On the presence and market-structure of exchanges around the world

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Abstract

We investigate the cross-section of 256 financial exchanges throughout the world. First, we empirically analyze the country characteristics that are related to having a financial exchange. Second, we investigate the determinants of an exchange's choice of trading mechanism, and third, we examine whether the presence of an exchange in a country impacts the domestic country's economy. We find that the main determinants for an exchange to exist in a country are the size of the economy, trade policy, foreign investment, development of the banking sector and the legal system. Our results show that the choice of trading mechanism depends on the number of assets traded and the legal system. Lastly, we find that the presence of an exchange is associated with a reduction in the growth of the monetary aggregates but is not associated with other measures of domestic growth and productivity.

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0. Introduction

Understanding the inner workings and overall impact of a financial exchange cannot be underestimated, particularly given the increasing globalization of capital markets. Consistent with its importance, a large literature studies exchange trading and its macroeconomic impact on the economy. Interestingly, this literature focuses almost exclusively on a handful of exchanges in the most developed countries. While crucial to our understanding of exchanges, this literature is incomplete given that at least 60 new equity exchanges have been created globally since 1990, and a significant proportion of global trading is executed on financial exchanges not covered by existing research. For example, equity trading outside the Frankfurt, London, New York, NASDAQ, Paris and Tokyo Stock Exchanges is approximately 27% of global dollar volume and 58% of the global number of transactions.[1]

We broaden the scope of research on international financial exchanges by analyzing the cross section of 256 financial exchanges within 101 countries out of the total 191 countries around the world. Our analysis has three goals. The first goal is to enhance the understanding of the characteristics of the economic environment that are associated with the presence of a financial exchange in a country. We do this by examining the factors that predict the existence of a financial exchange in a country. In addition, we examine the factors that predict multiple exchanges; this is crucial if competition among exchanges has important economic effects. Our second goal is to analyze factors that determine the choice of trading mechanisms by financial exchanges. This is salient given that the market-microstructure literature has been relatively silent about whether particular trading mechanisms are used within different economic environments and with different types of financial securities. The third goal is to investigate the long-run relation, if any, between the presence of a financial exchange and the domestic economy. Previous research investigating the impact of equity markets on the macro economy has focused on well-developed equity markets in the industrial countries of the world. The contribution of this work is that we investigate the *initial* exchange formation within a country since 1950 and include countries that *do not* currently (in 1998) have a financial exchange. Thus, our analysis benefits from knowing the exact formation dates as well as using a more comprehensive sample.

From a policy perspective, understanding why some, but not all, countries choose to have one or more exchanges remains a crucial issue. Our findings provide guidance to policy makers trying to determine the viability of an exchange in their country. Moreover, our results help officials of existing exchanges that are facing competitive pressures better evaluate their optimal choice of trading mechanism.

Our results show that the presence of at least one financial exchange within a country is associated with larger economies and civil law legal systems. In addition, countries with greater economic freedom are more likely to have an exchange, with trade policy, foreign investment, and banking being the most critical factors. Specifically, countries with open trade policies, that are open to foreign investment,

[1]Based on the Federation of International Stock Exchange (FIBV) statistics.

and have developed banking sectors, are more likely to have a financial exchange. When we analyze the existence of *one* vs. *multiple* exchanges however, the results show that larger economies with well developed banking sectors and minimal government intervention are associated with a higher probability of multiple exchanges.

Our results on the choice of trading mechanism show that exchanges where market participants provide liquidity are more likely to occur within civil law legal systems where many assets are traded on the exchange. Conditioning the analysis on the presence of competing exchanges within a country, the type of government also becomes important as well as the size of the economy. The results are consistent with a hierarchy from systems in which *market makers* provide liquidity, such as open outcry, to systems where the *market participants* provide liquidity, such as a limit order book as the economy grows.

Lastly, our analysis of the long-run relation between a country's initial exchange formation and its domestic economy reveals that the presence of an exchange is associated with a marked reduction in the growth of the monetary aggregates with little or no impact on other aspects of the macro economy such as domestic credit, productivity and inflation. These results are consistent with the argument made by Allen and Gale (1997) that financial exchanges give market participants the ability to diversify wealth into liquid assets, thereby reducing the need for cash.

This paper relates directly to ongoing research that bridges the gap between finance and law and investigates how institutional country characteristics, such as legal system, legal origin and type of government, impact firms' choice of financing, dividend policy, and corporate ownership structure.[2] In a similar vein, we relate institutional country characteristics to the presence or absence of any exchanges within a country and the exchanges' choice of trading mechanism. In addition, work by Arnold et al. (1999) and Jorion and Goetzmann (1999) on the history and evolution of stock exchanges and stock markets highlights the impact of changes in liquidity provision on the distributed trading volume across markets and the equity premium, respectively.

A substantial market microstructure literature addresses how the structure of a financial exchange affects market participants. This literature concentrates on analyzing one, or comparing two, exchanges. Typically this work has focused on the larger United States exchanges: the New York Stock Exchange, NASDAQ and Chicago derivative exchanges (Chicago Board of Trade, Chicago Mercantile Exchange, and Chicago Board of Options Exchange). Subsequent studies focus attention on dominant equity exchanges in developed countries around the world; however, there are exceptions, for example Jain (2003), who compares liquidity measures across 51 exchanges around the world.[3] Collectively, these studies cover

[2]See Demirguc-Kunt and Maksimovic (1998), La Porta et al. (1996, 1999), henceforth LLSV, and Henisz (2000).

[3]Examples include Niemeyer and Sandås (1993), Hedvall and Niemeyer (1997), Lehmann and Modest (1994), Biais et al. (1995), Frino and McCorry (1995), Hamao and Hasbrouck (1995), de Jong et al. (1995), Lau and McInish (1995), Gemmill (1996), Harris (1996), Reiss and Werner (1996), Griffiths et al. (1998), and Jarnecic and McInish (1997).

only a small fraction of the 256 exchanges that are operating in the world today. Like the market microstructure literature, we analyze the trading mechanism chosen by an exchange; however, we investigate the choice using a large cross-section of exchanges.

Lastly, a burgeoning literature presents a broad spectrum of arguments concerning the impact of financial market development on the macro economy. Levine (1991), Atje and Jovanovic (1993), Levine and Zervos (1996, 1998) and Rajan and Zingales (1998), among others, argue that the development of a capital market within a country serves to make capital more readily available, thereby lowering firms' cost of capital. In contrast, Allen and Gale (1997) model the benefits of a developed capital market as the ability of market participants to diversify risks. However, it is unclear whether the existence of an exchange provides the catalyst for the economy to grow at a faster rate. Lucas (1988) suggests that the benefit of financial market development on economic growth is at best badly overstated. Still others, such as Devereux and Smith (1994) and Morck et al. (1990a, b), argue that financial market development can actually impede economic growth.

More recently, Bekaert and Harvey (2000), Bekaert et al. (2002a, b) and Bekaert et al. (2001, 2005) analyze the impact of the integration of emerging equity markets into the world economy. Their work is similar to ours in that they *date* market liberalizations and measure the impact on the domestic economy. Collectively, their results suggest that liberalization increases economic growth and expands the size and liquidity within the domestic stock market by reducing the cost of capital by as much as 0.75% and increasing equity inflows by an average of 1.4%.

The remainder of this paper is organized as follows. Section 1 provides the theoretical background for the study. Section 2 describes our data and presents some summary statistics. Section 3 relates country characteristics to the existence of a financial exchange within a country using a probit model. Section 4 provides a probit model of a financial exchange's choice of trading mechanism. Section 5 analyzes the relation between the existence of a financial exchange and the macro economy and Section 6 concludes.

1. Theoretical background

In this section, we outline a collection of theoretical arguments that motivate our hypotheses. While at times mutually exclusive, these arguments suggest performing empirical tests of whether a country has an exchange, and if so, the type of trading mechanism it employs.

First, LLSV (1996) demonstrate that the legal system is strongly tied to shareholder and creditor rights. They find that countries with common law systems (civil law systems) have strong (weak) shareholder and creditor protection under the law. Due to the weaker protection under the law, LLSV find that firm owners in civil law countries take additional steps to insure investors an adequate return, such as mandatory dividends, minimum capital requirements and concentrated ownership. When investors have limited ability to recover asset values from the firm, the

securities issued will have less worth; consequently, firms face more obstacles raising external funds. LLSV argue that the difference in legal systems greatly affects how firms operate, especially with respect to the decision to go public and the ability to raise funds from a diverse group of investors. Given these large differences in how firms raise capital, conditional on the legal system, we expect the benefits of an exchange would also be affected by the legal system. In particular, we hypothesize that legal protection for investors increases the ability of firms to secure external financing, and thus, increases economic efficiency.[4] Thus, based on the results of LLSV (1996), we expect that legal system would play a role in whether countries have an exchange, such that common (civil) law countries are more (less) likely to have an exchange.

Second, in a series of papers, Bekaert and Harvey demonstrate that liberalization, measured by regulatory changes, openness of capital flows through the introduction of depository receipts or country funds, is associated with increases in real economic growth as well as reductions in the cost of capital. Following their work we wish to include a measure of the degree of liberalization that a country has experienced. As a coarse measure of liberalization, we include rankings of economic freedom by country. The rankings are a measure of economic freedom on various dimensions, such as tax, trade and monetary policy. Consistent with the liberalization results of Bekaert and Harvey, we hypothesize that the probability that a country has established an exchange increases with its economic freedom.

Third, governments clearly impact the amount of autonomy citizens possess, which in turn has ramifications for citizens' behavior through social and political norms. Work by Henisz (2000) argues that governments also impact *economic considerations* via the number of constraints, or hurdles, citizens must overcome in order to realize their economic goals. To account for the possible effect governments can have on the economic environment and freedom of individuals we use the type of government as an explanatory variable.

Finally, Hagerty and Rogerson (1987) compare exchange trading mechanisms where prices are posted in advance, such as trading mechanisms relying on market participants' liquidity provision, to market makers' liquidity provision. They argue on theoretical grounds that the former trading mechanisms, where prices are posted in advance, are robust to the distribution of private information within the market but also place more demands on market participants to bear adverse selection risk. In contrast, trading mechanisms relying on market maker liquidity provision place less of a burden on all market participants but require sufficient compensation to those willing to bear the aggregate adverse selection risk. Our partition of exchange trading mechanisms is consistent with Hagerty and Rogerson (1987). We hypothesize that larger, more developed, markets will tend to have exchanges where market participants supply liquidity because their trading population is better suited to distribute and carry its own adverse selection risk. Less developed markets must still rely on, and pay for, market maker services to supply liquidity.

[4]Although this view is rather standard, it is not universally held; see Shleifer and Vishny (1997) for a survey of this literature.

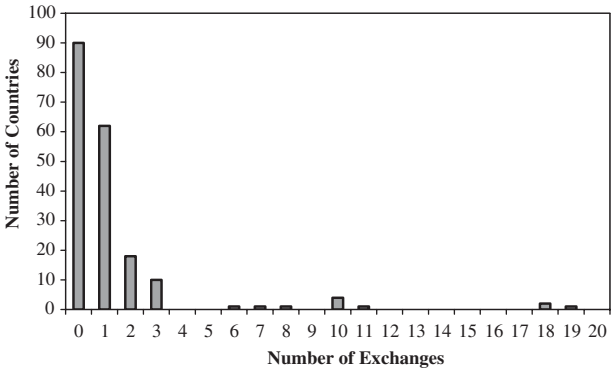

Chart 1. The graph displays a histogram of exchanges that exist in countries of the world as of December 1998. Exchanges include equity, derivative as well as fixed income and cash commodity exchanges. The following countries have more than five exchanges with the number of exchanges in parenthesis: Argentina (11), Brazil (10), Canada (7), China (10), Germany (10), India (19), Japan (18), Spain (8), Russia (10), United Kingdom (6) and United States (18).

2. Data and summary statistics

2.1. Data on financial exchanges

We gathered information for any exchange, equity or otherwise, that we could identify through various sources. A formal definition of what is meant by a financial exchange remains notoriously difficult. While Lee (1998) synthesizes the definitions and characteristics of exchanges, we use the *Handbook of World Stock, Derivative and Commodity Exchanges (1998)* as an initial main source of exchanges. We supplemented the dataset with information obtained from various Internet websites. While this may not capture all exchanges, we have been able to collect information on 256 exchanges spanning 101 countries.[5] We could not verify the existence of any financial exchanges in the remaining 90 countries. For each exchange, we collected information on the country in which it resides, the first trading date of the exchange, the primary type of asset traded, the number of domestic firms traded for equity markets or the number of different contracts for derivative markets, and the type of trading mechanism. We classify the predominant type of asset traded as equity, derivative, or other, where other covers cash commodities and fixed income securities. While many exchanges trade multiple asset types, we characterize the primary asset traded based on the largest number of securities traded and the highest trading volume.

Chart 1 shows the distribution of financial exchanges among the countries of the world. Approximately one half of the countries do not have an exchange of their own. Moreover, while most countries have three or fewer exchanges within their

[5]We thank an anonymous referee for helping us reconcile our dataset of exchanges with the dataset in Bhattacharya and Daouk (2002).

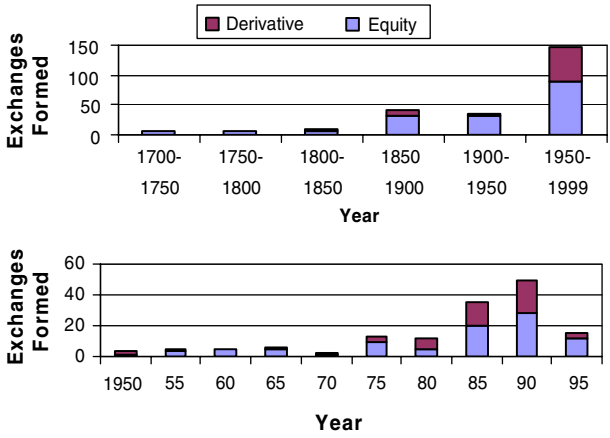

Chart 2. The graph displays a timeline of starting date of exchanges. Exchanges include equity and derivative exchanges. We report starting dates for exchanges existing as of December 1998. Panel 1 shows first trading dates from 1750 through 1998 while Panel 2 shows first trading dates from 1950 to 1998.

borders, 11 countries have substantially more exchanges: Argentina, Brazil, Canada, China, Germany, India, Japan, Russia, Spain, United Kingdom, and the United States. Equity exchanges make up 70% of the sample with derivative exchanges (futures and/or options written on commodities or financial assets) making up 27%. The remaining 3% is comprised of cash commodity or fixed income exchanges. Chart 2 provides a chronology of the first trading dates for equity exchanges and derivative exchanges that are in existence in 1998.[6] Panel 1 shows that most of the exchanges that currently exist are relatively young in that trading started in the past fifty years. Panel 2 displays a more detailed view of financial exchanges' first trading dates since 1950. For the period between 1985 and 1995 new exchanges start in countries that are widely dispersed around the world; 13 of the exchanges were from former European eastern block countries such as Poland, Romania and the former Soviet Union, and 5 of the exchanges are in China.

We classify each exchange into one of two categories based on who supplies liquidity in the market.[7] One category contains trading mechanisms in which *market makers* supply the liquidity. This category includes batch, open outcry, and electronic dealer systems, such as the Arizona Stock Exchange, Chicago Board of Trade, Copenhagen Stock Exchange, Mexican Stock Exchange, NASDAQ and the Zimbabwe Stock Exchange. The other category contains trading mechanisms in which the *market participants* supply the liquidity. This category includes specialist

[6]Note that these graphs are for exchanges that are in existence as of 1998. While we do include exchanges in our sample that were temporarily closed (mostly due to war), we exclude exchanges that are no longer in existence at the end of 1998.

[7]The available material on trading mechanisms is vague with vast differences in the details of the descriptions across exchanges. Due to this identification problem, we chose to partition trading mechanisms into two groups rather than some finer partitioning.

Table 1
Frequency table of trading mechanisms. This table provides a breakdown of trading mechanisms based on whether the primary liquidity providers are market makers or market participants. Examples of trading mechanisms whose primary liquidity providers are market makers include open outcry and electronic dealer markets while specialists and limit order book markets are examples of trading mechanisms whose primary liquidity providers are the market participants. Partitions are done by the International Finance Corporations (IFC) categorization of developed, emerging and frontier countries as well as by the type of security traded. The frontier category includes countries categorized as frontier as well as those not categorized. The other security type category includes fixed income assets and cash commodity assets. The table provides the number of financial exchanges in the sample that fall into each category.

	Primary liquidity provider		
	Market makers	Market participants	Total
Country's economic development			
Developed	47	51	98
Emerging	42	13	55
Frontier	49	7	56
Total	138	71	209
Security type			
Equity	85	58	143
Derivative	50	13	63
Other	3	0	3
Total	138	71	209

and limit order book systems, such as the stock exchanges in Johannesburg, Montreal, New York, Paris and Tokyo.

Using these definitions we were able to categorize 209 exchanges. A breakdown of the categories is shown in Table 1. Two items are worth noting. First, the proportion of total exchanges structured such that market participants are the primary liquidity provider is much higher in the developed countries (52%) than in emerging and frontier countries (24% and 13%, respectively). Second, equity exchanges have a much higher proportion of trading mechanisms based on market participant liquidity provision (43%) than do derivative exchanges (21%). These simple statistics suggest that the degree of economic development as well as the type of asset traded may impact the choice of trading mechanism used by financial exchanges.

2.2. Data on countries

To supplement the exchange-specific data we also assemble information on each country in the world, independent of whether it has a financial exchange.[8] The data consist of country categorical variables and macroeconomic time series data. The categorical variables contain information on the date of independence, the region of the world, the level of economic development (developed, emerging, frontier or

[8]The countries we used in the analysis are those that are identified as countries by the United States Central Intelligence Agency in their book, The World Factbook (1998).

Table 2
Frequency table of countries' legal system and government type. This table provides a breakdown of government and legal system based on the International Finance Corporation's (IFC) categorization of developed, emerging and frontier countries. The frontier category includes countries categorized as frontier as well as those not categorized. The other government type category includes communist states, military dictatorships as well as transitional governments. The table provides the number of countries in the sample that fall into each category.

	Developed	Emerging	Frontier	Total
Government type				
Monarchy	8	3	18	29
Parliamentary	3	7	26	36
Republic	10	18	80	108
Other	2	2	14	18
Total	23	30	138	191
Legal system				
Civil	15	13	64	92
Common	8	9	36	53
Not categorized	0	8	38	46
Total	23	30	138	191

other) based on the International Finance Corporation's (IFC) Emerging Market Factbook (1998).[9] Using data from the United States Central Intelligence Agency's *World Factbook*, we record for each country: government type, legal system, population, and Gross Domestic Product (GDP).[10]

The CIA classifies type of government as monarchy, parliamentary, republic, or other, where the latter group includes communist, military dictatorship and transitional governments. Table 2 also provides a breakdown of government type by the degree of economic development within a country. Panel 1 shows that over half of the countries in the world are republics. The dispersion across rows of the table shows that each government type comprises approximately equal proportions of the various development classifications. Two exceptions are that monarchies tend to be relatively more prevalent in developed countries of the world and republics tend to be more prevalent in emerging and frontier countries of the world. Using our government classification, monarchies, parliaments, republics and other countries contain 18%, 15%, 58% and 9%, respectively of our sample exchanges.

[9]A country is considered developed by the IFC if its GNP per capita exceeds the World Bank threshold for being a high-income economy for three consecutive years, (For example, in 1997, economies with a GNP per capita that exceeded $9.656 were classified as high-income economies.) and its investable market capitalization-to-GNP ratio is near the average of developed markets for three consecutive years. A country is considered emerging if its GNP per capita is found within the World Bank's classification for low or middle income economies. The remaining countries are considered frontier.

[10]Specifically, the latest population figures are from July 1996 while the latest GDP figures, adjusted for purchasing power parity, are from 1995.

Following LLSV we rely on Reynolds and Flores (1989) to classify the legal system of each country as either civil law or common law.[11] Since we have a larger number of countries in our sample, some countries are not classifiable based on Reynolds and Flores (1989). Our categorizations of legal system match those of LLSV (1996) for the countries included in their analysis; however, we have additional countries included in our analysis. Table 2 provides a breakdown of the legal system by the degree of economic development within a country. Panel 2 reveals that civil law legal systems are almost twice as prevalent as common law legal systems overall. Moreover, the civil legal systems make up a slightly higher percentage of all developed countries (65%) compared to emerging (43%) and frontier (46%). In contrast, common law systems make up approximately the same proportion of developed, emerging and frontier countries.[12]

For each country, we record the latest ranking of the index of economic freedom published in Johnson et al. (1999). The rankings result from scores of 10 economic categories on which countries are ranked on a scale from 1 (most economically free) to 5 (least economically free). The categories are trade policy, taxation, government intervention in the economy, monetary policy, capital flows and foreign investment, banking, wage and price controls, property rights, regulation, and the black market. Each of the ten categories is based on a number of more detailed criteria that pertain to it. For instance, the capital flows and foreign investment category is defined by a country's foreign investment code, restrictions on foreign ownership of business, restrictions on the industries and companies open to foreign investors and performance requirements, foreign ownership of land, equal treatment under the law for both foreign and domestic companies, restrictions on repatriation of earnings, and the availability of local financing for foreign companies.[13] It is important to note for our purposes that no category uses as part of its input any measure of financial exchange development such as market capitalization, trading volume or share turnover figures.

Finally, the macroeconomic data come from the International Monetary Fund's International Financial Statistics Database. The data include annual data on the capital account, domestic credit, direct investment into and out of a country, the financial account, GDP, industrial production, inflation rates measured by the consumer price index and the producer price index, the monetary aggregates (M1 and M2), and portfolio investment assets and liabilities. The data are not uniformly reported for each country each year and therefore present us with incomplete macroeconomic data for a number of countries.

[11]The distinction between civil and common law is that under civil law the basis and direction of law comes from the creation of laws within the legislature while under common law the basis and direction of law arises from decisions made within the courts.

[12]Another variable of interest is the origin of the legal system, also used by LLSV. However, there is a good deal of redundancy between legal system and legal origin, in particular for English legal origin and common legal system that has a correlation of 0.89. Thus, in the interest of a parsimony we use only legal system.

[13]A detailed description of the index construction can be found in Johnson et al. (1999).

3. Probit model of the presence of an exchange

We are interested in better understanding the relation between the presence or absence of financial exchanges within country. To understand the characteristics of the economic and political environments that support financial exchanges we investigate the characteristics of countries that have, and do not have, at least one financial exchange within their country.

The analysis consists of a probit regression where the dependent variable takes on the value zero if the country has no financial exchanges as of December 1998, and one otherwise. Following the theoretical framework outlined earlier, we choose independent variables based on the characteristics of the country. Specifically, we include sets of dummy variables for the government type, legal system, and the components of the index of economic freedom. We also include the natural log of GDP per capita adjusted for purchasing power parity. For each set of dummy variables the category associated with the United States was omitted to insure the regression matrix is full rank. In particular, republic governments and common law legal systems were omitted, thus forcing the intercept to capture the joint effect of these variables. The final sample for the probit analysis consists of 152 countries. 39 countries were omitted from the analysis because they had no ranking of economic freedom.

Table 3 presents the results for three model specifications for the full sample. Model 1 includes as explanatory variables government type, legal system, as well as the components of the index of economic freedom. Model 2 adds the natural log of GDP per capita in 1995. Model 3 splits the natural log of 1995 GDP per capita in Model 2 into its components, the natural log of GDP and the natural log of population. The coefficients of the probit analysis represent the impact on the probability of a country having at least one financial exchange. Therefore, a positive coefficient represents an increase in the probability that a country has at least one financial exchange.

Taking the results of the three models together, we see that the type of government is not useful in predicting whether a country has a financial exchange. In contrast the legal system is important. Consistent with our hypothesis that weak protection of shareholder rights will discourage exchange creation, civil law countries are less likely to have an exchange. We divided the economic freedom variables into two groups (as shown on Table 3): the first consists of trade policy, foreign investment, banking, taxes and government intervention, while the second group consists of monetary policy, wages, property rights, regulation and the black market. We find the first group is a significant determinant of exchange existence, multiple exchanges, or both. In particular, the trade policy, foreign investment and banking variables are important to predicting whether a country has an exchange. The negative coefficient on the trade policy variable means that fewer restrictions placed on international trade and capital flows increase the likelihood that an exchange will be present within the country (consistent with Bekaert and Harvey's liberalization results). Similarly the negative coefficients on the foreign investment and banking variables suggest that the more open the country is to foreign investment and the more

Table 3
Probit model of the presence of a financial exchange in a country for all exchanges. This table provides the results of a probit model of the presence of at least one financial exchange within each of 152 countries for which we have sufficient data. The value of the dependent variable (existence of a financial exchange) takes on the value 1 if at least one financial exchange exists in a country and zero otherwise. Columns represent various specifications of the regression model. For each model the coefficients are provided as well as the standard errors listed in parentheses; correspondingly, coefficients in *italics* are significant at the 10% level while those in bold are significant at the 5% level. The 'other' category variables among the Government and Legal variables are uniformly not significant and are therefore not shown to conserve space and facilitate readability.

Variables	Model 1		Model 2		Model 3	
Intercept	**4.17**	**(1.13)**	−4.73	(2.88)	**−22.94**	**(6.49)**
Government dummy variables						
Parliamentary	−0.48	(0.41)	−0.27	(0.45)	0.14	(0.65)
Monarchies	−0.15	(0.53)	−0.32	(0.57)	0.57	(0.82)
Legal system dummy variables						
Civil	*−0.62*	*(0.35)*	**−1.12**	**(0.42)**	**−1.26**	**(0.57)**
Economic freedom variables						
Trade policy	**−0.63**	**(0.17)**	**−0.64**	**(0.19)**	**−0.80**	**(0.28)**
Foreign invest	*−0.38*	*(0.22)*	*−0.46*	*(0.24)*	**−0.74**	**(0.34)**
Banking	**−0.57**	**(0.25)**	*−0.55*	*(0.29)*	**−0.94**	**(0.44)**
Taxes	0.23	(0.18)	0.24	(0.20)	*0.57*	*(0.33)*
Gov't interv.	0.18	(0.20)	0.07	(0.22)	0.19	(0.33)
Mon. policy	0.10	(0.11)	0.07	(0.13)	0.12	(0.19)
Wages	0.05	(0.29)	−0.16	(0.34)	−0.31	(0.47)
Property right	−0.31	(0.28)	−0.07	(0.34)	−0.31	(0.55)
Regulation	0.24	(0.28)	*0.58*	*(0.34)*	0.71	(0.52)
Black market	−0.04	(0.20)	0.16	(0.24)	0.36	(0.31)
Macro variables						
Ln (GDP/ Pop)			**0.96**	**(0.27)**		
Ln(GDP)					**1.65**	**(0.45)**
Ln(Population)					**−0.78**	**(0.39)**

developed the banking sector, the more likely the country will have an exchange. Finally, the size of the economy, measured as the log level of GDP in 1995, total or per capita, is a significant explanatory variable, with larger economies being more likely to have a financial exchange. Thus, the results suggest that a country's economy generally needs to be of a minimum size before an exchange forms.

One potential problem with this analysis is that countries may develop exchanges for reasons unrelated to economic considerations. This would tend to mask the significance of characteristics that are associated with *economic motivations* for exchanges. Assuming that this problem may be most acute for countries with a single exchange, we address this issue by conditioning on countries that have at least one exchange. We execute the same three models as before except the dependent

variable takes on the value one when a country has *two or more* exchanges and zero if the country has a single exchange; thus this analysis is conditional on a country having at least one exchange. Table 4 displays the results, which are distinct from the results on the full sample.

In contrast to the probit analysis on the entire sample, the results for the conditional analysis are more tenuous. Parliamentary governments are weakly significant, being associated with a lower probability of multiple exchanges; however, none of the legal variables is significant. The economic freedom variables display a weak association with the presence of exchanges, with the banking variable, and to a lesser extent the government intervention variable, being the most prominent. Again, the coefficient on the banking variable suggests that the more developed the banking

Table 4
Probit model of the presence of more than one financial exchange in a country conditioning on at least one exchange in a country. This table provides the results of a probit model of the presence of at least one financial exchange existing within each of 98 countries for which we have sufficient data. The value of the dependent variable is conditional on having at least one financial exchange and takes on the value 1 if a country has two or more financial exchanges and zero if there is a single exchange. Columns represent various specifications of the regression model. For each model the coefficients are provided as well as the standard errors listed in parentheses; correspondingly, coefficients in *italics* are significant at the 10% level while those in bold are significant at the 5% level. The 'other' category variables among the Government and Legal variables are uniformly not significant and are therefore not shown to conserve space and facilitate readability.

Variables	Model 1		Model 2		Model 3	
Intercept	−0.96	(1.04)	**−16.72**	**(5.05)**	**−26.96**	**(7.30)**
Government dummy variables						
Parliamentary	*−0.79*	*(0.44)*	*−0.94*	*(0.53)*	−0.63	(0.56)
Monarchies	−0.32	(0.51)	−0.32	(0.54)	−0.66	(0.63)
Legal system dummy variables						
Civil	0.17	(0.36)	−0.27	(0.44)	0.06	(0.53)
Economic freedom variables						
Trade policy	0.15	(0.17)	0.26	(0.20)	*0.45*	*(0.24)*
Foreign invest	0.21	(0.26)	0.34	(0.28)	−0.03	(0.34)
Banking	*−0.42*	*(0.25)*	*−0.50*	*(0.26)*	**−0.68**	**(0.30)**
Taxes	**0.60**	**(0.23)**	0.32	(0.26)	0.09	(0.29)
Gov't interv.	*−0.38*	*(0.21)*	**−0.65**	**(0.24)**	−0.40	(0.27)
Mon. policy	0.05	(0.13)	0.11	(0.15)	0.08	(0.17)
Wages	0.18	(0.32)	0.04	(0.34)	0.07	(0.39)
Property right	0.02	(0.30)	0.42	(0.35)	0.45	(0.40)
Regulation	−0.20	(0.27)	0.45	(0.33)	0.05	(0.40)
Black market	−0.17	(0.22)	0.00	(0.25)	−0.02	(0.27)
Macro variables						
Ln (GDP/ Pop)			**1.59**	**(0.50)**		
Ln(GDP)					**1.81**	**(0.62)**
Ln(Population)					**−1.19**	**(0.58)**

sector the more likely that the country will have multiple exchanges. This result suggests that banks and capital markets act as complements. Not surprisingly, the sign of the government intervention coefficient suggests that countries with minimal government involvement in economic affairs tend to have multiple exchanges. Lastly, the GDP variables are consistently positive across both samples providing evidence that larger economies support more exchanges.

4. Probit model of a financial exchange's trading mechanism

In this section, we empirically model the choice of trading mechanism by existing exchanges.[14] To this end, each exchange is assigned the value 1 if its trading mechanism relies on market participants as the primary liquidity providers and 0 if the mechanism relies on market makers as the primary liquidity provider. Many variables can potentially impact the choice of trading mechanism by an exchange. Macey and O'Hara (1999) argue that competition among exchanges, and its focus on trading costs, is an important determinant of liquidity provision services. We proxy for competition by the number of exchanges within a country. The degree of economic development is also potentially important. In particular, if developed countries tend to have one mechanism while emerging and frontier countries have a different mechanism, this suggests that there may be a hierarchy to trading mechanisms, or at a minimum, different environmental characteristics necessary to sustain these various mechanisms. The number, as well as the type, of assets an exchange trades suggests the possibility that certain mechanisms may constrain the number of assets it can accommodate. To be consistent with the previous probit analysis, we also include the type of government, legal system, the aggregated index of economic freedom, and the growth in GDP per capita.

Table 5 displays the results of the probit analysis. Models 1 through 3 correspond to the three previous models used in the probit analysis. Models 4 and 5 add four explanatory variables; categorical variables for developed countries and equity exchanges, and the number of exchanges within that country (in natural log) and the number of assets traded on the exchange (in natural log). Unlike the probit analysis analyzing the presence of an exchange within a country, the government type, the index of economic freedom and the growth in GDP are not useful in explaining the choice of trading mechanism. Two variables are consistently significant: a country's legal system and the number of assets traded on the exchange.[15] The results suggest that exchanges relying on market participants to supply liquidity are more prevalent

[14]Our investigation is related to, but distinct from, Jain (2003). In particular, we analyze the environmental determinants of an exchange's choice of trading mechanism. In contrast, Jain (2003) investigates the impact of different trading mechanisms on important liquidity measures such as quoted, effective and realized spreads.

[15]Consistent with our results, there is anecdotal evidence that exchanges that switch to electronic trading systems increase the number of assets that they trade. For example, over the year of the switch the Hong Kong Futures Exchange and the Sydney Futures Exchange displayed 9.7% and 9.2% increases respectively, in the number of listed securities.

Table 5
Probit model of financial exchange trading mechanisms for all exchanges. This table provides results from a probit regression analysis where the dependent variable is the choice of exchange trading mechanism within a set of 187 exchanges for which we have sufficient data and whose mechanism we have been able to identify. The dependent variable takes on the value 1 if the trading mechanism is based upon market participants supplying liquidity such as specialist or limit order book systems and 0 if the mechanism is based upon market maker supplying liquidity such as open outcry or electronic dealer systems. For each model the coefficients are provided as well as the standard errors listed in parentheses; correspondingly, coefficients in *italics* are significant at the 10% level while those in bold are significant at the 5% level. The 'other' category variables among the Government and Legal variables are uniformly not significant and are therefore not shown to conserve space and facilitate readability.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
Intercept	*1.09*	*(0.64)*	−4.03	(2.61)	−4.21	(2.63)	**−14.98**	**(8.53)**	**−1.39**	**(0.54)**
Government dummy variables										
Parliamentary	0.22	(0.27)	0.13	(0.28)	0.22	(0.29)	1.55	(1.22)		
Monarchies	−0.26	(0.25)	−0.31	(0.25)	−0.32	(0.25)	−1.14	(0.77)		
Legal system dummy variables										
Civil	**0.50**	**(0.22)**	*0.43*	*(0.23)*	**0.49**	**(0.24)**	**3.22**	**(1.31)**		
Economic freedom variable										
Index	**−0.74**	**(0.21)**	−0.24	(0.31)	−0.37	(0.33)	−0.34	(0.78)		
Macro variables										
Ln(GDP/Pop)			*0.42*	*(0.22)*			0.97	(0.74)		
Ln(GDP)					0.34	(0.23)				
Ln(Pop)					−0.28	(0.25)				
Other variables										
Ln(# of exchanges)							*−2.14*	*(1.26)*	−0.60	(0.37)
Ln(# assets traded)							**1.26**	**(0.42)**	**0.21**	**(0.10)**
Developed dummy							2.38	(1.96)	*1.83*	*(1.01)*
Equity dummy							2.86	(1.64)	−0.33	(0.63)

in countries with civil law legal systems. Again, given that the economic protections are weak within civil law systems, it is too expensive to induce market makers to provide liquidity, thereby forcing market participants to bear their own liquidity provision costs.

Given that the choice of trading mechanism is crucial when an exchange is subject to competition from other exchanges seeking to increase incoming order flow, it is instructive to condition the sample on those exchanges within countries with two or more exchanges. The same 5 models were estimated and the results on the sub-sample are presented in Table 6. Again countries with civil law legal systems are associated with market participants supplying liquidity. However, the type of government becomes important since monarchies are associated with exchanges having market makers as liquidity providers. Also, larger economies (measured by the log of 1995 per capita GDP) and developed economies are more likely to contain exchanges relying on market participants supplying liquidity. The results suggest

Table 6
Probit model of financial exchange trading mechanisms conditioning on more than one exchange in a country. This table provides results from a probit regression analysis where the dependent variable is the choice of exchange trading mechanism within a set of 102 exchanges for which we have sufficient data and whose mechanism we have been able to identify. The dependent variable takes on the value 1 if the trading mechanism is based upon market participants supplying liquidity such as specialist or limit order book systems and 0 if the mechanism is based upon market maker supplying liquidity such as open outcry or electronic dealer systems. For each model the coefficients are provided as well as the standard errors listed in parentheses; correspondingly, coefficients in *italics* are significant at the 10% level while those in bold are significant at the 5% level. The 'other' category variables among the Government and Legal variables are uniformly not significant and are therefore not shown to conserve space and facilitate readability.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
Intercept	**2.40**	**(1.09)**	**−13.60**	**(7.34)**	*−13.45*	*(7.40)*	−1.21	(9.54)	−0.08	(1.10)
Government dummy variables										
Parliamentary	0.40	(0.51)	0.46	(0.55)	0.37	(0.64)	0.22	(0.57)		
Monarchies	**−0.89**	**(0.39)**	**−1.14**	**(0.42)**	**−1.11**	**(0.43)**	**−1.26**	**(0.48)**		
Legal system dummy variables										
Civil	**1.49**	**(0.50)**	**1.81**	**(0.57)**	**1.74**	**(0.62)**	**1.36**	**(0.58)**		
Economic freedom variable										
Index	**−1.62**	**(0.56)**	−0.68	(0.77)	−0.58	(0.94)	−0.52	(0.84)		
Macro variables										
Ln(GDP/pop)			**1.41**	**(0.64)**			0.11	(0.96)		
Ln(GDP)					**1.44**	**(0.70)**				
Ln(Pop)					*−1.48*	*(0.78)*				
Other variables										
Ln(# of exchanges)							−0.37	(0.27)	−0.60	(0.42)
Ln(# assets traded)							0.01	(0.18)	0.05	(0.17)
Developed dummy							1.59	(1.04)	**2.08**	**(0.80)**
Equity dummy							−0.89	(0.83)	−1.33	(0.82)

that smaller, less developed countries likely rely on trading mechanisms with fewer demands on market participants and more demands on market makers, given the limited resources typically available to citizens in those countries. This suggests a hierarchy of these trading mechanisms. Lastly, once we condition on exchanges facing domestic competition, the number of assets is no longer significant.

5. Relation between the existence of a financial exchange and the macro economy

Theoretical predictions regarding the relationship between financial markets and economic growth are mixed. Some theories argue that financial markets increase economic activity. This can arise from an increase in the savings available to finance investments (see Bencivenga and Smith (1991) and Jappelli and Pagano (1994)), or because financial markets can increase the productivity of investment (see

Greenwood and Jovanovic (1990) and Fernandez and Galetovic (1994)). In contrast, other theories argue that financial markets slow economic growth due to greater risk sharing reducing saving rates (see Devereux and Smith (1994)) or by easing counter-productive corporate takeovers (Shleifer and Summers (1988) and Morck et al. (1990a, b)).

Recent empirical studies of the relation between stock market development and economic activity have found inconclusive results. Levine and Zervos (1998) find that three out of four stock market indicators are not related to economic growth, capital stock growth, or productivity growth. They also find that stock market liquidity is positively correlated with economic activity; however, volatility, market integration, and market size are not linked with economic activity. Atje and Jovanovic (1993) and Levine and Zervos (1996) also find a positive correlation between economic growth (GDP growth) and stock market development.[16] These results, however, need to be viewed with some hesitancy in light of Levine and Renelt (1992) who show the instability of these types of cross-country regressions to small changes in the conditioning set. All of the above studies focus on a relatively small number of countries with highly developed stock markets and use cross-sectional regressions to determine whether more highly developed stock markets lead to higher levels of economic activity.[17]

However, theoretical predictions regarding the relation between stock markets and economic development are typically based on the presence or absence of a stock market, rather than based on the market's level of development as measured by market liquidity, number of issues, or market capitalization.[18] If stock markets are important to economic activity, this may best be observed by looking at changes in economic activity at the inauguration of a stock market, instead of trying to measure differences in development of stock markets across countries. These studies also suffer from the criticism that the variables used to measure exchange development are likely highly correlated with GDP growth. For example, if a country has high GDP growth (for some other reason than the existence of a financial exchange) it is likely that the financial exchange benefits from the GDP growth with higher volume, larger market capitalization and more issues. This could lead to a spurious correlation between the level of stock market development (as measured in these studies) and GDP growth. Thus, even if the existence of an exchange has no effect on GDP growth these studies might find one.

[16]Atje and Jovanovic (1993) use the value of stock market trading divided by GDP as a proxy for stock market development. Levine and Zervos (1996) define an index of stock market development that includes measures of size, trading volume, and integration.

[17]The generally small sample size is due to the need for a long time series of market level data (such as volume, number of shares listed, and price levels) which is only readily available from the most highly developed countries.

[18]It is also possible that an exchange's trading mechanism may impact the macroeconomy; however, we do not analyze this effect due to the small sample of pure switches (not due to mergers) and difficulty dating the switch. A related literature addresses the impact of a switch in trading mechanism on liquidity and price discovery. Examples include: Grunbichler et al. (1994), Shyy and Lee (1995), Pirrong (1996) and Frino and Hill (2001).

To mitigate this problem we examine economic activity in countries both before and after the opening of the initial equity exchange in a country. We investigate whether economic activity is correlated with the existence of an equity exchange, controlling for other factors related to time-specific effects and country-specific effects that may exogenously affect economic growth.[19] In contrast to the prior literature, our sample includes countries whose first equity exchange was formed after 1950 and countries that currently do not have an equity exchange. However, we exclude initial equity exchanges formed within two years of the date of independence for that country in order to eliminate exchanges that may have been formed purely for political rather than economic reasons. We use a number of different dependent variables to measure the potential impact of the exchange on economic growth: the monetary aggregates (M1 and M2); capital flows as measured by the capital account, financial account, domestic credit, direct investment into and out of a country, and portfolio investment assets and liabilities; economic growth as measured by GDP and industrial production; and inflation as measured by the consumer and producer price index.

Consistent with the existing long-run growth research, we aggregate these macroeconomic variables by constructing the average annual growth rate over each decade. This gives rise to five observations for each country corresponding to each decade from the 1950s to the 1990s. Based on Jayaratne and Strahan (1996), we run several regressions to analyze the effect of the existence of an exchange on various aspects of the economy. For each dependent variable we run the following regression on the average 10-year growth rates:

$$(Y_{t+1,i} - Y_{t,i})/Y_{t+1,i} = \alpha_t + \beta_i + \delta D_{t,i} + \varepsilon_{t,i}, \tag{1}$$

where $i = 1, \ldots$, number of countries, and $t = 1,2,3,4,5$, $Y_{t,i}$ equals the measure of the dependent variable during decade t in country i, and $D_{t,i}$ is a dummy variable which is 1 if the country i has an exchange during decade t and 0 if the country does not have a financial exchange during decade t. We drop the decade during which the first exchange begins operation in a country. The variable α_t captures any worldwide shocks of decade t and β_i captures the country-specific component of long-run growth rates. The coefficients on the time and country dummy variables are both constrained to sum to zero. The coefficient δ captures the change in the growth rate of the dependent variable associated with the formation of an exchange.[20]

Table 7 presents these regression results. The monetary aggregates, measured by M1 and M2, are the only set of variables where the existence of the exchange has a statistically significant impact. The coefficients on the monetary aggregates suggest

[19]If the birth of the initial exchange has a particular effect on the economy, then the death of the last exchange in a country should have the opposite effect. Unfortunately, we are unable to investigate this conjecture given that no country closed their only exchange during our sample period. We thank an anonymous referee for highlighting this point.

[20]Concerns about simultaneity issues between the presence of an exchange and the macroeconomic variables are mitigated by the fact that the relationship between the variables of interest is jointly positive or jointly negative. Specifically, in this setting it is straightforward to prove that failing to reject the null hypothesis of no relation between two potentially simultaneously determined uni-directional variables can only occur if (1) the null is true or (2) the power of the test is low.

Table 7
Long-run relation between financial exchange existence and macroeconomic variables. This table provides results from an OLS regression analysis adopted from Jayaratne and Strahan (1996) where long-run growth in macroeconomic variables is regressed upon a constant, time period dummy variables, country dummy variables and an exchange existence dummy variable. The macroeconomic data are ten year growth rates in the relevant series. The coefficients on the set of time period dummy variables and the set of country dummy variables are both restricted to sum to zero. Values for Time and Country dummies represent *F*-statistics under the null that the relevant set of dummy variables are jointly zero. Coefficients are provided for the constant and the exchange dummy as well as the standard errors listed in parentheses; correspondingly, coefficients in *italics* are significant at the 10% level while those in bold are significant at the 5% level. The variables direct investment into and out of an economy and portfolio investment assets and liabilities are uniformly not significant and are therefore not shown to conserve space and facilitate readability.

Dependent variable	Number of countries	Constant	Time dummies	Country dummies	Exchange dummy	R^2
M1	117	**0.16**	**5.18**	**2.87**	**−0.07**	0.571
		(0.05)			**(0.03)**	
M2	117	**0.17**	**5.43**	**2.96**	**−0.07**	0.586
		0.05			**(0.03)**	
Capital account	72	0.08	0.88	**6.49**	0.38	0.873
		(1.63)			(1.91)	
Financial account	117	−0.35	1.23	**3.09**	−1.47	0.680
		(4.13)			(4.40)	
Domestic credit	119	1.31	0.99	0.88	−0.66	0.263
		(2.45)			(1.28)	
GDP	84	0.02	**3.33**	1.12	−0.001	0.361
		(0.03)			(0.02)	
GDP per capita	84	−0.02	**3.03**	1.09	0.001	0.356
		(0.03)			(0.02)	
Industrial product	28	0.006	**5.37**	**1.79**	0.01	0.656
		(0.02)			(0.02)	
CPI	108	0.35	0.51	0.53	−0.05	0.171
		(1.35)			(0.45)	
PPI	36	0.12	*1.92*	**2.75**	−0.08	0.530
		(0.08)			(0.10)	

that the presence of the equity exchange reduces the growth rate of both M1 and M2 by 7%, respectively over a ten year period. These findings are consistent with Allen and Gale (1997) who argue that the benefit of a well-functioning capital market is that it allows individuals the chance to diversify their wealth into liquid financial assets thereby having less need for cash. Moreover, these results are inconsistent with studies finding a significant positive relation between capital market growth and macroeconomic growth. Specifically, the productivity variables (GDP, GDP per capita and industrial production) suggest that the existence of an exchange does not have any impact on economic growth. Furthermore, the regression suggests the existence of an exchange does not affect inflation variables (consumer and producer

price indices). The capital flow variables (capital account, direct investment into and out of an economy, the financial account and portfolio investment assets and liabilities) are similarly insignificant.[21]

6. Conclusion

Unlike previous work focusing on a small subset of financial exchanges, we analyze a cross-section of 256 exchanges residing in 101 countries out of the total 191 countries in the world. Initially, we document that about half of the countries have at least one financial exchange. Our analysis reveals that countries with exchanges tend to have larger economies, with developed banking sectors, and civil law legal systems and are more open to foreign trade and investment. In addition, multiple exchanges tend to be in countries with larger economies and well developed banking sectors but also in countries with little, if any, governmental intervention.

Our investigation relates an exchange's choice of trading mechanism to the country's legal system and the number of assets traded. Mechanisms relying on market participant liquidity provision are used more often in civil law countries and larger economies. Our results suggest a hierarchy in the set of trading mechanisms, with mechanisms driven by market maker liquidity provision being easier to implement and sustain in smaller, potentially less-developed financial economies. Mechanisms that rely on market participants to supply liquidity require more from market participants to function efficiently.

While we have identified factors related to the existence of financial exchanges and their resulting trading mechanisms, the discernible impact of these exchanges on the macro economy seems to be limited to a reduction in the growth rates of the monetary aggregates. This result is consistent with the argument that financial exchanges serve as a vehicle for market participants to diversify their wealth into liquid assets. The creation and availability of liquid financial assets made possible by a financial exchange serves to make cash less of a necessity for market participants. In contrast, we find no significant effect on the economy-wide productivity measures.

In conclusion, this paper serves to broaden the scope of research on liquidity provision by taking a macro perspective on the characteristics of financial exchanges around the world. As the global economy expands, it is paramount that we understand why financial exchanges exist, which trading mechanisms are likely to survive within particular economic environments, and what impact financial exchanges have on the domestic economy.

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[21]The variables measuring direct investment into and out of an economy and portfolio investment assets and liabilities are not shown to conserve space.

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