ \text{i : for individual country} \]
\[ \text{t : for specific year} \]

V. RESEARCH RESULTS AND DISCUSSION

Descriptive Results

Figure 2 provides an easy-read timeline for the establishment of the first main stock exchanges and the first SME stock exchange boards by country. These two variables are both binary, with 0 indicating no stock exchange and 1 indicating the formation year. The figure shows that most of the countries set up their stock exchange prior to the starting point of this panel and only 8 countries did not have a main stock market before 1987. This can also be seen as a control for the difference in level of capital market development, which may influence both the key independence variable
and the dependent variable in this research. As for the years when SME stock exchange was introduced, there are a few variations. First, six African countries installed the SME stock board in 2013; they are: Ghana, Kenya, Nigeria, Rwanda, Tanzania and Uganda. Second, India, Malaysia, and Turkey once developed two SME boards, and Malaysia and Turkey ended up merging one SME board back into the main market, leaving only one SME stock exchange. These variations justify the use of fixed-effect model to conduct the empirical research.

Figure 3 presents changes in GDP per capita growth rate in six African countries before and after the introduction of the SME stock exchange. Without running regression, the effect of the SME stock exchange establishment seems unimpressive. Since the SME boards were formed, only Rwanda and Nigeria show an upward trend. Tanzania and Uganda’s growth rate changes have become more stable, while Ghana and Kenya have experienced a decline in growth rate. However, these six countries might not be representative of all the countries as they share similar geographical, cultural and economic features which are not comparable to other countries. This calls for an empirical research tool, such as fixed-effect models to automatically control for the time-invariant characteristics.

Regression Results

The key question this paper addresses is whether the adoption of SME equity boards affects emerging markets’ economic development, and more specifically, their GDP per capita. As described above, the dependent variable is the inverse hyperbolic sine of the GDP per capita growth rate in the 1987-2016 period, regressed on the treatment variable, and SME stock exchange adoption. I started with a simple OLS regression to examine the correlation between my treatment variable and the transformed dependent variable as it can identify a full range of variation. Table
2 shows the result of all my OLS models with different control variables; columns from left to right represent different specification.

The estimate of my key independent variable stays significant through model 1 to model 5, but loses the significance after I introduced the variable, domestic stock market capitalization. In model 6, the coefficient on my key independent variable is 0.1972, which means that, on average, the establishment of an SME stock exchange board increases the GDP per capita growth rate by 19.72 percent. This result suggests that, when I controlled for main stock market performance, the SME stock exchange does not cause the economic development. It is worth noticing, however, that the numbers of observation dropped from 653, to 638 when claims to private sector was added and sharply decreased to 608 when market capitalization was included. Such data insufficiency may account for the lack of causality between the establishment of an SME stock exchange board and economic development.

Although the above analysis seems to shed light on the correlation between the SME stock exchange establishment and economic development, there are time-invariant factors which are not captured by my simple OLS regressions, and this makes the simple OLS models uninformative. Such factor includes geographical location, demographic distribution, cultural trends and political regime types in these countries, which can be measured by various indicators. Therefore, not including all of them in an OLS model will cause an omitted variable issue. One common characteristic of all these potential explanatory factors is that they are likely to stay unchanged over the chosen time period. In this case, a fixed effect model will be helpful. As a result, to be consistent with the research question of this paper and with the methodology adopted and to avoid omitted variable bias, I introduce a panel regression and receive coefficients of interest which pool
across the 30-year time period and the 22 countries. The fixed-effect regression results are shown in Table 3.

Looking at the numbers of observation, although still missing some data, we can see that the panel is relatively balanced when proper transformation of variables was conducted: According to Stata output, the balance range now is 20-30, compared to previously tested specification which only gives a balance of 13-30. Additionally, the underlying assumption of fixed-effects regression that there are no omitted variables that are correlated with both the key independent and dependent variable and time-varying. The regression provides estimates on my key independent variable and the chosen control variables. Based on this explanation of my choice of research methods, I argue that the identifying assumption holds, and thus a causal relationship can be drawn.

From model 1 to model 6, I gradually added more control variables. With only the SME stock exchange variable, the estimate is 0.232. This indicates that establishing an SME board increases the GDP per capita growth rate by 23.2 percent. The magnitude is overestimated because this simplified model has omitted variable problem. When adding more control variables, model 5 and 6 paint a different picture: unlike what the simple OLS regressions and model 1-4 suggests, the significance of SME stock exchange introduction first disappears when the variable, the existence of main stock market, is introduced. The insignificant coefficient on SME board persists in the final model which adds domestic market capitalization as a control variable. If it were significant, the coefficient on SMEB in model 6, at 0.0087, would indicate that SME stock exchange adoption increases emerging markets’ GDP per capita growth rate by 0.87 percent using the inverse hyperbolic sine transformation of variables. More specifically, the mean of GDP per capital growth rate for these 22 countries is approximately 2.81%, meaning that the average effect of SME board
introduction will be roughly a 0.02 percentage point increase (2.81*1.0087). This magnitude is comparable to changes in other economic indicators.

In order to determine why the coefficient on my independent variable of interest becomes insignificant in model 5 and model 6, I need to probe on the relationship between SME board establishment and these influential variables. I also note that, $Claims_{i,t}$, has a significant effect in model 5 and thus might be another source of economic development. The biggest concern is that the control mechanism is not perfect and may contain a collinearity issue. Therefore, I apply a follow-up examination of estimates to this variable, too. Because the dependent variable in this test is my binary variable, $SMEB_{i,t}$, I use a logit model instead of a linear regression. Since main stock market adoption is the prerequisite of an SME board formation, the logit regression on these two variables does not indicate any useful predictive information so I did not include this particular variable in the follow-up regression. Table 4 presents the regression results. First column identifies two variables, claims on private sector and market capitalization of domestic stock, and r-square of the regressions. The second, third and fourth columns of table 4 show OLS, fixed effect, and panel logit regression results, respectively.

The panel logit coefficient on claims to private sector is -0.007, indicating a negative correlation with the establishment of an SME stock exchange: one percentage point increase in the claims to private sector (as a % of GDP) decreases the probability of establishing an SME stock exchange platform by 0.7 percent. This is consistent with my hypothesis and previous literature showing that reducing financing barriers will push small and medium enterprises to raise capital in other venues, especially through equity listing. In other words, when claims to the private sector are not reaching a desirable level for the growth of SMEs, an SME board will be more likely to be formed to meet the market need in the capital market.
Following the same logic, the coefficient on $Ihs_{MrkCap_{i,t}}$ is 0.193, indicating that a percent increase in the market capitalization to GDP ratio will increase the likelihood of introducing SME board by 0.193 percent. This validates my reasoning in variable specification that domestic main stock market performance can signal demand for expansion in stock exchange type and, therefore, may encourage a country establish SME board in the stock market. OLS and fixed-effect regressions return similar results, with r-squares of 0.2748 and 0.2722 respectively, meaning that the variation in these two variables can account for 27.48% and 27.22% of the variation in the SME board adoption. However, the fact that about one third of the variation can be explained by these two variables may pose an additional barrier to efforts to represent the effect of introducing SME board on real economic performance because the independent variables are too correlated with each other.

I also conducted a robustness check by running regressions on a fully-balanced panel. A fully-balanced panel requires me to narrow my time period from 1989-2016 to 1994-2012. This adjusted time period guarantees that the specification chosen has no missing data. Table 5 shows the regression result based on the robustness check. As the table shows, the estimate of SME board establishment’s effect on economic performance remains significant when domestic market capitalization is controlled, even when the panel is fully balanced. However, this might also be attributable to the collinearity between stock market capitalization and SME board adoption.

VI. CONCLUDING REMARKS

Despite the importance of having a sound understanding of the effects of SME stock exchange adoption on economic growth, the existing literature has not explored and explained the relationship sufficiently. In this paper, I have been able to report results from an empirical data analysis that fills important gaps in previous understanding. My empirical strategy is made
possible by the use of country-level data on macro and micro-level factors for the 22 countries from World Bank databank, IMF Statistics, FRED (Federal Reserve Bank of St. Louis), World Federations of Exchanges and Milken Institute. These data allowed me to identify years between 1987 and 2016 when countries established SME boards and then to control for various potential explanatory factors of economic growth and capital market development. I recognize that unobserved heterogeneity may be an obstacle to building an accurate causal relationship, so I exploit the longitudinal nature of the data and estimate fixed effects models instead of OLS models. Moreover, I alleviate omitted variable bias problem by using close equivalent variables which have more data points.

With regard to whether the establishment of SME boards in capital markets affect the economic development of emerging markets, this paper shows mixed results. When a simple univariate OLS model is used, the effect of SME board introduction is significant even when I control for the measurement of financing barrier and claims to the private sector. However, in my fixed-effect regression model, after introducing domestic main stock market capitalization, the effect of the SME stock exchange itself goes away. This, according to separate logit regression models, may result from strong correlation between these two factors and SME stock exchange establishment. Because of data limitations, I also conducted a robustness test on a fully-balanced panel. The significance level improves but the estimate still does not indicate a significant causal relationship between my key independent variable and dependent variable. In other words, SME stock exchange adoption standing alone may not impose an obvious influence on GDP per capita growth, but it can affect economic growth through reducing financing barriers for private exercises and general stock market performance improvement.
With these things said, there remain a number of limitations of my analysis. First, the results apply to a small number of markets, specifically the emerging countries. The results might not be representative of all other countries (that is, countries with more developed economic development or longer capital market histories). Second, there are unavailable and time-varying variables which might affect both the SME stock exchange establishment decision and economic development and the number of observations is less than expected. This is primarily due to the nascence of data-driven, quantitative research on both capital markets and on SME stock exchange development. Data on many pertinent factors such as stock market capitalization excluding 10 largest companies, SME density, SMEs’ economic contribution to domestic GDP, financial reporting quality of SMEs, and stock market listing requirements are not available for my specific time range or for the selected economies. Although close equivalents are included in the empirical regression model, these variables may not be able to separate the effects of larger corporations on economic development from the effects of SMEs on economic development. Third, the robustness test points to some disadvantage of the model used: the model does not take the transition period between the installation of SME boards and economic development improvement into consideration. Many studies have pointed out that the effects of stock markets on economic growth are usually not immediate; they tend to be lagging influence and will show in the economic indicators after a certain period. Also, today’s economic growth may be endogenous, a natural outcome of past economic performances.

As more and more international organizations and research institutes are updating their databases on these indicators, more data will be available. Future work should then focus on finding more relevant variables, selecting a more data-sufficient period and including larger sample size based on logical and informative reasoning. With regard to the transition period,
subsequent studies should investigate whether exposure to an SME stock exchange in later periods of the capital market development process has a stronger correlation with overall economic development than earlier installation. Additionally, empirical and case studies of single countries in the context of an SME stock exchanges are also encouraged because the experience of any county on groups of countries does not represent the experience of all other countries.

As for policy implications, my regression results suggest some useful lessons. In particular, my inconclusive results should encourage emerging market governments to pay close attention to financing barriers and credit gaps for small and medium-sized enterprises, because the coefficient of the variable, claims to private sector (% of broad money), is significant and highly correlated with SME board installation. At the same time, my results also suggest that emerging governments should continue main stock exchange development, not only in terms of scale, but also in terms of liquidity and inclusiveness. In any given case, however, emerging markets must decide on whether to explore additional stock market options based on their needs and market development conditions.
VII. APPENDIX: FIGURES AND TABLES

**Figure 1. Conceptual Framework**

- **Introduction of SME Stock Exchange**
- **Economic Growth: GDP Growth Rate**

**Market Factors:**
- Length of the Existence of the main stock market
- Market capitalization of total domestically listed companies

**Macro-Level Factors:**
- Financial crisis year
- Banks’ credits to private sectors
- Claims on private sector
- Number of SMEs
Figure 2. Founded Year of the Main Stock Market and the SME Stock Exchange, and Number of SMEB, by Country (Stata Visualization)

Source: Milken Institute and World Federation of Exchanges
NumofSMEB: Number of SME stock exchange

Figure 3. Tentative Correlation between the GDP Growth Rate in Six African Countries and Their SME Board Installation Time

Source: World Bank
Table 1. Definitions of Variables and Sources

<table>
<thead>
<tr>
<th>Variables</th>
<th>Variable Names in the Model</th>
<th>Definitions</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita Growth rate</td>
<td>Ihs_GDPpcg</td>
<td>GDP per capita growth rate in power purchasing parity in percentage form²</td>
<td>World Bank Development Economics Indicator Databank</td>
</tr>
<tr>
<td>SME stock exchange</td>
<td>SMEB</td>
<td>A binary variable indicating whether the stock exchange for SMEs has been established. 0: no; 1: yes.</td>
<td>World Federation of Exchanges and Milken Institute Joint Database</td>
</tr>
<tr>
<td>Financial Crisis Incidence</td>
<td>FinCri</td>
<td>Common consent year when world-widely recognized financial downturn happened</td>
<td>IMF definition, the Economist and common consensus</td>
</tr>
<tr>
<td>Banks Credit to Private Sector</td>
<td>BankCrdPri</td>
<td>A continuous variable measuring financial asset of a country as of % of GDP</td>
<td>International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates. Retrieved from World Bank Development Economics Indicator Databank</td>
</tr>
<tr>
<td>Claims to Private Sector</td>
<td>Claims</td>
<td>A continuous variable measuring financial asset of a country as of % of GDP</td>
<td>International Monetary Fund, International Financial Statistics and data files. Retrieved from World Bank Development Economics Indicator Databank</td>
</tr>
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<td>Market Capitalization</td>
<td>Ihs_MrkCap</td>
<td>Market capitalization is the share price times the number of shares outstanding for listed domestic companies, as of % of GDP³</td>
<td>World Federation of Exchanges database. Retrieved from World Bank Development Economics Indicator Databank</td>
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<tr>
<td>Main Stock Market Establishment</td>
<td>MainStockMarket</td>
<td>A binary variable indicating whether the main stock exchange has been founded. 0: no; 1: yes.</td>
<td>Countries’ Stock Exchanges information pages</td>
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² Transformation of this variable will be discussed in the research method section.
³ Transformation of this variable will be discussed in the research method section.
### Table 2. Regression Result (Simple OLS)

<table>
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<tr>
<th>GDP per capital Growth Rate</th>
<th>Model 1</th>
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<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
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<td>0.3396***</td>
<td>0.3393***</td>
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<td>0.2658***</td>
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### Table 3. Regression Result (Panel Fixed-Effect)

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<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
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<tbody>
<tr>
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<td>0.232**</td>
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<td>0.2181*</td>
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### Table 4. Correlation between SME Board, Claims to Private Sector and Market Capitalization

<table>
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<tr>
<th></th>
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<th>OLS Regression</th>
<th>FE regression</th>
<th>Panel Logit Regression</th>
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<td>(0.0010)</td>
<td>(0.0011)</td>
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### Table 5: Robustness Check with a Fully-Balanced Panel

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<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
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<td>0.3353*</td>
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<td>(0.18)</td>
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<td>(0.0065)</td>
<td>(0.0065)</td>
<td>(0.0064)</td>
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<tr>
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