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On the Formation and Structure of International Exchanges

**Matthew J. Clayton
Bjorn N. Jorgensen
Kenneth A. Kavajecz**

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The Wharton School
University of Pennsylvania

The Rodney L. White Center for Financial Research

The Wharton School
University of Pennsylvania
3254 Steinberg Hall-Dietrich Hall
3620 Locust Walk
Philadelphia, PA 19104-6367

(215) 898-7616

(215) 573-8084 Fax

<http://finance.wharton.upenn.edu/~rlwctr>

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On the Formation and Structure of International Exchanges

by

Matthew J. Clayton
Finance Department
The Stern School of Business
New York University
New York, NY 10012-1126
Email: mclayton@stern.nyu.edu

Bjorn N. Jorgensen
Accounting and Control Area
Graduate School of Business Administration
Harvard University
Soldiers Field Park
Boston, MA 02163
Email: bjorgensen@hbs.edu

and

Kenneth A. Kavajecz
Finance Department
The Wharton School
University of Pennsylvania
Philadelphia, PA 19104-6367
Email: kavajecz@wharton.upenn.edu

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errors are our own responsibility.

On the Formation and Structure of International Exchanges

We investigate the formation and structure of 248 financial exchanges throughout the world. First, we empirically analyze the determinants of exchange formation as well as the impact of exchange formation on the domestic country's economy. Second, conditional on formation, we use a probit model to relate the choice of trading mechanism to the characteristics of the economic environment in which the exchange exists. We find that the main determinants of exchange formation in a country are the degree of economic freedom, the size of the economy, the availability of technology, and the legal system. In addition, we find that the impact of exchange formation on the macro economy is limited to a reduction in the growth of the monetary aggregates with no significant impact on productivity. Lastly, our results show that the choice of trading mechanism depends on the country's economic development, the degree of competition, and the extent of economic freedom.

This paper takes a global perspective of financial exchanges by analyzing the cross section of 248 financial exchanges in 191 countries around the world. The analysis has three goals. The first goal is to enhance the understanding of the characteristics of the economic environment that effect the formation of a financial exchange in a country. The second goal is to investigate the long-run impact, if any, of the formation of a financial exchange on the domestic economy. The third goal is to analyze factors that determine the choice of trading mechanisms by financial exchanges. From a policy perspective, understanding these issues is crucial. For example, 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.

This paper serves to broaden the scope of the research on international financial exchanges in three respects. First, given that more than 60 new financial exchanges have been created globally since 1990, 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 Second, previous research investigating the impact of equity markets on the macro-economy focuses on well-developed equity markets in the industrial countries of the world. In contrast, we empirically investigate the initial exchange formation within a country and we include countries that do not currently have a financial exchange in our study. Thus, our analysis benefits from knowing the exact formation dates as well as using a more comprehensive sample. Third, the finance literature has been relatively silent about whether particular trading mechanisms are used for different economic environments and different types of financial securities. We take a comparative approach in analyzing the economic and institutional characteristics of countries that form exchanges and relate these characteristics to the their choice of trading mechanism.

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

Our results on exchange formation show that financial exchanges are weakly more prevalent in economies that have legal systems based on common law traditions and legal systems that originate in Germany. Not surprisingly, the extent of economic freedom present in the economy is also important for exchange formation, with taxes, banking and regulation being the most critical factors. Finally, we find that larger economies are associated with a higher likelihood of exchange formation. In contrast, technology shocks that increase communication links, making it easier for market participants to trade from remote locations, reduce the likelihood of exchange formation.

Our analysis of the long-run impact of exchange formation on the domestic economy reveals that there is a marked reduction in the growth of the monetary aggregates with little or no impact on the 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.

Lastly, our analysis of trading mechanisms reveals that there is 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. Highly developed countries' choice of trading mechanism clusters around the latter whereas less developed countries are more likely to choose the former mechanism. While this hierarchy is unexplained by macro economic characteristics, it does depend on the asset traded, and the level of economic freedom, as well as the degree of competition the exchange faces.

This paper is directly related to a number of areas of ongoing financial research. In particular, work by Jorion and Goetzmann (1999) and Arnold, Hersch, Mulherin and Netter (1999) on the history and evolution of stock markets and stock exchanges highlights the impact of changes in liquidity provision on the equity premium and distributed trading volume across markets, respectively.

Demirguc-Kunt and Maksimovic (1998) and La Porta, Lopez-de-Silanes, Schleifer and Vishny

(1996, 1999), henceforth LLSV, are examples within another area of related financial research. Their work 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 or corporate ownership structure. In a similar vein, we relate institutional country characteristics to the number of exchanges in a country and the exchanges' choice of trading mechanism. That is, our unit of analysis is the individual exchange whereas their unit of analysis is the individual firm.

There is also a growing literature presenting 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 (1997), 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, Shleifer, and Vishny (1990a, 1990b) argue that financial market development can actually impede economic growth. Unlike previous research, which relates measures of equity market development to economic growth in developed economies, our investigation benefits from knowing the year that the financial exchanges were formed as well as utilizing data on countries without exchanges.

There is a substantial market microstructure literature on how the structure of a financial exchange affects market participants. This literature concentrates on the analysis of one, or a few, exchanges at a time.

Initial work in market microstructure has concentrated on the larger United States markets: the New York Stock Exchange, NASDAQ and Chicago derivative exchanges (Chicago Board of Trade, Chicago Mercantile Exchange, and Chicago Board Options Exchange). Subsequent studies focus attention on dominant equity

exchanges in the developed countries around the world.² Collectively, however, these studies cover only a small fraction of the 248 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 decision using a large cross-section of exchanges.

The remainder of this paper is organized as follows. Section I provides a characterization of a financial exchange. Section II describes our data along with summary statistics. Section III investigates the determinants of the number of financial exchanges within a country using an ordered probit model. Section IV analyzes the impact that financial exchanges have on the macro economy and Section V provides a probit model of a financial exchange's trading mechanism. Section VI concludes.

I. Definition of an Exchange

The definition of an exchange is the subject of much debate. Given the vast numbers of liquidity provision organizations that exist, the question of what constitutes an exchange is paramount to this study. Lee (1998) provides a framework to analyze what differentiates exchanges from other organizations. While defining an exchange is admittedly difficult, there are, nonetheless, certain characteristics indicative of what we consider an exchange. First, while an exchange is often associated with a centralized physical location, the advent of the computer has made it possible for an exchange to facilitate trade from multiple locations simultaneously, e.g. NASDAQ. Consequently, we do not require a centralized trading location as a necessary characteristic of an exchange. Second, members of an exchange share a common goal to facilitate trade for their individual betterment as well as the betterment of the other members of the exchange. Lastly, trades on an exchange are executed in the local currency and are under the control of the laws and regulations of the

² Examples include Niemeyer and SandΔs (1993), Hedvall and Niemeyer (1994), Lehmann and Modest (1994), Biais, Hillion and Spatt (1995), Frino and McCorry (1995), Hamao and Hasbrouck (1995), de Jong, Nijman and R ell (1995),

domestic country. As such, we view each exchange as inextricably linked to a country and this is our motivation for using country characteristics in the probit analyses. Therefore, for the purposes of our analysis, we restrict an exchange to be a cohort of individuals within a country whose common goal is to facilitate the secondary market trading of an asset among them and among market participants. The property rights of the traded assets are subject to the laws, regulations and currency of the domestic country.

II.A Data on Exchanges

Information is gathered for any exchange, equity or otherwise, that we could find through our sources. Our main source of information is the *Handbook of World Stock, Derivative and Commodity Exchanges (1998)*. These data were supplemented with information obtained from internet websites. While there is no guarantee that we have captured all exchanges, we have been able to collect information on 248 exchanges spanning 90 countries. We could not verify the existence of any financial exchanges in the remaining 101 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.

Trading Mechanisms

We classify each exchange into one of two categories based on who supplies liquidity in the market.³ 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 and limit order book systems; such as the stock exchanges in Johannesburg, Montreal, New York, Paris and Tokyo. The partition of exchange trading mechanism we utilize is consistent with the theoretical work by Hagerty and Rogerson (1987). They argue that trading mechanisms where prices are posted in advance, such as trading mechanisms relying on market participant liquidity provision, are robust to the distribution of private information within the market, unlike alternative trading mechanisms, e.g. mechanisms relying on market maker liquidity provision, which may prevent trade from occurring.

Using these definitions we were able to categorize 201 exchanges, a breakdown of the categories is shown in Table I. 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 (at most 24%). Second, equity exchanges have a much higher proportion of trading structures based on market participant liquidity provision (42%) than do derivative exchanges (20%). 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.

³ 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.

II.B Data on Countries

To supplement the exchange specific data we also assembled information on each country in the world, independent of whether it has a financial exchange.⁴ The data consist of country category variables and macroeconomic time series data. The category variables contain information on the date of independence, the region of the world, the level of economic development (developed, emerging, frontier or other) based on the International Finance Corporation's (IFC) *Emerging Market Factbook (1998)*.⁵ Using data from the United States Central Intelligence Agency's *World Factbook*, we record for each country: legal type and legal origin, government type, population, and Gross Domestic Product.⁶

Legal Type and Legal Origin Variables

Following LLSV we classify countries' legal types as civil law, common law, or not classifiable.⁷ Likewise, legal origins are classified as English, German, Romantic, Scandinavian or other, where Romantic includes French, Italian, Portuguese and Spanish origins and other includes Islamic, Russian, and non-classifiable countries. Our categorizations of legal type and legal origin match those of LLSV (1996) for the countries included in their analysis; however, we have additional countries included in our analysis. LLSV (1996) demonstrate that legal type and legal origin are strongly tied to shareholder and

⁴ 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)*.

⁵ A country is considered developed by the International Finance Corporation 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.

⁶ Specifically, the latest population figures are from July 1996 while the latest GDP figures, adjusted for purchasing power parity, are from 1997.

⁷ The distinction between common and civil law is that under common law the basis and direction of law comes from the creation of laws within the legislature while under civil law the basis and direction of law comes from decisions made within the courts.

creditor rights. They find that countries with common law (civil law) have strong (weak) shareholder and creditor protection under the law. Due to the weaker protection under the law, LLSV find that firms in civil law countries must take additional steps to insure investors receive an adequate return, such as mandatory dividends, minimum capital requirements and concentrated ownership. If investors cannot be guaranteed the ability to recover value from the firm, the securities issued will be worthless; consequently, firms will be unable to raise external funds. This difference in legal system greatly affects how firms operate in these countries, especially with respect to the decision to go public and the ability to raise funds from a disperse group of investors. Given these large differences in how firms raise capital, conditional on the legal system, we expect the benefit of forming an exchange would also be affected by the legal system. In particular, we take the view that legal protection for investors increases the ability of firms to secure external financing, and thus, increase economic efficiency.⁸ Thus, based on the results of LLSV (1996), we expect that both legal type and legal origin would play a role in describing exchange formation.

Table II provides a breakdown of the legal type and legal origin variables by the degree of economic development within a country. Panel 1 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 (30%) of developed, emerging and frontier countries. Panel 2 provides the breakdown for legal origin. English, Romantic and other legal origins describe the legal systems in over 90% of the countries in the world. In addition, each of these origins is dominant in one of the economic development classifications. In the developed countries of the world, the English origin is most common describing 34% of these countries. For emerging countries, the dominant legal origin is Romantic with 47% of the total, while frontier countries are dominated by the other legal origin (40%), which is

⁸ Although this view is rather standard, it is not universally held (see Shleifer and Vishny (1997) for a survey on this

composed mainly of legal systems with an Islamic origin. The German and Scandinavian legal origins, while both a very small proportion of the total countries in the world, are very different in that the German origins are equally spaced across the three development classifications while the Scandinavian origins are concentrated in the developed countries of the world. The correlations between the legal type and legal origin variables are typically small in absolute value. The one exception is the English legal origin and common legal type that has a correlation of 0.89.

Government Type Variables

We also classify the type of government of the country as monarchy, parliamentary, republic, or other, where the latter group includes communist, military dictatorship and transitional governments. The government variables describe the amount of autonomy individuals have from the government which may impact citizen's behavior through social and political norms. We include these variables to capture the freedom of individuals to act in their own economic self-interest.⁹ Table II also provides a breakdown of government type by the degree of economic development within a country. Panel 3 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 each of the development classifications. Two exceptions are that monarchies tend to be more prevalent in developed countries of the world and republics tend to be more prevalent in emerging and frontier countries of the world.

Economic Freedom Variables

For each country, we record the latest ranking of the index of economic freedom published in

literature).

⁹ An alternative approach in analyzing the impact of government structures on the economy is to investigate the constraints, rather than freedoms, facing market participants, see Henisz (1999).

Johnson, Holmes and Kirkpatrick (1999). The rankings are a compilation of 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 each particular category. 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.¹⁰ 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.

Macro Economic Data

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, gross domestic product, industrial production, inflation rates measured by the consumer price index and the producer price index, monetary aggregates (M1 and M2), portfolio investment assets and liabilities, exchange rates, and the slope of the yield curve measured by the difference between the interest rate on long-term government bonds less the rate on short-term government bills. The data are not uniformly reported for each country each year and therefore present us with incomplete macro-economic data for a number of countries.

¹⁰ A detailed description of the index construction can be found in Johnson, Holmes and Kirkpatrick (1999).

Technology Variable

Lastly, Pirrong (1998) argues that the rapid advance of communications technology has served to minimize the fragmenting effect of physical distance on exchange formation. His theoretical model predicts that economies of scale will produce consolidation among exchanges until profitable entry into the liquidity provision market is eliminated. To accommodate the potential impact of communications technology, we include a technology variable to capture this effect on exchange formation. The technology variable takes on the value one whenever the average formation date for the financial exchanges in a country is after 1960 or whenever a country doesn't have exchanges at all, otherwise the variable takes on the value zero. The year 1960 was chosen to coincide with the arrival of the computer as a communication tool. Consequently, this is meant to model the effect of the availability of computers on the probability of exchange formation.

II.C Summary Statistics

The summary statistics on this unique data set reveal a number of interesting findings. 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 borders, there are 11 countries: Argentina, Brazil, Canada, China, Germany, India, Japan, Russia, Spain, United Kingdom, United States, that have substantially more. The breakdown of exchanges by the primary type of financial security traded is as follows. 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 formation dates for existing financial exchanges broken out by equity and derivative

exchanges.¹¹ Panel 1 shows that there has been explosive growth in the number of exchange formations over the past fifty years relative to the formations that occurred up to 1950. Moreover, the growth is most dramatic for derivative exchanges, that began with 16 exchanges in existence in 1950 to a total of 74 in existence presently. Panel 2 displays a more recent and detailed view of financial exchange formation since 1950. The period between 1985 and 1995 has substantially more exchange formations than the other time periods and accounts for much of the dramatic increase in exchange formation over the past 50 years. While the formation over this ten year period are widely dispersed among the countries of the world, 12 of the exchange formations come from former eastern block countries such as Poland, Romania and the former Soviet Union and 5 of the exchange formations come from China.

III. Ordered Probit Model

We are interested in better understanding what determines the existence or absence of financial exchanges within a country. To understand the characteristics of economic and political environments that encourage financial exchange formation we investigate the number of financial exchanges existing in the cross-section of all countries.

The analysis consists of an ordered probit regression where the dependent variable is the number of financial exchanges (equity or otherwise) existing in a country as of December 1998. The dependent variable is censored at 4 exchanges to provide 5 categories of countries: 0, 1, 2, 3 and 4 or more exchanges. Using our working definition of a financial exchange, we choose independent variables based on the characteristics of the country that we identified earlier. Specifically, we include sets of dummy variables for the legal system type, the legal system origin, the government type, a technology variable and the components of the index of economic freedom. We also include two macro economic variables: the natural log of GDP per capita

¹¹ Note these graphs are for exchanges that are in existence now. While we do include exchanges in our sample that

adjusted for purchasing power parity and the variance of the domestic country's exchange rate with the United States dollar over the past 10 years. 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, common law legal systems, English origin legal systems and republic governments were omitted, thus forcing the intercept to capture the joint effect of these variables. The sample used for the ordered probit analysis consists of 150 countries. Countries were omitted from the analysis because either they had no ranking of economic freedom (33 countries) or there was insufficient data to construct the variance of the exchange rate with the U.S. dollar (8 countries).

Table III presents the results for three model specifications for the full sample. Model 1 uses as explanatory variables legal type, legal origin and government type dummy variables as well as the components of the index of economic freedom. Model 2 adds three additional variables to Model 1, the natural log of GDP per capita, the variance of the exchange rate and the technology dummy variable. Model 3 splits the natural log of GDP per capita in Model 2 into its components, the natural log of GDP and the natural log of population. The coefficients of the ordered probit analysis represent the impact on the probability of a country having the largest number of exchanges (e.g. 4 or more exchanges). Therefore, a positive coefficient represents a increase in the probability that a country has 4 or more exchanges and by symmetry also represents a decrease in the probability that a country has 0 to 3 exchanges.

Taking the results of the three models together, we see that the type of government is not useful in explaining the number of financial exchanges. In contrast, both the legal type and the legal origin are weakly important explanatory variables consistent with our definition of an exchange being tied to the property rights of the asset traded. Based on stronger investor protection within common law countries we expect, *ceteris paribus*, countries with a common law system to be more likely to form exchanges than countries with a civil

were temporarily closed (mostly due to war), we exclude exchanges that are not currently (1998) in existence.

law system. Our results demonstrate that civil law legal systems tend to have fewer exchanges, a finding consistent with the arguments presented in LLSV (1996). Furthermore, the constant, which collapses the effect of republics, common law legal systems and English law origins, suggests that common law legal systems have more exchanges based on the results of Models 2 and 3. In addition, German and Romantic legal origins also tend to have more exchanges on average.

The components of the index of economic freedom show little individual impact with taxes, banking and the black market the only components displaying a significant impact on exchange formation. The coefficient on the tax component implies that the heavier the tax burden within a country the more likely that a country will have a large number of exchanges. This result is consistent with market participants creating equity exchanges for the ability to move wealth through time so as to avoid taxes altogether or at least to be taxed at a differentially lower rate. The interpretation of the banking component is that the more restrictions placed on the banking sector, the fewer exchanges within a country. This implies that the banking sector and capital markets are complements rather than substitutes for financing within a country.

Finally, the size of the economy, measured either as GDP or GDP per capita, is a significant explanatory variable, with larger economies having more financial exchanges. Population, after controlling for GDP, decreases the number of exchanges in an economy. This suggests that financial exchanges are not constrained by a maximum number of market participants it may serve and that, potentially, the real variable of interest is concentration of wealth among the population. While we expected, based on our definition of an exchange, that the existence of an exchange would be explained by the variability of the exchange rate, we see that this does not have a significant impact in explaining financial exchange formation. This is in contrast to previous papers, see Rajan and Zingales (1997). The technology variable coefficient suggests that countries forming financial exchanges within the computer era tend to form fewer exchanges on average, a result consistent with financial exchanges being able to service market participants located a great distance away

reducing the need for regional exchanges.

Table IV displays the results of the same three models using two sub-samples. The sub-samples are formed using country groupings based on the IFC country classification. Developed and emerging economies fall into the *developed* sub-sample, which contains 52 countries, while frontier countries and countries not classified make up the *undeveloped* sub-sample consisting of 98 countries. The models display stark and revealing differences across the two sub-samples. Again the type of government is insignificant; however, the legal type and legal origin variables are also in general insignificant. In contrast, the components of the index of economic freedom play a much greater role across both the developed and undeveloped sub-samples. For the developed sample, trade policy, government intervention, banking and property rights are significant explanatory variables. The coefficients suggest that there are more financial exchanges within a country the more restrictive a country's trade policy, the smaller the size of the government sector within the economy, the more developed the banking system and the more lax the property rights. In contrast, undeveloped countries are significantly impacted by trade policy, property rights and the black market, consistent with the notion that under developed countries tend to rely more heavily on international trade but also tend to have under developed legal and regulatory systems. This is consistent with Khanna and Palepu (1999a,b) who find that diversified business groups in two emerging markets, Chile and India, serve as competing intermediaries for more traditional capital markets. Furthermore, the signs of these undeveloped coefficients are exactly opposite those of the developed sample. For the undeveloped sample, the signs imply that there are more financial exchanges within a country the more *open* a country's trade policy, the more *stringent* the property rights within the country and the more developed the black market.

The GDP variables are consistently positive across both samples implying that larger economies support more exchanges. Population is only significant within the undeveloped sample where population growth rates tend to be far higher than in developed countries. Lastly, since most developed countries have

formed exchanges earlier than 1960, is it not surprising that the technology variable has little impact. The undeveloped countries show that the impact of the computer technology has been to reduce the number of financial exchanges formed.

IV. Impact of Financial Exchanges on the Macro Economy

The theory on the relationship between financial markets and economic growth is mixed. Some argue that financial markets can increase economic activity by raising the savings available to finance investment, see Bencivenga and Smith (1991), and Jappelli and Pagano (1994). Other theories state that economic activity can be improved because financial markets can increase the productivity of investment, see Greenwood and Jovanovic (1990) and Fernandez and Galetovic (1994). Alternatively, Devereux and Smith (1994) show that greater risk sharing can actually reduce saving rates and slow economic growth, and Shleifer and Summers (1988) and Morck, Shleifer, and Vishny (1990a, 1990b) argue that stock market development can lower economic growth by easing counter productive corporate takeovers.

Recent empirical studies have investigated the relation between stock market development and economic activity. This empirical work has been inconclusive. 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 find that stock market liquidity is positively correlated with economic activity; however, volatility, market integration, and market size are not linked with economic activity.¹²

Other empirical work, such as Levine and Zervos (1996) and Atje and Jovanovic (1993), does find a correlation between economic growth (GDP growth) and stock market development.¹³ These results,

¹² Liquidity is measured both as the value of stock trading relative to the size of the market and as the value of trading relative to the size of the economy.

¹³ Levine and Zervos (1996) define an index of stock market development that includes measures of size, trading volume, and integration. Atje and Jovanovic (1993) use the value of stock market trading divided by GDP as a proxy for stock market development.

however, need to be viewed with some hesitancy in light of the results 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 countries with developed stock markets and use cross sectional regressions to determine whether more highly developed stock markets lead to higher levels of economic activity.

However, many of the theories on the relation between stock markets and economic development only yield predictions based on the presence or absence of a stock market rather than on the market's level of development as measured by market liquidity or size. If stock markets are important to economic activity, this may be best 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.

In this section, we examine economic activity in countries both before and after the opening of the initial equity exchange formed 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. Specifically, our sample includes countries whose first equity exchange was formed after 1950 or 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 variables to measure the potential impact of the exchange on economic growth. We use as dependent variables ten year growth rates of the capital account, domestic credit, direct investment into and out of a country, the financial account, gross domestic product, industrial production, the consumer price index and the producer price index, the monetary aggregates (M1 and M2), portfolio investment assets and liabilities as well as the variance of the exchange rate with the United States dollar and the slope of the yield curve measured by the long and short term government interest rates. The regression is based on the analysis in Jayarante and Strahan (1996). The

specification includes dummy variables for each decade (1950-1959, 1960-1969, etc), dummy variables for each country included in that particular regression, and an exchange dummy variable that takes on the value one after an exchange is formed and zero otherwise. The coefficients on the time and country dummy variables are both constrained to sum to zero.

Table V presents the regression results. The productivity variables (GDP, GDP per capita and industrial production) suggest that the existence of an exchange has a positive impact on economic growth; however, none of the coefficients are statistically significant. Furthermore, the sign of the inflation variables (consumer and producer price indices) show that the existence of an exchange has a deflationary impact on prices albeit, like the productivity variables, this effect is not significant. 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 but the sign nonetheless suggests that having an exchange tends to keep domestic capital inside the country and draws foreign capital into the country. 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 that the presence of the equity exchange reduces the growth rate of M1 and M2 by 8% and 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 of a need for cash. Moreover, these results are inconsistent with studies finding a significant positive relation between capital market growth and macro-economic growth.

V. Probit Model of a Financial Exchange's Trading Mechanism

In this section, we empirically model the choice of trading mechanism by an exchange as follows: an exchange is assigned 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. There are many variables that can potentially impact the choice of trading mechanism by an exchange. Macey and O'Hara (1998) argue that competition among exchanges, and its focus on trading costs, is an important determinant of the nature 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 type of mechanism while emerging and frontier countries have a different mechanism, this suggests that there may be a hierarchy to the trading mechanism, or at a minimum, different environmental characteristics necessary to sustain these various mechanisms. The number, as well as the type, of securities the exchange trades captures the possibility that certain types of mechanisms may have constraints on the number of assets it can trade. To be consistent with the previous ordered probit analysis, we also include the aggregated index of economic freedom along with the macro economic variables used in the previous analysis.

Table VI displays the results of the probit analysis. Models 1 through 3 correspond to the three previous models used in the ordered probit analysis. Models 4 through 6 add as additional explanatory variables; a developed country dummy variable, an equity exchange dummy variable, the number of exchanges within that country and the natural log of the number of assets traded on the exchange. Unlike the ordered probit analysis explaining the number of exchanges within a country, government type, legal type, legal origin and the index of economic freedom are not useful in explaining the choice of trading mechanism. Moreover, even the macro economic variables and technology dummy variable do little to explain an exchange's choice of trading mechanism. Thus, the decision on whether or not to form a financial exchange is separate from the decision of how to structure an exchange.

The results suggest that financial exchanges in developed countries are more likely to be structured such that the market participants are the primary liquidity providers. Non-developed countries are less likely

to be able to sustain such an exchange and instead opt for trading mechanisms having fewer demands on market participants and more demands on market makers. This is suggestive of a hierarchy to these trading structures.

In addition to the level of development, the level of competition is also important. Specifically, the greater the level of competition, measured by the number of exchanges in a country, the greater the likelihood that the exchange will rely on market maker liquidity provision. This result is consistent with Glosten (1994), who argues that a trading mechanism relying on market participant liquidity provision, e.g. a limit order book trading mechanism, is ‘inevitable’ in that it will draw order flow away from a trading mechanism relying on market maker liquidity provision. In equilibrium, this argument would imply that non-competitive exchanges would be eliminated in the presence of an exchange relying on market participant liquidity provision. The number of assets traded is weakly important, with more assets being traded on mechanisms relying on market participant liquidity provision. This result indicates that there may be constraints to the number of assets that can be traded on mechanisms relying on market maker liquidity provision. Conditioning on the other explanatory variables, we see that the type of asset traded does not help explain the choice of trading mechanism despite the fact that Table 1 shows that market participant liquidity provision is more prevalent for equity exchanges than for derivative exchanges.

VI. Conclusion

Unlike previous work that focuses on a small subset of financial exchanges, we analyze a cross-section of 248 exchanges residing in 90 countries. The number of financial exchanges within an economy can be explained by the level of economic freedom, the size of the economy as well as whether or not the exchange was created in the computer era or not. While we have identified factors explaining the existence of financial exchanges within a country, the 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. In contrast to the findings of Levine and Ross, among others, we find no significant effect on the economy-wide productivity measures. The creation and availability of liquid financial assets made possible by the financial exchange serves to make cash less of a necessity for market participants. Finally, our investigation into an exchange's choice of trading mechanism reveals that the choice depends on the country's degree of economic development, the level of competition, measured by the number of exchanges in a country, and to a lesser extent the number of assets traded. Mechanisms relying on market participant liquidity provision are used more often in developed countries and in countries where there are fewer competing exchanges. Our results suggest that there is a hierarchy to the set of trading mechanisms, with mechanisms driven by market maker liquidity provision being easier to implement and sustain in less developed financial economies. Mechanisms that rely on market participants to supply liquidity, require more from market participants to function efficiently and are sustainable primarily in more developed economies.

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, what impact they have on the domestic economy, and what trading mechanisms are likely to survive within that environment.

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Chart 1

Number of Exchanges per Country

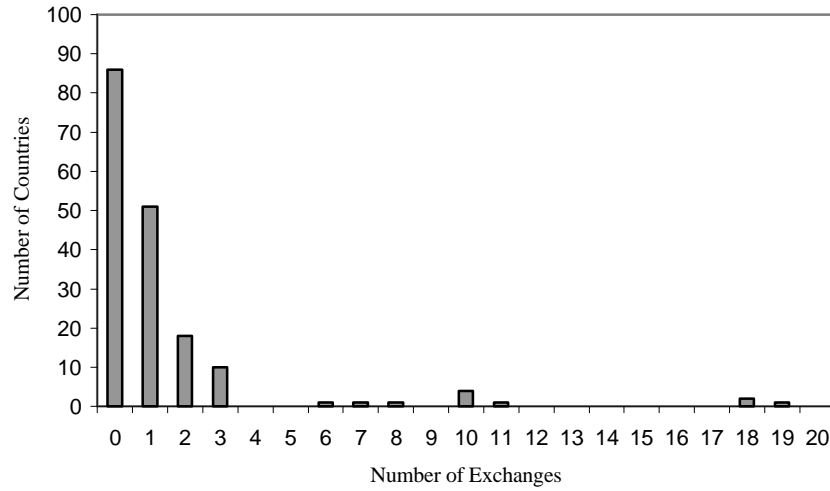


Chart 1 displays a histogram of exchanges that exist in countries of the world as of January 1999. Exchanges include equity, derivative as well as fixed income and cash commodity exchanges. The following countries have more than five exchanges with the number of exchanges in parenthesis: Argentina (11), Brazil (10), Canada (7), China (10), Germany (10), India (19), Japan (18), Spain (8), Russia (10), United Kingdom (6) and United States (18).

Chart 2

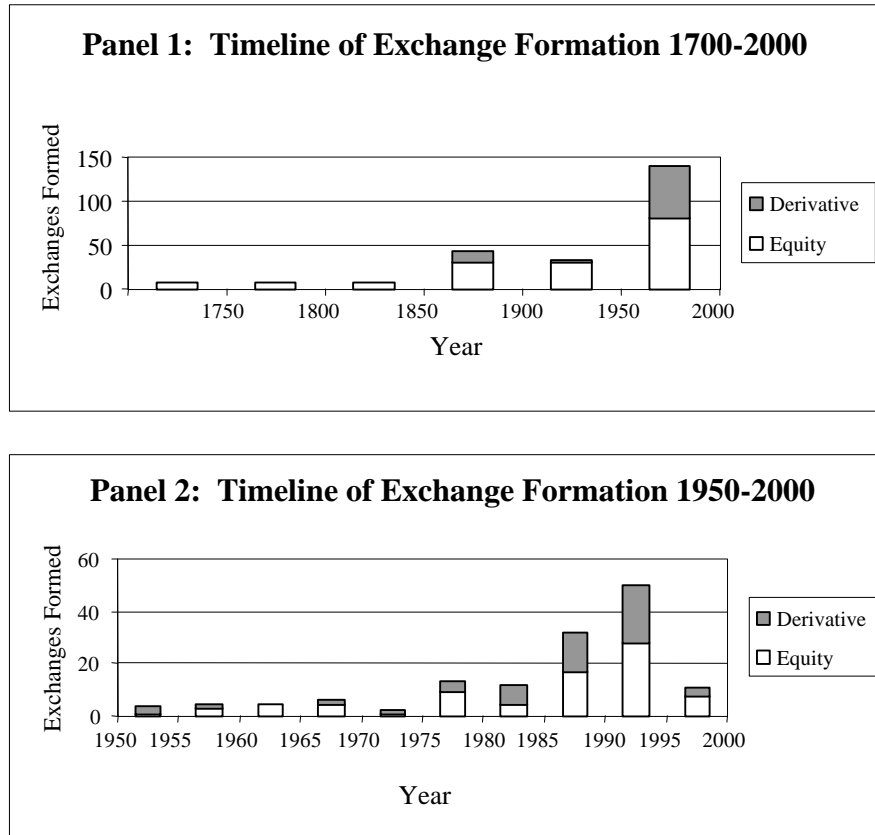


Chart 2 displays a timeline of exchange formation. Exchanges include equity, derivative as well as fixed income and cash commodity exchanges. Formations are recorded for exchanges existing as of January 1999. Panel 1 shows formations from 1750 through the present while Panel 2 shows formations that occurred from 1950 to the present.

Table I

Frequency Table of Trading Mechanisms

This table provides a break down of trading systems based on whether the primary liquidity providers are market makers or market participants. Examples of trading systems 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 systems 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		Total
	Market Makers	Market Participants	
	Country's Economic Development		
Developed	47	51	98
Emerging	42	13	55
Frontier	42	6	48
Total	131	70	201
	Security Type		
Equity	78	57	135
Derivative	50	13	63
Other	3	0	3
Total	131	70	201

Table II

Frequency Table of Countries' Legal Type, Legal Origin and Government Type

This table provides a break down of legal type, legal origin and government type based on the International Finance Corporations (IFC) categorization of developed, emerging and frontier countries. The frontier category includes countries categorized as frontier as well as those not categorized. The Romantic legal origin category includes legal systems originating from France, Italy, Portugal and Spain while the other legal origin category includes Islamic origins, Russian origins 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
<hr/>				
Legal Type				
Civil	15	13	64	92
Common	8	9	36	53
Not Categorized	0	8	38	46
Total	23	30	138	191
<hr/>				
Legal Origin				
English	8	7	38	53
German	4	5	3	12
Romantic	5	14	42	61
Scandinavian	4	0	0	4
Other	2	4	55	61
Total	23	30	138	191
<hr/>				
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

Table III

Ordered Probit Model of the Number of Exchanges in a Country

This table provides the results of an ordered probit model of the number of exchanges that exist in a cross-section of 150 countries for which we have sufficient data. The value of the dependent variable (number of exchanges) is limited to 5 values: 0, 1, 2, 3 and 4 or more. 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.

Variables	Model 1		Model 2		Model 3	
Constant	1.89	(0.60)	-7.65	(2.36)	-20.49	(3.15)
Government Dummy Variables						
Parliamentary	0.06	(0.29)	0.13	(0.34)	0.15	(0.36)
Monarchies	-0.07	(0.34)	-0.13	(0.36)	0.04	(0.39)
Other	0.56	(0.43)	0.50	(0.47)	0.17	(0.51)
Legal Type Dummy Variables						
Civil	-0.90	(0.56)	-1.16	(0.58)	-0.40	(0.64)
Other	-0.61	(0.57)	-0.69	(0.60)	-0.24	(0.66)
Legal Origin Dummy Variables						
Romantic	<i>1.02</i>	<i>(0.59)</i>	<i>1.02</i>	<i>(0.61)</i>	0.03	(0.67)
German	1.34	(0.67)	1.53	(0.72)	0.29	(0.80)
Scandinavian	1.24	(0.84)	0.93	(0.87)	-0.01	(0.93)
Other	<i>1.06</i>	<i>(0.58)</i>	0.97	(0.62)	0.18	(0.67)
Economic Freedom Variables						
Trade policy	-0.12	(0.11)	-0.06	(0.12)	-0.05	(0.12)
Taxes	0.25	(0.12)	0.11	(0.13)	0.17	(0.14)
Gov't Interv.	-0.17	(0.14)	-0.24	(0.16)	-0.13	(0.17)
Mon. Policy	-0.01	(0.08)	0.07	(0.10)	0.01	(0.10)
Foreign Invest	-0.10	(0.16)	-0.09	(0.17)	-0.19	(0.19)
Banking	-0.25	(0.16)	-0.26	(0.17)	-0.44	(0.19)
Wages	-0.08	(0.20)	-0.16	(0.22)	-0.10	(0.23)
Property Rights	-0.21	(0.19)	0.27	(0.23)	0.11	(0.25)
Regulation	-0.04	(0.18)	0.28	(0.21)	0.11	(0.22)
Black Market	-0.04	(0.14)	0.12	(0.15)	0.28	(0.16)
Macro Variables						
Ln (GDP/ Pop)			1.01	(0.22)		
Ln(GDP)					1.32	(0.24)
Ln(Population)					-0.66	(0.24)
VAR(exch. rate)			-1.47	(1.62)	-2.66	(1.74)
Technology			-1.20	(0.29)	-0.29	(0.33)

Table IV

Ordered Probit Model of the Number of Exchanges in a Country

This table provides the results of an ordered probit model of the number of exchanges that exist in a cross-section of 150 countries for which we have sufficient data. The value of the dependent variable (number of exchanges) is limited to 5 values: 0, 1, 2, 3 and 4 or more. The developed (52 countries) and undeveloped (98 countries) sub-samples are formed by taking those countries classified by the IFC as developed and emerging, and frontier and non-classified respectively. 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.

Variables	Developed						Undeveloped					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Constant	-0.18	(1.42)	-30.46	(8.83)	-34.95	(13.9)	0.37	(1.01)	-8.22	(4.40)	-54.16	(14.9)
Government Dummy Variables												
Parliamentary	-0.90	(0.91)	0.03	(0.83)	0.51	(1.07)	0.21	(0.43)	0.70	(0.66)	0.75	(0.84)
Monarchies	-0.64	(0.57)	-0.49	(0.62)	-0.71	(0.69)	0.10	(0.59)	0.37	(0.79)	-1.99	(1.56)
Other	0.63	(0.87)	1.09	(0.91)	-0.11	(1.04)	-2.20	(5.57)	-3.40	(7.85)	-10.31	(3295)
Legal Type Dummy Variables												
Civil	2.23	(1.28)	1.22	(1.25)	1.38	(1.88)	-1.13	(1.07)	-0.95	(1.09)	-1.79	(2.28)
Other	3.24	(1.48)	2.16	(1.49)	2.66	(2.56)	-1.41	(1.08)	-0.96	(1.12)	-3.64	(2.60)
Legal Origin Dummy Variables												
Romantic	-1.56	(1.60)	-0.18	(1.31)	-0.11	(2.20)	1.25	(1.17)	1.42	(1.25)	4.32	(2.63)
German	-1.54	(1.60)	-0.94	(1.32)	-0.79	(2.73)	-0.75	(9.30)	-0.25	(16.2)	2.13	(4903)
Scandinavian	-1.22	(1.51)	-0.37	(1.41)	0.54	(2.39)						
Other	-1.22	(1.38)	-0.92	(1.30)	0.09	(2.81)	1.78	(1.13)	1.35	(1.29)	1.52	(2.55)
Economic Freedom Variables												
Trade policy	0.39	(0.41)	1.28	(0.50)	1.22	(0.74)	-0.00	(0.15)	-0.32	(0.21)	-1.20	(0.39)
Taxes	0.48	(0.27)	0.13	(0.34)	-0.08	(0.45)	0.04	(0.17)	0.33	(0.21)	0.42	(0.37)
Government Int.	-0.73	(0.44)	-1.29	(0.49)	-0.98	(0.52)	0.08	(0.21)	-0.12	(0.31)	0.72	(0.46)
Monetary Policy	-0.15	(0.22)	-0.26	(0.27)	-0.37	(0.30)	0.01	(0.12)	0.12	(0.26)	0.43	(0.28)
Foreign Invest	0.34	(0.70)	0.34	(0.49)	-0.13	(0.86)	-0.09	(0.21)	0.07	(0.24)	0.19	(0.38)
Banking	-0.78	(0.39)	-0.46	(0.39)	-0.58	(0.75)	-0.30	(0.27)	-0.16	(0.33)	-0.74	(0.62)
Wages	0.42	(0.50)	-0.16	(0.53)	0.08	(0.57)	-0.23	(0.29)	-0.54	(0.39)	-0.08	(0.62)
Property Rights	1.13	(0.65)	1.94	(0.76)	1.58	(0.95)	-0.37	(0.30)	-0.01	(0.42)	-1.36	(0.64)
Regulation	-0.30	(0.42)	0.32	(0.42)	-0.38	(0.49)	0.29	(0.30)	0.36	(0.38)	0.80	(0.68)
Black Market	-0.83	(0.43)	-0.64	(0.45)	-0.82	(0.55)	0.14	(0.21)	0.55	(0.26)	1.09	(0.43)
Macro Variables												
Ln (GDP/Pop)			2.98	(0.87)					1.19	(0.46)		
Ln(GDP)					2.43	(1.23)					3.78	(0.92)
Ln(Population)					-1.61	(1.15)					-2.15	(0.63)
VAR(exch. rate)			0.68	(3.77)	-2.92	(9.73)			0.94	(16.2)	-0.01	(0.009)
Technology			0.33	(0.51)	0.20	(0.66)			-3.71	(0.91)	-3.03	(1.71)

Table V

Long-Run Impact of Financial Exchange Existence on Macro-Economic Variables

This table provides results from an OLS regression analysis adopted from Jayaratne and Strahan (1996) where long-run growth in macro variables are regressed upon a constant, time period dummy variables, country dummy variables and an exchange existence dummy variable. The macro-economic data are 10 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.

Dependent Variable	Number of Countries	Constant	Time Dummies	Country Dummies	Exchange Dummy	R ²
Capital Account	73	-0.10 (1.29)	0.40	6.38	0.35 (1.86)	0.872
CPI	110	0.38 (0.95)	0.04	0.50	-0.05 (0.48)	0.172
Domestic Credit	121	0.84 (2.11)	0.87	0.88	-0.56 (1.34)	0.262
Dir. Invest Inside	114	0.58 (6.35)	0.27	0.68	-2.52 (6.56)	0.353
Dir. Invest Outside	55	35.07 (78.35)	0.47	0.56	-25.65 (59.45)	0.348
Financial Account	120	-7.23 (7.91)	0.49	0.75	-1.53 (7.55)	0.338
GDP	84	0.01 (0.03)	2.72	1.13	0.005 (0.02)	0.358
GDP per Capita	84	-0.01 (0.03)	2.58	1.10	0.004 (0.03)	0.312
Industrial Product	28	-0.006 (0.02)	5.67	2.26	0.01 (0.02)	0.480
M1	119	0.19 (0.04)	9.78	3.49	-0.08 (0.03)	0.583
M2	119	0.21 0.04	9.67	3.56	-0.07 (0.03)	0.596
Port. Invest Assets	54	4.45 (14.96)	0.51	0.48	-4.66 (11.82)	0.379
Port. Invest Liab.	58	-17.45 (53.78)	0.66	0.93	8.07 (45.43)	0.498
PPI	36	0.21 (0.07)	1.94	2.67	-0.09 (0.10)	0.524
VAR(Exch. Rate)	133	4 31309	1.05	0.85	-10343 (20518)	0.173
Slope of Yield Cur	21	2.09 1.29	0.61	0.70	0.53 (2.22)	0.369

Table VI

Probit Model of Financial Exchange Trading Mechanisms

This table provides results from a probit regression analysis where the dependent variable is the choice of exchange trading mechanism within a set of 177 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.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Constant	0.99	(0.73)	-3.22	(3.01)	-3.96	(3.13)	-0.82	(1.08)	-3.21	(2.26)	-1.07	(0.63)
Government Dummy Variables												
Parliamentary	0.11	(0.29)	-0.01	(0.31)	-0.03	(0.33)	0.25	(0.36)				
Monarchies	-0.39	(0.27)	-0.42	(0.28)	-0.55	(0.29)	-0.36	(0.51)				
Other	0.19	(0.41)	0.11	(0.40)	0.08	(0.41)	0.27	(1.77)				
Legal Type Dummy Variables												
Civil	-0.32	(0.93)	0.06	(0.93)	-0.46	(0.92)	0.43	(1.68)				
Other	-0.71	(1.01)	-0.28	(1.00)	-0.73	(1.00)	-0.37	(1.10)				
Legal Origin Dummy Variables												
Romantic	0.51	(0.96)	0.04	(0.97)	0.58	(0.96)	0.04	(1.18)				
German	1.17	(1.00)	0.63	(0.99)	1.24	(0.98)	0.52	(1.07)				
Scandinavian	0.66	(1.11)	0.13	(1.13)	0.72	(1.13)	-1.84	(2.28)				
Other	0.84	(0.91)	0.57	(0.94)	1.22	(0.95)	0.36	(1.13)				
Economic Freedom Variable												
Index	-0.67	(0.24)	-0.19	(0.36)	-0.12	(0.40)	0.42	(0.57)				
Macro Variables												
Ln(GDP/Pop)			0.34	(0.25)					0.20	(0.26)		
Ln(GDP)					0.41	(0.26)						
Ln(Pop)					-0.42	(0.29)						
VAR(exch. rate)			3.05	(2.96)	4.51	(6.38)			122.8	(105)		
Technology			-0.34	(0.31)	-0.48	(0.34)			-0.12	(0.32)		
Other Variables												
Developed Dummy							0.88	(0.39)	1.16	(0.63)	1.57	(0.82)
Equity Dummy							-0.39	(0.52)	-0.20	(0.51)	-0.44	(0.64)
# of Exchanges							-0.10	(0.08)	-0.12	(0.06)	-0.13	(0.07)
Ln(# Assets traded)							0.21	(0.32)	0.20	(0.12)	0.15	(0.10)