J.P. MORGAN, THE CLAYTON ANTITRUST ACT, AND INDUSTRIAL FINANCE-CONSTRAINTS IN THE EARLY TWENTIETH CENTURY[1]

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ABSTRACT

Restrictions on the American banking system in the early Twentieth Century affected the ability of commercial banks to provide financing to large industrial firms. Consequently, the investment and growth of these firms may have been finance-constrained. This paper examines the ability of J.P. Morgan & Company to alleviate finance-constrained investment and growth for firms with which it became affiliated. The paper also studies the impact of the Clayton Antitrust Act on the investment and growth of Morgan-affiliated firms versus non-affiliated firms. The overall findings suggest that a relationship with Morgan helped firms reduce finance-constraints.

Introduction

During the early part of the Twentieth Century the United States' commercial banking system was the most regulated in the world. Prohibitions on branching and restrictions on loan sizes hindered the ability of commercial banks to meet the financing needs of large industrial companies. Unable to obtain the funds required for large-scale investment and growth from the commercial banking system, industrial firms often turned to private banking houses for financing. These private banks provided funds to firms in a variety of ways, including the granting of loans and the underwriting of stock and bond issues. Although private banks certainly provided financing to firms, it remains unclear to what extent private banks were able to alleviate potential problems caused by commercial bank regulations.

This paper studies the ability of one particular private bank, J. P. Morgan & Company, to affect the financing of investment and growth for firms with which it was affiliated. To test for Morgan's impact on firm financing, a panel data set is constructed from original sources of seventy industrial firms from 1911-1922. The data are then used to examine differences in investment and growth sensitivities to cash flow for firms affiliated with the House of Morgan versus non-affiliated firms. The initial findings do not indicate that Morgan-affiliated firms faced less severe finance-constraints than other firms. The paper then examines the potential impact of the Clayton Act of 1914 on Morgan-affiliated firms versus non-affiliated firms. The Act, which restricted the ties between firms and bankers, provides a type of natural experiment that can be used to test Morgan's influence on corporate finance. The results of these tests suggest that firms affiliated with Morgan suffered more severely from the Clayton Act than non-affiliated firms.

This finding indicates that Morgan helped to alleviate, though not eliminate, firm finance-constraints.

The rest of this paper is organized as follows. Section two briefly describes the American financial system during the early Twentieth Century and the role J.P. Morgan played in firm financing. Section three provides a brief introduction to finance-constraints, concentrating on the importance of information asymmetries. Section four presents a methodology for testing for finance-constrained investment. Section five introduces the data used in this study. Section six presents the results from tests of finance-constrained investment while section seven presents a model to test for finance-constrained firm growth. Section eight examines the effect of the Clayton Act on firm finance-constraints for Morgan-affiliated firms versus non-affiliated firms. Section nine concludes.

J.P. Morgan and the American Financial System

By the early Twentieth Century the American financial system had become unique in the world. While other industrialized countries such as Belgium, Germany, and Switzerland had a few large universal banks[2] at the heart of their financial systems, the United States' banking system was comprised mostly of thousands of small unit banks.[3] The vast majority of these small banks were prohibited from branching, thus constraining their geographic range of operation and limiting the size of total assets these banks could acquire. A large literature in economic history explores the United States' unique banking system structure and its effects on American economic growth and development. Recently, much of this literature has focused on the possibly negative effects of the American banking structure. Charles Calomiris[4] and Daniel Giedeman[5], for example, provide evidence that restrictions on the commercial banking system in the early 1900s hindered banks' ability to finance large-scale industrial firms.

Because large American firms were unable to receive adequate financing from commercial banks, they were forced to turn to other sources of financing. The most common source of funds for investment and growth was, and still is, retained earnings. For projects for which retained earnings were not adequate, firms could potentially have obtained financing using commercial paper or investment bankers. Commercial paper was a form of debt that could be used by high-quality borrowers for short-term periods. Commercial banking houses brokered the paper to banks providing a link between firms and the banking system. The commercial paper market reached its peak in 1920 with $1.3 billion in lending to more than 4000 borrowers.[6] Although commercial paper was able to provide financing for low-risk borrowers, its high costs and frequent rollover limited its usefulness for long-term financing.

Faced with the limitations of the commercial banking sector and the high costs and short maturity of commercial paper, American firms often turned to investment bankers for their financing needs. The investment banking system in the United States became organized during the Civil War as a way to place large issues of government bonds.[7] The

system evolved during the late Nineteenth Century as a means to finance railroads and, later, large industrial firms as well as other enterprises in transportation and utilities. By the second decade of the Twentieth Century, investment bankers were issuing about $500 million in securities annually. As the investment banking system grew it also became extremely concentrated so that in the years prior to World War One every security issue greater than $10,000,000 was placed by one of the top six investment banking firms.[8] Investment banking was also extremely profitable in the United States with bankers earning average commissions of over 20% on common stock issues (compared with 4% commissions for similar flotations by German universal banks).[9]

The basic job of the investment bankers was to act as middlemen between investors and borrowing firms. There are several keys to their success in this role, including access to large amounts of mobilized savings. Douglass North argues that the growth of large insurance companies greatly fostered the development of investment bankers by providing huge sums of liquid funds for security purchases.[10] Insurance companies entered into mutually beneficial relationships with investment bankers and could be counted on to accept placement of securities the investment banks issued. Investment bankers, particularly J.P. Morgan, were also able to obtain funds from Europe, although, as North notes, this source of funds diminished during the first decade of the Twentieth Century.

In addition to having access to the mobilized savings of the United States and Europe, the success of investment bankers also likely resulted from their ability to monitor borrowing firms. Through this monitoring the investment bankers were able to reduce the degree of information asymmetry between borrowers and lenders and therefore lower the possibility of adverse selection and moral hazard problems. As will be discussed in greater detail in the next section of the paper, an end result of the monitoring by investment banks should have been more effective capital markets and reduced problems of finance-constraints.

The most well-known and important of the private banks were J. P. Morgan & Company; Kuhn, Loeb, & Company; Kidder, Peabody, & Company; and Lee, Higginson, & Company. Foremost among these was J. P. Morgan & Company.[11] By the second decade of the Twentieth Century Morgan had 23 directorates in 13 commercial banks and had been directly involved in the public marketing of almost $2 billion of security issues for interstate corporations from 1902-1912.[12] Morgan also took the lead in terms of monitoring (and controlling) his clients. Firms seeking an affiliation with Morgan were subject to restructuring of assets and replacement of management.[13] At the least, Morgan would place a representative on the affiliated firm's board of directors. The other large investment banking houses were not as stringent in their affiliation requirements, so a firm unwilling to wear the "Morgan collar" could have potentially turned to a different investment house for financing.

It seems puzzling that any firm would subject itself to Morgan's borrowing requirements if other financing options were available, yet more than twenty firms were under his control at the start of World War One. Obviously, there must have been something special about Morgan. Recent research has highlighted the effect that J. P. Morgan &

Company had on firms that chose and were chosen to become affiliated with Morgan. Bradford De Long argues that firms affiliated with Morgan benefited from the relationship.[14] Most notably, De Long finds the presence of a representative of Morgan on a firm's board of directors increased the value of the firm's common stock equity by 30%. More recently, Carlos Ramirez has examined the effects of an affiliation with Morgan on firm finance-constraints.[15] Ramirez finds the investment of firms affiliated with Morgan was much less sensitive to the firms' cash flow than the investment of non-affiliated firms, suggesting that Morgan played a positive role in firm financing.[16]

As mentioned above, Morgan's affiliations with firms often took the form of Morgan placing its representative(s) on the firms' boards of directors. These representatives (often referred to as "Morgan's Men") could closely monitor the firms, reducing information asymmetries between the firms and Morgan. The ability of J. P. Morgan & Company to reduce information asymmetries may have reduced the risk premiums that firms affiliated with Morgan would have had to pay for external financing. If Morgan was able to substantially reduce capital market imperfections caused by information asymmetries, the detrimental effects of commercial bank restrictions would have been mitigated. The next section of this paper discusses in more detail how information asymmetries may create problems in a financial system and it explains how Morgan may have been able to alleviate these problems.

Information Asymmetries, Financial Intermediaries and Finance-Constraints

When economists study the influence of financial intermediaries on an economy they typically focus on the usually passive role intermediaries play in affecting the money supply. Recently, however, a new literature has begun to focus on a more active role of intermediaries as a means to reduce information asymmetries between borrowers and lenders. Particularly important within this new literature is the study of how banks' ability to alleviate information asymmetries may reduce costs of capital and promote firm investment and growth.

To understand why information asymmetries might hinder firms' investment and growth, suppose that capital markets are not perfect because the managers/owners of firms have more information about the expected profitability of investment projects than do potential outside lenders. It has been shown that the associated problems of adverse selection and moral hazard will cause outside lenders to require a "lemons premium" on funds they provide to firms.[17] Hence, the cost of funds obtained externally will be higher than the cost of funds obtained from internal sources (such as retained earnings). Firms may therefore be forced to forego investment in some projects that have positive net present value (or in other words, firm investment may be finance-constrained).[18]

A simple example illustrates how information asymmetries may affect the cost of capital for firms and in turn cause firms to pass up investment projects that have positive expected profitability. Suppose several firms in an economy seek to obtain funds for investment projects from external sources and that each firm possesses information about

the expected profitability of its projects, but that this information is costly to transmit to outsiders. Suppose also that there are some firms that do not have any investment projects with positive expected profitability, but that these firms also seek funding from outsiders on which they will then default (there is a problem of adverse selection). It is in each firm's interests to seek financing from lenders by telling the lenders that they have a profitable project in which to invest, but because information is costly to transmit, "good" borrowers cannot credibly convince investors that they will not default. Since lenders cannot distinguish worthy from unworthy borrowers they will charge a premium on all of the loans that they provide. The higher costs of borrowing resulting from these premiums will cause firms to limit their investment and/or growth.

The risk premium charged on loans depends upon the degree of information asymmetry between the firm and the lender. The greater the asymmetry, the larger the risk premium borrowers must pay. If the degree of asymmetry can be reduced, the risk premium will decrease. One possible way to reduce the degree of information asymmetries would be to allow outside lenders to become firm insiders. If, for example, lenders are given positions on the firm's board of directors, it would be possible for the firm to credibly convey information to the lenders, allowing for reduced risk premiums. As mentioned earlier, "Morgan's Men" were in a position to perform exactly this sort of task for firms affiliated with J. P. Morgan & Company. The remainder of this paper examines the hypothesis that an affiliation with Morgan helped firms to more easily obtain external funding (and thereby reduce the problem of finance-constraints that the firms may have been facing).

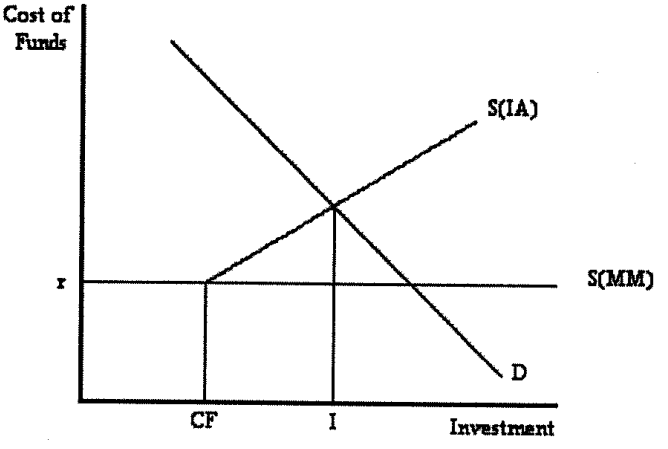
Testing for Finance-Constrained Investment

To test the hypothesis that firms affiliated with J. P. Morgan & Company were less finance-constrained than non-affiliated firms, it is necessary to implement a basic model of firm investment. Steven Fazzari, R. Glenn Hubbard and Bruce Petersen provide a framework well suited for this task and their ideas can be summarized by Figure One and Figure Two.[19] In these figures, r is the risk-adjusted market interest rate (it is also the rate of return a firm could earn on money if it chooses not to use that money for investment). CF represents the firm's internal cash flow. If cash flow is greater than the firm's desired investment, the firm can self-finance all of its investment and agency problems resulting from information asymmetries do not arise. If cash flow is less than desired investment, the firm will seek external financing from outside lenders. If there are no information asymmetries between borrowers and lenders or any other capital market imperfections, the supply of funds curve a firm faces will be S(MM). (The S(MM) supply curve corresponds to the world of perfect capital markets described by the Modigliani-Miller Theorem).[20] If, however, there are information asymmetries between the firm and the lender, a risk premium must be incorporated into the supply of funds curve. This premium is illustrated in Figures One and Two, by the upward slope of the supply of funds curve, S(IA), as firms obtain external financing.[21] The slope of the supply curve is determined

by the degree of information asymmetry; the greater the asymmetry, the steeper the slope of the supply of funds curve. Given this supply of funds curve, a firm's optimal level of investment is determined by the intersection of the supply curve with the firm's investment demand curve.

Figure Two illustrates how the sensitivity of investment to changes in cash flow is related to external finance premiums arising from information asymmetries. If cash flow is initially at some level CF, the firm's optimal level of investment, given that the firm is

Figure One

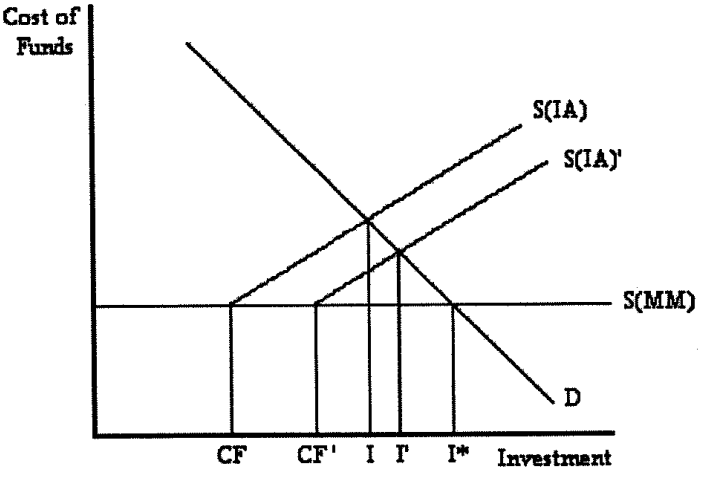


facing S(IA), is I. If cash flow increases to CF', the optimal level of investment will increase to I' (i.e. in the presence of capital market imperfections caused by information asymmetries, firm investment will be sensitive to changes in cash flow). The larger the degree of information asymmetries, the steeper the S(IA) curve, and the greater will be the sensitivity of investment to cash flow. Alternatively, as the degree of information asymmetry between the firm and the lenders is lessened, the S(IA) curve becomes flatter, and investment sensitivity to cash flow decreases. In the extreme case that all information asymmetries (and other capital market imperfections) have been eliminated, the supply of funds curve becomes S(MM). With S(MM) the optimal level of investment is always I* regardless of the firm's cash flow; so investment sensitivity to cash flow is zero.

The predictions concerning sensitivity of investment to cash flow from Figure Two provide a framework with which to test whether or not affiliations with J.P. Morgan improved firms' access to financing. If a relationship with Morgan helped firms overcome financing problems caused by information asymmetries then the investment of firms with such a relationship should be less sensitive to changes in cash flow than for firms without such a relationship.

Fortunately, as a large existing literature demonstrates, it is possible to examine firms' investment sensitivity to cash flow through the use of firm-level data.[22] Among the existing research on finance-constraints and modern firms, Takeo Hoshi, Anil Kashyap, and David Sharfstein's study of the Japanese *keiretsu* is most closely related to the current

Figure Two



study.[23] Hoshi et al. find that Japanese firms having affiliations with banks show less evidence of being finance-constrained than firms without such affiliations. Economic historians, notably Caroline Fohlin and Carlos Ramirez have also utilized similar firm-level tests of finance-constraints. Fohlin finds evidence that large German banks did not reduce firms' finance-constraints from 1903-13.[24] As mentioned previously, Ramirez provides evidence that in the first decade of the Twentieth Century firms associated with Morgan were less finance-constrained than those without such an affiliation. Ramirez also examines the effect of the Glass-Steagall Act of 1933 on firm financing, concluding the Act increased the cost of external funds to firms.[25]

Description of the Data

The firm-level data analyzed in this paper were collected from various issues of *Moody's Analyses of Investments* and consist of annual observations of 70 industrial firms for the years 1911-1922. For a firm to be included in this study it is required that *Moody's* reported its income statement, balance sheet, and stock prices for at least five consecutive years during the period under study. Firms meeting these criteria were grouped into two sets according to whether the firm was affiliated with J. P. Morgan & Company or non-affiliated. Information on affiliations with Morgan comes from Congressional reports from the Pujo investigation in 1913.[26] The Pujo Committee reported that Morgan had affiliations with twenty-two firms. Industrial firms made up slightly less than half of the twenty-two; and of these, adequate data could be compiled for eight firms. To control for possible differences in the financing of small firms compared to large firms, firms having total assets of less than the smallest of the Morgan-affiliated firms were not included in the sample. Table One provides the complete list of firms included in this study and their classification.

Table Two presents the summary means of several key statistics for firms affiliated with Morgan versus non-affiliated firms.[27] No clear differences appear between the two sets of firms for the ratio of cash flow to investment and the ratio of cash flow to total

Table One

Morgan-affiliated Firms	Non-Affiliated Firms		
Adams Express	Allis-Chambers	Crucible Steel Company	Phelps Dodge
Baldwin Locomotive	American Agriculture Chemical Co	Cuba-Cane Sugar	Pittsburgh Coal
General Electric	American Can	Cudahy Packing	Republic Iron and Steel
International Harvester	American Car and Foundry	Eastman Kodak	Sears
International Mercantile Marine	American Cotton Oil	General Asphalt Company	Standard Oil CA
Pullman Company	American Locomotive Company	General Chemical	Standard Oil IN
U.S. Steel	American Smelting and Refining	General Motors	Standard Oil NY
Westinghouse Electric & Machinery	American Sugar Refining	Goodyear Tire	Studebaker
	American Tobacco Company	Virginia-Carolina Chemical	Swift and Co
	American Woolen	International Nickel	Texas Company
	American Writing Paper	International Paper	Union Oil of CA
	Anaconda Copper Mining	Kennecott Copper	United Drug
	Atlantic Gulf and West India	Lackawanna Steel	United Fruit Co
	B.F. Goodrich	Lehigh Coal and Navigation	United Shoe Machinery
	Bethlehem Steel	Liggett and Myers	U.S. Rubber
	Cambria Steel	Mexican Petroleum	Utah Copper
	Central Leather	Midvale Steel and Ordnance	Wells, Fargo & Co.
	Chile Copper	Nabisco	Willys Overland
	Colorado Fuel and Iron	National Lead	Wilson and Co
	Consolidation Coal	New York Shipbuilding	Woolworth, FW
	Corn Products Refining	P. Lorillard	

assets. Firm size, as measured by total assets, is the most obvious difference between the sets of firms. On average, Morgan firms were more than seven times larger than non-affiliated firms. At first blush the finding that firms affiliated with Morgan were able to grow to such large sizes might appear as obvious evidence that a relationship with Morgan reduced potential problems of finance-constraints. It is also possible, though, that these firms did face finance-constraints but were able to become large using retained earnings.

A second key difference between the types of firms can be seen in the ratio of investment to cash flow. Firms not affiliated with Morgan had rates of net fixed investment almost twice that of Morgan-affiliated firms. Similar to firm size, this difference could

Table Two

Summary Means of the Data		
	Morgan-Affiliated Firms	Non-Affiliated Firms
Firm's Total Assets	300,510,000	40,539,464
Ratio of Firm Cash Flow to Capital	0.181483	0.227574
Ratio of Firm Investment to Capital	0.023086	0.042225
Ratio of Firm Cash Flow to Total Assets	0.062339	0.069732
Firm Growth Rate	0.039471	0.053641
Tobin's *q*	1.083464	1.09884

initially be interpreted as evidence that non-affiliated firms were more easily able to obtain funds for investment than affiliated firms. It might also be the case, though, that non-affiliated firms were forced to invest more heavily in tangible fixed capital (that could have been used as collateral for obtaining financing) than Morgan firms. Non-affiliated firms also had higher growth rates than Morgan firms. Again, although this finding seems to indicate that non-affiliated firms were less finance-constrained than affiliated firms, it is alternatively possible that growth rates for non-affiliated firms were high because the expected marginal profits from expansion were higher for these firms than for Morgan firms even if non-affiliated firms faced greater finance-constraints than Morgan firms.

Although Tobin's q has not been discussed previously in this paper, it is included in this study for a very important reason. Suppose that a firm's investment is found to be positively correlated with its cash flow. Until now this paper has suggested that this correlation would be evidence that the firm was finance-constrained. This conclusion omits, however, the possibility that the relationship between cash flow and investment might be the result of a simultaneous change in the firm's current cash flow and the firm's expected future profitability. It is very possible that if a firm's current cash flow increases, the firm might think its future prospects will also be better and therefore the firm might decide to increase its current period investment too. To refer back to Figures One and Two, this would be equivalent to having the investment demand curve shift outward at the same time that cash flow increased. In this case, any apparent sensitivity of investment to cash flow would not have been the result of finance-constraints.

To control for the possibility that investment sensitivity to cash flow is being influenced by shifts in the demand for investment, Tobin's q was incorporated into the analysis to provide a measure of the investment opportunities available to the firm. Tobin's q is the ratio of a firm's market value to the replacement cost of the firm's capital and provides a measure of the value to a firm from additional investment. If Tobin's q is greater than one, then the value of additional investment is positive, and if the value of additional investment increases (i.e. the firm's investment opportunities have increased) then Tobin's q will increase. Because Tobin's q is directly correlated with a firm's investment opportunities it is frequently used as a way to control for changes in a firm's demand for investment and by incorporating Tobin's q into this paper we will be more clearly able to identify any effects that Morgan may have had on firm investment.

Results of the Finance-Constrained Investment Tests

To determine if Morgan was able to reduce finance-constraints, the sensitivity of investment to changes in cash flow was estimated for firms affiliated with Morgan and for non-affiliated firms. These estimates (presented in Table Three) show that, even after controlling for the influence of Tobin's q, firm investment was sensitive to cash flow for both Morgan-affiliated firms and non-affiliated firms, indicating that both groups of firms were finance-constrained.[28] The impact of cash flow on investment for Morgan-affiliated firms, however, was more than three times larger than for non-affiliated firms.

Morgan firms therefore appear to have been significantly more finance-constrained than other firms. This finding is surprising because one of the key things an affiliation with Morgan is believed to have done was reduce information asymmetries between Morgan and the borrowing firms. The reduction in information asymmetries should have resulted in improved capital markets and a consequently lower likelihood of finance-constraints.[29]

Testing for Finance-Constrained Growth

The investment-cash flow sensitivity results presented above provide interesting evidence that Morgan-affiliated firms' investment in capital was more finance-constrained than the investment of non-affiliated firms. In this section of the paper a separate test

Table Three

Sensitivity of Investment to Changes in Cash Flow	
Morgan-Affiliated Firms	Non-Affiliated Firms
0.398401	0.121950

that firm growth was finance-constrained is presented. Growth is measured by the percentage change in total assets and is likely to be more accurately measured than investment for this data.[30] The basis of this test, developed by Robert Carpenter and Bruce Petersen, is similar to the tests of finance-constrained investment.[31] Analogous to the investment model presented earlier, if a firm faces an upward-sloping supply of funds curve, an increase in cash flow will cause an increase in its expansion. Or put another way, costs of external finance cause the growth of the firm's total assets to depend upon internal cash flow. The sensitivity of growth to cash flow again depends upon the slope of the supply of funds curve. If a firm would like to grow larger but cannot because it is finance-constrained, when the firm's available cash flow grows larger the firm will increase its total assets. As Carpenter and Petersen note, if the firm exists in a perfectly competitive industry, the presence of finance-constraints will cause a firm's growth sensitivity to cash flow to be equal to one.

To determine if Morgan was able to help the growth of firms become less finance-constrained, the sensitivity of growth to cash flow was estimated for affiliated and non-affiliated firms. These estimates (presented in Table Four) indicate that the growth of both Morgan firms and non-affiliated firms appears to have been finance-constrained, but neither group appears significantly more constrained than the other.[32]

The Clayton Act and Finance-Constraints

The absence of any evidence that Morgan firms were less finance-constrained than non-affiliated firms and the possibility (from the investment sensitivity to cash flow esti-

Table Four

Sensitivity of Firm Growth to Changes in Cash Flow	
Morgan-Affiliated Firms	Non-Affiliated Firms
1.161304	0.964479

mates) that the Morgan firms were actually more finance-constrained than other firms begs further investigation. There are several possible explanations for these findings. The first potential explanation is that J. P. Morgan & Company did not actually help alleviate the financial market imperfections firms faced during this period. An alternative explanation is that an affiliation with Morgan did reduce finance-constraints for the affiliated firms, but that the firms choosing to affiliate with Morgan were those firms for which problems of finance-constraints were originally more severe than for other firms. Consequently, a relationship with Morgan would not appear to ameliorate problems of finance-constraints for affiliated firms compared to non-affiliated firms even if Morgan actually did help to reduce firm finance-constraints. Given the costs to a firm of obtaining an affiliation with Morgan (in terms of the loss of owner/managerial control), it seems likely that firms facing severe finance-constraints initially would have been more likely to self-select to become a Morgan firm than firms for which finance-constraints were less of a problem. A test of these competing explanations could be developed if it were possible to determine the severity of finance-constraints for the group of Morgan-affiliated firms in the absence of a Morgan affiliation. Fortunately, the Clayton Act of 1914 provides the opportunity to conduct such a test.

Among other things, the Clayton Antitrust Act limited the interlocking of firm directorates. This measure was designed to curb the managerial influence of financiers on corporate boards.[33] By hindering Morgan's opportunities to place representatives on firms' boards of directors, the Act reduced Morgan's ability to collect information about firms. If Morgan had alleviated finance-constraints by reducing information asymmetries, the Act would result in just the opposite effect. Finance-constraints would increase as the information-transmitting "Morgan's Men" were forced out of their positions on boards of directors.

To implement a new set of tests of finance-constraints, the data observations were again grouped by Morgan affiliation and then subdivided into groups based on time. Although the Clayton Act was passed in 1914, it did not completely go into effect until 1916. Therefore, 1916 was chosen as the breakpoint between the early and the late periods. Investment sensitivity to cash flow was again estimated for the four groupings of observations. These estimates (presented in Table Five) show that for both Morgan-affiliated firms and non-affiliated firms the investment sensitivity to cash flow was higher in the later period than in the early period. This observation suggests that even firms not affiliated with Morgan suffered increased finance-constraints as a result of the Clayton Act. This finding may seem peculiar, but it is reasonable. If a firm was not affiliated with

Morgan it may have been affiliated with another private banking company. As the Clayton Act would also affect the ability of these other private banks to reduce information asymmetries between themselves and firms, higher investment sensitivities to cash flow following the Act's implementation should be expected for many firms.

To specifically analyze the effect an affiliation with J.P. Morgan had on firm finance-constraints, one should compare the change in investment sensitivity to cash flow from the early period to the late period for Morgan-affiliated firms compared to non-affiliated firms. The estimates show that the Clayton Act much more severely impacted Morgan-affiliated firms than non-affiliated firms. Investment sensitivity to cash flow for Morgan firms more than tripled following the Clayton Act, implying that the Act caused finance-constraints to become three times more severe for Morgan-affiliated firms. For non-affiliated firms, investment sensitivity to cash flow did not quite double following the Clayton Act indicating that Morgan-affiliated firms were more affected by the Clayton Act than non-affiliated firms. This evidence is consistent with the hypothesis that prior to the Clayton Act, J. P. Morgan & Company was able to reduce finance-constraints for affiliated firms.

In addition to the testing for changes in finance-constrained investment following the Clayton Act, it is also possible to analyze the effects of the Act on finance-constrained growth. Similar to the investment analysis, the observations were grouped according to Morgan affiliation and time and then growth sensitivity to cash flow was estimated for the four groupings. These estimates (also presented in Table Five) show that prior to the

Table Five

	Sensitivity of Investment to Changes in Cash Flow		Sensitivity of Firm Growth to Changes in Cash Flow	
	Morgan-Affiliated Firms	Non-Affiliated Firms	Morgan-Affiliated Firms	Non-Affiliated Firms
1911-1916	0.203645	0.064925	0.29092	0.978158
1917-1922	0.669727	0.120735	3.478155	1.008788

Clayton Act, the growth of Morgan-affiliated firms was much less sensitive to cash flow than the growth of non-affiliated firms. Following the implementation of the Clayton Act, however, the results change dramatically for the Morgan-affiliated firms. Their growth became much more sensitive to cash flow after the Act was implemented, while the growth sensitivities for non-affiliated firms remained almost unchanged over the two periods. These findings are consistent with the hypothesis that J. P. Morgan & Company did alleviate finance-constraints on growth—at least until the Clayton Act lessened its opportunity to reduce information asymmetries by limiting Morgan's ability to place representatives on firms' boards of directors.

Conclusion

The early Twentieth Century was an interesting time for the American financial system. The increasing size of industrial firms dramatically increased the demand for

large-scale financing. At the same time, the American public, fearful of large money interests, maintained restrictions on the commercial banking system, thereby limiting banks' ability to provide large-scale financing. Private bankers stepped in to provide a substitute source of funding for firms. The American people, however, also feared private banking interests and imposed regulations that potentially limited the private bankers' ability to provide firm financing too. This paper has examined the effects of these regulations on the financing of large American industrial firms.

Specifically, this paper has concentrated on the ability of private bankers, notably J. P. Morgan & Company, to alleviate finance-constraints on firms' investment and growth in the second decade of the Twentieth Century. Analysis incorporating the effects of the Clayton Act of 1914 suggests that the severity of finance-constraints was reduced for firms willing to become affiliated with Morgan. The results do not show, however, that an affiliation with Morgan completely eliminated firm finance-constraints.

The finding that Morgan did not completely reduce firm finance-constraints is particularly important when one considers the impact of commercial bank regulations on the overall financial system. The results indicate that although private bankers were able to substitute for the regulation-laden commercial banking system the substitution was not perfect. Although the total social costs (or benefits) resulting from the structure of the American financial system are still not completely known, the findings of this paper suggest it is likely that the system hindered the development of large-scale industrial firms.

Notes

1. I am grateful for advice and suggestions offered by Steven Fazzari, Sukkoo Kim, Laurence Malone, Douglass North, John Nye and attendees of the 2003 Economic and Business Historical Society Conference in Memphis. All remaining errors are solely attributable to the author.

2. Also known as "mixed banks" (or *Grossbanken*, literally meaning "great banks" in German), universal banks combine commercial and investment banking and may offer the entire range of financial services. They can issue loans, underwrite securities, and carry out securities transactions on behalf of others. They may also own equity interests in firms and vote the shares of companies they own. Furthermore, universal banks may sometimes even elect their own employees as members of the boards of directors on those companies. For a review of universal banking, see George J. Benston, "Universal Banking," *Journal of Economic Perspectives* 8, no. 3 (1994): 121-43.

3. In 1920 the number of state and national banks and trust companies in the United States peaked at 27,633.

4. Charles W. Calomiris, "The Costs of Rejecting Universal Banking: American Finance in the German Mirror, 1870-1914." In *Coordination of Economic Activity Between and Within Firms* edited by N. Lamoreaux and D. Raff. (Chicago: University of Chicago Press, 1995) pp. 257-315.

5. Daniel C. Giedeman, "Finance-Constraints in Early Twentieth Century America," Paper presented at the Economic and Business Historical Society Conference, Chicago, 2002.

6. Charles W. Calomiris and Carlos D. Ramirez, "Financing the American Corporation: The Changing Menu of Financial Relationships." National Bureau of Economic Research, Historical Paper 79, (1996) p. 21.

7. Ibid, p. 22.

8. J. Bradford De Long, "Did J.P. Morgan's Men Add Value? An Economist's Perspective on Financial Capitalism." In *Inside the Business Enterprise: Historical Perspectives on the Use of Information*, edited by Peter Temin. (Chicago: University of Chicago Press, 1991) p. 206.

9. Calomiris and Ramirez, "Financing," p. 25.

10. Douglass C. North, "Life Insurance and Investment Banking at the Time of the Armstrong Investigation." *Journal of Economic History* 14, (1954): 209-28.

11. Henceforth, frequently referred to as simply Morgan.

12. Carlos Ramirez, "Did J.P. Morgan's Men Add Liquidity? Corporate Investment, Cash Flow, and the Financial Structure at the Turn of the Twentieth Century." *Journal of Finance* 50, (1995): 661-78.

13. Ibid, p. 664.

14. J. Bradford De Long, "Did J.P. Morgan's Men Add Value?"

15. Carlos Ramirez, "Did J.P. Morgan's Men Add Liquidity?", 661-78.

16. The research undertaken in this paper is similar to the Ramirez described above, although it differs in several key respects. The most important difference is the analysis of the impact of the Clayton Act undertaken in this paper. A second important difference is the testing that firms' growth was finance-constrained. Other differences include this paper's focus on industrial firms rather than railroads and the use of longer data set from *Moody's Analysis of Investments* instead of *Poor's Manuals of Industrials, Public Utilities and Railroads.*

17. See, for example, Dwight M. Jaffee and Thomas Russell, "Imperfect Information, Uncertainty, and Credit Rationing." *Quarterly Journal of Economics* 90, no. 4 (1976): 651-66.

18. Lenders may also ration credit, a feature found in a model developed by Joseph E. Stiglitz and Andrew Weiss, "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71, (1981): 393-410. Myers, Stewart C. and Nicholas S. Majluf, "Corporate Financing and Investment Decisions when Firms Have Information that Investors do not Have." *Journal of Financial Economics* 13, no. 2 (1984): 187-221 develops a model of equity finance which shows that agency problems caused by information asymmetry will also raise the cost of equity financing of investment.

19. Steven M. Fazzari, R. Glenn Hubbard, and Bruce C. Petersen, "Investment and Finance Reconsidered." *Brookings Papers on Economic Activity* (1988): 141-95.

20. Modigliani, Franco and Merton H. Miller, "The Cost of Capital, Corporate Finance, and the Theory of Investment." *American Economic Review* 48, (1958): 261-97.

21. R. Glenn Hubbard, "Capital Market Imperfections." Working Paper No. 5996, National Bureau of Economic Research, 1997.

22. A review of this literature can be found in R. Glenn Hubbard, "Capital Market Imperfections."

23. Takeo Hoshi, Anil K. Kashyap and David Scharfstein, "Coporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups." *Quarterly Journal of Economics* 106, no. 1 (1991): 33-60.

24. Caroline Fohlin, "Relationship Banking, Liquidity, and Investment in the German Industrialization." *Journal of Finance* 103, no.5 (1998): 1737-58.

25. Carlos Ramirez, "Did Glass-Steagall Increase the Cost of External Finance for Corporate Investment?: Evidence From Bank and Insurance Company Affiliations." *Journal of Economic History* 59, no. 2 (1999): 372-96.

26. From Carlos Ramirez, "Did J.P. Morgan's Men Add Liquidity?"

27. Because the variables used in the analyses are not directly reported by *Moody's* it was necessary to determine them from the available data. Cash flow is defined as the sum of net profits plus depreciation and is then normalized by the beginning-of-period capital stock for the investment analysis or beginning of period total assets for the growth analysis. The capital stock is the sum of property, equipment, machines, etc. Investment is the firm's net investment determined by the change in capital stock normalized by the beginning-of-period capital stock. Growth is the percentage change in total assets. Tobin's *q* is somewhat harder to measure. The *q*-ratio is the market value of a firm divided by the replacement cost of its capital. To calculate a firm's market value I subtracted the book value of the firm's equity outstanding from the book value of its total assets. I then added to this the market value of the firm's equity (determined by multiplying the number of shares outstanding by the average of the yearly high and low stock price). Finally, I divided this by the book value of the firm's total assets to obtain a measure of average Q for the firm. Stock price change is the percentage change in the average yearly common stock price. All variables are converted to real terms by deflating them by the Index of the General Price Level (NBER series 04051).

28. The specific model used to estimate investment sensitivity to cash slow is a fixed-effects model of the form: $I_{it} = a_i + g_t + b_1 Q_{it} + b_2 CF_{it} + e_{it}$ where I represents investment, Q represents Tobin's *q*, CF represents cash flow, a_i is a firm-specific intercept; and g_t is a year-specific intercept; the subscript *i* denotes the individual

firm and t denotes the year. Complete results from all of the paper's statistical tests are presented in the Appendix.

29. To check these results for robustness, a second set of tests were conducted using the percentage change in the firm's stock price as the control for changes in investment demand rather than Tobin's q. Again, these results indicate Morgan firms were significantly more finance-constrained than other firms.

30. Investment is determined solely from the capital stock while growth is determined by the capital stock plus all other firm assets. These assets include items such as cash and inventories that are easier for firms to report accurately.

31. Robert E. Carpenter and Bruce C. Petersen, "Is the Growth of Small Firms Constrained by Internal Finance?" *Review of Economics and Statistics* 84, no. 2 (2002): 298-309.

32. The model used to estimate growth sensitivity to cash flow is virtually the same as the investment sensitivity model except that firm growth now replaces firm investment as the dependent variable.

33. Carlos Ramirez and Christian Eigen-Zucchi, "Understanding the Clayton Act of 1914: An Analysis of the Interest Group Hypothesis." *Public Choice* 106, (2001): 157-81.

(*Appendix* appears on following page.)

Appendix—Complete Statistical Test Results

	1911-1922			
	Investment Sensitivities		Growth Sensitivities	
	Morgan Firms	Non-Morgan Firms	Morgan Firms	Non-Morgan Firms
Tobin's *q*	-0.069788	-0.005172	-0.143409*	-0.039346
(se)	(-0.075)	(-0.0264)	(-0.0704)	(-0.02)
Cash flow	0.398401*	0.121950*	1.161304*	0.984479*
(se)	(-0.1202)	(-0.0252)	(-0.3973)	(-0.0891)
Adj R-sq	0.1372	0.0867	0.2789	0.3419
Stock Pr. Δ	-0.008419	0.025953*	-0.079345	0.004416
(se)	(-0.0641)	(-0.0106)	(-0.0587)	(-0.0194)
Cash flow	0.374625*	0.081910*	0.923268*	1.189810*
(se)	(-0.1237)	(-0.0106)	(-0.4101)	(-0.1272)
Adj R-sq	0.1199	0.0651	0.2468	0.3862

	1911-1916			
	Investment Sensitivities		Growth Sensitivities	
	Morgan Firms	Non-Morgan Firms	Morgan Firms	Non-Morgan Firms
Tobin's *q*	0.067927	0.005853	0.016979	0.043681
(se)	(-0.13)	(-0.0237)	(-0.1107)	(-0.0379)
Cash flow	0.203645	0.064925*	0.29092	0.978158*
(se)	(-0.1892)	(-0.0202)	(-0.5128)	(-0.1402)
Adj R-sq	0.096	0.0509	0.1795	0.3153
Stock Pr. Δ	-0.068137	0.029204*	-0.07773	0.004416
(se)	(-0.0609)	(-0.0128)	(-0.0543)	(-0.0194)
Cash flow	0.224575	0.070057*	0.354529	1.189810*
(se)	(-0.18)	(-0.0192)	(-0.5509)	(-0.1272)
Adj R-sq	0.1869	0.0715	0.276	0.3862

	1917-1922			
	Investment Sensitivities		Growth Sensitivities	
	Morgan Firms	Non-Morgan Firms	Morgan Firms	Non-Morgan Firms
Tobin's *q*	0.204968	0.033512*	-0.025561	-0.056881*
(se)	(-0.2919)	(-0.0167)	(-0.2597)	(-0.0251)
Cash flow	0.669727*	0.120735*	3.478155*	1.008788*
(se)	(-0.1788)	(-0.0159)	(-0.7787)	-0.1226
Adj R-sq	0.2626	0.0721	0.4544	0.3507
Stock Pr. Δ	0.210685	0.002642	0.051518	-0.000441
(se)	(-0.114)	(-0.0157)	(-0.1091)	(-0.0274)
Cash flow	0.767449*	0.139234*	3.658938*	1.063126*
(se)	(-0.1789)	(-0.0156)	(-0.8447)	(-0.1353)
Adj R-sq	0.3291	0.0914	0.4585	0.3995

Notes: Standard errors are reported in parentheses.
* indicates statistical significance at the 5% level of confidence.