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*Country and Firm Sources of
International Competitiveness:
The Case of the Foreign Exchange
Market*

by
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Country and Firm Sources of International Competitiveness:
The Case of the Foreign Exchange Market ¹

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Abstract: Competitiveness in the foreign exchange market depends on both country and firm-specific factors. Country-specific factors in the form of the importance in the foreign exchange market of the home currency and the home regulatory and legal system explain much; of the two the legal and regulatory system appears more critical. Firm-specific factors in the form of the size and international reach of the banks that make the market play a role. When the domestic market is particularly rivalrous, in the sense that firms face strong domestic competitors, that itself is an important factor. Still nothing is absolute; some banks overcome national weakness and some banks do not live up to the potential inherent in their national origin. Lastly, a bank's competitiveness tends to persist in time and to extend across even to unrelated currency markets.

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Abstract

Competitiveness in the foreign exchange market depends on both country and firm-specific factors. Country-specific factors in the form of the importance in the foreign exchange market of the home currency and the home regulatory and legal system explain much; of the two the legal and regulatory system appears more critical. Firm-specific factors in the form of the size and international reach of the banks that make the market play a role. When the domestic market is particularly rivalrous, in the sense that firms face strong domestic competitors, that itself is an important factor. Still nothing is absolute; some banks overcome national weakness and some banks do not live up to the potential inherent in their national origin. Lastly, a bank's competitiveness tends to persist in time and to extend across even to unrelated currency markets.

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Country and Firm Sources of International Competitiveness: The Case of the Foreign Exchange Market

1.0 Competing in one of the world's largest markets

The foreign exchange market currently trades over US\$1.2 trillion per day and is one of the world's oldest markets -- being almost as old as money itself. Even today the foreign exchange market is one of the few in which commercial and investment banks from all countries participate to some degree. It is also one in which banks from several countries are important competitors. The banks' trading operations are located in many cities around the world and trading moves around the world almost continuously throughout the 24-hour day. Together, these characteristics make the foreign exchange market one of the most international markets of all.

Despite the size and importance of the market, the economics literature on the firms that comprise the market is almost non-existent. Typically, the economics literature has pursued the issue of the determinants of foreign exchange rates while the finance literature has pursued the issue of the efficiency of the market. However, and except for two notable studies that I discuss in Section 3 (Holmes *et al.*, 1991 and Zaheer 1995), the scholarly literature on sources of competitiveness in the foreign exchange market is nil. This is particularly unfortunate from the point of view of research: banking is everywhere a highly regulated industry but foreign exchange trading is an activity that almost all national regulatory authorities consider a part of banking.

The foreign exchange market then permits one to observe the influence of the domestic regulatory system on international competitiveness.

In the four substantive sections that follow I examine country and firm sources of competitiveness in the foreign exchange market. Essentially I propose and test some hypotheses concerning the role and relative importance of several factors, some of which are country and some of which are firm-specific in nature.

In Section 2, below I examine how the banks make the foreign exchange markets. First I describe the structure of the market. Then I discuss how banks profit from trading in foreign exchange. Lastly, I conclude the section with a description of the size of the market in London, New York and Tokyo.

In Section 3, I propose some factors that might determine competitiveness. The country-specific factors I discuss are the international importance of the domestic currency and the nature of the domestic legal system while the firm-specific factors are the size of the bank and the extent of its international presence. Plus, when a country generates several firms that are themselves competitive, rivalry may spur further competitiveness.

In Section 4, I subject the hypothesized factors to tests. The measure of a firm's competitiveness is a score based on the firm's rank in Euromoney's annual survey of foreign exchange markets. (The firms in this study are almost all commercial banks though some US investment banks do appear.) Clearly a large number of US firms appear in the rankings because of the importance of the US\$. Other countries have fewer ranked banks because their currencies play a smaller

role in the world's financial system. Countries such as the US, UK, Canada, Australia and Hong Kong, with legal and regulatory systems based on common law, also appear to have more ranked banks than do countries such as France, Germany and Japan, with legal and regulatory systems based on code law.

Next, to control for country effects I look across banks but within countries and find that larger banks tend to have higher rank-scores. I also find that the greater the number of the major financial centers that each bank operates in the higher the bank's rank-scores.

When I combine country and firm-specific factors, the most important factor in explaining firms' rank-scores is the competitiveness of the domestic industry. Banks such as Chase Manhattan that have capable competitors such as Citibank or Bank of America are themselves capable; banks such as Banque Nationale de Paris that have weak domestic competitors are themselves weak.

Also, it is more important to be a large, international bank from a country with a common law legal system than to be a large, international bank from a country with an important domestic currency. That is, Royal Bank of Canada has a higher rank-score than Dresdner Bank.

In Section 5, I investigate the transferability of competitiveness over time and to other currency markets. Briefly, the results suggest that competitiveness follows a random walk; Barclays Bank's rank-score in the 1990-94 period equals its rank-score in the 1985-89 period, plus noise. This persistence does not permit us to infer a lack of competition. Rather, the persistence suggests that

competitiveness follows from many factors each of which contributes only a portion to the final outcome.

Furthermore the results suggest that competitiveness in home-currency markets (say Yen/US\$ for Chase Manhattan) carries over to competitiveness in third-currency markets (say Yen/Deutsche Mark, again for Chase Manhattan). The banks that are high among the Top 20 banks overall tend to be among the Top 10 in third-currency markets.

2.0 Banks make the foreign exchange market

2.1 The banks deal with each other and with their customers

The foreign exchange market exists as a market for the exchange of national means of payment, primarily demand deposits but also currency. There is no floor or exchange; instead participants communicate electronically through phones and terminals.

The foreign exchange market actually consists of two markets, the interbank (wholesale) and the customer (retail) markets, which meet in the commercial banks. In the interbank market, dealers at banks trade with each other directly or through brokers. Some non-banks such as investment banks, central banks and major trading companies also participate in this wholesale market. As a rule of thumb and brokers aside, what distinguishes participants in the interbank

market is the willingness and obligation to quote two-way (bid-ask or buy-sell) prices to other interbank participants.

The participants in the customer market are all the firms and individuals that have recourse to the foreign exchange markets but who do not themselves trade as a line of business. Rather, customers engage in trading in support of their primary businesses. Major categories of customers include commodities dealers, multinational companies, nonbank financial companies and multinational petroleum companies. As a rule of thumb, customers do not ask the banks for two-way quotes (because they are not willing or able to reciprocate) but instead specify whether they are buying or selling.

Commercial banks are key to the functioning of the foreign exchange market because only banks can issue demand deposits. Even non-bank participants in the wholesale market must ultimately pass their transactions through banks.

2.2 The banks make profits in four ways

Essentially, banks make profits from four activities, listed here in order of increasing risk: arbitrage, executing transactions for clients, market-making and position-taking. Arguably, the most profitable activities are transactions and market-making, both activities that consist of performing services for others (Grubel 1993). Although performing services for others may not be highly profitable on a per transactions basis, the volume of transactions is large.

Arbitrage consists of profiting from discrepancies between contemporaneous prices in different markets. By definition, arbitrage is riskless as the dealer simultaneously buys in one market while selling in another. Arbitrage profits are fleeting and generally small per unit traded and are usually a by-product of dealers' constant monitoring of prices across markets separated by geography or instruments but linked by economic relationships. For instance, the price of the US\$ in terms of Deutsche Marks should equal the price of the US\$ in Yen, adjusted for the exchange rate between Yen and Deutsche Marks. An analogy to arbitrage profit is keeping an eye out for money on the pavement while walking along the streets of a city. One cannot make a living this way but one can find some coins and the occasional note.

Transactions comprise the execution of payment instructions. Every day individuals and firms receive payments in foreign currencies and make payments to firms and individuals in foreign currencies. Each of these transactions requires an exchange of one means of payment for another. Only banks may issue demand deposits and so only banks can execute transactions for others; even US investment banks must ultimately instruct a commercial bank to make the requisite payments. State Street Bank has divested itself of most commercial banking activities but has retained its bank charter because access to the payment system is important to the bank's success in its specialization in the processing of transactions.

The banks charge fees for the transmission and execution of the payment instructions. Also, when the banks exchange one means of national payment for another the banks receive the bid-ask spread, buying one currency at their bid and selling the other at their ask. Furthermore, executing transactions enhances the banks' ability to make markets.

Market-making is the service of providing liquidity or immediacy. Frequently individuals and firms wish to transact immediately and not wait for the arrival of a counter-party with the opposite requirements. The bank steps in as the counter-party, agreeing to buy the ¥en for US dollars, for instance, in the expectation that shortly someone will come along and wish to sell dollars for ¥en. Banks that receive a large, continuous flow of customers' orders to buy and sell can accept mismatches in their positions, confident that the flow of orders will ensure that the mismatch is temporary. When making the market, the bank's buys at its bid and sells at its ask and the bid-ask spread then compensates the bank for assuming two risks.

The first risk is that prices will change in the period between when the bank accepts the position and when it ends it. The expected value of the position is small (changes are as likely to favor the position as to reduce its value) and equal to the difference in the cost of borrowing in the two currencies involved.

The second and more important risk is that the bank's counterparty knows something that the bank does not. Then the bank will lose. If the bank knows more than its counterparty, the bank wins. At a first approximation then, banks

simply transfer profits from uninformed traders to informed traders.

Uninformed or liquidity traders (firms and individuals conducting buying or selling foreign exchange as an ancillary activity to real need and without expectations about price changes) pay the bid-ask spread. Informed traders (speculators) only buy or sell when they believe prices are wrong. Speculators earn a return that compensates them for their investment in information with which to price currencies. The bank sets its bid-ask spread so that its gains from uninformed traders cover its losses to informed traders.

Position-taking is the glamorous part of the foreign exchange market.

Dealers, through their purchase and sale of currencies, bet on the direction that exchange rates will take. In position-taking, banks act as informed traders.

Position-taking is inherently a zero-sum activity. Every gain to one party (bank or customer) represents a loss to the counter-party. When banks take positions they act as speculators. However, banks do not need to engage in position-taking and position-takers do not need to be banks.

The banks' speculative profits, if the banks do speculate profitably, come from three sets of participants: central banks, rogue traders, and uninformed traders. Central banks frequently transact in the foreign exchange market with macro-economic policy objectives rather than profit-making objectives. The evidence is mixed, but suggests that central bank intervention in foreign exchange markets is not profitable to the central banks.

Recent bank failures and trading disasters (BCCI, Orange County, Barings Bank, Daiwa Bank, Sumitomo Trading and many others) point out how the failure of governance mechanisms are like a failed shut-off valve that permits money to flow to the speculative activities of the counterparties. If the Bank of England had ensured that the management of Barings had installed and used standard risk control measures, Nicholas Leason would not have been able to lose almost US\$1 billion and 1995 would have been a less profitable year for Barings' counterparties (Tickell 1996).

Lastly, banks, when acting as speculators or informed traders, make profits from uninformed traders, as do all other successful speculators (Grubel 1993). Banks profit not only from their research but also from their position in the wholesale market. Successful dealers are able to read the order flow in the market and to profit from their knowledge. That informed traders earn their profits from uninformed traders does not mean that uninformed traders are being victimized (Grubel 1993). The uninformed traders benefit from the price discovery process and receive the services of money exchange and immediacy.

2.3 The biggest markets are in London, New York and Tokyo

London is the primary center for foreign exchange trading, followed by New York and Tokyo. Over 200 institutions are active in the US foreign exchange market; of these some 30 are market makers in the major currencies (Holmes *et*

al. 1991). Table 1a presents some statistics on the development of the size and relative importance of the three markets since 1979.

Business hours in London, New York and Tokyo span 22.5 hours in the 24 hour day. Any institution with a branch in each center can trade almost continuously in world-wide financial markets. Callier (1986) even makes a case that large banks engaged in foreign exchange trading *must* be present in all three centers. He argues that the ability to trade continuously facilitates the management of the risk of open positions. Table 1b shows the evolution between 1970 and 1995 in the number of foreign banks in these three cities.

Improvements in communications mean that banks can move supporting clerical operations to more remote and cheaper locations. However, the trading rooms themselves tend to be in financial centers, suggesting the existence of agglomeration economies.

3.0 Country and firm-specific factors contribute to competitiveness

Holmes *et al.* (1991), in the only study of competitiveness in foreign exchange markets that I am aware of, categorize the factors into two categories, the banks' endowed and acquired factors. For Holmes *et al.* (1991), a bank's endowment consists primarily of the characteristics of its home economy. These characteristics include the size of the economy, its history, and its role in international trade and finance. Other characteristics are the legal and regulatory

framework that governs the firm and the domestic market, the organization of the financial services industry and the degree of local competition. All of these influence the role of the home currency in international markets. In addition, for Holmes *et al.*, the firm's endowment includes the workforce's training and education and the firm's traditional client base and lines of business.

The firm's acquired characteristics are attributes that arise from past management decisions in response to the firm's endowment. Acquired characteristics include: the branch network, the firm's capitalization and perceived creditworthiness, degree and history of internationalization, scale and scope of existing foreign exchange operations, penetration into finance and current service offerings of capital market instruments and attitudes towards innovation and product development.

I prefer to classify factors into country and firm-specific factors. Country factors are factors that are available to or affect all national firms. Firm-specific factors are those factors that the firm possesses and that distinguish it from other firms from the same country. Country-specific factors influence the prevalence (both in terms of numbers and impact) of firms from specific countries in the global market. Firm-specific factors influence which firms from any given country will be particularly competitive in the global market. The two sets of factors are not independent. Still country factors, although they condition outcomes, do not absolutely determine outcomes. A firm from a weak national

environment may still succeed in international competition and a firm from a strong national environment may still fail.

Lastly, Hu (1995) points out that a firm's advantages are always relative to its competitors such that superiority at home does not necessarily mean superiority abroad, or vice-versa. A firm may also be weak at home but strong abroad, and vice versa. Hu also conjectures that in general, that the differences between countries are probably greater than the differences between firms of the same nationality, suggesting that country factors would dominate firm-specific factors in importance as sources of advantage.

3.1 Country factors include the home currency and legal system

A vehicle currency is one that firms and individuals use for their international transactions even though it is not their national currency (Krugman 1980). When a currency becomes a vehicle currency for the world or a region, banks from the currency's home country benefit.

The currencies that firms and individuals have chosen to use as vehicle currencies typically have been the currencies of major trading nations such as the UK or now the US. The large volumes of trade generate large volumes of transactions. Large volumes of transactions denominated in US\$ means that banks trading in the US\$ can spread their losses to informed traders over a very large volume of uninformed traders and so keep their spreads narrow. Clearly, once traders start to use a currency the process can be self-reinforcing. So many

firms use the US\$, that Mitsukoshi Department Store might find it cheaper (in terms of transactions costs such as the bid-ask spread) when dealing with Louis Vuitton to go from Japanese yen (¥en) to French francs (FFr) via the US\$ than to go directly via the small or even non-existent ¥en/FFr market. The bid-ask spreads on the FFr/US\$ and the ¥en/US\$ together may be less than on the ¥en/FFr. Ultimately, a vehicle currency may retain its role long after the home country has lost its commercial predominance. Sterling (£stg) remained important long after the UK had lost its position as the most important trading nation in the world. However, when the US became predominant after World War II, what had been a virtuous circle for sterling became a vicious one as the US\$ replaced sterling in world trade and payments.

Related factors reinforced the role of the volume of transactions. Banks and other firms in London and New York created liquid markets in short-term debt instruments. This meant that the Treasurer of Mitsui Busan could easily manage his firm's £stg or US\$ balances, investing short-term surpluses or borrowing to cover short-term deficits. All this rested on a regulatory and legal infrastructure conducive to contracting and trade.

One critical regulatory factor is the issue of non-resident convertibility. If a currency is to be a vehicle currency non-residents must have the legal right to hold balances in the currency and to transact freely in it. Although it is the decisions of firms and individuals whether a currency becomes a vehicle currency, governments hold a veto over the use of their own currency. For most

of the post-World War II period the Japanese government, concerned about its control over monetary policy and over the Balance of Payments, chose to restrict the access of non-residents to the domestic currency. This hampered the Yen from becoming a vehicle currency.

Lastly, even geography has played a role in making the US\$ today's premier vehicle currency. On any calendar day, the clearing (payments) system for Yen closes before the clearing system for sterling or Deutsche Mark (DM). These clearing systems close before the clearing system for the US\$. The reason is that the world has agreed that a day starts at the international date line in the Pacific Ocean. The implication is that the US\$ has the longest day; firms can receive and make payments on a stated day later in US\$ than in any other major currency.

Banks benefit from their home currency being a vehicle currency through their access to information and to the payments clearing system. The high volume of transactions also helps amortize the fixed costs of establishing a foreign exchange trading operation. Still, Holmes *et al.* (1991) suggest that because the US\$ is the main reserve currency and the currency against which other currencies trade, US financial institutions cannot focus on a single dominant currency. This has forced the US banks to develop expertise in a variety of currencies.

The legal and regulatory system can impact the ability of domestic firms to compete internationally through the system's effect on the ability of the domestic firms to innovate. The legal and regulatory system affects how good the firms are in crafting new instruments, contracts and practices to meet client needs. I would

hypothesize that common law legal systems are better at fostering innovation than are code law systems.

Numerous authors, for example Rybczynski (1984) and Walter (1992), have contrasted market and bank-oriented financial systems. Recently Corbett and Jenkinson (1996) have challenged the meaningfulness of this categorization, at least regarding putative effects on the financing of industry. Allen (1993) accepts the categorization but critiques the common association of bank-oriented systems with more rapid economic growth than that evident in market-oriented systems (Ellsworth 1985; Porter 1992). Still, Coleman's (1994) analysis of political power and the banking sector in France, Germany, Canada, the United Kingdom and the United States ends up dichotomizing the systems into the familiar two categories. He argues that, "To an extent not found in the Anglo-American countries, the French and German banking policy communities were able to plan and steer their responses to financial innovations and other pressures from the new international markets." According to Coleman, the two Continental European states saw a slow, step-by-step introduction of innovations. The Anglo-American states had many of the innovations first, with the regulators having to play catch-up. Coleman expresses his doubt that twenty years of intense innovation have left the Anglo-American financial services firms stronger than their French and German counterparts. My results below suggest that the Anglo-American firms *are* more competitive, at least in the foreign exchange market.

The categorization of market and bank-oriented financial systems could equally be a categorization of countries into common law and code law legal systems. Unfortunately from the point of view of theoretical and empirical research, one cannot untangle the two categorizations. The categorization of Anglo-American and Continental Europe, is broadly descriptive though Japan follows the code law and European pattern and Singapore, Malaysia and Hong Kong follow the common law and Anglo-American pattern. I use the code and common law dichotomy in the empirical work for two reasons. First, it has theoretical content. Second, I have found it easier to operationalize than the distinction between bank and market-oriented financial systems.

In common law systems, such as the US and the UK, the law tends to be ill-specified. As a result, contracts must be long and detailed with negotiation and litigation specifying their content. More critically, under common law, the presumption is that what is not forbidden is permitted. Banks and other providers of financial services can seek out lacunae in the law and gather for themselves any first-mover advantages that may result from offering an innovation. Particular firms may even develop a reputation for aggressiveness. The result may be a constant competition in innovation.

In civil law systems the law is codified and explicit. As a result, contracts can be short and general; the law specifies the details. However, the presumption is that what is not permitted is forbidden. Kanda (1993) gives a fascinating description of the Japanese case. (With the passage of a new foreign exchange law

in 1980, Japan changed the rules governing the foreign exchange market in Japan from "restriction in principle, freedom only as an exception" to "freedom in principle, restriction only in exceptions.") Once a law is in place, there is relatively little room for ex post litigation to determine the law's content. Consequently, the negotiation and litigation that establishes the law's content takes place before the actual passage of the Act authorizing the innovation.

The rule of "What is not permitted is forbidden" impedes private institutions trying to force the pace of innovation because it results in the dissipation of first-mover advantages. In Japan the government circulates the outline of any proposed innovation to all interested parties for debate and negotiation before authorizing the innovation (Kanda 1993). In France and Germany it is the industry that helps draft the new rules (Coleman 1994).

3.2 Firm-specific factors include size and international reach

Firms differ in their ability to exploit country-specific advantages. The two primary factors that appear to matter are the firm's size and its international reach. Large banks tend to have an international network of offices (Tschoegl 1983) though size and international reach are separable concepts.

Many large banks are relatively domestic and there are a number of smaller banks that are highly international. A bank's origins and history are an important source of these differences. In 1915, Citibank acquired the International Banking Company, a bank chartered in Connecticut in 1901 to

operate in Asia (including Pacific Russia) and Latin America. Barclays Bank incorporates the former Barclays DCO (Dominion, Colonial and Overseas) Bank. By contrast, Deutsche Bank, established to facilitate and handle German overseas transactions, lost many of its international offices in or after World War I and again in World War II; apparently it was slow to try a third time. Banque Indosuez's name signals its colonial origins. Japan's Bank of Tokyo (descended from the Yokohama Specie Bank and now merged into Mitsubishi Bank) was for many years something of a flagship bank. It had an officially sanctioned role of operating offices abroad. As a result Bank of Tokyo had more branches than any other Japanese bank though it was never larger than the *keiretsu* banks such as Fuji, Mitsubishi, Mitsui or Sumitomo.

Still, size matters, not so much for its own sake as for the signal that it gives of a customer base. The signal is imperfect. Not all large banks have a strong clientele of international corporations; some large banks are the central offices of confederations of savings banks. Some apparently smaller banks such as Bankers Trust may be good at arranging loans for an extensive base of corporate clients but may choose not to retain the loans on their balance sheets. Still, large banks do tend to be bankers to the corporate sector (Rhodes 1982).

Size may also correlate with safety, either through portfolio effects on the variability of the firm's results or through a belief that the regulatory authorities will view the bank as too large to fail. In recent years regulators have forced bank capitalization to grow with assets so larger banks will typically have a

larger capitalization. All these considerations come together in the form of the size of the risks the firm can take and the size of the position counterparties will feel comfortable establishing with the firm (Jagtiani 1996).

International reach matters for at least four reasons. First, as Callier (1986) argues, banks must have operations in at least the three major centers to be able to compete in the foreign exchange market. Second, traders in banks with trading rooms in different countries are better informed than traders operating at a distance. Deutsche Bank's traders trading DM for US\$ in New York can benefit from being able to talk to Deutsche Bank's economists and DM/US\$ traders in Frankfurt. Third, when Banque Nationale de Paris (BNP) has a trading room in Sydney it is easier for BNP to speak to its customers there in Strine and during Australian business hours. Fourth, when Swiss Bank Corporation (SBC) is making payments in Tokyo on behalf of customers in Basle, SBC may be able to handle the entire transaction in-house if the recipient, say a Swiss MNC, has an account with SBC's Tokyo branch. Even if the transaction has to end in a local bank, dealing with complications and unraveling mistakes is faster and easier if SBC has personnel in Tokyo who can pursue the matter.

3.3 Country-specific effects on firm-specific sources of competitiveness

One cannot completely separate country and firm-specific factors. The two sets of factors interact in complex ways to condition firms' strategies. One way is

through the effect on rivalry between firms. Another way is through processes within the firm.

A country with an internationally important currency and several large banks may generate a rivalrous domestic market. As Emery and Trist (1965) point out in their seminal article, an environment of several large competitors may become turbulent with an endogenous change-gradient. Competition for the business of US firms between Citibank, Chase Manhattan, J.P. Morgan, Bankers Trust and Goldman Sachs, among others, has resulted in pressure to innovate. As Porter (1990) has argued, the “presence of strong local rivals is a final, and powerful, stimulus to the creation and persistence of competitive advantage.” Nickell (1996), writing on competition and corporate performance, argues there are some theoretical reasons to believe that competition improves corporate performance but that the reasons are not overwhelming and the evidence is sparse. Still, his own results for a sample of some 670 UK companies does provide some support for the view.

Having an important currency and large banks does not guarantee that a rivalrous foreign exchange market will develop. First, the banks, though large, may not have well-developed international networks of offices. Second, the banks may not be competing.

The German, Italian and Japanese banks lost many of their overseas offices, particularly those in London and New York, as a consequence of World War II. Many of the banks appear to have been reluctant expanders for some years

thereafter, perhaps because of caution, perhaps because of the priority of rebuilding their domestic operations. In addition, the Ministry of Finance held back the international expansion of Japanese banks until the early 1980s.

Banks may choose not to compete, unilaterally, or collusively, with the tacit or actual approval of the domestic regulatory authorities. As a number of observers have noted, the Swiss banks have been slow to expand abroad and have apparently engaged in *de facto* mutual forbearance pacts with German banks; Choi *et al.* (1986 and 1996) provide supporting statistical evidence. Also, until at least the mid-1980s, many European banks responded to what they saw as a potential enhanced competition due to the liberalization of banking in the European Economic Community through cross-national partnerships such as EBIC, Euro-Partners, Inter-Alpha, Orion and SFE-Abecor. Again, Choi *et al.* (1986 and 1996) provide supporting statistical evidence. Banks may even enter into pacts with regulators (Breton and Wintrobe 1978) or take part in the regulatory system (Coleman 1994) in ways that mute domestic rivalry.

Lastly, national factors, including regulation, may affect processes within the firm. Zaheer's (1995) research shows that firms' organization of their trading rooms follows national patterns. Zaheer studied foreign exchange dealing rooms in New York and Tokyo and found that differences between Japanese and Western firms in their internal organization affected risk-taking and profits. The trading rooms in Japanese banks followed a bureaucratic-clan control structure. The Western firms followed a market control structure. The bureaucratic-clan

firms tended to hire at entry level, had low bonuses relative to base salary and used limits on traders' open positions extensively to control trading. The market control firms hired experienced traders, had large bonuses relative to salary and made little use of position limits. The market control trading rooms produced higher profits per trader although the positions were no larger on average than in bureaucratic clan trading rooms.

Zaheer's findings are consistent with Kogut's (1991) argument that technologies and management often diffuse more readily across industries within a country than within an industry but across countries. Possible reasons for this include legal and institutional factors that limit the profitability of innovation and hysteresis and lock-in to current practice. Kogut argues that learning is more difficult when the knowledge is know-how rather than information. The know-how resides in relationships within institutions. To adopt new practices means establishing new relationships.

The Japanese case is particularly interesting because one can observe the pressures that arise from the incongruent demands of two markets. The Japanese banks existed in a highly regulated and therefore placid environment (Emery and Trist 1965) that permitted them to evolve in a way that, while not conducive to developing expertise, was congruent with Japanese labor markets. Deregulation and the advent of competition from foreign banks (Tschoegl 1988) has increased the turbulence in the environment and is forcing the Japanese banks to change. As Zaheer points out, the Japanese banks have used a

generalist career path for their foreign exchange traders. However, competitiveness in foreign exchange requires specialists. As Tateno (1993) among others points out, the creation of a job category called “foreign exchange dealers” presents an important issue for the future development of the Tokyo market.

4.0 Testing the factors

4.1 We measure competitiveness by rank in league tables

Ideally, my dependent variable would be a measure of market share or profitability dis-aggregated by firm and market. However, such data does not exist. As far as market share data is concerned, the best data comes from the triennial central bank surveys that the BIS has coordinated since 1989. However the BIS does not release bank-by-bank figures and only provides aggregate statistics for locations and currencies. As far as profitability is concerned, few non-US banks break out their profits from their foreign exchange activities. Those banks that do report foreign exchange profits do not disaggregate them by currency or location. Even within the banks there are conceptual difficulties in identifying the profitability of activities in particular locations and currencies.

For my dependent variables I have, therefore, created measures reflecting or based on the rankings in Euromoney's annual survey of foreign exchange market competitiveness. Every year since 1976, Euromoney has mailed out a

questionnaire to over a thousand banks and firms worldwide asking the treasurers to rank their favorite banks for foreign exchange activities.

Euromoney then combines the results and issues rankings for overall competitiveness and competitiveness in particular activities, locations and currency markets.

Table 2 presents some data on the number of banks and firms that appeared in Euromoney's rankings in the 1985-89 and 1990-94 periods, and their national origins. (The Top 100 in the Table refers to The Banker's list of the 100 largest banks, ranked by total assets.) In the 1990-94 period, the number of banks that appeared in the rankings dropped by eight from the 1985-89 period's 35. At the same time, the number of banks that appeared in all five years of each period rose from 5 to 13. These two facts together suggest that the identity of the major firms in the market has become more stable. Firms coming from the US or the UK are noticeably well-represented and banks from Germany and Japan are noticeably absent or under-represented.

4.2 The home legal system may matter more than the home currency

Table 3 shows the results from regressions with a dependent variable that consists of the number of different firms from each OECD country that appear in the overall Euromoney rankings. The dependent variable therefore does not reflect how strong these firms are; I pursue that issue in the next sub-section. For the present investigation I use three independent variables.

The first independent variable is the share of a country's home currency in total foreign exchange trading in the 1989 and 1992 BIS surveys (BIS 1993). The hypothesis follows: the more important a currency is, the larger is the number of banks from the currency's home country that the market can sustain.

The second independent variable is a (1,0) dummy variable for countries with a common law legal system. Here the argument is that a common law legal system is particularly conducive to the innovation that supports the competitiveness of firms.

The third independent variable is the number of banks from the country that appear in The Banker's list of the top 100 banks in the world (ranked by total assets). One could reasonably expect that the number of top-rated banks a country has would depend on the number of large banks that it has.

Because the dependent variable consists of count data, I use two estimation techniques: OLS and the Poisson binomial model. I use two statistical methods because if the two methods provide qualitatively similar results one can be confident that the results do not depend critically on the statistical assumptions underlying each method.

Also, I estimate the OLS regressions using standardized variables on both sides and the Poisson regressions with standardized variables on the right side. Bringing variables to a common metric (units of standard deviations from the mean) facilitates comparisons of economic significance (McCloskey and Ziliak 1996). Tests of the statistical significance of the coefficients are not affected.

The results in Table 3 suggest that the importance of the country's currency matters in determining the number of internationally competitive banks that a country fields in the foreign exchange market. Whether or not the country has a common law legal system also matters. Which matters more depends on the estimation technique. The importance of the number of large banks within the country also depends on the estimation technique. The ambiguity about the relative importance reflects the high degree of correlation between the factors.

4.3 Firm size perhaps matters more than international spread

To investigate firm-specific factors I have first to control for country factors. The simplest way to control for country factors is to perform separate tests on banks from different countries. For these tests I have chosen to look at banks in The Banker's Top 100 (based on total assets) in 1985 and 1990 from five countries. France, Germany, Japan, the United Kingdom and the United States represent five of the six most important currencies (in terms of volume of trading) in the foreign exchange markets. The Swiss Franc (SFr) is a more important currency than the French Franc but my data contains only three large Swiss banks. Even though the DM is the second most important currency, Germany had no internationally competitive banks in the 1985-89 period.

For my dependent variable I have chosen to use an average rank-score for each bank, based on each bank's ranking in Euro money's survey. I give a bank a score of 20 for a first-place ranking and a score of 1 for a twentieth-place ranking

in a particular year. (Euromoney reports only the top 20 banks each year.) I then average each bank's score over a period to get its score for the period.

My two independent variables are measures of the size of each bank and of its international spread. The size measure is the natural logarithm of each bank's total assets in 1985 or 1990. Size represents the bank's customer base and reflects economies of scale. The natural logarithm captures the notion of a decreasing marginal influence of additional size.

To measure international spread I use the natural logarithm of the number of financial centers (out of fourteen) in which each bank has an agency, branch or subsidiary. The fourteen centers are from Choi *et al.* (1986). Only agencies, branches or subsidiaries represent entities that the parent unambiguously controls and that can book transactions. Tokyo forbids foreign banks to establish subsidiaries and Canada forbids foreign banks to establish branches. The natural logarithm captures a declining marginal contribution of additional spread.

Because the dependent variable consists of scores based on ranks, the dependent variable cannot take on a value higher than 20 or lower than 0. I therefore again use two statistical methods: OLS and Tobit with an upper and lower bound. Tables 4a&b present the OLS results.

The goodness-of-fit in both periods is higher for the UK and US models than for the French, German or Japanese models. Alternatively, the models work better in common law countries than in code law countries. The cause is not the importance of the home currency; sterling ranks fourth, after the DM and the

yen. The problem is that the code law countries have few rated banks and their rank-scores are low; as a result, the dependent variable exhibits little variation.

Both size and the number of centers in which the bank operates have generally positive effects. In the 1985-89 period, one cannot prefer one variable to the other; in the 1990-94 period, size appears the more important variable.

Tables 5a & b present the Tobit results. The limited variation in the dependent variable for the code law countries made it difficult to estimate equations for Germany and Japan in the 1990-94 period. For the model covering the German banks the algorithm pushed the effect of size as high as possible to account for Deutsche Bank, while pushing the effect of international reach as low as possible to account for the fact that many German banks had a reach equal to or greater than Deutsche Bank's but were not ranked in the market. The algorithm was unable to estimate the model covering the Japanese banks.

For the 1985-89 period, the Tobit results suggest that international reach is more important than size. For the 1990-94 period, the Tobit results appear to favor size over reach, except for the US. This may be a consequence of large banks becoming more similar on our reach variable with its ceiling.

4.4 Overall, domestic rivalry is key

In order to examine the combined effect of country-specific and firm-specific factors I performed regressions of three independent variables on the rank-scores of the Top 100 banks. (As in the case of the regressions in Tables 4 and 5,

banks that never appeared in the Euromoney rankings received rank-scores of zero.)

The analysis to this point suggests that country factors determine which countries will generate internationally competitive firms and that firm-specific factors determine which firms can benefit from the potential. I therefore created two interactive independent variables. The first independent variable consists of the product of three variables: the importance of the home country currency, the natural logarithm of each bank's total assets and the natural logarithm of the number of centers in which the bank had a presence. The second independent variable too consists of the product of three variables: the dummy variable for a common law legal system, the natural logarithm of each bank's total assets and the natural logarithm of the number of centers in which the bank had a presence. The two new independent variables combine each of the two most important independent variables from the regressions in Table 3 with the independent variables from Tables 4&5. The hypotheses are that: 1) large, internationally active banks from countries with important currencies will be internationally strong competitors; and 2) that large, internationally active banks from countries with common law legal systems will be internationally strong competitors.

My third independent variable consists of the average rank-score of a bank's domestic competitors. The hypothesis is that firms with strong competitors will themselves be strong competitors. For US money center banks I defined the set of competitors as other money center banks plus Bank of America. For Japanese

banks, the set was the major *keiretsu* city banks (Dai-Ichi Kangyo, Sumitomo, Sakura, Mitsubishi and Fuji) plus the Bank of Tokyo. For the German banks, the set was the three largest banks: Deutsche, Dresdner and Commerz. For the French banks, the set was Banque Nationale de Paris, Société Générale, Crédit Lyonnais, Banque Indosuez and Compagnie Financière Parisbas. For the UK, the set was the clearing banks plus Standard Chartered Bank.

As in the case of the regressions for Tables 4 and 5, I estimate both OLS and Tobit models. Again, the independent variables are in standardized form (OLS and Tobit), as is the dependent variable (OLS).

Table 6 presents the results. In both periods and for both estimation methods, the strength of domestic competitors is the most important variable determining a bank's own competitiveness. For both periods and methods, the interaction variable that incorporated the common law/code law dichotomy proved to be more powerful than the interaction variable that incorporated the importance of the currency.

Examination of the standardized residuals revealed two qualifications. The models seriously underestimated the rank-scores of Citibank, Chase Manhattan, Chemical, Barclays, Hongkong & Shanghai/Midland and Royal Bank of Canada. Citibank, Barclays and Royal Bank of Canada at the time were the largest banks in their home countries. More importantly, all these banks have international networks of offices that are substantially more extensive than our variable for presence in fourteen centers can capture.

The second point is that firm-specific factors may occasionally matter independently of interactions with country-specific factors. The regression for the 1990-94 period substantially underestimated the international competitiveness of Deutsche Bank and Union Bank of Switzerland. Both of these banks were not competitive in the 1985-89 period but now are. Both are also the largest banks in countries that happen, however, to have code law legal systems.

5.0 Competitiveness extends across time and currencies

5.1 Competitiveness continues from one period to the next

Table 7 presents the results of OLS models that regress each firm's rank score in the period 1990-94 on the firm's rank score in the period 1985-89. The population for Model 7.1 is all the commercial banks that entered into either regression for the determinants of competitiveness. The population for Model 7.2 is all the commercial or investment banks that received a non-zero ranking in either period. In both cases I accounted for mergers by associating the successor firm with the higher of its two parents' rank scores in the previous period.

As Table 7 shows, rank-scores persist. More importantly, an F-test does not reject the constraints that the intercept is zero and that the slope coefficient is 1. That is, if my data did not consist of rank scores I would not be able to reject the null hypothesis of a random walk.

The fact that Citibank has ranked first in the survey for some seventeen consecutive years does not contradict this result. As Shaffer (1986) points out, a Gibrat process (random walk of firm size) may generate rank stability and so rank stability does not necessarily imply an absence of competition.

5.2 Competitiveness transfers across currencies

Competitiveness in one currency also appears to translate into competitiveness in other currencies. This is not surprising when markets share a currency; the competitiveness of US banks in the Yen/US\$ market carries through the US\$ to competitiveness in the DM/US\$ market. However, a more demanding test is whether competitiveness in a home-currency market translates into competitiveness in third-currency markets. For example, can US banks compete in the Yen/DM market?

To investigate this issue I calculated average rank-scores for third-currency banks in seven markets over the period 1990-1995. With 10 possible positions, the average rank-score (across both home-currency and third-currency banks) for a market is 5.5. (A score of 10 equals a first place ranking and a score of 1 a tenth place ranking.) A rank score in Table 8a of less than 5.5 means that home-currency banks have higher average rank-scores than do third-currency banks; for instance, the average rank-score for the five non-US and non-UK banks that Euromoney ranked in the top 10 in the US\$/£stg market in the period was 3.1, indicating that UK and US banks dominate the rankings there. A rank score of

more than 5.5 means that third-currency banks have higher average scores than do home-currency banks. As Table 8a shows, home-currency banks dominate in six out of seven markets; the rank score of 5.8 means non-Japanese and non-German banks dominate in the ¥en/DM market.

Next I regressed the scores from Table 8a on three dummy variables for the US\$, £stg, and SFr. Each of these dummy variables takes on a value of one if the market in question includes the currency named in the variable, and zero otherwise. Thus for the US\$/£stg market, the three variables take on the values (1,1,0). I expect the coefficients of the dummy variables to be negative because the rank scores reflect the scores of third-currency banks. In the US\$/£stg market third-currency banks have to compete with US and UK banks and so their scores will be lower. Table 8b presents the results.

The model shows that in a market that does not involve the US\$, sterling or the Swiss franc, the average rank-score for third-currency banks is about 5.5. In markets against the US\$ where US banks have a home-currency advantage, the average rank score of the remaining banks is 1.7 points lower. In markets for currencies against £stg or the SFr where British or Swiss banks have a home-currency advantage, the average rank score of the remaining banks is 1 point lower. In the ¥en/DM market, where the third-currency firms include US, British and Swiss banks, the third-currency banks have a higher average rank score than the German and Japanese banks in the market.

Lastly, I also performed a disaggregated analysis, regressing the average rank-score (across markets) of banks in third-currency markets on their overall rank-score (Table 8c). In Model 8.1 the group consists of only those banks that appeared in the rankings in third-currency markets. In Model 8.2 the group consists of all those banks that appeared in the overall rankings, whether or not the banks also appeared in the third-currency markets. The results clearly demonstrate a positive correlation between a firm's overall rank-score and its rank-score in third-currency markets.

6.0 Conjecturing about the future

For me, the one surprising result of this paper was the importance of the legal and regulatory system. I expected this to be a significant factor both statistically and in terms of its role in explanation; I did not expect it to be more important than the international role of the currency. The importance of the legal and regulatory system may reflect a particular period in history after the introduction of floating exchange rates and may mean less in the future.

Regulatory authorities in code law countries are amending their laws and regulations and are permitting their institutions to develop new instruments, contracts, markets and so forth. Under the pressure of competition, the firms from those countries are adapting and learning. Also, firms from code law countries are buying firms and hiring individuals from common law countries.

This suggests that research into the country and firm determinants of the ability to learn and to assimilate will prove a fruitful area for research.

Currently, US financial institutions dominate the foreign exchange markets but their relative competitiveness may erode in the future. The major sources of this potential erosion are obvious. Other currencies, especially the European currency should one emerge, are chipping away at the pre-eminent role of the US\$. Additionally, the differences between countries in the scope of their financial markets are shrinking. The interpenetration of financial centers through the exchange of institutions means that competition is intense in all centers. Many countries now have large, international financial institutions. However, competitiveness appears to follow a random walk. Put another way, competitiveness is contingent on many factors, and we can forecast the evolution of only some of them, and those with only limited confidence.

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	<u>1979</u>	<u>1984</u>	<u>1986</u>	<u>1989²</u>	<u>1992²</u>	<u>1995²</u>
London	33%	33%	30%	26%	27%	30%
New York	23%	24%	20%	16%	16%	16%
Tokyo	3%	5%	16%	15%	11%	10%
Daily volume (US\$B)	75	150	300 ¹	717	1076	1572

Notes: (1) Based on extrapolation from data for the three centers only. (2) UK, US and Japan.
Sources: Giddy (1979), BIS, Bank of England, Bank of Japan, Federal Reserve Bank of New York.

	London (1)		New York (2)	Tokyo
	<u>Directly</u>	<u>Indirectly</u>		
1970	159	22	75	61
1975	263	72	127	
1980	352	50	253	149(3)
1985	418	64	326	
1990	419		363	
1991	415		376	
1992	403		360	
1993		425	325	170
1994		429	324	
1995		450	326	

Notes: (1) For London we have included the figures for the number of foreign banks indirectly represented through their ownership of consortium banks when this is available. We have no such data for New York or Tokyo. By the late 1980s the number of surviving consortia is small. (2) For New York, the numbers do not include banks represented through securities or investment banking subsidiaries or subsidiaries engaged in other financial activities such as consumer finance and leasing. The numbers also do not include a number of foreign-owned US banks that engage primarily in domestic banking activity. (3) Average of figures for 1979 and 1981.
Sources: The Banker, various issues. Banking System in Japan, Federation of Bankers Associations of Japan, various issues.

Table 2: Between 1985-1989 and 1990-1994, the number of the Top 100 banks that are rated participants in the global foreign exchange market has declined

	<u>1985-89</u>	<u>1990-1994</u>	<u>Change</u>
Number of banks named	35	27	-8
Number of banks named in all 5 years	5	13	8
Number of named banks also in Top 100	30	25	-5
Number of US investment banks named	2	2	0
Number of times banks were named			
United States	45	41	-4
United Kingdom	18	23	5
Australia	11	2	-9
Japan	8	2	-6
Canada	7	8	1
France	4	3	-1
Switzerland	2	10	8
Germany	0	5	5
Sweden & The Netherlands	5	6	1

Sources: Euromoney, May, 1985-95; The Banker, July, 1986 and 1991.

Table 3: The number of internationally competitive firms in the foreign exchange market that an OECD country has depends on whether or not the country has a common law legal system, on the importance of its currency in foreign exchange markets and on the number of large banks that it has.

Dependent variables: The total number of banks from the country that achieved a Euromoney rank-score in the time period in question.

	1985-89		1990-94	
	<u>OLS</u>	<u>Poisson</u>	<u>OLS</u>	<u>Poisson</u>
Intercept		-0.68 (-1.98)		-0.53 (-1.81)
Importance of currency	0.79 (6.54)	0.03 (0.18)	0.72 (5.53)	0.30 (2.31)
Common law legal system	0.22 (2.66)	0.83 (3.54)	0.26 (2.35)	0.61 (2.65)
No. of large banks	0.06 (0.52)	0.78 (3.68)	0.07 (0.54)	0.44 (2.44)
R ²	0.87		0.76	
SER	0.37		0.51	
F	50.0		23.6	
Likelihood Ratio (LR) Statistic		81.2		40.2
X ²		26.4		32.1

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses. The number of observations is 25, representing the members of the OECD.

Table 4a: In the 1985-89 period, a bank's rank-score depends on the bank's size or the bank's international spread but it is not clear which factor is more important.

Dependent variables: Average rank-scores (1985-89) for the largest banks

	<u>France</u>	<u>Germany</u>	<u>Japan</u>	<u>UK</u>	<u>US</u>
σ (dep. variable)	1.09	0	1.28	5.53	7.04
Ln(Assets)	0.55 (1.04)		0.05 (0.23)	0.57 (1.65)	0.82 (4.24)
Ln(Centers)	0.12 (0.22)		0.46 (1.96)	0.80 (2.34)	0.01 (0.03)
R ²	0.40		0.25	0.68	0.69
SER	0.87		0.89	0.73	0.58
F	1.31		3.47	3.21	17.41
NOBs	6	9	23	5	18

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 4b: In the 1990-94 period, a bank's rank-score and size are positively correlated, and for the UK and the US, so too are a bank's rank-score and international spread

Dependent variables: Average rank-scores (1990-94) for the largest banks

	<u>France</u>	<u>Germany</u>	<u>Japan</u>	<u>UK</u>	<u>US</u>
σ (dep. variable)	0.31	3.40	0.09	7.30	7.47
Ln(Assets)	0.45 (0.84)	1.18 (3.93)	0.50 (1.43)	0.84 (29.4)	0.57 (3.20)
Ln(Centers)	0.02 (0.03)	-0.62 (-2.06)	-0.13 (-0.37)	0.35 (12.4)	0.47 (2.66)
R ²	0.22	0.71	0.16	1.00	0.81
SER	0.97	0.58	0.94	0.07	0.46
F	0.70	8.46	2.20	666	17.2
NOBs	7	9	25	7	10

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 5a: In the 1985-89 period, a bank's rank-score depends on the bank's size and the bank's international spread with the spread being more important for three out of four countries.

Dependent variables: Average rank-scores (1985-89) for the largest banks

	<u>France</u>	<u>Germany</u>	<u>Japan</u>	<u>UK</u>	<u>US</u>
Intercept	-2.63 (-1.23)		-6.63 (-1.71)	7.99 (5.74)	1.48 (0.64)
Ln(Assets)	2.53 (1.26)		3.81 (1.57)	3.14 (2.14)	6.39 (3.08)
Ln(Centers)	3.37 (1.26)		3.42 (2.50)	4.41 (3.02)	6.97 (1.56)
LR Statistic	8.32		25.4	25.6	65.6
NOBs	6	9	23	5	18

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 5b: In the 1990-94 period, a bank's rank-score and size are positively correlated, and for the UK and the US, so too are a bank's rank-score and international spread

Dependent variables: Average rank-scores (1990-94) for the largest banks

	<u>France</u>	<u>Germany</u> (1)	<u>Japan</u> (2)	<u>UK</u>	<u>US</u>
Intercept	-0.55 (-0.79)	-1.25 (-12.6)		7.39 (21.8)	5.20 (1.39)
Ln(Assets)	0.74 (0.75)	7.67 (113)		6.11 (27.3)	3.13 (1.51)
Ln(Centers)	-0.17 (-0.02)	-5.21 (-37.3)		3.27 (4.89)	13.7 (1.66)
LR Statistic	7.08	8.28		8.68	35.8
NOBs	7	9	25	7	10

Notes: 1) Model failed to converge; results in the table report the situation at the end of 25 iterations. 2) Singular Hessian. **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 6: Banks that are successful in foreign exchange markets have strong competitors and tend to be large, international banks from countries with common law legal systems.				
Dependent variables: Rank-score in the time period in question.				
	1985-89		1990-94	
	<u>OLS</u>	<u>Tobit</u>	<u>OLS</u>	<u>Tobit</u>
Intercept		-3.27 (-2.80)		-4.41 (-3.06)
Currency*ln(Assets)*ln(Centers)	0.05 (0.51)	-0.45 (-0.05)	0.16 (2.13)	0.86 (0.91)
Common law*ln(Assets)*ln(Centers)	0.19 (1.77)	2.61 (2.38)	0.27 (3.09)	2.92 (2.63)
Avg. rank-score of dom. competitors	0.58 (5.68)	3.95 (3.87)	0.50 (5.18)	3.76 (3.22)
R ²	0.58		0.68	
SER	0.66		0.57	
F	43.1		67.6	
LR Statistic		233		200
NOBs	97	97	98	98

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 7: Performance persists; a firm's rank-score in the period 1990-94 is equal to its rank-score in the period 1985-89, plus random noise.

Dependent variable: Rank-score 1990-94

	Model 7.1 <u>Commercial Banks</u>	Model 7.2 <u>Ranked Firms Only</u>
Intercept	0.17 (0.69)	0.90 (0.98)
Rank-score 1985-89	0.91 (16.4)	0.85 (6.96)
R ²	0.71	0.57
SER	2.39	4.17
F	270	48.4
NOBs	115	39

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.

Table 8a: In all but the Yen/DM market, home-currency banks dominate the rankings with the result that the average rank-scores of the third-currency banks are below 5.5.

<u>Market</u>	<u>Third-currency banks (1990-95)</u>	
	<u>Number</u>	<u>Average rank-score (per annum)</u>
US\$/£stg	5	3.1
DM/£stg	8	5.0
Sfr/US\$	6	3.2
DM/US\$	11	3.9
Yen/US\$	6	4.5
Yen/DM	13	5.8
DM/Sfr	11	4.8

Source: Euromoney, May 1990-95.

Table 8b: US banks are the most competitive in third-currency markets, followed equally by the British and the Swiss

Dependent variable: Average rank-score of third-currency banks in the seven markets of Table 8a.

Intercept	5.87 (29.7)
US\$ market	-1.67 (-8.42)
£stg market	-1.02 (-4.33)
SFr market	-1.05 (-4.46)
R ²	0.97
SER	0.26
F	28.7
NOBs	7

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses

Table 8c: A firm's overall competitiveness carries over to third-currency markets.
Dependent variables: Firms' rank-scores in third-currency markets.

	Model 8.1	Model 8.2
Population	Firms ranked in third-currency markets	All ranked firms
Intercept	0.10 (0.37)	0.02 (0.10)
Overall rank-score 1990-94	0.19 (6.01)	0.19 (6.80)
R ²	0.57	0.60
F	36.1	46.2
SER	1.02	0.97
NOBs	28	33

Notes: **Bold** type indicates statistical significance at the 5% level. t-statistics are in parentheses.