Economic Review

FEDERAL RESERVE BANK OF DALLAS
THIRD QUARTER 1996

Corporate Finance In International Perspective: Legal and Regulatory Influences on Financial System Development

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Much of the discussion on the relative superiority of one system over another ignores the possibility that these systems are the products of particular legal and regulatory environments that may be difficult to create in other countries.

In the postwar period, dramatically different systems of corporate finance and governance have emerged among the major industrialized countries. Even the casual observer notices large differences between the way firms finance and govern themselves in the United States on the one hand, and in Japan and Germany on the other. Why should corporate finance and governance systems differ so dramatically across countries? The difference poses a problem for the theory of corporate finance and governance. Theoretically, there is a single best way to organize and finance firms. Since we should expect finance and governance systems to converge to this optimum, we ought not to find much difference in these mechanisms across countries. The large differences we actually observe thus suggest accidents of history or culture or factors that theory ignores—such as differences in the laws, rules, and regulations that govern the financial systems of industrialized countries.

Recently, much has been written in the scholarly and policy-oriented literature on the relative merits of the different corporate finance systems in the developed countries.[1] There is, however, little focus on the *reasons* we observe such differences despite the problems these differences pose for the theory of corporate finance.[2] Many studies appear implicitly to assume that the outcomes we observe are essentially cultural or historical accidents. And much of the discussion on the relative superiority of one system over another ignores the possibility that these systems are the products of particular legal and regulatory environments that may be difficult to create in other countries.

I argue in this article that there are, in fact, large legal and regulatory differences among the United States, Japan, and Germany that affect the corporate financial systems in place. The differences are essentially of three kinds. First is the severity of the legal and regulatory restraints on large investors' being "active" investors in firms. U.S. laws are in general much more hostile to investors' taking large influential stakes in firms than are the laws of Japan or Germany. Second is the degree to which sources of nonbank finance are actively suppressed. For much of the postwar period, the development of securities markets in Japan and Germany has been impeded by discriminatory taxation, regulatory fiat, and cumbersome mandated issuance procedures. Third is the degree to which corporate securities markets have been "passively" suppressed by the absence of any strong mandated, standardized disclosure requirements by firms

wishing to issue securities to outside investors. U.S. disclosure requirements have been much more severe than those in Japan or Germany. These differences may have been important in determining the relative speed of securities markets development if there is a large public good aspect to the production of information by firms seeking external finance that only the imposition of government-backed disclosure requirements can solve.

I argue these legal and regulatory differences are largely responsible for the very different systems of corporate finance and governance in the United States, Japan, and Germany. One natural question is, Which system is superior in terms of providing external finance at the lowest cost? The academic literature on this topic does not yield a clear conclusion as to the more efficient system, or whether any efficiency differences are large enough to be of practical relevance. However, I point out that this literature ignores that changes in technology, the globalization of financial markets, and the changing structure of the firm may have made the Japanese and German systems of finance and governance less attractive systems over time. There is evidence that the U.S. system of finance, for example, is more favorable to the growth of new, high-technology companies than are the German and Japanese systems.

Perhaps in response to the perceived advantages of the U.S. system, the legal and regulatory environments of the German and Japanese systems are changing rapidly, and securities markets are being substantially deregulated in an effort to increase their importance as a source of firm finance. However, it is important to realize that the regulatory environment of the U.S. financial system is changing, too, albeit much more slowly than the German or Japanese system, as financial institutions are being given more latitude to be active investors in firms. Thus, over the long term, the legal and regulatory environments of all three countries appear to be converging, and the focal point of this convergence is not the Japanese/German or U.S. system as it currently stands but an entirely new environment where financial institutions are free to be active investors *and* where corporate securities markets are unhindered by regulatory obstacles.

These issues are fundamental to the theory of the firm, corporate finance, and corporate governance that have engaged academic debate for many years. However, recently they have taken on a policy relevance not experienced before. In the United States, there has been an intense, ongoing debate about the most preferred methods of financing and governing firms.[3] And in the last few years, both Japan and Germany have substantially deregulated their corporate securities markets. In addition, the stark differences between these systems provide alternative paths of development for policymakers in a whole host of countries considering revamping their financial systems. These include developed countries such as France and Italy, as well as the excommunist countries of Central Europe and many of the emerging market countries of Latin America and Asia, which all face decisions about how to craft the outlines of their rapidly developing financial markets. In doing so, they would undoubtedly appreciate an understanding of the factors behind the differences in the major industrialized countries' financial systems and their relative costs and benefits. This article addresses these issues by describing in detail the important characteristics of the corporate financing systems in the United States, Japan, and Germany, examining why such differences exist, and comparing some of their strengths and weaknesses.

In the following section, I describe the corporate finance and governance system in the United States, Japan, and Germany, highlighting the major differences. I then focus on the major legal and regulatory factors I believe are the main determinant of these differences. Finally, I look at why the Japanese/German system and the U.S. system may be converging and explore some implications of this convergence.

Corporate finance and governance across countries

All corporate finance markets must address two generic information problems faced by firms attempting to raise funds from outsiders: sorting problems and incentive problems.

Sorting problems arise in the course of selecting investments: firm owners and managers typically know much more about their business than do outsiders, and it is in their interests to accent the positive while downplaying potential difficulties. Sorting problems and their implications for corporate finance were first analyzed by Leland and Pyle (1977) and Ross (1977), who emphasized that the choice of capital structure was important in minimizing such problems. More generally, potential outside financiers must conduct extensive information gathering and verifying activities in order to minimize such information asymmetries.

Incentive problems arise in the course of the firm's operations. Firm managers have many

opportunities to benefit themselves at the expense of outside investors. Jensen and Meckling (1976) were the first to address these issues. They stressed that a combination of methods is usually needed to align the incentives of managers and investors, including the use of an appropriate capital structure, collateral, security covenants, and direct monitoring. Diamond (1991) highlighted the role of reputation in mitigating incentive problems: managers of firms that have a stake in maintaining a good reputation with outside investors have strong incentives not to act opportunistically at the investors' expense.

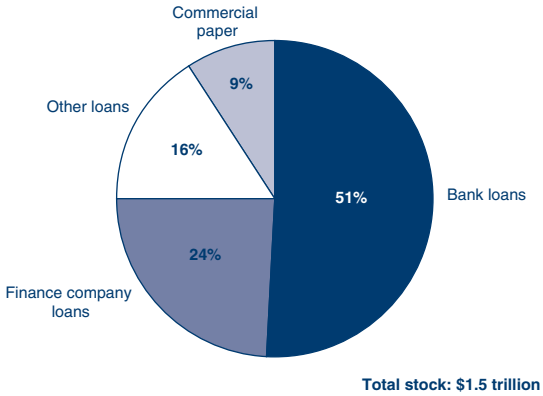
Information problems vary in severity across firms. The firm's age, size, growth rate, and line of business all influence the degree of information problems it poses to outside investors. For example, firms with heavy investments in tangible fixed assets pose less severe information problems to investors because they may be able to offer some of their fixed assets as collateral to potential creditors and because monitoring the sale of fixed assets or their transformation from one use to another is likely to be easier than it is for more liquid assets. Conversely, firms that focus on research and development may have wide scope for discretionary behavior, since the risk implicit in a particular research and development program cannot easily be monitored or controlled by outside investors. Finally, other things being equal, small firms pose greater information problems than large firms. Smaller firms do not produce detailed information about themselves and are often too young to have a credible reputation. Larger, public firms make available detailed information about their activities and have a bigger stake in maintaining a good reputation among potential financiers.

The following section describes the structure of U.S., Japanese and German corporate financial markets and how they address these information problems.

The U.S. system

The U.S. system is developed broadly and deeply enough to allow a large variety of suppliers of finance to compete with one another in a number of different finance markets. These markets differ from one another partly in the degree to which they are designed to mitigate the information problems posed by firms. This differentiation provides a natural selection mechanism as to which firms use which markets. While banks play an important financing role, they are more limited by regulation than in Japan or Germany. Conversely, more liberal regulation of securities markets permits a greater role for securities financing than in Japan or Germany.

Figure 1
Short-Term Liabilities of Nonfinancial Business, 1994



Although banks dominate U.S. short-term finance markets, they have much competition from finance companies, savings institutions, and the commercial paper market, which is an option for larger, more highly rated firms (*Figure 1*).[4] While banks are still an extremely important source of funds for small firms, over the past fifteen years rapid consolidation of the banking industry has led to a decrease in small business lending. Bank lending to large firms has also shown declines in recent years, possibly owing to increasing competition from other intermediaries and from securities markets.[5]

Securities markets play a more important role in long-term financing than in short-term financing, and they play a more important overall role in corporate financing than in most other countries (*Figure 2*). The public bond market is the largest source of long-term finance because it caters to the biggest firms that have the largest

Figure 2
Issuance of Long-Term Securities, 1990–94

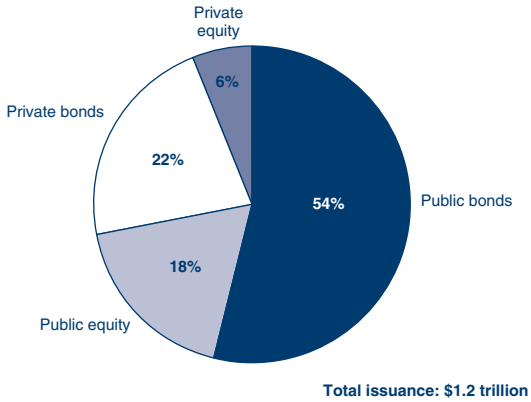


Table 1
Capital Sources for Firms

	Firm size		
	Small	**Medium**	**Large**
Information availability	Low	More	High
Sorting/incentive problems:	High	Less	Low
Capital sources	Angel capital Private equity Bank loans	Private equity Bank loans Private bonds Public equity	Bank loans Public equity Public bonds Commercial paper

capital needs. The public equity market is also an extremely important source of long-term funds for large firms and small, fast growing firms that make initial public offerings. Two private markets—the private bond and private equity markets—are often the only realistic sources of long-term finance for small and middle market companies. These markets involve the issuance of securities that are exempt from registration with the Securities and Exchange Commission and, thus, free from much of the expense in money and time of the registration process and the continuing reporting and disclosure requirements. The largest of these private markets is the private placement, or private bond, market. It offers long-term debt at fixed interest rates and is a significant source of funds for middle-market firms with annual revenues between $100 million and $500 million that are generally not large enough to issue public bonds.[6] The private equity market consists of equity investments in small and medium-sized firms professionally managed by specialized intermediaries, mostly limited partnerships.[7]

Just as firms vary in the degree to which they suffer from sorting and incentive problems, U.S. corporate finance markets differ in the extent to which they are designed to mitigate these problems. Thus, as shown in Table 1, small firms are forced to raise funds in markets that have developed the greatest safeguards to mitigate information problems, such as the private equity and bank loan market. Medium-sized firms may be able to tap the private bond market, while larger or more promising middle-market firms may be able to issue public equity. Large firms that suffer least from information problems gravitate toward the markets with the fewest such safeguards and where capital is the cheapest, such as the public bond and commercial paper markets.

Two common features in the bank loan, private placement, and private equity markets safeguard against the most severe information problems that occur in smaller firms. First, investors in these markets have the expertise and resources to obtain and analyze information about the firms that solicit them for money, helping to mitigate the sorting problem. Second, investors use various control mechanisms to influence the firm after funds are invested to ensure that it makes proper use of their capital, which helps mitigate the monitoring problem. For example, tight covenants in bank loans and private placements help control risk and constrain opportunistic behavior. Private equity investors use a number of mechanisms to give them influence, including board representation and voting rights. In addition, they will typically control the firm's access to subsequent capital. Fast-growing firms depend crucially on the initial investors to either provide subsequent capital themselves or find other investors to do so. Finally, management is almost always given a significant stock ownership, which more closely aligns management's incentives with those of the private equity investors.

Large, public firms share some of small firms' information problems, though to a lesser extent. The public bond and equity markets have a number of characteristics that help mitigate these problems. First, there are a host of stock and bond analysts, ratings agencies, and other advisors that analyze the operations and reports of large firms and offer opinions about whether the firm is worthy of new capital. Second, the public equity market is highly liquid, making the threat of a takeover of a firm that is performing poorly a credible one in many cases, helping to discipline management to act in shareholders' interests.

The German/Japanese systems

Although there are some differences, methods of finance and governance in Japan and Germany share a number of important characteristics. In particular, they both look very different from those of the United States.

First, there has been a much less diverse spectrum of finance markets available to firms in Japan or Germany than in the United States. Japanese and German firms, regardless of their size or the severity of their information problems, have traditionally relied more on bank financing than have U.S. firms, while securities markets have been much less important. For example, from 1970 to 1985, intermediated loans (principally from banks) comprised 85 percent

Table 2
Stock Market Capitalization, 1985
(As a Percentage of GNP)

	United States	Japan	Germany
Unadjusted	51	71	29
Adjusted	48	37	14

NOTE: Adjusted figures are corrected for the double-counting of shares associated with intercorporate share holdings.

SOURCES: Borio (1990) and national data.

Table 3
Composition of Companies' Credit Market Debt, 1985
(As a Percentage of Total Credit Market Debt)

	United States	Japan	Germany
Securities	55	9	6
Intermediated debt	45	91	94
of which, from banks	36	NA	88

NOTE: Credit market debt excludes trade debt. Intermediated debt refers to loans from financial intermediaries. Securities includes commercial paper and other short-term bills and long-term bonds.

SOURCES: Borio (1990) and national data.

of the total gross external financing of Japanese nonfinancial firms, with only 15 percent sourced from bond and equity markets.[8] German nonfinancial firms raised 88 percent of their gross external funds from intermediated loans over the same period, with only 12 percent from securities markets.[9]

Another important characteristic of the financial systems of Germany and Japan is the closeness of ties between banks and their corporate borrowers, which are much tighter than the traditional arm's length relationships observed in the United States. One important aspect of these tight relationships is the ownership of equity of nonfinancial firms by banks. Unlike in the United States, banks are the most important large shareholders in firms in both countries. In Japan, they own over 20 percent of the outstanding common stock of nonfinancial firms. In Germany, they own 10 percent, but under current law they have great flexibility to vote according to their own wishes the additional 14 percent of common stock owned by individuals but held by banks in trust for them. In contrast, U.S. banks own negligible amounts of nonfinancial firms' equity.

Banks consequently have a potentially powerful position as active monitors in both Germany and Japan. First, they have typically comprised the lion's share of external finance to firms and may, therefore, exercise influence through their control of the firm's access to external funds. Second, the loans they make are often short-term in nature. In normal times, they would be rolled over on an almost automatic basis, but should questions arise about management strategy or quality, the bank always has the option of not renewing the loan at a fairly frequent interval. Finally, their large shareholder status means that they have both the incentive and ability to directly monitor management through their presence on the board and the votes they can exercise at the shareholders meeting.

Unlike U.S. banks, banks in Germany and Japan have effectively acted as insiders to firms. They have had great access to information about the firm's operations and have had the ability to

Table 4
Summary Statistics of Ownership Concentration of Large Nonfinancial Corporations
(Percentage of Outstanding Shares Owned by the Largest Five Shareholders)

	United States	Japan	Germany
Mean	25.4	33.1	41.5
Median	20.9	29.7	37.0
Standard deviation	16.0	13.8	14.5
Minimum	1.3	10.9	15.0
Maximum	87.1	85.0	89.6
Mean firm size[1] (millions of US$, 1980)	3,505	1,835	3,483
Mean firm size[2] (millions of US$, 1980)	1,287	811	1,497

[1] Measured by total assets.
[2] Measured by market value of equity.

NOTE: The samples were as follows: United States—457 nonfinancial corporations in 1980; Japan—143 mining and manufacturing corporations in 1984; and Germany—41 nonfinancial corporations in 1990.

SOURCES: For the United States and Japan, Prowse (1992); for Germany, Prowse (1993). Size data converted to US$, using 1980 average exchange rates and deflated by U.S. consumer prices.

engage in monitoring and influencing management. Banks' dual role as important lenders and shareholders has given them a primary role in the financing and governing of firms.

U.S. and German/Japanese systems compared

These differences between corporate finance systems show up in a variety of ways. First, the relative importance of corporate securities markets across industrialized countries differs dramatically. Stock market capitalization (as a share of gross domestic product) is much larger in the United States than in Japan and Germany after adjustment for the double-counting associated with intercorporate shareholding (*Table 2*).[10] Corporate bond markets also differ dramatically in size across countries. In Japan and Germany, less than 10 percent of nonfinancial corporations' credit market debt was in the form of securities in 1985, compared with more than 50 percent in the United States (*Table 3*). These differences also show up in the financing patterns of individual large firms in the three countries. For example, in 1994, the two largest firms in Germany, Daimler-Benz and Siemens, had long-term debt securities outstanding accounting for 10 percent and 2 percent, respectively, of their total assets. In Japan, the numbers for Toyota and Nissan were 10 percent and 4 percent, respectively. In contrast, the percentage of total assets financed by long-term bond securities for two of the largest U.S. firms were 30 percent for Ford and 20 percent for GE.

Corporate ownership structures in the Untied States, Japan, and Germany also differ markedly. Ownership concentration is significantly higher in Japan and Germany than in the United States (*Table 4*). The holdings of the largest five shareholders average over 40 percent in Germany, 33 percent in Japan, and only 25 percent in the United States. Many of the large shareholders in Japan and Germany are banks with lending ties to the firm.

Another major difference is the frequency of corporate takeovers. The market for corporate control is much less active in Japan and Germany (*Table 5*). Part of the reason for the much greater merger and acquisition activity in the United States is, of course, the larger number of companies listed on the stock market. However, even after normalizing the dollar value of mergers and acquisitions by stock market capitalization, the U.S. merger market appears fifteen to twenty times more active than those in Japan or Germany.

Hostile takeovers are also very much less frequent in Japan or Germany than in the United States. Table 6 illustrates the paucity of hostile offers (whether ultimately successful or not) in continental Europe compared with those in the United States (no comparable data for Japan are available). The differences across countries in *actual, completed* hostile takeovers are even more striking. Since World War II, for example, there have only been *four* successful hostile takeovers in Germany (see Franks and Mayer 1993). Kester (1991) claims that the use of takeovers in large Japanese firms is very infrequent. Conversely, in the United States, almost 10 percent of the Fortune 500 in 1980 have since been acquired in a transaction that was hostile or that started off as hostile.[11]

Table 5
Average Annual Volume of Completed Domestic Mergers and Corporate Transactions with Disclosed Values, 1985–89

	United States	Japan	Germany
Volume (in billions of US$)	1,070	61.3	4.2
As a percentage of total market capitalization	41.1	3.1	2.3

NOTES: Dollar values calculated at current exchange rates for each of the five years covered. Market capitalization figures are for 1987, converted to dollars at prevailing exchange rate.

SOURCES: For the United States and Germany, Securities Data Corp., Mergers and Corporate Transactions database; for Japan, Yamaichi Securities Corp., as reported in Beiter (1991).

Legal and regulatory determinants of corporate financial systems

Much of the scholarly and policy-oriented literature is silent on the reasons for the differences in corporate finance and governance systems across countries. Studies that do focus on differences in the legal and regulatory environment mistakenly focus on only one aspect of it:

Table 6
Hostile Takeovers and Leveraged Buyouts as a Percentage of All Attempted Transactions, 1985–89

	United States	Rest of Europe
Hostile takeovers	17.8	9.6
Leveraged buyouts	20.0	2.7

NOTES: Hostile offers are defined as those transactions in which the acquiring company proceeds with its offer against the wishes of the target company's management. Data include both completed and withdrawn transactions.

SOURCES: Securities Data Corp.; Mergers and Corporate Transactions database.

Table 7
Legal and Regulatory Constraints on Corporate Control

Institution	United States	Japan	Germany
Banks	Stock ownership prohibited or requires prior approval of Federal Reserve Board and must be "passive." Source: Glass–Steagall and Bank Holding Company Act.	Prior to 1987 banks could hold up to 10 percent of a firm's stock. After 1987 can hold up to 5 percent. Source: Anti-Monopoly Act.	No restrictions, apart from some generous prudential rules.
Life insurance companies	Can hold up to 2 percent of assets in a single company's securities; can hold up to 20 percent of assets in equities. Source: New York insurance law.	Can hold up to 10 percent of a firm's stock. Source: Anti-Monopoly Act.	Can hold up to 20 percent of total assets in equities. Source: Insurance Law.
Other insurers	Control of noninsurance company prohibited. Source: New York insurance law.	Can hold up to 10 percent of a firm's stock. Source: Anti-Monopoly Act.	No restrictions.
Mutual funds	Tax penalties and regulatory restrictions if ownership exceeds 10 percent of a firm's stock. Source: Investment Company Act, Internal Revenue Service.	No restrictions.	No restrictions.
Pension funds	Must diversify. Source: ERISA.	No restrictions.	No restrictions.
General	Securities and Exchange Commission notification required for 5-percent ownership. Antitrust laws prohibit vertical restraints. Insider trading laws discouraging active share holding. Bankruptcy case law makes creditor in control of firm liable to subordination of its loans.	—	Regulatory notification required for 25-percent ownership.

SOURCES: For the United States, Roe (1990); for Japan and Germany, various national sources.

differences in the degree to which banks are allowed to be active investors in firms.[12]

In fact, there are large legal and regulatory differences among the United States, Japan, and Germany that affect the corporate financial systems in place. These differences are of three kinds. First is the aforementioned severity of the restraints on large investors being active investors in firms. Second is the degree to which sources of nonbank finance are actively suppressed. Finally, there are differences regarding disclosure requirements by firms wishing to issue securities. All these differences play a role in determining the different outcomes observed across countries. I consider them in turn.

Restraints on ownership of corporate equity. As Table 7 documents, financial institutions in Japan and Germany are generally given much more latitude to own shares in and exert control over firms than they are in the United States.

In the United States, financial institutions face significant constraints on their ability to take large stock positions in firms and use them for corporate control purposes.[13] Banks are simply prohibited from owning any stock on their own account. Bank holding companies cannot own more than 5 percent of any unaffiliated, nonsubsidiary, nonbank firm without Federal Reserve Board approval, and their holdings must be passive.[14] Bank trust departments are allowed to hold equity for the beneficial owners. However, they cannot invest more than 10 percent of their trust funds in any one firm, and there are often other trustee laws

that encourage further fragmentation of trust holdings.

Other financial institutions also face strict rules governing their equity investments. New York insurance law, which currently governs almost 60 percent of total life insurance industry assets, places a limit of 20 percent of a life insurer's assets, or one-half of its surplus, that can be invested in equity, and a limit of 2 percent of its assets that can be invested in the equity of any one firm. Other states have similar rules. Property and casualty insurers are prohibited outright from owning a noninsurer. Mutual funds are subject to tax and regulatory penalties if they own more than 10 percent of the stock of any one firm. Pension fund investments are governed by the Employment Retirement Income Securities Act of 1974 (ERISA). ERISA requires all pension funds to be diversified, allowing little room for an influential position in a company.

Table 8
Legal and Regulatory Constraints on Nonfinancial Firms' Access to Nonbank Finance

Instrument	Japan	Germany
Commercial paper	Issuance prohibited until November 1987.	Issuance discouraged until 1992 by issue authorization procedure and securities transfer taxes.
Domestic bonds	Stringent criteria for issuance of straight and convertible bonds until 1987.	Issuance discouraged until 1992 by issue authorization procedure and securities transfer taxes.
Eurobonds	One-year approval period for foreign bond issuance until 1982; restrictions on issuance of Euroyen bonds until 1984; withholding tax on interest income of nonresidents until 1985; Eurobond issuance restrictions eased further in 1992.	Issuance abroad required prior notification of the authorities and was subject to maturity restrictions until 1989; issuance of foreign currency bonds prohibited until 1990.
Equity	Heavy taxes on equity transactions until 1988.	New share issues must be offered to existing shareholders first. One-percent corporation tax on all equity issues until 1992. Secondary trading in equities subject to securities transfer tax until 1992, ranging from 0.1 percent to 0.25 percent. Annual net asset tax of 1 percent on corporate net assets, payable irrespective of net income position.

SOURCES: Döser and Broderson (1990); Takeda and Turner (1992).

U.S. securities laws discourage concentrated, active shareholding by investors in general. First, all entities acquiring 5 percent or more of a company must file with the SEC, outlining the group's plans and revealing its ownership and sources of finance. Second, any stockholder who exercises control over a firm may be liable for the acts of the firm. Third, insider trading rules restrict large active shareholders from short-term trading of stock they own. Thus, Bhide (1993) reports that pension fund managers are reluctant to own more than 10 percent of a firm because this would restrict the liquidity of their stake, which by law they have a responsibility to protect. Finally, the legal doctrine of equitable subordination discourages all creditors from taking equity positions in the firm, since their loans are subject to subordination should they exert control.

In Japan, there are far fewer regulations constraining particular financial institutions from holding corporate stock or from using the stock they own for corporate control purposes. The sole restrictions derive from the Anti-Monopoly Act, which until 1987 limited a bank's holdings of a firm's shares to 10 percent (the limit has since been lowered to 5 percent). Insurance companies are similarly restricted to owning at most 10 percent of a firm. Antitrust laws and insider trading legislation on paper look similar to those of the United States. However, there is widespread recognition that they are not enforced by the authorities.

The institutional structure of the German financial system is based on the universal banking principle. Universal banks can hold whatever share of equity they like in any nonfinancial firm, limited only by a number of prudential rules that do not appear to be particularly binding.[15] Antitrust laws have not been used to discourage intercorporate shareholdings as they have in the United States. And for much of the postwar period, there was no explicit legislation against insider trading: Germany has only recently adopted the European Community standards regarding the establishment of minimum levels of shareholder protection.

Suppression of sources of nonbank finance in Japan and Germany. Table 8 documents some of the legal and regulatory restraints on access to external nonbank finance by nonfinancial firms in Japan and Germany in the postwar period. Unlike in the United States, significant obstacles have confronted firms wishing to raise external finance from sources other than banks

Table 9
Selected Results from a Survey of the Implementation of OECD Guidelines on the Disclosure of Information by Multinational Enterprises
(Number of Firms)

Country	Implementation of guidelines on disclosure of operating results[1]			Implementation of guidelines on disclosure of intragroup pricing policies[2]		
	Full	Partial	Not implemented	Full	Partial	Not implemented
United States	34	19	0	29	0	18
Japan	2	21	0	2	0	17
Germany	0	19	0	0	0	15

[1] Includes industrial and financial firms.
[2] Industrial firms only.

SOURCE: OECD, "Disclosure of Information by Multinational Enterprises," *Working Document by the Working Group on Accounting Standards*, no. 6, 1989.

until the mid-1980s in Japan and until very recently in Germany.

Until the early 1980s, Japanese firms had no direct recourse to capital markets for external finance. The domestic bond market was open to only a few government-owned firms or electric utilities. The Bond Issuance Committee set severe eligibility requirements on issuers of corporate bonds through a detailed set of accounting criteria that in 1979 only permitted *two* firms to issue unsecured bonds domestically. These requirements were gradually relaxed in the mid-1980s, so that, by 1989, about 300 firms were eligible to issue unsecured straight bonds.[16] Similar restrictions on access to the Eurobond market were relaxed in stages from 1982. Commercial paper issuance was prohibited by the authorities until 1987. While not directly restricted, equity issuance was discouraged by heavy taxes on transactions in equities until 1988.

Restrictions on nonbank finance in Germany have been significant until even more recently. Issuance of commercial paper and longer term bonds was hampered by requirements under the issue authorization procedure and the securities transfer tax (see Deutsche Bundesbank 1992). The issue authorization requirements included obtaining prior approval by the Federal Ministry of Economics. Such approval was granted if the issuer's credit standing was satisfactory and if a bank supported the application. While this procedure was a formality for large German firms, it added to the effective cost of a bond issue because firms could not generally issue the bonds at a time of their own choosing but were forced to wait for approval from the ministry. The securities transfer tax often imposed a considerable burden on the secondary market for corporate securities, particularly at its short end. Foreign issuance of corporate debt has been subject to similar restrictions. Equity issuance and secondary trading of equities historically have been subject to a variety of taxes that have generally made equity uncompetitive with bank loans as a form of external finance (see Döser and Broderson 1990). Most important, however, has been the legal requirement for employee representation on boards of publicly listed firms, which has discouraged many private firms from going public (see Borio 1990). Overall, these restrictions have made securities issuance "not a viable alternative for most German businesses."[17]

Fostering nonbank finance in the United States through disclosure requirements. Quite apart from the active discrimination against nonintermediated forms of finance, the lax disclosure requirements in Japan and Germany *may* have been an additional (passive) factor in discouraging the development of securities markets.

Firms in the United States wishing to issue securities to the public have been required to disclose much more information than those in Japan and Germany. Results from a recent Organization for Economic Cooperation and Development survey, which rated the degree of information disclosure by firms relative to OECD guidelines, illustrate this pattern.[18] Table 9 illustrates the results for two areas of disclosure—operating results and intragroup pricing policies. Two-thirds of U.S. firms surveyed had fully implemented the OECD disclosure guidelines for operating results; the rest had partially implemented them. In Germany none of the firms surveyed and in Japan less than 10 percent of those surveyed had fully implemented the guidelines. The results for disclosure of intragroup pricing policies (and other areas not reported here) reveal a similar pattern.

There is a fairly intense academic debate as to the effects of mandated corporate disclosure requirements, with no conclusive answer. One hypothesis is that mandated disclosure rules help firms make credible commitments to outside investors to provide honest and timely disclosure and protection from market manipulation or insider trading. In this view, for strategic, competitive reasons firms may not have sufficient incentives voluntarily to provide the financial information outside investors would require to consider extending such finance (for example, they may be afraid that competitors could take advantage of such information). Thus, absent a regulatory requirement for adequate disclosure

to outside investors, the development of a liquid market for corporate securities may be effectively impeded. Proponents of such a view include Dye (1990), Dye and Magee (1991), and Demski and Feltham (1994).

The alternative hypothesis is that regulation unduly constrains the choices of firms and investors and prevents efficient contracting. In this view, firms have sufficient incentives to provide the optimal amount of disclosure to obtain external financing and regulations mandating such disclosure are, at best, irrelevant and, at worst, burdensome and costly on both firms and investors. Proponents of this view include Bentson (1973), Leftwich (1980), Watts and Zimmerman (1986), and Phillips and Zecher (1981).

Ultimately, the effect of mandated disclosure requirements is an empirical issue. Unfortunately, only a limited amount of research bears on this topic. Stock price studies of firms before and after the 1933 Securities Act suggest that mandated disclosure regulations impose costs on firms (see Benston 1973 and Chow 1983). On the other hand, Sylla and Smith (1995) explain the differing speeds of development of stock markets in the United States and U.K. since 1800 on differences in mandated disclosure rules. They attribute the faster development of the stock market in the U.K. in the nineteenth and early twentieth centuries to the various companies acts between 1844 and 1900 that required substantial disclosure by firms wishing to issue equity. Disclosure requirements were significantly less onerous in the United States until the 1930s, when the Securities Acts of 1933 and 1934 went beyond even what the British had put in place. Sylla and Smith claim these disclosure rules were responsible for putting the United States ahead of the U.K. in terms of the size and depth of the stock market in the immediate postwar period.

While this debate is far from settled, it is possible that the marked differences in disclosure requirements among countries may, in part, be responsible for the differences in the relative speeds of development of corporate securities markets.

Costs and benefits of different systems of finance and governance

There has been much debate about the efficiency of the different systems of corporate finance and governance we observe in the industrialized countries, with no clear consensus. While the academic and policy-oriented literature often finds *specific* advantages in a particular country's financing and governance systems, it has not found demonstrably cheaper capital for firms or obviously superior mechanisms of corporate control in any one country.

The academic literature to date makes the following points: first, there are some advantages in fostering tight ties between banks and firms. Prowse (1990), Hoshi et al. (1990a), Lichtenberg and Pushner (1993), Cable (1985), and Elston (1993) all provide evidence suggesting that the concentrated holding of debt and equity claims by financial institutions in Germany and Japan mitigates the information problems of external finance and governance to a greater extent than in the United States, where ties between banks and firms are more arm's length.

However, there are also advantages to having large, active corporate securities markets. Porter (1992) and Sahlman (1990) provide evidence that the U.S. system appears better at funding emerging companies and new (often high-technology) business activities than the German or Japanese system. Franks and Mayer (1992) argue that such a comparative advantage is the reason for the predominance of high-technology firms in the fields of oil exploration, biotechnology, pharmaceuticals, and computer software in the United States. Porter also claims that liquid U.S. capital markets are able to reallocate capital from low- to high-growth sectors more efficiently than those of Japan and Germany.

The specific advantages of each system do not appear to translate into overall measurable differences in either the cost of external financing or the effectiveness of the corporate control mechanism. There are legions of cost of capital studies with no clear message as to which system delivers external finance to firms at the lowest cost.[19] And Kaplan (1993a, 1993b) reports that top management turnover exhibits *similar* sensitivities to measures of poor firm performance in the United States, Japan, and Germany. Conversely, both systems clearly have their embarrassing examples of breakdowns in corporate control. The German and Japanese systems appear particularly susceptible to potential problems involving "who monitors the monitor?"[20] The U.S. system appears to have particular weaknesses when, for one reason or another, hostile takeovers pose no credible threat to current management.[21] Overall, it may well be that neither system clearly dominates the other. After all, firms from all three countries have been competing internationally with each other for years, yet no obvious winner has emerged.

Perhaps the most important consideration in evaluating the effectiveness of each system is the system's long-run stability, a factor many studies ignore. It appears that the legal and regulatory environment that sustains the corporate finance system in Japan and Germany is not stable, but is changing rather rapidly. These changes may be a result of a conscious decision by policymakers in these countries to capture some of the aforementioned advantages of the U.S. system in financing emerging high-technology ventures. Or they may have resulted from the fact that legal and regulatory systems have costs, both economic and political, the bulk of which may have little to do with the particular mechanism of corporate finance and governance they support and which have increased in response to changes in the power of vested interests, financial innovations, and other market developments.

Japan is the clearest example of this phenomenon. The regulatory and legal structure of the Japanese financial system has been changing since the 1970s under both domestic and international pressure for reform. One aspect of Japanese deregulation has been the gradual removal of restrictions on nonbank finance. Rosenbluth (1988) argues that the strict regulation of Japanese corporate finance in favor of bank lending until the early 1980s proved unsustainable in the face of growing competition from the Euromarkets and the decline in profitability of domestic bank lending after the removal of interest rate controls.

Ties between banks and large firms in Japan that have easy access to the Euromarkets and the developing domestic bond market are weakening substantially in response to this deregulation, as the financing patterns of many firms are changing (see Hoshi et al. 1993 and Kester 1991). While Japanese nonfinancial firms obtained only 15 percent of their total gross external financing from securities markets between the years 1970 and 1985, from 1986 to 1990 they obtained over 30 percent from bond and equity markets.[22] What these changes mean for the mechanisms of corporate control employed in Japan is not clear. It may mean that takeovers start to become more frequently used to discipline management. However methods of corporate control evolve, and there will likely be significant changes from the previous regime.

The German legal and regulatory environment has also shown recent signs of changing. As part of the attempt to compete with London as a center of finance, many of the restrictions on corporate finance have been relaxed (see Deutsche Bundesbank, March 1992). In addition, other aspects of the German legal and regulatory framework will have to change under planned European Economic Community reforms. As in Japan, this may increase the role of securities markets in the financing of German firms. Again, how methods of corporate control will change is unclear.

The U.S. financial system has also been changing, albeit much more slowly than those in Japan and Germany. Some restrictions, such as the SEC's rules on shareholder activism, have already been loosened and have led to some institutional investors flexing their muscles somewhat. However, the wide variety of different laws that support the U.S. system of corporate control—portfolio regulations on financial institutions, tax laws, antitrust rules, and securities laws—means that any changes are likely to be evolutionary rather than revolutionary.

Implications of changing legal and regulatory environments

This article has shown that differences in the legal and regulatory environment pertaining to corporate ownership by financial institutions and to corporate securities market development have been of great importance in determining differences in the finance and governance systems observed across the industrialized countries. It follows that as these legal and regulatory environments change, so will methods of finance and governance. As noted above, there is clearly some long-term convergence going on in the legal and regulatory environments of the United States, Japan, and Germany, and the focal point of this convergence is not the Japanese/German or U.S. system as it currently exists but an environment in which banks are free to conduct investment and commercial banking activities (including active investments in firms) *and* corporate securities markets are unhindered by regulatory and legal obstacles.

What will be the primary mechanisms of corporate finance and control in such a system? This is a difficult question because we do not have models among the developed industrialized countries we can look at that embody such a legal and regulatory environment. The closest to this model might arguably be the United States in the early twentieth century. In the United States in the 1920s, firms had relatively free access to nonbank finance, securities markets were relatively active, and there were few restrictions on the ability of financial insti-

tutions to take equity and debt positions of a size to confer some control.[23] In this system, there might plausibly be some firms that would solve their financing and governance problems better by using intermediated finance from intermediaries that also take active equity positions in the firm, while others might better rely on securities markets for external finance and an active takeover market for corporate control. Just how and why this "mix" occurs is a subject worth further investigation in the form of a more detailed analysis of this period in U.S. financial history.

For the United States, the movement toward a more deregulated environment for financial intermediaries should not necessarily be viewed with trepidation. As pointed out, there are some clear advantages to be gained from letting banks and other financial intermediaries form tighter ties with the firms to which they lend. Perhaps the biggest concern relates to the issue of deposit insurance. Allowing commercial banks to engage in investment banking activities, including the holding of corporate equity, clearly requires a thorough review of the implications for the deposit insurance fund and possible modifications to the U.S. deposit insurance system.

Notes

[1] For example, see Jensen (1989), Kester (1991), Bisignano (1990), Porter (1992), Franks and Mayer (1992 and 1990), Bhide (1993), Roe (1993), Edwards and Fischer (1994), and Charkham (1994).

[2] An exception is Roe (1993).

[3] A recent manifestation of this is the Council on Competitiveness' 1992 report, *Capital Choices: Changing the Way America Invests in Industry*. See Porter (1992).

[4] Recent innovations in asset-backed commercial paper programs and other credit-enhancement techniques are, however, allowing smaller, less highly rated firms to access the commercial paper market.

[5] See Berger, Kashyap, and Scalise (1995) for evidence on these trends in bank lending.

[6] See Carey, Prowse, Rea, and Udell (1993).

[7] Large firms will also use the private equity market on occasion. See Fenn, Liang, and Prowse (1995).

[8] 1985 is chosen as the year for comparison because it reflects the situation in Japan prior to much of the corporate securities market deregulation in the second half of the 1980s.

[9] See Prowse (1995).

[10] Comparing unadjusted stock market capitalization across countries can be misleading if there is a high degree of intercorporate shareholding in one country because these shares are double-counted.

[11] See Morck, Shliefer, and Vishny (1989).

[12] Thus, Roe (1993), Allen and Gale (1996), Boot and Thakor (1996), Gorton and Schmidt (1992), and Calomiris (1993) distinguish the U.S. and German financial systems solely on the principle of universal banking, with no acknowledgement of the severe restrictions on corporate securities markets in Germany.

[13] For a detailed description of these restrictions, see Roe (1990) and Prowse (1995 and 1990).

[14] Bank holding companies are regulated by the Federal Reserve Board under the Bank Holding Company Act of 1956. In addition, they may purchase up to 24.9 percent of a nonbank firm's total capital (including subordinated debt and nonvoting stock); again, the investment must be passive. See Carey et al. (1993).

[15] The most onerous appears to be the requirement that total qualifying investments in equity and real estate should not exceed the bank's capital. A qualifying investment is one in which the bank takes a greater than 10-percent share of the enterprise. See Deutsche Bundesbank (1991).

[16] See Nomura Securities (1989).

[17] See Döser and Brodersen (1990).

[18] See OECD (1989).

[19] See, for example, Kester and Luehrman (1992).

[20] That is, banks in Japan and Germany are the very institutions that are themselves diffusely held by shareholders. Thus, there may be a problem in ensuring that banks in these countries act to maximize value and conduct the monitoring function in an efficient manner in the firms in which they have large stakes.

[21] Two examples would be during periods when the financing for takeovers becomes scarce and when, in particular industries such as commercial banking, regulatory constraints effectively preclude hostile takeovers. See Prowse (1995). Regarding the corporate control mechanism in U.S. commercial banks, see Prowse (1994).

[22] See Prowse (1995). See also Bank of Japan (1992).

[23] See, for example, De Long (1990).

References

Allen, F., and D. Gale (1996), "Universal Banking, Intertemporal Risk Smoothing, and European Financial Integration," in A. Saunders and I. Walter (eds.), *Universal Banking: Financial System Design Reconsidered* (Burr Ridge, Ill.: Irwin).

Bank of Japan (1992), "Analysis of Recent Changes in the Relationship Between Banks and Corporations Based on Financial Data of Corporation," Special Paper, no. 217, July.

Beiter, J. (1991), "The Japanese Market for Corporate Control," Salomon Center Occasional Paper, no. 10.

Benston, G. (1973), "Required Disclosure and the Stock Market: An Evaluation of the Securities Exchange Act of

1934," *American Economic Review* 63 (1): 132–55.

Berger, A. N., A. K. Kashyap, and J. M. Scalise (1995), "The Transformation of the U.S. Banking Industry: What a Long, Strange Trip It's Been," *Brookings Papers on Economic Activity* 2, 55–218.

Bhide, A. (1993), "The Hidden Costs of Stock Market Liquidity," *Journal of Financial Economics* 34 (1): 31–52.

Bisignano J. R. (1990), "Structures of Financial Intermediation, Corporate Finance, and Central Banking" unpublished manuscript.

Board of Governors of the Federal Reserve System (1991), "Flow of Funds Accounts: Financial Assets and Liabilities."

Boot, A., and A. Thakor (1996), "Banking Scope, Financial Innovation, and the Evolution of the Financial System," in A. Saunders and I. Walter (eds.), *Universal Banking: Financial System Design Reconsidered* (Burr Ridge, Ill.: Irwin).

Borio, C. E. V. (1990), "Leverage and Financing of Nonfinancial Companies: An International Perspective," BIS Economic Papers, no. 27.

Cable, J. (1985), "Capital Market Information and Industrial Performance: The Role of West German Banks," *Economic Journal* 95: 118–32.

Calomiris (1993), "Corporate Finance Benefits from Universal Banking: Germany and the United States, 1870–1914," NBER Working Paper, no. 4408.

Carey, M., S. Prowse, J. Rea, and G. F. Udell (1993), "The Economics of the Private Placement Market," Board of Governors of the Federal Reserve System Staff Study, no.166.

Charkham, J. (1994), *Keeping Good Company: A Study of Corporate Governance in Five Countries* (Oxford: Clarendon Press).

Chow, C. (1983), "The Impacts of Accounting Regulation on Bondholder and Shareholder Wealth: The Case of the Securities Acts," *Accounting Review* 58 (4): 485–520.

De Long, B. (1990), "Did J.P. Morgan's Men Add Value?" *NBER Working Paper*, no. 3461.

Demski, J. S., and G. A. Feltham (1994), "Market Response to Financial Reports," *Journal of Accounting and Economics* 17 (1–2): 3–40.

Deutsche Bundesbank (1992), "Financial Center Germany," Deutsche Bundesbank Monthly Report, March.

——— (1991), *Banking Act of the Federal Republic of Germany*, Frankfurt.

Diamond, D. W. (1991), "Monitoring and Reputation: The Choice Between Bank Loans and Directly Placed Debt," *Journal of Political Economy* 99 (4): 689–721.

Döser, W., and Christian Broderson (1990), "A Guide to the Law on Issuing Securities in Germany," International Financial Law Review Special Supplement.

Dye, R. A. (1990), "Mandatory vs. Voluntary Disclosures: The Cases of Financial and Real Externalities," *Accounting Review* 65 (1): 1–24.

———, and R. P. Magee (1991), "Discretion in Reporting Managerial Performance," *Economics Letters* 35 (1): 359–63.

Edwards, J., and K. Fischer (1994), *Banks, Finance, and Investment in Germany* (Cambridge: Cambridge University Press).

Elston, J. A. (1993), "Firm Ownership Structure and Investment: Theory and Evidence from German Panel Data," unpublished manuscript.

Fenn, G., N. Liang, and S. D. Prowse (1995), "The Economics of the Private Equity Market," Federal Reserve Board Staff Study, no. 168.

Franks, J., and C. Mayer (1993), "German Capital Markets, Corporate Control, and the Obstacles to Hostile Takeovers: Lessons from Three Case Studies," unpublished working paper, London Business School.

———, and ——— (1992), "Corporate Control: A Synthesis of the International Evidence," unpublished working paper, London Business School.

———, and ——— (1990), "Capital Markets and Corporate Control: A Study of France, Germany, and the U.K.," *Economic Policy* 11 (1): 191–31.

Gorton, G., and F. Schmidt (1992), "Universal Banking and the Performance of German firms," unpublished manuscript.

Hoshi, T., A. Kashyap, and D. Scharfstein (1993), "The Choice Between Public and Private Debt: An Analysis of Post-Deregulation Corporate Financing in Japan," unpublished manuscript.

———, ———, and ——— (1990), "Bank Monitoring and Investment: Evidence from the Changing Structure of Japanese Corporate Banking Relationships," in R. Glenn Hubbard (ed.), *Asymmetric Information, Corporate*

Finance, and Investment, (Chicago: University of Chicago Press).

Jensen, M. C. (1989), "The Eclipse of the Public Corporation," *Harvard Business Review* September–October, 61–74.

———, and W. H. Meckling (1976), "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics* 3 (2): 305–60.

Kaplan, S. (1993a), "Top Executive Rewards and Firm Performance: A Comparison of Japan and the U.S.," University of Chicago Working Paper.

——— (1993b), "Top Executives, Management Turnover, and Firm Performance in Germany," University of Chicago Working Paper.

Kester, W. Carl and T. Luerhman (1992), "Cost of Capital Comparisons Across Countries," *Harvard Business Review*.

——— (1991), *Japanese Takeovers: The Global Quest for Corporate Control*, (Boston: Harvard Business School Press).

Leftwich, R. (1980), "Market Failure Fallacies and Accounting Information," *Journal of Accounting and Economics* 2 (3): 193–211.

Leland, H., and D. Pyle (1977), "Informational Asymmetries, Financial Structure, and Financial Intermediation," *Journal of Finance* 32 (2): 371–87.

Lichtenberg, F., and G. Pushner (1992), "Ownership Structure and Corporate Performance in Japan," NBER Working Paper, no. 4092.

Morck, R., A. Shleifer, and R. Vishny (1989), "Alternative Methods for Corporate Control," *American Economic Review* 79 (4): 842–52.

Nomura Securities (1989), *Finance Handbook*, Tokyo.

OECD (1989), *Disclosure of Information by Multinational Enterprises* (Paris: Organization for Economic Cooperation and Development).

Phillips, S., and J. R. Zecher (1981), *The SEC and the Public Interest: An Economic Perspective* (Cambridge, Mass.: MIT Press).

Porter, M. (1992), *Capital Changes: Changing the Ways America Invests in Industry* (Boston: Harvard Business School Press).

Prowse, S. D. (1995), Corporate Governance in an International Perspective: A Survey of Corporate Control Mechanisms Among Large Firms in the United States, United Kingdom, Japan, and Germany *Financial Markets, Institutions, and Instruments* 4 (1).

——— (1994), "Alternative Methods of Corporate Control in Commercial Banks," *Proceedings of a Conference on Bank Structure and Competition: The Declining Role of Banking?* Federal Reserve Bank of Chicago.

——— (1993), "The Structure of Corporate Ownership in Germany," unpublished manuscript.

——— (1992), "The Structure of Corporate Ownership in Japan," *Journal of Finance* 47 (3): 1,121–1,140.

——— (1990), "Institutional Investment Patterns and Corporate Financial Behavior in the United States and Japan," *Journal of Financial Economics* 27 (1): 43–66.

Roe, M. J. (1993), "Some Differences in Corporate Structure in Germany, Japan, and America," *Yale Law Journal* 102 (8): 1927–2003.

——— (1990), "Political and Legal Restraints on Ownership and Control of Public Companies," *Journal of Finance Economics* 2 (1): 7–43.

Rosenbluth, F. (1988), *Financial Politics in Contemporary Japan* (Ithaca: Cornell University Press).

Ross, S. (1977), "The Determination of Financial Structure: The Incentive-Signaling Approach," *Bell Journal of Economics* 8 (1): 23–40.

Sahlman, W., (1990), "The Structure and Governance of Venture Capital Organizations," *Journal of Financial Economics* 27 (1): 473–521.

Sylla, R., and G. D. Smith (1995), "Information and Capital Market Regulation in Anglo-American Finance," in Michael Bordo and Richard Sylla (eds.) *Anglo–American Financial Systems* (Burr Ridge, Ill.: Irwin).

Takeda, M., and P. Turner (1992), "The Liberalization of Japan's Financial Markets: Some Major Themes," *BIS Economic Papers*, no. 34.

Watts, R., and J. Zimmerman (1986), *Positive Accounting Theory* (Englewood Cliffs, N.J.: Prentice Hall).

Capacity Utilization As a Real-Time Predictor of Manufacturing Output

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The use of real-time data is critical, for the Federal Reserve indices of capacity and utilization are subject to extensive revisions, which may extend back several years.

The notion that aggregate output has both a permanent component and a transitory component is consistent with a wide range of business cycle theories. Insofar as the permanent component of output is observable in real time, the gap between current and permanent output will contain information useful in predicting future changes in output.

The empirical literature contains several efforts to predict output in this way. In a bivariate setting, Cochrane (1994) has shown that the permanent component of U.S. real gross domestic product (GDP) can be closely approximated by mean-adjusted real household consumption of nondurable goods and services and that the gap between current real output and mean-adjusted consumption has significant marginal explanatory power for future output growth. A procedure for approximating the permanent component of output using only current and lagged output observations is suggested by DeLong and Summers (1988, 459). In a limiting case, the DeLong and Summers formula reduces to using the historical maximum of output as a measure of permanent output. The implicit underlying assumption is that any decline in output is likely to be transitory. Beaudry and Koop (1993) report success including the difference between output and its historical maximum in forecasting equations for U.S. real GDP. Wynne and Balke (1992, 1993) use essentially the same approach to establish a tendency for deep recessions to be followed by strong recoveries.

In this article, I examine whether manufacturing capacity, as estimated by the Federal Reserve Board, is a useful measure of the permanent component of manufacturing output. Specifically, I consider whether manufacturing capacity utilization has marginal explanatory power for subsequent growth in manufacturing output. Except for a brief, illustrative aside, I use only real-time utilization data. The use of real-time data is critical. The Federal Reserve indices of capacity and utilization are subject to extensive revisions, which may extend back several years. Moreover, revision procedures are designed, quite consciously, to smooth capacity and to ensure that utilization is a stationary series. The effect is to incorporate information about future output in the revised capacity data. Real-time data, obviously, cannot incorporate information unavailable to analysts at the time.

The empirical results indicate that the Federal Reserve's initial capacity utilization releases do, indeed, contain useful information

about future manufacturing output growth. Significant marginal explanatory power remains even after controlling for real-time estimates of lagged output growth, a measure of labor force utilization, and lagged changes in the Commerce Department's composite leading index. On the other hand, although the Federal Reserve's utilization measure appears to contain more useful information than does the Beaudry–Koop measure, the difference in information content is not statistically significant. These results hold regardless of whether one is trying to predict the Federal Reserve Board's initial estimate of output growth or a revised estimate. Using data available through the fourth quarter of 1995, the forecasting model developed in this article is predicting essentially no change in the level of manufacturing output during 1996.

The Federal Reserve indices of capacity and utilization[1]

For a given industry, the Federal Reserve Board obtains a series of reference end-of-year capacity estimates by dividing its output index for that industry by utilization rates taken from a biennial Census Bureau survey of manufacturing plants.[2] These reference estimates establish the long-term trend growth rate of the Board's published capacity index. Detrended year-to-year variations in the published capacity index for a given industry are determined by movements in the estimated capital stock for that industry or, less frequently, by movements in direct physical-unit capacity measures. Estimated capital stocks are calculated from Bureau of Economic Analysis surveys of capital spending plans using the perpetual inventory method. The capital stock estimates are subject to substantial revision every fifth year, when Census investment data become available. Capacity series are aggregated across industries, using the same value-added weights employed in the construction of the Board's aggregate output indices.

Monthly estimates of capacity are obtained by interpolating between end-of-year figures. It follows that within-year variation in capacity utilization largely reflects month-to-month movements in output (Shapiro 1989). Accordingly, this article uses only output, capacity, and utilization data reported for the fourth quarter of each year.

Although capacity and utilization data extend back to 1948, regular publication did not begin until 1968.[3] Hence, the analysis that follows is limited to a sample period that starts in 1968.

Predicting initial estimates of output growth

In this section, I look at whether the Federal Reserve's initial estimates of capacity utilization have real-time predictive power for its initial estimates of manufacturing output growth. To shed light on this question, I undertake a series of regressions of the form

$$(1) \qquad \Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \alpha_2 u_{t-1} + \alpha_3 z_{t-1},$$

over a sample period running from 1968 through 1994. Here, Δy_t denotes the change in the logarithm of manufacturing output from the fourth quarter of year $t-1$ to the fourth quarter of year t, as published in the *Federal Reserve Bulletin* early in year $t+1$, when data for the fourth quarter of year t first become available; Δy_{t-1} denotes the change in the logarithm of output from the fourth quarter of year $t-2$ to the fourth quarter of year $t-1$, as published early in year t; u_{t-1} denotes the logarithm of capacity utilization in the fourth quarter of year $t-1$, as published early in year t; and z_{t-1} is any one of several lagged explanatory variables.[4] Lagged (real-time) capacity growth and additional lags of (real-time) output growth are not statistically significant when included on the right-hand-side of the estimated equation.

Column 1 of Table 1 presents results for the case in which $\alpha_3 \equiv 0$. The coefficient on the Federal Reserve's measure of capacity utilization is statistically significant at better than the 1-percent level. Its point estimate indicates that each 1-percent increase in utilization implies a nearly 57 basis-point decrease in output growth over the coming year.

In columns 2 and 3, z is the Beaudry–Koop measure of utilization that would have been observed in real time. That is, z_t is the real-time difference between the current log level of output and the logarithm of the historical maximum level of output. Introduced separately, as in column 2, the impact of the Beaudry–Koop measure on subsequent output growth is highly statistically significant. Each 1-percentage-point increase in output, relative to its historical maximum, is associated with a 1.1-percentage-point reduction in output growth over the coming year. In going from column 2 to column 3, the impact of the Beaudry–Koop measure drops sharply in magnitude and is no longer statistically significant. The Federal Reserve measure is also insignificant, but the magnitude of its coefficient is affected less and its t statistic is larger than that of the Beaudry–Koop measure. The adjusted R^2s and standard errors reported at the bottom of columns 1 and 2

Table 1
Predicting the Initial Estimate of Manufacturing Output Growth

Estimated equation: $\Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \alpha_2 u_{t-1} + \alpha_3 z_{t-1}$
Fourth-quarter data: 1967–94

	z						
	None	Beaudry–Koop		Avg. weekly hours		Leading index growth	
α_0	2.499***	–.0128	1.854	.397	1.975**	.0231***	1.650**
	(.771)	(.0161)	(1.432)	(.896)	(.875)	(.0082)	(.636)
α_1	.523**	.680**	.606**	.181	.428*	.046	.326*
	(.213)	(.262)	(.265)	(.256)	(.224)	(.148)	(.172)
α_2	–.568***	—	–.422	—	–.686***	—	–.373**
	(.177)		(.324)		(.200)		(.146)
α_3	—	–1.102***	–.365	–.0093	.0258	2.427***	2.012***
		(.381)	(.679)	(.0222)	(.0211)	(.518)	(.495)
Adj. R^2	.253	.207	.230	–.061	.268	.441	.546
SE	.0445	.0458	.0452	.0530	.0441	.0385	.0347
Q(6)	2.718	2.379	2.063	10.138	3.715	6.162	4.337

* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

confirm that the Federal Reserve utilization measure has greater marginal predictive power than does the Beaudry–Koop measure.

In columns 4 and 5, z is defined as average weekly hours of manufacturing production workers—a measure of labor force utilization.[5] The estimated coefficient of this variable is not statistically significant even in a regression with $\alpha_1 \equiv 0$. With α_1 unconstrained, the Federal Reserve capacity utilization measure is both statistically and economically significant, while the labor force utilization measure is not.

Finally, columns 6 and 7 report results for the case in which z_{t-1} is defined as the change in the logarithm of the Commerce Department's composite index of leading economic indicators, where this change is measured from September to December of year $t - 1$.[6] The change in the composite leading index (CLI) clearly has substantial marginal predictive power for future output growth.[7] However, including CLI growth in the forecasting equation does not eliminate the influence of capacity utilization as measured by the Federal Reserve Board.

Figure 1 shows fourth-quarter-over-fourth-quarter growth in manufacturing output, as initially reported by the Federal Reserve Board, along with predictions obtained from the forecasting equation of Table 1, column 7. With isolated exceptions, the forecasting equation appears to do a good job of capturing the qualitative pattern of output growth. Thus, in six of the seven years in which output was reported to have fallen, the model would have predicted either an output decline or zero growth (more precisely, growth of less than 0.5 percent). Only in 1981 would the model have stumbled badly, predicting 3.1 percent positive growth when output subsequently actually fell by 2.5 percent. Similarly, the model would have been qualitatively correct in nineteen of twenty years in which output was reported to have

Figure 1
Real-Time Growth in Manufacturing Output

Percent, fourth quarter-over-fourth quarter

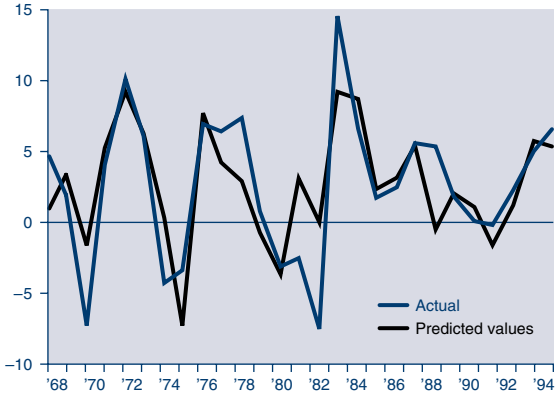


Table 2
Predicting the Final Estimate of Manufacturing Output Growth

Estimated equation: $\Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \alpha_2 u_{t-1} + \alpha_3 z_{t-1}$
Fourth-quarter data: 1967–94

	z						
	None	Beaudry–Koop		Avg. weekly hours		Leading index growth	
α_0	2.527***	–.0059	2.195	.533	2.082**	.0285***	1.650**
	(.757)	(.0161)	(1.413)	(.884)	(.866)	(.0079)	(.600)
α_1	.430*	.560**	.473*	.106	.349	–.052	.227
	(.209)	(.263)	(.261)	(.252)	(.222)	(.142)	(.163)
α_2	–.573***	—	–.498	—	–.673***	—	–.372**
	(.174)		(.320)		(.198)		(.138)
α_3	—	–1.056**	–.187	–.0125	.0219	2.490***	2.076***
		(.382)	(.670)	(.0220)	(.0209)	(.496)	(.467)
Adj. R^2	.255	.179	.225	–.068	.258	.472	.582
SE	.0437	.0459	.0446	.0524	.0436	.0368	.0328
Q(6)	1.157	5.963	5.038	11.839*	5.828	5.643	5.187

* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

increased. The glaring exception is 1988, when the model would have predicted a 0.5-percent output decline, and actual output growth was +5.4 percent.

Predicting final estimates of output growth

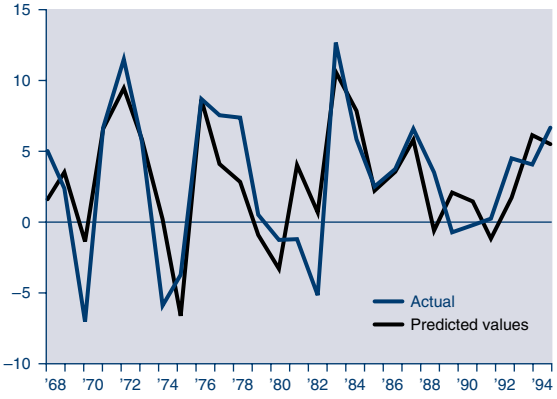
In Table 1, the dependent variable is manufacturing output growth as first reported by the Federal Reserve. Table 2 presents corresponding empirical results for the case in which the dependent variable is output growth as recorded in final revised data. Presumably, the final revised output data more accurately reflect actual economic developments. For most purposes, it is these data that are probably most relevant to policymakers.[8] On the right-hand side of the forecasting equation, I use exactly the same variables as before. In particular, on the right-hand side I continue to use only output and utilization data that would have been available to a forecaster in real time.

Both qualitatively and quantitatively, the results displayed in Table 2 are very similar to those reported in Table 1. The Federal Reserve's utilization series continues to have significant marginal predictive power in the presence of lagged output growth, in the presence of lagged labor force utilization, and in the presence of lagged growth in the Commerce Department's composite leading index. Neither lagged labor force utilization nor the Beaudry–Koop utilization measure has marginal predictive power in the presence of the Federal Reserve utilization index. While a head-to-head contest between the Federal Reserve and Beaudry–Koop utilization measures is inconclusive, results tend to favor the Federal Reserve measure. This tendency is even clearer in Table 2 than in Table 1.

Figure 2 is the revised-data counterpart of Figure 1. It shows how successfully one can predict final revised output growth using lagged CLI growth and initial estimates of lagged output

Figure 2
Revised Growth in Manufacturing Output

Percent, fourth quarter-over-fourth quarter



growth and capacity utilization. While the model's overall ability to predict final revised output growth—as measured by the model's adjusted R^2 or its standard error—is better than its ability to forecast the initial estimate of output growth, a comparison of Figures 1 and 2 suggests that the model does a somewhat poorer job of catching changes in the sign pattern of revised growth than it does catching the sign pattern of real-time output growth. Thus, in the revised data, eight years show declines in output. In only four of these eight years is growth predicted to be negative or zero (growth of less than 0.5 percent). In nineteen years, the final revised data show an expanding manufacturing sector. But in three of these nineteen years, the model predicts an output decline.

How important is it to use real-time data?

Analysts typically forecast in real time using equations estimated with revised data. There are two dangers associated with this practice. First, because revised right-hand-side data are used in estimation but not in forecasting, there is a danger that the in-sample predictive performance of the forecasting equation will significantly overstate the equation's actual performance in real time. Second, there is a danger that the actual forecasting performance of the equation will fall significantly short of the performance that would have been obtained had the equation been estimated correctly, using real-time data for the right-hand-side variables. This section argues that both of these dangers are serious when forecasting growth in manufacturing output using data on manufacturing capacity utilization.

Consider a regression of manufacturing output growth on lagged output growth, lagged capacity utilization, and the lagged change in the composite leading indicators, where all data are now revised:[9]

$$(2)\quad \Delta y_t = \underset{(.665)}{1.985} + \underset{(.156)}{.249}\Delta y_{t-1} - \underset{(.152)}{.447}u_{t-1} + \underset{(.478)}{1.930}z_{t-1}.$$

$$\text{Adj. } R^2 = .598 \qquad \text{SE} = .0321$$

Coefficient estimates are broadly similar to those obtained when real-time data are used as right-hand-side variables. (Compare the estimates above with those reported in the last column of Table 1 and the last column of Table 2.) Here, however, substantially greater weight is placed on lagged utilization, and somewhat smaller weight is placed on the lagged change in the leading index. The coefficient of lagged output growth is smaller than that reported in Table 1 but greater than that reported in Table 2.

Are these differences in coefficient estimates of practical importance? Consider, first, an effort to forecast output growth as initially reported by the Federal Reserve. For this purpose, one would, ideally, substitute real-time data into the equation estimated in the last column of Table 1. Label the resultant forecasts "model 1." The more usual approach is to substitute real-time observations into the right-hand side of an equation like 2, above, which has been estimated using revised data. Call this approach "model 2." Not surprisingly, the standard error of model 2 forecasts is larger than the standard error of model 1 forecasts. For example, model 2's standard error is 0.0373 over the sample period, as compared with a standard error of 0.0347 for model 1. A formal encompassing test (see the box titled "Forecast Encompassing") indicates that this difference in forecast performance is statistically significant at the 10-percent level. In other words, the payoff to estimating the forecasting equation using real-time data is nontrivial.

Now consider an effort to forecast the Federal Reserve's final *revised* estimates of manufacturing output growth. In this case, there are a total of three modeling exercises to consider. First, a naive analyst might expect to be able to reproduce the performance of equation 2 itself. Call this purely hypothetical forecasting approach "model A." Second, the analyst could regress revised output growth on real-time observations of the right-hand-side variables, as in Table 2. Label the resultant forecasts "model B." More usually, the analyst would obtain forecasts by substituting real-time data into the right-hand side of equation 2. Call this approach "model C." Generally, one would expect model A to (appear to) outperform model B.[10] Invariably, the forecasts of model B will outperform those of model C. In the present instance, model A's standard error is 0.0321 (see equation 2, above), as compared with 0.0328 for model B (see Table 2, column 7) and 0.0339 for model C. Formal encompassing tests indicate that the difference in forecasting performance between model A and model C is statistically significant at the 10-percent level—meaning that the analyst who estimates the forecasting equation using revised data obtains a view of that equation's forecasting performance that is significantly too optimistic. However, neither the difference in performance between model A and model B nor the difference in performance between model B and model C is statistically significant.

Forecast Encompassing

The intuition underlying the Chong and Hendry (1986) forecast encompassing test is simple. Let Δy denote the variable being forecasted, and let Δy_1^f and Δy_2^f denote forecasts generated by two competing models. Consider the regression equation

$$\Delta y = \alpha \Delta y_1^f + (1 - \alpha)\Delta y_2^f + \epsilon,$$

where ϵ is a random-error term. If $\alpha \neq 0$, then Δy_1^f contains useful information for forecasting Δy that is not contained in Δy_2^f, and model 1 is said to "encompass" model 2. If $\alpha \neq 1$, then Δy_2^f contains useful information for forecasting Δy that is not contained in Δy_1^f, and model 2 encompasses model 1. If model 1 encompasses model 2, but model 2 fails to encompass model 1 (that is, if $\alpha = 1$), then model 1 is clearly superior for forecasting purposes. If model 1 is encompassed but is not encompassing (that is, if $\alpha = 0$), then it is model 2 that has clear superiority.

Two applications are considered in the main text. In the first application, Δy is defined as growth in manufacturing output as initially reported by the Federal Reserve. Model 1 is defined as the regression equation displayed in the last column of Table 1, which is estimated using real-time data. Model 2 is defined to be equation 2, estimated using revised data. For both models, real-time data are used on the right-hand side for forecasting purposes. The estimated value of α is 1.000, with standard error 0.496 and marginal significance level 0.054. It follows that model 1's performance is superior to that of model 2 at better than the 10-percent-significance level. That is, the forecasts generated by the equation estimated with real-time data are significantly superior to the forecasts generated by the equation estimated using revised data.

In the second application, Δy is defined as growth in manufacturing output as it appeared in August 1995, after numerous revisions. Three alternative forecasting models are considered. Model A is defined to be equation 2 under the unrealistic assumption that revised right-hand-side data are available for forecasting. Model B is the equation displayed in the last column of Table 2, estimated using real-time data and with real-time data substituted into the equation's right-hand side for forecasting purposes. Model C is equation 2 with real-time data substituted into the equation's right-hand side for forecasting purposes.

In a comparison of models A and C, the estimated value of α is 0.722, with standard error 0.380 and marginal significance level 0.068. It follows that model A's forecasting performance is superior to that of model C at better than the 10-percent-significance level. The proper interpretation of this result is that models estimated using revised data give a strongly misleading impression of how accurately one can forecast output growth. In a comparison of models B and C, the estimated value of α is 1.000, with standard error 0.725, and in a comparison of models A and B, the estimated value of α is 0.627, with standard error 0.490. In neither case does one model clearly dominate the other.

(For details, see the box titled "Forecast Encompassing.")

Thus, it would appear that in predicting growth in manufacturing output, there is a very real danger that forecasting equations estimated with revised utilization data will either (1) perform significantly worse than summary statistics from the regression would suggest or (2) perform significantly worse than would a forecasting equation estimated with real-time utilization data.

Forecasts for 1995 and 1996

The estimates reported in Tables 1 and 2 and the predictions displayed in Figures 1 and 2 extend only through 1994. How well did this simple forecasting model predict 1995 output growth? What is it predicting for 1996?

The answer to the first question is "very well, indeed." The initial Federal Reserve Board estimates of 1994 manufacturing output growth and 1994:4 manufacturing capacity utilization were 6.6 percent and 84.4 percent, respectively. CLI growth during the final three months of 1994, as reported early in March 1995, was 0.2 percent (not annualized). Combining these numbers with the coefficient estimates reported in Table 1, column 7, one obtains predicted output growth of 2.0 percent between the fourth quarter of 1994 and the fourth quarter of 1995—only 0.5 percentage point above the Federal Reserve Board's initial estimate of actual growth.

As of January 1996, the Federal Reserve Board estimated 1995 output growth and 1995:4 capacity utilization to be 1.5 percent and 82.0 percent, respectively. As of early March 1996, the CLI was reported to have fallen 0.4 percent in the final three months of 1995. According to the coefficient estimates recorded in Table 1, column 7, it follows that manufacturing output will likely expand by only 0.2 percentage points between the fourth quarter of 1995 and the fourth quarter of 1996—essentially no growth at all. Recall, however, that in 1974 a similar

forecast was followed by a 4.3-percent output decline, while in 1988 a similar forecast was followed by a 5.4-percent output increase![11] More generally, the standard error associated with the output-growth forecasts of the model is large enough (roughly 3.5 percentage points) to cover a fairly wide range of outcomes.

Concluding remarks

This article tests whether the Federal Reserve Board's initial capacity utilization releases contain information useful in forecasting future growth in manufacturing output. Results suggest that initial utilization releases do indeed have significant predictive power for both initial and final estimates of output growth. Significant predictive power is evident even after controlling for the initial estimate of lagged output growth, lagged labor force utilization, and lagged growth in the Commerce Department's composite leading index. However, although the Federal Reserve's utilization measure appears to contain more useful information than does a utilization measure proposed by Beaudry and Koop, the difference in information content between the two measures is not statistically significant.

Together, the leading index, real-time lagged output growth, and real-time capacity utilization explain more than half the variation in the initial and final estimates of fourth quarter-over-fourth quarter manufacturing output growth. With a few important exceptions, the forecasting equations have also performed well in predicting the qualitative pattern of the initial output growth estimates. Data available early in the year suggest that the level of manufacturing output is likely to be essentially flat over 1996. However, the standard error attached to this forecast is such that one cannot rule out either a moderate expansion or a moderate contraction of manufacturing activity.

Notes

Shenghi Guo, Chih-Ping Chang, and Sheila Dolmas provided research assistance. An earlier version of this paper was presented at the annual meeting of the Southern Economic Association. Nathan Balke, Sarah Culver, Ken Emery, Richard Raddock, and Mark Wynne offered helpful suggestions.

1 The following discussion draws upon Raddock (1985, 1990).

2 The Census Bureau began its survey in 1974. Prior to then, the Federal Reserve Board relied on end-of-year utilization surveys conducted by McGraw-Hill/DRI and the Bureau of Economic Analysis. These surveys were discontinued in 1988 and 1983, respectively. The Board adjusts the level of the Census Bureau utilization rates to minimize any historical discontinuities between them and the McGraw-Hill/DRI rates.

3 Moreover, pre-1967 data are not fully consistent with data for subsequent years. In particular, both physical-unit capacity data and Bureau of Economic Analysis investment estimates receive substantially greater weight in the post-1966 calculations of capacity and utilization than in pre-1967 calculations (Shapiro 1989, 193–4; Raddock 1990).

4 Initial estimates of fourth-quarter manufacturing output and fourth-quarter capacity utilization are typically released in mid-January of the following year and appear in the March issue of the *Federal Reserve Bulletin.*

5 An alternative measure of labor force utilization—average weekly overtime hours in manufacturing—failed stationarity tests.

6 I use final revised leading index data in the regressions, rather than real-time data. Historically, the Commerce Department's leading index has been subject to two kinds of revisions. First, there are routine revisions to the CLI's component data series. Second, there are occasional changes in the structure of the CLI. Arguably, the first type of revision should not be a source of concern in the present context. The largest routine data revisions typically occur within the first few months following the CLI's initial release. In particular, the bulk of the routine revisions to fourth-quarter CLI growth are completed by the end of the first quarter of the following year. A two or three month delay in the availability of reliable CLI data might be significant if I were forecasting quarterly output growth, but here I am concerned only with output growth over four-quarter spans. As regards structural revisions, while the historical record of the CLI's current formulation may *over*state the CLI's future forecasting performance, the historical record of older formulations of the CLI would almost certainly *under*state the current CLI's future performance. I have chosen the alternative most likely to bias my results against finding a significant role for capacity utilization in the output forecasting equation.

7 Additional lagged changes in the composite leading index were not significant.

8 However, the Federal Reserve's initial published estimates of output growth may have an important influence on the investment and pricing decisions made by households and firms. Consequently, predicting the initial estimate of output growth is an exercise not without interest.

9 The data are for the fourth quarter of each year from 1968 through 1994, as published in August 1995.

10 That is, one would expect it to be easier to predict revised output growth using revised right-hand-side variables than using real-time right-hand-side variables.

11 Both of these estimates were later revised downward—to a 5.9-percent decline and a 3.5-percent increase, respectively.

References

Beaudry, Paul, and Gary Koop (1993), "Do Recessions Permanently Change Output?" *Journal of Monetary Economics* 31 (April): 149–63.

Chong, Yock Y., and David F. Hendry (1986), "Econometric Evaluation of Linear Macro-Economic Models," *Review of Economic Studies* 53 (August): 671–90.

Cochrane, John H. (1994), "Permanent and Transitory Components of GNP and Stock Prices," *Quarterly Journal of Economics* 109 (February): 241–65.

De Long, J. Bradford, and Lawrence H. Summers (1988), "How Does Macroeconomic Policy Affect Output?" *Brookings Papers on Economic Activity,* no. 2: 433–80.

Raddock, Richard D. (1990), "Recent Developments in Industrial Capacity and Utilization," *Federal Reserve Bulletin* 76 (June): 411–35.

——— (1985), "Revised Federal Reserve Rates of Capacity Utilization," *Federal Reserve Bulletin* 71 (October): 754–66.

Shapiro, Matthew D. (1989), "Assessing the Federal Reserve's Measures of Capacity and Utilization," *Brookings Papers on Economic Activity*, no. 1: 181–225.

Wynne, Mark A., and Nathan S. Balke (1993), "Recessions and Recoveries," Federal Reserve Bank of Dallas *Economic Review*, First Quarter, 1–17.

——— (1992), "Are Deep Recessions Followed by Strong Recoveries?" *Economics Letters* 39 (June): 183–89.

Externalities, Markets, and Government Policy

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While public production or Pigovian taxes might correct for market failures, theory cannot solve the problem without a detailed analysis of the institutional structure of the problem at hand.

In 1991, Ronald H. Coase received the Nobel prize for his work on the role of transaction costs in economics. His paper on "The Nature of the Firm" (Coase 1937) introduced transaction costs as the primary reason for the existence of firms. Coase pointed out that firms substitute an internal management structure for market transactions to eliminate the costs of negotiating, writing, and enforcing contracts. More than two decades later, his classic paper, "On the Problem of Social Costs," (Coase 1960) revolutionized the way in which economists perceived market and nonmarket solutions to the problem of externalities. In this paper, Coase argued that the problem of externalities cannot be examined without looking at the institutional setting of the problem and the size of transaction costs. According to the Nobel committee, the latter paper is the most cited paper in economics in the years since its publication. His work has stimulated research in the areas of law and economics, antitrust economics, regulation, public choice, and the role of government in economic society. The purpose of this article is to offer an explanation of Coase's contribution to the analysis of the role of government.

Externalities

Until the work of Coase (1960), economists had a highly simplified view of the role of markets. From Adam Smith, they believed that the basic role of government is to establish the rules of the game (defend property rights); from A. C. Pigou (1932), they learned that it is worthwhile for the government to subsidize or tax private activities whenever the market produces too little of a good thing (such as education) or too much of a bad thing (such as pollution). Such externalities (unpriced benefits or costs) constituted the main exception to the rule that Adam Smith's invisible hand will efficiently allocate resources. Coase basically showed that externalities may or may not require a governmental solution; the need for a government solution depends on the circumstances of each case. In shifting the terms of the debate, Coase single-handedly moved economics from presuming specific roles for government action to a more neutral position requiring detailed analysis.

Let us reconsider a simple situation examined by Pigou and Coase: one agent's profit-maximizing decisions affect the profits of another party through a technological external diseconomy. For concreteness, imagine a railroad engine is the source of fire-starting sparks to a farmer's crops. Pigou had argued that the rail-

road should be held liable for the damage done to the farmer's crops because, otherwise, too many resources would be allocated to the railroad. Pigou suggested that efficiency could be brought about by imposing a tax on the railroad.

Coase began his analysis with a simple point: if the railroad is made liable to the farmer, in a world of zero transaction costs, the railroad and farmer would reach an agreement themselves. Moreover, even if the railroad were not liable, an agreement would be reached with substantially the same allocation of resources. As an example, suppose a railroad could make $100 running one train per day and $150 running two trains per day. The farmer can make $150 planting one field or $160 planting two fields. If the fields are planted next to the tracks, the railroad destroys $60 worth of crops per train per field. It is assumed that there is no problem of assessing damages.[1]

Tables 1, 2, and 3 describe three situations. Each row describes the consequences of the railroad running no trains, one train, or two trains per day. Each column shows the consequences of the farmer's planting no fields, one field, or two fields. The lower-left-hand corner of each cell shows the profits to the railroad; the upper-right-hand corner of each cell shows the profits to the farmer; if positive, the lower-right-hand corner shows payments to third parties (Table 3 only). In Table 1, the railroad must directly compensate the farmer for damages to his crops. In Table 2, the railroad has the right to start fires on the farmer's fields. Table 3 shows an ideal Pigovian tax: the railroad is taxed by the amount of the damage and a third party receives the lump-sum amount of the tax revenues.

In any table, the total benefit to society is the sum of the payoffs shown (ignoring consumer surplus). In all three tables, the maximum attainable total benefit is $190 and is reached when one train is run and one field is planted.

In Table 1, the railroad is liable for damages inflicted and must pay $60 per train per field to the farmer. When one train is run and one field is planted, the railroad receives a payoff of $40 (= $100 – $60) and the farmer receives a total payoff of $150 (the same as if there were no railroad). While this is the social optimum, if the railroad is running one train per day, the farmer has an incentive to plant two fields because, with the payment of damages, the farmer can make $160, more than can be made by planting only one field. This would lower the railroad's profit to –$20. Clearly, in a world of zero transaction costs, it would pay the railroad to make an agreement with the farmer not to plant the second field. The railroad could offer the farmer, say, $11 not to plant the field, increasing the railroad's net profit to $29 and increasing the farmer's payoff to $161 (for a total of $190 still).[2]

Coase then considered the alternative or reciprocal situation in which the railroad has the right to destroy whatever crops are planted near the tracks. In Table 2, if the farmer again plants one field and the railroad runs one train, the railroad earns $100 while the farmer earns only

Table 1
Railroad Directly Compensates Farmer

Railroad (Trains per day)	Farmer: fields planted 0	1	2
0	0 / 0	150 / 0	160 / 0
1	0 / 100	150 / 40	160 / –20
2	0 / 150	150 / 30	160 / –90

Railroad liable

Table 2
Railroad May Start Fire in Farmer's Field

Railroad (Trains per day)	0	1	2
0	0 / 0	150 / 0	160 / 0
1	0 / 100	90 / 100	40 / 100
2	0 / 150	30 / 150	–80 / 150

Railroad has rights

Table 3
Railroad Pays Tax to Government

Railroad (Trains per day)	0	1	2
0	0 / 0 / 0	150 / 0 / 0	160 / 0 / 0
1	0 / 100 / 0	90 / 40 / 60	40 / –20 / 120
2	0 / 150 / 0	30 / 30 / 120	–80 / –90 / 240

Pigovian tax on railroad paid to third party

$90 (= $150 – $60). However, now the railroad has an incentive to run another train, increasing its profits to $150 and lowering the farmer's profits to $30. But, again, in a world of zero transaction costs, it would now pay the farmer to offer, say, $51 to the railroad to not run the second train, raising the railroad's payoff to $151 and raising the farmer's from $30 to $39. This is again the social optimum, where the total gain to society is still $190.

In comparing Tables 1 and 2, when there is full and costless cooperation between the two parties, the resulting allocation of resources is the same: one field is planted and one train per day is run. The only difference is the distribution of the spoils. This is the celebrated Coase theorem: in a world of zero transaction costs, the allocation of resources does not depend on who has the property rights but rather on the existence of well-defined rights.

Why was this analysis so innovative in its impact on economics? To understand the Coasian contribution, it is useful to go back to the original Pigovian analysis of externalities. In Table 3, the railroad pays a tax to the government equal to the damages imposed on the farmer. The tax revenue is then redistributed to a third party, shown in the lower-right-hand corner of each cell. If the tax revenue is paid to the farmer, we are again back to Table 1, and it is necessary for the railroad to bribe the farmer into planting only one field.[3] If the tax is paid to a third party, a profit-maximizing railroad will run one train per day if the farmer plants one field; a profit-maximizing farmer will plant one field if the railroad runs one train per day. The total benefit to society is again $190 (= $40 + $90 + $60). The optimum appears to be achieved without any necessity of negotiation between the parties. It is an equilibrium because if the farmer is planting one field, the railroad maximizes its income with one train per day; and if the railroad is running one train per day, the farmer maximizes his income with one field.

The problem with the Pigovian analysis is threefold.[4] The first is that the optimum solution need not be the only equilibrium. In this example, there are two equilibria. Imagine the railroad just happens to come along after the farmer has planted two fields (the optimum with no railroad). Then if there is a Pigovian tax, the railroad would not find it optimal to run any trains. This, too, is an equilibrium because there is no incentive for either the railroad or the farmer to deviate from zero trains and two fields.[5] But this solution is not Pareto-optimal. The total social surplus is only 160 instead of 190 as in the previous equilibrium. If we take the reverse, where the farmer comes along after the railroad is established, the railroad initially would run two trains per day and the farmer would have the incentive to plant one field, causing the railroad to run only one train per day. In other words, historical accident can determine the equilibrium and whether or not the solution is optimal in the case of a Pigovian tax scheme.

The second problem is that if the farmer receives the payments to the government (the $60) and is aware of the link between his actions and government payments, he again will have an incentive to plant two fields. Therefore, there is still no solution to the externalities problem. To solve the externalities problem by a Pigovian tax requires that the tax receipts be paid to a third party who will not alter his or her behavior as a consequence of the payment. But as our first point illustrates, this is a necessary but not a sufficient condition due to the possibility of multiple equilibria.

The Pigovian solution seems rather strange because who in society would push for a tax on the railroad other than the farmer who is having to suffer the damages created by the sparks? Why pay the tax revenue to a third party? But if the tax revenue is paid to the farmer, we again have the original problem of having to make an agreement between the railroad and the farmer to reach the optimal solution. Thus, the Pigovian "solution" is no solution at all.

A third problem with the Pigovian solution can be seen if we broaden the example. Suppose that we are discussing the damages imposed by smokers on nonsmokers. There are many smokers and many nonsmokers. It is clear that in the real world, smokers and nonsmokers cannot negotiate to reach the optimum because the transaction costs are prohibitive. It seems to make sense, therefore, for the government to step in and, say, impose a Pigovian tax on smokers. But this has one problem: who is going to get the revenue from the tax? Tullock (1967), in a path-breaking article, pointed out that people in a democratic society will compete for tax revenues. This competition for revenues can dissipate all or part of the gains because lobbying has opportunity costs (hiring lawyers, public relations experts, word processors, and so forth). Thus, in Table 3, if the $60 revenue is dissipated by such actions, the total gain to society from a Pigovian tax would be only $130 if the farmer planted one field and the railroad ran only one train per day.

A precursor of Coase was the great institutional economist and legal scholar, John R. Com-

mons. According to Commons (1923, 326), judges have often ruled that "taxes may not be used for private purposes." But Commons pointed out that taxes are always used for some type of private purpose. The question is whether that private purpose is tinged with enough public interest to make the taxes worthwhile. For example, property taxes in many localities are used to support "public education." Teachers' unions consistently lobby to increase their share of the public purse, and the educational bureaucracies expand at the cost of sacrificing the very goal of teaching students. This example can be multiplied many times. Taxes imposed on the working population are used to support large segments of the nonworking population. Government employees become a central clientele to the political party that hires them.

Coase's basic insight is really that we cannot separate the analysis of externalities from the real-world situation we are describing. What we have just said simply shows that there is no a priori role for government policy in controlling externalities. It does not say that there is no role. But instead of concocting abstract theories about externalities and what to do about them, the Coasian research agenda requires the economist to actually study the detailed setting in which the alleged externality is taking place. We must examine the institutions, the property rights, and the costs of contracting in each and every instance. As Coase (1993, 97) once put it, "What I object to is mindless abstraction or the kind of abstraction which does not help us to understand the working of the economic system."

Positive transaction costs and property rights

A transaction cost is a cost of using a market. "There are negotiations to be undertaken, contracts have to be drawn up, inspections have to be made, arrangements have to be made to settle disputes" (Coase 1992, 715). It is important to distinguish between what has been called the Coase theorem and what I will call the Coasian hypothesis. This is the hypothesis that the legal system under a system of positive transaction costs "will have a profound effect on the working of the economic system and may in certain respects be said to control it" (Coase 1992, 718).

To illustrate this at the simplest level, in the parable of the railroad and the adjacent farmer, suppose it costs the railroad $10 or the farmer $20 for each planted field to build a protective firewall. This is a transaction cost because, from the point of view of the railroad, it is a cost of preventing damages. When a lawyer is hired to write a contract, it is done to protect the firm in a legal dispute. Whether the railroad is liable or not, a firewall will be built by profit-minded agents. But now we get a different allocation of resources. If railroad is liable, it will run two trains a day and the farmer will plant two fields. But if the farmer must build the firewall, the farmer will only plant one field because of the exorbitant cost of protecting two fields and diminishing returns. The major implication, then, of the existence of transaction costs is that changing the rules of liability has an impact on resource allocation.

The Coasian hypothesis suggests that it makes a real difference what the law stipulates about what is legal and not legal. If the law imposes the rule that companies are responsible for whatever illnesses are caused by their products and the standard of proof is relatively ambiguous, there will be a strong tendency for the product to disappear from the marketplace. Indeed, there are many examples of products that have disappeared in the United States that can be obtained elsewhere.[6]

Whether or not the change in the allocation of resources is beneficial requires a detailed study of costs and benefits. For example, a recent study by Richard Manning (1994) of the effect of changes in the tort law on the prices of childhood vaccines shows that the price of the DPT vaccine has increased by 2,000 percent over the past decade, with 96 percent of the price increase due to litigation costs.

Public goods

In the classic treatment of public goods (Samuelson 1955), it is supposed that public goods exhibit two characteristics: nonrivalry in consumption and the inability of providers to exclude users. A lighthouse has been used by economists of the stature of John Stuart Mill, A. C. Pigou, and Paul Samuelson as an example of a pure public good (Coase 1974). Apparently, the light from any lighthouse could be used by any number of ships and no ship could be excluded from using the light. Thus, the problem of free riding would make it difficult to privately finance a lighthouse. Coase (1974) used the lighthouse as a real-world illustration of his method of examining the argument for government interference into the economy. Coase surveyed the history of lighthouses and discovered that lighthouses were built by private parties even though everyone within sight of the lighthouse can use its services without any conges-

tion costs. Coase simply pointed out that ships usually arrive one at a time, they can be easily identified, and if a captain never pays, the light can simply be turned off, as it had throughout the early history of the lighthouse. The lighthouse operators also charged ships according to their tonnage, so that the price paid roughly corresponded to the benefits received by the owner of the ship. This is a market: a price is charged, and if the price is not paid, the next time the service will be denied. The institutional structure of production is important. If the lighthouse is made liable for any accidents caused by turning off the light, suddenly a service that could be provided privately is turned into one that will not be provided at all unless by some governmental agency.

This point and our analysis of externalities illustrate how even the greatest economists cannot, through deductive reasoning, decide whether government action is required to correct some perceived market failure. Some type of institutional examination of the facts is necessary before any policy prescription can be reached.

Conclusion

In this article, I have tried to clarify the debate that has raged over the Coase theorem since its inception. Basically, Coase pointed to a flaw in the argument for correcting market failures. While public production or Pigovian taxes might correct for market failures, theory cannot solve the problem without a detailed analysis of the institutional structure of the problem at hand. We pointed out that even if Pigovian taxes can be calculated, the solution requires (1) third-party payments, and (2) relatively small costs due to the competition for government revenues. As Coase (1990, 185) colorfully put it, presumably recalling Humphrey Bogart in the *Maltese Falcon*, "Such tax proposals are the stuff that dreams are made of." Similarly, whether a good is public or private depends on technology, transaction costs, and the institutions of the economy. At the same time, while there is no a priori argument for government intervention, there is also no a priori argument for *laissez faire*. Each case must be decided on the pragmatic principle of what works best in the real world.

Notes

I wish to thank Stephen Brown for his valuable comments on an earlier version of this article. The article was stimulated by the author's communications with Paul Samuelson over the penetrating analysis of Coase in Samuelson (1995). The current essay does not answer Samuelson's questions but simply tries to clarify the nature of the Coasian debate.

[1] Some might raise the issue that a farmer might locate next to the tracks just to sue the railroad. This is really just a transaction cost in disguise. We are assuming here that the example represents the technological opportunities available to the society as well as all the possibilities. The conclusions would not be changed by assuming *N* farmers, each with some clear-cut damage. If a farmer has the option to locate elsewhere with the same fecundity, there is no externality to worry about. I am indebted to Steve Brown for this point.

[2] Paul Samuelson (1995) has raised the issue of bargaining and negotiation failures. But this is, once again, a situation in which there are costs of contracting. The zero-transaction-cost world in economics is like the law of inertia when no forces are operating on an object: nothing stops perfection.

[3] See Coase (1990, 151) and Baumol (1972).

[4] The following analysis does not try to replicate the views of Coase (see, for example, Coase 1990, 179–85).

[5] It is an established point in economic theory that in the presence of externalities, competitive behavior can result in multiple equilibria (see Ruffin 1972).

[6] Diving boards are disappearing from neighborhood pools in the United States (*Investor's Business Daily*, May 13, 1996, A2). See also Peter W. Huber (1988, 155–61), for other examples, such as contraceptive devices and leprosy drugs.

References

Baumol, William J. (1972), "On Taxation and the Control of Externalities," *American Economic Review* 62: 307–22.

Coase, R. (1937), "The Nature of the Firm," *Economica* 4 (n.s.): 386–405.

——— (1960), "The Problem of Social Cost," *Journal of Law and Economics* 3: 1–44.

——— (1974), "The Lighthouse in Economics," *Journal of Law and Economics* 17: 357–76.

——— (1990), *The Firm, the Market, and the Law* (Chicago: University of Chicago Press).

——— (1992), "The Institutional Structure of Production," *American Economic Review* 82: 713–19.

——— (1993), "Coase on Posner on Coase," *Journal of Institutional and Theoretical Economics* 149: 96–98.

Commons, John R. (1923), *The Legal Foundations of Capitalism* (Madison: University of Wisconsin Press).

Huber, Peter V. (1988), *Liability* (New York: Basic Books).

Manning, Richard L. (1994), "Changing Rules in Tort Law and the Market for Childhood Vaccines," *Journal of Law and Economics* 37: 247.

Pigou, A. C. (1932), *The Economics of Welfare*, 4th ed. (London: Macmillan).

Ruffin, R. J. (1972), "Pollution in a Crusoe Economy," *The Canadian Journal of Economics* 5: 110–18.

Samuelson, Paul. A. (1955), "Diagrammatic Exposition of a Theory of Public Expenditures," *Review of Economics and Statistics* 32: 350–56.

——— (1995), "Some Uneasiness with the Coase Theorem," *Japan and the World Economy* 7: 1–7.

Tullock, Gordon (1967), "The Welfare Cost of Tariffs, Monopolies, and Theft," *Western Economic Journal* 5: 224–32.