

The Growth of Global Equity Markets: A Closer Look

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Abstract

This paper presents both the time-series and cross-country evidence on the growth of global equity markets and attempts to shed some light on the sources of equity market growth. Using data on 33 countries, I find that development of financial intermediaries and openness to trade are positively associated with the size and activity of equity markets, while government consumption is negatively associated with equity market activity and liquidity. Under the stochastic frontier modeling approach, the legal and institutional characteristics of a country are assumed to affect its equity market development through the channel of institutional efficiency. I show that there are wide differences in institutional efficiency across countries and over time and, Canada, the United States and Singapore possess the most investor-friendly institutional framework that enhances stock market development. My most striking finding is that improvements in institutional efficiency, and changes in investor sentiment, appear to be the driving force behind the phenomenal expansion of global equity markets over the past two decades.

JEL classification: G15, international financial markets; G18, government policy and regulation; G34, corporate governance; C11, Bayesian analysis; C15, statistical simulation methods

Keywords: law and finance; government regulations; corporate governance; stochastic frontier; Bayesian inference

1 Introduction

A growing body of research has shown that stock market development explains economic growth.¹ Thus, it is important to explore the determinants of stock market development using a variety of econometric techniques. According to Demirgüç-Kunt and Levine (2001), and Beck, Demirgüç-Kunt and Levine (2003), exogenous factors such as the legal origin and natural resource endowments influence the institutions, laws, and policies that shape stock market development, which in turn influences economic growth. This paper contributes to the literature by examining one part of the chain, namely, the channel through which the legal and institutional framework affects the development of national equity markets, using a generalized version of the stochastic frontier model.

The stochastic frontier modeling approach captures the following intuition. According to Stulz (2001), legal, regulatory, and policy factors influence the effectiveness with which the overall financial system channels capital to productive ends. Under an efficient institutional framework, the financial system is better utilized and thus better developed. And we tend to observe that for a given level of macroeconomic conditions, a country with an efficient institutional framework is associated with more highly developed stock markets.. In a world with the most efficient laws, institutions, and government policies, a country can be found to be associated with the frictionless neoclassical level of equity market development. While, imperfect laws, institutions, and policies would prevent a country's equity market development from reaching its frictionless maximum capacity: they force the actual level of equity market development to be below, but never above, the frictionless neoclassical level of market development. Thus, in a world with market imperfections, we would expect the institutional factors to have an asymmetric effect on the level of equity market development.

In this paper, I show that measures of equity market development can be modeled as a one-sided deviation from a frictionless level, and that the effects of laws, institutions, and government policies on equity market development can be identified and quantified by imposing a distributional

¹See: Demirgüç-Kunt and Maksimovic (1998), Levine and Zervos (1998), Rajan and Zingales (1998), Beck, Levine and Loayza (2000), Wurgler (2000), Beck and Levine (2003), and the review by Levine (1997).

assumption on the effects. Specifically, I view all the institutional factors as the determinants of market efficiency (i.e., efficiency factors), and measures of the macroeconomic condition as the fundamental factors (i.e., input factors) in the stochastic frontier model. This paper establishes evidence that the link between the stock market development and its institutional determinants is through the efficiency channel. That is, countries with better laws, institutions, and policies are associated with more efficient, well-functioning stock markets, both in terms of size and liquidity measures, an intuitive result that cannot be obtained through the standard regression framework.

A growing recent literature shows that institutional factors matter for development of finance and for economic growth (La Porta et al. (1997), (1998), and Stulz (2001)). As countries grow, one expects their institutional framework to evolve as well. None of the existing studies have examined the effects of time-varying institutional variables on financial and economic development. One advantage of the stochastic frontier modeling approach adopted in this paper is that it is able to handle both time-varying and time-invariant institutional factors when these factors are put into the efficiency part of the model, thus allowing for not only cross-sectional but also intertemporal comparison of the effects of institutions, laws and policies on equity market development. This is in fact the first paper in the literature that explicitly allows for temporal changes in institutional factors.

One interesting aspect of the stochastic frontier model is that it decomposes the change in the level of equity market development into three components which cannot be done using any other existing approaches. This decomposition is insightful as it shows the relative importance of macroeconomic conditions, institutional factors, and market sentiment on a nation's stock market development and thus, the decomposition results are of great policy relevancy. Specifically, under the stochastic frontier framework, the equity market development of a country is determined by its macroeconomic characteristics (fundamentals), institutional factors (efficiency), and investor sentiment. Over time, due to changes in government policy and improvements in the institutional framework, a country's equity market can become more highly developed and catch up to the frictionless neoclassical level. In addition, equity markets develop if a country improves its fun-

damentals. Finally, investors might simply become more upbeat and invest or trade more for a given level of market fundamentals and institutional factors. I will interpret the improvement in equity market development, unrelated to macroeconomic fundamentals or institutional efficiency, as the change in investor sentiment.² In sum, the stochastic frontier modeling approach allows me to view the change in the measure (i.e., growth) of equity market development in terms of three different components: reduction in institutional inefficiency, improvements in macro fundamentals, and changes in investor sentiment.

The main drawback of the stochastic frontier model is that the model does not have the flexibility to address the simultaneity issue.³ Thus caution has to be exercised when interpreting the results. Moreover, there is no well-established finance theory other than Stulz (2001) on how to classify determinants of stock market development into macro fundamentals and efficiency factors. Thus, it is important that various robustness checks are implemented before interpreting the results definitively.

This paper examines the channel through which the legal and institutional framework influences the development of equity markets and has its origin from the literature on exogenous and endogenous determinants of stock market development (Beck, Demirgüç-Kunt and Levine (2003), and Demirgüç-Kunt and Levine (2001)). The empirical results in Beck et al. (2003) indicate that both the legal systems brought by colonizers and the initial endowments in the colonies are important determinants of stock market development, and much of the book by Demirgüç-Kunt and Levine (2001) empirically examines the legal, institutional, and policy determinants of development of financial system.

The current paper distinguishes itself from the existing literature in several aspects. First, the objectives and scope of analyses are different. Beck et al. (2003) focus on examining the historical determinants of financial development. As a result, they employ cross-sectional regressions over

²In the stochastic frontier literature, this shift is called the change in production technology or “technological changes.” In this paper, it is more appropriate to use the term “investor sentiment” instead given the specific application in mind.

³Existing work in the finance and growth literature by Levine, Loayza and Beck (2000), Demirgüç-Kunt and Levine (2001), and Beck and Levine (2003) offers excellent references on the state-of-the-art dynamic panel GMM techniques in dealing with simultaneity biases.

a sample of former colonies and adopt measures of financial developments covering the banking sector, the stock market, and the private property rights. In contrast, I ask a different question in the current paper: what are the determinants of stock market development? I focus on contemporaneous, instead of historical, determinants, and my measures of stock market development are broader, including one measure of size (the same as used by Beck et al. (2003)) and two measures of market activity and liquidity. In that sense, the findings in this paper complement Beck et al. (2003).

Second, the methodological approaches differ substantially between the current paper and existing literature. Beck et al. (2003) employ cross-sectional regressions with instrumental variables to control for reverse causality and simultaneity, while Beck and Levine (2003) employ dynamic panel GMM estimators to deal with simultaneity. This paper employs the stochastic frontier model which captures cross-sectional as well as temporal variation in stock market development. The model can also accommodate both time-varying and time-invariant measures of institutional characteristics.

Third, the samples are different. For their purpose, Beck et al. (2003) employ a sample of former colonies, thus their sample covers predominantly developing countries and excludes most of the European countries (as there were the colonizers), and their financial development measures are five-year or twenty-year averages. I look at both developed and developing countries and thus, my sample has a larger dispersion in various measures of equity market development than those in Beck et al. (2003). Moreover, my sample period is more recent (1978-1997) and I work with a panel dataset. Essentially, the cross-sectional estimation helps determine whether the cross-country variance in stock market development and the sources of stock market development can be explained by variance in the right-hand-side. Moreover, I would also like to know how temporal changes in macroeconomic conditions, and temporal changes in legal and institutional characteristics within a country affect stock market development through their respective channels. By using a panel data set, I gain degrees of freedom by adding the variability in the time-series dimension.

Using data on 33 countries, I find that development of financial intermediaries and openness to trade are positively associated with the size and activity of equity markets, while government con-

sumption is negatively associated with equity markets activity and liquidity. Under the stochastic frontier modeling approach, the legal and institutional characteristics of a country are assumed to affect its equity market development through the channel of institutional efficiency. I find that countries with French and German legal origins tend to discourage their equity markets from getting bigger, while make efforts to enhance liquidity of the listed shares. Laws that protect shareholders rights, transparent accounting standards, and good country credit ratings tend to foster a country's equity market development. Finally, greater economic freedom of a country is associated with more developed equity markets. Overall, I find that there are wide differences in institutional efficiency across countries and over time and, Canada, the United States and Singapore clearly possess the most shareholder-friendly institutional framework.

My most striking finding is that improvements in institutional efficiency, and changes in investor sentiment, appear to be the driving force behind the phenomenal expansion of global equity markets over the past two decades. Many developed countries and some developing countries experience little to moderate improvements in their macro fundamentals during the sample period. Improvements in institutional efficiency vary across countries, particularly in developing countries.

My finding that favorable changes in investor sentiment contribute a large part of the expansion in global equity markets has obvious implications for both policy and international investing. Governments should exercise caution when contemplating any economic policies that foster the development of their national stock markets. Professional portfolio investors when judging the soundness of a country's financial system should focus more on its economic fundamentals including its institutional framework, rather than on various measures of equity market development which are prone to speculative attacks driven by inexplicable market sentiment.

The remainder of the paper proceeds as follows. In Section 2, the modeling framework and the decomposition of growth in equity markets into its three components are presented. The measures of equity market development and list of macroeconomic fundamentals and institutional efficiency factors are given in Section 3. Section 4 presents the empirical results, and Section 5 offers some concluding remarks. Estimation details are provided in the appendix.

2 The Modeling Framework

The stochastic frontier model was first introduced by Aigner, Lovell and Schmidt (1977), and Meeusen and van den Broeck (1977), and it came from the microeconomic tradition where “inputs” are turned into “outputs” using a production technology. The model by construction is more structural than standard regression models and allows for a deeper interpretation of parameters and errors. Since its appearance, the stochastic frontier model has been used by researchers in many different areas of economics. Most recently, variants of the model are applied to economic growth by Koop, Osiewalski and Steel (1999, 2000), and to valuation by Hunt-McCool, Koh and Francis (1996), and Koop and Li (2001).

In this paper, I examine the determinants of global equity market development using a generalized version of the model. It is natural to think that there is a frictionless maximum level of equity market development depending only on macroeconomic fundamentals of a country, and that institutional factors are governments’ effort to narrow the gap between what would happen to equity market development under perfect institutions and laws and what the actual level of equity market development is. The stochastic frontier model is well suited for capturing the above intuition. It allows for “errors” in a regression model to be decomposed into two terms, one of which reflects the efficiency effects of a country’s institutional, legal and policy framework on its equity market development, the other is the standard regression error. Investor sentiment is captured through the time-varying regression parameters under the stochastic frontier model. The intuition here is that for a given level of macroeconomic fundamentals and institutional factors, if the level of equity market development differs over time, it must be that investors tend to have a different view about the future prospect of a country’s equity market and thus invest and/or trade accordingly.

As a result, the stochastic frontier model decomposes the growth in global equity markets (i.e., the change in the level of equity market development) into three types of changes: reduction in institutional inefficiency, improvements in macro fundamentals, and changes in investor sentiment. This decomposition sheds light on the relative importance of these three components of equity market growth, and on the manner in which institutional efficiency changes over time and across

markets. These are important policy questions that the standard regression modeling framework cannot address.

In summary, the stochastic frontier model generates richer empirical implications. At the level, the model is in a regression setup with various measures of equity market development as the left-hand-side variables, thus able to shed lights on which macroeconomic fundamentals and institutional factors are conducive to a country's equity market development. At the change, the model attributes the sources of equity market growth to the change in institutional, legal and policy environments, change in macroeconomic fundamentals, and finally, time variation in investor sentiment.

2.1 The Model

The stochastic frontier model used in this paper is based on the following specification:

$$Y_{ti} = f_t(X_{ti}, \beta_t) \varepsilon_{ti} \tau_{ti}, \quad i = 1, \dots, N, \quad t = 1, \dots, T \quad (1)$$

where Y_{ti} is the measure of country i 's equity market development in period t , either in terms of market size or liquidity (to be defined later), and X_{ti} is a $K \times 1$ vector of country-specific macroeconomic characteristics. β_t is a $K \times 1$ vector of parameters. f_t is the function which captures the maximum possible level of equity market development that can be obtained from given levels of market fundamentals under a perfect institutional framework. The function f_t can vary over time, and I interpret changes over time in f_t as reflecting changes in investor sentiment. ε_{ti} is the error term. τ_{ti} is the level of institutional efficiency, and it is bounded between zero and one. $\tau < 1$ indicates that the level of equity market development of a country is only a τ fraction of the maximum it could be, or the equity market is underdeveloped by $(1 - \tau)$ percent.

Assuming f_t is loglinear, by taking the logarithm of (1) I obtain the following linear specification

$$y_{ti} = x_{ti}' \beta_t + v_{ti} - u_{ti}, \quad (2)$$

where $y_{ti} = \ln(Y_{ti})$, $x_{ti} = \ln(X_{ti})$, $v_{ti} = \ln(\varepsilon_{ti})$, $u_{ti} = -\ln(\tau_{ti})$ a nonnegative random variable, and v_{ti} and u_{ti} are assumed to be independent over time and across countries. The error term v_{ti} is assumed to be normally distributed with mean 0 and variance σ^2 , denoted by $N(0, \sigma^2)$, and the

efficiency term u_{ti} is assumed to be exponentially distributed with mean λ_{ti} which depends on m different exogenous variables W_j , a $T \times N$ matrix, $j = 1, \dots, m$, in the following way

$$\lambda_{ti} = \prod_{j=1}^m \phi_j^{-w_{tij}}, \quad (3)$$

where w_{tij} is the ti 'th element of W_j , W_1 is a matrix of ones, and $\phi_j > 0$, $j = 1, \dots, m$, are unknown parameters.⁴ By allowing λ_{ti} to depend on country-specific institutional characteristics fits in with one of the purposes of the paper—to examine the role of institutional efficiency on equity market development. If $\phi_j = 1$, then the j^{th} institutional characteristic has no effect on the efficiency distribution, whereas if $\phi_j > 1$ (< 1) then the j^{th} characteristic is associated with a higher (lower) level of institutional efficiency. For instance, empirically, w_{ti10} is a dummy variable that equals one if the Economic Freedom of the World index for country i at time t is greater than the sample average, and zero otherwise,⁵ so a finding of $\phi_{10} > 1$ (< 1) indicates that greater economic freedom is associated with a higher (lower) level of institutional efficiency, thus a higher (lower) level of equity market development.

Imposing structure on the regression parameters (β_t 's) is more challenging. There is little guidance from finance theory on how to measure investor sentiment and let alone its change over time (Baker and Wurgler (2003), Brown et al. (2002), and Kumar and Lee (2003)). *A priori*, it is perhaps reasonable to assume that investors change their perception of a country's equity market only gradually, i.e., β_t is not too different from β_{t-1} . Following Koop et al. (2000), I assume that the $K \times 1$ vector of slope parameters β_t evolve stochastically. Formally, the specification for β_t is an AR(1) process. That is, investors' sentiment in this year is closely related to that of last year,

$$\beta_t = (1 - r)\iota_K + r\beta_{t-1} + \xi_t, \quad (4)$$

where $r \in [0, 1)$ is a fixed hyperparameter that captures the close relationship between β_t and β_{t-1} ,

⁴Common distributions for u_{ti} are the truncated normal or various members of the Gamma class. Ritter and Simar (1997) have noted some identification problems which occur if the distribution of u_{ti} is allowed to be too flexible. For instance, the truncated normal distribution becomes indistinguishable from the normal if the truncation point is too far out in the tail of the distribution. The unrestricted Gamma distribution runs into similar problems. For this reason, researchers have worked with restricted versions of these general classes, such as the exponential distribution in Koop and Li (2001). The specification in (3) ensures that the mean of the efficiency distribution λ_{ti} is positive.

⁵As computational burdens are greatly reduced if the W_j 's are 0-1 dummy variables, all institutional factors are duly transformed. See the notes to Table 2 for details.

ι_K is a K -dimensional vector of ones, and ξ_t is i.i.d. $N(0, (1-r)^2 c_2 D_2)$ with prior hyperparameters c_2 and D_2 . The implied marginal prior, i.e., not conditional on β_{t-1} , for β_t is $N(\iota_K, c_2 D_2)$. In the empirical section of the paper, I obtain results by setting $r = .90$ implying β_t is not too different from β_{t-1} , although values in the interval $[0, 1)$ yield similar results. To capture possible time trend effects, I include a quadratic time trend in the regression model of (1),

$$\beta_{0t} = m_0 + m_1 t + m_2 t^2. \quad (5)$$

In summary, the stochastic frontier modeling framework used in this paper assumes that the difference between the actual level of market development and that implied by the frictionless economy is composed of both the random error and institutional efficiency. In order to differentiate between the two, the symmetric error term is assumed to be independent of the measure of institutional efficiency and different stochastic specifications are used: normal for the error term and exponential for institutional efficiency.⁶

2.2 Decomposing the Growth of Equity Markets

Given levels of macro fundamentals and institutional efficiency of country i in periods t and $t + 1$, the expected change in country i 's equity market development is

$$y_{t+1,i} - y_{ti} = (x_{t+1,i}' \beta_{t+1} - x_{ti}' \beta_t) + (u_{ti} - u_{t+1,i}), \quad (6)$$

where the first term on the right hand side of (6) is due to both the change in investor sentiment (i.e., changes in β) and the change in fundamentals (i.e., changes in x) and the second term reflects the change in the level of institutional efficiency. The first term can be further written as

$$x_{t+1,i}' \beta_{t+1} - x_{ti}' \beta_t = \frac{1}{2}(x_{t+1,i} + x_{ti})'(\beta_{t+1} - \beta_t) + \frac{1}{2}(\beta_{t+1} + \beta_t)'(x_{t+1,i} - x_{ti}), \quad (7)$$

where the first component on the right hand side of (7) reflects the change in investor sentiment (SC) and the second component captures the change in fundamentals (FC).

⁶In contrast, most existing models leave out the institutional efficiency component. As a benchmark assuming full efficiency, i.e., there are no composed errors but only the symmetric error term, I have estimated the regression, and found statistically different results from those using (2). Results are available upon request.

Consider the change in investor sentiment. If the fundamentals were fixed at some level x_{*i} , the change in sentiment could be measured as

$$\exp[x_{*i}'(\beta_{t+1} - \beta_t)]. \quad (8)$$

Since fundamentals vary over time, the effect of changes in investor sentiment on the equity market development of country i can be measured as a geometric average of two pure sentiment changes for $x_{*i} = x_{ti}$ and $x_{*i} = x_{t+1,i}$. In other words,

$$SC_{t+1,i} = \exp\left[\frac{1}{2}(x_{ti} + x_{t+1,i})'(\beta_{t+1} - \beta_t)\right]. \quad (9)$$

Similarly, the change in fundamentals is captured by

$$FC_{t+1,i} = \exp\left[\frac{1}{2}(\beta_{t+1} + \beta_t)'(x_{t+1,i} - x_{ti})\right], \quad (10)$$

which is a geometric average of two pure fundamental changes: one measured with respect to the investor sentiment in period t , and the other measured with respect to the investor sentiment in period $t + 1$.

Finally, the change in the level of institutional efficiency (EC) is

$$EC_{t+1,i} = \exp(u_{ti} - u_{t+1,i}). \quad (11)$$

In sum, the change in the equity market development of country i 's equity market (DC) equals the product of the above three components, and in the empirical section, average changes of these three components for each country are reported.

3 Variable Definition

3.1 Measures of Equity Market Development

As indicator of the size of the stock market I follow the work of La Porta et al. (1997, 1998) and Levine and Zervos (1998) using the stock market capitalization to GDP ratio which equals the value of listed shares divided by GDP. Given that this indicator is the ratio of a stock to a flow variable, both numerator and denominator are deflated appropriately. The numerator equals the average of

the end-of-year value for year t and year $t - 1$, both deflated by the respective end-of-year CPI, and the denominator (GDP) deflated by the annual value of the CPI. This eliminates the potential mis-measurement induced by inflation (Beck, Demirgüç-Kunt and Levine (2001)).

To measure the activity of the stock market I use stock market total value traded to GDP which is defined as total shares traded on domestic exchanges divided by GDP following Levine and Zervos (1998) and Beck and Levine (2003). Since both numerator and denominator are flow variables measured over the same time period, deflating is not necessary in this case.

Finally I use the stock market turnover ratio as liquidity indicator of stock markets. It is defined as the ratio of the value of total shares traded and market capitalization. It measures the activity or liquidity of a stock market relative to its size. A large, less liquid stock market will have a low turnover ratio whereas a small but active stock market will have a high turnover ratio. Since this indicator is the ratio of a flow to a stock variable, I apply a deflating procedure similar to that for the market capitalization indicator.

3.2 The Macroeconomic Fundamentals

I rely on finance theory and prior research to guide my choices of macro fundamentals which are expected to affect the development of equity markets. First, I control for GDP growth because growth is likely to affect both valuations and market breadth (La Porta et al. (1997)). Second, I control for the size of the economy on the theory that maintaining and operating equity markets might be an increasing returns to scale activity, and therefore countries with large GDPs might have large and liquid equity markets (La Porta et al. (1997)). Thus, my first two macro factors are the growth rate and level of real per capita GDP.

Macroeconomic instability may importantly distort and complicate financial contracting. Huybens and Smith (1999) develop a theoretical model that implies a negative long-run correlation between inflation and financial market activity, and Boyd, Levine and Smith (2001) empirically assess these predictions and find that, for economies with inflation rates exceeding 15 percent, there is a discrete drop in financial sector performance. However, due to data limitation, Boyd et al. (2001) cannot conduct the panel estimation with the stock market data and thus, the temporal

relationship between inflation and measures of stock market development remains unclear in the literature. Based on these earlier findings, in this paper I control for inflation by introducing a nonlinear measure of inflation capturing the potentially more detrimental effect when inflation is high. The inflation variable takes the value of one when the actual inflation exceeds the sample average of 15 percent per annum, and zero otherwise.

Financial intermediaries play a pivotal role in economic development because they research and identify profitable ventures, monitor and control managers, ease risk management, and facilitate resources mobilization. Beck, Levine and Loayza (2000) show that financial intermediaries exert a large positive impact on total factor productivity which feeds through to overall GDP growth. I hypothesize that financial intermediaries also facilitate the development and functioning of local equity markets. The measure of the level of financial intermediary development, following Beck et al. (2000) and Bekaert, Harvey and Lundblad (2001), is the value of credits issued by financial intermediaries to the private sector divided by GDP. Given that the measure is a ratio of a stock and a flow variables, numerator and denominator are deflated appropriately.

Barro (1991) concludes that government consumption has a negative association with growth and investment. His findings suggest that although government consumption has no direct effect on private productivity, it lowers saving and growth through the distorting effects of taxation or government-expenditure programs. Levine and Renelt (1992) identify a positive robust correlation between growth and international trade. In light of these results, I consider two more macro factors: the share of government consumption in GDP as indicator of macroeconomic stability, and the sum of exports and imports as a share of GDP to capture the degree of openness of an economy. Both variables are ratios of flow variables, and thus deflating is not necessary here.

The last macro factor I consider is the role of global portfolio diversification on equity market development. Is it true that countries having high stock return correlation with the world portfolio are more likely to have well developed equity markets? Following Bekaert, Harvey and Lundblad (2002), I compute the correlation between a local market and the MSCI world portfolio using five-year overlapping observations of monthly returns. The correlation is then rescaled to fall between

zero and one using the following transformation

$$\textit{Scaled correlation} = \ln(2 - \textit{correlation}) / \ln(3), \quad (12)$$

with one representing perfect negative correlation.

3.3 The Institutional Efficiency Factors

There are many other country characteristics, particularly related to the country’s legal and institutional framework, which may not be viewed as macro fundamentals in determining the development of an equity market, but are relevant nonetheless for the market’s proper functioning hence its size and liquidity. For example, various government restrictions on businesses could prevent development of stock markets from reaching its “best-practice” potential. The stochastic frontier model used in the current paper incorporates such characteristics in the distribution of institutional efficiency. In fact, the model allows for time-varying, country-specific characteristics to directly affect institutional efficiency and hence equity market development.

Recently, there has been some growing interest among academics in the link between the legal framework and corporate finance. In a series of cross-country studies, La Porta et al. (1997, 1998) show that in terms of protection against expropriation by insiders, common law countries protect shareholders the most, French civil law countries the least, and German and Scandinavian civil law countries somewhere in the middle. Countries with poor quality of legal rules and law enforcement are associated with smaller and narrower capital markets. Subsequent studies by Demirgüç-Kunt and Maksimovic (1998), Dyck and Zingales (2002), and Leuz, Nanda and Wysocki (2003) conclude that better legal regimes are associated with more availability of external finance, lower levels of private benefits of control, and minimum levels of earnings management. Based on these findings, I include the following variables in the efficiency distribution (3) to capture the character of legal rules and the quality of law enforcement.

French origin is equal to one if the legal origin of the country is French civil law, and zero otherwise. German origin is defined similarly. The intercept term captures the effect of the baseline case, the Anglo-Saxon and Scandinavian origins.

Law and order, compiled by the Political Risk Services (PRS), is based on experts' evaluation of the efficiency of the state in enforcing property rights. The index is on a scale of 0 to 6. High levels of the index indicate sound political institutions and a strong court system, while low levels of the index indicate a tradition of depending on physical force or illegal means to settle claims. The average of the April and October indices is used to construct the annual measure.

Bhattacharya and Daouk (2002) show that the cost of equity in a country does not change after the introduction of insider trading laws, but decreases significantly after the first prosecution. Their finding has some direct bearing on the issues examined here. Specifically, if companies have to pay an extra return in stock markets because insiders trade with impunity, the market value and liquidity of their equities would be lower, everything else remaining constant. This implies that the existence of insider trading laws and their enforcement directly affect the institutional efficiency of a country. Data from Bhattacharya and Daouk (2002) is used to construct two insider trading regulation indicator variables. The first one, insider trading law enactment, changes from zero to one in the year after the insider trading laws are established. The second variable, insider trading law enforcement, changes from zero to one in the year after the first prosecution case is recorded.

In addition to the above indicators of the legal system, I consider other measures of the institutional environment, namely, shareholder rights, quality of accounting standards, country credit ratings, and economic freedom in the efficiency distribution (3). La Porta et al. (2002) show that poor shareholder protections are penalized with lower valuations. Their finding adds an important link to the explanation of the consequences of investor protections for financial market development. Using the data from La Porta et al. (1998), an index measuring shareholder rights is constructed which ranges from 0 to 6.⁷

Lombardo and Pagano (2000) find that there is a positive correlation between the risk-adjusted return on equity and quality of accounting standards. The variable on quality of accounting stan-

⁷Specifically, the index adds one when (1) there is one share-one vote; (2) shareholders are allowed to mail their proxy vote to the firm; (3) shareholders are not required to deposit their shares prior to the shareholders' meeting; (4) cumulative voting or proportional representation of minorities on the board of directors is allowed; (5) there are mechanisms to allow oppressed minority shareholders to make legal claims against the directors; and (6) there is possibility for minority shareholders to call for an extraordinary shareholder meeting.

dards is obtained from the Center for International Financial Analysis and Research (CIFAR, 1995). This variable measures the quality of companies' annual reports along seven dimensions: general information, income statement, balance sheet, funds flow statement, accounting policies, stockholders' information, and supplementary information. The index ranges from 0 to 100, with 100 representing the highest quality of accounting standards.

Erb, Harvey and Viskanda (1996) find that country credit ratings are a very good proxy for the ex ante risk exposure, particularly of segmented emerging markets.⁸ The data on country credit ratings come from the Institutional Investor's semi-annual survey of leading international bankers and are on a scale of 0 to 100, with 100 representing the least chance of default. The survey is published in March and September of each year, and the average of these two ratings is used to construct the annual measure.

Finally, I include the Economic Freedom of the World (EFW) index published by the Fraser Institute.⁹ The EFW index combines factors relating to trade policy, taxation policy, government consumption, monetary policy, foreign investment, banking, wage and price controls, property rights, regulation policy, and the black market. It measures the extent to which a business can operate in a stable environment in an unrestricted manner and keep as much of its profit as possible. The EFW index is on a scale of 0 to 10, with higher values indicating greater economic freedom.

4 Empirical Results

The data on the three measures of equity market development come from the World Bank's Financial Structure and Economic Growth database compiled by Beck, Demirgüç-Kunt and Levine (2001). The availability of this database across countries and over time determines the scope of my analysis in this paper. Data on stock returns are obtained from Datastream. Data on macro-

⁸The top three factors to make the credit rankings are debt service, political outlook, and economic outlook (Erb, Harvey and Viskanda (1996)).

⁹The EFW index comprises 21 components designed to identify the consistency of institutional arrangements and policies with economic freedom in seven major areas (Gwartney et al. (2001)). They are (1) size of government, (2) economic structure and use of markets, (3) monetary policy and price stability, (4) freedom to use foreign currencies, (5) legal structure and security of private ownership, (6) freedom to trade with foreigners, and (7) freedom of exchange in capital markets.

economic fundamentals are mainly obtained from the World Bank's World Development Indicators 2001 CD-ROM (WDI), and the OECD Main Economic Indicators 2001 CD-ROM. When data is not available from WDI, the IMF's International Financial Statistics are used to construct the relevant variables by definition.

Across the 33 countries covered in this study,¹⁰ some countries appear to be well developed by all measures: Australia, Hong Kong, Malaysia, the Netherlands, Singapore, Sweden, Thailand, the United Kingdom, and the United States. Some countries are large and illiquid, such as Chile. Other countries have active but small stock markets, especially noteworthy are Korea and Germany.

4.1 Basic Findings

Table 1 presents posterior means and standard deviations of the model parameters (i.e., β) in the stochastic frontier function (2). When using the market capitalization ratio as the measure of equity market development, I find that countries with high growth in real GDP per capita is associated with large equity markets, consistent with the findings in La Porta et al. (1997). I also find that the level of financial intermediary development and openness to trade appear to be the two most significant factors in positive association with the size of equity markets. This result complements Beck et al. (2000) and Bekaert et al. (2001, 2002) who find that financial intermediaries and trade are conducive to real economic growth.

When using the value traded to GDP as the left-hand-side variable, I find that again, the level of financial intermediary development is positively associated with, while government consumption, one of my two measures for macroeconomic stability, is negatively associated with equity market activity.

When using the turnover ratio as the left-hand-side variable, I find that poor macroeconomic stability, as captured by the fraction of government consumption in GDP, is negatively associated with equity market liquidity. Interestingly, openness to trade is also negatively associated with

¹⁰The list of countries is: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom, the United States, Hong Kong, Singapore, Argentina, Brazil, Chile, Colombia, Greece, India, Indonesia, Jordan, South Korea, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Thailand, Venezuela, and Zimbabwe.

equity market liquidity.

Throughout, high inflation appears to be weakly affecting the three measures of equity market development, consistent with the findings in Boyd et al. (2001). I have also tried using other threshold values to distinguish between high and low inflation and using the actual inflation in level, and the above results remain robust. It appears that there is no quadratic time trend in the stochastic frontier function.

Given that the stochastic frontier model is not poised to address endogeneity issues, to ensure that I am identifying the right association between macroeconomic fundamentals and equity market development indicators, I have conducted extensive robustness checks on the above results. For instance, macroeconomic fundamentals that are typically used to explain economic growth are also considered. They are: total external debt over GDP, budget deficit over GDP, industry value added, gross capital formation, population growth, school enrollment, life expectancy, domestic credit, interest rates, and stock market volatility. The results obtained so far are fairly robust with inclusion of these other variables.

Table 2 presents posterior means and standard deviations of the parameters (i.e., ϕ) in the institutional efficiency function (3). Note that if $\phi_j > 1$ (< 1) then the country characteristic j is associated with a higher (lower) level of institutional efficiency, and $\phi_j = 1$ indicates that the country characteristic has no effect on efficiency. Bayes factors for testing the null $\phi_j = 1$ with unrestricted alternatives are also given in Table 3 (in brackets). Values of Bayes factors greater than one indicate support for the null.

Consistent with La Porta et al. (1997, 1998), I find that French and German civil law countries and countries with poor quality of legal rules and law enforcements are associated with low level of institutional efficiency as reflected in smaller equity markets. Interestingly, although French and German civil law countries tend to have smaller equity markets, these same countries tend to have equity markets with higher turnover ratios than their common law counterparts. This is a new finding in the literature which has not been documented before. The intuition here is that although governments of French and German civil law countries cannot change their legal origins,

they are making efforts to improve other aspects of their legal environment, as a result, their stock markets are performing more efficiently in terms of turnover ratios as compared to those of common law countries.

I find that the enactment of insider trading laws and its subsequent enforcement greatly enhance the institutional efficiency of a country, fostering larger, active, and more liquid equity markets. Stronger shareholder protections improves a country's institutional efficiency in fostering larger and more active equity markets. High quality of accounting standards adds transparency, good country credit ratings reflect macroeconomic stability, and I find both are conducive to equity market activity and liquidity.

La Porta et al. (2002) and Rodrik (2001) argue that the presence (or creation) of institutions that generate market-oriented incentives, protect investors, and enable social and political stability, is the key to economic growth of a nation. I find that greater economic freedom overall as captured by the EFW index, facilitate the development of a nation's equity market: the greater the economic freedom, the larger, more active, and more liquid a nation's equity market becomes.

For robustness, I also examined the role of creditor rights (La Porta et al. (1998)), trading costs (from Elkins/McSherry), information disclosure (from S&P/IFC EMDDB), the corruption perception index (from Transparency International), the role of financial liberalization (Bekaert and Harvey (2000)) and privatization (Perotti and van Oijen (2001)) in affecting the institutional efficiency of a country. It appears that the results reported above remain unchanged.

4.2 Institutional Efficiency Over Time and Across Countries

The role of country characteristics in institutional efficiency can be partly understood through ϕ 's, but an examination of the institutional efficiency itself is more informative. To illustrate the different effects of various country characteristics on institutional efficiency, I present some efficiency numbers associated with hypothetical economies. For example, using the market capitalization ratio as the measure of equity market development, the level of institutional efficiency τ is 82% for an economy with establishment and enforcement of insider trading laws, and quality of accounting standards, country credit ratings and economic freedom above the sample average values. That is,

the size of equity market in this economy is 82% of the maximum it could be under a frictionless world, or the equity market is underdeveloped by 18%. Using the value traded to GDP as the measure, for the same economy, the level of institutional efficiency τ is 95%. If using the turnover ratio as the measure, the level of institutional efficiency τ is 96%. That is, in terms of turnover, the equity market in this economy is very close to the maximum it could be under a perfect institutional framework.

To examine how institutional efficiency evolves over time and differs across countries, Figure 1 presents posterior means of the average levels of efficiency in each year across sample countries, and Figure 2 present similar statistics of the average levels of institutional efficiency in each country during the sample period.

It appears that for all three measures of equity market development, there is a general trend of moderate improvement in institutional efficiency over time, particularly for the efficiency measure using the metric of the valued traded to GDP and turnover ratio. The institutional efficiency using the turnover metric appears to be most bumpy over the sample period, reflecting the fact that both the numerator and denominator are subject to institutional influences.

Among all the countries examined, which country has the highest level of institutional efficiency given its level of macro fundamentals? Figure 2 provides the answer. Using the market capitalization to GDP ratio as a metric of equity market development, Panel A of Figure 2 shows that Australia, Canada, the United Kingdom, the United States, Hong Kong, and Singapore clearly have the highest level of institutional efficiency. Using the valued trade to GDP ratio as the metric, Panel B of Figure 2 shows that the countries with the highest level of institutional efficiency are: Canada, the United States, and Singapore. Finally, using the turnover ratio as the measure of equity market development, Panel C of Figure 2 shows that Canada, France, the United States, and Singapore are the countries with the highest level of institutional efficiency. Across countries, there is a fairly large dispersion in the average levels of institutional efficiency.

4.3 The Sources of Equity Market Growth

The stochastic frontier modeling framework adopted in this paper allows for the breakdown of changes in equity market development into changes due to reduction in institutional inefficiency, improvements in macro fundamentals, and changes in investor sentiment. Figure 3 presents the decomposition results where the height of each bar represent the average change in measures of equity market development over time, and three colored components within a bar represent the change of equity market development due to the above three components.

It appears that many sample countries have experienced some moderate improvement in its legal, institutional and policy framework during the sample period. For a couple of the countries, the improvement in institutional efficiency has been drastic, notably, Austria, Denmark, Indonesia, and Pakistan. One country, Colombia, experienced some deterioration in its institutional framework.

Not surprisingly most of the sample OECD countries have made relatively little progress in terms of the macroeconomic fundamentals, while most of developing countries have enjoyed moderate improvement in macroeconomic fundamentals, the exceptions are Mexico and Venezuela. Overall, the role of changes in macroeconomic fundamentals on a country's equity market development is the smallest relative to the other two components of the decomposition for most of the countries.

Finally, favorable shifts in investor sentiment have played an important role in the development of global equity markets during the sample period. That is, during my sample period of 1978-1997, for a given level of macroeconomic fundamentals and institutional efficiency, investors tend to have a favorable view about the future prospect of equity markets, and thus invest and/or trade more, consistent with the evidence in Baker and Wurgler (2003) who find that investor sentiment has strong effects on the cross-section of stock prices. Many of these findings could not be obtained using other models or methods, and hence have no counterpart in the existing literature.

The finding that favorable shifts in investor sentiment contribute to a large part of the growth in global equity markets carries with it a number of significant implications for both policy and international investing. Governments should exercise caution when contemplating any economic policies that foster the development of their national stock market. The size and activity of their

stock market may be high when market sentiment shifts in their favor, but it can also shift against them for reasons beyond governments' control, making it difficult to attract foreign investment and maintain stability in the local stock market. One way for countries to insure against the capriciousness of stock markets is to diversify sources of financing beyond equity.

From the viewpoint of professional portfolio investors, when judging the soundness of a country's equity market focus should be more on the economic and institutional determinants of equity market, rather than on various indicators of equity market development which are prone to speculative attacks driven by the inexplicable market sentiment.

5 Conclusions

A growing body of research has shown that stock market development explains economic growth. This paper contributes to the literature by examining the channel through which the legal and institutional framework influences the development of equity markets, using a generalized version of the stochastic frontier model. While considerable effort in the past has been expended on explaining the cross-section of growth in equity markets, the stochastic frontier model allows me to focus on the temporal component of growth in addition to the cross-sectional relationship.

Using data on 33 countries, I find that development of financial intermediaries and openness to trade are positively associated with the size and activity of equity markets, while government consumption is negatively associated with the activity and liquidity of equity markets. Under the stochastic production frontier model, the legal and institutional characteristics are assumed to affect a country's equity market development through the channel of institutional efficiency. Specifically, French and German legal origins lead to smaller but more active equity markets. Laws that protect shareholders rights, accounting standards that produce high-quality, comprehensive and comparable corporate financial statements, and good country credit ratings tend to foster the country's equity market development. Finally, greater economic freedom of a country is associated with more developed equity markets. Overall, I find that there are wide differences in institutional efficiency across countries and over time.

My most striking finding is that improvement in institutional efficiency, and changes in investor sentiment, appear to be the driving force behind the phenomenal expansion of global equity markets over the past two decades. Many developed countries and some developing countries experience little to moderate improvements in their market fundamentals during the sample period. Improvements in institutional efficiency vary across countries, particularly in developing countries.

It is interesting to note that when this research project first started in early 2000, the investment community and the media were still very excited about the “new economy” and the stellar performance of equity markets around the world. My findings provide a diagnosis on the causes of this growth spurt in global equity markets: a large part of the expansion in global equity markets was fueled not by improved economic fundamentals or by better institutions, but by extremely optimistic market sentiment, which of course was not sustainable as we have all learned by now.

Appendix

The model presented in Section 2.1 defines the likelihood function and some aspects of the prior. In specifying the prior, little subjective prior information is introduced, and a proper prior is adopted, which ensures that the resulting posterior distribution is well-defined (Koop et al. (2000)).

Let $y_t = (y_{t1}, \dots, y_{tN})'$, $X_t = (x_{t1}, \dots, x_{tN})'$, and u_t, v_t are defined conformably with y_t . To write the model in (2) in matrix form the following notations are introduced. Let

$$Q_t = \iota_N \otimes (1 \quad t \quad t^2), \quad Q = \begin{bmatrix} Q_1 \\ Q_2 \\ \vdots \\ Q_T \end{bmatrix},$$

$$X_\beta = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & 0 & \vdots \\ \vdots & 0 & \ddots & 0 \\ 0 & \cdots & 0 & X_T \end{bmatrix},$$

$$X = \begin{bmatrix} Q & X_\beta \end{bmatrix},$$

where ι_N is an N -dimensional vector of ones, and \otimes is the Kronecker product. The model specified in Section 2.1 can then be written as

$$y = X\beta - u + v, \tag{A1}$$

where $y = (y'_1, \dots, y'_T)'$, $u = (u'_1, \dots, u'_T)'$, $v = (v'_1, \dots, v'_T)'$, and $\beta = (m_0 \ m_1 \ m_2 \ \beta_1, \dots, \beta_T)'$ is a $(3 + KT)$ -dimensional vector of parameters.

The model specification is completed with the following independent prior structure

$$p(\beta, \sigma^{-2}, \phi) = p(\beta)p(\sigma^{-2})p(\phi), \tag{A2}$$

where $\phi = (\phi_1, \dots, \phi_m)'$. In addition to the assumptions about the prior for β made in Section 2.1, the following prior specification for β is used

$$p(\beta) = f_N^{3+KT}(\beta|b_0, B_0^{-1}), \tag{A3}$$

where $f_N^{3+KT}(\cdot|b_0, B_0^{-1})$ is the density function of the $(3 + KT)$ -variate normal distribution with mean b_0 and variance-covariance matrix B_0^{-1} , $b_0 = \iota_{3+KT}$, a $(3 + KT)$ -dimensional vector of ones, and

$$B_0^{-1} = \begin{bmatrix} c_1 I_3 & 0 \\ 0 & c_2 R \otimes D_2 \end{bmatrix},$$

with c_1, c_2 , and D_2 being prior hyperparameters, and

$$R = \begin{bmatrix} 1 & r & \dots & r^{T-1} \\ r & 1 & \dots & r^{T-2} \\ \vdots & \vdots & \ddots & \vdots \\ r^{T-1} & r^{T-2} & \dots & 1 \end{bmatrix}.$$

First set $c_1 = c_2 = 100$, and $D_2 = I_K$ (the baseline case). Then vary these values in a prior sensitivity analysis. It appears that changing the baseline values by a factor 10 in either direction has little effect on results.

The prior specification for the variance of the symmetric error term is given as

$$p(\sigma^{-2}) = f_G(\sigma^{-2} | \frac{n_0}{2}, \frac{a_0}{2}), \quad (\text{A4})$$

where $f_G(\cdot | \frac{n_0}{2}, \frac{a_0}{2})$ is the density function of the Gamma distribution with shape parameter $\frac{n_0}{2}$ and scale parameter $\frac{a_0}{2}$, the mean being n_0/a_0 and the variance n_0/a_0^2 , and $n_0 = a_0 = 10^{-6}$ which makes the prior on σ^{-2} very close to the noninformative prior.

The prior specification for the ϕ_j 's is independent Gamma

$$p(\phi_j) = f_G(\phi_j | a_j, g_j), \quad j = 1, \dots, m, \quad (\text{A5})$$

with $a_j = 1$ ($j = 1, \dots, m$), $g_1 = -\ln(\tau^*)$, and $g_j = 1$ ($j = 2, \dots, m$). This prior on the ϕ_j 's is noninformative and centered reasonably. In particular, if the country characteristics W_2, \dots, W_m have no effect on the efficiency distribution, then the prior median efficiency would be τ^* . First set $\tau^* = .75$, then vary values of τ^* in the interval $[.10, .99]$ yielding results that are virtually identical to those reported in the paper. The priors for ϕ_2, \dots, ϕ_m are all centered at one, a value which implies that the country characteristics W_2, \dots, W_m have no effect on valuation efficiency.

In sum, the full Bayesian model can be written as

$$p(\beta, \sigma^{-2}, \phi | y, X, W) = f_N^{TN}(y | X\beta - u, \sigma^2 I_{TN}) \prod_{t=1}^T \prod_{i=1}^N f_G(u_{ti} | 1, \prod_{j=1}^m \phi_j^{w_{tij}}) p(\beta, \sigma^{-2}, \phi). \quad (\text{A6})$$

To obtain posterior estimates of the model parameters in (A6), Gibbs sampling methods (Gelfand and Smith (1990)) are used. Specifically, posterior draws of β can be obtained from the following conditional distribution

$$p(\beta|y, \sigma^{-2}, u, \phi) = f_N^{3+KT}(\beta|B^{-1}[B_0b_0 + \sigma^{-2}X'(y + u)], B^{-1}), \quad (\text{A7})$$

where $B = B_0 + \sigma^{-2}X'X$.

The next conditional is

$$p(\sigma^{-2}|y, \beta, u, \phi) = f_G(\sigma^{-2}|\frac{1}{2}(n_0 + TN), \frac{1}{2}[a_0 + (y - X\beta + u)'(y - X\beta + u)]). \quad (\text{A8})$$

Then, the level of valuation efficiency can be drawn from

$$p(u|y, \beta, \sigma^{-2}, \phi) = f_N^{TN}(u|X\beta - y - \sigma^2\eta, \sigma^2I_{TN})I(u\epsilon R_+^{TN}), \quad (\text{A9})$$

where $\eta = (\lambda_{11}^{-1}, \dots, \lambda_{TN}^{-1})$, $I(\cdot)$ is an indicator function, which equals one if u is positive, and zero otherwise.

The conditional distribution of any of the ϕ_h 's ($h = 1, \dots, m$) depends only on u and $\phi^{(-h)} = (\phi_1, \dots, \phi_{h-1}, \phi_{h+1}, \dots, \phi_m)'$ and is given by

$$p(\phi_h|u, \phi^{(-h)}) = f_G(\phi_h|a_h + \sum_{t=1}^T \sum_{i=1}^N w_{tih}, g_h + \sum_{t=1}^T \sum_{i=1}^N w_{tih}u_{ti} \prod_{j \neq h} \phi_j^{w_{tij}}). \quad (\text{A10})$$

The Gibbs chain is constructed from sequential draws from (A7)-(A10). After a burn-in of 1,000 draws, 10,000 Gibbs draws are retained. Many runs of different lengths and from various starting values are conducted and the results are similar to those reported in the paper. Bayes factors for comparing various restricted versions of the model are calculated using the Savage-Dickey density ratio as in Verdinelli and Wasserman (1995).

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Table 1. Posterior estimates of the parameters in the stochastic frontier function (2)

The dependent variable is one of the following three measures of stock market development in logarithms. Market capitalization is the stock market capitalization to GDP ratio which equals the value of listed shares divided by GDP. Both numerator and denominator are deflated appropriately. Value traded is the stock market total value traded to GDP which equals total shares traded on the stock market exchange divided by GDP. Turnover is the ratio of the value of total shares traded and market capitalization. Growth of GDP per capita is the growth rate of real gross domestic product per capita. GDP per capita is the real gross domestic product per capita in 10,000 US dollars and measured in logarithms. Inflation is equal to one if the annual CPI inflation rate exceeds the sample average, and zero otherwise. Private credit refers to financial resources provided to the private sector, normalized by GDP and measured in logarithms. Government consumption includes all current expenditures by all levels of government, normalized by GDP and measured in logarithms. Trade is the sum of exports and imports of goods and services, normalized by GDP and measured in logarithms. Stock market correlation is the scaled correlation between the local equity market and world returns by following Bekaert et al. (2002) and defined in (12). The sample period is 1978-1997. Posterior standard deviations are in parentheses.

Variable	Market Capitalization	Value Traded	Turnover
Growth of GDP per capita	3.14 (2.46)	3.64 (2.89)	1.53 (2.47)
GDP per capita	.011 (.116)	-.011 (.195)	.032 (.153)
Inflation	.137 (.372)	-.171 (.684)	-.231 (.526)
Private Credit	.756 (.232)	.702 (.378)	.168 (.292)
Government Consumption	.157 (.230)	-.539 (.370)	-.362 (.310)
Trade	.438 (.144)	.117 (.202)	-.294 (.167)
Stock Market Correlation	-.924 (1.20)	-1.32 (1.64)	.601 (1.28)
Intercept	.785 (1.30)	-3.52 (.905)	-3.22 (.593)
Linear Trend	.007 (.115)	.129 (.164)	.117 (.121)
Quadratic Trend	-.004 (.005)	-.0004 (.007)	.002 (.005)

Table 2. Posterior estimates of the parameters in the institutional efficiency distribution (3)

The dependent variable is one of the following three measures of stock market development in logarithms. Market capitalization is the stock market capitalization to GDP ratio which equals the value of listed shares divided by GDP. Both numerator and denominator are deflated appropriately. Value traded is the stock market total value traded to GDP which equals total shares traded on the stock market exchange divided by GDP. Turnover is the ratio of the value of total shares traded and market capitalization. French origin is equal to one if the legal origin of the country is the French civil law, and zero otherwise. German origin is defined similarly. Law and order is equal to one if the corresponding index from the Political Risk Services is greater than 4.5 (out of 6), and zero otherwise. The insider trading law enactment indicator changes from zero to one in the year after the insider trading laws are established. The insider trading law enforcement indicator changes from zero to one in the year after the first prosecution is recorded (Bhattacharya and Daouk (2002)). Shareholder rights is equal to one if the corresponding index from La Porta et al. (1998) is greater than 4 (out of 6), and zero otherwise. Quality of accounting standards is equal to one if the corresponding index from CIFAR (1995) is greater than 68 (out of 100), and zero otherwise. Country credit ratings is equal to one if the actual rating from the Institutional Investor is greater than 65 (out of 100), and zero otherwise. Economic Freedom of the World is equal to one if the corresponding index from the Fraser Institute is greater than 7 (out of 10), and zero otherwise. Values of the parameter estimate greater (less) than one indicate that the corresponding explanatory variable is positively (negatively) associated with institutional efficiency. Values of Bayes factors greater than one indicate support for the null that the explanatory variable has no effect on the efficiency distribution, i.e., the parameter has a value of one. The sample period is 1978-1997. Posterior standard deviations are in parentheses, and Bayes factors testing the null are in brackets.

Variables	Market Capitalization	Value Traded	Turnover
	.378	.965	1.49
French Origin	(.078) [< .001]	(.131) [7.68]	(.194) [.062]
	.269	1.21	3.56
German Origin	(.066) [< .001]	(.255) [3.67]	(1.04) [< .001]
	.586	.985	1.22
Law and Order	(.149) [.378]	(.240) [4.28]	(.296) [3.79]
	1.55	1.58	1.43
Insider Trading Law Enactment	(.248) [.130]	(.208) [.029]	(.187) [.223]
	1.15	2.14	3.56
Insider Trading Law Enforcement	(.275) [4.12]	(.762) [.096]	(1.38) [< .001]
	6.45	1.83	1.05
Shareholder Rights	(1.85) [< .001]	(.253) [< .001]	(.150) [7.22]
	1.03	1.64	2.15
Quality of Accounting Standards	(.141) [7.88]	(.188) [< .001]	(.278) [< .001]
	1.37	1.61	1.77
Country Credit Ratings	(.342) [2.02]	(.354) [.680]	(.372) [.232]
	2.04	2.64	1.70
Economic Freedom of the World	(.387) [.018]	(.582) [< .001]	(.357) [.193]
	2.75	.367	.453
Intercept	(.790) [-]	(.059) [-]	(.073) [-]

Figure 1. Institutional Efficiency Over Time

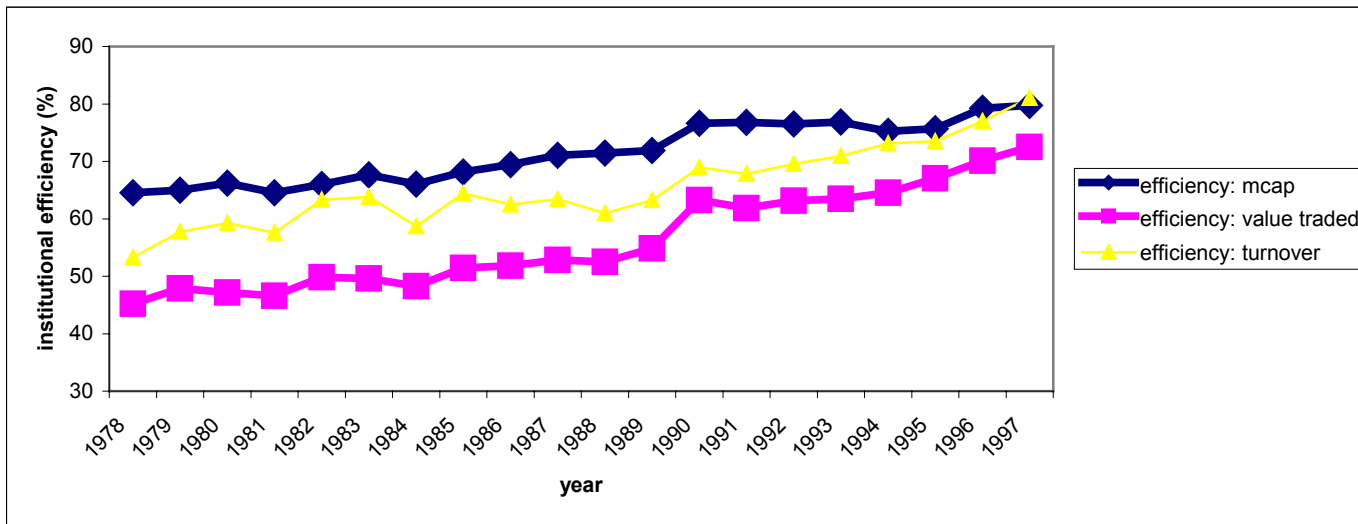
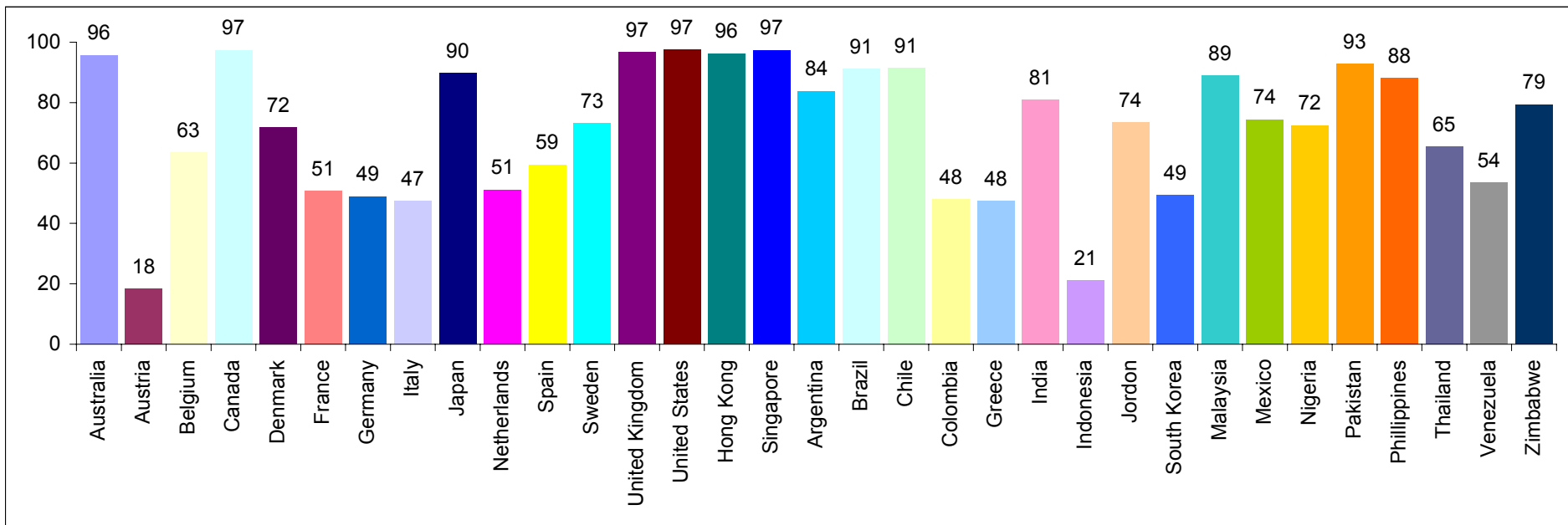
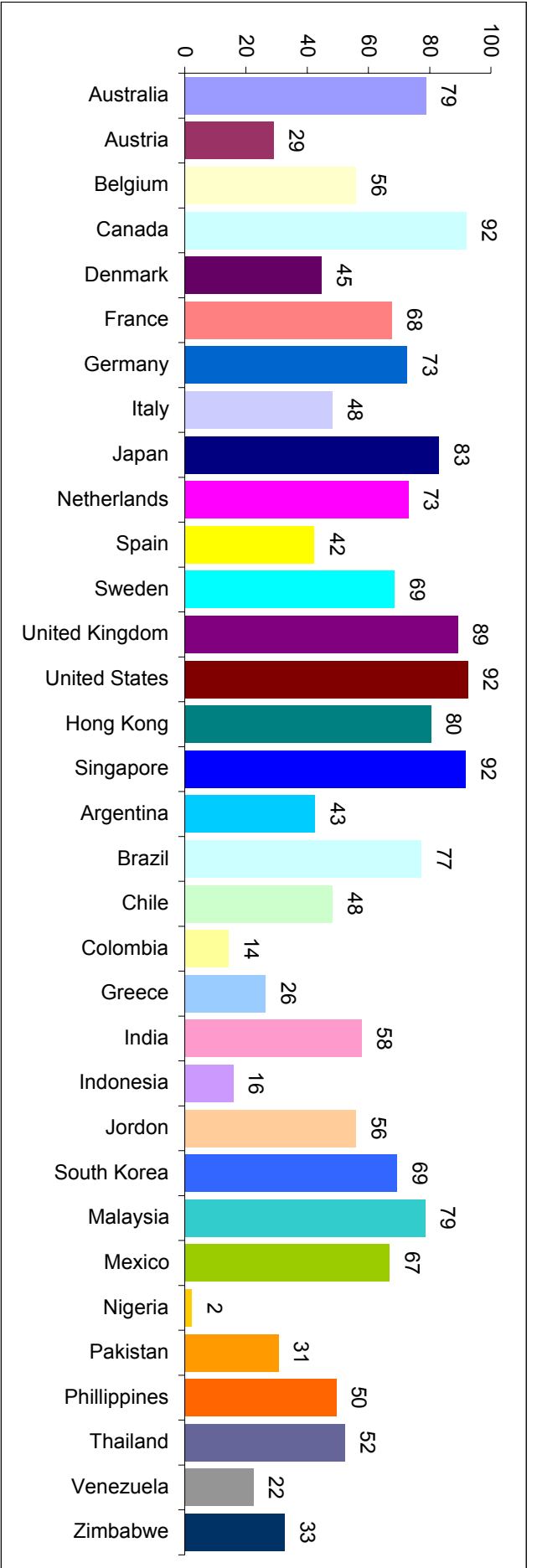


Figure 2. Institutional Efficiency Across Countries
Panel A. Market Capitalization



Panel B. Value Traded



Panel C. Turnover

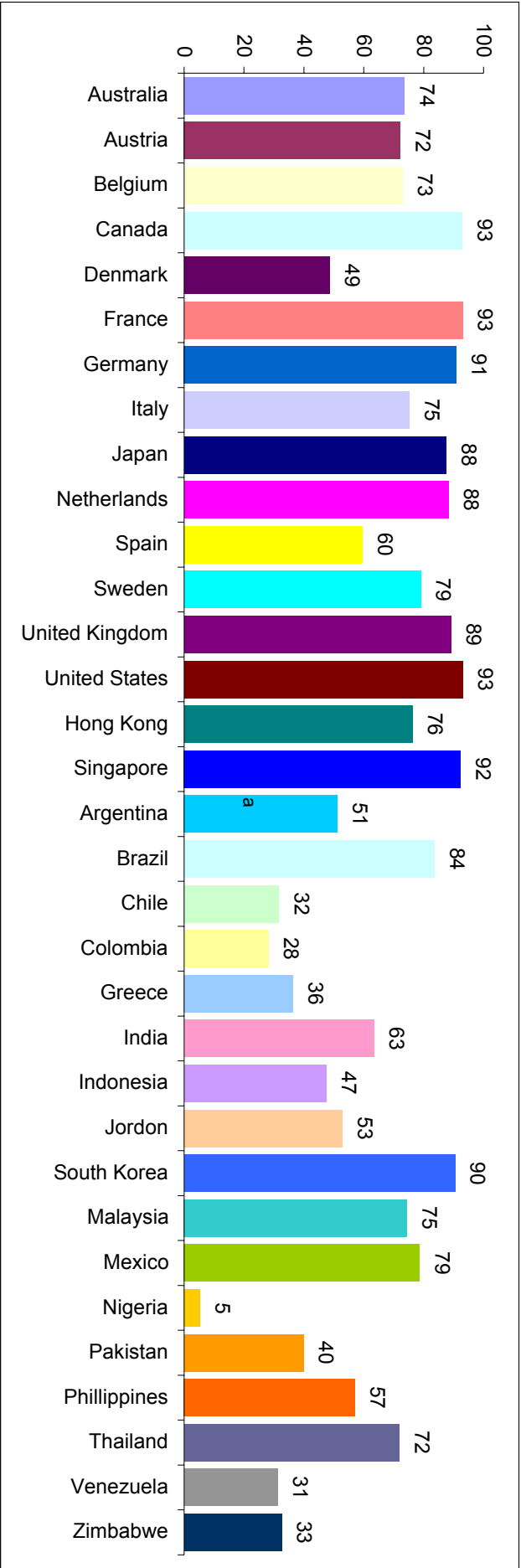
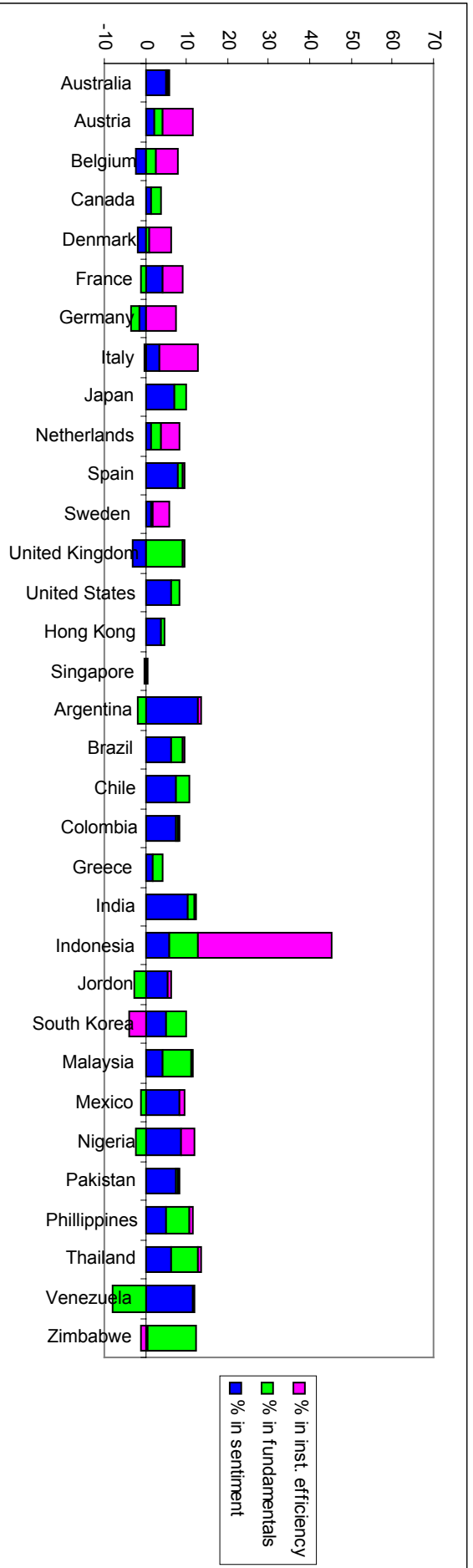


Figure 3. Sources of Growth of Global Equity Markets
 Panel A. Market Capitalization



Panel B. Value Traded

