

Financial systems in advanced economies have undergone remarkable changes in recent years, driven primarily by deregulation and improvements in technology. The pace of these changes has varied across countries, and important differences remain in the structure of financial systems across these economies. This chapter explores how these differences in financial systems may affect the response of households and firms to changes in the economic environment, and thus influence the cyclical behavior of national economies.

The changes that have occurred in financial systems have transformed the opportunities for borrowing and saving facing households and firms. Households now have access to a broader range of borrowing options (e.g., through the widespread use of credit cards and home equity loans) and can easily invest in a wide range of financial instruments, such as stocks, bonds, mutual funds, and derivatives. Firms have been able to increasingly diversify their financing away from banks through the issuance of bonds in capital markets, while banks themselves have increasingly moved away from their traditional deposit-taking and lending role into fee-generating activities, such as the securitization of loans and the sale of risk management products. The increase in securitization—through instruments such as collateralized debt obligations (CDOs)—has allowed the unbundling of financial risks, which can be repackaged into portfolios of financial instruments and transferred to investors willing to assume such risks. The cross-border component of financial intermediation has also grown rapidly, particularly at the wholesale level (i.e., between financial institutions). For example, although household mortgages are still typically

originated by domestic financial institutions, markets for mortgage-backed securities attract a significant presence of foreign investors in a number of countries.

Despite these overall trends, however, there are still wide differences across national financial systems. Variations persist in the size of financial markets and in the importance of bank and nonbank financial intermediaries (such as mutual funds, private pension funds, and insurance companies; see Figure 4.1). Average stock market capitalization as a ratio to GDP during 1995–2004, for example, ranged from 140 percent in the United Kingdom to 40 percent in Italy. Over the same period, nearly half of the financial liabilities of the German nonfinancial sector (including households, nonfinancial corporates, and the government) were with the banking sector, while in the United States this ratio was only around 15 percent.

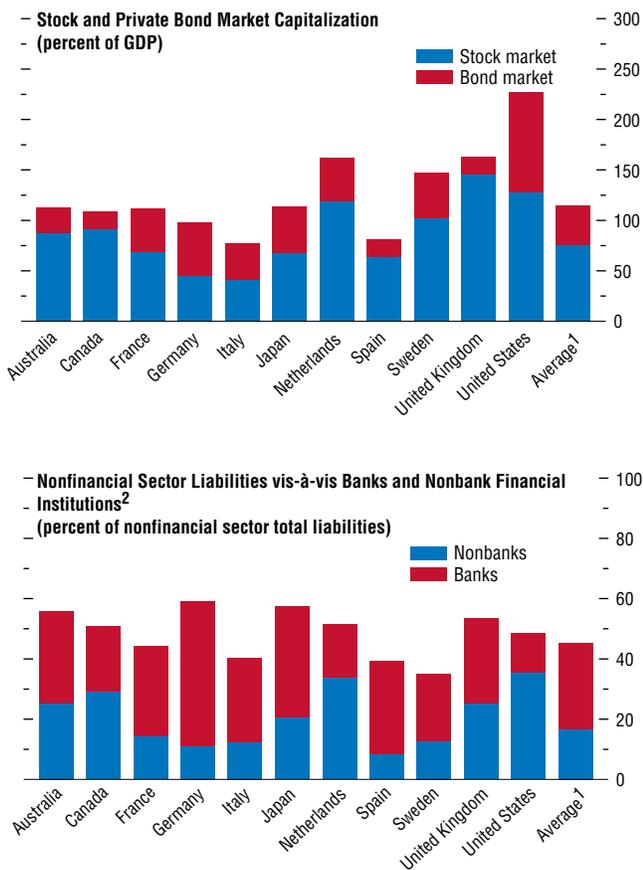
Given the close link between the financial sector and household and firm balance sheets, a key question is how these differences in financial systems affect macroeconomic behavior. Although the amplitude of business cycle fluctuations has been on a declining trend across advanced economies, differences remain in the resilience of individual countries to business cycle downturns, asset price fluctuations, and technological changes (see, for example, Cotis and Coppel, 2005). Yet few empirical studies to date have analyzed the effect of different financial structures on business cycle behavior—attention has mostly focused on the role of overall financial development for growth performance (see, for example, Levine, 1997; and Wurgler, 2000).

Against this background, this chapter constructs an index that captures the key differences between financial systems across advanced economies. This index is then used to examine the relationship between the structure of

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Figure 4.1. Stock and Bond Market Capitalization and Nonfinancial Sector Liabilities, 1995–2004

Substantial differences exist across advanced economies in terms of the size of their financial markets and the volume of funds intermediated by banks and nonbank financial institutions.



Sources: National financial accounts from Eurostat and OECD; World Bank, Financial Structure Database; and IMF staff calculations.

¹ Average includes Austria, Belgium, Denmark, Finland, Greece, Norway, and Portugal in addition to other countries already listed.

² The remaining nonfinancial sector liabilities are primarily securities held directly by households.

national financial systems and economic cycles. In particular, the chapter addresses the following questions:

- How have financial systems evolved in the advanced economies? Have they converged across countries, or have changes in financial structure proceeded at a differing pace, leading to greater divergence? Have these trends influenced the relative attractiveness of different countries as a destination for cross-border capital flows?
- Does the responsiveness of household consumption and residential investment to changes in income and wealth differ across countries depending on the financial system?
- Does the character of the financial system influence how firms respond to short-term changes in demand and longer-term changes in investment opportunities?

The chapter finds that while there has been a general trend toward bank disintermediation and a greater role for financial markets in many countries, the pace has differed and there are still important differences across financial systems. The results support the view that these differences in financial structures do affect how households and firms behave over the economic cycle. In financial systems characterized by a greater degree of arm’s length transactions,¹ households seem to be able to smooth consumption more effectively in the face of unanticipated changes in their income, although they may be more sensitive to changes in asset prices. In financial systems that rely less on arm’s length transactions, firms appear to be better able to smooth investment during business cycle downturns, as they are better positioned to access external financing based on their long-term relationships with financial intermediaries. However, when faced with more fundamental changes in the environment that require a reallocation of resources across sectors, financial

¹An arm’s length transaction is typically defined as one between two unaffiliated parties or between two related parties acting as if they were unaffiliated parties with no relationship with each other.

systems with a greater degree of arm's length transactions appear to be better placed to shift resources to take advantage of new growth opportunities. There is also evidence that cross-border portfolio investors appear to allocate a greater proportion of their holdings in countries where the arm's length content of the financial system is higher, which may contribute to the financing of current account deficits.

How Have Financial Systems Changed?

A first step in exploring the links between financial systems and macroeconomic responses is to characterize the key differences among financial systems in the advanced economies.² While there are various ways of classifying financial systems, the approach taken in this chapter focuses on the degree to which financial transactions are conducted on the basis of a direct (and generally longer-term) relationship between two entities, usually a bank and a customer, or are conducted at arm's length—where entities typically do not have any special knowledge about each other that is not available publicly.

A financial system featuring a high volume of arm's length transactions (hereafter referred to as a “more arm's length financial system”) is highly dependent on publicly available information and on the enforcement of contracts through formal and standard legal mechanisms and procedures applicable to unrelated parties. There is a strong role for price signals and open competition among lenders. On the other hand, in a more relationship-based system, transactions between two parties—such as a bank and a corporate borrower—primarily rely on information the lender has about the borrower that is not available publicly. Mechanisms for enforcement of contracts rely more heavily on the lender's direct influence on the borrower and/or the

lender's monopolistic power in the market. In practice, no system is purely relationship-based or purely arm's length, and even systems that are more reliant on arm's length transactions do not preclude the use of relationships. Indeed, recent years have seen the rise of certain types of financial intermediation that do have relationship-based elements—such as venture capital and private equity—within arm's length structures.³ Nevertheless, it is useful to assess where financial systems are placed along a spectrum—with a country's position depending on the degree to which arm's length contracts dominate its financial transactions.

For this purpose, a new Financial Index is constructed to summarize the extent of the arm's length content of a financial system.⁴ The index ranges between 0 and 1 for each country, with a higher value representing a greater arm's length content in the financial system. The overall Financial Index is derived from three subindices (which are weighted equally in the overall index) that seek to capture key elements of a financial system:⁵

³It is important to recognize that the distinction between more or less arm's length-based financial systems is different from the more conventional distinction drawn in the literature between bank-based and market-based financial systems (see, for example, Levine, 2002). The analysis in this chapter attempts to take into account, for example, the higher or lower degree of arm's length content within national banking systems.

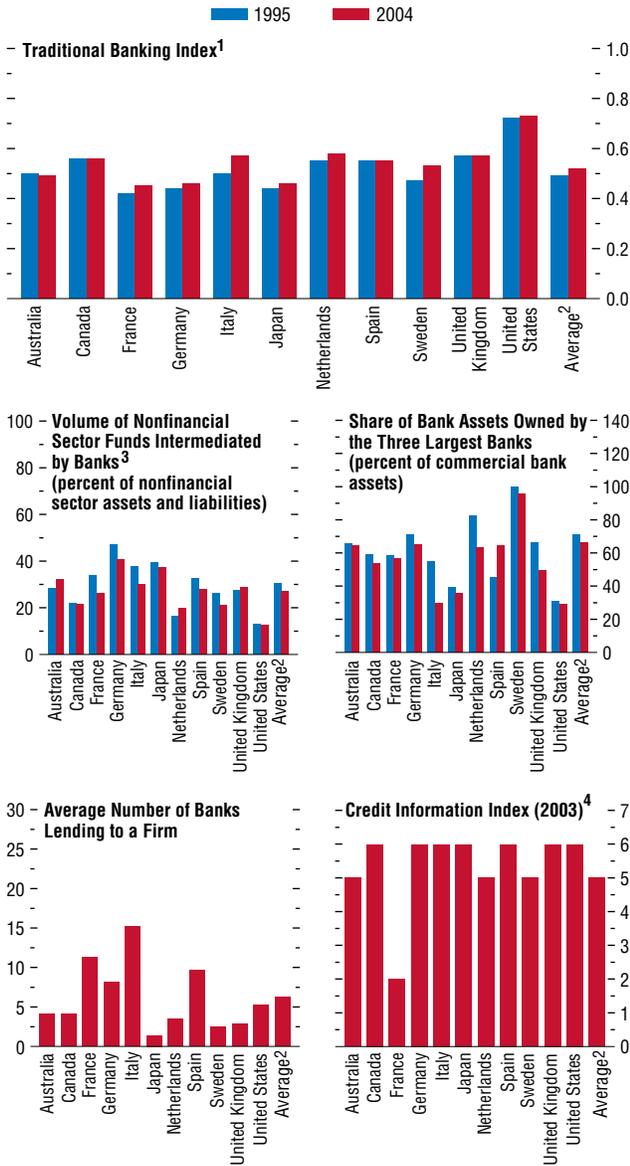
⁴While a summary indicator of course cannot capture all the aspects in which financial systems differ across countries, it provides a broad measure that is helpful for analyzing the link between financial systems and economic cycles.

⁵Each subindex was constructed as an average of three (third-level) indicators capturing key aspects relevant to arm's length content, building on a range of underlying indicators. For each of these indicators, a country is assigned a value equal to the ratio of the variable for this country and the maximum value across all countries. While an ideal index in the context of this chapter would include only fundamental determinants of how a financial system influences economic agents' decisions, data limitations have led to the inclusion of a mix of indicators capturing both fundamentals (such as the degree of investor protection) and outcomes (such as the existing financial structure). See Appendix 4.1 for further details on the index construction methodology and data sources.

²Data availability limited the sample to the following 18 countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States.

Figure 4.2. Traditional Banking: Index for Selected Advanced Economies

Banks still intermedate a larger volume of funds in European countries and Japan, despite faster bank disintermediation in these countries over the last decade. However, the inclusion of indicators of competition in the banking sector and of financial information disclosure narrows cross-country differences in traditional banking, as several European countries score high on these measures.



Sources: National financial accounts from Eurostat and OECD; Ongena and Smith (2000); World Bank, Doing Business Database; World Bank, Financial Structure Database; and IMF staff calculations.

¹A higher value on the index denotes a lower degree of traditional banking.
²Average includes Austria, Belgium, Denmark, Finland, Greece, Norway, and Portugal in addition to other countries already listed.
³Average of assets with banks and liabilities vis-à-vis banks of the nonfinancial sector (household, nonfinancial corporate, government, and rest of the world), as a percent of the nonfinancial sector average of assets and liabilities. IMF staff calculations based on national financial accounts.
⁴The index ranges from 0 to 6, with higher values indicating that more credit information is available from either a public registry or a private bureau.

- The degree of *traditional bank intermediation*, which is the most obvious manifestation of a high degree of relationship-based financial transactions.⁶ This measure of the extent to which deposit-taking institutions dominate the process of intermediating savings takes into account factors that may weaken the role of relationships in lending decisions, most notably the degree of competition between banks and the availability of public financial information.⁷
- The degree to which *new financial intermediation* has developed to provide an alternative non-bank channel for financing and/or to facilitate the transformation of traditional relationships between intermediaries and final customers. New financial intermediation includes the activities of a range of nondeposit taking institutions, such as pension and insurance companies; nontraditional activities undertaken by banks, including the securitization of loans; and the extent of financial innovation through the use of new financial instruments, including derivatives. The measures of financial innovation used in this subindex are intended to gauge the transformation of aspects of traditional relationship-based lending not captured elsewhere. For example, the market for credit derivatives and collateralized debt obligations (CDOs) may allow banks to develop lending relationships less influenced by long-term credit risk considerations.⁸ Similarly, the use of interest rate swaps allows lenders to meet the demand for specific loan structures by

⁶This is because historically banks have been the main intermediaries in a financial system, and have based lending decisions on insider knowledge about their clients. Traditional banking in this chapter also includes the activities of other deposit-taking institutions, such as credit unions and building societies.

⁷The role of relationships is likely to be weaker in a system where banks pose greater competitive challenges to each other and where inside information about borrowers is much more limited.

⁸Securitization through CDOs allows credit risk to be distributed in various tranches tailored to the different risk tolerances of investors, with the sponsoring organizations (such as banks) able to remove the credit risk from their own balance sheets.

their customers, while transferring interest rate risk to investors more willing to assume such exposures.

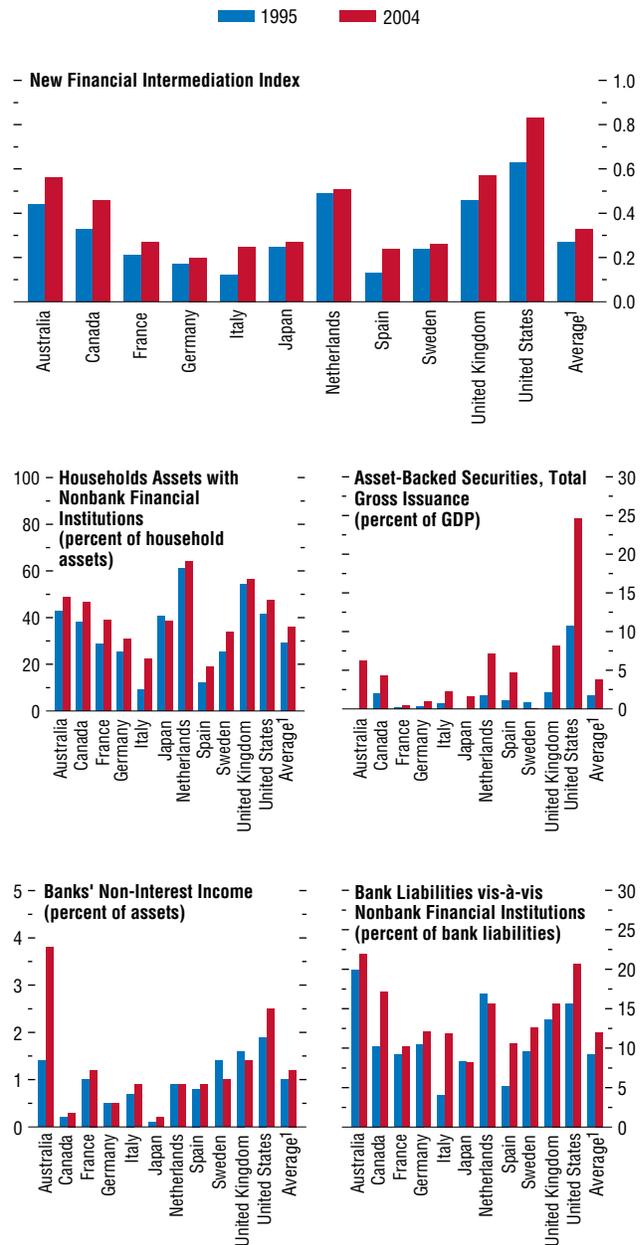
- The role played by *financial markets*, which have a symbiotic relationship with nonbank financial intermediation and the expansion of banks into nontraditional activities described above (see, for example, Allen and Santomero, 2001). Deep and liquid financial markets are essential, for example, for the efficient functioning of a mutual fund industry. The ease of market access, efficiency of contract enforcement, and the degree of investor protection are important determinants of how well financial markets can perform their functions.

One conclusion to emerge from the first of these subindices is that the importance of traditional banking activities has declined in most countries, with differences between countries narrowing, and several countries moving closer to the United States, the country where the role of traditional banking is the smallest (Figure 4.2).⁹ Nevertheless, there are still large differences in the volume of funds intermediated by banks across countries. For example, over the last decade, the share of nonfinancial sector assets and liabilities intermediated by banks has declined an average of 5 percentage points in the euro area countries, but at about 30 percent in 2004 this share was still twice as high as in the United States. These differences, however, are partly offset by the fact that the degree of competition and availability of information is generally high in most countries where the banking system still has a prominent role. This suggests that there is a greater degree of arm's length content in banking activity in Europe than suggested only by the higher volumes of funds intermediated by banks.

Differences across countries are more striking in the area of new financial intermediation (Figure 4.3). Countries with a greater proportion of household savings allocated outside the

Figure 4.3. New Financial Intermediation: Index for Selected Advanced Economies

Differences persist and have increased in the extent to which financial intermediation is conducted through new financial intermediaries. The United States, United Kingdom, Australia, and the Netherlands are characterized by a relatively larger role of nonbank financial institutions, a greater diffusion of new financial products, and a greater shift of banks away from traditional intermediation services.



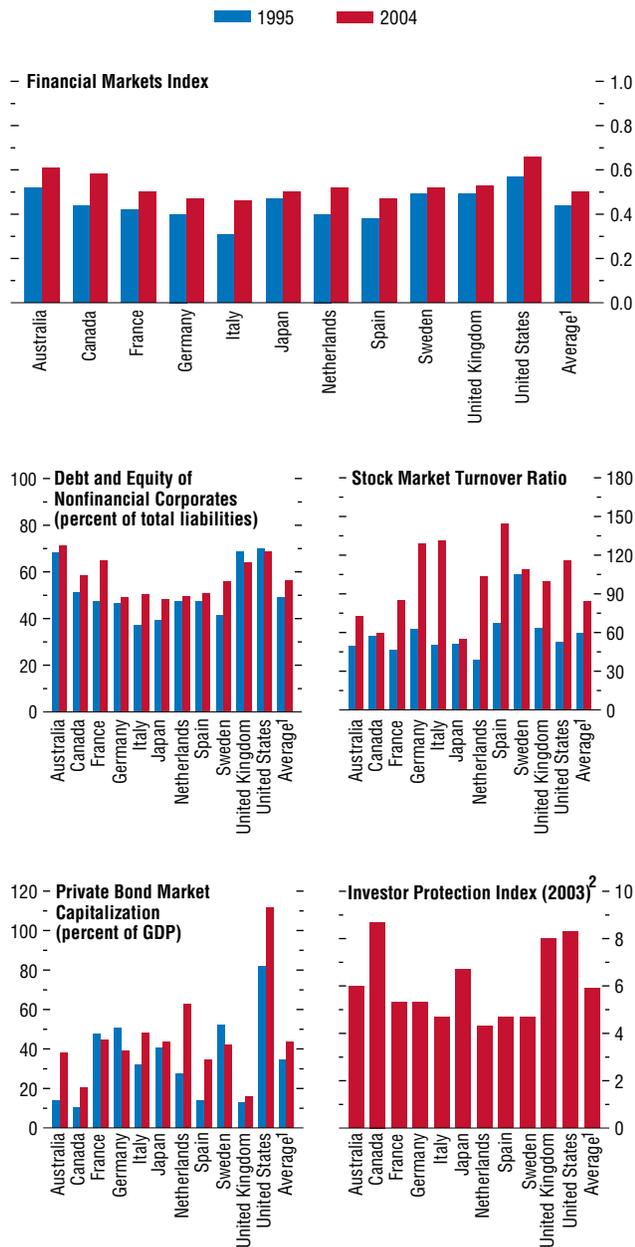
Sources: National financial accounts from Eurostat and OECD; European Securitization Forum and other sources, see Appendix 4.1; OECD, Bank Profitability database; and IMF staff calculations.

¹Average includes Austria, Belgium, Denmark, Finland, Greece, Norway, and Portugal in addition to other countries already listed.

⁹A higher score on the index implies a lower degree of traditional bank intermediation.

Figure 4.4. Financial Markets: Index for Selected Advanced Economies

Over the past decade, all countries have shown a trend toward larger, more liquid, and more accessible financial markets.



Sources: National financial accounts from Eurostat and OECD; World Bank, Financial Structure Database; World Bank, Doing Business Database; and IMF staff calculations.

¹Average includes Austria, Belgium, Denmark, Finland, Greece, Norway, and Portugal in addition to other countries already listed.

²The index ranges from 0 to 10, with higher values indicating better investor protection.

banking system include Australia, Canada, the Netherlands, the United Kingdom, and the United States. In response to competitive pressures from the nonbank financial sector, banks in these countries have also expanded more into nontraditional fee-generating areas of intermediation such as loan securitization.¹⁰ In general, they also appear to make greater use of financial innovations such as asset-backed securities and alternative investment vehicles such as venture capital. While venture capital relies importantly on relationships with firms (including managerial influence, informational advantages, and a longer investment horizon), its rapid growth over the past two decades has been facilitated by the evolution in its financing structure and by the associated increase in the importance of institutional investors as suppliers of venture capital financing (see Gompers and Lerner, 1998).¹¹

Cross-country differences in the financial market development subindex are generally smaller across countries than for the banking and new financial intermediation indices (Figure 4.4). This is in part due to the rapid convergence of market infrastructure and securities regulation across advanced economies. In particular, many countries have either improved market access

¹⁰Clearly, differences in these indicators also reflect heterogeneous regulatory and legislative environments. For example, the large degree of nonbank financial intermediation in countries like the Netherlands and the United Kingdom reflects in part the relative importance of private pension funds in these two countries. See Allen and Gale (2000) for a study of the historical factors underlying observed differences across financial systems.

¹¹Venture capital (VC) is now predominantly set up as a pooled fund with a VC firm as a general partner and other investors—institutional investors, in particular—as limited partners. As a result, the growth of institutional investors has supported the expansion of venture capital financing. The VC firm provides the management expertise and charges the other partners a management fee (similar to other investment managers, such as mutual and hedge funds). As a result, both the size and the arm's length content of venture capital have risen rapidly over the past two decades. Reflecting in part these factors, venture capital financing as a percent of GDP in the United States was three times as large as in European countries during 1998–2004 (see OECD, 2006).

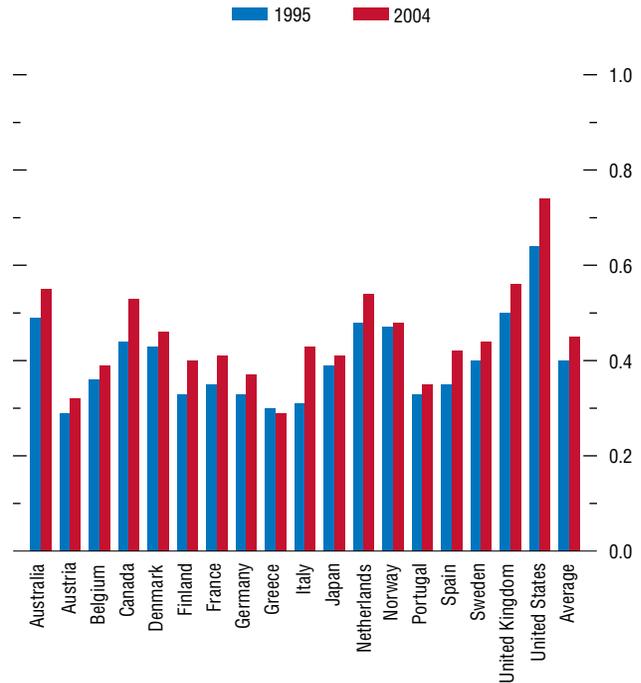
(as in France and Italy, where the share of nonfinancial corporate liabilities financed by markets through bonds and equities has increased sharply over the last decade) or increased the liquidity and depth of their stock and bond markets (as in Italy, the Netherlands, and Spain).

The aggregate picture, as measured by the overall Financial Index, suggests that despite an increase in the arm's length content of financial systems across advanced economies, important differences remain (Figure 4.5). Indeed, the increase in the index has generally been larger for those countries with relatively high values already in 1995. Thus, there is little evidence of convergence, a conclusion confirmed by more formal statistical tests (see Appendix 4.1). The differences across countries are mainly related to persistent dissimilarities in the area of new financial intermediation, the wider use of financial innovation, and banks' expansion into nontraditional banking activities.

This variation across countries in the Financial Index is indicative of important differences in the way financial systems perform their intermediation function. In countries with more arm's length content, a larger share of household and firm financing takes place through capital markets. At the same time, banks have moved away from traditional relationship-based lending, and their decisions are guided less by the imperatives of their relationship with borrowers and more by their ability to sell financial claims on to capital markets. Since their credit exposures are lower—as fewer loans now remain on balance sheets for the life of the loan contract—banks can increasingly choose from a larger pool of potential borrowers, and themselves have become one of a greater number of potential lenders. Finally, in systems with higher arm's length content, investors who move away from holding traditional bank deposits provide the necessary depth and liquidity to capital markets and take on associated risks, either directly, or more commonly through nonbank financial intermediaries such as hedge funds, mutual funds, and investment and pension companies.

Figure 4.5. Financial Index Scores for Advanced Economies

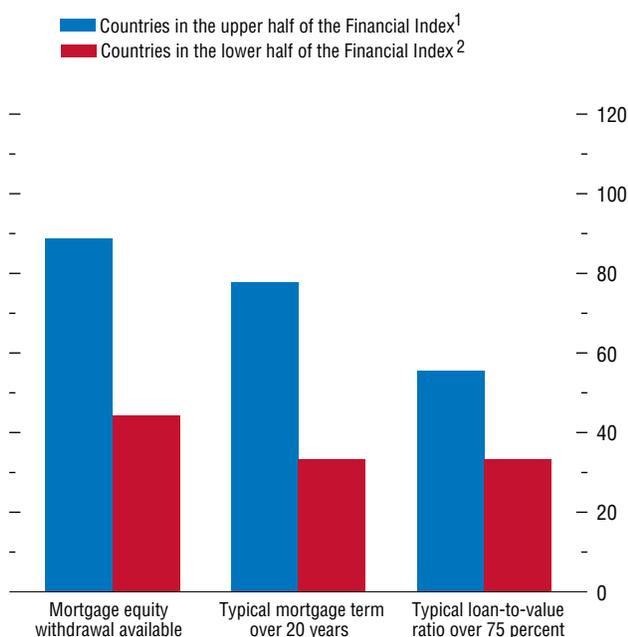
Despite a general trend toward arm's length financial systems, cross-country differences persist and have even increased as countries with the highest scores in 1995 are also at the top in 2004.



Sources: See Appendix 4.1 for sources used in the Financial Index.

Figure 4.6. Features of Mortgage Markets
(Percent of countries)

Mortgage markets in more arm's length financial systems typically offer borrowers more advantageous loan attributes.



Sources: Tsatsaronis and Zhu (2004); Catte and others (2004); and IMF staff calculations.

¹ Countries included are Australia, Canada, Denmark, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.

² Countries included are Austria, Belgium, Finland, France, Germany, Greece, Japan, Portugal, and Spain.

These differences in the way financial systems function are well illustrated in the structure of mortgage markets in different countries (Figure 4.6). Despite important differences between mortgage markets, even among countries with broadly similar financial systems, countries with more arm's length systems typically offer a higher degree of leverage, longer repayment horizons, and greater access to mortgage equity, with the latter representing a vehicle for extracting liquidity from housing assets to finance consumption. Additionally, certain economies with more arm's length systems (notably Denmark and the United States) provide better risk sharing for households through greater use of fixed-rate mortgages with long repayment schedules and fee-free refinancing; refinancing is typically subject to early repayment fees in countries where financial systems are less arm's length-based (see Green and Wachter, 2005). The ability of more arm's length systems to offer greater flexibility in housing finance is underpinned by supporting institutions that allow effective enforcement of collateral, and by securitization of mortgage loans that helps pool and diversify risks from individual borrowers.¹² The extent of mortgage securitization varies greatly across countries, with the United States securitizing over 60 percent of new mortgages with mortgage-backed securities, while France and Germany securitize less than 5 percent of new mortgages this way.¹³

¹²For example, the usual time required for mortgage enforcement procedures, from the writ of execution to the distribution of the proceeds to creditors, is 60 to 84 months in Italy, 15 to 25 months in France, 8 months in the United Kingdom and the United States, and 6 months in Denmark and the Netherlands. See Catte and others (2004).

¹³A number of European countries, notably Denmark and Germany, fund mortgage loans in the capital markets using bonds (such as German Pfandbriefe) that allow for better risk sharing than the traditional funding by depository institutions. However, these bonds differ from mortgage-backed securities as they remain on the balance sheet of the issuer, therefore limiting the extent of risk transfer by originating banks. In contrast, mortgage-backed securities can be traded away from the balance sheets of mortgage originators.

How Do Differences in Financial Systems Affect the Behavior of Households, Firms, and Cross-Border Capital Flows?

This section presents evidence that suggests that the substantial differences across financial systems do affect the behavior of households and firms over the economic cycle and influence financial flows across countries.¹⁴ It should be emphasized at the outset, however, that analyzing the links between financial systems and macroeconomic behavior is a challenging task, especially when trying to establish a causal link from one to the other, and it is important to keep in mind the possibility that third factors may also play a role in affecting both financial systems and economic outcomes.

The Household Sector

The degree of arm's length transactions in a financial system may affect household behavior through two channels:

- In a more arm's length financial system, households may be better able to smooth consumption in the face of income shocks. In such systems, investors can price collateral more effectively in a liquid market and acquire financial claims on a diversified pool of borrowers. This reduces the exposure of investors to risks emanating from individual households, such as the increased credit risk from a loss of income or employment, and makes available, on average, a larger amount of financial resources to households.¹⁵ Indeed, as systems have moved toward more arm's length transactions, household borrowing has grown across advanced economies,

with the increase more dramatic and the level of household debt higher in countries with a higher level of arm's length content in their financial systems (Figure 4.7).

- The flip side is that in such systems households themselves may be more exposed to asset price changes as they hold a greater proportion of market securities as assets on their balance sheets. Further, since more effective collateralization allows a greater degree of leverage, a sufficiently large change in the value of the collateral (such as a decline in housing prices) may require households to adjust their consumption sharply (see Box 4.1).

The Sensitivity of Households to Changes in Income

A large body of empirical evidence shows that private consumption is sensitive to changes in current income, contrary to the implications of the permanent income hypothesis, which proposes that consumption is determined by permanent income, typically defined as average or expected income or the annuity value of lifetime resources (see Deaton, 1992). This finding of “excess sensitivity” of consumption to current income has most often been attributed to borrowing constraints faced by households, implying that as borrowing constraints ease, consumption can be expected to become less sensitive to current income. Empirical studies suggest that the excess sensitivity of consumption is relatively low in Canada and the United States, somewhat higher in the United Kingdom, and higher yet in France, Italy, and Spain.¹⁶

To investigate whether the degree of arm's length financing affects the ability of households to cope with variations in income, two exercises were conducted. Both suggest that a higher degree of arm's length financing can reduce the

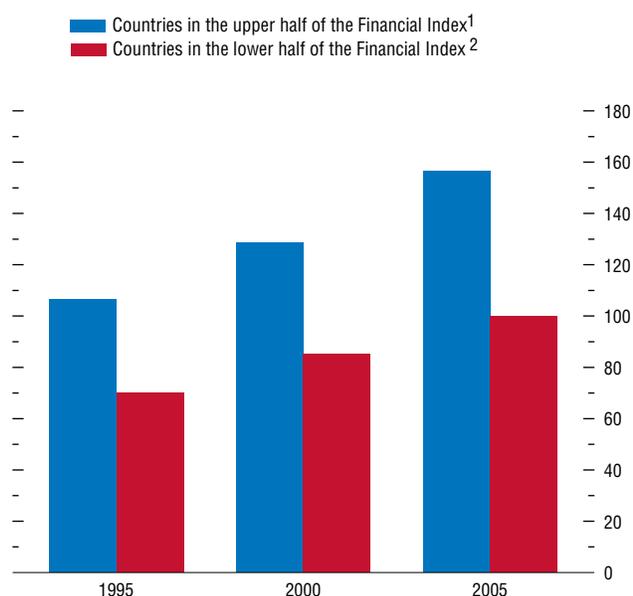
¹⁴The analysis in this section is based on the Financial Index measured in 2004 because a larger amount of information is available for that year. However, using 1995 values yields broadly similar conclusions.

¹⁵Evidence on the link between home equity withdrawal and consumption in advanced economies is examined in Catte and others (2004) and Klyuev and Mills (2006). For a discussion of the growth of household credit in emerging markets, see Chapter II of the IMF's *Global Financial Stability Report* (September 2006).

¹⁶See Campbell and Mankiw (1991); and Jappelli and Pagano (1989). Several studies, including Bacchetta and Gerlach (1997) and Dynan, Elmendorf, and Sichel (2006), have documented the decline in the excess sensitivity of consumption in the United States, attributing this to financial deregulation.

Figure 4.7. Total Household Liabilities
(Ratio to disposable income; group average)

Household indebtedness is higher and has risen more sharply in arm's length financial systems than in relationship-based systems.



Sources: National financial accounts from Eurostat and OECD; OECD Analytic Database; and IMF staff calculations.

¹Countries included are Australia, Canada, Denmark, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.

²Countries included are Austria, Belgium, Finland, France, Germany, Greece, Japan, Portugal, and Spain.

impact of changes in current income on household behavior (see Appendix 4.2 for details):

- First, a simple panel regression was estimated relating consumption growth to the growth of disposable income and an interaction term with the Financial Index (controlling also for the impact of real short-term interest rates). In general, countries with more arm's length systems tend to exhibit a lower correlation between consumption and current income growth, suggesting a greater degree of consumption smoothing. The marginal propensity to consume out of current income is smaller for countries with higher values of the Financial Index, as captured by the negative interaction term in the estimation.¹⁷ This result can also be seen from the mapping between the Financial Index and the correlation of consumption and current income growth (Figure 4.8).¹⁸ These findings are consistent with the notion that consumers in these countries are better able to smooth consumption in the face of changes in their income.¹⁹
- Second, country-by-country estimations using rolling regressions were analyzed to see if residential investment is less sensitive to mortgage rates and income when financial systems are more arm's length. The results suggest that these sensitivities have diminished over time in the United States, but generally not elsewhere.²⁰ These findings may be explained

¹⁷When interpreting the results, the issue of simultaneous determination of consumption and income needs to be kept in mind. The estimated marginal propensity to consume captures the correlation between private consumption and disposable income, and does not necessarily reflect causality.

¹⁸Appendix 4.2 reports the results of the formal empirical estimation.

¹⁹There may be a potential nonlinearity in the consumption response that is difficult to capture empirically. Households that are highly leveraged at the time of a downturn may be unwilling to increase their indebtedness further in order to smooth consumption.

²⁰Recent studies for the United States have attributed the observed decline in the sensitivity of residential investment to income and mortgage rates to the development of mortgage markets. See, for example, Peek and Wilcox (2006); and Dynan, Elmendorf, and Sichel (2006).

by the fact that the mortgage market in the United States has attained a high degree of sophistication and flexibility through the use of securitization (see Green and Wachter, 2005, for a detailed discussion).

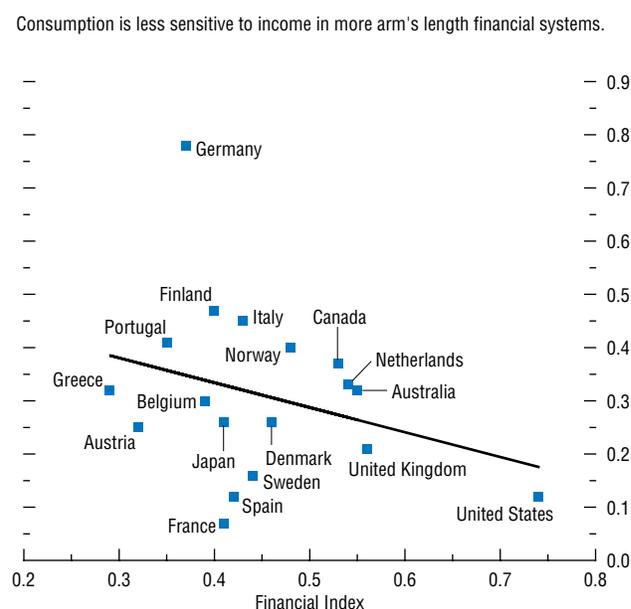
Impact of Changes in Asset Prices on Household Spending

While more arm's length systems may be conducive to consumption smoothing in the face of income shocks, this section presents evidence that they may also be more sensitive to changes in asset prices—through so-called “financial accelerator” effects—although both equity and housing price busts appear to have been shallower in such systems over the past two decades (see Bernanke, Gertler, and Gilchrist, 1996, for elaboration on the financial accelerator mechanism).

In a more arm's length financial system, the increased dependence of credit on housing values could exacerbate the impact of adverse house price developments, creating a ripple effect that depresses consumption. A severe downturn in the housing market could cause a drop in the value of the collateral, reducing households' ability to borrow, curbing their spending, and exacerbating the initial downturn. This mechanism is more likely to be set in motion in response to a substantial house price decline if households' ability to borrow is more closely linked to real estate values. Regarding financial assets, the higher proportion of marketable securities in a household's portfolio, and the lower share of bank deposits in a more arm's length system also could expose households to greater wealth shocks from equity market fluctuations.

An event analysis was conducted to compare responses of private consumption and residential investment to equity and housing downturns in different financial systems. Equity and housing busts were defined as episodes in which the associated price declines were in the top half of all such episodes in the sample, corresponding to real price declines of at least 26 percent for equity downturns and at least 6

Figure 4.8. Consumption-Income Correlations and the Financial Index, 1985–2005
(Correlations between quarter-on-quarter growth rates)

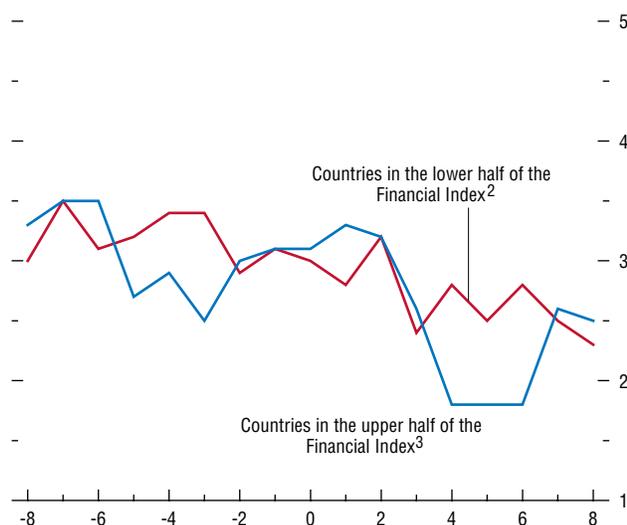


Sources: OECD Analytic Database; and IMF staff calculations.

Figure 4.9. Private Consumption: Response to Equity Busts, 1985–2005

(Percent change year-on-year; constant prices; x-axis in quarters)¹

The consumption response to equity busts has been larger in more arm's length financial systems.



Sources: OECD Analytic Database; and IMF staff calculations.

¹Zero denotes the quarter after which a bust begins.

²Countries included are Austria, Belgium, Finland, France, Germany, Greece, Japan, Portugal, and Spain.

³Countries included are Australia, Canada, Denmark, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.

percent for housing declines (Figures 4.9 and 4.10).²¹

Looking at equity market downturns, differences in the response of private consumption across countries in the upper and lower halves of the Financial Index were analyzed over the past two decades. The results of this event analysis suggest that countries with more arm's length financial systems do exhibit a larger median response of private consumption to equity market downturns, consistent with what would be expected given that households are more exposed to changes in stock market valuations.²²

For housing downturns, the responses of consumption and residential investment have become stronger since 1985 (the period during which mortgage markets have been liberalized in many advanced economies). This finding is consistent with the proposition that the increased role of housing as collateral has made household spending more dependent on housing prices. Because of data limitations, the analysis of responses of households was restricted to more arm's length systems.²³

While these results suggest that asset price declines can have a larger impact on household behavior in more arm's length systems, there is also evidence suggesting that asset price busts have been shallower in such systems, consistent with more continuous adjustments of asset valuations (Figure 4.11). Evidence from the United States, for example, suggests that the volatility of real housing activity and errors in the pricing of housing have been reduced through the expansion of the mortgage finance market (see Schnure, 2005). Empirical analysis of equity markets also suggests that more arm's length systems incorporate firm-specific information

²¹See Chapter II of the April 2003 *World Economic Outlook* and Appendix 4.2 for a more detailed explanation of the event analysis.

²²This is in line with Ludwig and Sløk (2002), who found that the wealth effect on consumption from stock prices is larger in market-based systems than in bank-based systems.

²³Complete data on house prices were available only for a limited number of countries in the upper half of the Financial Index.

more efficiently, indicating that stock prices adjust to underlying fundamentals more quickly and prevent systematic mispricing.

The Corporate Sector

Does a financial system with a greater degree of arm's length transactions dampen or amplify investment volatility during business cycles? And how does such a system perform in the face of longer-term changes in growth opportunities?

During normal business cycle downturns, financial systems with a lower degree of arm's length transactions (and a higher degree of relationship-based lending) could be expected to give greater weight to the longer-term gains from maintaining an existing relationship with a borrower by providing short-term assurance that financing will be available in the event of a temporary disruption in cash flow, particularly as the lender's own balance sheet is on average more exposed to the borrower. Providing financing to ride out such temporary downturns may then not only be in the interest of the borrower, but also of the lender.²⁴ A more arm's length financial system, on the other hand, may help smooth firm financing by diversifying the sources of financing—making them less vulnerable to credit crunches.

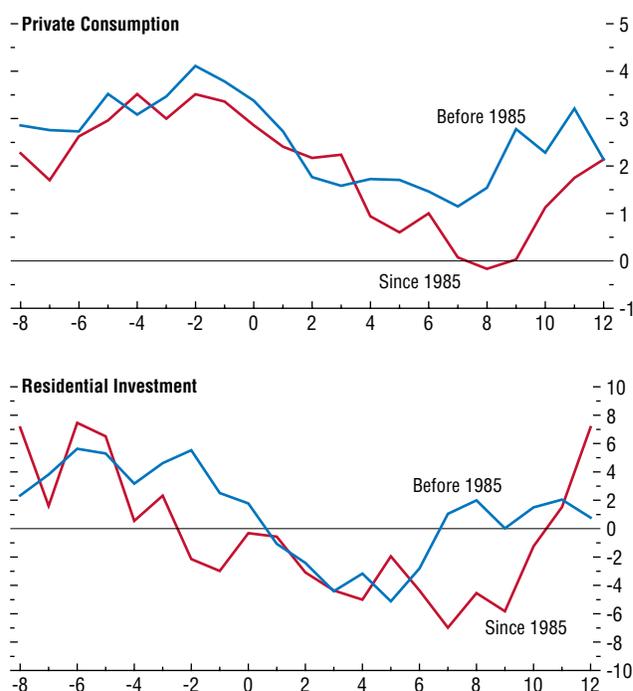
Empirical evidence supports the view that countries with a higher degree of relationship-based lending may experience shallower contraction in nonresidential business fixed investment during cyclical downturns (Figure 4.12, upper panel).²⁵ Evidence from the investment cycle in the aftermath of the bursting of the equity bubble in 2000 is also consistent with this view (Figure 4.12, middle and lower panels). In the United States, firms reduced investment

²⁴At the extreme, of course, this can lead to the perverse incentive to “evergreen” loans that are effectively in default in order to disguise the poor underlying asset quality on a bank's balance sheet.

²⁵See also Issing (2003). Kaufmann and Valderrama (2004) provide empirical evidence on the smoothing of business cycles in more relationship-based financial systems.

Figure 4.10. Private Consumption and Residential Investment: Response to Housing Busts, 1970–2005¹
(Percent change year-on-year; constant prices; x-axis in quarters)²

Responses of consumption and residential investment to housing busts have become stronger.



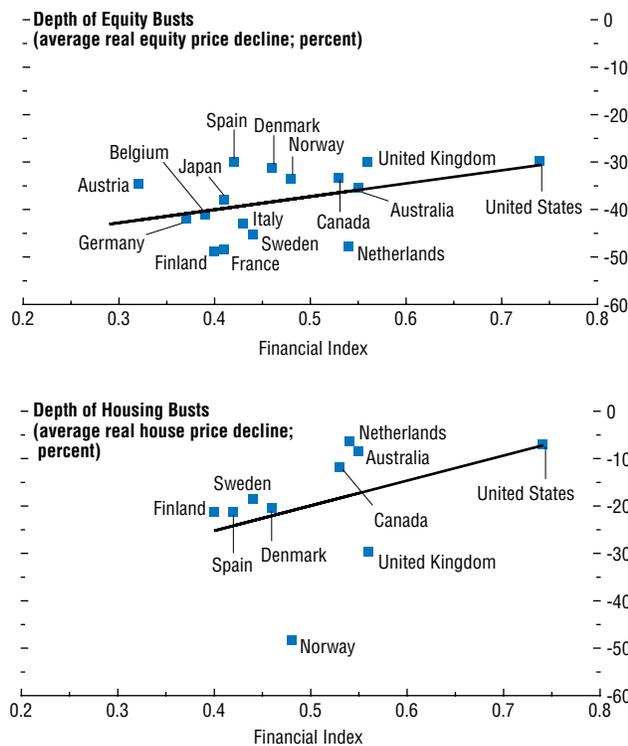
Sources: OECD Analytic Database; and IMF staff calculations

¹Countries included are Australia, Canada, Denmark, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.

²Zero denotes the quarter after which a bust begins.

Figure 4.11. Depth of Equity and Housing Busts and the Financial Index, 1985–2005

Equity and housing busts have been shallower in more arm's length financial systems.



Sources: OECD Analytic Database; and IMF staff calculations.

sharply and relied to a greater degree on internal financing compared with their European counterparts.²⁶

From a longer-term perspective, an important question is whether a more arm's length financial system is better equipped to reallocate resources relatively quickly in response to developments that necessitate investment in new areas and by new firms, as such systems are relatively unfettered by the constraints imposed by longer-term relationships with a borrower. One approach to this question is to examine the differences in the growth of industrial subsectors in response to global growth opportunities. A more arm's length system could be expected to take greater advantage of growth opportunities that lie away from the basic specialization of existing industry in a country. A more relationship-based system may conversely be expected to be more successful at taking advantage of organic growth opportunities—those within the area of expertise of existing industry, and thus likely requiring minor modifications of prevailing technologies (Rajan and Zingales, 2003).

To examine the difference in corporate sector responses to growth opportunities, this section looks at two separate measures:

- The correlation between real output growth in an industry within a country and world output growth of the same industry.²⁷ This gives a measure of the ability of an economy to grasp investment opportunities that emerge globally (and thus to achieve allocative efficiency).²⁸ A high correlation would indicate

²⁶One important caveat regarding the smoother response of European corporates during the most recent cycle is that, while relying less than their U.S. counterparts on internal financing, they have been able to tap into the rapidly growing corporate bond market. It remains to be seen, however, whether corporates in Europe will be more successful than in other countries in accessing bond financing during a downturn once the market has matured (ECB, 2001).

²⁷World output growth for an industry is calculated based on data for the sample of 181 countries covered by the United Nations Industrial Development database (see Appendix 4.2).

²⁸A detailed description of the methodology and data used in the analysis is contained in Appendix 4.2.

that this country is better able to take advantage of global growth opportunities. To the extent that more arm's length systems are in general more flexible in financing innovations that require a substantial change in production technology, this correlation should be positively linked to a country's score on the Financial Index.

- The ability of a country to take advantage of global growth opportunities in an industry can generally be expected to be higher if that country already has a high degree of specialization in that industry. One measure of the distance between a country's initial specialization and the one that would maximize growth based on global growth opportunities is the correlation between the contribution of an industry to world growth and the share of that industry in a country's value added at the outset of the period under consideration, with a higher correlation indicating a smaller distance. At the same time, a greater degree of arm's length financing should be able to mitigate the disadvantages of being initially specialized in other industries—that is, at a greater distance from the optimal industry mix. Hence, one could expect that the higher the score in the Financial Index, the lower the impediment to growth coming from the distance between the initial industry mix of a country and the mix that would maximize its growth potential.

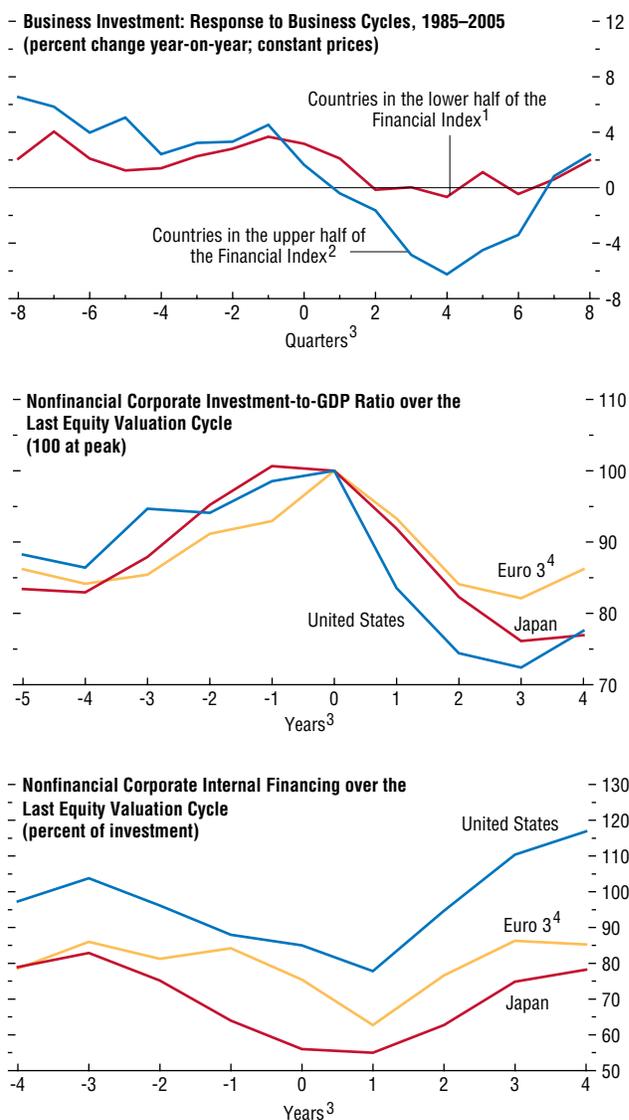
A formal econometric analysis testing the above propositions for the manufacturing sector supports the view that more arm's length systems allowed domestic industry to adapt better to a changing global environment.²⁹

- During 1980–2001, countries that scored higher on the Financial Index were also those that were better able to seize growth opportunities available worldwide.
- Those countries that in 1980 had already specialized in the (globally) fast-growing sectors

²⁹See Appendix 4.2 for regression results. These results are robust to the exclusion of the United States from the sample.

Figure 4.12. Investment and Financing by the Corporate Sector

Business investment tends to move sharply during cyclical downturns in more arm's length financial systems. Following the burst of the equity bubble in 2000 (1990 for Japan), U.S. nonfinancial corporates reduced investment and increased their reliance on internal funding faster than Japanese and Euro 3 firms.



Sources: National financial accounts from Eurostat and OECD; OECD Analytic Database; and IMF staff calculations.

¹ Countries included are Austria, Belgium, Finland, France, Germany, Greece, Japan, Portugal, and Spain.

² Countries included are Australia, Canada, Denmark, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States.

³ Zero denotes the peak quarter or year of the business cycle.

⁴ GDP-weighted average of France, Germany, and Italy (GDP at market exchange rates).

Box 4.1. Financial Leverage and Debt Deflation

Despite their increasing sophistication, modern financial systems still operate under informational and institutional constraints, such as the limited enforceability of credit contracts and imperfect information on the creditworthiness of borrowers. “Financial frictions,” such as constraints on borrowing against collateral and margin calls when the value of collateral falls, have provided mechanisms to protect financial systems from excessive credit risks related to such constraints. As discussed in the chapter, however, in more arm’s length financial systems new risk and information-sharing mechanisms have been used to extend the effective use of collateralization, thus allowing borrowers to acquire higher levels of debt relative to their assets or income, which are reflected in higher leverage ratios (see Figure 4.8 in the main text).

Under what circumstances does the move to more arm’s length financial systems, by permitting higher leverage ratios, generate increased systemic risks or raise macroeconomic vulnerabilities to asset price collapses? This box examines how asset price declines can damage the real economy and cause financial distress in financial systems characterized by different levels of leverage and collateralization.

One explanation for the intensity of financial crises is that asset price declines interact with increasing restrictions on access to credit to generate a downward spiral driven by financial frictions. Thus, a relatively “small” negative shock hitting a highly leveraged economy induces a decline in asset and/or goods prices, which causes financial institutions to cut back on credit creation as collateral constraints and other forms of credit limits become increasingly binding. As a result, borrowers are forced to engage in fire sales of assets and goods, inducing further declines in prices, which tighten borrowing constraints further (effectively increasing the real values of debts as borrowers rush to pay them). Irving Fisher labeled this process the “debt-defla-

tion” mechanism in his classic analysis of the Great Depression (Fisher, 1933).¹ As will become clear below, this mechanism provides a vehicle for the degree of financial leverage to amplify the effects of shocks on the real economy.

The likelihood that countries may run into collateral constraints and suffer debt-deflation crises is difficult to gauge because leverage ratios and effective limits on leverage vary widely across countries, across industries within countries, and over time. Recent episodes in which this phenomenon, however, played a role include the Asian Crisis of 1997–98 and the bursting of the bubble in technology stocks of the late 1990s.

To analyze the impact of asset prices on an economy through financial leverage, it is useful first to establish a benchmark case using the familiar example of a small open economy with perfect credit markets. This economy can be viewed as a country that is a small player in world capital markets, or as a region or industry within a country that takes domestic interest rates as given. In this small open economy with perfect credit markets, real shocks (e.g., to total factor productivity, the terms of trade, or government expenditures) have no impact on the economy as long as they are wealth-neutral—that is, if they induce a reduction in income at some initial date followed by an exactly offsetting increase in future income so that the present value of income is unchanged. Output, investment, the price of capital (Tobin’s q) and consumption would be unchanged, as there is

¹More recent studies that develop similar mechanisms include Kiyotaki and Moore (1997); Aiyagari and Gertler (1999); Bernanke, Gertler, and Gilchrist (1999); Mendoza (2005); and Mendoza and Smith (forthcoming).

As is common in models of the financial accelerator, Fisher’s debt-deflation theory works through balance sheet effects. The debt-deflation framework differs in that the spiral of collapsing asset prices and increasingly tight credit access amplifies the impact of balance sheet effects. Mendoza (2005) provides an example showing that the additional amplification due to the debt-deflation process dwarfs standard balance sheet effects.

Note: The author of this box is Enrique Mendoza.

no credit constraint to prevent households and firms from borrowing as needed to implement their pre-shock consumption and investment plans.²

The results are strikingly different when credit market imperfections are introduced. Suppose that agents are allowed to borrow only up to a fraction of the value of their assets. This can be the case because, for example, legal institutions or monitoring costs allow lenders to recover only a fraction of a borrower's assets in case of default, or because borrowers are only able to "securitize" a fraction of their assets as collateral. What happens if this economy is hit by the same wealth-neutral shock? As long as the collateral constraint does not bind, the results do not change: consumption, output, investment, and Tobin's q are unchanged because economic agents can borrow to smooth the temporary shock to income. For a "sufficiently large" shock, however, the collateral constraint becomes binding, and when this happens the debt-deflation mechanism is set in motion, triggering declines in consumption, investment, and output. Moreover, the real effects are persistent because the initial decline in investment lowers the economy's future productive capacity.

To explore the potential quantitative significance of this debt-deflation mechanism, an example was constructed using plausible parameter values that yields a predicted initial leverage ratio for the economy of 11 percent (see Mendoza, 2005).³ Now, suppose there is a wealth-neutral

shock that initially reduces income by 2 percent of GDP (similar to the standard deviation of real GDP over the business cycle in many industrial countries). Agents in the economy would want to borrow because of the negative shock (to smooth consumption) and because the capital stock is low relative to its long-run level. If credit markets were perfect, the leverage ratio would rise to almost 15 percent in this example. Hence, the economy requires sufficiently high access to leverage (of at least 15 percent of the value of assets) for consumption and investment to remain unaffected by the shock. However, if the degree of financial development is such that it supports leverage ratios at least as large as 11 percent, but not larger than 15 percent, the shock would trigger the debt-deflation mechanism. This does not imply, however, that arm's length financial systems necessarily make countries more vulnerable to a debt-deflation crisis just because they allow leverage to increase. Indeed, since the potential for leverage (i.e., the leverage limit) increases when these systems develop and work efficiently to provide better risk and information sharing, a higher degree of financial development that increases the scope for borrowing in response to a shock *reduces* the effects of a debt-deflation crisis for a real shock of a given size.

The table shows the real effects of the debt-deflation mechanism in response to the 2 percent of GDP wealth-neutral shock for a range of values of the limit on leverage from 11 to 15 percent. Within this range, the effects are stronger the lower the limit on leverage.

The effects decline to zero when the leverage ratio can rise as high as 15 percent because at that point the ability to leverage is sufficient so that the wealth-neutral shock does not trigger the collateral constraint. At the other extreme, when the limit on leverage is set at 11 percent, the shock would have a maximum effect on the

²Tobin's q is defined as the ratio of the market value of a firm's assets to the replacement cost of these assets.

³The real interest rate is set at 6 percent, the capital share in GDP is 34 percent, the intertemporal elasticity of substitution in consumption is 0.5, and the coefficient of capital adjustment costs is set at 1. The initial stock of debt is 60 percent of GDP and the initial stock of physical capital is 50 percent of its long-run value.

The leverage limits in the model pertain to the aggregate of all net liabilities of households and corporations as a share of the market value of all the capital stock (equipment and structures, including housing and business buildings). Actual measures of these ratios vary widely across industrial countries.

For example, the ratio of mortgage liabilities (a proxy for collateralized debt) to nonfinancial wealth of the household sector ranges from about 10 percent in Japan to about 30 percent in the United States (see Mendoza, Quadrini, and Rios-Rull, 2006).

Box 4.1. (concluded)**Macroeconomic Effects of the Debt-Deflation Mechanism in Response to a 2 Percent Wealth-Neutral Shock to Total Factor Productivity**

Leverage Limit	Output	Consumption	Investment	Tobin's q	Credit Flow as a Share of GDP
0.11	-1.32	-3.75	-3.72	-3.72	-18.02
0.12	-0.95	-3.13	-2.69	-2.69	-13.50
0.13	-0.57	-2.47	-1.62	-1.62	-8.78
0.14	-0.18	-1.79	-0.52	-0.52	-3.85
0.15	0.00	0.00	0.00	0.00	0.00

Note: Macroeconomic effects are defined as differences between economies with and without credit frictions in percent of the value of each variable in the economy with perfect credit markets. All the effects are for the initial date on which the shock hits, except for the output effect, which is for the following period.

economy with a decline in output of about 1.3 percent and a drop in consumption and investment of nearly 4 percent (see the table). Net exports, on the other hand, rise sharply because of the large decline in imports that accompanies the contraction of domestic demand induced by the loss of access to credit, which can be as large as 18 percentage points of GDP.⁴

⁴Chapter II of the April 2003 and Chapter IV of the April 2004 issues of the *World Economic Outlook* provide empirical evidence on the sharp swings in leverage of publicly listed corporations of emerging economies and discuss further their significance for explaining emerging markets crises.

during 1980–2001 were better able to take advantage of worldwide growth opportunities.

- However, the strength of this relationship between existing specialization and subsequent fast growth is weakened by a high score in the Financial Index—that is, the greater the degree of arm's length financing, the lower the impediment to growth from the “wrong” initial industry specialization.

These results provide support to the view that more arm's length systems are better equipped to deal with the reallocation process required at times of significant innovation and change in the industrial structure of the global economy. In other words, they may be better at real-locating resources from declining to growing

The above results suggest that for a shock of a given magnitude, countries that are close to their financial leverage limits are the most vulnerable. Hence, economies with higher potential for leverage can be more resilient to small shocks than economies with relatively lower credit access, but they remain vulnerable if a sufficiently large shock triggers the debt-deflation mechanism. In contrast, the lower use of collateral as a basis for lending may make relationship-based financial systems less vulnerable to large swings in asset prices and to the related risk of a debt-deflation spiral, but at the same time they leave unexploited the benefits that can result from financial development.

industries.³⁰ On the other hand, more relationship-based financial systems appear to be better at helping smooth temporary business cycle downturns.

Financial Systems and Cross-Border Flows

With the rising importance of cross-border financial flows, an issue that has recently received considerable attention is how differences in financial systems may affect a country's

³⁰Of course, financial systems that enable greater flexibility in industry also need to be complemented by other factors—such as flexible labor markets—in order to successfully allow industries to restructure.

ability to attract portfolio inflows, and hence finance its current account deficit. For example, Caballero, Farhi, and Gourinchas (2006) argue that it is the ability of a country to generate financial assets from real investments that is important, while Chinn and Ito (2005) find that overall financial development seems to matter, but only in advanced economies. Differences in the degree of arm's length transactions may also be important in influencing cross-border flows. Foreign investors typically do not have existing relationships with potential borrowers in a country, making a more arm's length system particularly well suited for intermediating foreign inflows. Moreover, a more arm's length system may typically offer a broader array of financial instruments for savers to meet investment and risk management goals, as well as greater liquidity and transparency. These factors can increase the pool of savings to which domestic households and firms have access, potentially supporting a higher level of consumption and investment. This suggests that aggregate domestic demand can on average be higher in countries that have higher scores in the Financial Index, supporting larger current account deficits in the short run.³¹

In the United States, for example, the high degree of securitization of mortgages has played an important role in attracting foreign investors. More than 10 percent of the \$8 trillion in outstanding U.S. residential mortgages is now estimated to be financed by foreign investors through their investment in mortgage-related securities (see Knight, 2006; and IMF, 2006a). Financial systems in the United States and the United Kingdom, in particular, also provide investors with a diverse pool of liquid instruments that can be tailored—by a highly developed financial services industry—to the risk-return preferences of individual investors, increasing their attractiveness to foreign investors (see IMF, 2006b). Of course, other well-documented factors—including expected

returns on investment, currency, and tax and regulatory frameworks—remain important additional driving forces in explaining the global pattern of cross-border flows.

More systematic empirical evidence on the relationship between the extent of arm's length financial transactions and cross-border flows across the broader group of advanced economies is, however, mixed. There is some evidence of a positive correlation between the extent of arm's length transactions and portfolio inflows, with the United States and the United Kingdom scoring high on both dimensions, when portfolio inflows are measured as a proportion of that country's exports and imports (Figure 4.13, upper panel). The correlation is less evident when portfolio inflows or the level of foreign holdings are measured as a proportion of total outstanding portfolio securities, with the proportion of domestic securities held by foreigners in the euro area relatively high despite the area's generally less arm's length financial systems (Figure 4.13, lower panel). However, this high share may reflect the influence of a common currency as well as harmonization of regulations. Taken as a whole, the euro area has a lower share of foreign-held securities than the United States or the United Kingdom.

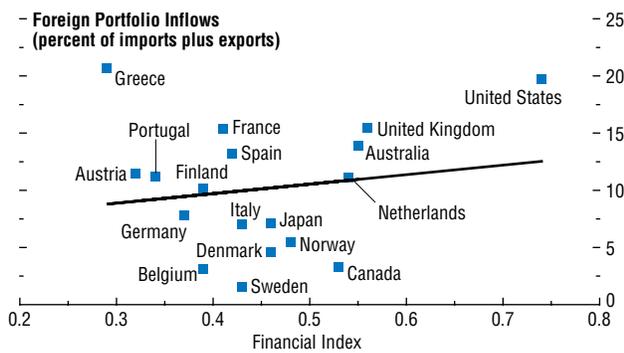
In an effort to identify more clearly the relationship between the arm's length content of financial systems and private cross-border portfolio holdings, a gravity model was estimated using data from the IMF's Coordinated Portfolio Investment Survey (CPIS). This exercise took into account the impact of country size and geographic proximity (as in standard gravity models) and also the effect of a common currency among euro area economies. The results, reported in Appendix 4.2, suggest that bilateral portfolio holdings are positively associated with the extent of arm's length financing in the destination countries.³² Overall, foreign inves-

³¹See the April 2005 *World Economic Outlook* for more on the links between globalization and external imbalances.

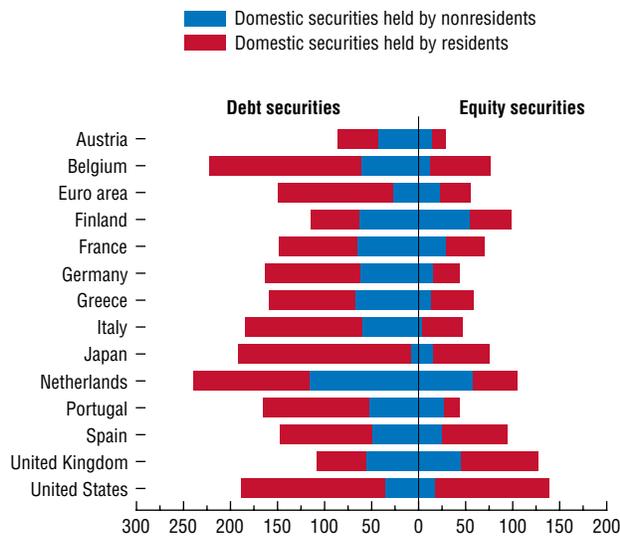
³²Among advanced economies, the evidence suggests that cross-border holdings of portfolio securities are positively related to the Financial Index scores of both the source and destination countries.

Figure 4.13. The Financial Index and Foreign Portfolio Investment

There is evidence of a positive correlation between foreign portfolio inflows and the Financial Index.



Foreign and Domestic Holdings of Debt Securities (percent of GDP)



Sources: Bank for International Settlements; Lane and Milesi-Ferretti (2006); OECD; and IMF staff calculations.

tors seem to hold a greater amount of portfolio securities in countries with a higher degree of arm’s length transactions. The degree of arm’s length transactions in the destination country, however, appears to matter less for cross-border investments within continental Europe.

Conclusions

Financial systems in advanced economies have changed significantly in recent years as technology has improved and financial deregulation has proceeded apace. Nevertheless, this chapter suggests that significant differences persist across countries in how funds are intermediated across household and firm balance sheets. The variations reflect underlying differences in the degree to which financial transactions are conducted at arm’s length and the importance of longer-term relationships between borrowers and lenders. The financial systems of Australia, the Netherlands, the United States, and the United Kingdom are increasingly characterized by a relatively high degree of arm’s length transactions; those in France, Germany, Italy, and Japan have moved in the same direction, but remain relatively more reliant on borrower/lender relationships.

The empirical results in this chapter suggest that these differences in financial system structure may affect household and corporate behavior over economic cycles. More arm’s length and more relationship-based systems each seem to have particular strengths and weaknesses depending on the specific challenges facing the economy. For example, under a more arm’s length system, households are able to access a larger amount of financing and seem better able to smooth consumption in the face of temporary changes in their income. This may have contributed to the reduction in consumption volatility over the business cycle. In more arm’s length systems, however, households appear to be more vulnerable to swings in asset prices, implying larger effects on demand from major asset price booms and

busts. This effect, however, may be countered to some degree by the fact that the amplitude of swings in asset prices may be lower in more arm's length systems.

Turning to the corporate sector, cyclical changes in investment seem to be shallower in more relationship-based systems, perhaps because such systems provide greater cash flow support to firms in the face of temporary changes in demand. Thus, the more closely aligned incentives of firms and lenders under these systems may allow for greater smoothing during economic downturns and less pressure for drastic balance sheet restructuring. However, when resources need to be reallocated away from declining to relatively new sectors and firms—such as those arising from the emergence of new technology—more arm's length systems seem better able to capitalize on these opportunities, with benefits for productivity growth and profitability.

The degree of arm's length content of financial systems also appears to be a factor affecting the portfolio allocation decisions of international investors. In addition to well-known factors such as the size of financial markets, international portfolio investors appear to place more assets in the financial systems of advanced economies with a higher degree of arm's length content. Among the advanced economies, investors in countries with more arm's length financial systems also seem to invest more in the portfolio securities of other countries.

The results in this chapter support the view that financial system structure does affect economic behavior and cyclical patterns. It is worth reiterating, however, that this is a new area of research, and the results are suggestive rather than definitive. This is in part due to the limited time span for observing cyclical behavior in economies with a high degree of arm's length financial transactions, and the need to characterize highly complicated financial systems using a single index. Further research in this area could, for example, look at how subcomponents of the Financial Index interact with cyclical behavior.

Looking forward, the move toward more arm's length financial systems is likely to continue as deregulation fosters greater competition in financial markets, globalization of financial markets and services continues, information and communications technology advances, and corporate governance, accounting, and legal standards are enhanced. In such an environment, competition across financial institutions can be expected to continue increasing the role of arm's length transactions intermediated through markets and reducing—but certainly not eliminating—the scope for profitable long-term financial relationships based on informational advantages. The move toward private pension plans is also likely to further boost the arm's length content of many financial systems by increasing the role of nonbank financial intermediaries and adding depth and liquidity to financial markets. There will still, however, be niches in financial systems for relationship-based transactions—such as private equity partnerships—that seek to exploit specialized knowledge of sectors and technologies. More generally, the move toward more arm's length systems facilitates the transformation of the nature of relationships themselves.

The key question for policymakers is how to maximize the benefits of this continuing move toward financial systems that are more reliant on arm's length transactions, while minimizing the downside risks. Financial and regulatory policies have to adapt to changing financial systems in order to maintain stability. The greater speed and flexibility with which transactions can be executed and the higher degree of leverage in the household sector in more arm's length systems could become sources of financial instability with macroeconomic consequences, if not adequately monitored (see Geithner, 2006). Supervisors and regulators will therefore need to continually assess and upgrade their policy tools to match financial systems' increased sophistication. The effect of interest rate changes on asset prices will also likely become an increasingly relevant channel

of monetary policy transmission through the impact on consumption and residential investment. In this environment, wealth effects could be larger than expected on the basis of historical data, and monetary policymakers will need to remain flexible, adapting their assessments of developments to reflect possible changes in the impact of asset prices on economic behavior.

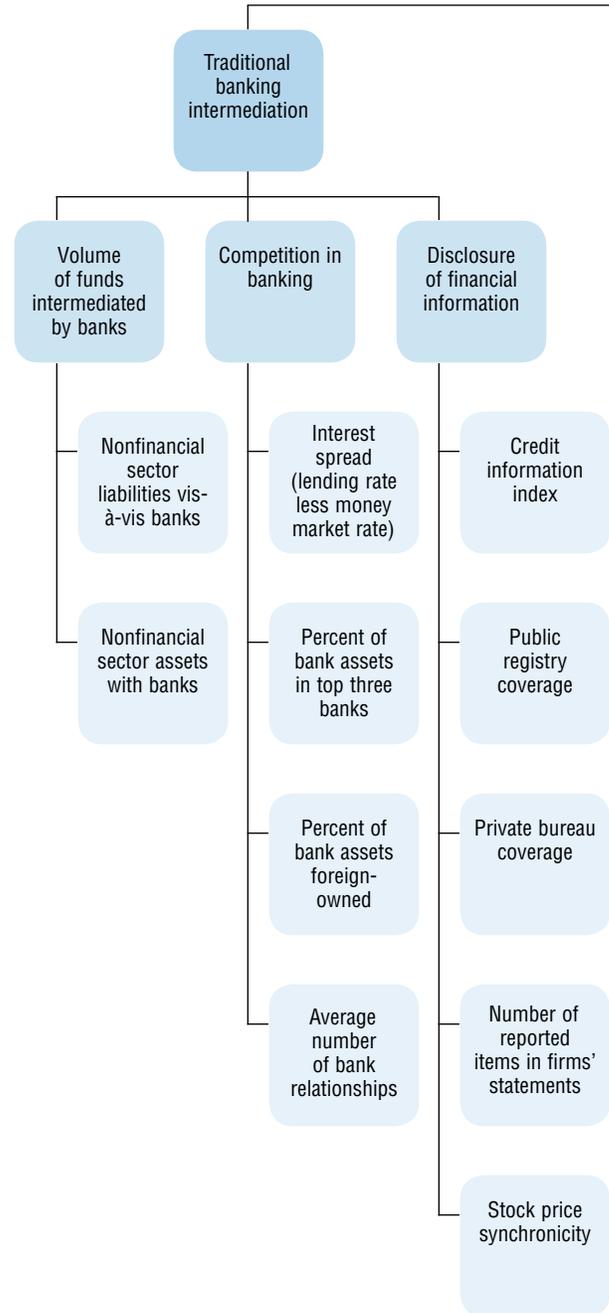
Greater demands will also be placed on firms to restructure their operations in the face of business cycle downturns as the temporary insurance provided by relationship-based lenders diminishes. Complementary reforms would help to ensure that firms are able to smoothly adjust all aspects of their operations to business cycle downturns and to facilitate the reorientation toward newer growth opportunities. Labor markets, the portability of employee pension plans, and bankruptcy laws are three key areas where reforms can support the corporate sector's ability to respond to the changing environment. Finally, strong, but well defined, social safety nets would ensure adequate support for individuals and help in retraining for new employment opportunities.

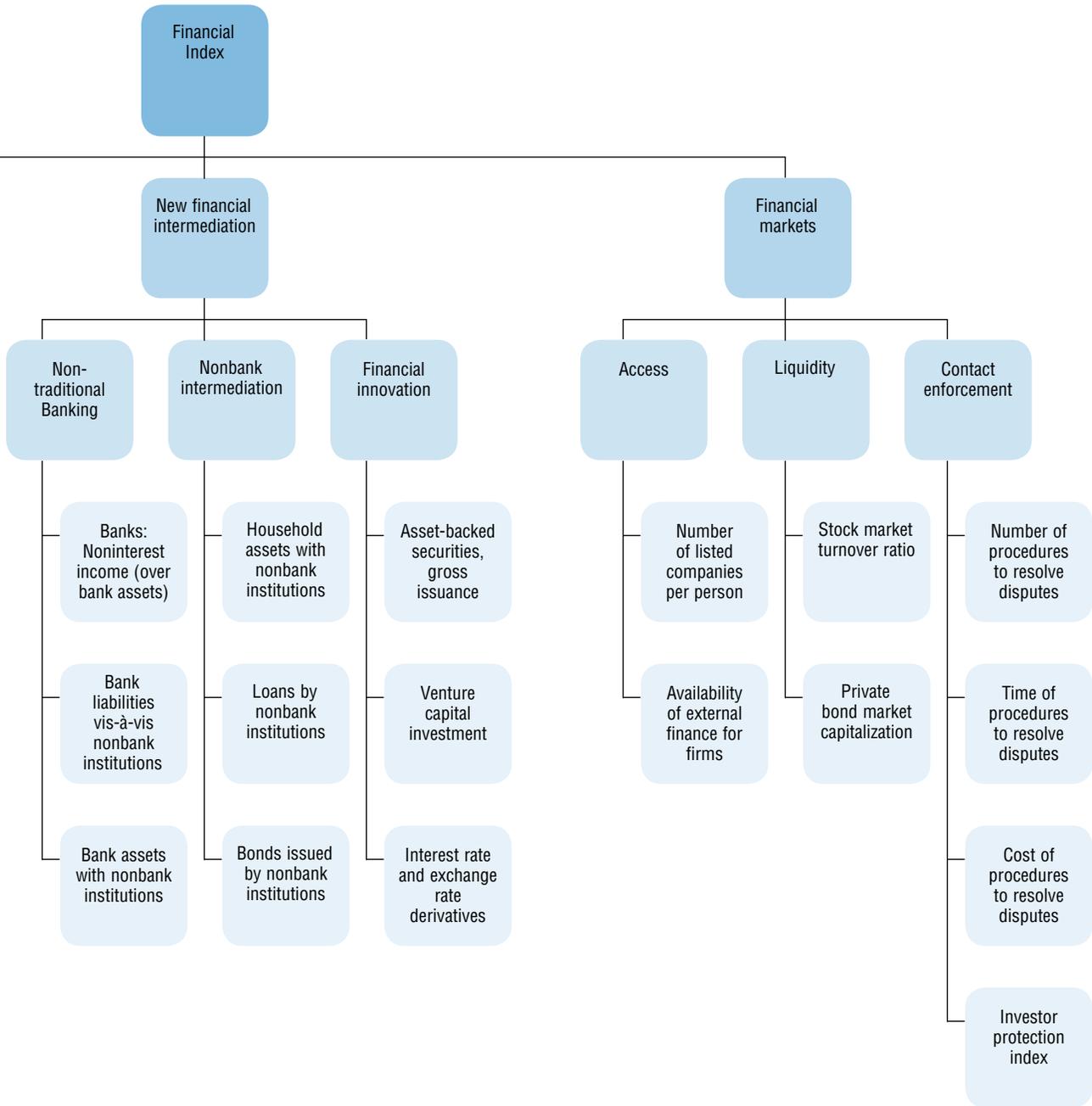
Appendix 4.1. Building the Financial Index

The main author of this appendix is Roberto Cardarelli.

This appendix describes in detail the methodology and data used to build the Financial Index discussed in the chapter. The overall Financial Index is computed as the simple average of three indices that capture the position of each of the 18 advanced economies considered in the chapter along three dimensions: the relevance of traditional (relationship-based) banking intermediation; the development of new types of financial intermediation conducted largely at arm's length; and, finally, the role played by financial markets. Each of these subindices is described below (see also Figure 4.14).

Figure 4.14. The Financial Index





Traditional Banking Intermediation Index

This index is constructed as the simple average of three subindices (shown in Figure 4.15).³³ The first subindex captures the traditional role of banks in taking deposits and making loans to firms and consumers. The other two capture the degree of competition in the banking sector and the extent to which financial information is publicly available in the economy. While the latter two variables may be grouped under more than one index (for example, as part of the new financial intermediation index, and/or of the financial market index), this grouping reflects the view that two key factors characterizing the traditional (relationship-based) banking mode of financing are the presence of some form of market power by banks over the borrowers they finance (which is lower in a more competitive banking system) and the relative scarcity of publicly available financial information on these borrowers. Hence, despite the large volume of funds intermediated by banks, a country would score lower on this index if there was considerable competition among banks—making a long-term borrower/lender relationship less likely—or there was widespread availability of information on borrowers’ capacity to repay loans and service debt (which means the bank does not benefit from private information gleaned from its relationship with a borrower). Each of the three subindices is in turn obtained as the simple average of a number of variables, which are described below.³⁴

³³In principle, other aggregation methodologies could have been used, such as principal components. Djankov and others (2005), however, show that using principal components is likely to lead to similar conclusions as those obtained using simple averages. The methodology used in the chapter has the advantage of simplicity and transparency, and avoids imposing implicit weights on the different components of the indexes.

³⁴Each country was given a score equal to the ratio of the variable for that country to its maximum value across the 18 countries. This means that all indices considered in this chapter are between 0 and 1. An alternative methodology was also utilized, based on a quadratic distance approach that gives a zero value to the country with the minimum value, and gave very similar results. It should also be noted that, in constructing the overall index, the traditional banking index was included with a “negative”

Volume of Funds Intermediated by the Banking Sector

- *Nonfinancial sector assets with banks (percent of total nonfinancial sector assets)*—a measure of the role of banks in attracting savings. Clearly, deposits on the asset side of the balance sheet of the nonfinancial sector (household, nonfinancial corporates, government, and rest of the world) correspond to a liability of the banking sector, and are included in this variable. For other instruments (such as “securities other than shares” and “shares and other equity”), it is difficult to identify the sector that has issued the claim, as national accounts do not break down financial assets by the sector of the issuer (e.g., it is impossible to know what fraction of bonds held by households has been issued by firms or the public sector). Hence, financial claims (such as bonds) are “allocated” to the various sectors according to the sector’s shares of the total liabilities (bonds) outstanding in that particular year. The share of nonfinancial sector assets with banks is thus estimated as the product between the assets of the nonfinancial sector and the banks’ share of total liabilities (for a similar methodology see Schmidt, Hackethal, and Tyrell, 1999; and Samolyk, 2004). The banking sector includes monetary financial institutions as defined by the System of National Accounts (SNA) 93 (it comprises central banks, commercial banks, “universal” banks, savings banks, post banks, and credit unions).³⁵ Source: IMF staff estimates using data from Eurostat and national statistical offices.
- *Nonfinancial sector liabilities vis-à-vis banks (percent of nonfinancial sector liabilities)*—a measure of the role of banks in lending to consumers, firms, and the public sector. As for assets,

sign—that is, the lower the traditional banking content of the system (the lower the score on this index) the higher the score on the overall financial index.

³⁵For Japan, the Trust Fund Bureau (a public, non-depository, financial institution) was included in the banking sector, given the strong linkages between this institution and postal savings.

several instruments on the liability side of the nonfinancial sector balance sheet cannot be allocated to a particular sector (it is impossible to know the extent to which bond financing for firms has been provided by banks or nonbank financial institutions). The rule for assets is also applied to liabilities, namely, they are allocated to each sector based on that sector's share of total assets outstanding in that particular year. Hence, nonfinancial sector liabilities vis-à-vis banks are estimated from national financial accounts as the product of the liabilities of the nonfinancial sector and the banks' share of total assets. Source: IMF staff estimates using data from Eurostat and national statistical offices.

Competition in the Banking Sector

- *Interest spread.* The difference between the bank lending rate and the money market rate. The interest spread is a measure of the degree of market power of banks. Source: *International Financial Statistics* (IMF).
- *Share of bank assets owned by the three largest banks*—a measure of concentration in the banking sector. Source: Beck, Demirgüç-Kunt, and Levine (1999; *A New Database on Financial Development and Structure*).
- *Percent of bank assets that are foreign owned.* A larger presence of foreign banks is likely to signal a more open and competitive banking sector. Source: Barth, Caprio, and Nolle (2004).
- *Average number of firms' relationships with banks.* If firms in a country maintain relationships with several banks, this is taken to indicate a more competitive banking system. Source: Ongena and Smith (2000).

Disclosure of Financial Information

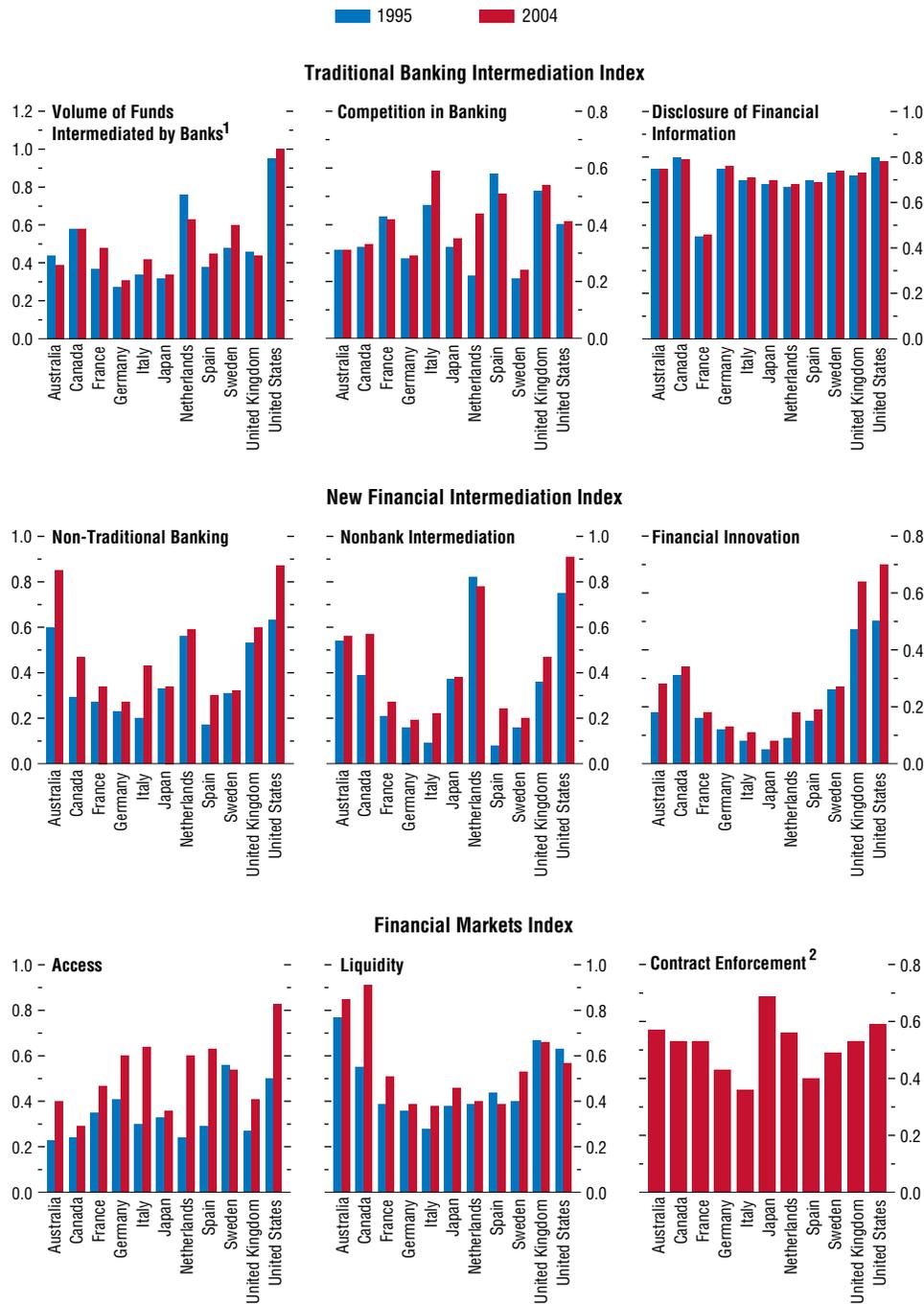
- *Credit Information Index.* The index ranges from 0 to 6, with higher values indicating that more credit information is available from either a public registry or a private bureau to facilitate lending decisions. Source: Doing Business database (World Bank).

- *Public credit registry coverage (percent of adults).* The number of individuals and firms listed in the public credit registry with current information on repayment history, unpaid debts, or credit outstanding. Source: Doing Business database (World Bank).
- *Private credit bureau coverage (percent of adults).* The coverage indicator reports the number of individuals or firms listed by the private credit bureau with current information on repayment history, unpaid debts or credit outstanding. Source: Doing Business database (World Bank).
- *Number of reported items in firms' statements.* The number of selected items that are reported in the annual balance sheet, income, and cash-flow statements for the top 20 companies in terms of market capitalization for each country. It is a measure of the amount of information communicated by firms to the general public. Source: De Nicoló, Laeven, and Ueda (2006).
- *Stock price synchronicity.* The fraction of stocks that move in the same direction in a country (as in Morck, Yeung, and Yu, 2000). It measures the ability of a national stock market to communicate firm-specific information to investors (the larger this fraction, the lower the firm-level information contained in the stock market). Source: De Nicoló, Laeven, and Ueda (2006).

New Financial Intermediation Index

This index measures the extent to which financial intermediation is conducted at arm's length in financial systems—by banks as well as other financial intermediaries. It is constructed as the simple average of three subindices (shown in Figure 4.15), which capture (1) the evolution of banks into new area of financial intermediation (by moving to fee-generating activities and establishing financial links with other financial institutions); (2) the relevance of nonbank financial intermediaries; and (3) the extent to which a country has embraced financial innovation by developing new types of financial

Figure 4.15. The Financial Index: Subindices for Selected Advanced Economies



Source: IMF staff calculations.

¹A higher value on the index denotes a lower volume of funds intermediated by banks.

²Data available only for 2003.

products, such as asset-backed securities, venture capital, and derivatives. Each of these subindices is obtained as a simple average of a number of variables, described below.

Nontraditional Banking Intermediation

- *Bank noninterest income (ratio to total assets)*—a measure of banks' ability to diversify their activity away from traditional credit risk intermediation and toward new (fee-generating) activities. Source: OECD, Bank Profitability database.
- *Bank liabilities vis-à-vis nonbank financial institutions (share of bank liabilities)*—a measure of the degree to which banks borrow from nonbank financial institutions. It is estimated from national financial accounts as the product of bank liabilities and nonbank financial institutions' share of total assets. Together with banks' assets with nonbank financial institutions (see below), this measure captures the financial linkages between banks and nonbank financial institutions. Source: IMF staff estimates using data from Eurostat and national statistical offices.
- *Bank assets with nonbank financial institutions (share of bank assets)*—a measure of the extent to which banks have extended credit to nonbank financial institutions. It is estimated from national financial accounts as the product of bank assets and the nonbank financial institutions' share of total liabilities. Source: IMF staff estimates using data from Eurostat and national statistical offices.

Nonbank Financial Intermediation

- *Household assets with nonbank financial institutions (share of household assets)*—a measure of the ability of nonbank financial institutions to attract household savings. Estimated as the product of household assets and the nonbank financial institutions' share of total liabilities. Source: IMF staff estimates using data from Eurostat and national statistical offices.
- *Loans by nonbank financial institutions (share of total loans)*—a measure of the extent to which loans are funded by nonbank financial institu-

tions (e.g., after they have been securitized). Estimated as the ratio of loan assets of nonbank financial institutions to total loan assets. Source: IMF staff estimates using data from Eurostat and national statistical offices.

- *Bonds issued by nonbank financial institutions (share of total bonds)*—a measure of the relevance of nonbank financial institutions that use bond issuance as a major form of financing. Estimated as the ratio of “securities other than shares” liabilities of nonbank financial institutions to total “securities other than shares” liabilities. Source: IMF staff estimates using data from Eurostat and national statistical offices.

Financial Innovation

- *Asset-backed securities, gross issuance (ratio to GDP)*. Sources: IMF staff estimates based on data from the European Securitization Forum for European countries; the Bond Market Association for the United States; Dominion Bond Rating Service for Canada; Australian Securitization Forum for Australia; and FinanceAsia.Com for Japan.
- *Venture capital investment (ratio to GDP)* (average 1998–2004). Source: OECD (2006).
- *Average daily turnover in foreign exchange and interest rate derivatives (ratio to GDP)*. Source: BIS, “Survey of Foreign Exchange and Derivatives Market Activity,” several issues.

Financial Markets Index

This index captures key factors determining the efficiency and depth of financial markets. It is constructed as the simple average of three subindices capturing (1) the existence of well-functioning mechanisms to enforce contracts and thus reduce the frictions that may impede the development of firms' length relations; (2) the ability of firms to access markets to finance their activities; and (3) the liquidity and depth of stock and bond markets. Each of these subindices is in turn obtained as the average of a number of variables, which are described below.

Contract Enforcement

- *Number of procedures.* The number of procedures from when the plaintiff files a lawsuit in court until when payment is received. Source: Doing Business database (World Bank).
- *Time of procedures.* Time (in calendar days) to resolve the dispute. Source: Doing Business database (World Bank).
- *Cost of procedures (as a percentage of the debt value).* Cost of going through court procedures, including court costs and attorney fees where the use of attorneys is mandatory or common, or the costs of an administrative debt recovery procedure. Source: Doing Business database (World Bank).
- *Investor Protection Index.* The index ranges from 0 to 10, with higher values indicating better investor protection. It is an average of subindices on (1) the transparency of transactions; (2) the extent to which directors are liable for damages to the company; and (3) shareholders' ability to sue officers and directors for misconduct. Source: Doing Business database (World Bank).

Access to Markets

- *Number of listed companies per person.* Source: IMF staff estimates based on data from the World Federation of Exchanges, and national statistical sources.
- *Availability of external finance for firms.* Estimated as the ratio of the sum of "securities other than shares" (bonds) and "shares and other equity" liabilities over total liabilities of nonfinancial corporates. Source: IMF staff estimates using data from Eurostat and national statistical offices.

Liquidity of Markets

- *Stock market turnover.* The ratio of the value of total shares traded and average real market capitalization. Source: Beck, Demirgüç-Kunt, and Levine (1999; A New Database on Financial Development and Structure).
- *Private bond market capitalization (ratio to GDP).* Source: Beck, Demirgüç-Kunt, and Levine

(1999; A New Database on Financial Development and Structure).

Clustering Analysis

Evidence on whether the financial systems of advanced economies have converged over the last decade can be gauged through a clustering exercise, which statistically groups countries based on similarities in their financial indicators. The objective of the cluster analysis is to group countries together based on their "distance" from each other in terms of their scores on all financial indicators in 1995 and 2004. Agglomerative hierarchical methods have been used, based on a series of successive mergers of the clusters of countries (see Johnson and Wichern, 2002). Starting with each country as a separate entity, successive iterations added the closest country to a cluster until finally all countries are grouped as a single cluster. When large differences persist between countries, a greater number of iterations are required to join a cluster. Based on this exercise, European countries tend to be grouped together in both years (Figure 4.16), even if some of them (France, Italy, and Spain) have increasingly differentiated themselves as they moved away from a relationship-based system in 2004 (when they are grouped to other European countries at a later stage of the clustering algorithm). In both 1995 and 2004, the United States was the last country to join the cluster, suggesting its financial system remains quite different from that of all the other advanced economies.

Appendix 4.2. Econometric Methodology

The main authors of this appendix are Roberto Cardarelli and Irina Tytell.

This appendix describes more fully the empirical evidence presented in the chapter, and in particular the econometric methodology and data used in linking the Financial Index to household consumption, residential investment, the response of national economies to global growth opportunities, and foreign portfolio inflows.

Household Sector and the Financial Index

To study how the extent of arm’s length finance affects the marginal propensity to consume out of current income, the following model was estimated using annual data for 18 countries over 1996–2004:

$$\Delta c_{it} = \alpha_i + \beta \Delta y_{it} + \gamma [\Delta y_{it} \times FI_t] + \delta r_{it} + \eta_t + \varepsilon_{it},$$

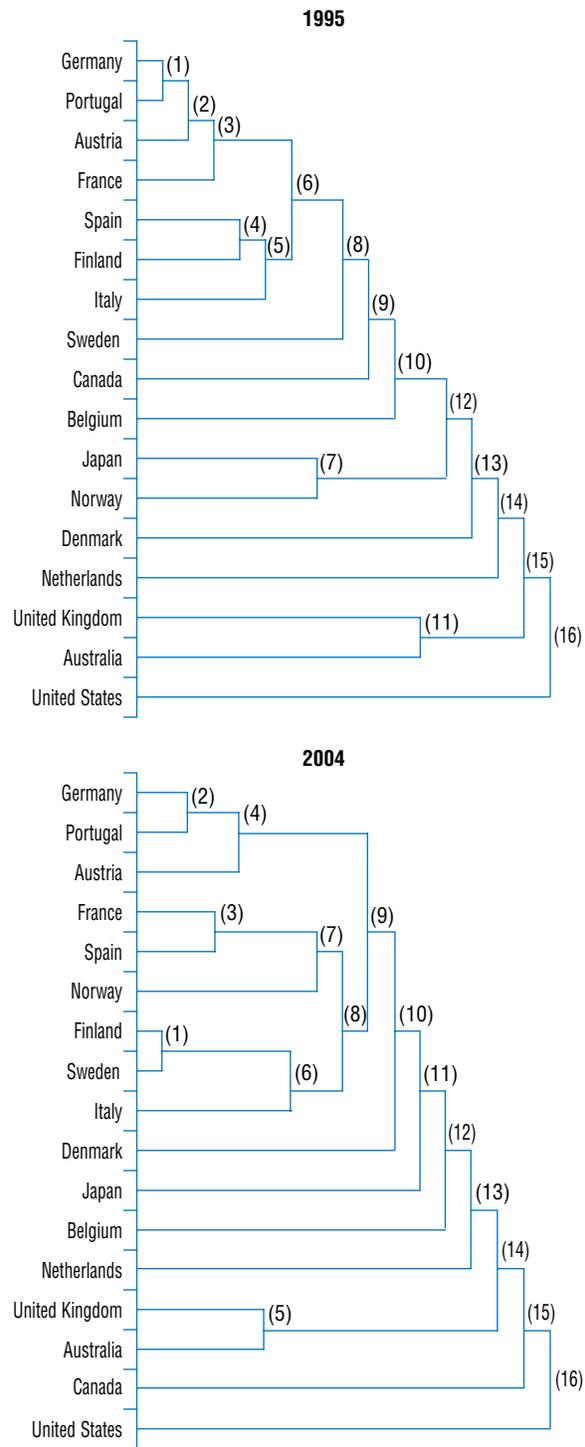
where *i* indexes countries, *t* indexes years, *c* stands for (log) consumption, *y* stands for (log) income, *r* denotes the real interest rate, and *FI* is the Financial Index (α and η are country and year fixed effects, respectively). Private consumption and disposable income were measured in real per capita terms. All the data are from the OECD.

This formulation is grounded in the literature on the “excess sensitivity” of consumption (see Campbell and Mankiw, 1991), but is implemented in a panel setup. To maintain comparability across countries, total consumption expenditure was used, which includes durables, in addition to nondurables and services. The model was estimated without using instrumental variables, hence the coefficients should be interpreted as correlations only. The negative coefficient on the interaction term suggests that the marginal propensity to consume out of current income is smaller for countries with more arm’s length financial systems (Table 4.1).

To study how the move toward more arm’s length finance affects the behavior of residential investment, a model in which the first difference of residential investment depends on current and lagged first differences in residential investment, disposable income, mortgage rate, and inflation rate was estimated using quarterly data (three lags of each variable were included). Residential investment and disposable income are in logs and were measured in logs in real per capita terms. The model was estimated using 40-quarter rolling regressions.³⁶ The results for the United States suggest that the sensitivities of resi-

³⁶A similar model was estimated for the United States by Dynan, Elmendorf, and Sichel (2006).

Figure 4.16. Clustering Results¹



Source: IMF staff calculations.
¹At each stage of clustering, one country is clustered to another country or an existing cluster. Numbers in parentheses indicate the stage at which two countries or existing clusters are put together.

Table 4.1. Dependent Variable: Private Consumption¹
(Log difference)

Disposable income ¹ (log difference)	0.599***
Interaction with Financial Index	-0.810**
Real short-term interest rate	0.001
Fixed country and year effects	Yes
Observations	161
R-squared	0.45

Source: IMF staff estimates.

Note: Heteroskedasticity and autocorrelation robust standard errors; ** significant at 5 percent; *** significant at 1 percent.

¹Private consumption and disposable income in real per capita terms.

dential investment to income and to mortgage rates have declined over the past two decades.³⁷ Analogous estimations for other countries did not indicate robust declines in these sensitivities. While some evidence of declining sensitivities was detected in Australia, it was not sufficiently clear. It is worth noting that in several European countries the estimations were complicated by short data series on mortgage rates.

Event Analyses Around Equity and Housing Busts

For this analysis, equity and housing price cycles were identified using the methodologies for the identification of business cycle turning points described in April 2003 *World Economic Outlook*. Busts were defined as those episodes where peak-trough asset price declines were large enough to fall into the top half of all declines in the sample, which included 19 countries since 1959 for equity busts and 14 countries since 1970 for housing busts. This methodology yielded 49 equity busts since 1985 and 34 housing busts throughout the period.³⁸ Responses of macroeconomic variables to asset price busts (as defined above) were assessed using median four-quarter growth rates across

³⁷The rates on conventional 30-year mortgages were taken from the Federal Reserve Board.

³⁸Due to insufficient data, housing busts could not be identified in Austria, France, Germany, Greece, Italy, Japan, and Portugal. Equity busts could not be identified in Greece and Portugal.

several subsamples. Countries were assigned to one of two groups based on whether they were in the top or bottom half of the sample ranked by Financial Index scores. For equity busts, the analysis focused on the recent period of financial liberalization beginning in 1985. During this period, 26 equity busts occurred in countries in the top half of the sample while 23 occurred in the other group. For housing busts, the analyses focused on countries in the top half of the Financial Index, due to data limitations. The analysis separated the pre-1985 period (prior to widespread financial liberalization) from the subsequent period. Among the countries in the top half of the Financial Index, 18 housing busts occurred prior to 1985 and 12 have occurred since then.

Resource Allocation and the Financial Index

The sectoral data used were from the United Nations Industrial Development Organization (UNIDO) database. Based on the three-digit ISIC standards, the database provides data on 29 industries in the manufacturing sector for 181 countries.

The econometric methodology consisted of estimating the following specification:

$$\rho_{1,i,t} = \alpha FI_i + \beta \rho_{2,i,t} + \gamma (\rho_{2,i,t} \times FI_i),$$

where:

- $\rho_{1,i,t}$ is the correlation—at time t and for country i —between real output growth of industry j ($j = 1 \dots 29$) in country i and the world output growth of industry j . It is meant to capture the ability of an economy to grasp growth opportunities available worldwide.
- FI_i is the Financial Index for country i (at year 2004). A positive value of the coefficient α would suggest that countries with more arm's length financial systems are better able to grasp worldwide growth opportunities (as they tend to have higher correlations $\rho_{1,i,t}$)
- $\rho_{2,i,t}$ is the correlation—at time t and for country i —between the contribution of industry j ($j = 1 \dots 29$) to world real output growth and the share of industry j in country i total

output in the first year of the sample. It is meant to capture the initial distance between the industry specialization of country i and the industry specialization that, over the years, would maximize the country's growth rate (a higher value of $\rho_{2,i,t}$ indicates that the country specializes in the fast-growing sectors). One would expect the coefficient of $\rho_{2,i,t}$ (β) to be positive if countries that specialize initially in the fast-growing sectors are better positioned to benefit from world growth opportunities over the years. However, the coefficient of the interaction term of this variable with the Financial Index (γ) should be negative if having an arm's length financial system makes it easier for a country with an initial specialization in low-growth industries to reallocate resources toward fast-growing sectors.

The world growth of real output in industry j was estimated as the GDP-weighted average of the real output growth of industry j in the 181 countries covered by the database. Every year the GDP weights were recalculated so as to exclude the countries for which output was missing or where a change in industrial classification was detected. Real output growth was estimated as the log-difference of nominal output in U.S. dollars deflated by the U.S. industrial producer price indices for each sector (base year 1982). Yearly log-output changes in the top 5 percent and bottom 5 percent of the distribution were excluded to reduce the influence of outliers. The contribution of industry j to world real output growth at time t was estimated as follows:

$$\sum_{i=1}^{181} \frac{\Delta y_{i,j} \left(\frac{y_{i,j}}{y_{w,j}} \right)}{\Delta y_{w,j}},$$

where $y_{i,j}$ is (log) real output of industry j in country i and $y_{w,j}$ is (log) real world output of industry j .

Table 4.2 shows the results of the estimation for the panel of 18 advanced economies considered in the chapter over the 1980–2001 period. All the coefficients have the expected sign, and are significant at the 1 percent level. Including year dummies and estimating cross-sections on

Table 4.2. Dependent Variable: $\rho_{1,i,t}$

Financial Index	1.30***
$\rho_{2,i,t}$	0.45***
Interaction of $\rho_{2,i,t}$ with Financial Index	-1.29***
Observations	345
R-squared	0.68

Source: IMF staff estimates.

Note: Heteroskedasticity and autocorrelation robust standard errors; *** significant at 1 percent.

the averages of the correlations across different time periods gave broadly consistent results, but yielded less precise estimates of the coefficient of the interaction term.

Cross-Border Flows and the Financial Index

To examine whether the nature of the financial system affects cross-border capital flows among advanced economies, the following gravity model was estimated using 2004 data on bilateral portfolio holdings from the Coordinated Portfolio Investment Survey (CPIS):

$$\ln P_{ij} = \alpha + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \beta_4 Euro + \beta_5 FI_i + \beta_6 FI_j + \varepsilon_{ij},$$

where i denotes the source country and j stands for the destination country. P is total bilateral portfolio investment of country i in country j (in millions of U.S. dollars), Y measures market size of, respectively, country i and country j (in millions of U.S. dollars), D stands for the great circle distance between countries i and j (based on the CIA World Factbook), $Euro$ is a dummy variable for country pairs in the euro area, and, finally, FI_i and FI_j refer to the Financial Index of countries i and j , respectively. The market size is measured by GDP (using total equity and bond market capitalization produced similar results).

The regression was estimated on three different samples. The first included all source countries for which portfolio data are reported in the CPIS, while destination countries were limited to those for which the Financial Index has been computed. In order to assess the effect of the financial system of the source country on portfolio holdings, the second sample included only those industrial

Table 4.3. Dependent Variable: Log Bilateral Portfolio Investment

	All Countries	Industrial Countries	Continental Europe
Log source GDP	0.876***	0.967***	0.824***
Log destination GDP	0.759***	0.868***	0.880***
Log distance	-1.182***	-0.755***	-0.713***
Euro area	1.789***	0.970***	0.994***
Source Financial Index	...	4.284***	7.280***
Destination Financial Index	5.700***	3.240***	1.276
Observations	943	305	156
R-squared	0.46	0.78	0.77

Source: IMF staff estimates.

Note: Heteroskedasticity and autocorrelation robust standard errors;

*** significant at 1 percent.

countries for which the Financial Index is available. Finally, the third sample focused on cross-border flows within continental Europe.

The regressions explain a large share of the variation in bilateral portfolio holdings (Table 4.3). The results show that countries with larger domestic markets both invest more abroad and receive more foreign investment and that cross-border portfolio holdings are negatively correlated with distance.³⁹ The results also reflect the fact that cross-border portfolio holdings are higher within the euro area. The findings suggest that the extent of arm's length finance matters for cross-border portfolio holdings. Bilateral investment depends positively on the extent of arm's length finance in the destination country, as well as in the source country in the sample of advanced economies, as reflected by the coefficient on the Financial Index. In other words, more arm's length economies tend to both invest more in foreign stock and bond markets and receive more portfolio investments from abroad. The extent of arm's length finance in the destination economy does not seem to matter, however, for cross-border portfolio holdings within continental Europe, which appear to be dominated by other factors.

³⁹Similar findings are reported and discussed in Faruqee, Li, and Yan (2004); and Portes and Rey (2005).

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