Essays in Corporate Finance and Taxation

by

Rebecca Elizabeth Zarutskie

B.A., The Johns Hopkins University (1999)

Submitted to the Department of Economics
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Abstract

This dissertation is a collection of three essays which address several questions in corporate finance and taxation. The first essay uses a panel dataset of balance sheet and income information, taken from the tax returns of U.S. corporations, to study the relationship between bank competition and the financing of firms. Over the period 1987 to 1998, I find that in more competitive banking markets firms use less outside debt and more inside debt and equity than firms in less competitive banking markets. The evidence is consistent with models in which market power provides banks with implicit equity stakes in their borrowers, making banks more willing to begin lending relationships with borrowers whose projects are characterized by substantial asymmetric information or delayed payoffs.

In the second essay, I reconsider the distortionary impact that the U.S. corporate and personal tax systems may have on organizational form choices by firms. I show that when Project choice is endogenous and when one considers the non-linear nature of the corporate tax schedule, it is not necessarily inefficient for a firm to choose to be a pass-through entity rather than a non-pass-through entity in response to differences in after-tax returns between the two entity types. I provide empirical evidence that is consistent with this theoretical point by examining the behavior of a sample of S corporations and C corporations.

The third essay is coauthored with Daniel Bergstresser and James Poterba. In this essay, we use a panel dataset of mutual fund characteristics and returns from Morningstar, Inc. to develop measures of the effective capital gains tax burden mutual fund investors face on unrealized capital gains in mutual funds. We explore the determinants of the effective capital gains tax burdens and the impact they have on net inflows of savings into mutual funds.

Thesis Supervisor: James Poterba
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Acknowledgments

Being a graduate student at MIT during the past four years has been a wonderfully challenging and gratifying experience. During my time here I have encountered many ideas, personalities, and world views and have had a great deal of fun interacting with people in the MIT and Cambridge communities. Somewhere along my journey here I hope that the seeds of future ideas and work have been planted in me and that this dissertation is just one of the first seeds to sprout.

I owe many debts of gratitude to the many people who helped me complete this dissertation. First and foremost amongst those I wish to thank are my advisors - Jim Poterba, David Scharfstein, and George Plesko. Jim has been a leader and a motivator, at times a strategist, and always an ally. David has been extremely generous with his time, has asked the toughest questions, and has shown me the fun in thinking hard about alternative economic explanations of the things we observe. George has provided data, resources, and time and has always been willing to give me some perspective on life. Karen Cys at the IRS Statistics of Income was very helpful in resolving computer glitches and reviewing the text and tables in the first two essays in a timely manner.

I also thank the faculty and graduate students who provided many comments and criticisms as I presented parts of this dissertation at different stages of development in lunches and seminars. My fellow graduate students have not only provided comments and been willing to engage in philosophical and other debates, but they have also been comrades. In particular, I thank Pol Antras, Lucia Breierova, Francesco Franco, Andrew Hertzberg, Silke Januszewski, Ben Jones, Nada Mora, Stavros Panageas, Rita Ramalho, Andrew Sweeting, and James Vickery for being friends and for being able to share a laugh with me in almost every situation. In addition, I thank Andrew Sweeting for the love and support he has given me during the past four years. I enjoy every day we spend together and hope we spend many more together.

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Contents

Chapter 1

Introduction

This dissertation is a collection of three essays which address several questions in corporate finance and taxation. The first two essays consider the impact of the U.S. banking and tax environments on the financial and organizational form choices of firms. The third essay considers the measurement and determinants of the effective capital gains tax burdens U.S. mutual fund investors face and explores the impact of these effective capital gains tax burdens on the flow of savings into and out of mutual funds.

In the first essay, I use a panel dataset of balance sheet and income information, taken from the tax returns of U.S. corporations, to study the relationship between bank competition and the financing of firms. Theoretical models reach different conclusions about the effects of bank competition on the equilibrium quantity of credit that banks provide to various types of borrowers. I use both cross-sectional and time-series variation in banking market concentration during a period of substantial change in the structure of U.S. commercial banking markets – 1987 to 1998 - to estimate the relation between small- and medium-sized privately held firms' methods of financing and the competitiveness of their banking markets.

I find that in more competitive banking markets firms use less outside debt and more inside debt and equity than firms in less competitive banking markets. Estimates from the entire sample period indicate that an increase in bank deposit concentration, as measured by the Hirschman-Herfindahl Index (HHI) of bank deposits at the metropolitan statistical area level, from the 25th percentile to the 75th percentile (an change of approximately 1000 HHI points) increases the likelihood a firm will have bank loans by about on percentage point

and decreases the likelihood that it will borrow from its owners by about one percentage point. For a firm aged five years or younger, an increase in bank concentration from the 25th percentile to the 75th percentile deceases the likelihood that it will borrow from its owners by two percentage points. An increase in HHI of 1000 points increases the bank debt to asset ratio by about one percentage point and decreases the ratio of capital from owners to assets by about the same amount.

The findings are strongest for the youngest firms in my sample. The evidence is consistent with models in which market power provides banks with implicit equity stakes in their borrowers, making banks more willing to begin lending relationships with borrowers whose projects are characterized by substantial asymmetric information or delayed payoffs. The evidence presented in this first essay is broadly similar to the findings of prior studies examining different time periods and countries.

In the second essay, I reconsider the distortionary impact that the U.S. corporate and personal tax systems may have on organizational form choices by firms. Previous research on tax distortions to organizational form choice has concluded or assumed that tax distortions to organizational form choice occur when firms choose to be pass-through (non-corporate) entities instead of pass-through (corporate) entities. Contrary to this previous research, I show that when project choice is endogenous and when one considers the non-linearity of the corporate tax schedule, it is not necessarily inefficient for a firm to choose to be a pass-through entity rather than a non-pass-through entity in response to differences in tax burdens between the two entity types. Because the tax functions faced by pass-through entities, which face tax at the personal level only, are typically less convex than the tax functions faced by non-pass-through, or corporate, entities, under certain project choice sets and tax brackets of the firm owners firms may actually choose to be corporate entities to exploit the graduated portion of the corporate tax schedule and implement projects with less extreme outcomes and with lower pre-tax returns, but with higher after-tax returns, than if they chose to be pass-through entities.

I provide empirical evidence that is consistent with this theoretical point by examining the behavior of a sample of S corporations (pass-through entities) and C corporations (non-pass-through entities) using the corporate tax return data. I find that the distribution of net income of S corporations is flatter than the distribution of net income of C corporations. Further, S corporations are more likely to have net income that exceeds the graduated

portion of the corporate tax schedule. S corporations have on average both larger losses, conditional on having losses, and higher net incomes than observationally equivalent C corporations. This is consistent with the theoretical point made in the first part of the essay.

The third essay is coauthored with Daniel Bergstresser and James Poterba. In this essay we use a panel dataset of mutual fund characteristics and returns from Morningstar, Inc. to develop measures of the effective capital gains tax burden mutual fund investors face on unrealized capital gains in mutual funds. A key concept in this exercise is the capital gains realization rate, or the ratio of capital gains realized to the stock of total capital gains of the fund, both realized and unrealized. The capital gains realization ratio can be thought of as the fund's propensity to realize a dollar of capital gains. We explore the determinants of the capital gains realization ratio for a sample of retail equity mutual funds and find that funds with high turnover and short manager tenure have higher capital gains realization ratios all else equal.

We find that funds with higher turnover rates had higher capital gains realization rates, Funds with new manager also had higher capital gains realization rates as new managers tend to shift investing strategies, resulting the sale of assets that had accrued gains. We also find that within funds there is substantial variation in capital gains realization ratios. This is particularly true when asset prices fluctuate greatly, as they did from 1999 to 2001, when the U.S. stock market experienced a massive decline in equity prices.

We also use the capital gains realization ratio to generate expected present-discounted values of the capital gains rate on unrealized capital gains. Mutual funds that have higher capital gains realization rates have higher effective capital gains tax rates on their unrealized capital gains. We use this effective capital gains tax rate to calculate a prospective tax burden and explore the impact of these prospective tax burden calculations on the net inflows of savings into the mutual funds. We compare the performance of the prospective tax burden measure with a tax burden measure which assumes a constant effective tax rate on unrealized capital gains of 10%. Fund with higher measures of both tax burden measures experienced lower inflows in 1993-1999; however, for the 1993-2001 period, we find strong effects only for the tax burden measure that assumes a constant effective tax rate of 10%. This poses a set of measurement and conceptual challenges for our prospective tax burden measure which will be addressed in future research.

Chapter 2

Does Bank Competition Affect How Much Firms Can Borrow? New Evidence from the U.S.

2.1 Introduction

Economic models provide divergent predictions about the effects of bank competition on the quantity and quality of credit extended to potential borrowers. Traditional models of competition, such as Klein (1971), predict that as fewer banks compete in a market they will charge higher interest rates on loans and pay lower interest rates on deposits, leading to a decrease in the equilibrium quantity of deposits and loans. On the other hand, starting with Stiglitz and Weiss (1981) models incorporating asymmetric information between lenders and borrowers have shown that credit rationing can be an equilibrium outcome in competitive lending markets. More recently, models such as Petersen and Rajan (1995) suggest that competition amongst banks may weaken lending relationships, leading to a decrease in the supply of bank credit to borrowers characterized by large informational asymmetries.

Because the effects of competition in the banking sector on the supply of credit are theoretically ambiguous and because bank regulators and firms seeking external financing are interested in knowing the size and sign of the effects, there is a need for empirical analysis of the impact that bank competition has on various populations of borrowers and depositors. Although theories about bank competition and lending apply to all borrowers,

this study focuses on one particular type of borrower - small firms - and explores the empirical relationship between bank competition and the amount and types of financing these firms use. I focus on small firms for three reasons.

First, theories such as Petersen and Rajan (1995) emphasize borrowers about whom little is known or whose projects are risky or difficult to evaluate. Small firms, especially newly created ones, are likely to be such borrowers. These firms often do not have established track records, which may make it difficult for banks to screen and monitor them. Second, because data are difficult to find, empirical research on small firms is limited despite the large number and economic significance of these firms. Small firms are typically privately-held and, therefore, not required by law to disclose financial information to the general public. Finally, examining the relationship between bank competition and the amount and type of financing small firms receive contributes to a second strand of empirical research that investigates the effects of financial market structure and development on economic growth. Studies which estimate the relationship between measures of financial market structure and economic growth often conclude that a statistically significant relationship between measures of the two variables is the result of financial market structure affecting the amount of financing obtained by firms, which in turn affects economic growth.[1] By estimating the relationship between bank competition and the types and amount of financing used by individual firms, I can evaluate this proposed link between financial market structure and growth in the context of the commercial bank credit market.

I employ a dataset of balance sheet and income information for a large panel of U.S. corporations maintained by the United States Internal Revenue Service which has not been used to examine issues of bank market structure and small firm finance before. I link the firms in this dataset to their local banking markets, defined at the metropolitan statistical area (MSA) level, using bank branch deposit data from the United States Federal Deposit Insurance Company (FDIC). I exploit variation in bank deposit concentration across banking markets and within banking markets over the period 1987-1998 to distinguish which theories about bank competition and lending are *on net* consistent with observed correla-

[1]For example, Rajan and Zingales (1998) find that GDP growth in industries classified as more dependent on external finance when young is higher when financial markets in a country are more developed. The authors interpret this as evidence that financial market development causes faster growth via more and/or better financing of these industries. In a follow-on study, Cetorelli and Gambera (2001) find that these same industries also grow faster if the banking market, defined on a national level, is more concentrated. The authors interpret this as evidence in support of the Petersen and Rajan (1995) model in which market power encourages banks to lend to informationally opaque firms.

tions between bank concentration and firms' balance sheets, controlling for firm and market characteristics.

My central findings are that, all else equal, an increase in bank market concentration is associated with an increase in firms' usage of outside debt and a decrease in firms' usage of the private savings of their owners to finance their activities. Estimates from the entire sample period indicate that an increase in bank concentration, as measured by the Hirschman-Herfindahl Index (HHI) of bank deposits, from the 25th percentile to the 75th percentile (a change of approximately 0.10 or 1000 HHI points) increases the likelihood a firm will have bank loans by about one percentage point and decreases the likelihood that it will borrow from its owners by about one percentage point. For a firm aged five years old or younger, an increase in bank concentration from the 25th percentile to the 75th percentile decreases the likelihood that it will borrow from its owners by two percentage points. An increase in bank concentration of 0.10 increases the bank debt to asset ratio by about one percentage point and decreases the ratio of capital from owners to assets by about the same amount.

Overall, my estimates suggest that having some market power over firms characterized by substantial informational asymmetries gives banks an incentive to develop lending relationships with these firms. Over the time period examined, such lending relationships appear to have increased the amount of bank financing these firms received and to have reduced the firms' reliance on the private savings of their owners, a plausibly more expensive form of financing for the firms than bank debt. Further research will explore whether the firms in more concentrated banking markets actually perform better than firms in less concentrated banking markets and whether the potential gains to small firms in more concentrated banking markets are greater or less than any offsetting losses to other borrowers and depositors in the same markets.

The remainder of this chapter is organized as follows. Section 2 discusses in more detail theories about the effects of bank competition on lending to small firms. Section 3 reviews the changes in U.S. state and federal banking regulations that occurred in the 1980s and 1990s and the correspondent changes in bank market structure. Section 4 describes the data used in the present study; section 5 presents the findings. Alternative explanations for these findings are considered in section 6. Finally, section 7 concludes and offers some directions for future research.

2.2 Theories of Bank Competition and Lending

Theories of why banks exist and extend loans take one of two forms: (1) banks are delegated monitors that reduce duplication of monitoring costs by multiple lenders to the same borrower;[2] and (2) banks provide liquidity to investors which is not available in exchange markets for other financing instruments. Versions of these two arguments are exposited in classic articles by Diamond (1984) and Diamond and Dybvig (1983). Once we take as given that banks exist as either liquidity providers or delegated monitors or both, we can then explore how the structure of the banking market may affect banks' willingness and ability to screen and monitor borrowers and, in turn, affect the amount of credit banks extend.

I assume that the firms considered in this study are choosing their capital structures from a combination of retained earnings, cash infusions of the owners, in the form of debt or equity, trade credit and bank debt. This is an important assumption because it removes the need to consider the effects of competition from other external finance markets, such as the bond market and the public equity market. Additionally, it is reasonable to assume that firms prefer bank credit to their owners' private savings or trade credit for external finance. Trade credit, when paid late, typically has higher interest charges than bank loans and borrowing money from the firms' owners can be undesirable due to the resulting lack of diversification in the owners' personal portfolios.

If a firm wishes to use debt to finance a project, it must decide whether to issue bonds to individual investors or to get a loan from a bank. The firm will presumably choose the method of financing that raises the needed amount of money at the lowest cost, taking into account transactions costs, informational costs, and the demand for different types of financing instruments by investors. Small firms are more likely to demand smaller amounts of external financing at a time and to be more "informationally opaque" than larger firms. Informationally opaque firms are firms about which little is known - e.g. new firms - or which are difficult to monitor. For such firms, bank loans are the likely to be less costly than issuing bonds, since a bond issuance may involve too many transactions costs for the amount of money needed to be raised and because the monitoring costs of individual bond

[2]There is a related justification for the existence of banks, or financial intermediaries, that has more to do with adverse selection than moral hazard. It is that if borrowers suffering from asymmetric information before contracting with investors form a coalition (i.e. get funding together from the same set of investors) and their project outcomes are independent, they can lower their (informational) cost of capital. See Leland and Pyle (1977) and Diamond (1984).

investors may be too high. Raising external finance either through an IPO or from venture capitalists is typically not an option for many small firms as it is likely to be too costly due to transactions costs and the lack of investors who are willing to screen and monitor the firms.

2.2.1 Traditional Theories of Bank Competition and Lending

Traditional theories of bank competition and lending invoke standard industrial organization models to predict what will happen to the equilibrium price and quantity of loans as the number of banks competing in a market increases. Klein (1971) presents a model in which banks choose the quantity of loans to "produce," given a downward sloping demand curve for loans and an upward sloping supply curve for deposits. Banks engage in Cournot competition with the standard result that, all else equal, as the number of banks in the market increases the greater is the equilibrium quantity of loans. Because it is more natural to think of banks as competing over prices rather than quantities, more recent models, such as Hannan (1991a), have modelled banks as engaging in double-sided Bertrand competition over deposits and loans. Typically these models incorporate product differentiation or transportation costs, so that each bank has some monopoly power over the borrowers located closest to it. These models do not usually explicitly incorporate informational asymmetries between borrowers and lenders, but do often have different categories of loans with different costs. A loan category having a higher cost can be interpreted as a loan requiring more hours and resources spent screening or monitoring the loan applicant before the bank is convinced of the borrower's prospects.

The theoretical literature has developed much more involved models than standard Bertrand or Cournot models by incorporating different types of borrowers and depositors and outside securities in which the bank can invest.[3] However, the basic flavor of the models remains the same. An increase in the number of banks competing over price for deposits and loans will lead to a decrease in interest rates charged on loans and the amount of deposits loaned out and an increase in the interest rate paid on deposits. The magnitude of these changes will depend on the degree of differentiation amongst the banks, the elasticities of demand for the different loan categories, and the value of the outside investment option for

[3]See in particular Freixas and Rochet (1997) for examples of and references to more detailed and realistic models.

the banks.

2.2.2 Theories of Bank Competition with Asymmetric Information

A second class of theories about bank competition and equilibrium lending and interest rates explicitly incorporates asymmetric information between borrowers and banks. These theories point out that, in the presence of adverse selection[4] or moral hazard[5], equilibrium lending to informationally opaque borrowers may actually decrease and the equilibrium interest rates charged to these borrowers may increase as bank competition increases. Petersen and Rajan (1995) present a model in which competition undermines relationships between banks and borrowers. If a bank does not know the quality of the firm applying for the loan or does not expect the lending relationship with the firm to be profitable until a few periods into the future, its decision about whether and how much to lend to the firm will depend on the bank's expected market power over the firm in the future periods. The bank's expected market power influences the likelihood the firm will stay with the bank and not refinance its loan with another bank offering better loan conditions. If the firm continues to borrow from the first bank, this allows the bank to extract future rents from the firm, affecting the banks incentives to lend to the firm ex ante. The following stylized model which captures the Petersen and Rajan effects of market power on whether credit extended to a firm.

A young firm has a project of unknown quality in the first period for which the firm needs I in external funds. The project will succeed with probability p, in which case it generates pre-interest profit of R. With probability $1-p$ the project fails and generates zero profits. If the project succeeds, there is a follow-on project requiring external finance of K and which yields a safe profit of S. Figure 2-1 depicts the timing of project financing.

Assume the firm has a project with positive net present value over the two periods; however, the first period project does not have a positive net present value. That is,

[4]Broecker (1990) shows that when price-competing banks independently perform imperfect tests to screen loan applicants, the equilibrium loan interest rate is increasing in the number of banks in the market, as the average credit-worthiness of applicants that pass the test with at least one bank is decreasing in the number of banks. Marquez (2002) presents a model in which information about borrowers becomes more dispersed as more banks compete, eroding banks ability to screen and leading to higher interest rates in equilibrium.

[5]Hoff and Stiglitz (1997) demonstrate that moral hazard problems may drive up interest rates as competition amongst banks increases. As the number of competing banks increases, information flows worsen, weakening borrowers' incentives to repay their debt, in turn leading to a rise in interest rates.

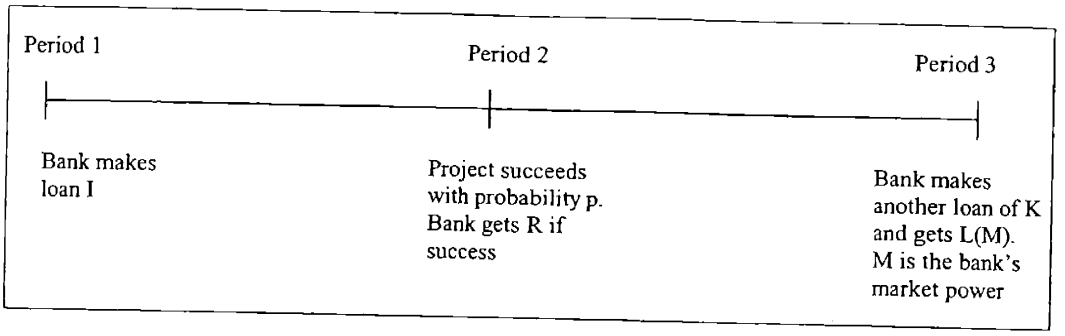

Figure 2-1: Timing of Project Financing

assuming no discount rate,

$$pR < I \tag{2.1}$$

$$p(R+S) > I+K \tag{2.2}$$

If the bank has monopoly power and expects to maintain its monopoly position in the next period, it will finance the initial project, assuming it is risk neutral. The bank simply extracts all of the rents from the firm being paid R if the firm is successful in the first period and S in the second period, leaving the firm just indifferent between seeking financing and not. Now suppose the bank has market share $M \in (0,1)$ of the firm's local banking market. If the bank invests in the first period project and the project succeeds, the most the bank can charge for the second period loan is $L(M) < S$, where $L'(M) > 0$ and $L(1) = S$ and $L(0) = K$. If the bank charges more than $L(M)$ the firm will go to a competing bank to finance the second period project. Assume that the bank can extract the full rent from the first period project $R - I$. The bank will only finance the firm in the first period if

$$p(R + L(M)) > I + K \tag{2.3}$$

Note there is some M^* such that $p(R + L(M^*)) = I + K$. For $M < M^*$, the bank will not make a loan to the firm in the first period and the firm will have to use the personal savings of its owners to finance the first period project or not undertake the project. Figure 2-2 depicts the bank's decision tree.

It is also possible to construct a model in which the bank must choose not only whether

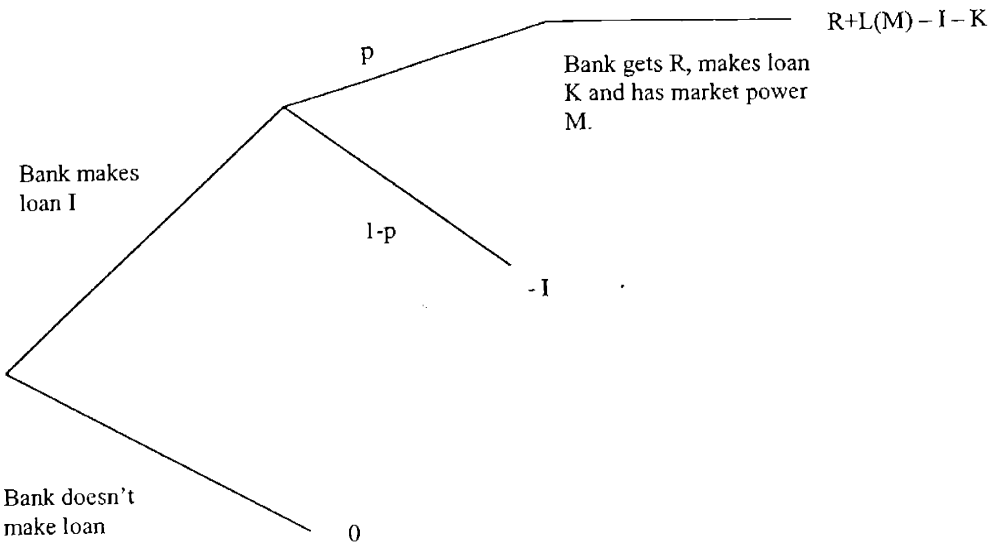

Figure 2-2: Bank's Decision Tree

to lend to the firm but also how much to lend. If the firm has two projects it wishes to finance, one of which yields a safe return to the bank the other which only yields a payoff after a second round of financing at the end of the second period, the bank may only finance the safe project. This would cause the amount the bank lends to the firm in the first period to be decreasing in the bank's market power M.

This simple model illustrates how competition between banks may create a disincentive to invest in learning about the quality of firms' projects or to invest in long-term projects which have delayed payoffs. An empirical prediction of the this model is, given firms with similar investment opportunities that are characterized by uncertainty or delayed payoff, the firm facing a banking market that is less competitive should have more bank debt than the firm in a more competitive banking market. A second empirical prediction is that the interest rate young firms pay on loans should start out lower but fall less over time in the less competitive banking market than in the more competitive banking market. The reason for this last prediction is that the higher interest rates paid later in life by a firm compensate the bank for the risk born at the start of the lending relationship.

Traditional industrial organization models and models of bank competition and asymmetric information provide differing views of the effects of bank competition on equilibrium

lending and interest rates, but they are not necessarily at odds with each other. Even if less competition among banks does strengthen relationships between banks and some borrowers, the total amount of lending to all categories of borrowers may decrease as bank competition decreases. Although banks may lend less as competition decreases, the composition of their lending may also shift. My empirical tests attempt to distinguish which theories best describe the lending markets for small firms in the U.S. from 1987 to 1998, but do not comment on the lending markets for other types of borrowers.

2.3 Deregulation of the U.S. Banking Sector During the 1980s and 1990s

Since the 1980s, the United States commercial banking sector has experienced major structural changes partly in response to state and federal legislation that eased restrictions on banks' abilities to branch within and across state borders. The end of these restrictions on bank expansion were welcomed by many as an end to inefficient protectionism by states which had become no longer viable in the wake of technological advances in the banking sector.

During the 1980s, individual states began relaxing restrictions on the ability of banks to branch within and across state lines. Prior to this wave of deregulation, states had restricted to various degrees how banks could expand, with some restrictions so severe as to limit banks to one branch each.[6] Both banks with state and national charters had to abide by the regulations of the states in which they were headquartered, as dictated by the McFadden Act of 1927. State laws also made interstate branching almost nonexistent.

All of this began to change in the late 1970s as banks faced increasing demands from their depositors for ATMs and branches farther away from home without high user fees. Further, the rise of alternative savings institutions threatened to steal away deposits and credit card business. One by one, states began to relax restrictions on bank expansion within their borders, with some states allowing intrastate branching only by mergers and acquisitions and others allowing both de novo branching and branching by M&A within their borders. Gradually, states also opened up their borders to banks headquartered in other states, though not unconditionally.[7] Once again, both national and state banks had

[6]Such states were called "unit banking" states.

[7]Maine was the first state to open its borders in 1978 to banks headquartered in other New England

to abide by the interstate banking regulations of their state headquarters as dictated by the 1956 Douglas Amendment to the Bank Holding Company Act.

By 1991, all states except Arkansas, Iowa and Minnesota allowed some type of intrastate branching, and all states except Hawaii, Kansas and Montana allowed some type of interstate banking.[8] Finally, in 1994 the United States Congress passed the Riegle-Neal Interstate Banking and Branching Efficiency Act, which for the first time took bank expansion regulatory powers from the states and transferred them to the federal government. The Riegle-Neal Act authorized interstate banking and branching across state lines regardless of states' laws regarding interstate banking. The act did, however, allow states to regulate intrastate branching once an out-of-state bank had crossed its borders. The act also allowed states to opt out of interstate branching (the ability of out-of-state banks to merge with banks or open new branches within a state) but states could not prevent out-of-state bank holding companies from acquiring banks in within their borders.[9]

These changes in state and federal bank regulations were coupled with a greater permissiveness by federal regulatory bodies such as the Federal Reserve Board and the Department of Justice in approving proposed bank mergers. In 1981, a U.S. Appeals Court ruled that the Federal Reserve needed to be more concrete in blocking proposed mergers than its previous claims of "potential anticompetitive effects." These changes combined with the regulatory reforms mentioned above lead to a spike in the number of bank mergers as banks expanded within and across state borders. Between year-end 1984 and March 31, 1996, the total number of bank holding companies and independent banks fell from 14,887 to 9,481.[10] This fall reflected the rise in mergers as well as a slowdown in new bank charters and a large number of insolvencies of banks started in the early 1980s.

At the same time that banks were becoming more consolidated, the easing of restrictions on bank expansion made banking markets more contestable since banks could now more easily enter new markets. The next section describes how banking market concentration changed towards the end of the period of state-by-state regulatory reform.

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states in the United States' first regional bank compact. Other states opened up their borders to other states on a case-by-case basis if given reciprocity.

[8]Minnesota allowed intrastate branching via M&A in 1993, and Arkansas allowed it in 1994. Kansas allowed interstate banking in 1992, and Montana allowed it in 1993.

[9]Only Montana and Texas chose to opt out of interstate branching under Riegle-Neal.

[10]See McCoy (2000).

2.3.1 How Much Did Bank Concentration Change between 1987 and 1998?

My measure of bank competition will be the Hirschman-Herfindahl Index (HHI) of bank deposits in an MSA.[11,12]

Table 2.1 summarizes bank deposit HHI for the 303 MSAs represented in my dataset. Panel A summarizes how bank deposit concentration varied within and between the MSAs. I summarize the data over two periods - the entire sample period 1987-1998, and the period before the enactment of the Riegle-Neal legislation 1987-1995.[13]

There is substantial variation in bank deposit HHI across MSAs. The average bank deposit HHI in an MSA from 1987 to 1995 was around 0.2 with a standard deviation of 0.07. Some MSAs had quite concentrated banking markets from 1987 to 1995, such as Pittsfield, MA (0.457). Other MSAs had very low bank deposit concentrations, such as Oklahoma City, OK (0.060). These differences in average HHI across MSAs are in part due to the historical accident coupled with the fact that entry was restricted since banking markets were only partially deregulated and in part due to differences in underlying economic conditions across MSAs.

Bank deposit HHI changed within MSAs over the sample period as well. From 1987 to 1995, some MSAs experienced substantial increases in HHI, such as Nashua, NH (0.179). Other MSAs experienced significant declines in HHI, such Tuscaloosa, AL (-0.257). On average, however, increases in HHI offset decreases from 1987 to 1995, and most MSAs did not experience very large changes. The changes observed within MSAs between 1987 and 1995 were due to a combination of intrastate bank mergers and de novo branching, bank failures, and the shifting of deposits between banks already in existence.

After passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act in 1994, there were greater changes in bank deposit HHI within MSAs. Many MSAs saw

[11]The Hirschman-Herfindahl Index (HHI) is calculated by summing the squared market shares of all the firms in the market. A market with just one firm would have an HHI of 1. A market approaching perfect competition would have an HHI approaching 0. In the case of the market for bank deposits, HHI is calculated as $\sum \left(\frac{Deposits_k}{\sum Deposits_k} \right)^2$, where $\sum Deposits_k$ is the sum of all the deposits in the MSA and where k indexes the banks having branches in the MSA.

[12]The advantages and disadvantages of using bank deposit HHI as a proxy for bank competition will be discussed in section 5. Future work will collect data on the number of banks operating in each MSA as an alternative measure of banking competition.

[13]Note that Riegle-Neal was enacted at the end of 1994, but my measures of HHI are taken from the beginning of the year. I, therefore, include 1995 as pre-Riegle-Neal.

spikes in their HHIs at the end of 1995 and also in 1997, when the act applied to all states and not just those that chose to "opt in" to interstate banking early in 1995 and 1996. Panel B in Table 2.1 depicts this fact. From 1987 to 1995, average bank deposit HHI remained fairly constant; then it jumped by about 0.05 in 1996 and remained at that level until 1998. This increase in average HHI in 1996 is caused by large jumps in HHI in a subset of MSAs. However, after HHI jumped in these MSAs, it did not necessarily remain at the higher level until 1998. Many MSAs had initial jumps in HHI in 1996, some as high as 0.1 and then by 1998 or 1999 HHI had fallen significantly, sometimes by as much as the jump in 1996. For example, Denver, Colorado had a jump in HHI from 0.135 in 1995 to 0.277 in 1996 after consistently low HHI from 1987 to 1995. Denver's HHI was 0.287 in 1997 and then jumped back down to 0.128 in 1998.

A key point to note is that, unlike in the period 1987 to 1995, increases in HHI post-Riegle-Neal appear to be of a more volatile and temporary nature. This raises the question of whether contemporaneous HHI from 1996-1998 is a good measure of market power since banks may expect not to retain their levels of market power in the following years. Even the increases in HHI in 1998 were often followed by significant declines in HHI in 1999 and 2000. The years 1987 to 1995 witnessed fewer drastic changes in MSA-level bank deposit HHI. Changes that did occur during this period tended to be of a more permanent nature. This is because by the late 1980s and early 1990s most of the states had partially deregulated, ushering in a period of relative stability before the passage of the Riegle-Neal Act, which again put banking markets into a state of flux.

Finally, Table 2.2 presents average bank concentrations and changes in bank concentrations for some larger MSAs. There is heterogeneity even across large MSAs in average HHI and changes in HHI. Some MSAs, such as San Francisco experienced jumps in bank concentration after Riegle-Neal. Others, such as Atlanta were relatively stable.

2.4 Evidence on the Effects of Bank Competition on Lending to Small Firms

Studies evaluating the traditional theories of bank competition have appeared mainly in the industrial organization literature. These studies test the structure-conduct-performance paradigm in the banking sector by estimating the relationship between measures of bank

market concentration and interest rates paid on deposits, interest rates charged on different loan categories, and bank profits. For example, Berger and Hannan (1989) find that interest rates paid on deposits in local banking markets decreases as bank deposit concentration in the market increases. Hannan (1991b) finds that commercial loan interest rates are higher in more concentrated banking markets.

Overall, these studies find evidence that increasing bank concentration is associated with increases in the equilibrium prices of some loan categories and decreases in equilibrium interest rate paid on deposits. However, these studies do not explicitly focus on loans to small firms, which are likely to be characterized by greater informational asymmetries than other types of borrowers. Studies which do are more often found in the "small firm finance" literature and can be classified according to where data are found.

2.4.1 U.S. Evidence

Evidence from the United States on the effects of bank competition on lending to small firms has come from three main data sources - the Federal Reserve's Survey of Small Business Finances (SBF), the consolidated Reports of Income and Condition (Call Reports), and the Federal Reserve's Survey of Terms of Bank Lending to Business (STBL).[14]

In cross-sectional evidence from the 1988 SBF, Petersen and Rajan (1995) find that firms in more highly concentrated bank markets, measured by three concentration categories, tend to have longer relationships with their banks, pay lower interest rates when young, and pay a smaller fraction of their trade credit late, all of which support the theory that competition harms relationships between banks and informationally opaque borrowers and may cause some firms to be credit-constrained. Jayaratne and Wolken (1999) use the 1993 SBF and find that small firms do not appear to be any less credit constrained, in terms of late payment of trade credit, or more likely to have a line of credit if there has been an increase in the fraction of small banks in the firms' local banking markets. However, Berger, Miller, Petersen, Rajan, and Stein (2002), also using the 1993 SBF, match firms with the individual banks from whom they most recently borrowed. The authors find that young firms that

[14]The SBF is a survey of several thousand private U.S. businesses, which are asked detailed questions about their methods of financing and the characteristics of their most recent loans. The survey is conducted every five years, but the same firms are not necessarily sampled each time. The Call Reports contain consolidated quarterly balance sheet and income information for U.S. commercial banks. Starting in 1993, the amount each bank lends to small businesses is reported in the Call Reports. The STBL contains more detailed contract information on a sample of bank loans to businesses and has been collected since the late 1970's. The STBL is typically only available to researchers inside the Federal Reserve system.

do not keep formal financial records are more likely to borrow from small banks, that small banks are more likely to communicate personally and have longer relationships with their borrowers, and that borrowers from small banks are less likely to pay their trade credit late. These last two papers do not comment directly on the effects of bank competition on lending to small firms, but do so indirectly if bank size is correlated with banking market concentration. For example, we may think that more concentrated banking markets have larger banks, though this is not necessarily true. I will further discuss this possibility in the section 7 when I consider alternative explanations for my empirical findings.

Black and Strahan (2002) use a panel of total incorporations in each U.S. state and regress log incorporations on state-wide measures of bank concentration and size during the period of state-by-state deregulation in the 1980s and early 1990s. They find a negative relationship between log incorporations and bank concentration and a positive relationship between log incorporations and bank size. They interpret their results as evidence that both bank competition and consolidation encourage the starting of new businesses, presumably because more bank credit is available to them. The authors do not, however, provide direct evidence that these new incorporations were financed primarily by bank debt.

Studies using the Call Reports and the STBL typically examine the broad lending behavior of banks. Some studies find that small banks tend to invest a higher proportion of their assets in small business loans than do large banks.[15] Other studies focus on the effects on bank's balance sheets after mergers and acquisitions. Dynamic analyses such as Peek and Rosengren (1998) and Strahan and Weston (1998) find that mergers between small banks tend to increase lending to small businesses but that mergers between large banks or between large and small banks have mixed effects on small business lending.[16]

In summary, evidence from the U.S. on the effects of bank competition on the supply of

[15]However, since by regulation banks cannot invest above a certain percentage of their assets in any one borrower, small banks may be lending to small businesses because they simply cannot lend to large businesses.

[16]Jayaratne and Strahan (1996) take a different approach, exploiting the different timing in bank branching deregulation across states to examine the growth of gross state product and personal income before and after state deregulation. They employ a differences-in-differences estimation strategy and find that states grew faster after banks in a state were allowed to branch within the state. They do not find state-wide increases in total lending after deregulation, but they do find that the statewide percentage of nonperforming loans falls after deregulation and interpret this as evidence that banks lend to better borrowers after deregulation. They suggest that competition in the banking industry allowed more efficient banks to take over, or threaten to take over, less efficient banks which in turn caused faster growth. The study, however, does not comment directly on the effects of bank competition on the financing and growth of informationally opaque firms. It is still possible that certain categories of borrowers suffered as a result of the changes in bank market structure.

credit to small firms has been mixed.

2.4.2 International Evidence

International data have also been used to investigate the relationship between bank market structure and the financing and growth of firms. Bonaccorsi di Patti and Dell'Ariccia (2001) examine firm births in a panel of Italian provinces and industrial sectors and find that the rate of firm births in industrial sectors characterized by more asymmetric information is higher when the banking market in the province is more concentrated. The authors classify sectors as characterized by greater asymmetric information if the ratio of physical assets to total assets is low.

Berger, Klapper, and Udell (2001) examine a dataset of Argentinian firms and find, using the size of firms as a proxy for informational opaqueness, that small firms receive fewer loans from large and foreign-owned banks and tend to lend money from just one bank. The authors interpret this as evidence in support of models in which relationship lending is important for small firms to obtain adequate financing. Sapienza (2002) examines loan contracts between Italian banks and firms before and after bank mergers. She finds loan interest rates decline after a merger if the resulting market share of the merging banks is not too high, but that small firms are often dropped from the merging banks loan portfolios.

In summary, studies using international data largely support theories in which bank market power and relationship lending increase the flow of capital to informationally opaque firms, though the evidence is still mixed.

2.4.3 Innovations in this Study

The present study is similar in approach to Petersen and Rajan (1995) since it examines the relationship between firm-level financial characteristics and the concentration of the banking markets in which firms are located. However, instead of having a cross-section of firms and a categorical variable for bank concentration, I have a 12-year panel of firms and a continuous measure of bank concentration. Having panel data allows me to estimate the relationship between MSA-level bank deposit concentration and the financial characteristics of firms using a variety of fixed-effects specifications that exploit to differing degrees the cross-sectional and time-series variation in bank concentration over the sample period. The panel data allows me to look at the effects of bank concentration before and after the passage

of the Riegle-Neal Act and to observe whether bank concentration seems to matter to the same degree over time.[17] Additionally, I know in which MSA each firm is located and can better control for MSA-level economic characteristics and fluctuations which may affect firms' demands for external financing.

2.5 Data

2.5.1 SOI Corporate Tax Files

The firm-level data used in this study are taken from the Statistics of Income (SOI) Corporate Tax Return Files maintained by the Internal Revenue Service.[18] The firms in the Corporate Tax Return Files are, as the database name suggests, corporations (both C and S corporations), but not partnerships, sole proprietorships, or limited liability companies choosing to be taxed as partnerships. The information contained in the SOI Corporate Tax Return Files is a subset of the information firms must report on Form 1120 and related schedules.[19] This information includes basic balance sheet and income statement information. The period over which I have this information is 1987-1998.[20]

It is possible to form an unbalanced panel of firms from the yearly SOI Corporate Tax Return Files. Each year SOI samples a cross-section of all the corporations filing tax returns in the U.S. Each annual cross-section is a stratified random sample. There is an oversampling of the larger corporations, in terms of both sales and assets, and a bias towards repeat sampling of firms.[21] The data are subject to potential survivorship bias, as firms disappear from the sample due to death, merger or a significant change in their sizes. In sections 5 and 6, I discuss how this potential bias may affect my estimates.

Just as firms disappear from the sample due to death, merger, or substantial change in their sizes, new firms are sampled each year, some of which are newly created firms and some of which had just not been previously sampled. My dataset follows firms from the

[17] Some have argued that bank concentration should become less important over time as banks have developed better information processing technology which allows them to more accurately screen loan prospects and mitigates adverse selection problems.

[18] The statistical analysis done in this chapter has been reviewed by the IRS to ensure that the identity of any single firm is not revealed in the tables or text.

[19] Examples of Form 1120 and related schedules for various years can be downloaded from the IRS website at http://www.irs.gov.

[20] Prior to 1987, the SOI electronic tax files are difficult to obtain and analyze.

[21] For a complete description of the SOI sampling procedure, see Section 3 of IRS Publication 16, various years.

year of their first appearance between 1987 and 1998 to the year of their last appearance.

I link the SOI data to bank market data from the Call Reports and the Federal Deposit Insurance Company's Summary of Deposits. The Summary of Deposits contains branch level deposit information for U.S. commercial banks. This data is used to create HHI of deposits by banking market, defined as a firm's MSA.[22,23] I use the zip code reported for a firm's headquarters to link the firm to a particular MSA.

The advantage of my dataset is that I observe basic balance sheet information for a large number of privately-held firms of various ages over time for whom bank debt is the most likely form of external financing. The disadvantage of the SOI dataset, compared to a dataset such as the SBF, is that it does not have detailed information about the interest rates charged on different loans; rather it just records the total amount of interest paid by the firm each year. Additionally, the SOI dataset records if a firm has bank debt and how much, but does not record from which bank or banks the firm is borrowing. As a result, I am limited to examining the effects of overall changes in the banking market on the firms in my sample. I select my sample to contain firms which, if they have bank debt, will plausibly have bank debt from banks with branches in the MSA in which the firm is headquartered.[24] The variables used in the empirical analysis are described in an appendix.

2.5.2 Sample Selection

I would like to estimate the relationship between banking market structure and the financing of young corporations whose financing options are likely to be the private savings of their owners, trade credit, or bank loans from banks in their MSAs. I, therefore, eliminate firms with access to banks outside their MSA and other types of capital markets, such as the public equity and bond markets or the internal capital markets of a parent or subsidiary company. I keep only nonconsolidated 1120, 1120A and 1120S tax returns of non-financial

[22] I thank Dan Bergstresser who generously provided the deposit HHI data by MSA.

[23] Following standard procedure in U.S. banking market studies, I use the MSA as the relevant definition of a banking market. The U.S. Office of Management and Budget defines MSAs according to published standards that are applied to Census Bureau data. An MSA includes counties which meet certain criteria, such containing a city with 50,000 or more inhabitants or having a significant fraction of the population working in the main MSA counties. See http://www.census.gov/population/www/estimates/aboutmetro.html for more information.

In non-MSA areas, the county is defined as the relevant banking market. However, since I only have bank concentration data for MSAs I do not consider firms in non-MSA counties.

[24] I further discuss the assumption that firms in my estimation sample borrow from banks in their own MSAs in section 5.4.

firms for each year. I do not include consolidated 1120 tax returns because these are the returns of conglomerate firms whose financing positions are likely very different from those of stand-alone firms. I combine the twelve cross-sections of tax returns, keeping firms for which there are at least two years of data, for a total of 406,860 firm-year observations. I then eliminate firms according to the following criteria:

- the firm is not located in an MSA, as I only have bank concentration data for MSAs. I keep only firms located in MSAs that are defined for the entire sample period 1987-1998.[25] This eliminates 104,069 firm-years;
- the firm reports having a parent or is part of a controlled group, indicating that it has access to internal capital markets to which stand-alone firms do not.[26] This eliminates 63,965 firm-years;
- the firm is a foreign corporation or reports having a foreign owner who holds more than 25% of the corporation's stock, indicating that the firm might have access to capital markets outside of the local banking market where it is headquartered. This eliminates 32,123 firm-years;
- the firm can be matched to COMPUSTAT, indicating that it has access to public equity markets. I also eliminate firms that file form 1120 and do not report number of shareholders.[27] These firms are likely to have a large number of shareholders and perhaps also be publicly-traded. This eliminates 19,874 firm-years;
- the firm has a total debt-to-asset ratio greater than 2 for any year in which it is in the dataset. This eliminates firms with extremely large levels of debt relative to assets. In most cases, these firms have high debt-to-asset ratios because they report little assets. This eliminates 402 firm-years.

I combine the remaining firm-years into one dataset, which forms an unbalanced panel from 1987-1998. My final sample contains 186,427 firm-years representing 30,301 firms.

[25] MSAs change over time; some are introduced, some die off as the characteristics of their component counties change. I include only MSAs that are defined over the entire sample period.

[26] A controlled group is defined as (1) a parent corporation and its 80 percent owned subsidiaries or (2) two or more corporations at least 80 percent owned by five or fewer noncorporate shareholders, who collectively own more than 50 percent of the stock of each corporation. Being part of a controlled group might give a firm access to internal capital markets through for example tunnelling.

[27] Firms filing form 1120 are required to report their number of shareholders if the number is less than or equal to the threshold for S corporation status (35 shareholders prior to 1997 and 75 after 1997).

Table 2.3 contains the distribution of firms by number of observations and by year. Over time SOI sampled more and more firms which partially explains the increasing number of firms observed each year. My final estimation samples are slightly different from the numbers reported in Table 2.3 since using lagged variables will eliminate observations and some firms are also missing contemporaneous variables used in the regressions.

2.5.3 Firm-Level Descriptive Statistics

Table 2.4 presents descriptive statistics for the tax return sample of firms, pooling observations across all years. The firms are small, having median total assets of approximately $1 million, and with some firms having only several thousand dollars in total assets. Sales, another measure of firm size, are also small, with a pooled median of approximately $2 million. The firms are closely-held, with the median firm having just two shareholders. These statistics support the assumption that I have selected small privately-held firms that are unlikely to have access to other types of external capital markets, other than the bank credit market, trade credit, and the savings of their owners.

Bank debt is an important means of finance for these firms. Approximately 70% of the observations are for firms with some bank debt. The pooled average ratio of bank debt to assets is 0.264, larger than the pooled average ratio of loans from stockholders to assets or the pooled average ratio of trade credit to assets.[28] However, these other two forms of finance are not insignificant. Approximately 36% of the observations are for firms with some loans from their stockholders and approximately 76% of the observations are for firms that use some trade credit.

Although the firms in the tax return sample are small, they appear to be engaged in real economic activity in a variety of industries. About 20% of the observations are for firms operating in the manufacturing sector, 20% for firms operating in the services sector, and another 40% for firms operating in the wholesale and retail trade sectors. The average ratio of tangible assets (property, plant, and equipment, land, and inventory) to assets is almost 0.50.

Table 2.5 divides the sample by age and presents means and standard deviations for some key variables. Firms in the youngest age category, those aged 0 to 5, are the smallest firms both in terms of assets and sales. Assets and sales increase monotonically with age.

[28]Trade credit is defined as accounts payable.

The youngest firms are also the most highly leveraged. The ratio of bank debt to assets for these firms is 0.319 versus 0.220 for firms over 20 years old. The mean ratio of loans from stockholders to assets is 0.151 for the youngest category of firms versus only 0.043 for the oldest category of firms. There is a monotonic decline in the ratio of loans from stockholders to assets as firms age, indicating that in the early stages of a firm's life it depends more on the private savings of its owners to finance investment and production. There is also a monotonic decline in the ratio of bank debt to assets from the youngest to oldest firms, though less of a decline in percentage terms than for the ratio of borrowing from the firms' stockholders to assets. These statistics indicate that as firms age they turn to other forms of finance, for example retained earnings.

The ratio of trade credit to assets does not appear negatively correlated with age. Because trade credit can serve multiple purposes, such as smoothing transactions costs as well as serving as a form of credit, it is likely that some of the trade credit usage we observe is due to industry-specific and technological needs and not due to the firm being unable to obtain external financing elsewhere.[29] Controlling for industry in the regression analysis may help control for these other reasons for using trade credit.

Both young and old firms are evenly distributed throughout the U.S., with slightly more young firms in the West and South and slightly more old firms in the Northeast and the Midwest. Older firms are more concentrated in the manufacturing and wholesale trade industries while younger firms are more concentrated in retail trade and services. There are, however, firms of all ages in all industries.

2.6 Empirical Findings

2.6.1 Bank Concentration and the Probability Firms Receive Financing

I first investigate whether bank concentration affects the probability a firm has a bank loan and the probability that it borrowers from its owners or has trade credit from its suppliers. I estimate probit models of the following form. Index k represents the type of debt - outside debt, loans from stockholders, and trade credit.

$$\Pr(Debt_{k,i,t} > 0) = \Phi(\alpha_{0k} + \alpha_{1k} HHI_{MSA,t} + \alpha_{2k}^{j} Age_{i,t}^{j} + \alpha_{3k} X_{i,t}) \qquad (2.4)$$

[29] Unfortunately, I do not observe whether a firm pays its trade credit late, which is often used in the small firm finance literature as a proxy for credit-constrainedness.

$$\Pr(Debt_{k,i,t} > 0) = \Phi(\beta_{0k} + \beta_{1k} HHI_{MSA,t} + \beta^j_{2k} Age^j_{i,t} + \beta^j_{3k} HHI_{MSA,t} \cdot Age^j_{i,t} + \beta_{4k} X_{i,t}) \quad (2.5)$$

The equations are estimated using maximum-likelihood allowing for an arbitrary variance-covariance matrix for firms in the same MSA. Clustering standard errors at the MSA-level, rather than the firm-level, is necessary because variation in the bank HHI variable is MSA-level variation. Clustering at the MSA-level allows for MSA-specific shocks that may cause firms within MSAs to have correlated error terms, both contemporaneously and over time.

Traditional structure-conduct-performance models of bank competition would predict that $\alpha_1 < 0$ for the regression in which bank debt is in the dependent variable. Other models suggesting market power gives banks an incentive to extend credit to firms they would otherwise not in a more competitive market would predict $\alpha_1 > 0$. Table 2.6(a) estimates the effect of bank concentration on the probability that a firm has some bank debt, using different combinations of fixed effects and control variables. Derivative effects at the sample means are reported. Column (1) includes no fixed effects or control variables; column (2) includes only year fixed effects. In Column (1), the coefficient on HHI is identified from both cross-sectional and time-series variation in HHI. In Column (2), identification of the coefficient on HHI comes from both cross-sectional and time series variation in HHI, but aggregate year effects on the fraction of firms having bank debt are taken out. Controlling for year effects more than doubles the coefficient on HHI; it is clearly important to control for cyclicality in the fraction of firms that lend from banks.

Columns (3) and (4) control for the industry and other firm characteristics and MSA economic characteristics. Identification of the coefficient on HHI still comes from both cross sectional and time series variation in HHI, but level effects of industry and firm characteristics, such as age and size, are taken out. Column (3) adds 3-digit SIC code fixed effects. Column (4) controls for firm characteristics - age, size, number of shareholders, tax status, and fraction of tangible and liquid assets out of total assets - as well as MSA-level economics activity by including 6 lags of both MSA-level employment growth and real personal income growth. Also included in the Column (4) is log of total bank deposits in the MSA. This variables controls for the overall size of the banking market. Including just industry fixed effects lowers the coefficient on HHI, as we might expect since certain

industries may be more prevalent in more concentrated banking markets, but the coefficient is still significant. The size of the banking market is negatively correlated with the HHI of the banking market. Including the size of the banking market in Column (4), significantly lowers the coefficient on HHI, as firms in larger banking markets are less likely to have bank debt. The coefficient on HHI is still positive but is now statistically insignificant.

Column (5) includes nine census division fixed effects and interactions of the census division fixed effects with the year fixed effects in addition to all the covariates included in Column (4). Now identification of the coefficient on HHI comes from variation in HHI across MSAs only within the same census division and variation in HHI within MSAs over time. The census division-year fixed effect interactions remove aggregate cyclical movements in debt which may vary across census divisions over time. Including this set of fixed effects increases the coefficient on HHI and the estimate is again statistically significant at the 5% level. It appears that controlling for census division cyclicality in bank debt is important. When I include MSA fixed effects, instead of census division fixed effects, in Column (6) identification comes from within MSA variation in the bank deposit HHI. Again, in Column (6) the coefficient on HHI is positive and statistically significant at the 5% level.

The estimates in Columns (1)-(6) in Table 2.6(a) are broadly similar. With the exception of Column (4), all estimates are statistically significant. The estimated coefficient in column (5) indicates that an increase in bank deposit HHI of 0.10, approximately one standard deviation, increases the probability that a firm will have a bank loan by almost one percentage point. At the sample mean this would mean an increase in the percentage of firms that borrowed from firm from 70% to 71%.

Table 2.6(b) presents probit estimates analogous to those in Table 2.6(a), but where the dependent variable is an indicator for whether the firm borrows from its owners. Now, the estimated coefficient on HHI is negative and statistically significant and robust to a variety of controls and fixed effects. The estimated coefficient in Column (5) predicts that if bank deposit HHI increases by 0.10 the probability that a firm borrows from its owners declines by almost 1 percentage point. At the sample mean, my estimates imply that the percentage of firms borrowing from their owners would decline from 36% to 35%. The slightly larger coefficients (in absolute value) estimated in Table 2.6(b) than those in Table 2.6(a) indicate that some firms receive bank debt, but perhaps not enough and are therefore forced to borrow from their owners to make up the difference. But overall, it seems that

in less concentrated banking markets, firms are making up for the fact that they do not receive bank financing by borrowing funds from their owners.

Table 2.7 reports the estimated coefficients for the firm-level control variables in the specification estimated in Column (5) of Tables 2.6(a) and 2.6(b), as well as specifications in which bank deposit HHI is interacted with firm age categories. While there is no statistically significant difference in the probability that younger firms will receive bank financing in more concentrated banking markets, there is a statistically significant increase in the probability that firms 5 years old or younger will not borrow from their owners in more concentrated banking markets. An increase in bank deposit HHI of 0.10 decreases the probability that a firm 5 years old or younger will borrow from its owners by a bit over 2 percentage points, from 44% to 42%.

I also report the results of probits in which the dependent variable is and indicator for whether a firm has trade credit, or accounts payable. There is no significant effect on trade credit usage for all firms nor for the youngest firms as bank concentration increases. It seems since I do not observe late paid trade credit, but only trade credit, that most firms using trade credit in my sample are using it not because they are credit constrained but because they are in industries where it is common to engage in trade credit. Therefore, my measure of trade credit used as a substitute for bank debt will be noisy.

Overall the results in Tables 2.6 and 2.7 suggest that increases in bank deposit HHI are associated with a significant increase in the likelihood that small, privately-held firms will use bank debt and a significant decrease in the likelihood that they will use loans from owners to finance investment, though the magnitude of these effects is not large. The negative effect of bank concentration on the probability that firms aged 0 to 5 borrow from their owners is, however, larger. This evidence is consistent with models in which possessing market power encourages banks to lend to firms characterized by greater asymmetric information. It is plausible that firms younger than 5 years are characterized by much greater informational asymmetries and are, therefore, more affected by local bank market structure.

Finally, Tables 2.6 and 2.7 also reveal some broad determinants of small, privately-held firms' capital structures. The larger the firm, the more bank debt it is likely to have and the less likely it is to borrow from its owners. Controlling for size, the younger a firm the more likely it is to borrow from a bank and from its owners. The more shareholders a firm has the less bank debt it will have, presumably because there is more equity financing

available for the firm. There is also evidence that S corporations, because they are not subject to the corporate level tax, have less of an incentive to take on debt for purposes of shielding corporate income from taxation and are, therefore, less likely to have bank debt.

2.6.2 Bank Concentration and the Amount of Financing Firms Receive

I next investigate whether firms in more concentrated banking markets have more bank debt and/or borrow less from their owners than firms in less concentrated banking markets. I first examine the sensitivity of firms' debt-to-asset ratios to changes in bank deposit HHI by estimating equations of the following form:

$$\frac{Debt_{k,i,t}}{Assets_{i,t}} = \alpha_{0k} + \alpha_{1k} HHI_{MSA,t} + \alpha_{2k}^{j} Age_{i,t}^{j} + \alpha_{3k} X_{i,t} + \varepsilon_{i,t} \quad (2.6)$$

$$\frac{Debt_{k,i,t}}{Assets_{i,t}} = \beta_{0k} + \beta_{1k} HHI_{MSA,t} + \beta_{2k}^{j} Age_{i,t}^{j} + \beta_{3k}^{j} HHI_{MSA,t} \cdot Age_{i,t}^{j} + \beta_{4k} X_{i,t} + \eta_{i,t} \quad (2.7)$$

I estimate equations (2.6) and (2.7) using Tobit estimation. Tobit corrects for left-censoring of the debt-to-asset ratios at zero by making distributional assumptions on the dependent variable (i.e. normality) and uses maximum likelihood to estimate the coefficients.

Tables 2.8(a) and 2.8(b) report estimates of equation (2.6). Columns (1)-(6) in Tables 2.8(a) and 2.8(b) correspond to Columns (1)-(6) in Tables 2.6(a) and 2.6(b), and identification of the coefficient on HHI comes from the same sources of variation as described in the previous subsection. In addition, Column (7) adds a specification with firm fixed effects. Here, identification of the coefficient on HHI comes from deviations from firm-specific mean debt-to-asset ratios, rather than MSA-specific mean debt-to-asset ratios, as in Column (6). The firm fixed effects specification eliminates variation in debt-to-asset ratios that arises from different types of firms entering or leaving the sample from year-to-year as HHI changes. The disadvantage of the firm fixed effects specification is that it does not exploit cross-sectional variation in HHI.[30]

The estimated coefficients on bank deposit HHI in Table 2.8(a) are positive and statistically significant, though not economically large. The estimates indicate that an increase in bank deposit HHI of 0.10 raises the bank debt-to-asset ratio by about 0.005. At the depen-

[30]This is a disadvantage to the extent that we think that cross-sectional variation is more due to different degrees of deregulation. I do not include a firm fixed effects specification in the probit estimates of the previous subsection because very few firms switch from having debt to not having debt and vice versa.

dent variable sample mean, such an increase in HHI would increase the bank debt-to-asset ratio from 0.264 to 0.269.

The dependent variable in Table 2.8(b) is the sum of loans from owners plus equity divided by total book value of assets. The estimated coefficients show that increases in bank deposit HHI clearly have a negative effect on the ratio of loans from owners and equity to total assets, however. The estimates in Columns (1) and (2) imply that an increase in bank deposit HHI of 0.10 leads to a decrease in the ratio of loans from owners to assets of around 0.002. The Tobit estimates in Column (7) (firm fixed effects) are marginally significant and imply that an increase in HHI of 0.10 would lower the ratio of loans from owners to assets by 0.002. The estimates in Tables 2.8(a) and 2.8(b) suggest that firms are substituting the private savings of their owners for bank debt to finance investment in less concentrated banking markets.

Table 2.9 interacts bank deposit HHI with the different age categories and reports Tobit estimates for the specification in Column (5). An increase in HHI lowers the dependence of the youngest firms on the savings of their owners much more so than it does for the older firms and increases their dependence on outside (bank) finance. An increase in HHI of 0.10 decreases the ratio of loans from owners to assets by half a percentage points for firms aged 0 to 5 years.[31] This would lower the average ratio of loans from owners to assets for these firms from 0.15 to 0.145.

If we believe that borrowing from owners to finance investment is more expensive for the firms than financing investment with bank debt, then we can interpret increases of this form of financing relative to bank debt as evidence that firms are more credit constrained.[32] We may think that borrowing from owners is less attractive to firms because owners would rather have their private savings held in more diversified portfolios. Owners of small firms

[31]The null hypothesis that the sum of the coefficient on HHI and the coefficient on HHI*Age0-5 is zero is rejected at the 95% confidence level.

[32]A firm is credit constrained if it wishes to borrow at the market lending rate, but is denied by the credit supplier. There is a large and divided literature on how to measure and statistically test for credit constraints. One commonly used measure is a firm's investment-cashflow sensitivity, first explored by Fazzari, Hubbard, and Petersen (1988) and most recently challenged by Kaplan and Zingales (2000). The main criticism of this measure is that cashflow is correlated with investment opportunities which also affect desired investment levels. Therefore, an positive investment-cashflow sensitivity may be driven by a variations in investment opportunities and not by credit constraints. Another measure of credit constrainedness is whether a firm uses a form of finance which is considered more expensive than the credit which the firm is presumably denied. The argument is that if the firm were not credit constrained it would not use the more expensive form of credit and instead use the cheaper form of credit. Often late-paid trade credit is a measure of credit constrainedness, as in Petersen and Rajan (1995).

often derive labor income from the firms. Investing too much in the firm might expose the owners' personal portfolios to too much idiosyncratic risk.

2.6.3 Bank Concentration Before and After Riegle-Neal

In section 2, I described how the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act removed many of the barriers to interstate banking and branching. As a result, banking markets may have become more contestable after the passage of the Act. Additionally, I described how many banking markets experienced often temporary spikes in their HHIs just after the Act was passed. Greater contestability of banking markets coupled with the fact that banks may have expected current market power to be temporary in first few years after the act may cause bank deposit HHI to be a poorer proxy for bank market power post-Riegle-Neal.

To test the hypothesis, I estimate the impact of bank deposit HHI before and after the passage of the Riegle-Neal Act.

$$Y_{i,t} = \alpha_0 + \alpha_1 HHI_{MSA,t} + \alpha_2 HHI_{MSA,t} \cdot PostRN_t + \alpha_3 PostRN_t + \alpha_2 X_{i,t} + \epsilon_{i,t} \quad (2.8)$$

PostRN is a dummy variable equal to 0 for the years 1987 to 1995 and equal to 1 for the years 1996 to 1998. Table 2.10 presents Probit and Tobit estimates of equation (2.6) for the set of dependent variables considered in the previous subsections, with industry, census division, and census division-year interaction fixed effects. It is indeed the case that HHI has a much stronger effect on the dependent variables in the pre-Riegle-Neale period. Looking at the coefficient on HHI before the passage of Riegle-Neal, an increase in bank deposit HHI of 0.15 increases the bank debt-to-asset ratio by around 0.01 and decreases the ratio of loans from owners plus equity to assets by about the same amount.

There are two ways to interpret the estimates reported in Table 2.10. The first is to say that bank market power is still provides an important incentive to banks to form lending relationships with informationally opaque borrowers, but that bank deposit HHI is just no longer a good measure of bank market power. The second interpretation is that the theories such as Petersen and Rajan (1995) are becoming less important in more recent times because banks are better able to screen and monitor borrowers in part due to better

information technology and credit scoring models.[33] The resolution of these competing interpretations of Table 2.10 is beyond the scope of the present study.

2.6.4 Issues with the Empirical Analysis

There a several challenges associated with the empirical analysis in this chapter. The first challenge is finding an appropriate metric for bank market competition. The degree of competition in the market for commercial bank loans may depend on a variety of factors, including the number of banks, technological differences amongst banks, the degree of differentiation amongst banks, and the contestability of the market for commercial loans. My measure of the degree of competition amongst banks in the commercial loan market in each MSA is bank deposit HHI. Bank deposit HHI measures how concentrated bank deposits in an MSA are amongst the banks having branches in that MSA. An identifying assumption, therefore, is that bank deposit HHI is negatively correlated with the degree of bank competition in lending to firms in an MSA. This seems a fairly reasonable assumption. The more deposits in an MSA a particular bank has, the more funds it has, relative to its competitors, to lend to firms in that MSA. There are, however, some scenarios in which an increase in bank deposit concentration may not necessarily correspond with a decrease in the degree of competition amongst banks in the commercial loan market.

For example, if the market for commercial loans is contestable then the threat of entry by another bank would still be competition for the bank which has increased its share of deposits amongst the banks already in the market. If this is the case, then changes in bank deposit HHI will not be as strongly negatively correlated with the competitiveness of the commercial loan market, if at all. Unfortunately, I have no way of controlling for the contestability of the banking markets in my sample. However, if the commercial loan market, particularly the commercial loan market for privately-held firms, is perfectly contestable, then I will observe no relationship between changes in bank deposit HHI and my dependent variables of interest. Therefore, market contestability is not a concern if we do observe a significant relationship between bank deposit HHI and the dependent variables.[34]

A second concern with using MSA-level bank deposit HHI as a measure of competition in

[33] See Petersen and Rajan (2002) and Amel and Starr-McCluer (2002) for opposing views on this matter.

[34] There is still the concern that if we do observe a significant relationship between bank deposit HHI and the dependent variable that this may be due to omitted variables correlated with HHI. This is a separate concern and will be discussed later on in this section.

the commercial loan market is that banks may face competition from other credit suppliers besides banks with branches in the same MSA - e.g. banks in other MSAs or public bond markets - in providing loans to the firms in my sample. Or we may think that the correct market for some firms is in fact smaller than the MSA. I have tried to eliminate the possibility of competition from non-bank credit suppliers by eliminating firms currently accessing public capital markets.[35] However, there still may be a concern that the MSA is not the correct market for bank loans for some of the firms in my sample. Because MSAs are urban areas, including a major city or cities and the counties in which a significant fraction of people living there commute to the city for work, it is reasonable to assume that banks having branches in the MSA are potential lenders to firms in that MSA as most banks will have branches in the city and in the suburbs if their customers are moving back and forth between them. Further, evidence from the SBF suggest that the banking markets for firms such as those in my sample are very local. Over half of firms are within two miles of their primary lending institution, and ninety percent are with fifteen miles.[36]

However, it is still possible that some of the firms may be able borrow from banks outside the MSA or only a subset of the banks in the MSA. For these firms, changes in MSA-level bank deposit HHI may be poor proxies for the true amount of choice they have amongst potential bank lenders. This again, will bias my analysis towards finding no effect of bank deposit HHI on the capital structures or growths of the firms in my sample.

Finally, it is possible to argue that I should use MSA-level bank asset HHI, instead of bank deposit HHI, as the measure of competition in the commercial loan market. Bank asset HHI would give a measure of the degree of concentration of all bank assets in the MSA, including deposits as well as other claims on the banks such as equity and other debt which can be lent to firms. However, there are practical problems with calculating this MSA-level bank asset HHI. While the FDIC's Summary of Deposits reports deposits of banks by MSA, publicly available balance sheets of U.S. banks are consolidated. If a bank has branches in more than one MSA, it is difficult to establish which of its assets should be allocated to one MSA versus another. I, therefore, use MSA-level bank deposit HHI as my best measure of the competitiveness of the loan market each firm in my sample faces.

[35]There is still the possibility, however, that even though a firm is not currently getting capital from the public markets that it might do so if the cost of bank borrowing becomes too high.

[36]Petersen and Rajan (1995) discuss the validity of using MSA level bank deposit HHI as a proxy for bank competition.

A second challenge in estimating the relationship between bank competition and the capital structures of firms is controlling for other factors correlated with bank deposit HHI that may also affect the amount and type of debt a firm has. Not properly controlling for these factors could lead to omitted variables bias in the estimated relationships between bank concentration and the dependent variables. There may be cross-sectional differences between firms which cause them to have different demands for debt or abilities to acquire debt; additionally, there may be changes over time within the same firm which affect its willingness or ability to finance investment with debt. Omitted variables bias, like endogeneity bias, can be avoided if one has an instrument which is correlated with HHI but which is uncorrelated with the omitted variable. For now, I adopt the strategy of including controls for possible alternative variables which may influence variation in the dependent variables.[37]

I control for cross-sectional differences amongst firms using information from the SOI dataset, including the firm's primary 3-digit SIC code, firm age, firm size (measured by the natural logarithm of total book assets), and the number of shareholders. Firms in different industries, by the nature of the investments they undertake and their production technologies, may have different needs for external finance. Firms of different ages may also have different needs for external finance. Finally, the more shareholders a firm has, the likely larger is the pool of personal savings from which the firm may borrow to finance investment.

Firms may increase their debt to shield their income from the corporate income tax, as interest payments on debt are tax deductible. I include a dummy variable equal to one if the firm is an S corporation and therefore pays only personal tax on its income. We should expect S corporations to have less of a need for tax debt shields because they do not pay corporate tax on their income.

Firms' debt ratios may also differ because they face different investment opportunities. If two firms are otherwise identical, but one of which is in a market with a great investment opportunity, the firm with the investment opportunity is likely to have more debt to finance the investment. I control for MSA-specific investment opportunities using current and six lags of MSA-level real personal income growth and employment growth.[38] I also control

[37]In future work, I will explore the use of bank mergers and/or failures as instruments for bank deposit HHI.

[38]These data were obtained from the U.S. Department of Commerce Bureau of Economic Analysis.

for the level of funds available to invest in the firms by including the natural logarithm of total bank deposits in the MSA. Further, I control for industry and region specific investment opportunity and demand differences using different combinations of 3-digit SIC code dummies, year dummies, MSA dummies, firm dummies, and year-census division interactions.

2.7 Alternative Explanations

2.7.1 Bank Size or Bank Concentration?

It is possible that MSA-level bank deposit HHI proxies for the size of banks in the MSA, rather than the market power of the banks in the MSA. If smaller MSAs have more concentrated banking markets because there are fewer deposits to spread amongst banks, it is possible that bank concentration is negatively correlated with bank size. Likewise, it may be the case that bank deposit HHI is positively correlated with bank size if banks with a lot of market power are also larger banks.

Just as there are conflicting theoretical predictions about the effects of bank competition on lending, there are conflicting theoretical predictions about the effects of bank size and consolidation on the quantity and price of lending to informationally opaque firms. One set of theories suggests that as banks gain more deposits they are better able to diversify their loan portfolios, which makes them more willing to lend to riskier borrowers. Diamond (1984) formalizes this in a model in which the bank becomes more transparent to the depositors as the bank's loan portfolio becomes more diversified.

Another set of theories about bank size and lending to informationally opaque firms involves a purported information processing diseconomies of scale in banks. The main idea behind this type of theory is that as banks become larger, with more layers of management, it is difficult for local loan officers to communicate "soft" information to their superiors, who allocate capital to regional offices. This idea is most recently formalized in Stein (2002). Loan officers may observe information about prospective borrowers, such as whether they seem trustworthy, but cannot easily "harden" this information and communicate it to those allocating capital to loans. Because those making loan decisions in small banks are those observing "soft" information about the borrower, small banks are better able to distinguish good loan prospects from bad ones. Small banks have better technology in processing and

acting on soft information and, therefore, lower costs of screening and monitoring borrowers that have little reliable "hard" information.

I reestimated the equations above including controls for bank size. I define four bank asset categories - banks having less than $50 million in assets, banks having between $50 and $100 million in assets, banks having between $100 and $300 million in assets, and banks having greater than $300 million in assets.[39]

I construct measures of bank size using the Call Reports, which only report consolidated bank information. Therefore, I cannot distinguish the total amount of assets held by banks with branches in a particular MSA. Thus my measure of small bank presence in the local banking market may be overstated if I am not accounting for large banks that are not headquartered in the MSA but do have branches there; my measure of small bank presence in the local banking market may be understated if I am not accounting for small banks that are not headquartered in the MSA but have branches there.

Re-estimation including the bank size variable does not qualitatively alter the coefficients on HHI. In fact, in many cases the size and significant of the coefficient on HHI increases when a measure of bank size is included in the regressions. However, because my measures of bank size may be noisy, I cannot completely rule out the explanation that bank HHI is proxying for bank size.

2.7.2 Price versus Quantity of Loans?

Because I am using balance sheet data in my construction of debt-to-asset ratios and debt levels, it is possible to argue that an observed increase in either may be because interest rates on loans have risen as a result of bank market power rather than that quantities of loans have risen. If this were the case, however, we should not expect to see reductions in borrowing from owners. In particular, if increases in bank HHI lead to much higher interest payments for firms we should in fact expect to see firms in more concentrated markets borrowing more from their owners. However, we observe the reverse.

Unfortunately, I cannot conduct a more direct test of this alternative explanation as I can only construct a measure of the average interest rate, by dividing interest payments by some measure of debt. Additionally, I only have information on interest paid for all firms beginning in 1993. Running regressions with Interest Paid/(Bank Debt+Owner Loans) as

[39]Dollars are constant 1993 dollars.

the dependent variable for the period 1993-1998 leads to an small, positive, but insignificant coefficient on bank deposit HHI.

2.7.3 The Impact of the Community Reinvestment Act

Starting in 1993, the Community Reinvestment Act, which requires that all banks involved in a proposed merger pass certain low- to moderate-income small business lending tests, began to be more vigorously enforced. If banks in more concentrated banking markets are more likely to be involved in or expect to be involved in mergers, then the increased bank lending I observe may be due to the Community Reinvestment Act and not evidence of a model in which market power encourages the formation of lending relationships. However, there is no reason to expect CRA to differentially impact young versus old firms in low to moderate income areas, but such a differential impact is consistent with theories of bank market power and lending relationships.

2.7.4 Bank Market Power or Bank Efficiency?

It is possible that bank concentration proxies for the relative efficiency of banks in the market. If a particular bank or banks have lower costs and/or better monitoring or screening technology, they may compete better with other banks in a market and consequently gain market share. Therefore, more concentrated banking markets may be more concentrated because the banks in them are better lenders. As a result, bank concentration would be positively correlated with bank debt held by firms. The fact that bank concentration differentially affects young and old firms is evidence in support of market power theories; however, it may still be the case that some banks are more efficient at lending to younger firms. If this is the case, then there is no way to distinguish between the market power theories of lending and whether banks in more concentrated banking markets are inherently better lenders due to information processing technology or organizational structure.

2.7.5 Selection Effects

Finally, it is possible that my findings suffer from sample selection biases. For example, in more concentrated banking markets survivorship bias may be more prevalent if firms fail more often. Perhaps many firms do not get bank financing in these markets and then fail, or never even begin. The observed positive correlation between bank concentration

and bank debt held by the firms may not account for the fact that we do not observe the firms that did not get financing. However, specifications with firm fixed effects still show a positive impact of bank concentration on bank debt, and these specifications are not subject to survivorship biases at least for the firms in the sample. For these firms, at least, bank concentration does appear to be beneficial. In subsequent research I plan to model how firm survivorship depends on banking market concentration.

2.8 Conclusion

This chapter has examined the empirical relationship between bank market structure and the capital structures of small firms in the United States from 1987-1998, using a unique dataset previously unexplored in this context. The effects of bank market structure on firm financing and growth is of growing interest to academics and policy-makers alike, in part, because of recent and prospective regulatory reforms of the banking sector.

Using the age of a firm as a proxy for its degree of informational opaqueness, I find evidence consistent with models, such as Petersen and Rajan (1995), that possessing market power encourages banks to lend to firms whose quality is ex ante unknown because the banks can extract rents from the firms in later stages of the relationship. I find that increases in bank market concentration are associated with an average increase in firms' usage of bank debt and a decrease firms' usage of the private savings of their owners to finance investment. These findings are strongest for the youngest firms. Further work will explore the sensitivity of these findings to other subsamples of the data and to different measures and functional forms of bank competition.

These findings do not, however, imply that decreases in bank competition are overall good for growth. I did not consider the effects of changes in bank competition on other loan markets, such as consumer loans or loans to larger firms, or on depositors in my empirical analysis. My central findings, however, do suggest that in many banking markets increases in bank market power may have good consequences for certain types of borrowers, namely small, young firms. However, to really conclude this I must estimate the effect of bank market structure on individual firm and overall growth.

I have observed that changes in bank concentration seem to effect the composition of debt that small firms use to finance productive activity. This evidence is consistent

with models such as Petersen and Rajan (1995), but leads to a number of questions as to whether this change in the composition of debt is associated with any real economics effects. For example, does the observed increase in bank debt usage and decrease in borrowing from firms' owners affect the amount or type of investments these firms make? Does greater bank concentration lead to faster firm growth? Do differences in banking market concentrations affect who starts firms? Does the quality of entrepreneurs or firms change in more concentrated banking markets? Does bank market power lead to greater market power of the borrowing firms? I will address these and related questions in future research.

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2.9 Variable Definitions

Tax Return Variables:

Total Assets	book value of assets; includes cash, accounts receivable, other current assets,tax-exempt and government obligations, PP&E, intangible assets, loans to shareholders, real estate loans, land, other investments and assets
Trade Credit	accounts payable
Outside Debt	short- and long-term notes, bonds, and mortgages
Inside Debt	loans from shareholders
Equity	common stock plus paid-in capital
Tangible Assets	property, plant, and equipment, and land
Liquid Assets	cash, accounts receivable, other current assets
Age	current year minus date of incorporation
Shareholder number	reported if less than or equal to 35
Sales Growth	log of gross receipts minus log of lagged gross receipts
S Corporation	dummy equal one if firm passes income through to its shareholders to be taxed as the shareholders' personal tax rates

Banking Market Variables:

HHI	sum of squared market shares (deposits) of banks having branches in the market (MSA)
Total Deposits	sum of all commercial bank deposits in the MSA
Real Personal Income	disposable income in an MSA in constant dollars, calculated by the U.S. Bureau of Economic Analysis
Employment	total number of workers in an MSA

Table 2.1 Variation in Bank Deposit HHI (303 MSAs)

Panel A - Variation in HHI across and within MSAs

	Mean	Std Dev	Median	Minimum	Maximum
Average HHI within MSA (1987-1995)	0.201	0.072	0.191	0.060 (Oklahoma City, OK)	0.457 (Pittsfield, MA)
Average HHI within MSA (1987-1998)	0.210	0.074	0.199	0.065 (Kansas City, MO-KS)	0.447 (Pittsfield, MA)
Change in HHI within MSA (1987-1995)	-0.008	0.053	-0.007	-0.257 (Tuscaloosa, AL)	0.179 (Nashua, NH)
Change in HHI within MSA (1987-1998)	0.026	0.093	0.011	-0.265 (Tuscaloosa, AL)	0.371 (Casper, WY)
$\lvert HHI_{1995} - HHI_{1987} \rvert$	0.040	0.035	0.032	0.000 (Springfield, IL)	0.257 (Tuscaloosa, AL)
$\lvert HHI_{1998} - HHI_{1987} \rvert$	0.068	0.069	0.046	0.000 (Gadsden, AL)	0.371 (Casper, WY)
Standard Deviation of HHI within MSA (1987-1995)	0.024	0.021	0.020	0.002 (Owensboro, KY)	0.107 (Nashua, NH)
Standard Deviation of HHI within MSA (1987-1998)	0.041	0.034	0.031	0.003 (Iowa City, IA)	0.219 (Casper, WY)

Panel B - Variation in HHI over Sample Period

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Average HHI (MSAs weighted equally)	0.207	0.204	0.197	0.196	0.201	0.197	0.203	0.198	0.200	0.237	0.242	0.233
Average HHI (MSAs weighted by # of firms)	0.166	0.165	0.156	0.156	0.159	0.155	0.168	0.163	0.167	0.225	0.230	0.227

Bank deposit HHI for 303 MSAs are calculated from the FDIC's Summary of Deposits, which reports deposits by bank branch.
HHI is calculated at the beginning of each year.

Table 2.2 Some MSAs and their Bank Concentrations

MSA	Average HHI 1987 - 1995	Average HHI 1987 - 1998	Std. Dev. of HHI 1987 - 1995	Std. Dev. of HHI 1987 - 1998	$HHI_{1995} - HHI_{1987}$	$HHI_{1998} - HHI_{1987}$
Atlanta, GA	0.132	0.134	0.015	0.014	-0.037	-0.015
Boston, MA	0.136	0.150	0.010	0.033	0.028	0.121
Chicago, IL	0.071	0.078	0.007	0.015	-0.018	0.034
Cincinnati, OH	0.142	0.189	0.012	0.086	-0.004	0.184
Detroit, MI	0.176	0.203	0.022	0.053	0.056	0.116
Houston, TX	0.103	0.105	0.013	0.011	0.024	0.018
Las Vegas, NV	0.241	0.237	0.027	0.045	-0.019	0.085
Miami, FL	0.090	0.097	0.007	0.016	-0.011	0.008
San Diego, CA	0.119	0.167	0.029	0.091	0.049	0.173
San Francisco, CA	0.236	0.311	0.023	0.138	0.008	0.304
Scranton-Wilkes Barre-Hazleton, PA	0.118	0.138	0.018	0.043	0.059	0.043
Trenton, NJ	0.186	0.214	0.040	0.065	0.070	0.035
Waco, TX	0.144	0.142	0.034	0.032	-0.040	-0.042

HHI is MSA-level bank deposit HHI as calculated from the FDIC's Summary of Deposits. HHI is calculated at the beginning of each year.

Table 2.3 Distribution of Firms in SOI Corporate Tax Return Sample

Panel A - Firms by number of observations

Number of Years	Number of Firms	Number of Firm-Years
12	4,087	49,044
11	1,841	20,251
10	1,492	14,920
9	1,497	13,473
8	1,768	14,144
7	1,841	12,887
6	1,840	11,040
5	2,770	13,850
4	3,229	12,916
3	4,030	12,090
2	5,906	11,812
	30,301	186,427

Panel B - Firms by year

Year	Number of Firm-Years
1987	9,088
1988	9,637
1989	10,788
1990	12,327
1991	13,449
1992	14,536
1993	19,114
1994	20,221
1995	20,924
1996	19,620
1997	20,050
1998	16,673
	186,427

Table 2.4 Descriptive Statistics for Tax Return Sample (186,427 firm-year observations)

Variable	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Firm Characteristics					
Total Assets (Thousands 1993 $)	6,950	26,100	250	1,060	4,170
Sales (Thousands 1993 $)	14,500	63,700	510	2,210	9,100
Gross Profits (Thousands 1993 $)	3,990	15,100	210	730	2,520
Net Income (Thousands 1993 $)	510	3,560	0	20	150
Bank Debt (Thousands 1993 $)	2,180	13,200	0	90	780
Bank Debt/Total Assets	0.264	0.310	0	0.148	0.441
Loans from Owners/Total Assets	0.086	0.215	0	0	0.052
(Loans from Owners+Equity)/Total Assets	0.203	0.315	0.013	0.068	0.245
Trade Credit/Total Assets	0.147	0.195	0.002	0.073	0.211
Interest Paid/(Bank Debt+Owner Loans)*	0.088	0.098	0.039	0.076	0.104
Tangible Assets/Total Assets	0.469	0.300	0.210	0.483	0.711
Intangible Asset/Total Assets	0.016	0.079	0	0	0
Liquid Assets/Total Assets	0.416	0.300	0.164	0.374	0.633
Operating Income/Total Assets**	1.92	369.2	0.047	0.154	0.313
Gross Profits/Total Assets	10.9	1,605	0.412	0.754	1.44
Age	16.6	15.2	5	13	23
Number of Shareholders	2.98	4.46	1	2	3
S Corporation	0.476	0.499	0	0	1
Bank Deposit HHI	0.182	0.092	0.115	0.164	0.220

1-digit SIC code		*Census Divisions*	
Agriculture, forestry, fishing	0.028	New England	0.053
Construction	0.138	Mid-Atlantic	0.183
Manufacturing	0.179	South Atlantic	0.171
Mining	0.009	East South Central	0.041
Retail trade	0.206	East North Central	0.198
Services	0.226	West South Central	0.094
Transportation	0.044	West North Central	0.067
Wholesale trade	0.170	Mountain	0.049
		Pacific	0.144

Percentiles for dollar figures have been rounded to the nearest ten thousand dollars to preserve the confidentiality of the data.

* Interest paid is only available for all corporations from 1993-1998.

** Operating income is operating net income plus interest, taxes and depreciation.

Table 2.5 Descriptive Statistics for Tax Return Sample by Firm Age

	Firm Age			
	0 - 5	6 - 10	11 - 20	> 20
Total Assets (Thousands 1993 $)	3,210 [1,2,3]	4,780 [2,3]	5,930 [3]	12,400
	(17,600)	(21,000)	(22,100)	(35,700)
Sales (Thousands 1993 $)	5,670 [1,2,3]	10,700 [2,3]	12,700 [3]	25,900
	(35,800)	(61,800)	(43,500)	(91,000)
Bank Debt (Thousands 1993 $)	1,420 [1,2,3]	1,770 [2,3]	1,950 [3]	3,300
	(9,820)	(9,680)	(12,100)	(17,600)
Bank Debt/Total Assets	0.319 [1,2,3]	0.285 [2,3]	0.247 [3]	0.220
	(0.358)	(0.320)	(0.287)	(0.253)
Loans from Owners/Total Assets	0.151 [1,2,3]	0.0925 [2,3]	0.0661 [3]	0.0434
	(0.299)	(0.220)	(0.173)	(0.128)
(Loans from Owners+Equity)/Total Assets	0.337 [1,2,3]	0.220 [2,3]	0.160 [3]	0.117
	(0.405)	(0.329)	(0.264)	(0.202)
Trade Credit/Total Assets	0.137 [1,2,3]	0.155 [2]	0.150	0.149
	(0.223)	(0.209)	(0.187)	(0.164)
Average Interest Rate	0.081 [1,2,3]	0.088 [2]	0.091	0.090
	(0.105)	(0.100)	(0.100)	(0.091)
Operating Income/Total Assets	3.96	0.986	3.62	-0.321
	(332)	(398)	(542)	(116)
Gross Profits/Total Assets	12.4	11.8	19.2	2.88
	(756)	(1,694)	(2,754)	(190)
Manufacturing	0.113 [1,2,3]	0.138 [2,3]	0.167 [3]	0.271
Retail	0.216 [1]	0.207	0.205	0.198
Wholesale	0.118 [1,2,3]	0.151 [2,3]	0.174 [3]	0.225
Services	0.334 [1,2,3]	0.267 [2,3]	0.222 [3]	0.111
Northeast	0.225 [3]	0.221 [3]	0.225 [3]	0.263
South	0.344 [2,3]	0.334 [2,3]	0.306 [3]	0.256
Midwest	0.230 [1,2,3]	0.243 [3]	0.256 [3]	0.315
West	0.201 [3]	0.202 [3]	0.213 [3]	0.167
HHI	0.179 [2]	0.180 [2]	0.183	0.185
N	47,257	33,135	49,184	55,702

Means and (standard deviations).

1 - mean statistically different from mean for firms aged 6-10 at 5% level, standard errors corrected for clustering within MSA

2 - mean statistically different from mean for firms aged 11-20 at 5% level, standard errors corrected for clustering within MSA

3 - mean statistically different from mean for firms older than 20 at 5% level, standard errors corrected for clustering within MSA

Table 2.6(a) The Influence of Bank Concentration on the Probability that Firms have Bank Debt

Dependent Variable: dummy = 1 if firm has outside (bank) debt (sample mean = 0.70)	(1)	(2)	(3)	(4)	(5)	(6)
HHI	0.0413 *	0.110 ***	0.0647 ***	0.0238	0.0730 ***	0.0625 **
	(0.0220)	*(0.0241)*	*(0.0233)*	*(0.0207)*	*(0.0247)*	*(0.0241)*
Year fixed effects?	No	Yes	Yes	Yes	Yes	Yes
3-digit SIC code fixed effects?	No	No	Yes	Yes	Yes	Yes
Other Controls?	No	No	No	Yes	Yes	Yes
Census division fixed effects?	No	No	No	No	Yes	No
Year*Census division fixed effects?	No	No	No	No	Yes	Yes
MSA fixed effects?	No	No	No	No	No	Yes
N	183,648	183,648	183,648	182,531	182,531	182,531
Pseudo-R^2	0.0001	0.0045	0.0547	0.196	0.197	0.207

Derivative effect of a change in MSA level bank deposit HHI on the probability a firm has bank debt. Standard errors are reported in parentheses and have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Other controls include firm characteristics - natural log of book assets, dummy variables for whether a firms is 0-5 years old, 6-10 years old, and 11-20 years old, dummy variable for whether firm is an S corporation, number of shareholders, fraction of assets that are tangible, and fraction of assets that are liquid - and MSA characteristics - 6 lags of employment growth in the MSA, 6 lags of real personal income growth in the MSA, and the natural logarithm of total MSA bank deposits. All specifications are probits estimated using maximum likelihood

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.6(b) The Influence of Bank Concentration on the Probability that Firms have Loans from Their Owners

Dependent Variable: dummy = 1 if firm has loan from owners or an increase in equity from owners (sample mean = 0.362)	(1)	(2)	(3)	(4)	(5)	(6)
HHI	-0.0905 ***	-0.0794 ***	-0.0895 ***	-0.0420 *	-0.110 ***	-0.0107
	(0.0223)	*(0.0244)*	*(0.0239)*	*(0.0244)*	*(0.0274)*	*(0.0279)*
Year fixed effects?	No	Yes	Yes	Yes	Yes	Yes
3-digit SIC code fixed effects?	No	No	Yes	Yes	Yes	Yes
Other Controls?	No	No	No	Yes	Yes	Yes
Census division fixed effects?	No	No	No	No	Yes	No
Year*Census division fixed effects?	No	No	No	No	Yes	Yes
MSA fixed effects?	No	No	No	No	No	Yes
N	183,648	183,648	183,648	182,531	182,531	182,531
Psuedo-R^2	0.0003	0.0011	0.0248	0.0537	0.0558	0.0640

Derivative effect of a change in MSA level bank deposit HHI on the probability a firm has bank debt. Standard errors are reported in parentheses and have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Other controls include firm characteristics - natural log of book assets, dummy variables for whether a firms is 0-5 years old, 6-10 years old, and 11-20 years old, dummy variable for whether firm is an S corporation, number of shareholders, fraction of assets that are tangible, and fraction of assets that are liquid - and MSA characteristics - 6 lags of employment growth in the MSA, 6 lags of real personal income growth in the MSA, and the natural logarithm of total MSA bank deposits. All specifications are probits estimated using maximum likelihood

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.7 The Influence of Bank Concentration on the Probability that Firms have Debt

Dependent Variable: dummy = 1 if firm	Has Bank Debt		Has Loans from Owners or increase in equity		Has Accounts Payable (Trade Credit)	
Bank Concentration and Firm Age						
HHI	0.0730 ***	0.0251	-0.110 ***	-0.0696 *	-0.0018	-0.0123
	(0.0247)	*(0.0377)*	*(0.0274)*	*(0.0417)*	*(0.0188)*	*(0.0258)*
HHI*Age 1-5		0.0404		-0.148 ***		0.0390
		(0.0469)		*(0.0531)*		*(0.0391)*
HHI*Age 6-10		-0.0330		-0.0351		0.0286
		(0.0495)		*(0.0557)*		*(0.0393)*
HHI*Age 11-20		-0.0480		0.0321		-0.0179
		(0.0467)		*(0.0521)*		*(0.0355)*
Age 1-5	0.129 ***	0.0923 ***	0.117 ***	0.125 ***	-0.0296 ***	-0.0366 ***
	(0.0060)	*(0.0104)*	*(0.0066)*	*(0.0119)*	*(0.0049)*	*(0.0087)*
Age 6-10	0.110 ***	0.103 ***	0.0654 ***	0.0625 ***	-0.0097 **	-0.0149 *
	(0.0059)	*(0.0108)*	*(0.0065)*	*(0.0122)*	*(0.0045)*	*(0.0085)*
Age 11-20	0.0627 ***	0.0636 **	0.0362 ***	0.0251 **	0.0041	0.0073
	(0.0056)	*(0.0103)*	*(0.0060)*	*(0.0114)*	*(0.0039)*	*(0.0076)*
Firm Characteristics						
Log(Total Assets)	0.0807 ***	0.0745 ***	-0.0111 ***	-0.0148 ***	0.0792 ***	0.0792 ***
	(0.0011)	*(0.0011)*	*(0.0013)*	*(0.0012)*	*(0.0010)*	*(0.0010)*
Number of shareholders	-0.0038 ***	-0.0034 ***	-0.0059 ***	-0.0057 ***	-0.0014 ***	-0.0014 ***
	(0.0005)	*(0.0005)*	*(0.0005)*	*(0.0005)*	*(0.0003)*	*(0.0003)*
Tangible Asset Share	0.333 ***	0.333 ***	0.299 ***	0.299 ***	-0.0007	-0.0006
	(0.0108)	*(0.0108)*	*(0.0139)*	*(0.0139)*	*(0.0012)*	*(0.0015)*
Liquid Asset Share	-0.117 ***	-0.117 ***	0.0393 ***	0.0393 ***	0.0020	0.0021
	(0.0106)	*(0.0106)*	*(0.0140)*	*(0.0140)*	*(0.0017)*	*(0.0017)*
S corporation	-0.0686 ***	-0.0683 ***	-0.0167 ***	-0.0165 ***	-0.0568 ***	-0.0568 ***
	(0.0045)	*(0.0043)*	*(0.0049)*	*(0.0048)*	*(0.0038)*	*(0.0038)*
N	182,531	182,531	182,531	182,531	182,531	182,531
Psuedo-R^2	0.223	0.223	0.0473	0.0711	0.371	0.371
Dependent variable sample mean	0.70	0.70	0.362	0.362	0.761	0.761

Standard errors have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Independent variables included in each regression, but whose coefficients are not reported, are 6 lags of MSA employment growth, 6 lags of MSA real personal income growth, natural logarithm of total MSA bank deposits, year fixed effects, 3-digit SIC code fixed effects, census division fixed effects, census division year fixed effects interactions, and a constant.
All specifications are probits estimated using maxium likelihood; derivative effects at sample means are reported.
*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.8(a) The Influence of Bank Concentration on Firms' Bank Debt to Asset Ratios (Tobit estimates)

Dependent Variable: Outside (Bank) Debt/Total Assets (sample mean = 0.264)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HHI	0.0236 **	0.0508 ***	0.0318 **	0.0209 *	0.0425 ***	0.0256 **	0.0471 ***
	(0.0107)	*(0.0113)*	*(0.0108)*	*(0.0109)*	*(0.0121)*	*(0.0122)*	*(0.0104)*
Year fixed effects?	No	Yes	Yes	Yes	Yes	Yes	Yes
3-digit SIC code fixed effects?	No	No	Yes	Yes	Yes	Yes	No
Other Controls?	No	No	No	Yes	Yes	Yes	Yes
Census division fixed effects?	No	No	No	No	Yes	No	No
Year*Census division fixed effects?	No	No	No	No	Yes	Yes	No
MSA fixed effects?	No	No	No	No	No	Yes	No
Firm fixed effects?	No	No	No	No	No	No	Yes
N	183,648	183,648	183,648	182,531	182,531	182,531	152,350
Pseudo-R^2	0.000	0.001	0.152	0.205	0.235	0.236	0.174

Coefficient reported for MSA level bank deposit HHI. Standard errors are reported in parentheses and have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Other controls include firm characteristics - dummy variables for whether firm is between 0-5 years old, 6-10 years old, and 11-20 years old, dummy variable for whether firm is an S corporation, number of shareholders - and MSA characteristics - 6 lags of employment growth in the MSA, 6 lags of real personal income growth in the MSA, and the natural logarithm of total MSA bank deposits.

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.8(b) The Influence of Bank Concentration on Firms' Loans from Owners to Asset Ratios (Tobit estimates)

Dependent Variable: (Loans from Owners + Equity)/Total Assets (sample mean = 0.202)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HHI	-0.0134 **	-0.0252 ***	-0.0163 **	-0.0258 ***	-0.0215 **	-0.0116	-0.0196 *
	(0.0057)	*(0.0086)*	*(0.0084)*	*(0.0086)*	*(0.0091)*	*(0.0164)*	*(0.0104)*
Year fixed effects?	No	Yes	Yes	Yes	Yes	Yes	Yes
3-digit SIC code fixed effects?	No	No	Yes	Yes	Yes	Yes	No
Other Controls?	No	No	No	Yes	Yes	Yes	Yes
Census division fixed effects?	No	No	No	No	Yes	No	No
Year*Census division fixed effects?	No	No	No	No	Yes	Yes	No
MSA fixed effects?	No	No	No	No	No	Yes	No
Firm fixed effects?	No	No	No	No	No	Yes	Yes
N	183,648	183,648	183,648	182,531	182,531	182,531	152,350
Pseudo-R^2	0.000	0.0067	0.117	0.229	0.233	0.252	0.193

Coefficient reported for MSA level bank deposit HHI. Standard errors are reported in parentheses and have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Other controls include firm characteristics - dummy variables for whether firm is between 0-5 years old, 6-10 years old, and 11-20 years old, dummy variable for whether firm is an S corporation, number of shareholders - and MSA characteristics - 6 lags of employment growth in the MSA, 6 lags of real personal income growth in the MSA, and the natural logarithm of total MSA bank deposits.

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.9 The Influence of Bank Concentration on Firms' Debt to Asset Ratios

Dependent Variable:	Bank Debt/Total Assets				(Loans from Owners + Equity)/ Total Assets				Accounts Payable/ Total Assets			
Bank Concentration and Firm Age												
HHI	0.0425	***	0.0398	***	-0.0215	**	-0.0232	***	-0.0057		-0.0117	
	(0.0121)		*(0.0192)*		*(0.0091)*		*(0.0062)*		*(0.0107)*		*(0.0148)*	
HHI*Age 1-5			0.0187				-0.0324	***			-0.0015	
			(0.0275)				*(0.0085)*				*(0.0213)*	
HHI*Age 6-10			0.0023				-0.0122				0.0403	*
			(0.0288)				*(0.0090)*				*(0.0221)*	
HHI*Age 11-20			-0.0235				0.0190				-0.0062	
			(0.0273)				*(0.0101)*				*(0.0199)*	
Age 1-5	0.111	***	0.112	***	0.202	***	0.234	***	0.0387	***	0.0390	***
	(0.0027)		*(0.0057)*		*(0.0034)*		*(0.0071)*		*(0.0027)*		*(0.0050)*	
Age 6-10	0.0829	***	0.0826	***	0.0973	***	0.0997	***	0.0357	***	0.0284	***
	(0.0027)		*(0.0059)*		*(0.0035)*		*(0.0075)*		*(0.0026)*		*(0.0050)*	
Age 11-20	0.0397	***	0.0440	***	0.0462	***	0.0336	***	0.0185	***	0.0196	***
	(0.0026)		*(0.0057)*		*(0.0034)*		*(0.0073)*		*(0.0023)*		*(0.0046)*	
Firm Characteristics												
Number of shareholders	0.0025	***	0.0025	***	-0.0118	***	-0.0119	***	-0.0009	***	-0.0009	***
	(0.0002)		*(0.0002)*		*(0.0003)*		*(0.0003)*		*(0.0002)*		*(0.0002)*	
S corporation	-0.0088	***	-0.0088	***	-0.0092	***	-0.0092	***	-0.0249	***	-0.0249	***
	(0.0032)		*(0.0032)*		*(0.0024)*		*(0.0024)*		*(0.0020)*		*(0.0020)*	
N	182,531		182,531		182,531		182,531		182,531		182,531	
Psuedo-R^2	0.0830		0.0830		0.0635		0.0637		0.0712		0.0712	
Dependent variable sample mean	0.264		0.264		0.233		0.233		0.147		0.147	

Standard errors have been corrected for heteroskedasticity and clustering within each MSA cell (303 MSAs). Independent variables included in each regression, but whose coefficients are not reported, are 6 lags of MSA employment growth, 6 lags of MSA real personal income growth, natural logarithm of total MSA bank deposits, year fixed effects, 3-digit SIC fixed effects, census division fixed effects, census division year fixed effects interactions, and a constant. All regressions are Tobit maximum likelihood estimates.

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.10 Comparing Financing Pre- and Post-Riegle-Neal Legislation

Dependent Variable:	Has Bank Debt (1)		Has Loan from Owners (2)		Bank Debt/ Total Assets (3)		(Owner Loan + Equity)/ Total Assets (4)	
HHI	0.0890	***	-0.172	***	0.0830	***	-0.103	***
	(0.0185)		*(0.0517)*		*(0.0173)*		*(0.0221)*	
HHI*PostRN	-0.0407	*	0.0926	**	-0.0668	***	0.0756	***
	(0.0237)		*(0.0460)*		*(0.0223)*		*(0.0282)*	
PostRN	-0.0306	***	-0.0029		0.0086	*	0.0099	
	(0.0053)		*(0.0095)*		*(0.0050)*		*(0.0063)*	
N	182,531		182,531		182,531		182,531	
R^2	0.157		0.0463		0.117		0.0678	

Standard errors are reported in parentheses and have been corrected for heteroskedasticity and clustering within each MSA cell. Other controls include firm characteristics - dummy variables for whether firm is between 0-5 years old, 6-10 years old, and 11-20 years old,dummy variable for whether firm is an S corporation, number of shareholders, MSA characteristics - 6 lags of employment growth in the MSA, 6 lags of real personal income growth in the MSA, and the natural logarithm of total MSA bank deposits - 3-digit SIC code fixed effects, and census division fixed effects.
Specifications (1) and (2) are probits and derivative effects are reported; specifications (3) and (4) are Tobits; specifications (5) and (6) are estimated using OLS.

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

Table 2.11 Coefficients from Columns (4)-(6) of Tables 2.6(a) and 2.6(b) and Coefficients from Columns (4)-(7) of Tables 2.8(a) and 2.8(b)

	Columns (4)-(6) Table 2.6(a)			Columns (4)-(6) Table 2.6(b)			Columns (4)-(7) Table 2.8(a) Tobit				Columns (4)-(7) Table 2.8(b) Tobit			
	Has Bank Debt			Has Loans from Owners			Bank Debt/Total Assets				(Loans from Owners+Equity)/ Total Assets			
HHI	0.0238	0.0730***	0.0625**	-0.0420*	-0.110***	-0.0107	0.0039	0.0425***	0.0256**	0.0471***	-0.0258***	-0.0215***	-0.0116	-0.0196*
	(0.0207)	*(0.0247)*	*(0.0241)*	*(0.0244)*	*(0.0274)*	*(0.0279)*	*(0.0109)*	*(0.0121)*	*(0.0122)*	*(0.0104)*	*(0.0086)*	*(0.0091)*	*(0.0164)*	*(0.0104)*
Age 1-5	0.112***	0.115***	0.117***	0.101***	0.102***	0.101***	0.109***	0.111***	0.111***	0.0595***	0.201***	0.202***	0.202***	0.107***
	(0.0093)	*(0.0091)*	*(0.0093)*	*(0.0071)*	*(0.0071)*	*(0.0073)*	*(0.0027)*	*(0.0027)*	*(0.0027)*	*(0.0033)*	*(0.0033)*	*(0.0034)*	*(0.0034)*	*(0.0040)*
Age 6-10	0.109***	0.110***	0.111***	0.0577***	0.0591***	0.0587***	0.0816***	0.0829***	0.0829***	0.0264***	0.0959***	0.0973***	0.0973***	0.0431***
	(0.0070)	*(0.0069)*	*(0.0071)*	*(0.0076)*	*(0.0077)*	*(0.0078)*	*(0.0027)*	*(0.0027)*	*(0.0027)*	*(0.0030)*	*(0.0035)*	*(0.0035)*	*(0.0035)*	*(0.0036)*
Age 11-20	0.0626***	0.0645***	0.0649***	0.0326***	0.0327***	0.0320***	0.0383***	0.0397***	0.0397***	0.0132***	0.0458***	0.0462***	0.0462***	0.0175
	(0.0066)	*(0.0067)*	*(0.0068)*	*(0.0072)*	*(0.0073)*	*(0.0073)*	*(0.0026)*	*(0.0026)*	*(0.0026)*	*(0.0025)*	*(0.0034)*	*(0.0034)*	*(0.0034)*	*(0.0032)*
Log(Total Assets)	0.0838***	0.0848***	0.0853***	-0.0153	-0.0152**	-0.0147***								
	(0.0018)	*(0.0018)*	*(0.0018)*	*(0.0014)*	*(0.0014)*	*(0.0015)*								
Number of shareholders	-0.0040***	-0.0040***	-0.0040***	-0.0073***	-0.0072***	-0.0069***	0.0025***	0.0025***	0.0025***	0.0000	-0.0120***	-0.0118***	-0.0118***	-0.0062***
	(0.0005)	*(0.0005)*	*(0.0005)*	*(0.0008)*	*(0.0008)*	*(0.0008)*	*(0.0002)*	*(0.0002)*	*(0.0002)*	*(0.0003)*	*(0.0003)*	*(0.0003)*	*(0.0003)*	*(0.0004)*
Tangible Asset Share	0.364***	0.0361***	0.362***	0.305***	0.309***	0.313***								
	(0.0164)	*(0.0159)*	*(0.0170)*	*(0.0129)*	*(0.0127)*	*(0.0126)*								
Liquid Asset Share	-0.137***	-0.138***	-0.137***	0.0431***	0.0443***	0.0471***								
	(0.0144)	*(0.0145)*	*(0.0146)*	*(0.0119)*	*(0.0117)*	*(0.0117)*								
S corporation	-0.0730***	-0.0771***	-0.0783***	-0.0146**	-0.0172***	-0.0193***	-0.0068***	-0.0088***	-0.0088***	0.0000	-0.0062***	-0.0092***	-0.0092***	-0.0101***
	(0.0064)	*(0.0066)*	*(0.0070)*	*(0.0066)*	*(0.0066)*	*(0.0068)*	*(0.0019)*	*(0.0019)*	*(0.0019)*	*(0.0025)*	*(0.0024)*	*(0.0024)*	*(0.0024)*	*(0.0031)*
Log(Bank Deposits)	-0.0134***	-0.0096***	0.0078	0.0104***	0.0102***	-0.0019	-0.0120**	-0.0120**	0.0009	0.0007	0.0104**	0.0102*	-0.0004	-0.0003
	(0.0037)	*(0.0031)*	*(0.0116)*	*(0.0027)*	*(0.0029)*	*(0.0109)*	*(0.0036)*	*(0.0036)*	*(0.0036)*	*(0.0024)*	*(0.0060)*	*(0.0065)*	*(0.0065)*	*(0.0065)*
MSA employment growth	0.0685	0.334**	0.167	-0.697***	-0.231	-0.324**	0.436***	0.618***	0.618***	0.237***	-0.715***	-0.326**	-0.326**	-0.202**
	(0.140)	*(0.151)*	*(0.118)*	*(0.163)*	*(0.161)*	*(0.135)*	*(0.0911)*	*(0.103)*	*(0.103)*	*(0.0567)*	*(0.114)*	*(0.0130)*	*(0.0130)*	*(0.0795)*
MSA employment growth$_{t-1}$	0.117	0.189	-0.0027	-0.415***	-0.133	-0.172	0.377***	0.437***	0.437***	0.141**	-0.362***	-0.111	-0.111	-0.116
	(0.121)	*(0.137)*	*(0.105)*	*(0.119)*	*(0.120)*	*(0.115)*	*(0.0994)*	*(0.109)*	*(0.109)*	*(0.0584)*	*(0.124)*	*(0.136)*	*(0.136)*	*(0.0829)*
MSA employment growth$_{t-2}$	0.0248	0.182*	-0.0603	-0.256**	-0.0775	-0.169	0.248***	0.296***	0.296***	0.0855	-0.230**	0.0593	0.0593	-0.0736
	(0.0966)	*(0.109)*	*(0.102)*	*(0.108)*	*(0.118)*	*(0.113)*	*(0.0965)*	*(0.105)*	*(0.105)*	*(0.0567)*	*(0.121)*	*(0.132)*	*(0.132)*	*(0.0808)*
MSA employment growth$_{t-3}$	0.244*	0.292**	0.0749	-0.346***	-0.127	-0.203	0.342***	0.317***	0.317***	0.159***	-0.372**	-0.193	-0.193	-0.163
	(0.127)	*(0.131)*	*(0.121)*	*(0.104)*	*(0.125)*	*(0.121)*	*(0.0953)*	*(0.104)*	*(0.104)*	*(0.0565)*	*(0.119)*	*(0.131)*	*(0.131)*	*(0.0805)*
MSA real personal income growth	-0.0512	-0.172	0.0515	0.237**	0.111	0.185*	-0.348***	-0.368***	-0.368***	-0.161***	0.209**	0.125	0.125	0.0403
	(0.100)	*(0.111)*	*(0.0975)*	*(0.119)*	*(0.115)*	*(0.111)*	*(0.0712)*	*(0.0790)*	*(0.0790)*	*(0.0438)*	*(0.0885)*	*(0.0985)*	*(0.0985)*	*(0.0612)*
MSA real personal income growth$_{t-1}$	-0.0614	-0.192	0.0964	0.283***	0.0670	0.145	-0.328***	0.379***	0.379***	-0.161***	0.188**	0.0007	0.0007	-0.0331
	(0.121)	*(0.124)*	*(0.106)*	*(0.106)*	*(0.106)*	*(0.109)*	*(0.0703)*	*(0.0785)*	*(0.0785)*	*(0.0435)*	*(0.0868)*	*(0.0974)*	*(0.0974)*	*(0.0601)*
MSA real personal income growth$_{t-2}$	0.0023	-0.131	0.133	0.166*	0.0157	0.0952	-0.210***	-0.248***	-0.248***	-0.100**	0.0870	-0.0537	-0.0537	-0.0095
	(0.0821)	*(0.0901)*	*(0.0898)*	*(0.0870)*	*(0.106)*	*(0.113)*	*(0.0709)*	*(0.0788)*	*(0.0788)*	*(0.0437)*	*(0.0876)*	*(0.0978)*	*(0.0978)*	*(0.0606)*
MSA real personal income growth$_{t-3}$	-0.151	-0.270**	-0.0141	0.0972	-0.0130	0.0424	-0.207***	-0.256***	-0.256***	-0.105**	0.138	0.0374	0.0374	0.0105
	(0.108)	*(0.118)*	*(0.0994)*	*(0.0975)*	*(0.115)*	*(0.117)*	*(0.0718)*	*(0.0796)*	*(0.0796)*	*(0.0442)*	*(0.0884)*	*(0.0986)*	*(0.0986)*	*(0.0611)*
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3-digit SIC code fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Census division fixed effects?	No	Yes	No	No	Yes	No	No	Yes	No	No	No	Yes	No	No
Year*Census division fixed effects?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No
MSA fixed effects?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	No	Yes	No
Firm fixed effects?	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes

Chapter 3

Tax Function Convexity, Risk-Taking, and Organizational Form Choice

3.1 Introduction

When deciding how to organize their activities, firms in the United States must choose amongst several organizational forms, or business entities. Each organizational form has different tax and non-tax features, which a rational decision-maker must trade off when choosing a firm's optimal organizational form.

Understanding the features of each organizational form and how they may affect a firm's rate of return is an on-going task of business owners and managers. This is especially true for the owners and managers of young firms since these are the firms which usually have the broadest choice of organizational form.

While firms may individually optimize their organizational form choices in response to the legal and tax environments, the total effect of individual firms' choices may not be optimal for the economy as a whole. Understanding the potential economic inefficiencies that may result from firms' organizational form choices and the empirical relevance of these potential inefficiencies is an important goal for those interested in designing efficient tax and legal systems.

Much of the research analyzing the potential inefficiencies introduced by firms' organiza-

tional form choices focuses on the trade-offs between tax and non-tax features of organizational forms. An inefficiency, or "distortion," may be introduced when a firm finds it most profitable to chose one organizational form when it must pay taxes, but would have found it most profitable to choose another organizational form in the absence of taxes. Part of this research consists of theoretical attempts to identify the distortionary incentive effects of business entity law; the other part consists of attempts to empirically identify how large are these potential distortions in firm behavior.

This chapter focuses on the differences in the tax treatment of losses and the progressiveness of tax rates between pass-through entities and non-pass-through entities and examines how these differences may lead to inefficient choice of organizational form by firms.[1] The contribution of this chapter is two-fold. First, contrary to previous research on tax distortions to organizational form choice, I show that when project choice is endogenous it is not necessarily inefficient for a firm to choose to be a pass-through entity rather than a non-pass-through entity in response to differences in after-tax returns between the two entity types. Second, I provide empirical evidence that is consistent with this theoretical point by examining the behavior of a sample of S corporations (pass-through entities) and C corporations (non-pass-through entities) using microlevel U.S. corporate tax return data.

This remainder of this chapter proceeds in five sections. Section 2 describes the array of business organizational forms that firms in the United States may take and provides some historical context for the current set of business entities. Section 3 reviews the traditional economic thinking and empirical evidence on distortions in organizational form choice introduced by differences in the tax treatment of pass-through and non-pass-through entities. Section 4 describes how differences in tax loss offsets between pass-through and non-pass-through entities and the progressiveness of the corporate tax schedule may in fact lead to inefficient organizational form choice in a direction contrary to the usual thinking. Section 5 presents the empirical evidence; section 6 concludes.

[1]Pass-through entities are firms that typcially pay only one layer of tax, at the personal level, on their incomes. Income is "passed through" to the owners of the firm, who are then liable for taxes owed on the income.

Non-pass-through entities are firms which pay the corporate tax on their incomes and additional personal tax on income paid out as dividends or capital gains.

3.2 The Array of Business Organizational Forms in the U.S.

Currently in the United States, firms may choose one of five organizational forms. These are sole proprietorship, partnership, C corporation, S corporation, and limited liability company (LLC).

When deciding which organizational form to choose, a firm must weigh the non-tax and tax features of each form. The main non-tax features of the five organizational forms are (1) limited liability; (2) transferability of ownership; and (3) flexibility in allocating profits and losses to the owners of the firm. Corporations, both S and C, and LLCs provide limited liability to their owners, unlike sole proprietorships and partnerships.[2] Corporations provide much easier transferability of ownership than LLCs, partnerships, or sole proprietorships. LLCs and partnerships afford greater flexibility in how a firm's income may be allocated amongst its owners than S or C corporations.

The main tax features of the five organizational forms are (1) whether income is passed through to the firm's owners or taxed at the entity level; (2) deductibility of employee fringe benefits for owners; (3) treatment of capital gains; and (4) treatment of accumulated earnings and losses from when the firm had a different organizational form. S corporations, LLCs, partnerships, and sole proprietorships are pass-through entities. Owners include their share of a firm's income on their tax returns and pay their individual tax rates on the income. C corporations are non-pass-through entities and pay a "double tax," both corporate and personal, on their profits. Pass-through entities pass both gains and losses through to their owners, so owners may offset their other income with the losses from the pass-through entity. A non-pass-through entity can offset past income with losses. If it does not have enough past income to offset current losses, it may carry forward the losses and use them to offset any future income that it earns.

Table 3.1 summarizes the tax and non-tax features of the five business organizational forms, which are described in further detail below.

[2]Talk about how corporate veil is often pierced and how this may not be such a big distinction anymore.

Table 3.1 Summary of Current U.S. Business Organizational Forms

Entity	Pass-through?	Non-tax features	Other tax features
Sole Proprietorship	Yes	Only one owner; unlimited liability	Employee fringe benefits not deductible
Partnership	Yes	Managing partners have unlimited liability; limited partners have limited liability; harder to sell ownership stake than in corporation; may split gains and losses in any way amongst partner	Employee fringe benefits deductible, except for partners
C Corporation	No	Owners have limited liability; easy to transfer ownership; continuity of life	Employee fringe benefits deductible for all employees; PSCs not eligible for graduated tax schedule; no favorable treatment of capital gains
S Corporation	Yes	Same as C corporation with restrictions; fewer than 75 shareholders; one class of stock, no corporate or foreign shareholders, no DISCs	Employee fringe benefits not deductible for ¿ 2% owners; Cannot pass through losses or gains from C corp years
Limited Liability Company	Possible	Like partnership, but all members have limited liability; may choose to be taxed as corporation or partnership	Employee fringe benefits, deductible, except for LLC members

3.2.1 Non-Tax Features

A sole proprietorship may have only one owner and is essentially indistinct from its owner. A sole proprietorship does not need any official documentation to exist; the owner may just simply run the firm. The sole proprietorship ceases to exist when the owner dies or simply no longer carries out the firm's activities. A sole proprietor is personally liable for the debts and obligations of the firm.

A partnership must have two or more owners, or partners. Partners can be general or limited partners. Limited partners are not personally liable for the firm's obligations and may not be engaged in the active management of the firm; general partners are personally liable for the firm's obligations and are engaged in the management of the firm. A partnership agreement determines the partners' shares in the firm and how income will be split amongst the partners, as well as other details. If a formal partnership agreement is not drafted it is then often assumed that all partners are general partners and that each has an equal share of the partnership.

Unlike sole proprietors and partners, the owners of both C and S corporations have limited liability. In addition, the owners of a corporation are distinct from the corporation. A corporation is its own legal entity and has an indefinite lifespan. The owners of corporations have shares of stock which they may sell; however, the corporation remains its own entity regardless of who owns its stock and how many owners it has. This stands in contrast to a partnership or LLC which must redraft its partnership agreement whenever a partner departs or joins the firm. Because corporations are distinct entities with indefinite lifespans, the transferring of ownership of corporations from one person or entity to another is easier than for partnerships or LLCs.

A C corporation is the traditional type of corporation. Its stock can be publicly traded, and it can have any type of legal entity as a shareholder. S corporations, so named after the section of the Internal Revenue Code which establishes their legality, can be thought of a subset of C corporations. All S corporations could become C corporations, but the reverse is not necessarily true. S corporations must have fewer than 75 shareholders, have no corporate or foreign shareholders, have only one class of stock, and may not be Domestic International Sales Corporations (DISCs).[3]

An LLC is like a partnership except that all of the "partners," called members, have limited liability. An LLC can choose to be taxed as either a corporation or a partnership. LLCs are viewed by many business advisors as combining the flexibility and potential tax advantages of the partnership organizational form with the limited liability of a corporation.

3.2.2 Tax Features

Sole proprietorships, partnerships, and S corporations are all pass-through entities. That is, the income of these firms is passed through to their owners, according to ownership share or the partnership agreement, and is reported on the owners' tax returns and taxed at the individual level. The income of a C corporation, a non-pass-through entity, is instead taxed at the corporate level and then again at the individual level if the income is paid out to the shareholders as dividends or as capital gains. Hence, C corporations face what is typically known as the corporate "double tax." LLCs may choose to be taxed as pass-

[3]Domestic International Sales Corporations is a type of corporation designed to yield benefits to U.S. exporting businesses.

through or non-pass-through entities. That is, LLCs may choose whether they will abide by partnership tax laws or by C corporation tax laws.

Although it may seem that a firm will always have a lower tax burden if it chooses to be a pass-through entity rather than a C corporation, this is not always the case. A firm organized as a C corporation may have a lower tax burden than if it organized as a pass-through entity if its retained income falls within the graduated area of the corporate tax schedule and this income is reinvested in the firms and, hence, paid out to owners in future capital gains.[4,5] Like individual federal tax schedules, corporate tax schedules are graduated. Currently, C corporations pay 15% on the first $50,000 of taxable income, 25% on the next $25,000, and 34% on the next $25,000. Between $100,000 and $18,333,333 of taxable income, the corporate marginal tax rate fluctuates between 34% and 39%. The corporate marginal tax rate is 35% on taxable income above $18,333,333. Appendix A lists the federal corporate and personal tax schedules from 1984 to the present.

A firm may choose to organize as a C corporation and pay out earnings as wages or interest to owners and leave $100,000 or less of the earnings within the firm for reinvestment. This strategy will be discussed in further detail in Section 4. This strategy will not work, however, for Personal Service Corporations (PSCs), whose incomes are taxed at a flat 35% rate. PSCs are corporations engaged primarily in the health, law, engineering, and business services industries and whose stock is substantially owned by the employees of the corporation.[6]

Another tax issue firms must consider when choosing an organizational form is the deductibility of contributions to employee fringe benefit programs, such as health insurance and pension plans. Contributions to employee benefit programs made for non-owner employees are tax deductible for all entity types. However, only C corporations may deduct contributions made for employees who are also owners of the firm.

Yet another tax issue is the treatment of capital gains of the firm. In pass-through entities, capital gains and losses are passed through to the owners just like ordinary income and are therefore taxed at the lower capital gains tax rate. In C corporations, capital

[4]This thought experiment assumes that the level of pre-tax income will not change if the firm is organized as a pass-through or non-pass-through entity. This may not be the case, as will be discussed in a later section, if the "transactions costs" of one organizational form are higher than another

[5]Deferring capital gains lowers the effective capital gains tax rate that an investor pays through the ability of the investor to earn interest on the deferred taxes.

[6]PSCs were subject to a flat 35% corporate tax rate in 1987 because Congresss feared that they were being used to shelter the income of the corporations' owners.

gains are taxed at the same rate as ordinary income. Finally, if a firm plans to switch organizational forms, it must be concerned with the tax implications of doing so. If a firm switches from being a C corporation to being an S corporation, the losses or gains that the firm carries with it from when it was a C corporation are still treated as corporate earnings. These gains must still face the double tax; and the losses can only be used to offset income earned when the firm is a C corporation. This feature may dampen a firm's incentives to switch to being an S corporation in order to pass through losses accrued while the firm was a C corporation, and underscores the importance of choosing the best organizational form from the beginning of a firm's life.

3.2.3 A Brief History of U.S. Business Entity Law

Until 1958, the only business entities in the United States were sole proprietorships, partnerships, and C corporations. Then Congress introduced Subchapter S to the Internal Revenue Code, which created the S corporation. The purpose of Subchapter S, in the words of Congress, was to afford small businesses "the advantages of the corporate form of organization without being made subject to the possible tax disadvantages of the corporation."[7] The aim of Subchapter S was to have these special corporations be taxed as partnerships; however, the tax rules embodied in the legislation bore little resemblance to partnership tax laws.

It was not until 1982 that Congress amended Subchapter S to make the tax treatment of S corporations more like that of partnerships. After these changes were made, the S corporation became a more popular organizational form. After the passage of the Tax Reform Act of 1986, which lowered the top individual tax rate below the top corporate tax rate, the number of S corporations relative to C corporations has grown steadily. In 1999, according to the IRS Statistics of Income division (SOI), S corporations accounted for 55.2 percent of all corporations filing tax returns, accounting for 2,725,775 returns in total. 216.5 thousand of these S corporations were newly incorporated business. The number of S corporations in the United States is expected to grow between 4 and 5 percent annually in the coming years; in contrast, the number of C corporations is expected to grow between 2 and 3 percent annually. This growth in S corporations relative to C corporations will in part be fueled by 1996 legislation which relaxed eligibility restrictions for S corporation

[7]See Chapter 12 of Pratt and Karlsrud (2000).

status. Starting in 1997, S corporations could have 75 shareholders, instead of 35, and the set of eligible shareholders was broadened to include certain trusts and employee stock ownership plans.

Although the number of S and C corporations is growing, the vast majority of firms in the United States are still either partnerships or sole proprietorships. In 1999, according to SOI, there were 1,936,919 partnerships and about 17,575,600 sole proprietorships in the United States. However, the number of S corporations is growing more quickly than the number of partnerships.[8]

In 1997 Congress formally introduced the LLC organizational form in its current state.[9] Despite widespread opinion that this organizational form would replace the S and C corporation for small firms because of the perceived flexibility in choosing tax regime and limited liability, this has not yet occurred.[10] Although the number of LLCs is increasing, it is increasing at a rate about one half to a third of the rate of new incorporations according to the International Association of Corporation Administrators. Time will tell whether the new LLC organizational form will eventually grow more rapidly than corporations as perhaps it becomes more familiar to lawyers and business advisors.

This section has described the different tax and non-tax features of the five business organizational forms in the U.S. and has shown that pass-through organizational forms have been growing relative to C corporations in the United States. The following sections discuss models of how firms may trade off these features when choosing an optimal organizational form.

3.3 The Gravelle-Kotlikoff Model of Tax Distortions to Organizational Form Choice

Gravelle and Kotlikoff (1989) extended the Harberger corporate tax incidence model to allow for both corporate and non-corporate production of the same good. Here, "non-corporate" refers to all pass-through entities, even S corporations which are in fact corporations, but not subject to the corporate tax. In previous analyses of the incidence of the corporate

[8] In the late 1990s, the number of partnerships in the United States was actually declining.

[9] From 1988 to 1997, the LLC existed in certain states, but the rules governing its tax status were more complicated.

[10] For an examination of the causes behind the enduring popularity of S and C corporation status for small firms see Lee (2000).

tax, such as Harberger (1966) and Shoven (1976), it was assumed that certain sectors were inherently non-corporate and others corporate. For example, machine manufacturers might be inherently corporate because of limited liability and law firms might be inherently non-corporate because of the benefits of allocating income in different shares to different partners. Taxing the capital in the corporate sector lead to a distortion in the allocation of capital across the corporate and non-corporate sectors, creating a DWL as capital that should have been employed in the corporate sector was used in the non-corporate sector. In the Gravelle-Kotlikoff model the corporate tax leads to even bigger distortions to the allocation of capital since both corporate and non-corporate capital can produce the same goods.

The Gravelle-Kotlikoff model is a general equilibrium model in which capital, labor, and managerial labor are allocated across corporate and non-corporate production of two goods. Whether a firm is corporate or non-corporate is determined by the type of manager it has. All managers have the ability to manage corporate or non-corporate firms; however, some are more "talented," or productive as managers of non-corporate entities. In the first best equilibrium, managers who are more productive as non-corporate managers create non-corporate firms, and managers who are more productive as corporate managers create corporate firms.

Then a tax system is introduced in which corporations' incomes are taxed at rate τ^c, the corporate tax rate, and then at rate τ^e, the personal rate on corporate income. Non-corporate firms' incomes are taxed at rate τ^p, the tax rate on personal income. Note that $\tau^e \leq \tau^p$, since the personal tax rate on corporate income will be a combination of the personal tax rate on ordinary income, τ^p, and the personal tax rate on capital gains, which is lower than τ^p.

If firm i with organizational form F has rate of return r_i^F, then in the first-best, or non-distortionary, equilibrium, all firms for whom the rate of return when non-corporate, r_i^{Pass} is less than the rate of return when the firm is corporate, r_i^{CCorp},choose to be to be corporations. In the Gravelle-Kotlikoff model, a distortion from the tax system occurs when conditions (1) and (2) are met.

$$r_i^{Pass} \leq r_i^{CCorp} \tag{3.1}$$

$$(1-\tau^p) r_i^{Pass} \geq (1-\tau^c)(1-\tau^e) r_i^{CCorp} \tag{3.2}$$

That is, a distortion occurs when a firm would find it more profitable to be a C corporation in a no-tax world, finds it more profitable after taxes to organize as a pass-through entity. The DWL from this distortion can be approximated by equation (3.3), the difference between the rates of return between the two entity types.

$$DWL_i \approx (r_i^{CCorp} - r_i^{Pass})K \tag{3.3}$$

The total DWL in the economy would be the sum of pretax rate of return differences multiplied by the firms' capital stocks for all firms which switched from being C corporations to being pass-through entities.

It is clear that the Gravelle and Kotlikoff model ignores two very important features of the U.S. tax code - tax loss offsets and the graduated C corporation tax schedule. In other words, the Gravelle-Kotlikoff model has a linear tax system with perfect loss offsets, when in fact the tax system in the U.S. is highly non-linear. In some empirical work meant to estimate the elasticity of substitution of capital between corporate and non-corporate production of the same good - a key parameter in the Gravelle-Kotlikoff model - losses are incorporated into the Gravelle-Kotlikoff model by assuming that if a firm has a loss it will prefer to be a C corporation rather than a pass-through entity since the tax loss offset in the Gravelle-Kotlikoff model for a C corporation, $(1-\tau^c)(1-\tau^e)$, is bigger than for a pass-through entity, $(1-\tau^p)$. However, as discussed in the previous section, pass-through entities typically have more generous loss offset provisions than C corporations, especially for young firms.

Because the Gravelle-Kotlikoff model ignores the nonlinearity of U.S. tax system, they derive the result that whenever a firm switches to being a pass-through entity from being a C corporation in response to taxes, that this switch is inefficient. Subsequent empirical work has assumed that a switch from being a C corporation to being a pass-through entity is inefficient and sets out the estimate the propensity of firms to switch organizational form. This is essentially an exercise which estimates a parameter of the Gravelle-Kotlikoff model, but does not test the validity of the Gravelle-Kotlikoff model. This empirical work is briefly reviewed below. I then present an alternative model which incorporates tax nonlinearity, uncertainty, and project choice and which is also consistent with the prior empirical evidence.

3.3.1 Empirical Evidence on the Gravelle-Kotlikoff Model

Most of the empirical work on tax distortions to organizational form choice has focused on estimating the impact of the "tax-wedge" between the top statutory personal and corporate tax rates on the share of non-corporate production in various sectors. Empirical work such as Gordon and Mackie-Mason (1997) and Goolsbee (1998) has tried to estimate the elasticity of substitution between the corporate and noncorporate sectors in response to time series variation in the relative personal and corporate statutory tax rates. More recently, Goolsbee (2002) uses variation across states in the tax wedge between the top corporate and personal tax rates to estimate the elasticity of substitution of capital between corporate and non-corporate production of goods. These studies find that there is more production of goods in non-corporate entities when the difference between the top corporate tax rate and top personal tax rate increases. These studies use the estimated elasticity, which they find to be statistically significant but not economically very large, to calculate the DWL of the corporate tax based on the Gravelle-Kotlikoff model.

Gordon and Mackie-Mason (1994) estimate the cost of switching organizational form using a CAPM with taxes framework and U.S. data aggregated at the 1-digit SIC code level. Their ultimate estimate is made given many assumptions, many of which we may not accept, such as that all firms in the manufacturing industry no matter how large or small face the same cost of changing organizational form as well as linearity of the tax system. The authors find the costs of switching organizational form to be quite large.

Other studies do not offer DWL calculations, but just investigate whether taxes seem to matter in firms' organizational form choices. These studies also use the top statutory tax wedge between corporations and individuals as the measure of the tax influence on organizational form choice. Plesko (1994) and Carroll and Joulfian (1997) find that the firms are more likely to organize as S corporations when the difference between the top corporate tax rate and the top personal tax rate increases.

These empirical studies show that organizational form choice is influenced by taxes. However, the welfare implications drawn by Goolsbee and Gordon and MacKie-Mason may be incorrect. Firms may in fact be likelier to choose to be pass-through entities when the top personal tax rate falls relative to the top corporate tax rate, but such behavior may be consistent with models of organizational form choice other than the one proposed

by Gravelle and Kotlikoff. In fact, Carroll and Joulfian find that the sales growth of firms which switch to being S corporations from C corporation is higher than for firms which remain C corporations. This piece of evidence seems inconsistent with the Gravelle-Kotlikoff model in which a firm should perform more poorly after switching to being a pass-through entity since it is paying less in taxes.

3.4 Organizational Form Choice with Tax Progressiveness, Imperfect Tax Loss Offsets and Endogenous Project Choice

In the Gravelle-Kotlikoff model, firm i had a single rate of return associated with organizational form F, r_i^F. Now suppose that instead of a single rate of return, there is a project choice set for firm i associated with organizational form F, Ω_i^F. Each project in Ω_i^F has its own risky rate of return. If the firm organizes as a C corporation it can choose to implement a portfolio of projects chosen from Ω_i^{CCorp}. If the firm organizes as a pass-through entity it may choose a portfolio of projects from Ω_i^{Pass}. In a no-tax world, a risk neutral firm would choose the project portfolio with the highest expected return. Let $\overline{r}_i^{CCorp}$ be the expected return of the project portfolio chosen from Ω_i^{CCorp} with the highest expected return, and $\overline{r}_i^{Pass}$ the expected return on the project portfolio chosen from Ω_i^{Pass} with the highest expected return.

In this setup, a firm has two decisions to make. First, it must decide, conditional on being a particular organizational form, which portfolio of projects to implement. Second, it must decide which organizational form to take. The optimal decision for an individual firm in the absence of taxes would be to compare $\overline{r}_i^{CCorp}$ and $\overline{r}_i^{Pass}$ and to choose the organizational form for which the expected return of the best project portfolio is higher. For instance, if $\overline{r}_i^{CCorp} > \overline{r}_i^{Pass}$, then the firm would choose to be a C corporation and implement the project(s) in Ω_i^{CCorp} which yield $\overline{r}_i^{CCorp}$.

Taxes can distort both a firm's project choice and organizational form choice. If we introduced the same corporate tax system as Gravelle and Kotlilkoff, i.e. a linear tax system with perfect loss offsets, then there would be no distortion to project choice. Further if we also assume that $(1-\tau^c)(1-\tau^e) < (1-\tau^p)$, i.e. that the tax rate on corporate income is always higher than the tax rate on non-corporate income, then all distortions to organizational form choice will occur when C corporations switch to being pass-through

entities as in the Gravelle-Kotlikoff model.

Introducing a progressive corporate tax system with imperfect loss offsets, such as the one in the U.S., will lead to distortions both in firms' project choices and in their organizational form choices. progressiveness and imperfect tax loss offsets make the tax function a firm faces convex and may distort the portfolio of projects chosen.[11] The differences in convexity of the tax functions that a firm will face when organized as different entities, as well as the difference between the top corporate and personal tax rates, may distort a firm's organizational form choice.

In particular, a more convex tax function may distort a firm's project choice by reducing its desire to take on risk. The more convex a firm's tax function the more taxes are taken from the firm as the firm's income increases and the firm gets fewer subsidies as its losses become larger. Given a convex tax function, a firm may find it more profitable after taxes to choose a project which is less risky, e.g. has a lower variance, even though the riskier project might have a higher pre-tax return.[12] One organizational form may have a less convex function associated with it, but with higher overall level of tax rates, while another organizational form may have a more convex tax function, but with lower tax rates in certain regions. These difference across entities in tax functions may distort organizational form choice as well as project choice.

Let $\widetilde{r}_i^{CCorp}$ be the expected pre-tax return on the project(s) in Ω_i^{CCorp} with the highest expected after-tax return, $E[(1-\tau^c)(1-\tau^e)r_i^{CCorp}]$. Similarly, let $\widetilde{r}_i^{Pass}$ be the expected pre-tax return on the set of projects in yielding the highest expected after-tax return, $E[(1-\tau^p)r_i^{Pass}]$. A firm's project choice is distorted when it is organized as form F if $\widetilde{r}_i^F > \overline{r}_i^F$. In other words, the firm's project choice is distorted if the firm chooses a set of projects which yields a higher expected after-tax return but a lower expected pre-tax return than the first-best set of projects.

Firm i will choose to be a C corporation if $E[(1-\tau^c)(1-\tau^e)r_i^{CCorp}] \geq E[(1-\tau^p)r_i^{Pass}]$ and will choose to be a pass-through entity if $E[(1-\tau^c)(1-\tau^e)r_i^{CCorpTax}] \leq E[(1-\tau_i^p)r_i^{SCorpTax}]$. There is a distortion in the firm's organizational form choice if it chooses to be a pass-through entity but $\widetilde{r}_i^{CCorp} > \widetilde{r}_i^{Pass}$, or if it chooses to be a C corporation but $\widetilde{r}_i^{Pass} > \widetilde{r}_i^{CCorp}$.

Now, instead of just one type of distortion, i.e. firms choosing to be pass-through

[11] A tax function is the amount of tax a firm owes as a function of its taxable income.

[12] There is a substantial economics and finance literature on the effects of tax function convexity on risk taking. See for example Domar and Musgrave (1944) and Sandmo (1985).

entities instead of C corporations, as in the Gravelle-Kotlikoff model, there are two types of distortion that can occur. Firms may distort both their project choice and organizational form choice. Also, it is no longer the case that organizational form distortions only occur when firms choose to be pass-through entities rather than C corporations. A distortion can occur when a firm chooses to be a C corporation instead of a pass-through entity to take advantage of the lower corporate tax rates at lower levels of corporate income.

Taking account of tax progressiveness and imperfect tax loss offsets, organizational form choice distortion can occur both when firms choose to be C corporations over pass-through entities and when firms choose to be pass-through entities over C corporations. I will focus on the distortion when a firm chooses to be a C corporation rather than a pass-through entity because this is a possibility that has been ignored in the literature and because this is the most relevant distortion for young firms, the firms most likely to have a real choice of organizational form. Following is a numerical example in which a firm chooses to be a C corporation instead of a pass-through entity and chooses a project with a lower expected pre-tax return than it would have if it were forced to be a pass-through entity.

3.4.1 Numerical Example in which Firm Inefficiently Chooses to be a C Corporation

Consider a firm which has a project choice set $\Omega_i = \Omega_i^{CCorp} = \Omega_i^{Pass}$ which consists of two projects. The projects a firm has available to it do not change whether the firm is a C corporation or another entity. This assumption is a plausible one if the firm is young and is choosing between being a C corporation or an S corporation. The advantages of a C corporation over an S corporation, such as having more than 75 shareholders and corporate shareholders, are not so important for a young firm with a few owners, especially since it is virtually costless for an S corporation to switch to being a C corporation when its need for more shareholders becomes apparent.

Project 1 has income of \$100,000 with probability $\frac{1}{2}$ and income of -\$50,000 with probability $\frac{1}{2}$. Project 2 has income of \$50,000 with probability $\frac{1}{2}$ and income of -\$10,000 with probability $\frac{1}{2}$. Each project requires an initial outlay of \$250,000. So the expected pre-tax rate of return on Project 1 is $\frac{1}{2}[40\% - 20\%] = 10\%$, and the expected pre-tax rate of return on Project 2 is $\frac{1}{2}[20\% - 4\%] = 8\%$.

In the absence of taxes, a risk neutral firm will choose to implement Project 1 since

it has the higher expected pre-tax return. The firm is indifferent between being a C or S corporation. Now introduce a tax system similar to the one in the United States. Assume for simplicity there is one shareholder of the corporation and that she is in the 36% tax bracket due to other income she receives. Assume also that this is the firm's first year of operation so that the firm has no earnings in the past three years. For now, I will also ignore the effect of state-level taxes. For simplicity also assume that $\tau^e = 0$.

If the firm organizes as an S corporation it will face a linear tax function. If the firm earns $100,000, $36,000 will be paid in taxes. If the firm earns -$50,000, the shareholder will owe $18,000 less in taxes since she can offset the $50,000 loss against her other income. The expected after-tax return on Project 1, conditional on the firm being an S corporation, is therefore $(1-0.36)\cdot 10\% = 6.4\%$. The expected after-tax return on Project 2, conditional on the firm being an S corporation, is $(1-0.36)\cdot 8\% = 5.92\%$. If the firm organizes as an S corporation it will choose Project 1, the project with the highest expected pre-tax return since $6.4\% > 5.92\%$.

If the firm organizes as a C corporation it will face a non-linear tax function. The corporate income tax schedule taxes corporate income up to $50,000 at a rate of 15%. Income between $50,000 and $75,000 is taxed at a rate of 28%; income between $75,000 and $100,000 is taxed at 34%. The average tax rate on $100,000 is therefore 23%. The average tax rate on the $50,000 loss is 0% in the current period since there is no income in the past three years against which to offset the loss. However, if the firm expects to earn positive income in the next 15 years it can use the current period's loss to offset this income.

The expected after-tax return of Project 1 if the firm organizes as a C corporation is $(\frac{1}{2}\cdot(1-0.23)\cdot 40\%)+(\frac{1}{2}\cdot -20\%) = 5.4\%$. The expected after-tax return of Project 2 if the firm organizes as a C corporation is $(\frac{1}{2}\cdot(1-0.15)\cdot 20\%)+(\frac{1}{2}\cdot -4\%) = 6.5\%$. If the firm ignores future benefits from tax loss carryforwards it would choose to implement Project 2 since 6.5% ¿ 5.4%. Further since 6.5% ¿ 6.4%, the firm will choose to organize as a C corporation and choose to implement Project 2. So, there is a DWL of 0.1% as a result of the firm choosing to be a C corporation instead of an S corporation.

So far we have ignored the ability of the C corporation to carryforward any losses in the first period to future periods. Further if the C corporation had positive income in the past three years greater than $50,000, it would have had an immediate offset of its loss

from Project 1; however, we have assumed that the firm begins in the current period. To consider the effect of future tax loss carryforwards on future earnings the firm must have an expectation of what its future earnings will be. Let's assume that the firm whether it is an S or C corporation expects to earn \$10,000 for each of the next three years on its \$250,000 in assets. In choosing whether to implement Project 1 or Project 2 the firm will calculate the expected present discounted value stream of after-tax returns over the next four years. The firm will choose the course of action that yields the highest expected PDV of after-tax returns. The PDV sum of after-tax expected returns if the firm is organized as a C corporation are (assuming a discount rate of 0.06):

$$\begin{aligned} Project1 \quad &: \quad \frac{1}{2}(1-0.23)40\% - \frac{1}{2}20\% + \left\{\frac{1}{2}(1-0.15)4\% + \frac{1}{2}4\%\right\}\left\{\frac{1}{1.06} + \frac{1}{1.06^2} + \frac{1}{1.06^3}\right\} \\ &= \quad 15.29\% \\ Project2 \quad &: \quad \frac{1}{2}(1-0.15)20\% - \frac{1}{2}4\% + \frac{\frac{1}{2}(1-0.15)4\% + \frac{1}{2}4\%}{1.06} + 4\%\left\{\frac{1}{1.06^2} + \frac{1}{1.06^3}\right\} \\ &= \quad 15.87\% \end{aligned}$$

The PDV expected after-tax return on Project 1 is 13.24% and on Project 2 is 11.96%. The firm will choose to be a C corporation and implement Project 2.

Now imagine a tax rate change such that income from both individuals and corporations is taxed at 28%. Project 1 has a PDV after-tax return of 14.82% and Project 2 a PDV after-tax return of 13.42% if the firm is organized as a C corporation. Project 1 has a PDV after-tax return of 14.89% and Project 2 13.46%. The firm now finds it better to organize as an S corporation and undertake Project 1 after the tax change. This example illustrates how a change in the relative corporate and personal tax rates could cause a firm to reorganize as an S corporation and actually *decrease the DWL of the corporate tax.*

This example is stylized and I could have made another assumption about the firm's expectations about future earnings which would have altered the outcome of the tax change. For example, if I assumed that if the firm chose Project 1 it had income which was an iid draw from the same distribution as Project 1 for the next 3 years and that if it chose Project 2 it had income which was an iid draw from the same distribution as Project 2, I would have found that with $\tau^p = 0.36$ and $\tau^c = 0.23, 0.15$, the firm chose to be a C corporation and undertook Project 1. Given the tax change which set $\tau^p = \tau^c = 0.28$, the firm would have chosen to be an S corporation and implemented Project 1. In this case, the firm

reorganizing as an S corporation has no efficiency consequences.

This numerical example serves to illustrate that observing firms reorganizing as S corporations or choosing to be S corporation from the beginning of their lives does not necessarily imply a deadweight loss resulting from their choice. In fact, because the corporate tax code is graduated and has imperfect loss offsets, it is possible that by switching to S status in response to a change in the relative personal and corporate tax rates, deadweight loss may actually decrease.

This section has shown that it may be the case that organizational form changes by corporations to pass-through entities in response to taxes may not be inefficient. Considering a progressive tax system with imperfect loss offsets, it is clear that distortions to project choice and organizational form choice can occur in a variety of ways - both when C corporations switch to pass-through entities and when pass-through entities switch to C corporations.

However, the distortion when a firm chooses to be a C corporation instead of a pass-through entity, such as an S corporation, seems to be the most relevant. This is because young, smaller firms are firms for whom entity choice is most relevant since these firms can easily switch from being C corporations, to S corporations, to partnerships as they typically meet the legal requirements for all entity types. The corporate tax functions of these firms are also likely to be more convex than their non-corporate tax functions. This is because young firms do not have much past positive income against which to offset losses and are also likely to have small enough amounts of income to fall in the graduated area of the corporate tax schedule. It is also likely that the owners of these firms have enough personal income against which to offset losses of the firm and also to be above the graduated region of the personal tax schedule. Thus, young small firms are likely to have linear tax functions at the higher personal tax rates when organized as pass-through entities and highly non-linear tax functions when organized as C corporations. Thus, it would seem that these firms are more likely to inefficiently choose to be C corporations than to inefficiently choose to be non-pass-through entities.

3.5 Empirical Evidence from S and C Corporations

If firms choose to be C corporations instead of pass-through entities, such as S corporations, because of the graduated portion of the corporate tax code and not because the C corporation organizational form provides significant non-tax advantages, such as greater growth opportunities, then we should observe that the taxable incomes of these firms fall within the graduated area of the tax schedule or not far above it. We should also observe that S corporations' taxable incomes fall more often above the graduated area of the corporate tax schedule and that S corporations have greater losses than observationally equivalent C corporations. We should also observe that S corporations have on average higher taxable incomes than observationally equivalent C corporations and more volatile taxable incomes.

If we observe these facts, it does not necessarily follow that the C corporations' behavior is being distorted by the tax system; it may be the case that the C corporations have only one type of project and that the optimal organizational form for this project is a C corporation because it offers the lowest tax burden. Matching S and C corporations on observables does not control for the unobservable differences which may affect the investment opportunities of the firms and, hence, their organizational form choices. But observing the above facts does cast doubt on the assertions that C corporations would perform worse if they switched to being S corporations.

Finally, I can observe firms which switch from being C corporations to being S corporations and vice versa and can observe what happens to the size and volatility of their taxable incomes after the switch.

3.5.1 Data

The data I use are the micro-level corporate tax files maintained by the Statistics of Income Division (SOI) of the Internal Revenue Service. This dataset contains basic income statement and balance sheet information for annual stratified random samples of the set of corporations, both S and C, which file tax returns in the United States. Larger corporations, measured by assets-sales categories are oversampled. It is possible to form an unbalanced panel from the annual cross-sections because of a bias towards repeat sampling of firms. Once a firm has been sampled it is sampled again unless it dies, is merged, or in some other way changes its entity or if it falls into a lower sales-asset size category. I have data from

1988 to 1998.

I form an unbalanced panel of non-financial S corporations and C corporations eligible to become S corporations or which could easily become eligible. I keep only C corporations which have fewer than 35 shareholders, 75 in 1997 and 1998, have no parent corporation, are not part of a controlled group, and do not have a foreign owner. I want to compare the behavior of C corporations for which the costs or reorganization are not too large to the behavior of S corporations; for example, publicly traded C corporations cannot viably reorganize as S corporations, nor can subsidiaries of larger Corporations. These costs of reorganization stand in contrast to the costs of being an S corporation instead of a C corporation.

The sample contains 354,114 firm-years. 182,401 of the firm-years are S corporation-years; 171,173 are C corporation-years. 101,401 corporations comprise the 354,114 firm-years. 48,854 of these corporations are S corporations; 47,396 are C corporations. 5,151 of these corporations change organizational form during the sample period. 3,801 of these are C corporations changing to S corporations, and 1,125 are S corporations which switch to C corporations. 225 of these change form more than once.

3.5.2 Findings

Table 3.2 reports summary statistics for the corporate tax return sample. The S corporations are larger than the C corporations in both total assets and sales. Average total assets for the sample of C corporations are $5 million versus $9.5 million for the sample of S corporations. Average sales for the sample of C corporation is $ 9 million versus $20 millions for the sample of S corporations. Although the S corporations are on average larger than the C corporations, the firms in both samples are around the same age and spread similarly across industry groups.

Table 3.2 suggests that matching S and C corporations on observables such as age, number of shareholders, and industry, all else equal S corporation are larger in both sales and assets. This fact is consistent with the story in which C corporations take on less risky projects which have smaller losses and smaller potential upside, but which are expected to payoff in the graduated area of the corporate tax schedule.

Figures 3.1 and 3.2 depict in graphical form what will be seen in the following regression analysis. Figure 3.1 plots a histogram of net income for the subsample of S corporations.

Figure 3.2 plots a histogram of net income for the subsample of C corporations. While both subsamples have a large fraction of observations with net income very close to zero, the subsample of S corporations has a slightly flatter distribution of net income, with larger tails to the left and right of zero.

The first set of regressions test whether, all else equal, C corporations are more or less likely than S corporations to have net income which falls in the graduated area of the corporate tax schedule. Looking at the corporate tax schedules in Appendix A, over the period 1988 to 1998, corporate net income up to $75,000 was taxed at a lower rate than net income above $75,000. I create a dummy variable which is equal to one if a firm has net income greater than $75,000 and run linear probability models of the following form.

$$I(NI > 75,000)_{it} = \alpha_0 + \alpha_1 CCorp_{it} + \alpha_2 X_{it} + \alpha_3 Z_i + \alpha_4 Y_t + \varepsilon_{it} \tag{3.4}$$

The letter i indexes the firm, and t indexes the year. Equation (3.4) includes a dummy $CCorp$ which is equal to one if the firm is organized as a C corporation. The matrix X includes firm-level controls such as age, log of total assets, and number of shareholders. The matrix Z includes industry dummies, and the matrix Y includes year dummies and a time trend.

The first column of Table 3.3 reports OLS estimates for equation (3.4). Standard errors are corrected for clustering at the firm level. The estimated coefficient on the C corporation dummy is -0.154 and is significant at the 1% level. This means that, all else equal, a C corporation is 15 percentage points less likely to have net income above $75,000 than an S corporation.

Columns 2 through 5 of Table 3.3 run regressions similar to equation (3.4) but with different dependent variables. In column 2 the dependent variable is a dummy which is equal to one if the firm has a loss, i.e. net income is less than zero. In the full sample, 1988 to 1998, C corporations are about 2 percentage points more likely to have a loss than observationally equivalent S corporations. However, when net income is the dependent variable as in column 3, conditional on having a loss, C corporations have smaller losses than observationally equivalent S corporations. A C corporation has on average a loss which is $89,000 smaller than an observationally equivalent S corporation.

In column 4, net income is also the dependent variable, but here the regression is run

for both loss and gain firms. Now, a C corporation has $619,000 less in net income than an observationally equivalent S corporation. A C corporation has on average $2.5 million less in total income and $9 million less in sales than an observationally equivalent S corporation.[13]

Table 3.4 runs these five regressions on the annual subsamples of the total sample, and Table 3.5 runs the regressions on industry subsamples of the total sample. The results are broadly similar across these different subsamples. The findings for the coefficients on the C corporation dummy get stronger over time and are slightly strongest for the wholesale trade and services industries. However, the results are qualitatively similar in all of the subsamples.

The results in Tables 3.3, 3.4, and 3.5 reveal that C corporations are more likely to have net income in the graduated area of the corporate tax schedule and have both smaller losses and gains than observationally equivalent S corporations, though S and C corporations are just as likely to have losses, at least in the earlier part of the sample.

We have seen that C corporations have on average lower sales than S corporations, which may explain why some C corporations also have lower net income than S corporations. But it is also possible that some C corporations have lower net income because they shift their income out of the firm in the form of tax deductions, such as wages and interest paid to the owners of the corporations. Such "income shifting" would achieve lower net incomes for the C corporations without there being any real difference between the projects undertaken by S and C corporations.

Table 3.6 reports estimates from the following regression.

$$\frac{Deduction_{it}}{Sales_{it}} = \beta_0 + \beta_1 CCorp_{it} + \beta_2 X_{it} + \beta_3 Z_i + \beta_4 Y_t + \varepsilon_{it} \tag{3.5}$$

This regression tests whether C corporations deduct more items from their sales than S corporations in an attempt to shift income into the personal tax base without paying corporate tax on the income. There is some evidence that this occurs, however, not enough to lower net income to the levels observed in Table 3.3. In particular, officer compensation seems to be the deduction item that C corporations use to shift corporate income into the personal tax base without incurring the double taxation of the income.

Finally, I analyze the variability of C corporations' net income and sales. While the

[13]Total income is gross profits (sales minus cost of goods sold) plus any other rental or non-operating income.

cross-sectional evidence suggests that C corporations' incomes are less volatile than S corporations' incomes, I test this more directly by computing the standard deviation of individual corporations' incomes and regressing these on the control variables used in equations (3.4) and (3.5).

$$StdDev(Income)_i = \gamma_0 + \gamma_1 CCorp_i + \gamma_2 X_i + \gamma_3 Z_i + \gamma_4 Y_t + \varepsilon_{it} \tag{3.6}$$

The control variables which vary over time, such as age and log of assets, in equation (3.6) are taken from the first observation of the firm, and standard deviations of income are computed only for firms with 4 or more years of data. The results in Table 3.7 indicate that C corporations have more volatile net income and sales than observationally equivalent S corporations. A C corporation has a standard deviation of net income which is around $1,000 dollars less than an observationally equivalent S corporation. Table 3.8 estimates equation (3.6) on industry subsamples. The results are qualitatively the same for all industry groups, with the results being strongest for C corporations operating in the manufacturing and wholesale trade industries.

The empirical evidence presented has shown that small privately-owned C corporations in the U.S. have lower and less volatile net incomes and sales than observationally equivalent S corporations. This evidence supports the hypothesis that C corporations choose to be C corporations, i.e. because they expect to benefit from the lower corporate tax rates because they expect their net incomes to be less volatile and to fall mainly in the graduated area of the corporate tax schedule. This evidence is consistent with C corporations inefficiently taking on less risky projects than if they had chosen to be S corporations. However, it does not prove that this is the case.

To prove that C corporations are inefficiently choosing their projects because the after-tax return is higher rather than choosing better projects as S corporations, we would need to randomly assign or force corporations with identical project choice sets to be S and C corporations and then observe the differences in the size and volatility of incomes between the organizational forms. As it stands, the evidence presented in this chapter tells us that firms with projects yielding net income in the graduated area of the corporate tax schedule and not having very large losses in the event of negative net income choose to become C corporations. It could be the case that all of the firms which look the same according

to observable characteristics in the data have different unobservable project choice sets. Those firms with the less risky projects choose to be C corporations and those with more risky projects choose to be S corporations, but there is no inefficiency resulting from their choices.

However, what we have observed is necessary, though not sufficient, for the scenarios discussed in subsections 4 and 5. The evidence does, however, cast doubt on DWL calculations presented in empirical studies. Is not necessarily the case that when we observe business activity shifting from C corporations to S corporations that this corresponds to a DWL. It is possible that such movement corresponds to an increase in efficiency. It is also possible that such shifts correspond to neither an increase or decrease in DWL; it may be the case that the project choice set of a firm does not depend on whether it is a C corporation or an S corporation and that there are no real changes when firms change organizational form.

3.6 Conclusions

This chapter has shown how, given the progressiveness of the corporate tax schedule and differences in the treatment of losses between pass-through and non-pass-through organizational forms, firms may choose to organize as C corporations when in fact it would be more efficient for them to organize as pass-through entities. Further, empirical evidence was presented which is consistent with this possibility and which casts doubt on previous empirical studies which assume that shifting of business activity from non-pass-through to pass-through organizations corresponds to a deadweight loss to the economy.

For small firms, it may be more sensible to focus on the effects of the tax advantage of being a C corporation due to the graduated corporate tax schedule rather than focusing on the double-tax disadvantage of the C corporation form. It seems that in addition to focusing on more linear tax loss offsets and integration in the corporate tax system as ways of reducing inefficiency, some attention should be paid to the potentially distortionary effects of the progressiveness of the corporate tax schedule.

Young, small firms are the ones with most flexibility in their choice of organizational form and the ones we observe actually changing form. There is not much evidence that these firms perform more poorly as pass-throughs than as C corporations. Rather, it seems

that young small C corporations perform more poorly than pass-throughs.

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3.7 Figures and Tables

Figure 3.1 Distribution of Net Income ($1,000) for S Corporations

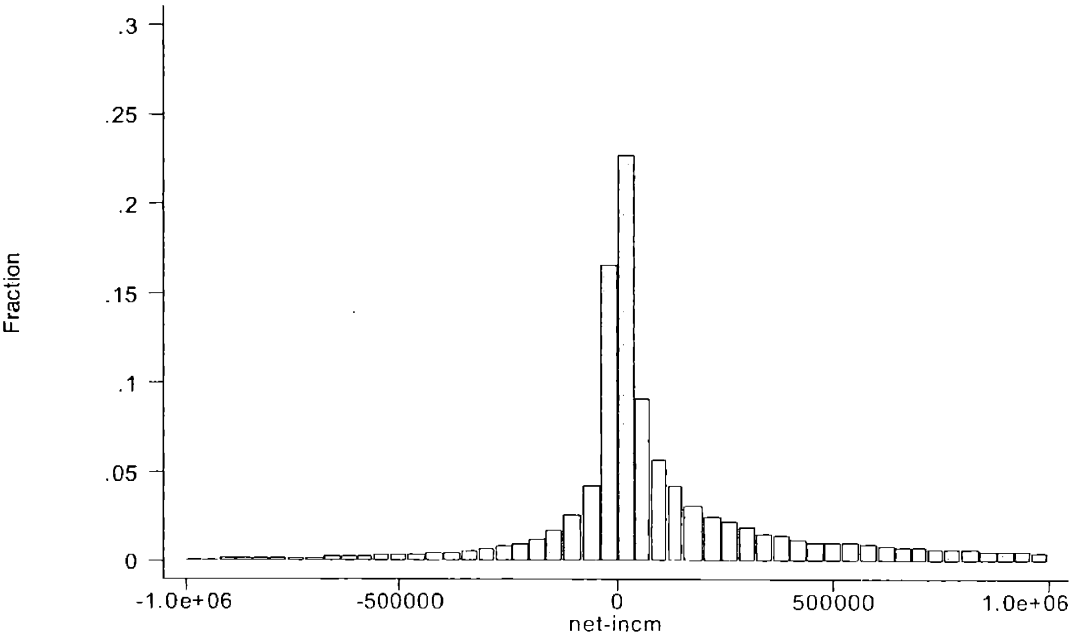

Figure 3.2 Distribution of Net Income ($1,000) for C Corporations

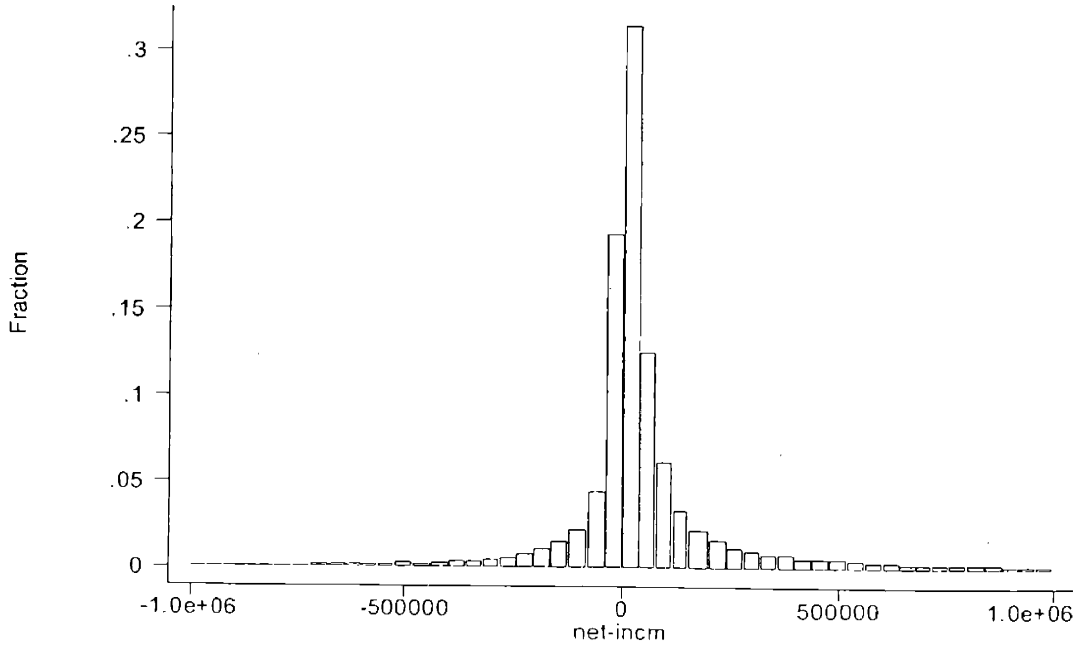

Table 3.2 Summary Statistics for Data Sample

Variable ($1,000)	C Corporations (n=171,173)					S Corporations (n=182,401)				
	Mean	StdDev	25th	50th	75th	Mean	StdDev	25th	50th	75th
Total Assets	5,020	27,800	190	810	2,600	9,590	31,500	190	1,410	8,500
Sales	9,300	51,500	370	1,630	5,960	20,100	68,100	330	2,570	16,400
Total Income	2,660	12,200	180	600	1,770	5,810	19,400	180	990	4,790
Total Deductions	2,280	10,200	120	500	1,570	4,750	16,700	170	860	3,780
Net Income	210	5,410	-1	10	90	1,060	5,230	-1	70	640
Age	16.5	14.6	6	13	23	15.2	15.4	4	10	22
# Shareholders	2.9	4.0	1	2	3	3.4	4.7	1	2	4
Manufacturing	0.175	0.380	0	0	0	0.191	0.393	0	0	0
Retail	0.200	0.400	0	0	0	0.200	0.400	0	0	0
Wholesale	0.164	0.370	0	0	0	0.144	0.351	0	0	0
Services	0.209	0.407	0	0	0	0.248	0.432	0	0	1
Transportation	0.049	0.215	0	0	0	0.048	0.214	0	0	0
Construction	0.143	0.350	0	0	0	0.114	0.318	0	0	0
Mining	0.012	0.108	0	0	0	0.014	0.115	0	0	0
Agriculture	0.048	0.214	0	0	0	0.040	0.196	0	0	0

Quartiles have been rounded to the nearest $10,000 so as to not reveal the identity of any single firm.

Table 3.3 Are C corporations More Likely to Have Net Income in the Graduated Area of the Corporate Tax Schedule?

	=1 if Net Inc Over 75,000	=1 if Loss	Net Inc if Loss ($1,000)	Net Inc ($1,000)	Tot Inc ($1,000)	Sales ($1,000)
C corporation	-0.205***	0.077***	65.0***	-649***	-2,344***	-8,522***
	(0.0024)	(0.002)	(23.9)	(31.8)	(107)	(428)
Age	0.008***	-0.008***	14.0***	21.5***	51.5***	135***
	(0.0002)	(0.0002)	(1.84)	(2.52)	(12.4)	(37.2)
Age^2	-0.000***	0.000***	-0.151***	-0.142***	0.109	0.844
	(0.000)	(0.000)	(0.030)	(0.047)	(0.249)	(0.729)
Log(Assets)	0.053***	-0.020***	-124***	203***	1,345***	4,549***
	(0.0004)	(0.0004)	(7.30)	(10.9)	(37.5)	(135)
Shareholders	0.006***	-0.001***	-45.6***	61.7***	404***	1,197***
	(0.0003)	(0.0002)	(3.52)	(6.61)	(28.8)	(99.2)
Manufacturing	0.211***	-0.053***	-360***	1,033***	2,282***	7,727***
Retail	0.075***	-0.031***	88.2	207***	2,116***	10,200***
Wholesale	0.169***	-0.078***	-33.5	318***	1,443***	16,700***
Services	0.115***	-0.050***	-144**	515***	3,331***	5,621***
Transportation	0.114***	-0.003	-487***	377***	4,460***	4,081***
Construction	0.129***	-0.054***	141***	252***	-30.8	5,429***
Mining	0.134***	0.026**	-393***	615***	1,021**	-2,178**
Trend	0.005	0.002***	-36.8***	-3.97	163***	471***
N	347,815	347,815	103,365	347,815	347,815	347,815
R^2	0.268	0.0553	0.0274	0.0384	0.116	0.100

All regressions are OLS, include year dummies, and have standard errors clustered at the firm level (99,260 clusters).

*** 1% significance; ** 5% significance; * 10% significance

Table 3.4 Coefficient on C Corporation Dummy for Regressions by Year

	=1 if Net Inc Over 75,000	=1 if Loss	Net Inc if Loss ($1,000)	Net Inc ($1,000)	Tot Inc ($1,000)	Sales ($1,000)
1988	-0.209***	0.092***	101***	-621***	-1,582***	-6,563***
	(0.006)	(0.006)	(42.9)	(43.1)	(122)	(437)
1989	-0.222***	0.102***	29.2	-598***	-1,433***	-6,122***
	(0.005)	(0.006)	(54.6)	(76.7)	(180)	(514)
1990	-0.230***	0.115***	-124	-678***	-1,669***	-6,926***
	(0.005)	(0.005)	(121)	(90.7)	(161)	(633)
1991	-0.304***	0.191***	-45.0	-938***	-1,614***	-5,952***
	(0.005)	(0.005)	(55.4)	(71.0)	(171)	(935)
1992	-0.295***	0.173***	-61.8	-948***	-1,523***	-4,544***
	(0.005)	(0.005)	(62.6)	(93.1)	(197)	(890)
1993	-0.154***	0.023***	153***	-469***	-2,329***	-8,725***
	(0.005)	(0.005)	(33.6)	(46.0)	(136)	(457)
1994	-0.165***	0.016**	112***	-631***	-2,533***	-9,298***
	(0.005)	(0.005)	(37.8)	(31.5)	(144)	(454)
1995	-0.159***	0.024***	161***	-596***	-2,522***	-9,737***
	(0.005)	(0.005)	(42.3)	(32.9)	(146)	(533)
1996	-0.164***	0.038***	167***	-764***	-3,040***	-11,300***
	(0.005)	(0.005)	(57.4)	(40.4)	(162)	(631)
1997	-0.176***	0.046***	264***	-918***	-3,516***	-12,600***
	(0.005)	(0.005)	(57.9)	(46.5)	(179)	(680)
1998	-0.191***	0.061***	123***	-1,049***	-3,444***	-10,900***
	(0.004)	(0.004)	(45.8)	(43.7)	(149)	(462)

All regressions include the controls in Table 3.3, with the exception of year dummies and trend. Estimation is by OLS and standard errors are clustered at the firm level.

*** 1% significance; ** 5% significance; * 10% significance

Table 3.5 Coefficient on C Corporation Dummy for Regressions by Industry

	=1 if Net Inc Over 75,000	=1 if Loss	Net Inc if Loss ($1,000)	Net Inc ($1,000)	Tot Inc ($1,000)	Sales ($1,000)
Manufacturing	-0.199***	0.083***	73.4	-1,104***	-3,040***	-10,200***
	(0.005)	(0.005)	(79.9)	(136)	(271)	(794)
Retail	-0.205***	0.049***	27.9	-519***	-2,416***	-10,200***
	(0.005)	(0.005)	(75.3)	(43.1)	(228)	(742)
Wholesale	-0.213***	0.055***	330***	-832***	-2,854***	-12,900***
	(0.006)	(0.005)	(94.8)	(49.0)	(206)	(1,872)
Services	-0.221***	0.122***	120**	-677***	-2,097***	-3,955***
	(0.004)	(0.005)	(61.2)	(48.7)	(245)	(310)
Construction	-0.178***	0.078***	281***	-433***	-1,200***	-7,785***
	(0.006)	(0.005)	(92.1)	(34.2)	(68.2)	(518)
Transportation	-0.171***	0.057***	18.5	-385	-1,532***	-7,117**
	(0.009)	(0.009)	(290)	(145)	(614)	(856)

All regressions include the controls in Table 3.3, with the exception of industry dummies. Estimation is by OLS and standard errors are clustered at the firm level.

*** 1% significance; ** 5% significance; * 10% significance

Table 3.6 Do C Corporations Achieve Lower Net Income by Shifting Income to Shareholders through Deductions?

	OfficerComp/ Sales	Wages/ Sales	Interest/ Sales	Employee Benefits/Sales	Pension/ Sales	TotalDeductions/ Sales
C corporation	0.034***	0.012**	0.017***	0.005***	0.003***	0.117***
	(0.004)	(0.006)	(0.004)	(0.002)	(0.001)	(0.045)
Age	0.0015***	-0.031***	-0.001***	0.000	0.0005***	-0.024***
	(0.0005)	(0.001)	(0.0003)	(0.000)	(0.0001)	(0.004)
Age^2	-0.000*	0.000***	0.000*	-0.000	-0.000***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.00005)
Log(Assets)	-0.0081***	0.0018	0.007***	0.0003	-0.0003	-0.052***
	(0.0012)	(0.0013)	(0.001)	(0.0004)	(0.0002)	(0.015)
Shareholders	0.0025***	0.0095***	0.004***	0.0009***	0.000	0.047***
	(0.0007)	(0.0012)	(0.0006)	(0.0002)	(0.000)	(0.007)
Manufacturing	-0.024*	-0.143***	-0.141***	-0.004	0.001	-1.76***
Retail	-0.047***	-0.137***	-0.134***	-0.014***	-0.001	-1.99***
Wholesale	-0.027**	-0.146***	-0.139***	-0.009***	0.002	-1.84***
Services	0.085***	0.001	-0.071***	0.006	0.013***	-0.980***
Transportation	-0.006	-0.042	-0.073***	-0.003	0.005	-1.16***
Construction	-0.008*	-0.178***	-0.122***	-0.009***	0.004**	-1.99***
Mining	0.097**	0.072	0.007	0.061	0.018**	0.631
Trend	-0.001	0.004***	0.007***	0.0005	0.000	0.033***
N	331,835	331,819	331,836	331,881	331,884	331,823
R^2	0.0030	0.0055	0.0031	0.0009	0.0006	0.0046

All regressions are OLS, include year dummies, and have standard errors clustered at the firm level.

*** 1% significance; ** 5% significance; * 10% significance

Table 3.7 Do C Corporations Have less Variable Incomes?

	Std Dev Net Income ($1000)	Std Dev Total Income ($1000)	Std Dev Sales ($1000)
C corporation	-382***	-836***	-2,871***
	(32.6)	(66.1)	(275)
Age	-9.66***	-3.98	-38.2*
	(2.12)	(4.92)	(22.0)
Age^2	0.115***	0.018	0.444
	(0.035)	(0.087)	(0.348)
Log(Assets)	270***	592***	1,962***
	(13.5)	(27.3)	(122)
Shareholders	37.3***	114***	268***
	(5.02)	(20.5)	(37.8)
Manufacturing	415***	542***	1,611***
Retail	-90.0**	236**	2,203***
Wholesale	40.4	254**	5,768***
Services	352***	1,146***	2,133***
Transportation	341***	1,426***	950**
Construction	24.1	15.4	1,997***
Mining	357***	120	-1,134***
Trend	31.2	81.5	237**
N	35,916	35,916	35,916
R^2	0.074	0.074	0.038

Standard deviations are for firms with 4 or more observations. All regressions have year dummies, are estimated using OLS, and have robust standard errors.

*** 1% significance; ** 5% significance; * 10% significance

Table 3.8 Coefficient on C Corporation Dummy for Regressions by Industry

	Std Dev Net Income ($1000)	Std Dev Total Income ($1000)	Std Dev Sales ($1000)
Manufacturing	-514***	-991***	-3,070***
	(103)	(174)	(428)
Retail	-128***	-497***	-1,983***
	(28.2)	(92.9)	(307)
Wholesale	-569***	-1,179***	-5,208***
	(142)	(208)	(1,776)
Services	-414***	-977***	-1,129***
	(74.0)	(213)	(234)
Construction	-337***	-448***	-2,481***
	(28.6)	(48.0)	(320)
Transportation	-210*	-874**	-1.781***
	(125)	(348)	(61.4)

All regression include the controls from Table 3.7 with the exception of industry dummies. Estimation is by OLS and standard errors are corrected for heteroskedasticity and serial correlation.

*** 1% significance; ** 5% significance; * 10% significance

3.8 Appendix: U.S. Federal Tax Schedules

Table 3.A1 Corporate Income Tax Rates 2003-1993

Taxable income over ($)	Not over	Tax rate
0	50,000	15%
50,000	75,000	25%
75,000	100,000	34%
100,000	335,000	39%
335,000	10,000,000	34%
10,000,000	15,000,000	35%
15,000,000	18,333,333	38%
18,333,333	.....	35%

Table 3.A2 Corporate Income Tax Rates 1992-1988

Taxable income over ($)	Not over	Tax rate
0	50,000	15%
50,000	75,000	25%
75,000	100,000	34%
100,000	335,000	39%
335,000	.....	34%

Table 3.A3 Corporate Income Tax Rates 1987

Taxable income over ($)	Not over	Tax rate
0	25,000	15%
25,000	50,000	16.5%
50,000	75,000	27.5%
75,000	100,000	37%
100,000	335,000	42.5%
335,000	1,000,000	40%
1,000,000	1,405,500	42.5%
1,405,500	.....	40%

Table 3.A4 Corporate Income Tax Rates 1986-1984

Taxable income over ($)	Not over	Tax rate
0	25,000	15%
25,000	50,000	18%
50,000	75,000	30%
75,000	100,000	40%
100,000	1,000,000	46%
1,000,000	1,405,500	51%
1,405,500	.....	46%

Table 3.A5 Individual Income (Married Joint) Tax Rates 2003-2002*

Taxable income over ($)	Not over	Tax rate
0	12,000	10%
12,000	47,450	15%
47,450	114,650	27%
114,650	174,700	30%
174,700	311,950	35%
311,950	.....	38.6%

* Tax brackets are adjusted each year for inflation; bracketsreported are for the year 2003.

Table 3.A6 Individual Income (Married Joint) Tax Rates 2001

Taxable income over ($)	Not over	Tax rate
0	45,200	15%
45,200	109,250	27.5%
109,250	166,500	30.5%
166,500	297,350	35.5%
297,350	.....	39.1%

Table 3.A7 Individual Income (Married Joint) Tax Rates 2000-1993*

Taxable income over ($)	Not over	Tax rate
0	43,850	15%
43,850	105,950	28%
105,950	161,450	31%
161,450	288,350	36%
288,350	.....	39.6%

* Tax brackets are adjusted each year for inflation; brackets reported are for the year 2000.

Table 3.A8 Individual Income (Married Joint) Tax Rates 1992

Taxable income over ($)	Not over	Tax rate
0	35,800	15%
35,800	86,500	28%
86,500	.....	31%

Table 3.A9 Individual Income (Married Joint) Tax Rates 1991-1988*

Taxable income over ($)	Not over	Tax rate
0	29,750	15%
29,750	71,900	28%
71,900	149,250	33%
149,250	.....	28%

* Tax brackets are adjusted each year for inflation; brackets reported are for the year 1988.

Table 3.A10 Individual Income (Married Joint) Tax Rates 1987

Taxable income over ($)	Not over	Tax rate
0	3,000	11%
3,000	28,000	15%
28,000	45,000	28%
45,000	90,000	35%
90,000	.....	38.5%

Table 3.A11 Individual Income (Married Joint) Tax Rates 1986-1984*

Taxable income over ($)	Not over	Tax rate
0	3,670	0%
3,670	5,940	11%
5,940	8,200	12%
8,200	12,840	14%
12,840	17,270	16%
17,270	21,800	18%
21,800	26,550	22%
26,550	32,270	25%
32,270	37,980	28%
37,980	49,420	33%
49,420	64,750	38%
64,750	92,370	42%
92,370	118,050	45%
118,050	175,250	49%
175,250	.....	50%

* Tax brackets are adjusted each year for inflation; brackets reported are for the year 1986.

Chapter 4

Mutual Fund Portfolio Turnover and the Effective Tax Burden on Taxable Investors

4.1 Introduction

The tax treatment of equity mutual funds is the result of a complex bargain originally struck in the Securities Act of 1940. Mutual funds are not subject to corporate income tax on their dividend income or realized capital gains. Instead, they must pass through their dividends and realized capital gains to investors, who then include these flows in their taxable income. Capital losses do not flow through to investors. If losses are realized within a fund, they can be used to offset other gains and to reduce the net gain distributed to investors, but net losses cannot be distributed. Losses that are not offset by gains must be carried forward.

The flow-through treatment of realized capital gains can create situations in which an investor purchases a mutual fund, sees the mutual fund shares decline in value, but still pays capital gains taxes prior to the sale of his shares. This would occur when the mutual fund manager liquidates positions that have accrued capital gains. When a fund distributes capital gains, the investor's tax basis is increased by the amount of the taxable distribution. This higher basis reduces the investor's capital gains tax liability when the fund shares are sold, so paying capital gains taxes when the fund distributes a gain represents a re-timing of the capital gains tax liability, rather than a creation of a new liability. When the investor

described above finally sells his mutual fund shares, his realized capital loss at sale will be larger than the simple difference between the sale price and the purchase price, because the intervening capital gain distribution will increase his tax basis.

The unusual tax treatment of mutual funds can make it difficult for investors to evaluate the prospective tax burden on fund investments, and there is even some debate about whether investors consider taxes in selecting mutual funds. For the substantial group of mutual fund investors who hold their shares through IRAs or other tax-deferred accounts, the tax issues associated with capital gains distributions are irrelevant. The central issue is therefore about the behavior of taxable investors. Two previous studies have explored the link between tax considerations and mutual fund inflows. Barclay, Pearson, and Weisbach (1998) focus on how unrealized capital gains within a fund affect fund inflows. They find that funds with a larger overhang of unrealized gains attract smaller inflows than otherwise similar funds with smaller unrealized gains. Bergstresser and Poterba (2002) investigate the impact of unrealized gains as well as recent capital gain distributions on inflows. They find that funds with substantial recent capital gain distributions, and with a high share of heavily-taxed dividends relative to lightly taxed unrealized capital gains, attract smaller inflows than funds with similar pretax return histories but lower investor tax burdens. They also find that large unrealized capital gains discourage inflows.

Neither of these studies provides a completely satisfactory analysis of the prospective tax burdens associated with holding a mutual fund. Barclay, Pearson, and Weisbach (1998) assume that the presence of an unrealized gain will lead to future capital gains tax burdens. They do not distinguish between funds that did not accrue capital gains, and therefore could not have substantial unrealized gains, and funds that accrued substantial gains but realized them and thereby raised investors' capital gains tax liability. Thus they combine differences in capital gain realization rates with differences in past return experience. Bergstresser and Poterba (2002) implicitly assume that a fund's historical tax burden will provide an accurate indication of its future tax burden. While some factors that affect the tax burden may be stable over time for a given fund or a fund-manager pair, such as the difference across managers in their propensity to realize gains or to hold dividend-paying stocks, there may also be substantial variation over time in a fund's tax burden. In particular, a fund that realizes most of its gains in one year, and thereby faces investors with a high tax burden, will be less likely to realize gains in the future, and thereby may face a lower tax burden.

In this chapter, we consider an alternative approach to analyzing a fund's prospective tax burden. We use data on the fund's historical rate of capital gain realizations to forecast the fund's future realizations and associated tax burdens. We implicitly assume that the fund's capital gain realization rate is a more stable attribute of the fund than other tax-related attributes, such as the realized tax burden and the stock of unrealized gains. We document the wide variation across funds in gain realization rates, and we develop an algorithm for computing future tax burdens based on these rates. We then estimate regression models for fund inflows to compare the explanatory power of this prospective capital gains tax burden with the alternative historical tax burden measure.

The chapter is divided into five sections. The first explains the problem of measuring the effective capital gains tax rate for a mutual fund investor, and concludes that there is no single approach to measuring this tax burden that solves all of the outstanding difficulties. Section two describes how we calculate the capital gain realization ratio (CGRR) and notes some of the conceptual problems with this measure. The third section describes how CGRR varies across large equity mutual funds, noting both cross-sectional differences in fund realization rates, and time series variation in the realization rates for individual funds. This section also reports the results of regression models that explain the differences across funds in their capital gain realization rates. We find that a number of factors, such as the length of a manager's tenure, help to predict a fund's gain realization rate. Section four reports regression models that compare the explanatory power of historical tax burdens, and effective tax rate measures based on the capital gain realization rate, for explaining fund inflows. The findings suggest that there have been changes in the relationship between past returns, tax burdens, and inflows during the last decade. Finally, there is a brief conclusion.

4.2 Defining the Tax Burden on Mutual Fund Investors

The central problem in measuring the tax burden on equity mutual funds is deciding what tax rate to impute to the capital gains component of mutual fund returns. These capital gains have two components: realized gains that are distributed to investors, and unrealized gains that remain within the fund. For a fund investor, the tax liability associated with unrealized gains could be triggered in either of two ways. The fund manager might realize the gains while the investor is still holding his shares in the fund, in which case the realized

capital gains will be passed through to the investor. Alternatively, the investor might choose to sell his shares in the fund, in which case taxes will be due on the appreciated value of the fund shares.

Research on the tax burdens faced by mutual fund investors is designed to calculate a measure of the tax burden on returns earned by mutual funds, so that the after-tax returns earned by investors can be compared with the after-tax returns on bonds, directly-held stocks, or other investment classes. For this purpose, it is essential to collapse the future tax liabilities associated with capital gain or loss realization into a current measure of the investor's tax burden. Bergstresser and Poterba (2002) do this when they define the ex post tax burden on fund i in year t as

$$T_{it} = \tau_{DIV}\, d_{it} + \tau_{CG}\,(g_L + g_S)_{it} + \tau_{UCG}\, u_{it} \tag{4.1}$$

where τ_{CG} is the tax rate on capital gains, τ_{DIV} is the tax rate on dividend income, d denotes current dividend income, g_L and g_S are long and short-term realized capital gains, respectively, u is the fund's unrealized capital gains that accrued in period t, and τ_{UCG} is the effective tax rate on unrealized capital gains. Measuring τ_{UCG} requires strong assumptions about future patterns of investor behavior, in particular with respect to the sale of fund shares and the probability that the shares will be held until death. Bailey (1969) is an early example of a study that developed crude algorithms for estimating the value of τ_{UCG} relative to τ_{CG}. For common stocks, Bailey (1969) suggested that a value of .25 for this ratio might be appropriate. Bergstresser and Poterba (2002) assume that the high turnover rate on mutual fund shares leads to a somewhat higher value of this ratio, and when the statutory tax rate on realized long-term gains is 20 percent, they assume that $\tau_{UCG} = .10$.

There are two important limitations of this approach to measuring the ex post tax burden on a mutual fund, and to projecting this tax burden into the future. The first is that it applies the same tax burden on undistributed capital gains to all mutual funds, despite the fact that different funds realize gains at very different rates. Even if investors have the same propensities to sell shares in different mutual funds, fund managers differ. Because the realization-based capital gains tax system provides investors with an interest free loan between the time a gain accrues and the time it is realized, funds with lower realization rates will impose lower effective tax burdens on the unrealized capital gains available to

their investors. Our empirical work is designed to remedy this limitation in earlier work by developing an alternative, fund-specific measure of the capital gains tax burden on accruing capital gains. We model the gain realization rates for different funds, and then using these rates to construct new measures of the effective capital gains tax burden on accruing gains.

There is a second limitation with the approach described in (1), and it is more difficult to address. This arises from the inability of mutual funds to pass through capital losses to their investors. Provided g_L, g_S, and u are all positive, so that the fund generates capital gains and the manager realizes net gains, the approach described above offers an attractive conceptual framework for analyzing tax burdens. When funds generate losses, however, so that u is negative, or when the fund manager realizes net losses, the basic framework becomes inadequate. It then becomes essential to recognize the time lag between the generation of losses by the securities held in the fund, and the recognition of losses by fund investors. This can be accelerated if investors sell their shares, but for buy-and-hold fund investors, the time lag may be substantial.

In the 1990s, when tax considerations in mutual fund investing first began to attract attention, most funds generated capital gains. The approach to measuring after-tax investor returns suggested in equation (4.1) therefore seemed reasonable, and it motivated work such as Bergstresser and Poterba (2002), who analyzed fund tax burdens over the 1993-1999 period. The last three years, however, have witnessed negative returns on many equity mutual funds. Accruing capital gains have been negative, and the stock of unrealized gains held by many funds has been replaced by a stock of unrealized losses.

The present chapter does not consider the problem of unrealized losses, but focuses instead on alternative approaches to treating the future tax burdens associated with mutual fund gains. In this way it provides new insight on the alternative ways to measure fund tax burdens during a period of rising share prices, such as the 1990s. In future work we hope to address the role of losses, and incomplete loss pass-through, on fund returns and fund investors.

4.3 Defining the Capital Gains Realization Rate and Implementing Effective Tax Rate Calculations

The centerpiece of our analysis of fund tax burdens is replacing the constant assumed tax rate on undistributed capital gains in equation (4.1) with an alternative measure of the unrealized capital gains tax burden that varies across funds. We calculate this tax measure by assuming that the rate at which investors in different mutual funds realize gains is the same, but allowing for differences across fund managers in their gain realization rates. This leads us to focus on the capital gain realization rate as a key attribute of a mutual fund.

A fund's capital gains realization rate (CGRR) during any interval is the fraction of the fund's accrued net unrealized capital gains that the manager chose to realize. Two pieces of information are needed to calculate the CGRR – the amount of capital gains the fund realizes and distributes to its shareholders and the stock of unrealized net capital gains from which the fund distributes the gains. If CGDIST is total amount of capital gain distributions and GAINSTOCK is the stock of unrealized capital gains, then fund i's capital gains realization rate in period t is

$$CGRR_{i,t} = CGDIST_{i,t}/GAINSTOCK_{i,t} \tag{4.2}$$

One challenge in generating fund-specific capital gains realization rates is measuring the fund's stock of unrealized net capital gains. We have annual data reported at the end of the calendar year, so we can only measure the stock of unrealized capital gains as of December 31st. Over the course of a year, however, a fund's stock of unrealized net gains may fluctuate due to changes in asset prices and realization decisions by the fund manager. Consider a fund that has $1 million in capital gains in August. If the fund manager realizes $100,000 in gains, but by the end of December, the prices of the fund's assets have fallen so that it now has only $700,000 in unrealized gains, we would calculate the fund's capital gains realization rate as 100,000/(100,000+700,000) or 0.125. When gains were actually realized, however, the capital gains realization rate was 0.10.

It is possible for the measured CGRR to be greater than one, less than zero, or undefined. Our measure of the stock of unrealized capital gains aggregates unrealized gains, unrealized losses, and tax-loss carry-forwards. We calculate GAINSTOCK as the sum of the year-

end stock of net unrealized capital gains plus capital gains distributions during the year. Distributed gains cannot be negative, but the other component of GAINSTOCK can be, which leads to the measurement difficulty.

Two examples highlight the measurement difficulties. First, consider a mutual fund that has $400,000 to invest at the beginning of the year. In one scenario it invests all of its money in a stock which costs $100 per share on January 1st and $120 per share on December 31st. Capital gains as a percent of net assets would then be ((120-100)*4,000)/(120*4,000) or 16.7 percent. Multiplying this number by year-end net assets, 120*4,000, would give us the correct measure of the stock of unrealized capital gains. Now consider the same mutual fund, but which now invests half of the $400,000 in the asset worth $120 per share on December 31st and half in a stock which costs $100 per share on January 1st but only $80 per share on December 31st. Now there are no net unrealized capital gains at year-end, even though the fund manager could sell some of the appreciated stock and thereby generated capital gain distributions for the fund shareholders.

As a second illustration of the measurement problems, consider a fund that fund invests $100,000 in the stock which is worth $120 per share on December 31st and $300,000 in the stock which is worth $80 per share on December 31st. The reported percentage of net assets that are capital gains would now be negative, (120*1,000+80*3,000-(100)*4,000)/(100*4,000) or -10 percent. We would calculate the stock of unrealized capital gains to be -$40,000. In this case, if the fund manager sold some appreciated stock, the CGRR would be negative.

Aggregating unrealized gains and losses and tax-loss carry-forwards in the denominator of CGRR captures differences in capital gains realization behavior of mutual funds. If two funds have the same amount of capital gains distributions and stock of unrealized gains, but one has a larger stock of unrealized capital losses, the fund with the larger stock of unrealized capital losses will have a larger CGRR. This reflects the fact that it could have used some of its losses to offset its gains. However, a practical problem arises since when CGRR is outside the unit interval, it can no longer be used a the probability that the fund will realize a $1 of accrued capital gains.

We can use a mutual fund's CGRR to generate a measure of an individual investor's expected future tax burden on the fund's unrealized capital gains. If we assume that the CGRR is a fund-specific constant, and that the nominal interest rate, r, the tax rate on

capital gains, τ_{CG}, and the tax rate on interest income, τ_{INT}, are all constants, then the expected present discounted value of the future tax payments on \$1 of unrealized capital gain in fund i in period t is:

$$\begin{aligned} EPVCG_{i,t} &= \tau_{CG} CGRR_{i,t} + \frac{\tau_{CG} CGRR_{i,t}(1 - CGRR_{i,t})}{(1 + r(1 - \tau_{INT}))} + \\ &\quad \frac{\tau_{CG} CGRR_{i,t}(1 - CGRR_{it})^2}{(1 + r(1 - \tau_{INT}))^2} + ... \\ &= \tau_{CG} CGRR_{i,t} \sum_{0}^{\infty} \frac{(1 - CGRR_{i,t})^k}{(1 + r(1 - \tau_{INT}))^k} \\ &= \tau_{CG} \frac{CGRR_{i,t}(1 + r(1 - \tau_{INT}))}{CGRR_{i,t} + r(1 - \tau_{INT})} \end{aligned} \tag{4.3}$$

In our calculations, we assume that $r = 0.05$, $\tau_{CG} = 0.20$ and $\tau_{INT} = 0.31$, and we then calculate fund-specific expected tax rates on capital gains each period. In fact, however, the nominal interest rate as measured by the 30-year Treasury constant maturity rate has ranged from 5% to 8% over our sample period. We allow the capital gains realization rates to vary across fund-years in most of our analysis, but one could alternatively assume that the CGRR is constant and construct an estimate of this value by averaging the results from different years.

Figure 4.1 shows the relationship between EPVCG and CGRR, under several assumptions about the nominal interest rate, r. The relationship between EPVCG and CGRR, when CGRR is between 0 and 100%, is concave. When CGRR rises slightly above 0, EPVCG rises at a rapid rate and then starts to asymptote towards 20%, the statutory tax rate on realized capital gains. When the nominal interest rate is 5%, EPVCG is already 18%, very close to the statutory capital gains tax rate, when CGRR is around 20%. For an EPVCG of 10%, given a nominal interest rate of 5%, CGRR must only be 3%.

The CGRR is the starting point for a forward-looking measure of a fund's tax burden that can be applied to the fund's accruing capital gains. We construct this "expected present value tax" measure as

$$EPVT_{i,t} = \tau_{DIV}\, d_{i,t} + EPVCG_{i,t}(g_L + g_S + u)_{i,t} \tag{4.4}$$

This expression assumes that investors assess the prospective tax burden on all of a fund's accruing gains in a given period by using the forward-looking EPVCG measure.

It assumes that investors do not distinguish between gains that the fund realizes in the current period, and all other accruing gains. A variant of this approach would replace τ_{UCG} in equation (4.1) with EPVCG, while still applying the statutory tax rate to any realized gains. The logic behind equation (4.4) is that it treats all accruing gains in the same way, and assumes that investors forecast their prospective tax burden on the basis of the capital gain realization rate. We have also considered the alternative approach, and the empirical findings are similar to the ones we report below.

We begin to apply our approach to measuring tax rates by considering the largest U.S. equity mutual funds. Table 4.1 reports the capital gain realization rates for the twenty largest U.S. equity mutual funds at the end of calendar year 2001. These funds include both actively managed and index funds, and they represent a range of different mutual fund families. The two largest funds, Fidelity Magellan and Vanguard Index 500, have more than $70 billion under management, while the smallest fund in the table has just over $15 billion in assets.

The entries in Table 4.1 show wide dispersion in the capital gains realization rates across funds in a given year and for a given fund over time. Consider the entries for calendar year 2001, a year when the market generated losses for many funds. In this case the highest CGRR is for the American Funds Fundamental Investor fund, which recorded a value of 18.75. For eight of the twenty largest funds, the CGRR was zero for 2001, and for two funds it could not be computed, because the denominator, the stock of unrealized gains plus realizations, was negative. The dispersion is greater in many of the earlier years, when most funds had accruing gains. In 1999, for example, the highest realization rate was for the Vanguard Windsor fund – it realized 35.3 percent of its available gains. The lowest realization rates were also for Vanguard funds. The Index 500 realized 1.7 percent of its gains, and the Total Stock Market Index fund realized 2.8 percent of its gains. There was a clear contrast between the two largest funds, with the CGRR for the Fidelity Magellan fund nearly ten times that of the Vanguard Index 500.

The rows of Table 4.1 show significant variation in fund realization rates from year to year. The realization rate for the Fidelity Magellan fund, for example, ranges from 2.7 percent (2001) to 69.5 percent (1996). The variation is generally greater for actively managed funds than for index funds. The American Funds ICA fund, the third largest fund in 2001, reports CGRR values between 57.3 and 7.4. These two extreme years are

adjacent, and show that after a year of high realizations, 2000, a fund may have a year of low realizations, reflecting the smaller pool of gains available for realization.

While the data for the largest funds is instructive, we also consider a much larger sample of equity mutual funds when we consider the determinants of mutual fund inflows. Our data come from Morningstar, Inc. We analyze a sample of broad domestic equity retail mutual funds and have annual data on these funds from 1993 to 2001. Table 4.2 shows how the data sample changes with the various restrictions we impose. We exclude funds that are younger than 3 years, following Chevalier and Ellison (1997), and fund-years with net inflows less greater than 1,000%, following Bergstresser and Poterba (2002). We also exclude funds that serve primarily institutional investors, as these investors are tax exempt, and funds that are not rated by Morningstar. These restrictions leave us with a sample of 12,335 fund-years, with the number of funds increasing over the period 1993 to 2001, as more funds are begun. We also exclude fund-years for which CGRR is greater than 100% or less than 0, because in our later analysis we treat the CGRR as though it was the probability of the fund realizing gains in each period. This eliminates 1,119 fund-years. Of these, 1,119 fund-years, 399 are in 2001 and 380 in 2000. This is due both to the larger overall sample in these years, and to the sharp coincident drop in equity prices.

Table 4.3 shows the annual sums of dividend and capital gain distributions and net assets of our sample of mutual funds. In 2000, our sample accounted for $13.5 billion in dividend distributions, $183 billion in capital gains distributions, and nearly $2 trillion in net assets. Total capital gains distribution and net assets grew with both asset prices and the number of funds during the period 1993-2000, but then fell sharply in 2001. The total amount of capital gains distributions in 2001 was only $18.5 billion, only one tenth of the value of the previous year. This reflects the general decline in equity values between 2000 and 2001.

Tables 4.4 and 4.5 provide summary statistics for the pre-tax returns, CGRRs, and two tax burden measures for our sample of mutual funds. Table 4.4 provides summary statistics for the entire sample period and Table 4.5 provides annual summary statistics. We report both weighted and unweighted summary statistics, but we focus on the results weighted by beginning-of-year net assets, since we use these weightings in our regression analysis. We weight our observations by net asset size because most of our variables are expressed as percentages of net assets and, therefore, funds with smaller asset bases will have larger

variances in these variables.

The average pretax return over the whole sample period is around 9%, but this average varies substantially year-by-year. This movement reflects general movements in the U.S. stock market over the sample period. With the exception of 1994 and 1993, the average annual pretax return is well above 15% during the 1990s. The pretax return then falls in starting in 2000, which has a -5% average pretax return, and then the average pretax return falls to around -13% in 2001. The average CGRR during the 1990s, when returns were strong, is fairly large, about 20%. The average CGRR in the sample actually rises in 2000, as the stock prices were declining, and then falls dramatically to an average of 5% in 2001. The temporary rise in CGRR occurs because funds were realizing capital gains from the stock price run-up in the late 1990s before the market correction. These capital gains distributions are reported at the end of 2000 when the stock of unrealized capital gains was much smaller than it was when the gains were being realized. The average tax burdens are larger in the 1990s when returns were higher, reflecting the greater number of dividend and capital gains distributions.

4.4 Explaining Inter-fund Differences in Capital Gain Realization Rates

The statistics in Table 4.1 suggest that funds differ in their CGRRs, and that even within the universe of actively managed funds, there is significant variation. We now consider the variation in the CGRR across individual funds, and seek to explain the differences as a function of fund characteristics. We estimate reduced form regression models with CGRR as the dependent variable. Table 4.6 reports these models. In the first specification, we relate the CGRR to two indicator variables, one for whether the fund is an index fund and the other for whether it is a tax-managed fund, as well as the fund's turnover rate. The regression model also includes time effects, indicator variables for each year. The coefficients on the two indicator variables are negative and suggest that both index funds and tax-managed funds have statistically significantly lower capital gain realization rates. The differences between these funds and the broad sample of other funds are substantively important. The average capital gains realization rate in our sample of 8,674 fund-years is 22.3 percent, while for index funds it is only 7.8 percent, and for tax-managed funds it is

10.4 percent.

A fund's turnover rate is also a statistically significant determinant of the CGRR. A ten percentage point increase in turnover, from 0.50 to 0.60, for example, is associated with an increase of roughly 0.9 percent in the capital gain realization rate. This suggests that the difference between the CGRR of index funds and tax managed funds, and all other funds, is not due just to differences in turnover rates between these funds and actively-managed funds.

The second column of Table 4.6 presents an expanded regression model with several additional explanatory variables. These include the age of the fund, the fund's lagged inflow and pre-tax return, and the tenure of the fund manager. The coefficients on turnover and the indicator variables for index funds and tax-managed funds are not substantially changed by including these new covariates, or by including indicator variables for funds with different investment styles. The age of the fund does not appear to be an important determinant of the capital gain realization rate. A fund's pretax return is negatively associated with the CGRR, suggesting that when a fund experiences large accruing gains, it does not increase the flow of capital gain realizations commensurately. The regression also shows that funds with managers who have been in the job for less than a year have higher CGRRs. This is a substantively important effect: a recent manager change raises the CGRR by 14 percentage points, relative to a sample mean of 22 percent.

4.5 Comparing the Performance of Alternative Measures of Mutual Fund Tax Burdens

The foregoing discussion explained how a fund's capital gains realization rate could be used to estimate the expected present discounted value of capital gains taxes per dollar of accruing capital gains. Table 4.7(a) presents these results for the largest equity mutual funds in 2001. The estimated tax burden is a function of the estimated capital gain realization rate (CGRR) and the assumed after tax return available to the investor on accruing gains which are kept in the fund. Given our assumptions that $r = 0.05$ and $\tau_{INT} = 0.31$, differences in the capital gain realization rates across funds map into differences in the capital gains tax burdens in Table 4.7(a). For the Fidelity Magellan fund, the expected PDV of future taxes to be paid on a dollar of capital gains averaged 16.6 cents over the 1993-2001 period. This

was lower than the statutory capital gains tax rate of 20 percent, and it reflects the value of deferral on accruing capital gains. Fidelity Magellan's average capital gain realization rate over this period was 25 percent, so the expected holding period for assets with capital gains was about four years. The difference between 20 percent and 16.6 percent reflects the value of deferring accruing capital gains, on average, by four years.

Because we construct the CGRR measure using data from only the current year, the measure of expected tax rates can vary substantially from year to year for a given fund as a function of year-to-year variation in realization activity. For Fidelity Magellan, for example, in 1996, when the CGRR was 69.5 percent, the expected PDV tax rate was 19.7 percent. With such a high CGRR, there is a minimal amount of deferral to create a distinction between the statutory and the expected present value tax rate. The estimated capital gain realization rate for 2001, on the other hand, was only 2.7 percent, which corresponds to a 9.0 percent expected PDV tax rate on capital gains.

Nonlinearity in the relationship between expected tax rates and capital gain realization rates mean that we must take care in aggregating numbers, for a given fund, across years. Consider a fund which realizes all of its available gains in even years and no gains in odd years. We would assign a 20% tax rate to such a fund in its realization years, and a zero tax rate in the non-realization years. The average expected tax rate of 10% would not be as informative as the expected tax rate based on the average realization propensity of 50%. The key nonlinearity is that the expected present discounted value tax rate is very low when the realization rate is very low, but that even modest increases from very low realization rates can result in substantial increases in the tax burden. The effect of small changes in the realization rate at high levels is very modest.

Table 4.7(b) repeats the same exercise as Table 4.7(a), but calculates the backward-looking tax burden measure described in equation (4.1). This is based on each fund's realization behavior in each year, and an effective tax rate of 20 percent is assigned to realized gains. An effective tax rate of 10% is assigned to the portion of capital gains that accrue but remain unrealized by the end of the year. This approach does not use information on the fund's realization rate to attempt to calibrate the future tax burden on accruing gains. Table 4.7(b) highlights the broad differences in tax burdens between high-realization and low-realization funds. The average backward-looking tax burden measure of the Fidelity Magellan fund over the period is 2.61%, while the Vanguard Index 500 Fund

has the lowest average, at 1.92%.

Table 4.7(c) describes the variation in the forward-looking tax burden measure, defined in equation (4.4), for the largest funds. This forward-looking measure uses the historical realization rates to project future capital gains tax burdens. When the CGRR is undefined, as it is when the stock of net accrued gains becomes negative, this tax burden measure is also undefined. Like the other versions of Table 4.7, Table 4.7(c) shows the average forward-looking tax burden measure over the entire period, as well as the measure computed separately for each year. The average forward-looking measure for the Fidelity Magellan fund is 2.73 percent over this period, remarkably close to the average backward-looking measure of 2.61 percent. The pattern of forward-looking tax burdens for this fund is also quite similar to the pattern for backward-looking burdens, with troughs in 1994 and 2001 and a peak in between.

The similarity of the measures reflects the fact that the two measures are just different ways of collapsing the information contained in the most recent year of the fund's experience. The difference is that the expected forward-looking measure uses additional information, notably the fund's capital gain overhang, and it combines the information in a highly non-linear way designed to capture more accurately the effective tax rate on accruing unrealized gains.

We now consider the explanatory power of the two measures of tax burdens in forecasting mutual fund inflows. We follow Bergstresser and Poterba (2002), and rely on data from Morningstar. We compute net inflows during each year, I_t^u, as a fraction of fund assets at the end of the previous year, as

$$I_t^u = Assets_t/Assets_{t-1} - (NAV_t + DIV_t + GAINS_t)/NAV_{t-1}. \tag{4.5}$$

In this equation, DIV_t and $GAINS_t$ correspond to dividend and capital gain distributions, respectively.We adjust this measure, which is common in the empirical literature on fund inflows, to allow for the return on fund shares within the year. Our modified measure is I_t, defined as $I_t = I_t^u\ /(1 + R_t/2)$ where R_t denotes the fund's return over the calendar year.

We investigate whether inter-fund differences in tax burdens, either backward-looking or forecast, explain fund inflows. We model mutual fund inflows as a function of past returns

and other fund characteristics:

$$I_{i,t} = R_{i,t-1} * \theta + X_{i,t} * \phi + \nu_t + \varepsilon_{i,t} \tag{4.6}$$

$I_{i,t}$ is the fund's inflow, $R_{i,t-1}$ denotes a fund's past returns, possibly risk-adjusted, and the $X_{i,t}$ vector includes other factors that may explain fund inflows, including either the lagged tax burden measure or the forward-looking tax burden. The variables included in $X_{i,t}$ are control variables that may influence inflows for reasons unrelated to returns. These include fund age, the initial size of the fund, fund turnover, the fund's stock of unrealized capital gains, and the fund's objective. We also include year-specific indicator variables in the estimating equations.

Table 4.8 uses the various measures of tax burden in inflow regressions. The first two columns use data for the 1993-1999 period, the same years as Bergstresser and Poterba (2002). The regressions in these columns confirm the results of that study; there is strong evidence that inflows are lower to funds that lower tax burdens, however measured. The third and fourth columns of Table 4.8 add data from 2000 and 2001 to the sample. Starting with the fourth column, adding the two new years of data does not change the basic findings. The coefficient on the pretax return declines, however, from 1.42 over the 1993-1999 sample to 0.922 for the 1993-2001 sample. This decline is statistically significant at the 1% level. More importantly, the forward tax burden measure has a statistically insignificant effect on inflows once data from 2000 and 2001 are added to the analysis.

An example may help to explain the loss of explanatory power for the forward-looking tax burden measure around the onset of the broad stock market decline in 2000. Consider a fund which starts the year with a stock of (net) unrealized gains equal to 20% of the value of the fund, and holds no dividend-paying stocks. Suppose this fund passed through 10% capital gains, and has an unrealized loss of 15% (for a net of –5%.) If we were to compare this fund to a fund which is the same in every dimension except for passing through 15% in capital gains and having an unrealized loss of 20% (again for a net of –5%), an interesting problem emerges. These two funds have the same pre-tax return, and the second fund arguably has worse tax management because it is passing through more capital gains. But, because total capital gains (realized and unrealized together) are negative, applying the higher estimated realization rates to the negative capital gain amount gives a measure of

the tax burden that is lower, strangely suggesting MORE able tax management.

Table 4.9 shows that the finding that the forward-looking capital gains measure loses power in 2000 and 2001 is not just the result of the lack of covariates in the estimated regression. Table 4.9 is similar to Table 4.8, except that it includes a variety of covariates, such as the capital gain overhang, lagged inflow, fund age, fund size, and expense ratios. The results for the 1993-1999 sample are again similar to the findings in Bergstresser and Poterba (2002), while the findings for the longer sample are again somewhat different and suggest weaker effects of tax burdens on inflows.

The empirical findings suggest an interesting challenge to the analysis of taxes and investor behavior. The backward-looking measure of fund tax burdens has a statistically significant, and substantively important, effect on inflows for both the 1993-1999 and 1993-2001 samples. Yet the coefficient on the forward-looking tax rate measure changes substantially from the first sample to the second. This may be due to the presence of many funds with capital gains realization rates that are within the unit interval, but near the edges. The CGRR measure is may not be very informative when values in these ranges are generated by unrealized losses. It may be that investors simply extrapolate a fund's tax burdens to the future, which could explain the stronger performance of the backward-looking measure.

We re-estimated the regressions in Table 4.9 on the sub-sample of fund-years which had net positive unrealized capital gains. In the 1993-1999 period, the coefficients on the tax burden measures are very similar to those estimated on the entire sample and are significant at the 10% level - -3.33 on the 'backward' measure and -2.14 on the 'forward' measure. In the 1993-2001 period the coefficient on the 'backward' measure was -1.96 and the coefficient on the 'forward' measure was -0.196. Neither of these coefficients was statistically significant at the 10% level. This analysis suggests that there is more behind the inability of the 'forward' tax burden to explain fund inflows during 2000 and 2001 than the fact that we do not accurately model the treatment of capital losses in our calculation of CGRR.

The continuing strong predictive performance on the backward-looking capital gains measure, coupled with the deterioration in predictive performance of the forward-looking measure, is a bit of a puzzle. One possible interpretation is that investors who already own shares in a fund are less reluctant to sell shares of funds which have recently distributed significant amounts of capital gains; the marginal taxes incurred by from selling out positions in a fund fall as the fund distributes increasing amounts of gains.

4.6 Conclusion and Directions for Future Work

This chapter has attempted to formulate a prospective measure of the tax burden faced by taxable investors in mutual funds. Past research on the effect of taxes on mutual fund manager and investor behavior suffered from the fact that measures of investors' tax liabilities did not model expectations about these liabilities. However, to properly evaluate the effect of taxes on investor behavior one must try to get a measure of investor beliefs about taxes at the time these investors made decisions about where to invest their money.

Our new tax burden measure is prospective in that it models individual mutual funds' capital gains realization behavior, and using the simple assumption that a fund's last period capital gains realization rate will be its next period capital gains realization rate we have calculated a forward-looking effective tax rate on capital gains. We model investor expectations as following the simple rule of expecting next period's return to equal last period's return and to be made up of dividends and capital gains in the same proportions as in the last period. Based on these assumptions, we calculate a tax burden measure which is forward-looking in its treatment of capital gains taxes.

In the process of calculating these prospective tax burdens we explored the cross-sectional and time-series variation in the capital gains realization rates of a sample of broad domestic equity mutual funds. We discovered, perhaps unsurprisingly, that funds with higher turnover rates had higher capital gains realization rates. Funds with new managers also had higher capital gains realization rates as new managers tend to shift investing strategies, resulting in the sale of assets that had accrued gains. We also discovered that within funds there is substantial variation in capital gains realization ratios. This is especially true when asset prices fluctuate greatly, as they did from 1999 to 2001, when the U.S. stock market saw a massive decline in equity prices after a long period of stock price growth in the late 1990s. Variation in capital gains realization ratios within mutual funds is driven both by changes in manager trading and investing strategy and by the prices of the funds assets and flow of money into the fund.

We compared the performance of the forward-looking tax burden measure with a more standard backward-looking measure for forecasting fund inflows. Funds with higher backward-looking or forward-looking tax burdens experienced lower inflows in the 1993-1999 period, although for the 1993-2001 sample, we found strong effects only for the backward-looking

measure.

The results in this chapter suggest several directions for further research. The most significant need is the conceptual development of forward-looking measures of capital gains tax burdens that recognize the role of capital loss carry-forwards within mutual funds. Our tax measure allows for fund-specific variation in the probability of realizing an accrued capital gain. This approach can offer a reasonable guide to the expected present discounted value of future taxes for a fund that is accruing capital gains and that has a stock of accrued but unrealized capital gains. For a fund that is accruing losses, however, the concept of the gain realization rate is not relevant. Rather, one needs to estimate how the accrual of an additional gain today will affect the expected present discounted value of future taxes over the time that the investor holds his fund shares. This requires analyzing whether the accruing losses can be used to offset previously-accrued but unrealized gains, and if they cannot be, modeling when the fund is likely to exhaust its loss carry-forwards and to return to taxable status. This will require analyzing not just the past relationship between fund returns and investor taxes, but also including information on the stock of realized and unrealized loss carry-forwards in the tax burden computation. An acceptable measure should provide insight on investor tax burdens both in rising stock markets, when most funds are generating gains, but also in falling markets, when capital losses exceed capital gains.

Another issue which could be explored in future research is whether differences in the capital gain realization rates across funds are due to manager style and preferences, or whether they are due to fund characteristics and objectives, perhaps related to investor clienteles. We find that some types of funds, particularly index funds and those that market themselves as tax-managed, have low capital gain realization rates. We have not explored the variation in CGRR more generally within the set of actively managed funds that do not fall into these categories. Data on the identity of managers at individual funds would make it possible to investigate these issues.

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4.7 Figures and Tables

Figure 4.1 Effective Tax Rate on Acruing Capital Gains (EPVCG) as a Function of the Capital Gains Realization Rate (CGRR) and the Nominal Interest Rate, r%

figure

figure

figure

Table 4.1 Capital Gains Realization Rates for the Largest 20 Domestic Equity Mutual Funds in 2001

Mutual Fund Name	Net Assets in 2001 ($ millions)	Average (1993-2001)	Capital Gains Realization Rates (%) 2001	2000	1999	1998	1997	1996	1995	1994	1993
Fidelity Magellan Fund	79,515	25.01	2.67	9.61	15.63	8.83	40.60	69.48	14.96	34.80	28.48
Vanguard Index 500 Fund	73,151	1.22	0.00	0.00	1.69	0.79	1.79	1.48	0.86	3.96	0.44
American Funds Investment Company of America Fund	54,008	18.54	7.37	57.25	15.26	18.39	16.67	11.73	12.31	14.36	13.51
American Funds Washington Mutual Investors Fund	48,135	15.47	10.18	27.24	23.11	18.42	11.77	13.63	13.42	12.19	9.28
American Funds Growth Fund of America	35,402	19.50	0.00	41.93	16.90	18.32	43.93	12.30	17.18	12.87	12.08
Fidelity Growth and Income Fund	34,255	16.40	2.82	18.47	12.77	10.31	10.63	14.79	14.26	44.85	18.68
Fidelity Contrafund	32,321	26.57	0.00	44.19	27.90	16.72	24.58	35.30	25.54	27.15	37.75
American Century Ultra Fund	26,911	15.83	0.00	33.54	6.03	23.15	37.59	16.70	11.07	14.42	0.00
Janus Fund	25,622	22.98	0.00	56.17	18.85	8.57	37.35	30.67	8.14	21.44	25.59
Fidelity Growth Company Fund	22,742	21.74	NA	25.93	11.76	16.88	23.88	17.23	15.27	34.25	28.74
Vanguard Windsor II Fund	22,429	19.24	3.15	15.96	30.33	24.88	17.14	11.91	12.68	42.38	14.76
Fidelity Blue Chip Growth Fund	21,959	22.24	0.00	14.43	8.31	9.95	15.60	40.77	36.44	22.38	52.28
Fidelity Equity-Income Fund	21,832	15.65	9.52	22.02	19.77	10.68	10.27	15.18	14.01	37.56	1.86
American Funds Fundamental Investor	19,100	23.62	18.75	27.47	21.64	26.37	25.71	24.59	11.28	18.63	38.11
Vanguard PRIMECAP Fund	18,096	8.63	3.81	15.35	12.81	6.76	7.25	7.48	6.77	7.98	9.50
Vanguard Windsor Fund	16,027	39.54	12.40	50.21	35.26	44.13	34.64	20.55	33.33	97.99	27.33
Putnam Voyager Fund	15,953	17.96	NA	32.67	15.62	16.39	16.14	17.91	14.98	18.01	11.94
Vanguard Total Stock Market Index Fund	15,782	2.38	0.00	2.04	2.84	1.46	3.70	3.72	2.91	-----	-----
Fidelity Dividend Growth Fund	15,210	21.98	11.46	21.07	27.98	26.63	33.13	11.63	-----	-----	-----
Janus Twenty Fund	15,082	15.79	0.00	15.07	9.07	1.42	33.17	45.71	25.52	0.00	12.16

A cell with NA indicates that the capital gains realization rate for that fund-year is greater than 100% or less than 0%.

Table 4.2 How Sample Size Varies with Data Restrictions

	Total	1993	1994	1995	1996	1997	1998	1999	2000	2001
Equity Funds	21,792	882	1,121	1,412	1,707	2,265	2,808	3,193	3,858	4,546
Age >= 3	15,437	662	750	920	1,168	1,548	1,886	2,325	2,857	3,321
Inflow < 10	14,993	644	717	878	1,151	1,529	1,837	2,277	2,761	3,199
Non-institutional fund	12,344	605	647	756	965	1,273	1,512	1,834	2,181	2,571
Has Morningstar rating	12,335	602	647	755	964	1,273	1,512	1,834	2,180	2,568
CGRR between 0 and 1	11,216	575	589	730	945	1,245	1,401	1,762	1,800	2,169
Not missing any RHS variable used in any regression	7,172	0	510	627	840	969	1,139	1,389	1,343	355

Data are from Morningstar.

Table 4.3 Total Capital Gains and Dividend Distributions in Sample with CGRR between 0 and 100% (N=11,216)

	Total Dividend Distributions ($ millions)	Total Capital Gains Distributions ($ millions)	Total Year-End Net Assets ($ millions)
1993	8,890	26,376	459,591
1994	7,407	21,411	431,629
1995	10,683	42,519	719,815
1996	12,654	70,356	985,370
1997	13,879	122,898	1,346,780
1998	13,721	104,714	1,705,238
1999	13,691	169,482	2,226,994
2000	13,476	182,877	1,980,574
2001	10,772	18,512	1,652,854

Table 4.4 Summary Statistics for Sample with CGRR between 0 and 100% (N = 11,216)

Panel A - Observations weighted equally

	N	Mean	Standard Deviation	25th percentile	Median	75th percentile
%						
Pretax return	11,216	11.0	21.8	-3.39	11.8	23.6
Dividend yield	11,216	0.573	0.964	0	0.046	0.884
Capital gains distributions	11,216	7.10	8.35	0.695	5.22	10.6
Capital gain overhang	11,216	16.3	39.8	9.0	20.0	30.0
Capital gains realization rate	11,216	22.4	21.3	3.14	18.9	33.7
Backward-looking tax burden	11,216	2.09	2.68	0.24	2.16	3.77
Forward-looking tax burden	11,216	2.03	2.97	0	1.56	3.81
Net inflow	11,216	20.0	75.7	-11.5	1.24	25.4

Panel B - Observations weighted by beginning-of-year net assets

	N	Mean	Standard Deviation	25th percentile	Median	75th percentile
%						
Pretax return	11,216	8.98	20.6	-7.98	10.0	23.4
Dividend yield	11,216	0.906	1.01	0	0.663	1.46
Capital gains distributions	11,216	6.58	6.22	1.38	5.47	9.61
Capital gain overhang	11,216	23.2	20.9	14.0	25.0	36.0
Capital gains realization rate	11,216	20.2	18.8	6.03	16.1	28.4
Backward-looking tax burden	11,216	1.86	2.47	-0.118	2.09	3.64
Forward-looking tax burden	11,216	1.82	2.76	0	1.47	3.81
Net inflow	11,216	4.48	28.6	-8.00	-0.270	11.6

Table 4.5 Annual Means for Sample with CGRR between 0 and 100%

Panel A - Observations weighted equally

Year	N	Pretax return	CGRR	Backward tax burden	Forward tax burden
1993	575	13.20%	20.00%	2.79%	2.29%
1994	589	-2.00	44.0	0.913	-0.176
1995	730	30.8	20.9	4.74	4.76
1996	945	18.5	27.4	3.70	3.16
1997	1,245	23.8	26.4	3.74	4.00
1998	1,401	13.8	23.4	2.19	2.03
1999	1,762	26.6	21.7	3.66	3.73
2000	1,800	-1.92	32.4	0.811	-0.291
2001	2,169	-10.5	9.22	-0.839	-0.025

Panel B - Observations weighted by beginning-of-year net assets

Year	N	Pretax return	CGRR	Backward tax burden	Forward tax burden
1993	575	14.40%	21.60%	2.99%	2.52%
1994	589	-0.882	29.4	1.09	0.141
1995	730	32.3	18.6	4.96	5.15
1996	945	18.1	25.4	3.57	3.12
1997	1,245	24.9	23.2	3.78	4.13
1998	1,401	13.1	15.9	2.84	2.93
1999	1,762	23.5	18.9	3.39	3.41
2000	1,800	-5.04	30.2	0.393	-0.605
2001	2,169	-13.1	5.83	-1.10	-0.093

Table 4.6 CGRR Determinant Regressions

	Mean	(1)		(2)	
Turnover	0.648	8.98	***	9.37	***
		(1.23)		(1.03)	
Pre-tax Return	12.3			-0.166	***
				(0.0335)	
Inflow	5.64			-0.0022	
				(0.0103)	
Index fund	6.08	-15.5	***	14.1	***
		(2.69)		(2.75)	
Tax managed fund	0.446	-11.9	***	-10.2	***
		(4.06)		(3.79)	
Manager tenure < 1 yr	2.15			14.4	**
				(6.97)	
Manager tenure = 1 yr	6.11			4.52	*
				(2.35)	
8 < Age <= 16	27.8			-1.79	
				(1.12)	
16 < Age	55.1			1.35	
				(1.05)	
Year Dummies?		Yes		Yes	
Style Dummies?		No		Yes	
R^2		0.288		0.356	
N		8,674		8,674	

Regressions weight observations by beginning-of-year net assets. Standard errors are corrected for clustering at the mutual fund level. The net asset weighted mean of CGRR is 21.3 for 1993-1999 and 22.3 for 1993-2001. Sample includes only observations for which CGRR is between 0 and 100%.

Table 4.7(a) Expected PDV Tax Rates on Capital Gains for the Largest 20 Domestic Equity Mutual Funds in 2001

Mutual Fund Name	Net Assets in 2001 ($ millions)	Average (1993-2001)	Expected PDV Tax Rate on Capital Gains (%)								
			2001	2000	1999	1998	1997	1996	1995	1994	1993
Fidelity Magellan Fund	79,515	16.55	9.02	15.22	16.95	14.88	19.07	19.71	16.81	18.82	18.45
Vanguard Index 500 Fund	73,151	4.61	0.00	0.00	6.80	3.87	7.06	6.22	4.13	11.05	2.35
American Funds Investment Company of America Fund	54,008	16.71	14.09	19.51	16.88	17.42	17.14	15.99	16.16	16.68	16.48
American Funds Washington Mutual Investors Fund	48,135	16.60	15.45	18.36	18.00	17.43	16.00	16.51	16.46	16.13	15.08
American Funds Growth Fund of America	35,402	15.41	0.00	19.12	17.18	17.41	19.18	16.16	17.23	16.32	16.09
Fidelity Growth and Income Fund	34,255	16.03	9.31	17.43	16.29	15.50	15.62	16.78	16.66	19.21	17.46
Fidelity Contrafund	32,321	16.37	0.00	19.19	18.41	17.15	18.14	18.85	18.23	18.36	18.96
American Century Ultra Fund	26,911	13.17	0.00	18.76	13.16	18.01	18.95	17.15	15.77	16.70	0.00
Janus Fund	25,622	15.54	0.00	19.49	17.49	14.75	18.94	18.60	14.53	17.82	18.23
Fidelity Growth Company Fund	22,742	17.61	NA	18.26	16.00	17.18	18.08	17.24	16.88	18.80	18.47
Vanguard Windsor II Fund	22,429	16.56	9.88	17.01	18.58	18.17	17.22	16.04	16.26	19.13	16.77
Fidelity Blue Chip Growth Fund	21,959	15.44	0.00	16.70	14.62	15.36	16.94	19.08	18.90	17.93	19.41
Fidelity Equity-Income Fund	21,832	15.72	15.19	17.89	17.62	15.64	15.49	16.86	16.60	18.95	7.24
American Funds Fundamental Investor	19,100	17.85	17.47	18.38	17.85	18.30	18.24	18.14	15.84	17.46	18.97
Vanguard PRIMECAP Fund	18,096	14.36	10.85	16.89	16.30	13.70	14.02	14.16	13.70	14.44	15.18
Vanguard Windsor Fund	16,027	18.58	16.19	19.36	18.85	19.19	18.82	17.72	18.75	19.99	18.37
Putnam Voyager Fund	15,953	17.17	NA	18.71	16.95	17.09	17.05	17.35	16.82	17.36	16.05
Vanguard Total Stock Market Index Fund	15,782	7.73	0.00	7.68	9.33	6.15	10.71	10.74	9.46	-----	-----
Fidelity Dividend Growth Fund	15,210	17.52	15.90	17.78	18.42	18.32	18.74	15.96	-----	-----	-----
Janus Twenty Fund	15,082	12.24	0.00	16.84	14.99	6.04	18.74	19.24	18.23	0.00	16.12

A cell with NA indicates that the capital gains realization rate for that fund-year is greater than 100% or less than 0%.

Table 4.7(b) Backward-Looking Tax Burdens for the Largest 20 Domestic Equity Mutual Funds in 2001

Mutual Fund Name	Net Assets in 2001 ($ millions)	Average (1993-2001)	Backward-Looking Tax Burdens (%)								
			2001	2000	1999	1998	1997	1996	1995	1994	1993
Fidelity Magellan Fund	79,515	2.61	-1.01	-0.52	3.38	3.98	3.59	3.96	5.11	0.53	4.50
Vanguard Index 500 Fund	73,151	1.92	-0.98	-0.70	2.44	3.20	3.78	2.82	4.37	0.76	1.57
American Funds Investment Company of America Fund	54,008	2.65	0.08	1.35	2.91	3.64	4.44	3.26	4.55	1.13	2.45
American Funds Washington Mutual Investors Fund	48,135	2.80	0.76	2.12	1.42	3.18	4.50	3.57	6.00	1.20	2.43
American Funds Growth Fund of America	35,402	2.90	-1.19	2.27	5.94	4.43	4.06	2.65	4.82	0.84	2.27
Fidelity Growth and Income Fund	34,255	2.42	-0.65	0.83	1.82	3.48	3.72	3.05	4.73	1.61	3.19
Fidelity Contrafund	32,321	2.73	-1.16	0.52	4.32	4.19	3.48	3.94	5.54	0.02	3.72
American Century Ultra Fund	26,911	2.35	-1.46	-1.00	4.53	4.52	4.76	2.57	4.91	0.18	2.18
Janus Fund	25,622	2.59	-2.61	-0.31	6.19	4.27	4.36	4.44	4.29	0.26	2.44
Fidelity Growth Company Fund	22,742	3.45	NA	0.25	8.99	3.56	3.03	2.62	5.11	0.50	3.55
Vanguard Windsor II Fund	22,429	2.70	0.15	2.64	0.75	2.99	4.71	4.05	5.42	1.06	2.58
Fidelity Blue Chip Growth Fund	21,959	2.51	-1.63	-0.59	2.84	3.89	3.39	2.95	4.67	1.41	5.65
Fidelity Equity-Income Fund	21,832	2.49	0.01	1.74	1.93	2.01	3.88	3.48	4.56	1.81	3.01
American Funds Fundamental Investor	19,100	2.82	-0.55	1.39	3.63	2.90	4.25	3.78	4.53	1.09	4.36
Vanguard PRIMECAP Fund	18,096	2.62	-1.15	1.28	5.15	3.09	4.23	2.48	4.30	1.67	2.53
Vanguard Windsor Fund	16,027	3.15	1.04	3.07	2.72	1.07	4.31	4.86	5.74	1.76	3.77
Putnam Voyager Fund	15,953	2.79	NA	-0.79	6.84	3.18	3.32	2.57	5.33	0.80	1.04
Vanguard Total Stock Market Index Fund	15,782	2.02	-0.89	-0.79	2.72	2.68	3.60	2.62	4.21	-----	-----
Fidelity Dividend Growth Fund	15,210	2.61	-0.17	2.18	1.73	4.40	3.99	3.51	-----	-----	-----
Janus Twenty Fund	15,082	3.20	-2.79	-3.01	7.29	7.53	4.64	6.72	8.10	-0.61	0.89

A cell with NA indicates that the capital gains realization rate for that fund-year is greater than 100% or less than 0%.

Table 4.7(c) Forward-Looking Tax Burdens for the Largest 20 Domestic Equity Mutual Funds in 2001

Mutual Fund Name	Net Assets in 2001 ($ millions)	Average (1993-2001)	Forward-Looking Tax Burdens (%)								
			2001	2000	1999	1998	1997	1996	1995	1994	1993
Fidelity Magellan Fund	79,515	2.73	-0.96	-1.35	4.00	5.01	5.17	2.12	6.28	-0.32	4.57
Vanguard Index 500 Fund	73,151	1.40	0.33	0.30	1.72	1.50	2.79	1.97	2.30	0.66	1.02
American Funds Investment Company of America Fund	54,008	2.70	-0.36	0.91	2.91	4.11	5.32	3.42	5.31	0.39	2.27
American Funds Washington Mutual Investors Fund	48,135	2.89	0.51	1.83	0.42	3.59	5.65	3.71	7.22	0.60	2.49
American Funds Growth Fund of America	35,402	3.36	0.06	1.50	7.69	5.55	5.19	2.51	5.28	0.10	2.40
Fidelity Growth and Income Fund	34,255	2.68	-0.67	-0.18	1.76	4.35	4.87	3.50	6.12	0.65	3.72
Fidelity Contrafund	32,321	3.07	0.14	-1.23	4.51	5.50	4.15	4.07	6.64	-0.20	4.08
American Century Ultra Fund	26,911	2.20	0.00	-3.69	5.42	6.09	4.25	2.41	5.90	-0.62	0.00
Janus Fund	25,622	2.93	0.00	-2.68	8.12	5.77	4.32	3.78	4.96	-0.19	2.26
Fidelity Growth Company Fund	22,742	3.95	NA	-1.16	12.41	4.60	3.39	2.98	6.74	-0.33	2.98
Vanguard Windsor II Fund	22,429	2.84	0.10	3.12	-0.77	3.17	5.90	4.31	6.82	0.16	2.71
Fidelity Blue Chip Growth Fund	21,959	2.93	0.04	-1.68	3.51	5.14	4.66	2.87	5.45	1.75	4.66
Fidelity Equity-Income Fund	21,832	2.42	-0.55	1.60	1.43	2.15	4.90	3.83	5.61	0.38	2.47
American Funds Fundamental Investor	19,100	2.86	-1.47	0.91	4.41	3.20	4.98	3.82	5.66	0.56	3.64
Vanguard PRIMECAP Fund	18,096	3.04	-1.35	0.89	6.69	3.60	5.24	2.71	5.03	1.75	2.78
Vanguard Windsor Fund	16,027	2.93	1.10	3.07	2.35	0.25	4.31	5.01	6.08	0.32	3.87
Putnam Voyager Fund	15,953	3.32	NA	-3.06	9.29	4.00	4.38	2.23	6.70	0.06	2.94
Vanguard Total Stock Market Index Fund	15,782	2.02	0.32	-0.57	2.46	1.79	3.66	2.63	3.89	-----	-----
Fidelity Dividend Growth Fund	15,210	3.28	-0.53	2.26	1.69	6.19	5.24	4.83	-----	-----	-----
Janus Twenty Fund	15,082	3.20	0.19	-5.42	9.73	4.55	5.56	5.55	7.89	0.09	0.70

A cell with NA indicates that the capital gains realization rate for that fund-year is greater than 100% or less than 0%.

Table 4.8 Basic Inflow Regressions

	Mean	(1) 1993-1999	(2) 1993-1999	Mean	(3) 1993-2001	(4) 1993-2001
Pre-tax Return (t-1)	21.2	1.35***	1.42***	18.3	0.566***	0.922***
		(0.145)	(0.154)		(0.113)	(0.0767)
Backward Tax Burden (t-1)	3.37		-6.27***	2.95		-4.71***
			(0.808)			(0.590)
Forward Tax Burden (t-1)	3.34	-4.44***		2.79	-1.04	
		(0.857)			(0.736)	
R^2		0.122	0.120		0.103	0.114
N		5,967	5,967		9,629	9,629

Regressions weight observations by beginning-of-year net assets. Standard errors are corrected for clustering at the mutual fund level. The net asset weighted mean of mutual fund inflows is 7.04 for 1993-1999. The net asset weighted mean of mutual fund inflows is 4.20 for 1993-2001. Sample includes only observations for which the lagged capital gains realization rate is between 0 and 100%.

Table 4.9 Inflow Regressions With Covariates

	Mean	(1) 1993-1999	(2) 1993-1999	Mean	(3) 1993-2001	(4) 1993-2001
Pre-tax Return (t-1)	21.2	1.44***	1.49***	18.3	0.395***	0.619***
		(0.241)	(0.214)		(0.123)	(0.117)
Backward Tax Burden (t-1)	3.37		-3.03***	2.95		-2.60***
			(1.04)			(0.638)
Forward Tax Burden (t-1)	3.34	-2.11**		2.79	-0.394	
		(0.982)			(0.686)	
Capital Gain Overhang (t-1)	26.9	-0.268***	-0.222***	28.5	-0.0276	-0.0184
		(0.0760)	(0.0686)		(0.0465)	(0.0456)
Inflow (t-1)	19.3	0.161***	0.159***	17.2	0.152***	0.147***
		(0.0296)	(0.0301)		(0.0175)	(0.0177)
8 < Age <= 16	29.1	-7.75***	-7.86***	28.7	-6.37***	-6.08***
		(1.85)	(1.90)		(1.22)	(1.22)
16 < Age	53.8	-6.74***	-6.65***	54.5	-4.71***	-4.05**
		(2.04)	(2.09)		(1.55)	(1.53)
Log fund size (t-1)	8.47	-3.15***	-3.21***	8.68	-3.11***	-3.22***
		(0.447)	(0.443)		(0.307)	(0.308)
Expense ratio (t-1)	0.931	-5.70***	-6.23***	0.925	-4.85***	-5.10***
		(1.77)	(1.86)		(1.31)	(1.28)
Turnover (t-1)	0.667	-0.0250**	-0.0205	0.662	-0.0239***	-0.0159
		(0.0124)	(0.0129)		(0.0073)	(0.0080)
Load dummy	0.553	2.01*	1.52	0.542	3.18***	3.26***
		(1.14)	(1.19)		(0.832)	(0.825)
Median market cap	25.94	-0.102**	-0.0939**	33.25	0.00205	0.00063
		(0.0465)	(0.0473)		(0.0249)	(0.0245)
Price/book ratio	6.20	0.941*	1.04*	6.30	1.53***	1.41***
		(0.554)	(0.546)		(0.461)	(0.440)
Morningstar rating	3.77	6.92***	6.43***	3.69	7.52***	7.46***
		(0.821)	(0.834)		(0.589)	(0.616)
R^2		0.406	0.404		0.345	0.347
N		5,967	5,967		9,629	9,629

Regressions weight observations by beginning-of-year net assets. Standard errors are corrected for clustering at the mutual fund level. The net asset weighted mean of mutual fund inflows is 7.04 for 1993-1999. The net asset weighted mean of mutual fund inflows is 4.20 for 1993-2001. Sample includes only observations for which the lagged capital gains realization rate is between 0 and 100%. Also included in the regressions are style and year dummies.